WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

REPORT ON 1996 GEOTECHNICAL AND HYDROGEOLOGICAL SITE INVESTIGATIONS (REF NO. 1784/1)

JUNE 7, 1996

Suite 1400
750 West Pender Street
Vancouver, British Columbia
Canada V6C 2T8
Telephone (604) 685-0543
Telefax (604) 685-0147
CIS: 72360,477

Knight Piésold Ltd.
CONSULTING ENGINEERS

Knight Piésold Ltd.
CONSULTING ENGINEERS

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

REPORT ON 1996 GEOTECHNICAL
AND HYDROGEOLOGICAL SITE INVESTIGATIONS
(REF. NO. 1784/1)

"THIS REPORT HAS BEEN PREPARED EXCLUSIVELY FOR WESTERN COPPER HOLDINGS LIMITED. NO THIRD PARTY SHALL BE ENTITLED TO RELY ON ANY OF THE INFORMATION, CONCLUSIONS, OPINIONS OR ANY OTHER MATTER CONTAINED IN THIS REPORT".

Knight Piésold Ltd.
CONSULTING ENGINEERS

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

REPORT ON 1996 GEOTECHNICAL AND HYDROGEOLOGICAL SITE INVESTIGATIONS (REF. NO. 1784/1)

TABLE OF CONTENTS

TABLES

FIGURES

DRAWINGS

APPENDICES

Appendix B3 AGRA Concrete Aggregate Report

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

REPORT ON 1996 GEOTECHNICAL AND HYDROGEOLOGICAL SITE INVESTIGATIONS (REF. NO. 1784/1)

SECTION 1.0 - INTRODUCTION

1.1 PROJECT DESCRIPTION

The Carmacks Copper Project is an open pit copper mine and processing facility being developed by Western Copper Holdings Limited. It is located in the Yukon Territory, 38 km northwest of the town of Carmacks. The project will comprise the operation of an open pit, crushing plant, acid heap leach and copper extraction facility, associated waste dumps, soil stockpiles, water storage facility, process water ponds, drainage ditches and sediment control ponds and miscellaneous structures to support mining operations.

The project general arrangement is shown on Drawing No. 1784.000.

1.2 SCOPE OF WORK

The preliminary level design for this project provided a basis for the evaluation of potential environmental impacts for the Initial Environmental Evaluation (IEE). As part of the permitting process, the Regional Environmental Review Committee (RERC) reviewed the preliminary design and expressed concerns associated with the design. Two of the main concerns were requests for additional geotechnical and hydrogeological site information. A detailed engineering study is currently in progress, and a portion of that scope of work is to collect additional geotechnical and hydrogeological data for detailed design and to satisfy permitting requirements.

The site investigation program completed in early 1996 has provided a considerable amount of new data for the project which will be incorporated into the detailed engineering study. The scope of this report is to present the data gathered from additional geotechnical and hydrogeological site investigation work.

1.3 PREVIOUS WORK

Two site investigations have been previously carried out by Knight Piésold at the project site. The first program was a preliminary surficial geotechnical investigation completed between mid August and mid September 1992. This program examined the geotechnical and hydrogeological conditions for the open pit, four potential heap leach pad sites, process plant site, waste rock storage area, and a water storage dam site. Field work comprised test pit excavations, overburden sampling, permafrost investigations, oriented diamond drilling and logging, and geologic mapping. Five standpipe piezometers and two thermistor string installations were completed by the Owner's site staff.

The second geotechnical site investigation program was carried out by Knight Piésold between February 21 and March 10, 1995. This program examined the geotechnical and hydrogeological conditions at an alternative heap leach pad site, the water storage dam site, and identified potential material types for earthworks construction. Field work comprised of trench excavations, overburden sampling, geotechnical drilling and permafrost characterization. Thirteen additional standpipe piezometers and one thermistor string installation were completed by Knight Piésold.

It is not the purpose of this report to repeat the results from previous site investigation programs but to present new data. This report should therefore be read in conjunction with the following reports:

- "Report on 1992 Surficial Geotechnical Investigations" Knight Piésold Ltd., May 1993, Ref No. 1782/2.
- "Report on Preliminary Design", Knight Piésold Ltd., May 1, 1995, Ref No.1783/1.

- "Western Copper Holdings Ltd., Carmacks Copper Project Initial Environmental Evaluation Addendum No. 3, " Hallam Knight Piésold Ltd., October 1995.

Detailed descriptions of the field work, geologic, geotechnical, and hydrogeologic conditions, permafrost, and results from the materials testing program are presented in the following sections.

SECTION 2.0 - FIELD WORK

2.1 GENERAL

Additional geotechnical and hydrogeological site investigation programs were carried out by Knight Piésold between February 9 and March 4, 1996. The site investigation programs examined the geotechnical and hydrogeological conditions for the process plant site, the camp location, the crusher site ,the heap leach pad site, the waste rock storage site, and the open pit. The site investigation program comprised the following aspects of work:

- Pioneering of access trails and drill pad construction with a D7 Cat.
- Test trenching.
- Overburden drilling and sampling.
- Bedrock coring.
- Air rotary drilling.
- Groundwater well installations.
- Thermistor installations.
- In-situ permeability testing.
- Laboratory testing.

The test pit, trench, and drill hole locations from the 1996 field work are shown on Drawing 1784.100. Geologic/Hydrogeologic sections have been developed across the site and are shown on Drawings 1784.101 to 104. Geological logs for the trenches, and drill holes are presented in Appendix A. Detailed laboratory testwork results are included in Appendix B.

The information obtained from the site investigation programs have provided the geotechnical and hydrogeological information necessary to characterize the site for detailed design work.

2.2 TRENCHING PROGRAM

A total of seventeen (17) trenches (TR96-1 to 17) were excavated at proposed project component sites. These included the following:

• Process Plant Site	TR96-1 to 5.
• Camp site	TR96-6 and 7.
• Crusher site	TR96-8 and 9.
• Waste rock storage area	TR96-10 to 13.
• Potential soil liner borrow area	TR96-14 to 17.

The locations of the trenches are shown on Drawing 1784.100. The trenching program comprised the following aspects of work:

- Pioneering of access trails with a D7 Cat.
- Excavation of trench.
- Careful logging of the excavation, including photographs.
- Bulk sampling of various materials.
- Permafrost and frost depth characterization.
- Bedrock assessment, where possible.

The trenching program was conducted to investigate the type and distribution of surficial materials, evaluate potential borrow sources and evaluate near surface foundation conditions across the site. Detailed geological logs from the trenching program are included in Appendix A.

2.3 DRILLING PROGRAM

The drilling program utilized two different drilling techniques for two separate phases of work. The first phase of drilling used Midnight Sun Drilling's CME 750 which was equipped for 6 inch diameter hollow stem augering with split spoon sampling, and NQ size diamond drilling. At the process plant site, a total of six (6) drill hole (DH96-11 to 16) were drilled using this technique to investigate the foundation conditions, overburden depths, material types and bedrock conditions.

for foundation design. A single drill hole (DH96-2) was drilled at the crusher site to determine the depth of bedrock and investigate the overburden materials. This drilling program was carried out between February 9 and 16, 1996. The drill hole locations are shown on Drawing 1784.100 and are also summarized in Table 2.1.

The procedure for this drilling program comprised the following aspects of work:

- Pioneer access trail and construct drill pad with a cat D7 dozer.
- Six inch hollow stem auger drilling down to hard bedrock.
- Standard Penetration Testing (SPT) and sampling at 1.5m intervals.
- Continue with NQ diamond drilling of bedrock for an additional 10 meters or to a maximum total depth of 20 meters.
- Install standpipe piezometer or thermistor string.
- Grout or backfill with cuttings the entire drill hole length.
- Install protective cover with a cement seal to prevent surface water infiltration.

The second phase of the drilling program used Midnight Sun Drilling's truck mounted Schramm Rotadrill which was equipped for air rotary drilling. A total of eleven (11) drill holes (BH96-A to BH96-K) were drilled between February 16 and 28, 1996 at the following locations:

• Leach pad site	MW96-A to E.
• Waste rock storage area	MW96-F to I.
• Open pit	MW96-J and K.

The drill hole locations are shown on Drawing 1784.100 and are summarized in Table 2.2. This phase of the drilling program focused on obtaining hydrogeological information across the project site. The procedure for this phase of the program comprised the following aspects of work:

- Pioneer access trail and construct drill pad with a cat D7 dozer.
- Air rotary drill down to through the unsaturated zone into a water bearing zone or to a maximum depth of 91m.

- Develop water bearing zone and install 2 inch diameter SCH 40 PVC standpipe piezometer.
- Backfill with cuttings the entire drill hole length.
- Install protective cover with a cement seal to prevent surface water infiltration.
- Complete in-situ permeability test after water level in standpipe piezometer has stabilized.

Detailed test hole logs showing geological and geotechnical information as well as the completion details from the drilling program are presented in Appendix A.

2.4 MONITORING AND INSTRUMENTATION INSTALLATIONS

A total of four (4) one inch diameter SCH 40 PVC flush threaded standpipe piezometers (DH96 -11, 12, 14, and 16) were installed in drill holes at the process plant site to obtain shallow groundwater information for foundation design. An additional eleven (11) two inch diameter SCH 40 PVC flush threaded standpipe piezometers (MW96-A to K) were installed at the following sites:

- Leach pad — MW96-A to E.
- Waste rock storage site — MW96-F to I.
- Open pit — MW96-J and K.

The location of these standpipe piezometers are shown on Drawing 1784.100. The installation and completion details are provided on the test hole logs, and on monitoring well completion logs in Appendix A. The monitoring sheets for each piezometer have also been included in Appendix A. The groundwater monitoring program results as of March 3, 1996 have been summarized in Table 4.2.

Two additional thermistor strings (designated Th 4 and Th 5 in drill holes DH96-13 and DH96-15) were installed in vertical drill holes to a maximum depth of 18.288 meters to initiate ground thermal monitoring for foundation design. The locations of the thermistor strings are shown on Drawing 1784.100. The installation and completion details are provided on the test hole logs in Appendix A. The monitoring sheets for each thermistor string installed at the site (Th 1 to 5) have been updated as of February 29, 1996 and are included in Appendix A.

SECTION 3.0 - GEOLOGICAL AND GEOTECHNICAL CONDITIONS

3.1 GENERAL

The surficial materials types found across the site have been previously grouped into the following categories:

- Organic/Ash Layer.
- Glaciofluvial/Glaciolacustrine Deposits.
- Well Graded Glacial Till.
- Weathered/Decomposed Bedrock.
- Bedrock.

The test pit, trench and drill hole locations are shown on Drawing 1784.100. New geologic and hydrogeological sections have been developed across the site to incorporate the results from the 1996 geotechnical and hydrogeological site investigation work and are shown on Drawings 1784.101 to 106.

Detailed descriptions of the material types, and foundation conditions encountered at the process plant site, camp site, crusher site, leach pad site, and waste rock storage site from the 1996 site investigation are presented in the following sections.

3.2 PROCESS PLANT SITE

Five (5) trenches (TR96 - 1 to 5) were excavated and six (6) geotechnical drill holes (DH96-11 to 16) were drilled which included piezometer and thermistor installations to evaluate the material types and investigate the foundation conditions for foundation design work. Detailed descriptions of the material types and near surface foundation conditions at this site are outlined below:

- The layer of organics and topsoil ranged in thickness between 150 and 200 mm and the white ash layer varied in thickness from 150 to 300 mm.

- Trench TR96-1 encountered 2,500 mm of glaciofluvial/glaciolacustrine sediments overlying the dense well graded till.

- Granodiorite and biotite gneiss bedrock was encountered in trenches TR96-4 and TR96-5 at a depth of 5,700 mm and 1,700 mm respectively. At these depths the D7 dozer had difficulty ripping the bedrock with a single shank ripper.

- Glaciofluvial/glaciolacustine deposits have been identified in trenches TR96-1 through 4.

- Trench TR96-2 encountered an irregular stratified clean sand and gravel deposit approximately 4 meters thick overlying a sequence of frozen silty sand. The frozen soil was classified as ice not visible, but well bonded and was assigned a N_b frozen soil designation.

- One side of trench TR96-3 encountered approximately 4 meters of the stratified clean sand and gravel deposit overlying laminated frozen fine sand and silts. The frozen soil was classified as ice not visible, but well bonded and was assigned a N_b frozen soil designation. On the opposite side of the trench the stratified clean sand and gravel deposit pinches out to a thickness of 600 mm and is replaced by a 2 meter thick deposit of laminated fine sand and silt which generally dips parallel to topography. Small discontinuous sand and gravel lenses approximately 300 mm thick and 1,500 mm long occur within the laminated sand and silt deposit.

- Trench TR96-4 encountered a stratified clean sand and gravel deposit approximately 3,000 mm thick decreasing in thickness downslope overlying several layers of laminated fine sand (150 mm to 200 mm thick). Below this laminated fine sand was a deposit of silty, gravelly sand up to 3,000 mm thick overlying granodiorite bedrock. The frost penetration for the slope extended to a depth of 1,800 mm.

- Hollow stem augering confirmed that the depth of frost penetration generally ranges between 1,500 mm and 2,000 mm.

- The depth to bedrock in the drill holes are summarized below:

Drill hole (DH96-)	Depth to Bedrock (meters)	Depth to Hard* Bedrock (meters)
11	6.1	6.1
12	4.6	9.1
13	4.9	9.1
14	4.6	7.6
15	4.6	7.6
16	14.3	15.2

* Hard bedrock defined as the depth when maximum allowable down pressure on the hollow stem augers was achieved.

The geological and geotechnical information from the bedrock coring is summarized in Table 3.1.

3.3 CAMP SITE

Two (2) trenches (TR96 6 and 7) were excavated to evaluate the material types and investigate the foundation conditions on the northern flank of the ridge at the proposed camp site. Detailed descriptions of the material types and near surface foundation conditions at this site are outlined below:

- The layer of organics and topsoil was approximately 150 mm thick. The white ash layer was also approximately 150 mm thick.

- A thin veneer (500 mm thick) of silty sand and gravel was encountered directly beneath the ash layer in TR96-6.

- Approximately 500 mm thick of transported decomposed weathered granodiorite was encountered in trenches TR96-6 and TR96-7 at depths of 800 mm and 300 mm respectively.

- Granodiorite bedrock was encountered in both trenches at shallow depths. In trenches TR96-6 and TR96-7 at depths of 1,300 mm and 700 mm respectively the D7 dozer had difficulty ripping the bedrock with a single shank ripper.

- Large angular granodiorite boulders up to 1,500 mm across were encountered as shallow as 500 mm along a portion of trench TR96-6.

3.4 CRUSHER SITE

Two (2) trenches (TR96 - 8 and 9) were excavated and one (1) geotechnical bore hole (DH96 - 2) was drilled to evaluate the material types and investigate the foundation conditions at the proposed crusher site. Detailed descriptions of the material types and near surface foundation conditions across this site are outlined below:

- The layer of organics and topsoil was approximately 300 mm thick and the white ash layer was approximately 150 mm thick.

- Two (2) trenches (TR96-8 and 9) were excavated at the crusher site. TR96-9 was an existing trench that was excavated a further 0.5m.

- Trench TR96-8 excavated to a depth of 3,600 mm encountered a sequence of silty sand and gravel 1,400 mm thick overlying laminated wet fine sands and silts.

- Bedrock was not encountered in either trench TR96-8 or TR96-9.

- Frost penetration generally extended to a depth of 1,500 to 2,000 mm.

- Drill hole DH96-2 encountered 22.86 meters of silty sand and gravel before intersecting bedrock.

- In drill hole DH96-2, permafrost was encountered at a depth of 4.6 meters and extended to a depth of 12.1 meters. The permafrost was classified as visible ice less than 25.4 mm thick containing random or irregular ice formations and was assigned the V_r frozen soil designation.

3.5 HEAP LEACH PAD SITE

Four (4) trenches (TR96-14 to 17) were excavated adjacent to the leach pad site to assess a potential borrow area for suitable soil liner materials. Five (5) geotechnical drill holes (MW96-A to E) were drilled to confirm bedrock depths and locate the water table at the proposed leach pad site. Detailed descriptions of the material types and near surface foundation conditions are outlined below:

- The organic/topsoil layer varies in thickness from 150 to 300 mm as does the white ash layer.

- Trench TR96-14 excavated to a depth of 2,740 mm exposed a material described as a silty sand and gravel. The depth of frost generally penetrated to a depth of 1,200 mm. Below the frost line, the silty sand and gravel was wet and also contained discontinuous small fine sand lenses 1,500 mm long by 150 mm thick. Two representative samples TR96-14-1 (frozen) and TR96-14-2 (unfrozen) of the silty sand and gravel were collected for laboratory testwork.

- Trench TR96-15 excavated to a depth of 1,800 mm encountered 450 mm of silt overlying the frozen silty sand and gravel. Permafrost encountered in this trench was classified as visible ice less than 25.4 mm thick containing random or irregular ice formations as well as ice coatings on larger particles and was assigned the dual V_c - V_r frozen soil designation. Two representative samples TR96-15-1 (frozen) and TR96-15-2 (frozen) of the silty sand and gravel were collected for laboratory testwork.

- Trench TR96-16 excavated to a depth of 3,000 mm encountered the frozen silty sand and gravel with a slightly higher proportion of gravel and cobble. Permafrost encountered in this trench was classified as visible granular ice less than 25.4 mm thick containing random or irregular granular ice formations as well as ice coatings on larger particles and was assigned the dual V_c - V_r frozen soil designation. One bulk sample TR96-16-1-BS of this silty sand and gravel was collected for laboratory testwork.

- Trench TR96-17 exposed a layer of laminated rusty fine sand 670 mm thick overlying a sequence of organic silts with grey silty gravel and wood fragments 670 mm thick. The silty sand and gravel was encountered at a depth of approximately 1,800 mm. Permafrost encountered in this trench was classified as visible granular ice less than 25.4 mm thick containing random or irregular granular ice formations as well as ice coatings on larger particles and was assigned the dual V_c - V_r frozen soil designation. One bulk sample TR96-17-1-BS from this silty sand and gravel was collected for laboratory testwork.

- The depth to bedrock in drill holes MW96-A to E are summarized below:

Drill hole (MW96-)	Depth to Bedrock (meters)
A	5.2
B	6.1
C	24.4
D	27.2
E	5.0

3.6 WASTE ROCK STORAGE AREA

Four (4) trenches (TR96-10 to 13) were excavated and four (4) hydrogeological drill holes (MW96-F to I) were drilled to evaluate the material types, investigate the foundation conditions, and determine the hydrogeological conditions at the waste rock storage area site proposed in the preliminary design. Detailed descriptions of the material types and near surface foundation conditions across this site are outlined below:

- Trench TR96-10 was excavated to a depth of 2,500 mm and exposed 300 mm of organics/topsoil overlying 300 mm of the white ash. Directly below the white ash was a thin veneer of frozen organic silt approximately 50 to 150 mm thick. A silty sand and gravel was encountered at a depth of approximately 600 mm and exposed with the dozer to a depth of 1,900 mm. Permafrost encountered in this trench was very hard to rip and broke off the single ripper on the D7 dozer. The frozen soil was classified as ice not visible, but well bonded and was assigned a N_b frozen soil designation. One sample TR96-10-1 from this silty sand and gravel was collected for laboratory testwork.

- Trench TR96-11 excavated to a depth of 3,350 mm exposed 150 mm of organics/topsoil overlying 150 mm of white ash. The glaciolacustrine deposits were encountered below the white ash and described as laminated silts, sandy silts trace clay some gravel, and clayey silts. The depth of frost generally penetrated to a depth of 1,800 mm. Three representative disturbed samples TR96-11-1 (frozen), TR96-11-2 (unfrozen), and TR96-11-3 (unfrozen) from fine grained soils were collected for laboratory testwork.

- Trench TR96-12 exposed 300 mm of organics/topsoil overlying 300 mm of the white ash. Directly below the white ash was a frozen organic silt layer approximately 400 mm. A frozen silty sand and gravel containing small silt lenses was encountered at a depth of approximately 1,000 mm and exposed with the dozer to a depth of 2,440 mm. Permafrost encountered in this trench was also very hard to rip. The frozen soil was classified as visible ice less than 25.4 mm thick containing random or irregular ice lenses up to 2 mm thick and was assigned the V_r frozen soil designation. One sample TR96-12-1-BS from this silty sand and gravel was collected for laboratory testwork.

- Trench TR96-13 exposed 300 mm of organics/topsoil overlying 300 mm of the white ash. Directly below the white ash was a frozen organic silt layer approximately 400 mm. A frozen silty sand and gravel was encountered at a depth of approximately 1,000 mm and exposed with the dozer to a depth of 2,000 mm. Permafrost encountered in this trench was also very hard to rip. The frozen soil was classified as visible ice less than 25.4 mm thick containing ice inclusions, distinctly oriented ice formations up to 2 mm thick spaced at 5 mm intervals and was assigned the V_s frozen soil designation. Two samples TR96-13-1 (frozen blocky) and TR96-13-2 (frozen loose) from this silty sand and gravel were collected for laboratory testwork.

- Drill hole (MW96-F) encountered a water bearing zone at a depth of 54.9m in a coarse sand deposit and was extended to a depth of 64.5 meters to complete the interval for the groundwater monitoring well.

- Three of the drill holes (MW96-G, H, and I) were drilled into bedrock before encountering a water bearing zone. The depth to bedrock for the three holes are summarized below:

Drill hole (MW96-)	Depth to Bedrock (meters)
G	16.8
H	36.6
I	44.2

SECTION 4.0 - HYDROGEOLOGICAL CONDITIONS

4.1 GENERAL

Previous site investigation work at the Carmacks Copper project indicated that the site was characterized by a deep groundwater flow system. The 1996 site investigation work included a program to investigate and establish the site hydrogeologic conditions. Standpipe piezometers were installed in drill holes to measure the water levels within specific intervals.

The locations of the piezometers are shown on Drawing 1784.100. Hydrogeologic information is shown on section on Drawing 1784.101 to 104. The one inch diameter standpipe piezometers(DH96-11, 12, 14, and 15) installed at the process plant site are summarized in Table 4.1. The two inch diameter groundwater monitoring wells(MW96-A to K) installed at the leach pad, waste rock storage site and open pit sites are summarized in Table 4.2. After the water levels recovered and stabilized in the groundwater wells, falling head permeability tests using the Hvorslev method were completed. The results have been summarized in Table 4.3. Completion details, monitoring record sheets, and falling head permeability calculation sheets for these piezometers are included in Appendix A.

Details on the regional groundwater system, as well as the site hydrogeologic conditions obtained during the 1996 site investigation are presented in the following sections.

4.2 REGIONAL GROUNDWATER SYSTEM

The Carmacks Copper project site is located adjacent to the Williams Creek drainage. The regional drainage pattern in the area has evolved into a contorted pattern influenced by complicated structural features associated with the intrusive and metamorphic rock types. The regional groundwater flow system at the Carmacks Copper project is further complicated by the presence of permafrost in the valley bottoms which produces a confining effect and possibly perched water tables. Regional groundwater occurs as an unconfined deep flow system within bedrock in which groundwater is recharged at higher elevations in the upland areas and flows toward the valleys at lower elevations. The groundwater table forms a subdued replica of topography whereby the depth to groundwater increases with increasing elevation. The result of exploration drilling and recent geotechnical site investigations indicate that the groundwater table lies at significant depths over most of the project area. In some areas the presence of discontinuous permafrost has resulted in the development of perched water tables, however, these are isolated and are discontinuous. In addition, minor groundwater flow occurs in the active zone just below the ground surface on a seasonal basis resulting in the development of local swamp areas. The discontinuous permafrost also acts as a barrier inhibiting infiltration in some areas thereby significantly reducing recharge resulting in the overall depression of the regional groundwater table.

4.3 SITE GROUNDWATER CONDITIONS

The groundwater table has been identified in deep drill holes at the leach pad site, and the waste rock storage site and forms a subdued replica of the surface topography. The groundwater table was identified during the installation of groundwater monitoring piezometers, and subsequent monitoring of the static water levels which are summarized in Table 4.2. The hydrogeologic conditions are shown on the geologic sections on Drawings 1784.101 to 104.

The groundwater table at the leach pad site is found at a depth of 40 to 60 meters within the bedrock whereby the depth to groundwater increases with increasing elevation. Falling head permeability tests conducted within the bedrock completion zone intervals of the standpipe piezometers resulted in permeability values ranging between 7×10^{-5} cm/s and 2×10^{-6} cm/s.

The groundwater table within the waste rock storage site is found at a depth of 48.4 meters within bedrock in drill hole MW96-G. Drill holes MW96-H and I drilled adjacent to the creek has identified groundwater at shallower depths of 16.9 and 18.0 meters in depth respectively. A water bearing coarse sand zone within the overburden was encountered in drill hole MW96-F at a depth of 54.9 meters. A piezometer was installed within this zone over an interval of 57.9 to 62.5 meters.

The water level has since risen to a depth of 13.4 meters indicating a confined aquifer. Falling head permeability tests conducted within the bedrock completion zone intervals of the standpipe piezometers resulted in permeability values ranging between 2 x 10^{-4} cm/s and 4 x 10^{-5} cm/s. Falling head permeability tests conducted within the coarse sand completion zone interval of the standpipe piezometer resulted in permeability value of 2 x 10^{-5} cm/s.

The depth to the groundwater table in the vicinity of the open pit exceeds 91 meters as a result of water level monitoring in drill holes MW96-J and K .

SECTION 5.0 - PERMAFROST

5.1 GENERAL

As previously reported the project site is located in the discontinuous permafrost zone corresponding to an area between the 0°C and -10°C mean annual air temperature isotherms. The site mean annual air temperature was calculated from the estimated annual freeze and thaw indices. The mean annual air temperature was calculated as -5°C for an elevation of 850 m at the project site. The occurrence of permafrost in the area is therefore anticipated. Previous site investigation work has reported the occurrence of permafrost.

During the 1992 site investigations thermistor strings Th-1 and Th-2 were installed on a north and south facing slope respectively to measure the temperature as a function of depth. Thermistor Th-3 was installed in 1995 along the alignment of the leach pad confining embankment and thermistors Th-4, and Th-5 were installed at the process plant site in 1996. The locations of the thermistors are shown on plan on Drawing 1783.100. The measurements are tabulated on individual monitoring sheets which are included in Appendix A.

This section presents the results to date of the thermal monitoring program.

5.2 THERMAL CONDITIONS

Temperature measurements to date indicate that the permafrost temperatures are near 0°C generally ranging between -0.1° and -0.3°C. All five thermistors have been installed in areas where the surface has been stripped to mineral soil. Ground temperature envelopes or "trumpet curves" have been prepared for thermistors Th-1 to 5 which are shown on Figures 5.1 through 5.5 respectively as temperature versus depth. These figures illustrate the periodic ground temperature variation caused by surface temperature variation.

Trumpet curves for thermistors Th-1 and 2 as seen on Figures 5.1 and 5.2 are well developed. Thermistors Th-1 and Th-2 located on a north and south facing slopes respectively indicate that the active layer is approximately 5 meters thick.

Temperature measurements for thermistor Th-3 installed during the 1995 site investigation program are widespread and suggest that this thermistor has malfunctioned. Thermistors Th-4 and 5 installed during the 1996 site investigation have just recently come on line for thermal monitoring and appear to be in working order.

SECTION 6.0 - MATERIALS TESTING

6.1 GENERAL

Laboratory testwork was completed on representative samples of soil (overburden and weathered/decomposed bedrock), bedrock, geosynthetics, and concrete aggregate to characterize these materials and evaluate the performance of these materials in specific end uses.

Testwork was carried out by Knight Piésold LLC's Denver based Geotechnical Laboratory, EBA Engineering Consultants Ltd in Whitehorse, and AGRA Earth and Environmental in Vancouver using ASTM standard procedures for routine tests and procedures specified by Knight Piésold Ltd.

This section describes the testwork performed and summarizes the results obtained.

6.2 SOILS

Laboratory testwork carried out on overburden and weathered/decomposed bedrock soil samples has been summarized below:

- Natural moisture content - 48 samples.
- Atterberg Limits - 19 samples.
- Grain size distributions - 34 samples.
- Modified Proctor compaction - 6 samples.
- CU multistage triaxial shear - 5 samples.
- Direct shear - 2 samples.
- Time Consolidation - 5 samples.
- Permeability - Flexible wall method - 5 samples.

The soils laboratory test results are summarized in Table 6.1 with consolidation test results summarized in Table 6.2. Detailed laboratory test results have been included in Appendix A.

Grain size distributions have been categorised and summarized onto the following summary sheets:

- Figure 6.1 Gradation Summary Of Suitable Soil Liner Material.
- Figure 6.2 Gradation Summary Of Fine Grained Soils.
- Figure 6.3 Gradation Summary Of Coarse Grained Soils.

Laboratory derived effective strength parameters were determined on samples using multi-stage consolidated-undrained (C-U) test methods. Samples TR96-1-2, 11-3, and 12-1 were prepared at natural moisture content. Samples TR96-16-1, and 17 were prepared to at least 95% Modified Proctor maximum dry density with targeted moisture contents in the range of 0 to +4%. Samples TR96-1-2, 16-1, and 17 were sheared at specified confining pressures of 250, 500, and 1,000 kPa. Samples TR96-11-3, and 12-1 were sheared at specified confining pressures of 500, 1,000, and 2,000 kPa.

Consolidation testing was carried out on remolded disturbed specimen resulting in conservative lower bound values since the stress history of the specific soil has been removed. Samples TR96-1-2, 11-3, and 12-1 were prepared at natural moisture content. Samples TR96-16-1, and 17 were prepared to at least 95% Modified Proctor maximum dry density with targeted moisture content in the range of 0 to +4%.

Flexible wall permeability test were carried out on samples TR96-1-2, 11-3, and 12-1 prepared at natural moisture content. Samples TR96-16-1, and 17 were prepared to at least 95% Modified Proctor maximum dry density with targeted moisture content in the range of 0 to +4%. Permeability test were carried out at minimum confining pressures and at specified confining pressures to simulate surcharge loading.

Detailed results from the point load testing are presented in Appendix A. The point load index (I_S) and the estimated uniaxial compressive strength from the point load testing are summarized in Table 6.3. The rock strength designation for both the granodiorite and biotite gneiss rock types classifies as medium strong to strong rock.

6.4 GEOSYNTHETICS

Testing of the interface shear strengths between the smooth HDPE liner and the soil liner and the HDPE liner and the geonet was carried out in Knight Piesold's laboratory in Denver. The tests were carried out in a 12 inch square shear box to ASTM 5321. The measured angles of friction between the liner and the geonet and the liner and the soil liner were 13° and 27° respectively. The test results are presented in Appendix B2.

6.5 CONCRETE AGGREGATE

A bulk sample of potential concrete aggregate was sampled from a long linear sand and gravel deposit 1.2 km northwest from the No. 2 zone. Preliminary laboratory tests included:

- Sieve Analysis.
- Organic Impurities.
- Petrographic Examination.
- Relative Density and Absorption.

Details on the concrete aggregate assessment are provided in the AGRA report which has been included in Appendix B. Based on the excessively coarse gradation of the fine aggregate, the high absorption values, and the low petrographic number (PN) from the physical quality petrographic examination, additional concrete aggregate sources should be assessed.

TABLE 2.1
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

SUMMARY OF PHASE I DRILL HOLES
1996 DRILL PROGRAM

J:\JOB\DATA\1784\96GEOTEK\DRILLING.XLS 3-May-96 11:52

DRILL HOLE NUMBER	DRILL HOLE INFORMATION						
	LOCATION	INSTALLED INSTRUMENT	NORTHING (m)	EASTING (m)	ELEVATION (m)	DRILLHOLE ORIENTATION	DEPTH (m)
DH96-11	Process Plant Site	Piezometer	29,929	30,230[1]	766	-90°	15.5
DH96-12	Process Plant Site	Piezometer	29,953	30,267	769	-90°	18.4
DH96-13	Process Plant Site	Thermistor	29,963	30,244	768	-90°	18.3
DH96-14	Process Plant Site	Piezometer	30,239	30,239	768	-90°	14.3
DH96-15	Process Plant Site	Piezometer	29,982	30,241	769	-90°	16.3
DH96-16	Process Plant Site	Thermistor	30,034	30,243	769	-90°	18.3
DH96-2	Crusher site	None	30,960	29,825	853	-90°	22.9

Note: 1. Easting coordinate for DH96-11 was scaled from drawing.

TABLE 2.2
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

SUMMARY OF PHASE II DRILL HOLES
1996 DRILL PROGRAM

J:\JOB\DATA\1784\96GEOTEK)RILLING.XLS 1-May-96 13:47

DRILL HOLE NUMBER	DRILL HOLE INFORMATION						
	LOCATION	INSTALLED INSTRUMENT	NORTHING (m)	EASTING (m)	ELEVATION (m)	DRILLHOLE ORIENTATION	DEPTH (m)
MW96-A	Leach Pad	Two Piezometers	30,755	29,835	861	-90°	91.4
MW96-B	Leach Pad	Piezometer	30,470	29,974	833	-90°	91.4
MW96-C	Leach Pad	Piezometer	30,094	30,382	755	-90°	50.0
MW96-D	Leach Pad	Piezometer	29,875	30,605	717	-90°	41.1
MW96-E	Leach Pad	Piezometer	30,300	29,827	831	-90°	91.4
MW96-F	Waste Rock Storage Area	Piezometer	31,745	30,185	785 [1]	-90°	62.5
MW96-G	Waste Rock Storage Area	Piezometer	31,341	30,655	777	-90°	74.7
MW96-H	Waste Rock Storage Area	Piezometer	31,670	30,975	738	-90°	55.2
MW96-I	Waste Rock Storage Area	Piezometer	31,404	31,371	715	-90°	54.9
MW96-J	Open Pit	Piezometer	30,935	30,390	846	-90°	90.5
MW96-K	Open Pit	Piezometer	30,515	30,545	849	-90°	93.0

Note: 1. Elevation)r MW96-F was scaled from drawing.

TABLE 3.1

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

SUMMARY OF GEOLOGICAL AND GEOTECHNICAL DATA FROM PLANT SITE DRILLHOLES

I:\JOB\DATA\17.. SITEDATA\CORETBL.XLS

3-May-96

Drillhole No.	Depth Interval (s) (m)		Rock Type	Weighted Average Values				Degree of Weathering	Rock Quality Description
	from	to		Recovery (%)	RQD (%)	Hardness	Breakage		
DH-11	6.10	6.49	Granodiorite	56	0	R3-R4	7 - 9	SW	Medium to strong strength, very poor quality
	6.49	7.62	Granodiorite	80	21	R3-R4	7 - 9	MW	Medium to strong strength, very poor quality
	7.62	9.14	Granodiorite	100	10	R3-R4	7 - 9	MW	Medium to strong strength, very poor quality
	9.14	10.67	Granodiorite	100	11	R3-R4	7 - 9	MW	Medium to strong strength, very poor quality
	10.67	12.19	Granodiorite	98	22	R3-R4	7 - 9	MW	Medium to strong strength, very poor quality
	12.19	13.41	Granodiorite	85	0	R3-R4	7 - 9	MW	Medium to strong strength, very poor quality
	13.41	13.72	Granodiorite	92	0	R3-R4	7 - 9	MW	Medium to strong strength, very poor quality
	13.72	15.24	Granodiorite	100	7.5	R3-R4	7 - 9	MW	Medium to strong strength, very poor quality
DH-12	9.14	10.21	Granodiorite	84	0	R3-R4	7 - 9	MW	Medium to strong strength, very poor quality
	10.21	10.97	Granodiorite	0	0	N/A	N/A	MW	
	10.97	11.43	Granodiorite	39	0	R3-R4	9	MW	Medium to strong strength, very poor quality
	11.43	11.89	Granodiorite	0	0	N/A	N/A	MW	
	11.89	12.33	Granodiorite	67	0	R3-R4	9	MW	Medium to strong strength, very poor quality
	12.33	13.41	Granodiorite/Biotite Gneiss	100	9	R3-R4	9	MW	Medium to strong strength, very poor quality
	13.41	13.87	Biotite Gneiss	89	0	R3-R4	9	MW	Medium to strong strength, very poor quality
	13.87	15.39	Biotite Gneiss	47	0	R3-R4	9	MW	Medium to strong strength, very poor quality
	15.39	16.92	Biotite Gneiss/Granodiorite	100	8	R3-R4	9	MW	Medium to strong strength, very poor quality
	16.92	18.44	Biotite Gneiss/Granodiorite	100	15	R3-R4	9	MW	Medium to strong strength, very poor quality
DH-13	9.14	10.67	Biotite Gneiss	0	0	N/A	N/A	N/A	
	10.67	12.19	Biotite Gneiss	0	0	N/A	N/A	N/A	
	12.19	13.72	Biotite Gneiss	0	0	N/A	N/A	N/A	
	13.72	15.24	Biotite Gneiss	0	0	N/A	N/A	N/A	
	15.24	16.76	Biotite Gneiss	17	0	N/A	N/A	MW	
	16.76	18.29	Biotite Gneiss	0	0	N/A	N/A	N/A	
DH-14	7.62	9.14	Weathered/DecomposedGranodiorite	78	23	R3-R4	7 - 9	MW	Medium to strong strength, very poor quality
	9.14	10.67	Granodiorite	78	22	R3-R4	7 - 9	MW	Medium to strong strength, very poor quality
	10.67	12.19	Biotite Gneiss	60	7	R3-R4	7 - 9	SW	Medium to strong strength, very poor quality
	12.19	13.72	Biotite Gneiss	23	13	R3	7 - 9	SW	Medium strength, very poor quality
DH-15	7.93	9.14	Decomposed/Weathered Biotite Gneiss	100	0	R3	9	HW	Medium strength, very poor quality
	9.14	9.60	Decomposed/Weathered Biotite Gneiss	0	0	N/A	N/A	HW	
	9.60	11.13	Decomposed/Weathered Biotite Gneiss	15	0	R3	9	HW	Medium strength, very poor quality
	11.13	11.74	Decomposed/Weathered Biotite Gneiss	67	0	R3	9	HW	Medium strength, very poor quality
	11.74	12.33	Decomposed/Weathered Biotite Gneiss	0	0	N/A	N/A	HW	
	12.33	13.87	Decomposed/Weathered Biotite Gneiss	0	0	N/A	N/A	HW	
	13.87	15.39	Decomposed/Weathered Biotite Gneiss	0	0	N/A	N/A	HW	
	15.39	16.76	Decomposed/Weathered Biotite Gneiss	0	0	N/A	N/A	HW	
DH-16	12.33	15.24	Granodiorite	14	14	R3-R4	N/A	MW	Medium to strong strength, very poor quality
	15.24	16.76	Sandy Decompoesd Granodiorite	45	0	N/A	N/A	HW	
	16.76	18.29	No Core	0	0	N/A	N/A	N/A	

TABLE 4.1
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

SUMMARY OF STAND PIPE PIEZOMETERS AT THE PROCESS PLANT SITE

J:\JOB\DATA\1784\SITEDATA\MSWELLS.XI ;

1-May-96 10:23

DRILL HOLE NUMBER	PIEZOMETEI DESIGNATIO I	LOCATION			WELL INFORMATION				GROUNDWATER INFORMATION		
		NORTHING (m)	EASTING (m)	GROUND ELEVATION (m)	GEOLOGY OF MONITORING ZONE	PIEZOMETER DEPTH (m)	TIP ELEVATION (m)	PIEZOMETER STICKUP (m)	DEPTH TO WATER (m)	WATER ELEVATION (m)	DATE
DH96-11	Stand Pipe	29,929	30230 [1]	766	Bedrock	15.9	750.1	0.3	Dry well	Dry well	21-Feb-96
DH96-12	Stand Pipe	29,953	30,267	769	Bedrock	17.1	751.9	0.3	Dry well	Dry well	21-Feb-96
DH96-14	Stand Pipe	29,964	30,239	768	Bedrock	14.4	753.6	0.3	7.3 [2]	768	23-Feb-96
DH96-15	Stand Pipe	29,982	30,241	769	Bedrock	16.3	752.7	0.3	14.3 [2]	769	23-Feb-96

Note: 1. Easting coordinate for DH96- I was scaled from drawing.

2. No goundwater was intersect l. The water level measurements were monitoring drilling induced water.

TABLE 4.2
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

SUMMARY OF GROUNDWATER MONITORING WELLS
1996 DRILL PROGRAM

J:\JOB\DATA\1784\SITEDATA\QLTYWELL.XLS 1-May-96 9:51

DRILL HOLE NUMBER	WELL INFORMATION										
	LOCATION	NORTHING (m)	EASTING (m)	GROUND ELEVATION (m)	GEOLOGY OF MONITORING ZONE	PIEZOMETER DEPTH (m)	TIP ELEVATION (m)	PIEZOMETER STICKUP (m)	DEPTH TO WATER (m)	WATER ELEVATION (m)	DATE
MW96-A1	Leach Pad Site	30,755	29,835	861	Bedrock	45.7	815.3	0.60	45.4	816	3-Mar-96
MW96-A2	Leach Pad Site	30,755	29,835	861	Bedrock	91.4	769.6	0.60	60.6	801	3-Mar-96
MW96-B	Leach Pad Site	30,470	29,974	833	Bedrock	91.4	741.6	0.30	41.6	792	3-Mar-96
MW96-C	Leach Pad Site	30,094	30,382	755	Bedrock	50.0	705.0	0.40	40.3	715	3-Mar-96
MW96-D	Leach Pad Site	29,875	30,605	717	Bedrock	41.1	675.9	0.30	12.4	705	3-Mar-96
MW96-E	Leach Pad Site	30,300	29,827	831	Bedrock	91.4	739.6	0.45	53.4	778	3-Mar-96
MW96-F	Waste Rock Storage Area	31,745	30,185	785 [1]	Coarse Sand	62.5	722.5	0.30	13.4	772	3-Mar-96
MW96-G	Waste Rock Storage Area	31,341	30,655	777	Bedrock	74.7	702.3	0.30	48.4	729	3-Mar-96
MW96-H	Waste Rock Storage Area	31,670	30,975	738	Bedrock	55.2	682.8	0.30	16.9	721	3-Mar-96
MW96-I	Waste Rock Storage Area	31,404	31,371	715	Bedrock	54.9	660.1	0.30	18.0	697	3-Mar-96
MW96-J	Open Pit	30,935	30,390	846	Bedrock	90.5	755.5	0.55	dry well	dry well	3-Mar-96
MW96-K	Open Pit	30,515	30,545	849	Bedrock	92.96	756.04	0.30	dry well	dry well	3-Mar-96

Note: 1. Elevation for BH96-F was scaled from drawing.

TABLE 4.3
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
SUMMARY OF FALLING HEAD PERMEABILITY TESTS USING HVORSLEV METHOD

J:\JOB\DATA\1784\SITEDATA\FALLHED.XLS 3-May-96 8:35

Hole Number	Permeability (cm/s)	Completion zone	Test Interval (m)
MW96-A1[1]	3.90E-08	Bedrock	11.4
MW96-A2	2.10E-06	Bedrock	9.8
MW96-B	2.60E-05	Bedrock	18.0
MW96-C	No reading[2]	Bedrock	6.7
MW96-D	6.50E-05	Bedrock	9.5
MW96-E	3.90E-06	Bedrock	15.2
MW96-F	1.80E-05	Coarse sand	4.6
MW96-G	3.40E-05	Bedrock	14.0
MW96-H	3.50E-05	Bedrock	15.6
MW96-I	2.10E-04	Bedrock	5.2
MW96-J	Dry well[3]	Bedrock	11.9
MW96-K	Dry well[3]	Bedrock	12.8

1. Permeability estimated from extension of data from falling head test.
2. Groundwater slushy, unable to get accurate water depth readings.
3. Wells reported as dry were so as of Feb. 29, 1996.

TABLE 6.1
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
SOILS LABORATORY TESTWORK

J:\JOB\DATA\1784\LABTESTS\SUMSHEET.XLS

11-Jun-96

Sample No.	Sample Depth	Atterberg Limits (%)				Grain Size Distribution				Natural Moisture Content	Compaction - Modified Proctor - Corrected for oversize		Triaxial Shear		Direct Shear		Lab Permeability		USCS Group Symbol	Soil Description
	(m)	LL	PL	PI	LI	> #4 % Gravel	#4 - #200 % Sand	#200 - 0.002mm % Silt	< 0.002mm % Clay	(%)	Optimum Moisture Content (%)	Maximum Dry Density (kg/m^3)	Friction Angle ϕ' (degrees)	Cohesion c' (kPa)	Friction Angle ϕ' (degrees)	Cohesion c' (kPa)	Flexible Wall Perm. 250 kPa (-3/8") cm/s	Flexible Wall Perm. 500 kPa (-3/8") cm/s		
DH 16-1	1.5									8.5										
DH 16-2	3.0									14.1										
DH 16-3	4.6									12.4										
DH 16-4	6.1									13.8										
DH 16-5	7.6									14.9										
DH 16-6	9.1									11.7										
DH 16-7	10.7									12.3										
DH 16 (1-7)		20	14	6		21.6	40.7	22.4	15.3										SM	Silty sand
TR96-1-1	1.0	14	12	2	-0.3	21.3	43.1	25.1	10.5	11.6									SM	Silty sand
TR96-1-2-BS	2.5	26	15	11	0.4	19.6	32.9	30.8	16.7	18.9	8.0	2,171	41	0			2E-08	6E-09	SC	Clayey sand
TR96-3-1-BS	1.5					34.7	59.6	1.7		3.1					44	0			SP	Poorly graded sand and gravel
TR96-3-2	1.5					0.0	95.0	5.0		4.6									SP	Poorly graded sand and gravel
TR96-3-3	3.0	-	N/P	N/A		0.0	44.3	50.6	5.1	28.4										
TR96-4-1	4.5					27.6	44.6	27.8		7.9									SM	Silty sands
TR96-5-1	0.6					0.0	98.1	1.9		3.1									SP	Silty sands
TR96-6-1	0.5					13.9	74.6	11.5		4.5									SP - SM	Poorly graded sand and gravel, silty sand
TR96-6-2-BS	1.5					39.5	55.3	5.2		3.2	5.8	2,212			36	95			SW-SM	Well graded sand and gravel, silty sand
TR96-8-1	1.4	16	N/P	-		12.9	51.3	26.7	9.1	9.5									SM	Silty sands
TR96-8-2	3.7	22	N/P	-		0.0	32.6	52.9	14.5	19.7										
TR96-9-1	2.5	22	17	5	-1.5	12.6	45.2	25.4	16.8	9.5									SM	Silty sand
TR96-10-1	2.5					18.1	70.3	11.6		12.8									SW - SM	Well graded sand and gravel, silty sand
TR96-11-1	1.2	21	15	6	-0.1	4.1	15.3	53.6	27.0	14.3									CL - ML	Inorganic silts and clays
TR96-11-2	2.0	19	14	5	-0.8	26.4	32.7	26.7	14.2	10.1									SM	Silty sands
TR96-11-3-BS	3.3	59	17	42	0.3	14.2	8.3	20.8	56.7	27.6	18.1	1,764	10	61				6E-08	CH	Inorganic clay of high plasticity
TR96-12-1-BS	2.3	20	13	7	-0.7	17.8	47.3	22.0	12.9	8.0	5.7	2,304	40	151				1E-08	SC-SM	Silty/clayey sand
TR96-13-1	1.3	17	12	5	-0.1	21.2	40.5	25.8	12.5	11.5									SM	Silty sand
TR96-13-2	2.0	16	13	4	-1.8	45.6	30.6	13.7	10.1	5.7									GM	Silty sandy gravel
TR96-14-1	1.0	17	N/P	-		18.3	43.8	26.3	11.7	13.6									SM	Silty sand
TR96-14-2	2.6	24	16	8	-0.4	26.3	35.4	23.5	14.8	13.2									SM	Silty sand
TR96-15-1	1.0	16	12	4	-0.8	19.0	43.1	25.7	12.2	8.5									SM	Silty sand
TR96-15-2	2.0	17	N/P	-		22.7	44.6	21.6	11.1	8.6									SM	Silty sand
TR96-16-1-BS	3.0	25	7	18	0.4	21.6	39.0	23.6	15.8	14.1	6.1	2,243	39	2			2E-08	1E-08	SC	clayey sand
TR96-17-BS	2.6	20	12	8	-0.5	17.6	45.8	20.4	16.2	8.4	6.5	2,283	37	18			1E-07	2E-08	SC	Clayey sand
BH-2-1	1.5									20.4										
BH-2-2	3.0									16.8										
BH-2-3	4.6									17.7										
BH-2-4	6.1									15.7										
BH-2-5	7.6									13.4										
BH-2-6	9.1									12.8										
BH-2-7	12.2									10.5										
BH-2-8	15.2									9.9										
BH-2-9	19.8									10.8										
BH-2-10	22.9									10.6										
BH-2 (1-10)		20	14	6		20.5	50.3	15.7	13.5										SM-SC	Silty, clayey sand
BH96-A-1	5.2					4.6	73.5	21.9		6.5									SM	Silty sand
BH96-C-1	27.4					0.4	82.8	16.8		8.1									SM	Silty sand
BH96-F-3	19.5					8.4	33.4	58.2		23.3										
BH96-F-4	32.0					0.0	2.9	25.9	71.2	57.0										
BH96-H-1	21.3					0.0	5.5	49.8	44.7	35.4										
BH-96-I-1	-					22.3	60.8	16.9		8.8									SM	Silty sands

TABLE 6.2
CARMACKS COPPER PROJECT
SUMMARY OF CONSOLIDATION TESTWORK

J:\JOB\DATA\1784\LABTESTS\CVTABLE.XLS 1-May-96

Sample No.	Coefficient of Consolidation (c_v) Taylor Method (m^2/year)				Coefficient of Consolidation (c_v) Casagrande Method (m^2/year)			
	306 kPa	613 kPa	1226 kPa	2451 kPa	306 kPa	613 kPa	1226 kPa	2451 kPa
TR96-1-2	6	13	9	Note 1	3	6	6	
TR96-11-3	13	3	3	4	2	1	1	1
TR96-12-1	11	35	17	34	Note 2	Note 2	Note 2	Note 2
TR96-16-1	18	35	17	Note 1	Note 2	Note 2	Note 2	Note 2
TR96-17	35	34	27	Note 1	Note 2	Note 2	Note 2	Note 2

Note: 1. Loading Terminated at 1226 kPa.
2. Casagrande Method provided inconclusive results.

Sample No.	Coefficient of Volume Compressibility (m_v) m^2/MN			
	306 kPa	613 kPa	1226 kPa	2451 kPa
TR96-1-2	0.131	0.078	0.035	Note 1
TR96-11-3	0.129	0.094	0.053	0.033
TR96-12-1	0.027	0.012	0.006	0.006
TR96-16-1	0.017	0.016	0.011	Note 1
TR96-17	0.061	0.044	0.027	Note 1

Note: 1. Loading Terminated at 1226 kPa.

TABLE 6.3
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
POINT LOAD TEST AND UNIAXIAL COMPRESSIVE STRENGTH RESULTS

J:\JOB\DATA\1784\LABTESTS\PLTABLE.XLS

2-May-96

Drill Hole	Depth (ft)	Rock Type	Test Type	Comments	I_s (psi)	I_s (MPa)	Uniaxial Compressive Strength 25 x I_s (MPa)
DH96-11	21.5	Granodiorite	diametrical	One fracture noted in core	1009	7.0	174
	37.0	Granodiorite	diametrical	Surface of core pitted	205	1.4	35
	38.5	Granodiorite	diametrical	ore badly pitted with two thin fracture	205	1.4	35
	47.5	Granodiorite	diametrical	Surface of core badly pitted	219	1.5	38
DH96-12	42.0	Biotite Gneiss	diametrical	Parallel to schistosity	205	1.4	35
	52.0	Biotite Gneiss	diametrical	Parallel to schistosity	300	2.1	52
	58.0	Granodiorite	diametrical	Parallel to schistosity	161	1.1	28
	59.0	Granodiorite	diametrical	Parallel to schistosity	205	1.4	35
DH96-12	42.0	Biotite Gneiss	diametrical	Perpendicular to schistosity	256	1.8	44
	52.0	Biotite Gneiss	diametrical	Perpendicular to schistosity	534	3.7	92
	58.0	Granodiorite	diametrical	Perpendicular to schistosity	205	1.4	35
	59.0	Granodiorite	diametrical	Perpendicular to schistosity	424	2.9	73

Note: 1. See Appendix A for EBA calculation sheets.

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
GROUND TEMPERATURE ENVELOPE - THERMISTOR Th-1
NORTH FACING SLOPE

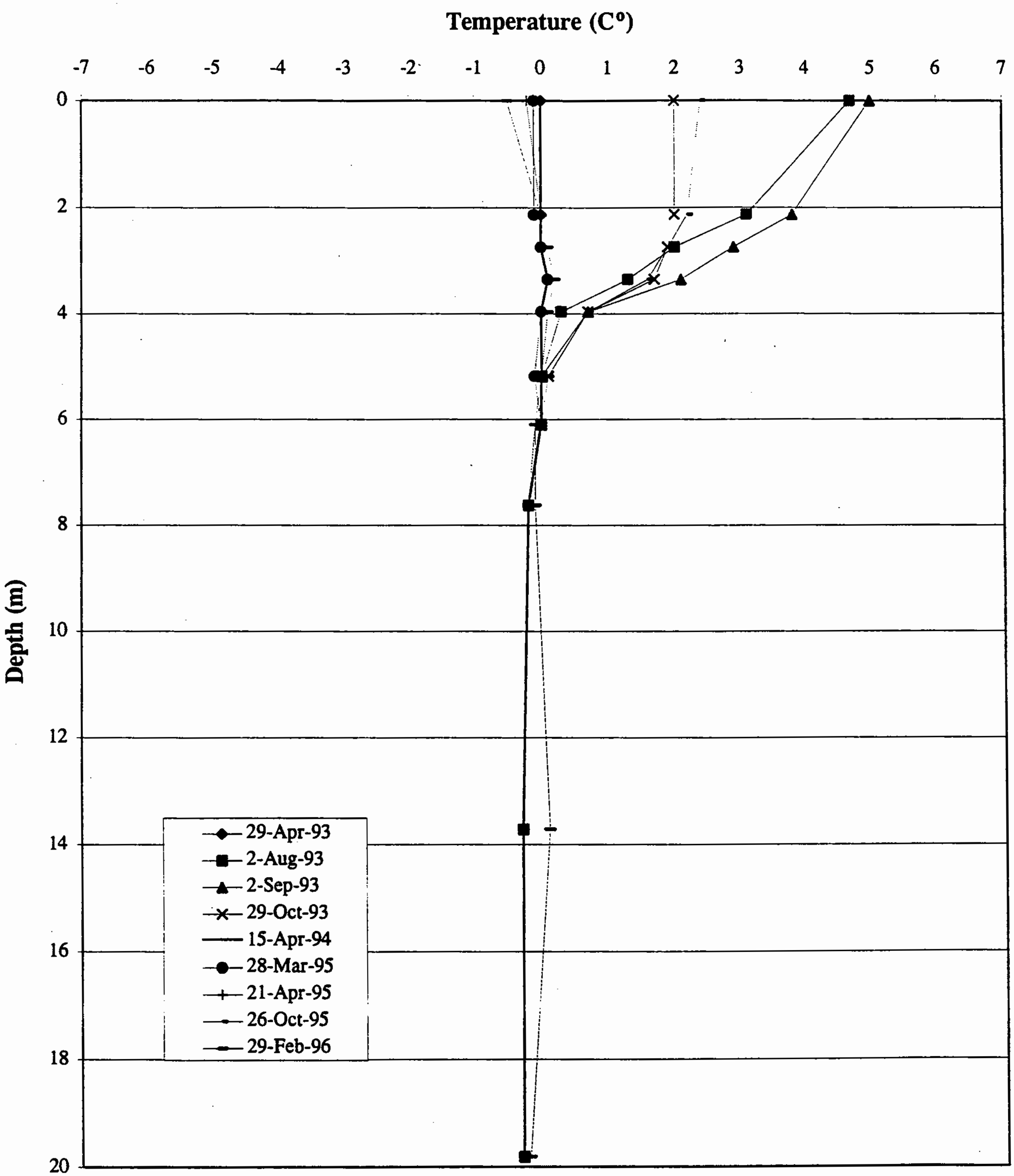


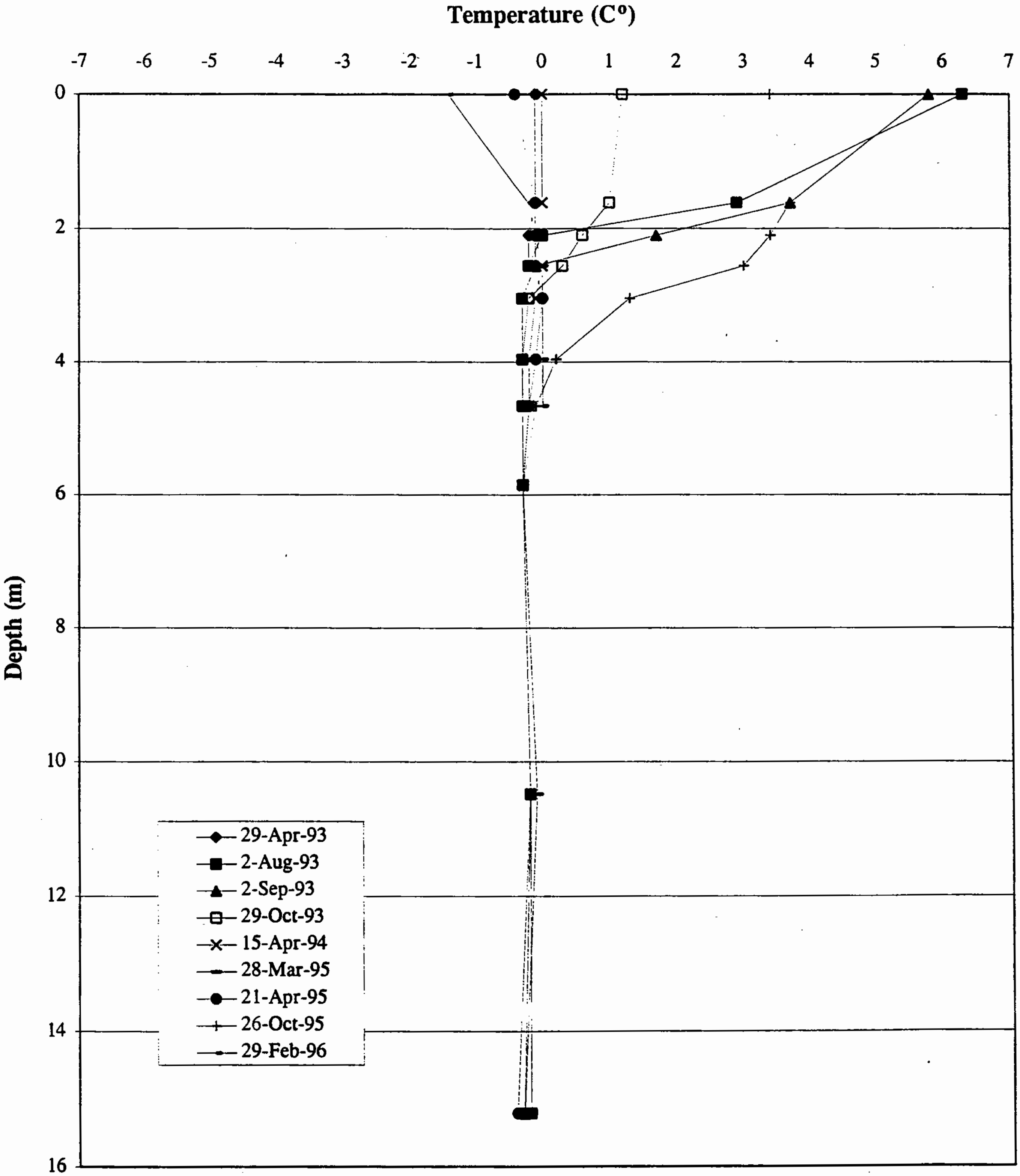
FIGURE 5.1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

J:\JOB\DATA\1784\SITEDATA\THERMIST.XLS 5/1/96

1784.A19

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
GROUND TEMPERATURE ENVELOPE - THERMISTOR Th-2
SOUTH FACING SLOPE



KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

FIGURE 5.2

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
GROUND TEMPERATURE ENVELOPE - THERMISTOR Th-3

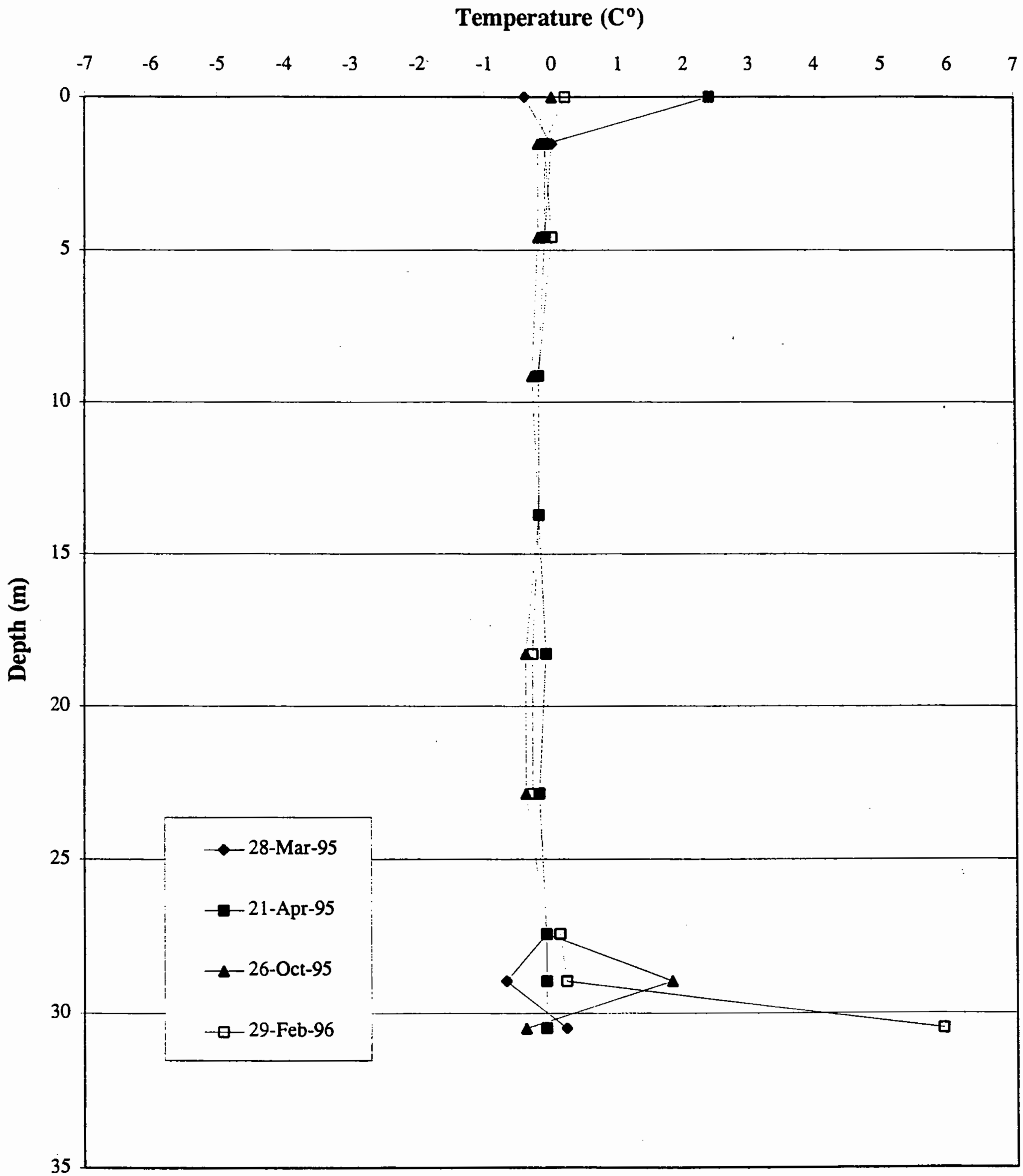
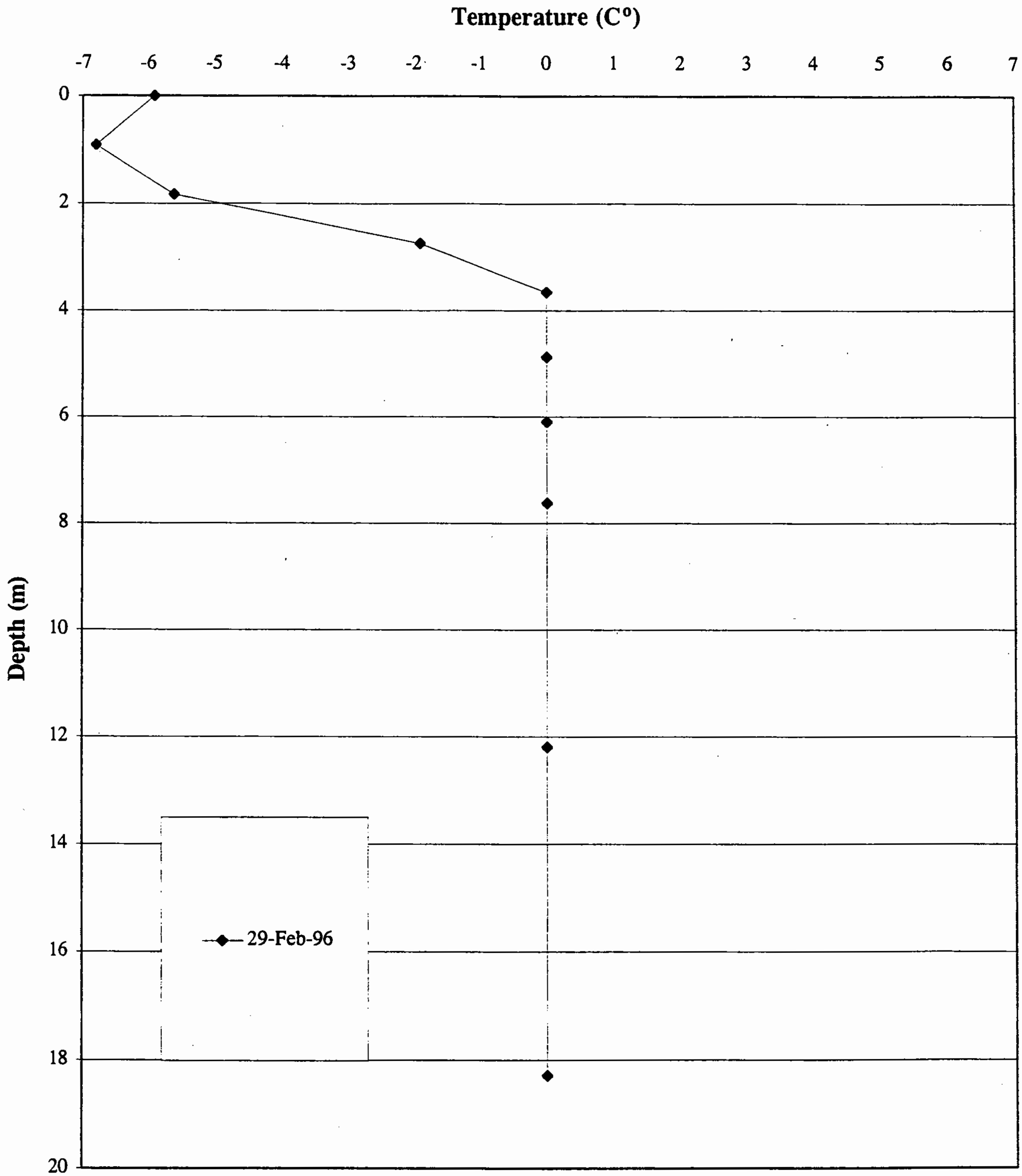


FIGURE 5.3

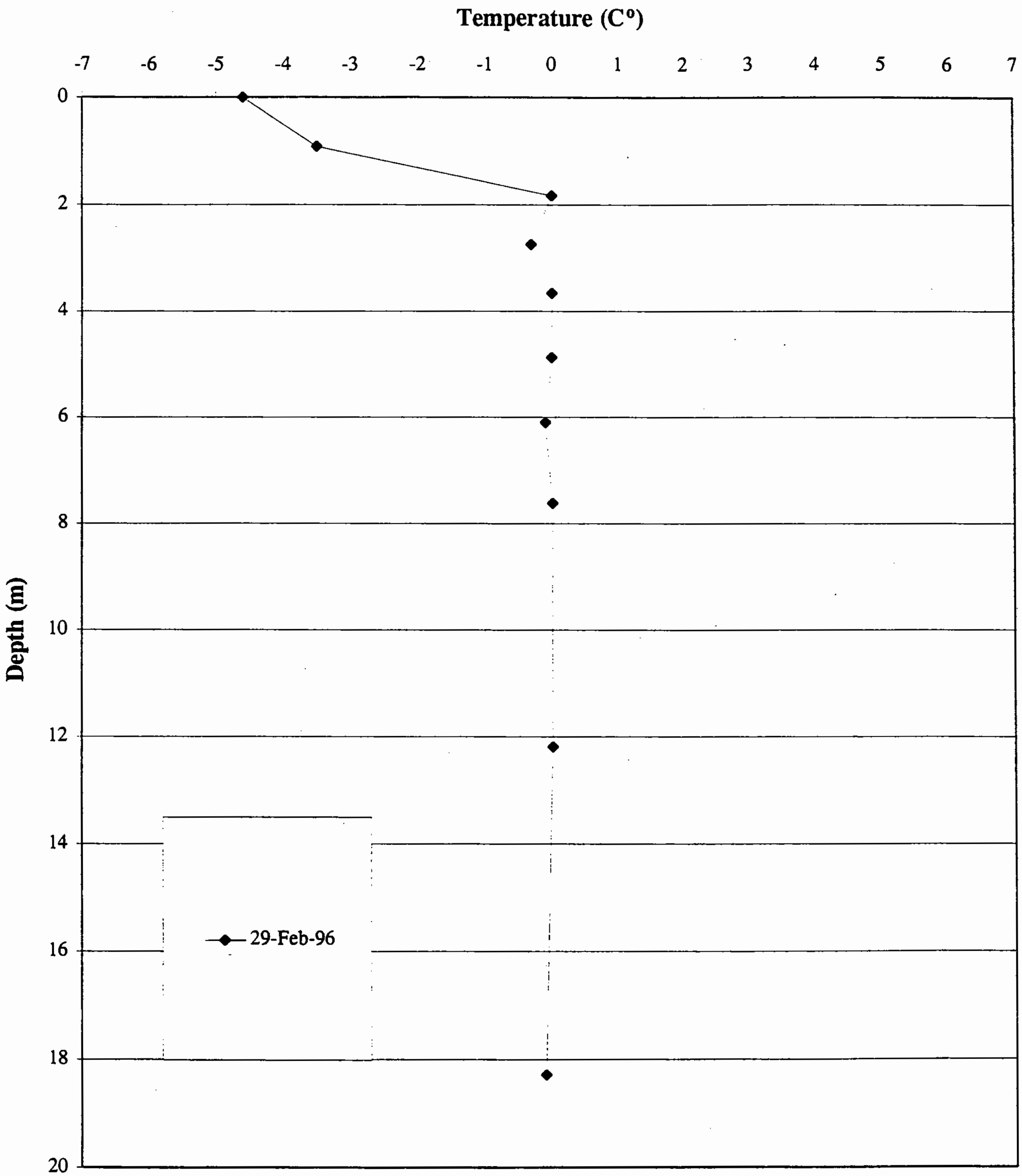
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
GROUND TEMPERATURE ENVELOPE - THERMISTOR Th-4



KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

FIGURE 5.4

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
GROUND TEMPERATURE ENVELOPE - THERMISTOR Th-5



KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

FIGURE 5.5

J:\JOB\DA   ...\LABTESTS\TILL.XLS 1996 results   5/2/96

UNIFIED SOIL CLASSIFICATION SYSTEM
WESTERN COPPER HOLDINGS LIMITED - CARMACKS COPPER PROJECT
GRADATION SUMMARY OF SUITABLE SOIL LINER MATERIAL

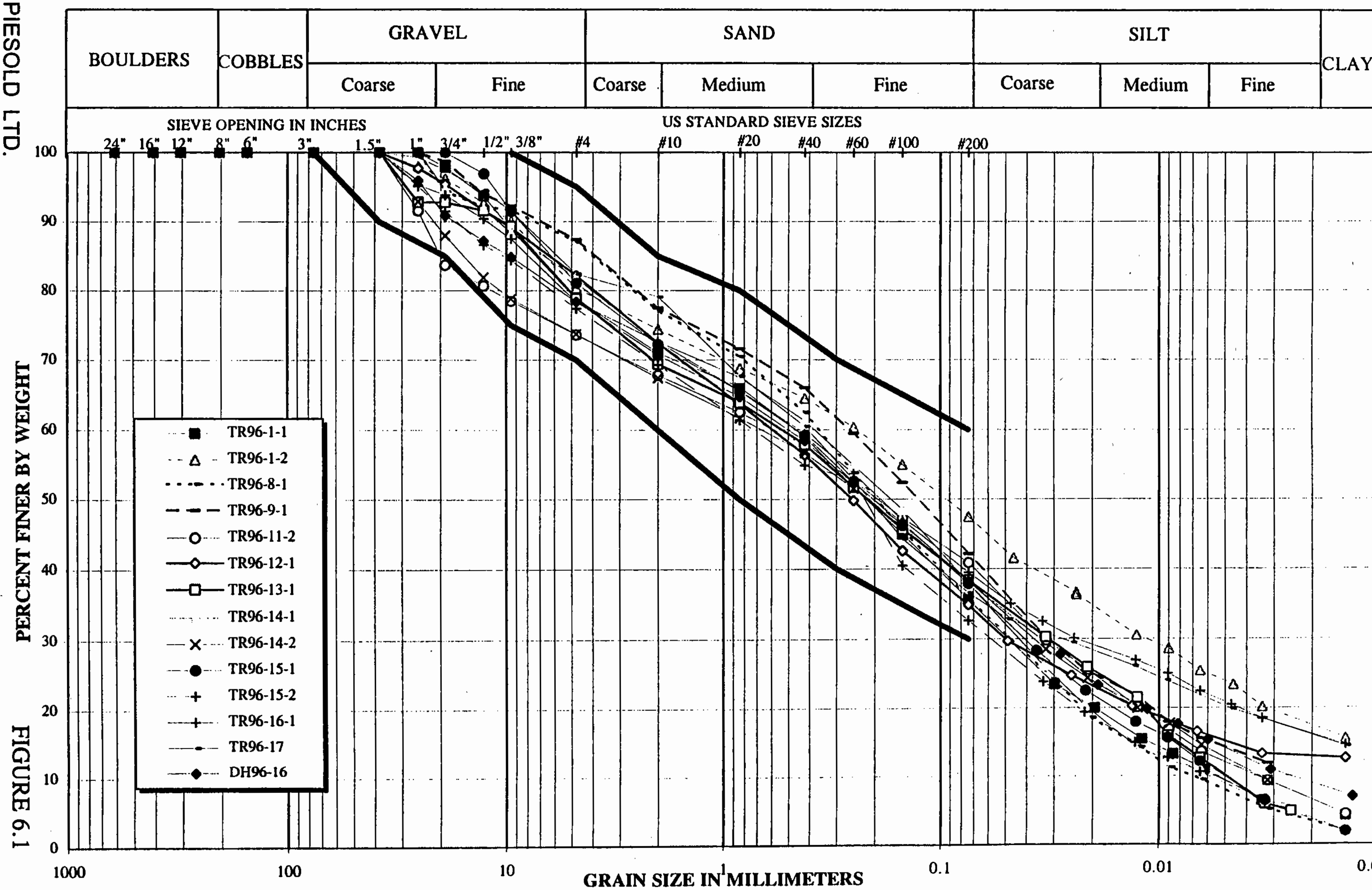
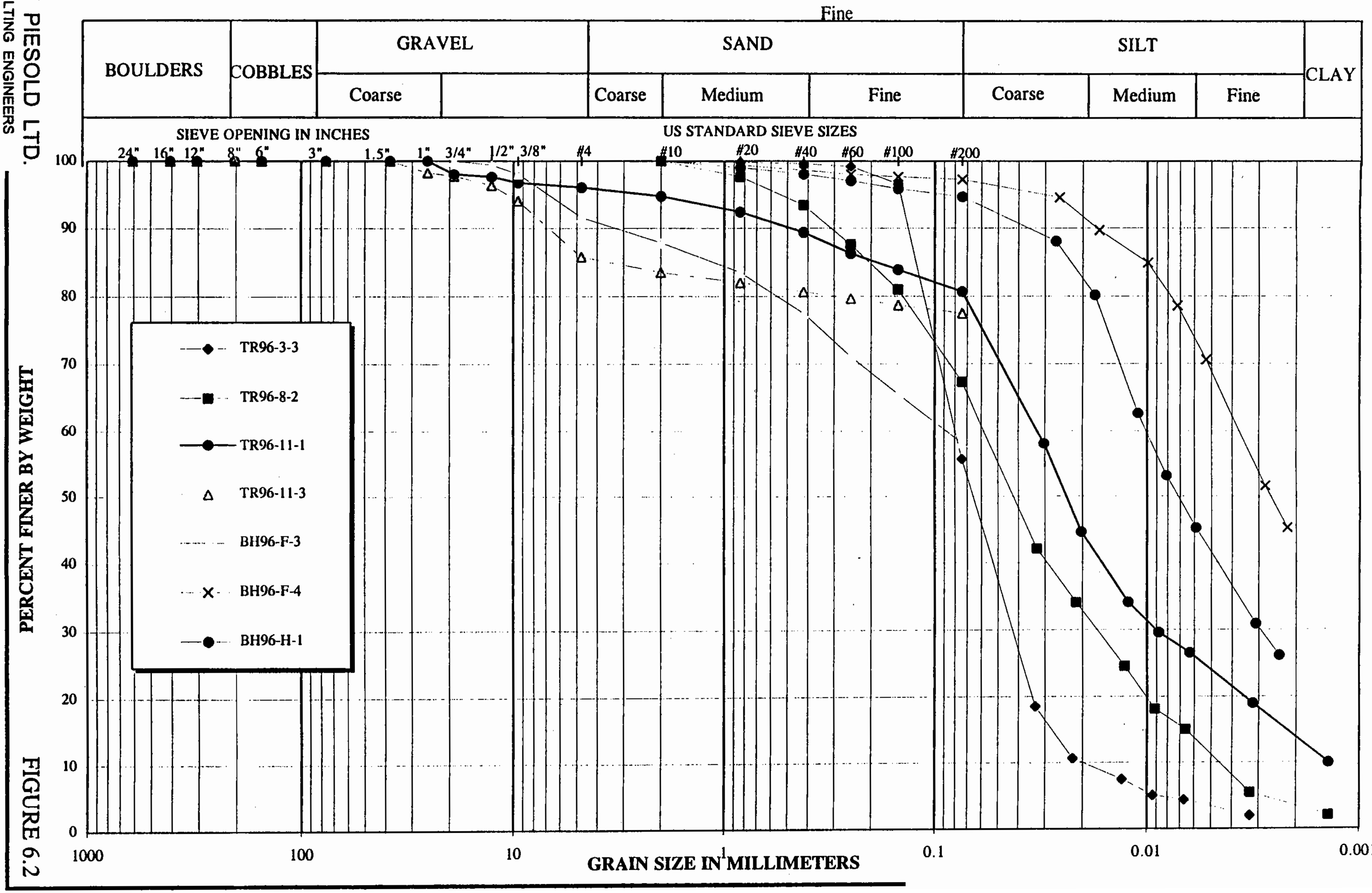


FIGURE 6.1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

1784.A23

UNIFIED SOIL CLASSIFICATION SYSTEM
WESTERN COPPER HOLDINGS LIMITED - CARMACKS COPPER PROJECT
GRADING SUMMARY FOR FINE GRAINED SOILS

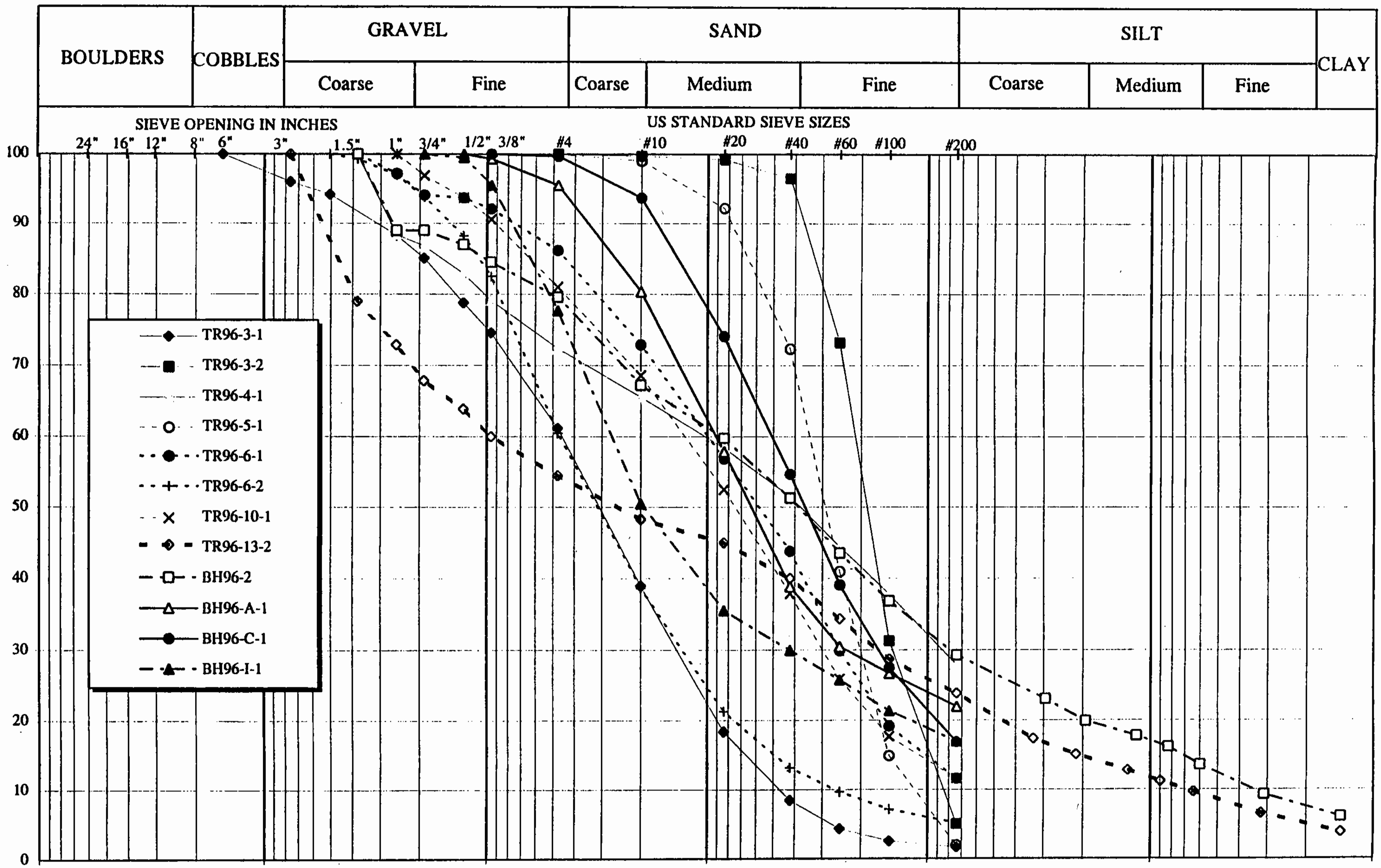


KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

FIGURE 6.2

J:\JOB\DA. 784\LABTESTS\WRSTORAG.XLS coarse grained 5/2/96 16:30

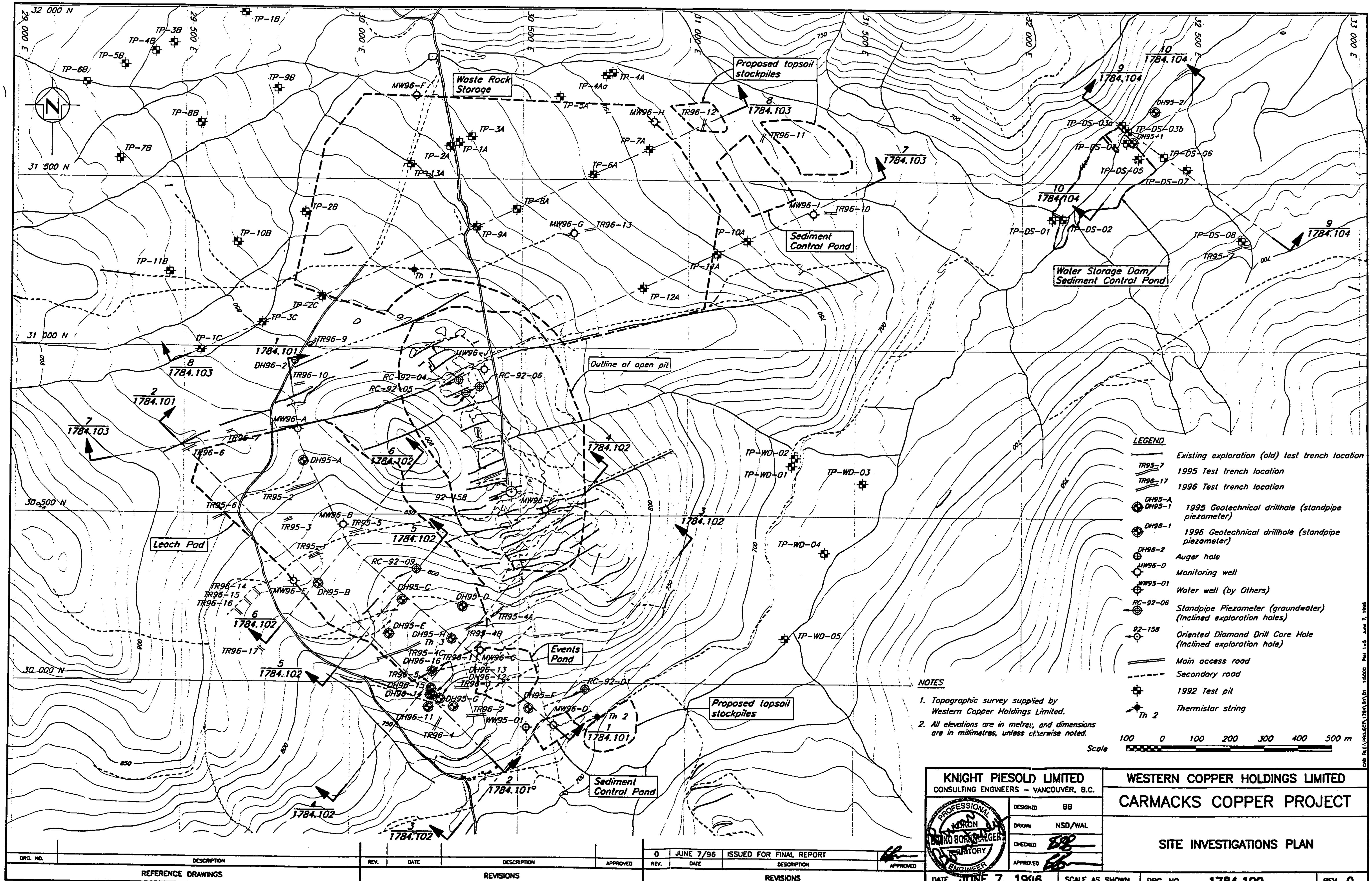
UNIFIED SOIL CLASSIFICATION SYSTEM
WESTERN COPPER HOLDINGS LIMITED - CARMACKS COPPER PROJECT
GRADING SUMMARY FOR COARSE GRAINED SOILS

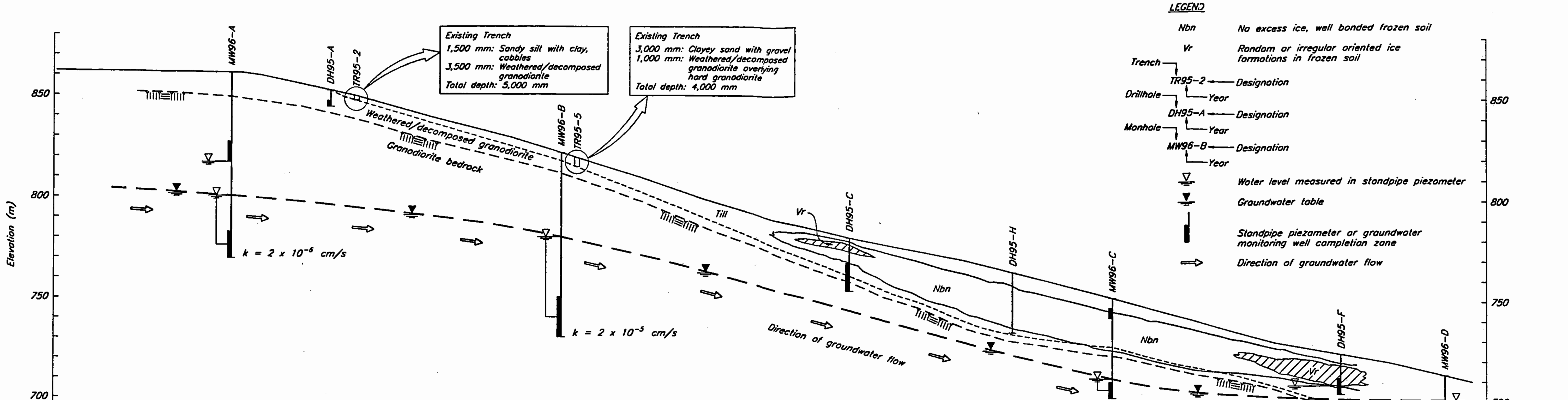


KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

FIGURE 6.3

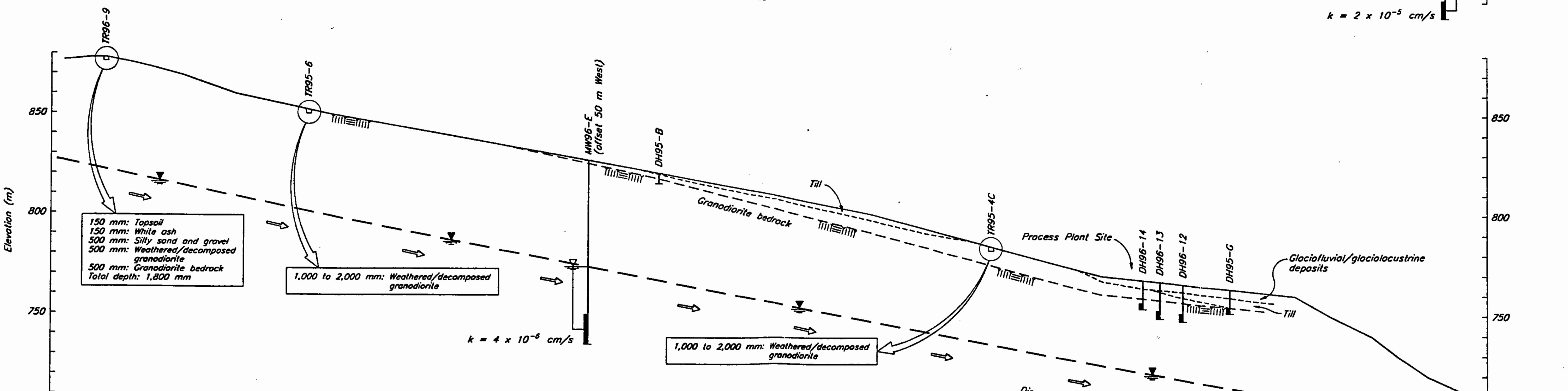
1784.A25


Waste Rock Storage
Proposed topsoil stockpiles
Sediment Control Pond
Water Storage Dam/ Sediment Control Pond
Outline of open pit
Leach Pad
Events Pond
Proposed topsoil stockpiles
Sediment Control Pond
32 000 N
31 500 N
31 000 N
30 500 N
30 000 N
29 000 E
29 500 E
30 000 E
30 500 E
31 000 E
31 500 E
32 000 E
32 500 E
33 000 E
LEGEND
Existing exploration (old) test trench location
1995 Test trench location
1996 Test trench location
1995 Geotechnical drillhole (standpipe piezometer)
1996 Geotechnical drillhole (standpipe piezometer)
Auger hole
Monitoring well
Water well (by Others)
Standpipe Piezometer (groundwater) (Inclined exploration holes)
Oriented Diamond Drill Core Hole (Inclined exploration hole)
Main access road
Secondary road
1992 Test pit
Thermistor string
NOTES
1. Topographic survey supplied by Western Copper Holdings Limited.
2. All elevations are in metres, and dimensions are in millimetres, unless otherwise noted.
Scale
100 0 100 200 300 400 500 m
KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.
DESIGNED BB
DRAWN NSD/WAL
CHECKED
APPROVED
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
SITE INVESTIGATIONS PLAN
DATE JUNE 7, 1996
SCALE AS SHOWN
DRG. NO. 1784.100
REV. 0
0 JUNE 7/96 ISSUED FOR FINAL REPORT
REFERENCE DRAWINGS
REVISIONS
REVISIONS



SECTION $\frac{1}{1784.100}$

(NOTE: Vertical scale exaggerated 2x horizontal)



SECTION $\frac{2}{1784.100}$

(NOTE: Vertical scale exaggerated 2x horizontal)

NOTES

1. All elevations are in metres, and dimensions are in millimetres, unless otherwise noted.
2. 1995 Geotechnical drillholes DH95-C, E and F standpipe piezometers have measured water levels from water introduced from diamond drilling.

Vert. Scale 20 0 20 40 60 80 100 metres

Horiz. Scale 100 50 0 100 200 metres

DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			

REV.	DATE	DESCRIPTION	APPROVED
0	JUNE 7/96	ISSUED FOR FINAL REPORT	
REVISIONS			

KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS – VANCOUVER, B.C.

PROFESSIONAL ENGINEER — YUKON TERRITORY — BRUNO BORNTRAEGER

DESIGNED BB
DRAWN NAR
CHECKED
APPROVED

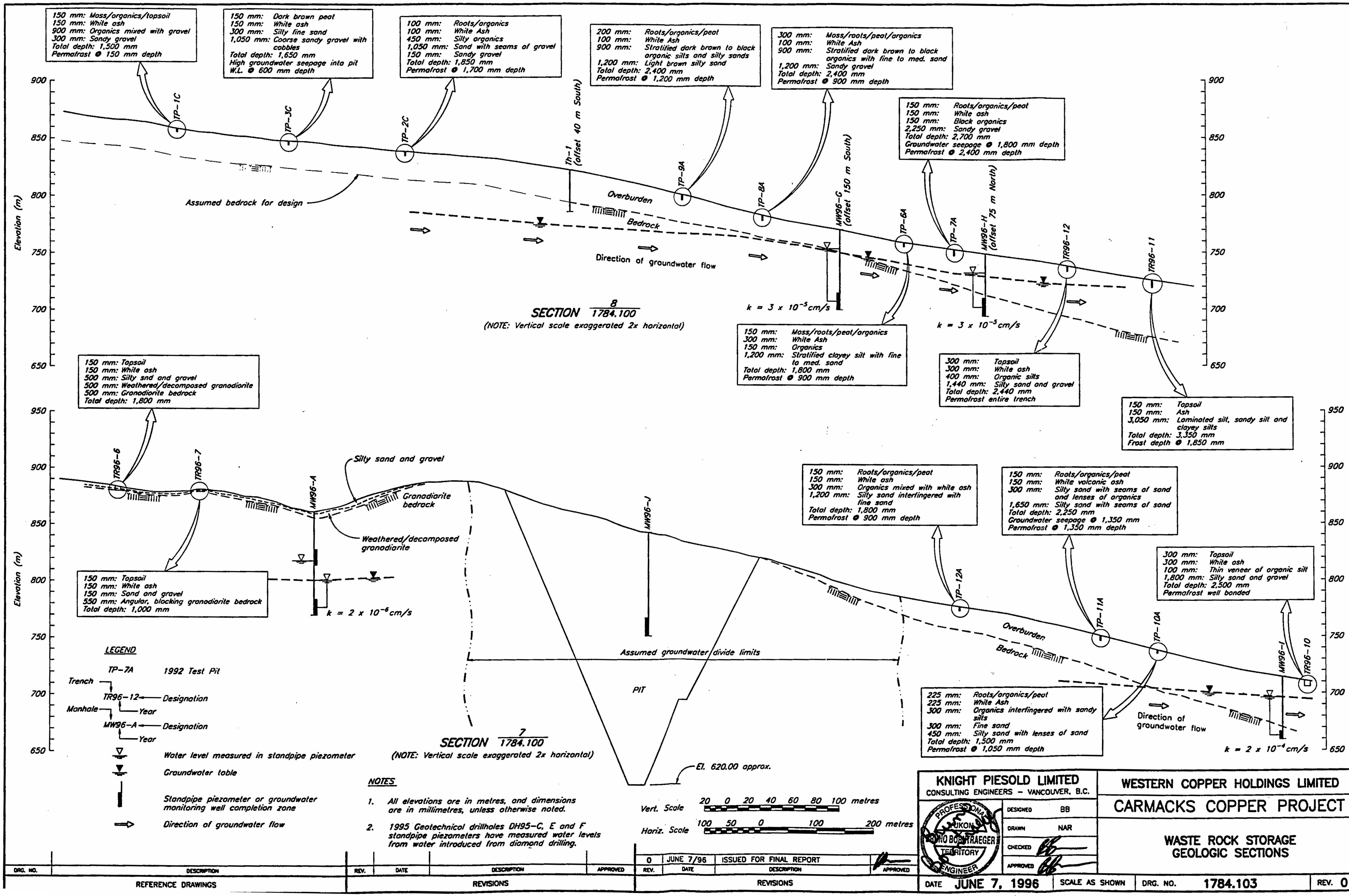
WESTERN COPPER HOLDINGS LIMITED

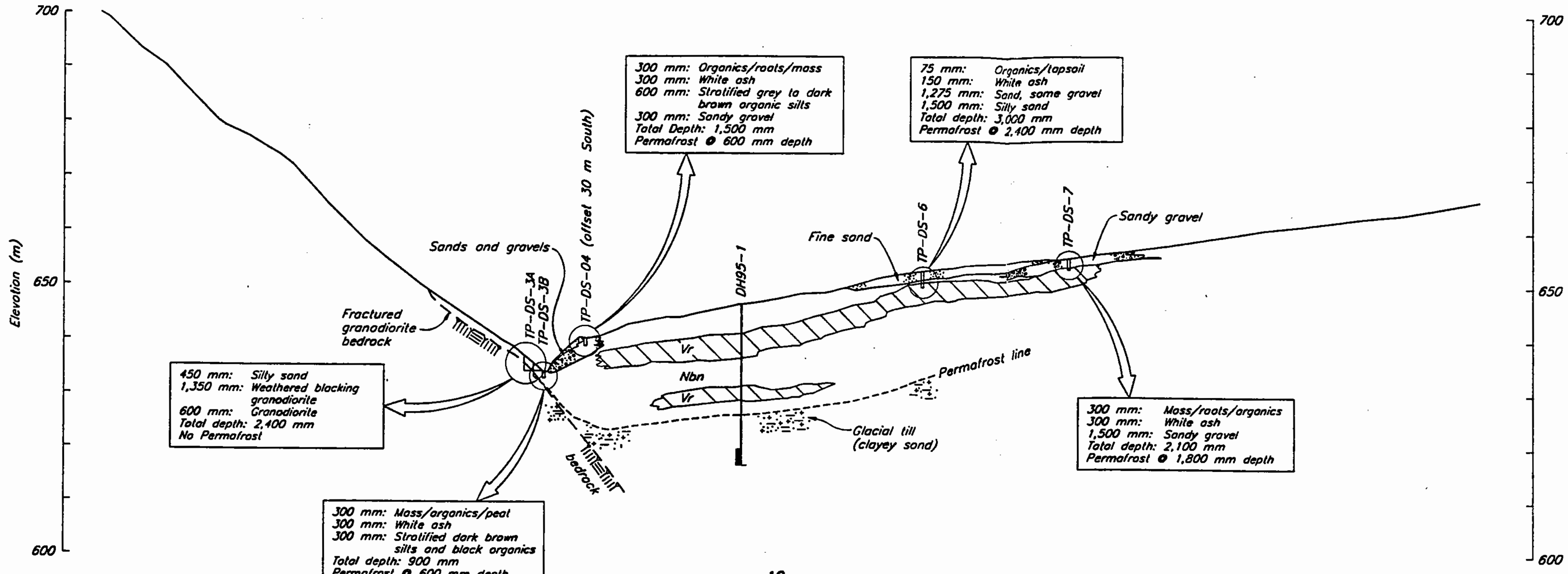
CARMACKS COPPER PROJECT

HEAP LEACH PAD
GEOLOGIC SECTIONS
SHEET 1 OF 2

DATE JUNE 7, 1996 | SCALE AS SHOWN | DRG. NO. 1784.101 | REV. 0

CAD FILE:\1784\C01\D2 1:2000 Plot 1=2 STD.1 JUNE 7, 1996


150 mm: Moss/organics/topsoil
150 mm: White ash
900 mm: Organics mixed with gravel
300 mm: Sandy gravel
Total depth: 1,500 mm
Permafrost @ 150 mm depth
150 mm: Dark brown peat
150 mm: White ash
300 mm: Silty fine sand
1,050 mm: Coorse sandy gravel with cobbles
Total depth: 1,650 mm
High groundwater seepage into pit
W.L. @ 600 mm depth
100 mm: Roots/organics
100 mm: White Ash
450 mm: Silty organics
1,050 mm: Sand with seams of gravel
150 mm: Sandy gravel
Total depth: 1,850 mm
Permafrost @ 1,700 mm depth
200 mm: Roots/organics/peat
100 mm: White Ash
900 mm: Stratified dark brown to black organic silts and silty sands
1,200 mm: Light brown silty sand
Total depth: 2,400 mm
Permafrost @ 1,200 mm depth
300 mm: Moss/roots/peat/organics
100 mm: White Ash
900 mm: Stratified dark brown to black organics with fine to med. sand
1,200 mm: Sandy gravel
Total depth: 2,400 mm
Permafrost @ 900 mm depth
150 mm: Roots/organics/peat
150 mm: White ash
150 mm: Black organics
2,250 mm: Sandy gravel
Total depth: 2,700 mm
Groundwater seepage @ 1,800 mm depth
Permafrost @ 2,400 mm depth
Elevation (m)
900
850
800
750
700
650
TP-1C
TP-3C
TP-2C
Th-1 (offset 40 m South)
TP-9A
TP-8A
MW96-G (offset 150 m South)
TP-6A
TP-7A
MW96-H (offset 75 m North)
TR96-12
TR96-11
Assumed bedrock for design
Overburden
Bedrock
Direction of groundwater flow
k = 3 x 10⁻⁵cm/s
k = 3 x 10⁻⁵cm/s
SECTION 8 / 1784.100
(NOTE: Vertical scale exaggerated 2x horizontal)
150 mm: Moss/roots/peat/organics
300 mm: White Ash
150 mm: Organics
1,200 mm: Stratified clayey silt with fine to med. sand
Total depth: 1,800 mm
Permafrost @ 900 mm depth
300 mm: Topsoil
300 mm: White ash
400 mm: Organic silts
1,440 mm: Silty sand and gravel
Total depth: 2,440 mm
Permafrost entire trench
150 mm: Topsoil
150 mm: Ash
3,050 mm: Laminated silt, sandy silt and clayey silts
Total depth: 3,350 mm
Frost depth @ 1,850 mm
150 mm: Topsoil
150 mm: White ash
500 mm: Silty snd and gravel
500 mm: Weathered/decomposed granodiorite
500 mm: Granodiorite bedrock
Total depth: 1,800 mm
950
900
850
800
750
700
650
TR96-6
TR96-7
MW96-A
Silty sand and gravel
Granodiorite bedrock
Weathered/decomposed granodiorite
150 mm: Topsoil
150 mm: White ash
150 mm: Sand and gravel
550 mm: Angular, blocking granodiorite bedrock
Total depth: 1,000 mm
k = 2 x 10⁻⁶cm/s
MW96-J
Assumed groundwater divide limits
PIT
El. 620.00 approx.
150 mm: Roots/organics/peat
150 mm: White ash
300 mm: Organics mixed with white ash
1,200 mm: Silty sand interfingered with fine sand
Total depth: 1,800 mm
Permafrost @ 900 mm depth
150 mm: Roots/organics/peat
150 mm: White volcanic ash
300 mm: Silty sand with seams of sand and lenses of organics
1,650 mm: Silty sand with seams of sand
Total depth: 2,250 mm
Groundwater seepage @ 1,350 mm
Permafrost @ 1,350 mm depth
300 mm: Topsoil
300 mm: White ash
100 mm: Thin veneer of organic silt
1,800 mm: Silty sand and gravel
Total depth: 2,500 mm
Permafrost well bonded
TP-12A
TP-11A
TP-10A
MW96-I
TR96-10
Overburden
Bedrock
225 mm: Roots/organics/peat
225 mm: White Ash
300 mm: Organics interfingered with sandy silts
300 mm: Fine sand
450 mm: Silty sand with lenses of sand
Total depth: 1,500 mm
Permafrost @ 1,050 mm depth
Direction of groundwater flow
k = 2 x 10⁻⁴cm/s
SECTION 7 / 1784.100
(NOTE: Vertical scale exaggerated 2x horizontal)
LEGEND
TP-7A 1992 Test Pit
Trench
TR96-12 Designation
Year
Manhole
MW96-A Designation
Year
Water level measured in standpipe piezometer
Groundwater table
Standpipe piezometer or groundwater monitoring well completion zone
Direction of groundwater flow
NOTES
1. All elevations are in metres, and dimensions are in millimetres, unless otherwise noted.
2. 1995 Geotechnical drillholes DH95-C, E and F standpipe piezometers have measured water levels from water introduced from diamond drilling.
Vert. Scale 20 0 20 40 60 80 100 metres
Horiz. Scale 100 50 0 100 200 metres
DRG. NO.
DESCRIPTION
REFERENCE DRAWINGS
REV.
DATE
DESCRIPTION
APPROVED
REVISIONS
0
JUNE 7/96
ISSUED FOR FINAL REPORT
REV.
DATE
DESCRIPTION
APPROVED
REVISIONS
KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.
PROFESSIONAL ENGINEER
YUKON TERRITORY
DESIGNED BB
DRAWN NAR
CHECKED
APPROVED
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
WASTE ROCK STORAGE GEOLOGIC SECTIONS
DATE JUNE 7, 1996
SCALE AS SHOWN
DRG. NO. 1784.103
REV. 0



SECTION $\frac{10}{1784.100}$

(NOTE: Vertical scale exaggerated 2x horizontal)

LEGEND

Nbn — No excess ice, well bonded frozen soil

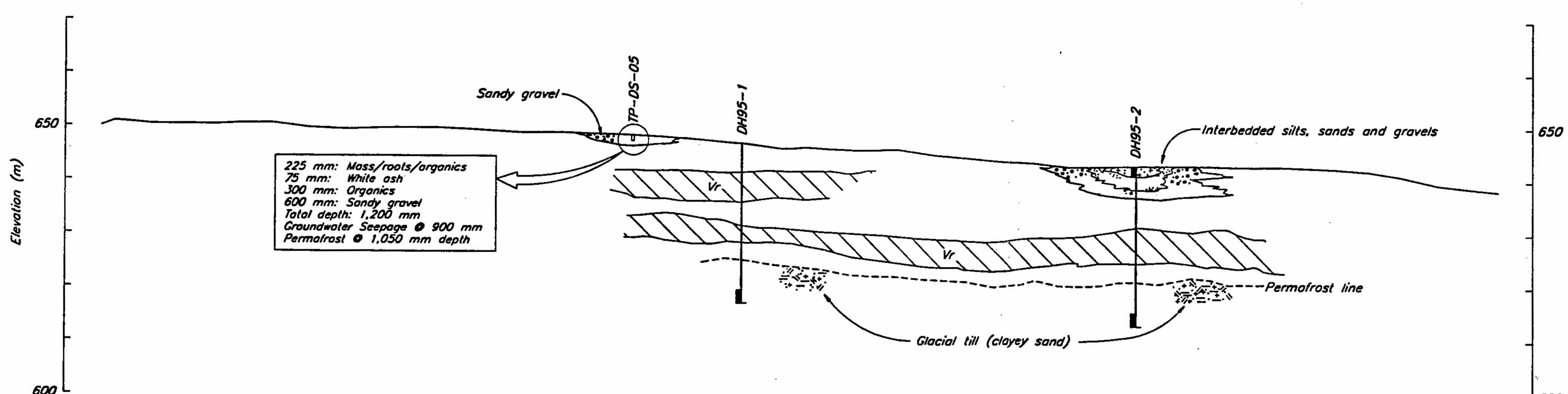
Vr — Random or irregular oriented ice formations in frozen soil

TP-DS-05 — 1992 Test Pit

Drillhole — DH95-A — Designation — Year

Manhole — MW96-B — Designation — Year

Standpipe piezometer or groundwater monitoring well completion zone



SECTION $\frac{10}{1784.100}$

(NOTE: Vertical scale exaggerated 2x horizontal)

Vert. Scale 10 0 10 20 30 40 50 metres

Horiz. Scale 20 10 0 20 40 60 80 100 metres

CAD FILE:\1784\DS\DS 1:1000 Plot 1=1 STD.1 JUNE 7, 1996

DRG. NO.	DESCRIPTION	REV.	DATE	DESCRIPTION	APPROVED	REV.	DATE	DESCRIPTION	APPROVED
						0	JUNE 7/96	ISSUED FOR FINAL REPORT	
REFERENCE DRAWINGS		REVISIONS				REVISIONS			

KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS – VANCOUVER, B.C.

PROFESSIONAL ENGINEER — YUKON TERRITORY — BRUNO BORNTRAEGER

DESIGNED BB
DRAWN NAR
CHECKED
APPROVED

WESTERN COPPER HOLDINGS LIMITED

CARMACKS COPPER PROJECT

WATER STORAGE DAM
GEOLOGIC SECTIONS

DATE JUNE 7, 1996 | SCALE AS SHOWN | DRG. NO. 1784.104 | REV. 0

Knight Piésold Ltd.
CONSULTING ENGINEERS

APPENDIX A1

DRILL HOLE LOGS
DH96-11 TO 16
DH96-2
MW96-A TO K

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. DH96-2 SHEET 1 of 2

PROJECT Carmacks Copper Project.
LOCATION OF TEST HOLE app. 31080N 30115E
DATE BEGUN Feb 14/96 DATE FINISHED Feb 15/96

PROJECT NO. 1784
GROUND EL.
LOGGED BY LG, RM

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
6" hollow stem Auger CME 750	13 19 36	SS	1.524		BH-2-1 Silty SAND some gravel			
purpose - to determine depth of bedrock	49 16R	SS	3.048		BH-2-2 - same			
	10 19 15	SS	4.572		BH-2-3 silty sand some gravel visible ice Vr			
	11 19 21	SS	6.096		BH-2-4 - same as BH-2-3			
	14 17 22	SS	7.62		BH-2-5 - same			
R = refusal boulder	29 21 32	SS	9.144		BH-2-6 silty sand some gravel reduced amount of visible ice Vr			

CAD FILE: \PROJECT\1783\TC\A2 Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. DH96-2 SHEET 2 of 2

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE app. 31080 N 30115 E
DATE BEGUN Feb 14/96 DATE FINISHED Feb 15/96
PROJECT NO. 1784
GROUND EL.
LOGGED BY LG, RM.

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
BH-2-7	11 50-R 5"	SS	12.192		Silt and Sand some gravel visible ice - same as BH-2-6			
	21 45 50-R 3"	SS	15.24		BH-2-8 silty sand some gravel - no visible ice			
R=refusal								
	10 31 50-R 5"	SS	19.812		BH-2-9 - Same as BH-2-8			
Hard grinding EOH.	22 50-R	SS	22.86		Silt and sand some gravel. BH-2-10 Bedrock			

CAD FILE: \PROJECT\1783\796\A2 Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. DH96-11 SHEET 1 of 2

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE Plantsite
DATE BEGUN Feb 13/96 DATE FINISHED Feb 14/96
PROJECT NO. 1734
GROUND EL.
LOGGED BY LG, RM

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
6" hollow stem Auger (HSA) CME 750			1.219		boulder			
	9 14 21	SS	1.529		DH-11-1 weathered SAND some gravel rust brown color			
	25 31-R 1"	SS	3.048		DH-11-2 same as above	Backfilled with cuttings		
	33-R 2"	SS	4.572		DH-11-3 same as above			
End of HSA Set up HW casing & continued NQ coring. recovery=56 RQD=0	39-R 3"	SS	6.096		DH-11-4 same as above			
		56 0	6.492				6.706	
		recovery 80 RQD=21	7.62		Granodiorite Bedrock	Pure Gold Med. Bentonite Chips ½ bag		
		recovery=100 RQD=10	9.149					
R=refusal		recovery=100 RQD=11	10.668				10.058	
recovery & RQD in %		recovery=98 RQD=22	12.192			10-20 Silica Sand 1 bag		

CAD FILE: \PROJECT\1734\HOLE\ PLOT SCALE 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. DH96-11
SHEET 2 of 2

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE [illegible]
DATE BEGUN Feb 13/96 DATE FINISHED Feb 14/96
PROJECT NO. 1784
GROUND EL.
LOGGED BY LG, RM

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
		recovery = 85 RQD = 0	13.411				12.497	
Recovery = 92 RQD = 0		92 0	13.716			Screen	14.021	
		recovery = 100 RQD = 7.5	15.240			slough	1329	
recovery & RQD in %					Point Load Samples @ 6.55 m @ 11.23 m @ 11.73 m @ 14.48 m			
No Groundwater [illegible] W.L. [illegible] [illegible] water added for drilling								

CAD FILE: \PROJECT\1783\1C\A2 Plot scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. DH96-12
SHEET 1 of 2

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE Plantsite.
DATE BEGUN Feb.09/96 DATE FINISHED Feb 13/96
PROJECT NO. 1784
GROUND EL.
LOGGED BY BB, RM, LG

DRILLING INFORMATION			GEOLOGY		COMPLETION DETAILS	
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	DESCRIPTION	COMMENTS	DEPTH (m)
6 inch dia Hollow Stem auger CME 750				Silty SAND, some gravel	Steel protective Cover installed with grout plug	
	7 6 8	SS	1.524	DH-12-1 0.15m Rec. Frost line		
				Boulder @ 2.1 M		
boulder	17 50R	SS	3.048	0.05 m Rec. DH-12-2 Clayey SAND, some gravel Dense, (Till)		
hard to drill					Hole backfilled with cuttings	
Cuttings Change	50R bouncing	SS	4.572	N.S weathered/ decomposed Bedrock		
change est. 60cm boulder @ 5.3 m						
hard grinding	50R	SS	6.096	N.S (Come ... and ground ... Chips)		
			7.620	Notes N.S. = No Samples L.S. = Large Spoon S.S = Small Spoon		
End of HSA	bedrock		9.144			
Set HW casing and continued NQ coring	Recovery 84 RQD=0			DH-12-3 Cuttings from bedrock	top seal Pure Gold Medium Bentonite Chips 1 bag	
	Rec.=0 RQD=0		10.211			
	Rec.=39 RQD=0		10.973			
	Rec.100 RQD=0		11.430			
NO GROUNDWATER			11.887			

CAD FILE: \PROJECT\1783\TC\A2 Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. DH96-12 SHEET 2 of 2

PROJECT: Carmacks Copper Project
PROJECT NO. 1784
LOCATION OF TEST HOLE: Plant site
GROUND EL.
DATE BEGUN: Feb 09/96 DATE FINISHED: Feb 13/96
LOGGED BY: RB, RM, LG.

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Rec=67 RQD			12.344					
	Rec.=100 RQD=9		12.8					
	Rec.=100 RQD=0		13.411		Biotite Gneiss			
	Recovery=47 RQD=0		13.866				14.326	
						10-20 Silica sand (1/2 bag)		
	Recovery=100 RQD=8		15.[illegible]					
			15.8		Granodiorite	* Slough (Rock chips)	16.96	
			16.5		Biotite Gneiss		17.069	
	Recovery=100 RQD=15		16.916					
			17.1		Granodiorite.			
			18.[illegible]		EOH	1 inch dia. PVC Sch40, 1.5M Well Screen.	18.[illegible]	EOH
No groundwater encountered.								
					Point Load Samples: @ 12.80 m, @ 15.85 m — Biotite Gneiss; @ 17.68 m, @ 17.98 — Granodiorite			
Drill water depth after drilling Feb 14, 3:00p - NO WATER Feb 15 2:30p - NO WATER								
						* when pulling augers, pyzometers raised to 17.069 m		

CAD FILE: \PROJECT\1783\TC\A2 Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. DH96-13 SHEET 1 of 2

PROJECT Carmacks Copper Project | PROJECT NO. 1783
LOCATION OF TEST HOLE Plant Site | GROUND EL.
DATE BEGUN Feb 9/96 | DATE FINISHED Feb 12 96 | LOGGED BY LG, RM, BB

NOTES (Water loss, type and size of hole, drilling method, groundwater level, etc.)	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	DESCRIPTION	COMMENTS	DEPTH (m)
6 inch diameter hollow stem auger CME 750				Silty SAND some gravel (coarse)		0
						0.91
no groundwater	7bl 4" R	SS	1.524	DH-13-1 2.134m Boulder Frost line	Thermistor string grouted - 10 pt thermistor string	1.83
			2.29			2.74
boulder	50R		3.048	DH-13-2 coarse SAND ice		3.66
	50R		4.572	no sample silty gravely SAND		
Change in cuttings			4.877	weathered/decomposed Bedrock (Biotite Gneiss)		4.88
	50R		6.096	DH-13-3 Silty SAND some gravel		6.10
	50R		7.620	no sample DH-13-4 Silt and Sand		7.62
End of HSA - Set HW casing & con't NQ coring in w.d. bedrock			7.925			
			9.149			
Recovery & RQD's in percent R= Refusal		Recovery = 0 RQD = 0	10.668	weathered Biotite Gneiss		
rusty dark orange return while NQ coring		Recovery = 0 RQD = 0	12.192			12.192

CAD FILE: \PROJECT\1783\FIC\A2 Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. [illegible] SHEET 2 of 2

PROJECT Carmacks Copper Project

LOCATION OF TEST HOLE Plantsite

DATE BEGUN Feb 9/96 DATE FINISHED Feb 12/96

PROJECT NO. 1783

GROUND EL.

LOGGED BY LG, [illegible], RM

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
		Recovery: 0 RQD = 0	13.716		weathered Biotite Gneiss.			
very poor recovery drill [illegible] water [illegible] resulted in poor sample recovery.		Recovery: 0 RQD = 0	15.240					
		Recovery: 17 RQD = 0	16.764					
No groundwater encountered.		Recovery: 0 RQD = 0	18.288		EOH	Thermistor string to 18.288m	18.288	

CAD FILE: \PROJECT\1783\FIC\A2 Plot scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. [illegible]
SHEET 1 of 2

PROJECT: Carmacks Copper Project
LOCATION OF TEST HOLE: Plant Site
DATE BEGUN: Feb 0/96
DATE FINISHED: Feb 10/96
PROJECT NO.: 1784
GROUND EL.:
LOGGED BY: [illegible]

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
6 inch Hollow Stem Auger CME 750					Silty SAND some gravel dry	1/2 bag med. bentonite chips		
	8 14 37	SS.	1.524		DH-14-A – as above DH-14-B fractured rock A= 0.152m B= 0.279m	hole backfilled with cuttings from 0.762m to 7.772 m		
			2.139		Sand and gravel			
no groundwater	50-R	SS	3.048		Silty sand some gravel			
grinding	R	SS.	4.572		weathered [illegible]			
			6.096		Combination of granodiorite and biotite gneiss cuttings/chips			
Hard bedrock			7.620					
End of HSA set HW casing and continued DD drilling		Recovery = 78 RQD = 23			moderately weathered granodiorite.	7.772m		
			8.53			1/2 bag med. bentonite chips		
Recovery & RQD in %			9.144		fine grained biotite gneiss slightly weathered			
		Recovery: 78 RQD: 22	10.21		granodiorite, slightly weathered.	Sand to 9.45m (1 bag of sand)		
			10.668					
R= Refusal		Recovery: 60 RQD: 7	12.192		Biotite gneiss as above slightly weathered.			

CAD FILE: \PROJECT\1784\[illegible]\A2 Plot scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. 2-96-14
SHEET 2 of 2

PROJECT Comanche Copper Project
LOCATION OF TEST HOLE Plant Site
DATE BEGUN Feb 9/96
DATE FINISHED Feb 10/96

PROJECT NO.
GROUND EL.
LOGGED BY LG, PM, 23

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
		Recovery = 23 2.3 / 13	13.716		Biotite gneiss	1.524m screen		
			14.326		EOH	slough	14.326	

CAD FILE: \PROJECT\1783\FIG\A2 Plot scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. [illegible]
SHEET of [illegible]

PROJECT [illegible]
LOCATION OF TEST HOLE [illegible]
DATE BEGUN Feb 11 '96 DATE FINISHED Feb 12 '96

PROJECT NO.
GROUND EL.
LOGGED BY [illegible]

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Hollow Stem Auger 6" CME 250 good drilling not frozen					cobbles	1" pvc piezometer to 16.307 m		
	4 9 9	SS	1.524		DH-15-1			
			1.829		Silty sand some gravel			
			2.134		Frost line			
drilling change - getting harder to drill			2.438					
	50-R 3"	SS	3.048		DH-15-2	Hole Backfilled with cuttings		
Dense, harder to drill	50		4.572		Biotite gneiss fragments chips, cuttings			
no sample hardened rock			6.096					
Ground core mislatch.					Highly weathered biotite Gneiss			
End of HSA			7.620					
Set HW casing & continued NQ coring	recovery: 100 RQD = 0		7.925					
Ground core,	rec 0 RQD 0		9.144		highly weathered zone.			
	recovery: 15 RQD = 0		9.601				10.363	
R = refusal	recovery RQD		10.668			1/2 bag medium bentonite pure gold chips 10.363 m to 12.497 m		
Recovery & RQD in % Ground core	rec 67 RQD 0		11.125					
			11.735					
			12.192					

CAD FILE: \PROJECT\[illegible] Plot scale 1:1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No.
SHEET 2 of 2

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE Plant site
DATE BEGUN Feb 11/96 DATE FINISHED Feb 12/96
PROJECT NO.
GROUND EL.
LOGGED BY LG, RM, BR

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Rec=0 RQD=0			12.344				12.497	
	Rec=0 RQD=0		13.716			1 bag 10-20 silica sand		
			13.868					
No ground water encountered	Rec=0 RQD=0		15.240				14.783	
			15.392					
	Rec=0 RQD=0		16.764		EOH	0.457 m sluff	16.307 16.764	

CAD FILE: \PROJECT\1783\FIG\A2 Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. DH96-11 SHEET 1 of 2

PROJECT Cormacks Copper Project
LOCATION OF TEST HOLE Plant site
DATE BEGUN Feb 13/96 DATE FINISHED Feb 14/96
PROJECT NO.
GROUND EL.
LOGGED BY LG, RM, BB

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
6" hollow stem auger CME 750							0	
							0.91	
	26 27 25	SS	1.529		DH-16-1 Silt & Sand Nb some gravel			
					boulder		1.83	
							2.74	
	10 27 26	SS	3.048		DH-16-2 Silt and sand Nb some gravel			
							3.66	
	17 21 23	SS	4.572		DH-16-3 Silt & sand Nb some gravel		4.88	
	12 21 19	SS.	6.096		DH-16-4 Silt & Sand Nb some gravel		6.10	
						Thermistor string to 18.288m grouted		
	12 13 17	SS	7.620		DH-16-5 Silt & Sand Nb some gravel		7.62	
	13 22 24	SS	9.144		DH-16-6 Silt & sand Nb some gravel			
R= refusal	15 33 23-R	SS	10.668		DH-16-7 Silt & Sand Nb some gravel			
		SS	12.192		DH-16-8 not frozen		12.192	

CAD FILE: \PROJECTS\...\...\... Plot scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. DH96-16
SHEET 2 of 2

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE Plant site
DATE BEGUN Feb 13/96 DATE FINISHED Feb 14/96

PROJECT NO.
GROUND EL.
LOGGED BY LG, RM, RS

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
	6 13 <17	SS			DH-16-8 - not frozen Silt & Sand some gravel			
	50-R	SS	13.716		DH-16-9 Silt & Sand N/o some gravel			
End of HSA Set up for NQ coring			14.326					
		recov: 14 RQD: 14	15.240		weathered / decomposed bedrock (granodiorite)			
		recovery: 45 RQD: 0	16.764		Granodiorite. highly weathered.	Thermistor String to 60' (18.288m) grouted.		
		recovery: 0 RQD: 0	18.288				18.288	
					EOH			

CAD FILE: \PROJECT\1783\FIG\A2 Plot scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. MW96-A
SHEET 1 of 2

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE 30755.3 N 29834.9 E
DATE BEGUN Feb 16/96 DATE FINISHED Feb 17/96

PROJECT NO. 1784
GROUND EL. 872.818
LOGGED BY RM, LG

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Drill - Schramm Rota Drill					OVERBURDEN			
			3.048					
light brown (finer) Weathered Bedrock		X	5.182		SAND, some gravel, some silt BH96-A-1 (weathered bedrock)	2 in. diameter PVC used for both piez.		
		X	12.802		BH96-A-2			
change harder, grey brown			16.459		Bedrock	Hole backfilled with cuttings		
change brown orange			18.288					
change harder, grey - Brown		X	24.384		BH96-A-3			
Change brown grey bedrock.			30.485				32.004	
						TOP SEAL Pure gold medium bentonite chips - 2 bags	34.442	
trace water -> change grey Bedrock. no WATER.		X	38.105		BH96-A-4			
						10-20 Silica Sand 6 bags	42.672	
						10' screen (3.048m)	45.720	
						Pure gold med. bentonite chips - 3 bags	49.682	
Change brown grey.			51.816					
change, grey			56.522		Same as BH96-A-4	cuttings		

CAD FILE: \PROJECT\1783\KC\A2 Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. MW96-A SHEET 2 of 2

PROJECT Carmacks Copper Project

LOCATION OF TEST HOLE 30755.3 N 29834.9 E

DATE BEGUN Feb 16/96 DATE FINISHED Feb 17/96

PROJECT NO. 1784

GROUND EL. 872.818

LOGGED BY RM, LG

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
							80.162	
no change						~~cuttings~~ bentonite 2-bags	81.686	
NO WATER						10-20 Silica Sand 12-bags	88.392	
			91.440		EOH 300 ft	3.048 m screen	91.440	

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. MW96-5 SHEET 1 of 2

PROJECT Carmacks Copper Project

LOCATION OF TEST HOLE 30469.5 N 29 974.2 E

DATE BEGUN Feb 17/96 DATE FINISHED Feb 18/96

PROJECT NO. 1784

GROUND EL. 854.735

LOGGED BY LG. Rm

DRILLING INFORMATION			GEOLOGY		COMPLETION DETAILS	
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	DESCRIPTION	COMMENTS	DEPTH (m)
Drill-Schramm Rota Drill			3.05	overburden.		
rusty brown		X	4.267	BH96-B-1	2" pvc used with 10' screen to 300' depth	
color change-greyish		X	6.096	BH96B-2 Bedrock		
greyish in color		X	18.898	BH96-B-3		
					Hole backfilled with cuttings	
Greyish in color very powdery		X	37.186	BH96-B-4		
				Bedrock		
Same as BH96-B-4		X	67.056	BH96-B-5		
change to slightly coarser material		X	70.104	BH96-B-6	pure gold med. bentonite chips - 2 bags 72m	13.4
					10-20 silica Sand 12 bags	

CAD FILE: \PROJECT\1783\1\IG\A2 Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. MW96-8 SHEET 2 of 2

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE 20469.5 N 29 034.2 E
DATE BEGUN Feb 17/96 DATE FINISHED Feb 18/96
PROJECT NO. 1299
GROUND EL. 854.735
LOGGED BY LG, RM

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Dry hole. BOH - 91.44m			91.440		Bedrock	10-20 silica Sand 12 bags 3.048m screen	91.440	

CAD FILE: \PROJECT\1299\FIG\A2 Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. MW96-C SHEET 1 of 1

PROJECT Cormacks Copper Project

LOCATION OF TEST HOLE 30 095.1 N , 30 385.3 E

DATE BEGUN Feb 26/96 DATE FINISHED Feb 26/96

PROJECT NO. 1789

GROUND EL. 754.731

LOGGED BY LG

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Schramm Rota Drill						2" PVC to 49.987m		
overburden Silty Sand & gravel						Hole Backfilled with cuttings.		
Bedrock			29.384		Bedrock			
			27.432		BH96-C-1			
							39.929	
						Pure gold med bentonite chips	43.282	
						10-20 Silica Sand	46.939	
Damp cuttings			48.0					
BOH 49.987 m			49.987				49.987	
Water entering borehole								

CAD FILE: \PROJECT\1783\FIG\A2 Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. MW96-D SHEET 1 of 1

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE 29 874.8 N 30 604.7 E
DATE BEGUN Feb 27/96 DATE FINISHED Feb 27/96

PROJECT NO. 1784
GROUND EL. 717.073
LOGGED BY LG

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Schramm Rotc Drill			3.048		Sand & Gravel some sand	2" PVC to 41.148m		
			15.240		Silt and Sand	Hole backfilled with cuttings		
			21.946		Silt & Sand some gravel			
			27.737		Silt and Sand		28.65	
			30.48		weathered bedrock	Pure Gold med Bentonite chips	31.7	
					Bedrock	10-20 Silica Sand 4 bags	38.10	
Damp cuttings BOH 41.148M			40.0			3.048m screen		
			41.148				41.148	
Water entering bore hole								

CAD FILE: \PROJECTS\1783\...\... Plot scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. MW96-E
SHEET 1 of 2

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE 30299.9 N 29826.8 E
DATE BEGUN Feb 16/96 DATE FINISHED Feb 17/96
PROJECT NO. 1784
GROUND EL. 840.134
LOGGED BY RM, LG

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Bedrock very near surface					weathered bedrock	2" PVC to bottom of well - 10' screen		
Drill - Schramm Rotadrill			5.0		Bedrock cuttings rusty brown to 30.5 m			
					Bedrock	Hole backfilled with cuttings		
			30.5					
			43m		grey brown			
			53.4		grey bedrock			
						Pure gold med. bentonite chips - 2 bags	72.542	
							76.2m	
			77.7		Some source of H_2O drilling < 1 gal/min	10-20 silica sand 12 bags		

CAD FILE: \PROJECT\1784\HOLE\A2 Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. MW96-E SHEET 2 of 2

PROJECT Carmacks Copper Project | PROJECT NO. 1784

LOCATION OF TEST HOLE 30299.9 N 29 8268 E | GROUND EL. 840.134

DATE BEGUN Feb 16/96 DATE FINISHED Feb 17/95 | LOGGED BY RM, LG

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
					Bedrock		88.392	
			91.49		BOH - 91.44m	3.048m screen	91.440	

CAD FILE: \PROJECT\1783\FIG\A2 Plot scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. MW96-F
SHEET 1 of 2

PROJECT: Carmacks Copper Project
PROJECT NO.: 1784
LOCATION OF TEST HOLE: 31 745.3 N 30 184.9 E
GROUND EL.: 781.420
DATE BEGUN: Feb 18/96
DATE FINISHED: Feb 20/96
LOGGED BY: LG.2M

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES (Water loss, type and size of hole, drilling method, groundwater level, etc.)	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Drill - Schramm Rota Drill						2" PVC to bottom of well -10' Screen		
SILT some gravel		X	3.658		BH96-F-1			
at 3.962 m - 0.305 m band of sand BH96-F-2			6.096		- SILT some gravel			
wet silt - Loose			9.144			Hole back filled with cuttings		
DID NOT HIT BEDROCK								
Same wet silt		X	19.507		BH96-F-3			
drilling with water			21.336					
Same wet silt		X	32.0		BH96-F-4			

CAD FILE: \PROJECT\1783\FIG\A2 Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. MW96-F SHEET 2 of 2

PROJECT Carmacks Copper Project — PROJECT NO. 1789

LOCATION OF TEST HOLE 31 745.3 N 30 184.0 E — GROUND EL. 781.420

DATE BEGUN Feb 18/96 — DATE FINISHED Feb 20/96 — LOGGED BY LG, RM

DRILLING INFORMATION: NOTES (Water loss, type and size of hole, drilling method, groundwater level, etc.)	BLOW COUNT	SAMPLES FOR TESTING	GEOLOGY: DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMPLETION DETAILS: COMMENTS	DEPTH (m)	GRAPHIC LOG
wet silt								
0.305 m band of gravel		46.025	45.72					
Trace of water			53.645					
change to coarse sand			54.864					
water bearing zone.					Coarse Sand	Pure gold med. bentonite chips - 2 bags	56.693	
						10-20 Silica sand 3 bags	57.912	
							59.436	
coarse sand			60.960		BH96-F-5	10' Screen		
			62.484	EOH			62.484	Boh

CAD FILE: \PROJECT\1789\FIG\A2 Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. MW96-G SHEET 1 of 1

PROJECT Connachs Copper Project PROJECT NO. 1784
LOCATION OF TEST HOLE 31 341.1 N 30655.0 E GROUND EL. 180.20
DATE BEGUN Feb 24 1996 DATE FINISHED Feb 25 1996 LOGGED BY LG.

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
drilling with Schramm Rota Drill					Sand Silt a gravel	2" pvc to 245' (74.676m)		
			12.192					
			15.24		BH 96-G-1			
Start of bedrock			16.764					
					Bedrock	backfilled with cuttings		
							55.778	
						pure gold medium bentonite 2 bags	60.655	
Damp cuttings			64.008			10-20 Silica Sand 9 bags		
							71.628	
BOH- 74.676m			74.676		BOH	3.048m screen	74.676	

CAD FILE: \PROJECT\1783\TC\A2 Plot scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. MW96-H
SHEET 1 of 1

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE 31672.1N 30892.7E
DATE BEGUN Feb 23/96 DATE FINISHED Feb 24/96

PROJECT NO. 1789
GROUND EL. 743.111
LOGGED BY LG

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Drilling with Schramm Rotadrill						2" pvc		
very cold -40°C made drilling difficult					Silty Sand some gravel	hole backfilled with cuttings.		
			21.336		BH96-H-1 - Silty sand			
start of bedrock			36.576		BH96-H-2			
							38.100	
						Pure Gold med. Bentonite chips 1 bag	39.629	
					Bedrock	10-20 Silica Sand 5 bags		
first sign of water			51.206					
							52.121	
BOH- 55.169 m			55.164			3.048 m screen	55.169	

CAD FILE: \PROJECT\1789\FIG\A2 Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. MW96-1 SHEET 1 of 2

PROJECT Carmachs Copper Project	PROJECT NO. 1789
LOCATION OF TEST HOLE 30403.6N 31371.1E	GROUND EL. 719.203
DATE BEGUN Feb 20/96 DATE FINISHED Feb 22/96	LOGGED BY LG, RM

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Drill - Schramm Rota Drill			2.743		Silty Sand	2" PVC piezometer in 59.864m		
Very Cold - -40°C Difficult drilling			6.096		silty sand some gravel			
						backfilled with cuttings		

CAD FILE: \PROJECT\1789\TG\A2 Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. MW96-1 SHEET 2 of 2

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE 30 403.6N 31 371.1 E
DATE BEGUN Feb 20/96 DATE FINISHED Feb 22/96
PROJECT NO. 1784
GROUND EL. 719.203
LOGGED BY LG, RM

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
			44.196		Bedrock		47.299	
						pure gold med. bentonite chips - 2 bags	49.682	
						10-20 Silica Sand 7-bags	51.816	
Damp cuttings			53.3			3.048m screen		
BOH- 54.864m			54.864				54.864	
watering entering borehole								

CAD FILE: \PROJECT\1783\KC\A2 Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. MW96-I SHEET 1 of 2

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE 30025.0 N 36390 E
DATE BEGUN Feb 25/96 DATE FINISHED Feb 26/96

PROJECT NO. 1784
GROUND EL. 853.509
LOGGED BY LG

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Schramm Rota Drill			0.914		Sand & Gravel some silt			
			2.743		Broken Bedrock			
					Bedrock.	2" PVC to 90.526m		
		X	15.240		BH96-I-1	Hole backfilled with cuttings.		
1305 band - below 22.25m the cuttings same as BH96-I-1		X	21.95 / 22.25		BH96-I-2			
						Dry hole		
					DRY HOLE			
						Pure Gold med bentonite chips	76.4	
						10-20 Silica Sand	78.638	

CAD FILE: \PROJECT\1783\TC\A2 Plot scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. MW96-I
SHEET 2 of 2

PROJECT Carmacks Copper Project
LOCATION OF TEST HOLE 30 935.0N 30 390.0 E
DATE BEGUN Feb 25/96 DATE FINISHED Feb 26/96

PROJECT NO. 1784
GROUND EL. 853.509
LOGGED BY LG

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
					DRY HOLE Bedrock	10-20 Silica Sand	87.478	
						3.048 m Screen	90.526	
E.O.H. - 91.44m			91.44			Broken Pieces of PVC	91.49	

CAD FILE: \PROJECT\1783\FIG\A2 Plot scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. MW96-x
SHEET 1 of 2

PROJECT Carmacks Copper Project
PROJECT NO. 1784
LOCATION OF TEST HOLE 30515.0 N 30525.0 E
GROUND EL.
DATE BEGUN Feb 27/96
DATE FINISHED Feb 28/96
LOGGED BY LG. BB

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
Drill: Schramm Rotary			1.0		Sand & Gravel some silt	2" pvc to 92.964m		
			2.6		Weathered bedrock			
					Bedrock			
Dry Well						Hole backfilled with cuttings		
							46.9	
						3 bags pure 30% med. bentonite chips		

CAD FILE: \PROJECT\1783\... Plot scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. MW96-1A SHEET 2 of 2

PROJECT Cormacks Copper Project

LOCATION OF TEST HOLE 30515.0 N 305750 E

DATE BEGUN Feb 27/96 DATE FINISHED Feb 28/96

PROJECT NO. 1784

GROUND EL.

LOGGED BY LG. BB

DRILLING INFORMATION			GEOLOGY			COMPLETION DETAILS		
NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	BLOW COUNT	SAMPLES FOR TESTING	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	COMMENTS	DEPTH (m)	GRAPHIC LOG
							80.2	
					Bedrock	11-bags 10-20 silica Sand.	89.916	
BOH 92.964m			92.964			3.048m screen	92.964	

Knight Piésold
CONSULTING ENGINEERS

GEOTECHNICAL DRILLING – BEDROCK LOG

HOLE NO. DH-11
SHEET 1 of 2

PROJECT Carmacks Copper Project
PROJECT NO. 1784
LOGGED BY BB
DATE

DEPTH (ft)	PERCENT CORE LOSS 25 50 75	DEFECTS TYPE	DEFECTS INFILLING	DEFECTS INCLINATION	DESCRIPTION AND REMARKS	WEATHERING	GRAPHIC LOG	BRECCIA/GOUGE BROKEN CORE	HARDNESS 4 3 2	ROCK QUALITY DESIGNATION 75 50 25	NATURAL DEFECT FREQUENCY		PERMEABILITY
20		Fr	none	80	granodiorite 1-2 hits w P.H	SW MW						10-20 defects per meter rough, planar	
		Soli		45°	PLT testing 21.5 37 38.5 47.5								
30													
40													

CAD\FIG\A19 Plot scale 1=1

Knight Piésold
CONSULTING ENGINEERS

GEOTECHNICAL DRILLING – BEDROCK LOG

HOLE NO. DH-11
SHEET 2 of 2

PROJECT ______
PROJECT NO. ______
LOGGED BY BB
DATE ______

DEPTH (ft)	PERCENT CORE LOSS 25 50 75	DEFECTS: TYPE	DEFECTS: INFILLING	DEFECTS: INCLINATION	DESCRIPTION AND REMARKS	WEATHERING	GRAPHIC LOG	BRECCIA/GOUGE BROKEN CORE	HARDNESS 4 3 2	ROCK QUALITY DESIGNATION 75 50 25	NATURAL DEFECT FREQUENCY		PERMEABILITY
50							EOH						

CAD\NC\A19 Plot scale 1=1

Knight Piésold
CONSULTING ENGINEERS

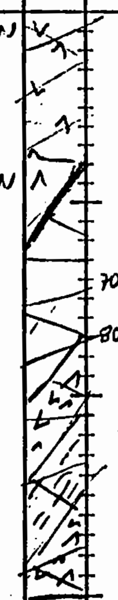
GEOTECHNICAL DRILLING – BEDROCK LOG

HOLE NO. DH-12
SHEET 1 of

PROJECT
PROJECT NO.
LOGGED BY
DATE

30 - ~~[illegible]~~ 60.5 ft

DEPTH ( )	PERCENT CORE LOSS 25 50 75	DEFECTS TYPE	DEFECTS INFILLING	DEFECTS INCLINATION	DESCRIPTION AND REMARKS	WEATHERING	GRAPHIC LOG	BRECCIA/GOUGE BROKEN CORE	HARDNESS 4 3 2	ROCK QUALITY DESIGNATION 75 50 25	NATURAL DEFECT FREQUENCY		PERMEABILITY
30					30-42 granodiorite	MW						10-20/m	
40				15°	42-52 Biotite gneiss	MW						10/m	
							70						
							80						
50					52-54 granodiorite							10/m	
		fol		0-10	54-56 biotite gniess							10/m	
					56-60. granodiorite							10/m	
60					57.51 vn 5mm thick parallel to c.a.								



DH 12 42' Biotite gneiss
52' Biotite gneiss
58' grdr
59 grdr

CAD\FIC\A19 Plot scale 1=1

Knight Piésold
CONSULTING ENGINEERS

GEOTECHNICAL DRILLING – BEDROCK LOG

HOLE NO. PH-13
SHEET 1 of 1

PROJECT Carnacks Copper Project
PROJECT NO. 1784
LOGGED BY
DATE

DEPTH ( )	PERCENT CORE LOSS 25 50 75	DEFECTS TYPE	DEFECTS INFILLING	DEFECTS INCLINATION	DESCRIPTION AND REMARKS	WEATHERING	GRAPHIC LOG	BRECCIA/GOUGE BROKEN CORE	HARDNESS 4 3 2	ROCK QUALITY DESIGNATION 75 50 25	NATURAL DEFECT FREQUENCY		PERMEABILITY
1		fol	none	45°	Biotite Gneiss 25-55 1.0 M recovery @ 50-55							broken core 0. 2-3" pcs 4 pcs. total	

CAD\FIG\A18 Plot scale 1=1

Knight Piésold CONSULTING ENGINEERS

GEOTECHNICAL DRILLING – BEDROCK LOG

HOLE NO. DH-14
SHEET 1 of 1

PROJECT Carmacks Copper Project
PROJECT NO. 1784
LOGGED BY BB
DATE

DEPTH (ft)	PERCENT CORE LOSS 25 50 75	DEFECTS TYPE	DEFECTS INFILLING	DEFECTS INCLINATION	DESCRIPTION AND REMARKS	WEATHERING	GRAPHIC LOG	BRECCIA/GOUGE BROKEN CORE	HARDNESS 4 3 2	ROCK QUALITY DESIGNATION 75 50 25	NATURAL DEFECT FREQUENCY		PERMEABILITY
		fr	n	20-30	weathered/decomposed coarse grained granodiorite 1-2 hits w R.H.	MW			1-2			highly ground/broken core.	
28													
30		fol	none	20	biotite gneiss, fine grained 1-2 hits with hammer	SW			1-2			10-20 defects per meter	
33.5						SW			1-2				
35					granodiorite as above								
40	-	fr	none	45		SW			1-2				
		fr	none	70									
45													
47 EOH													
50													

CAD\FC\A19 Plot scale 1=1

Knight Piésold
CONSULTING ENGINEERS

GEOTECHNICAL DRILLING – BEDROCK LOG

HOLE NO. DH 15
SHEET 1 of 1

PROJECT ______ LOGGED BY ______
PROJECT NO. ______ DATE ______

DEPTH (__)	PERCENT CORE LOSS 25 50 75	DEFECTS: TYPE	DEFECTS: INFILLING	DEFECTS: INCLINATION	DESCRIPTION AND REMARKS	WEATHERING	GRAPHIC LOG	BRECCIA/GOUGE ■ BROKEN CORE ▨	HARDNESS 4 3 2	ROCK QUALITY DESIGNATION 75 50 25	NATURAL DEFECT FREQUENCY		PERMEABILITY
25					Decomposed/weathered Biotite gneiss	HW						defects 10/m.	
30					fol 10-15° from c.a.								
					1 [illegible] with [illegible]								
40					Sandy texture.								
50													
60													

CAD\FIG\A19 Plot scale 1=1

Knight Piésold
CONSULTING ENGINEERS

GEOTECHNICAL DRILLING – BEDROCK LOG

HOLE NO. DH-16
SHEET 1 of 1

PROJECT Cun
LOGGED BY
PROJECT NO.
DATE

DEPTH (ft)	PERCENT CORE LOSS 25 50 75	DEFECTS TYPE	DEFECTS INFILLING	DEFECTS INCLINATION	DESCRIPTION AND REMARKS	WEATHERING	GRAPHIC LOG	BRECCIA/GOUGE BROKEN CORE	HARDNESS 4 3 2	ROCK QUALITY DESIGNATION 75 50 25	NATURAL DEFECT FREQUENCY		PERMEABILITY
40													
47					pc 5" long of granodiorite 1-2 bits ground and undulating core not drilled smoothly								
50					sandy decomposed granodiorite, no defects visible.								
					no core								
60													

Knight Piésold Ltd.
CONSULTING ENGINEERS

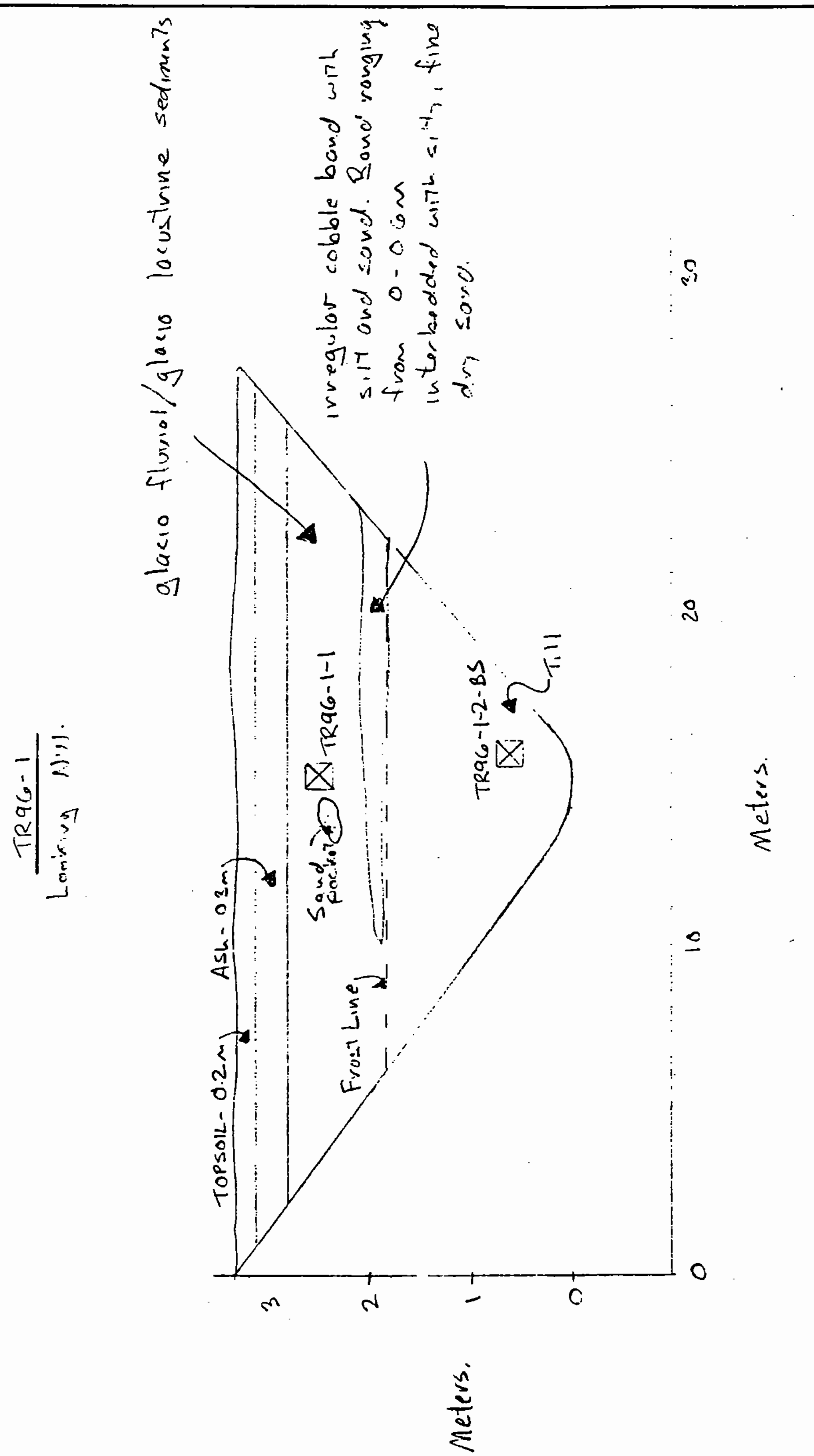
APPENDIX A2

TRENCH LOGS
TR96-1 TO 17

Knight Piésold Ltd.
CONSULTING ENGINEERS

Project: Carmacks Copper Project.
Calculations for: Trench logging - TR96-1
Calculations by: LG, EB, RM
Checked by: ______ Date: ______

Project No.: 1784
Date: Feb 14/96
Sheet 1 of 1

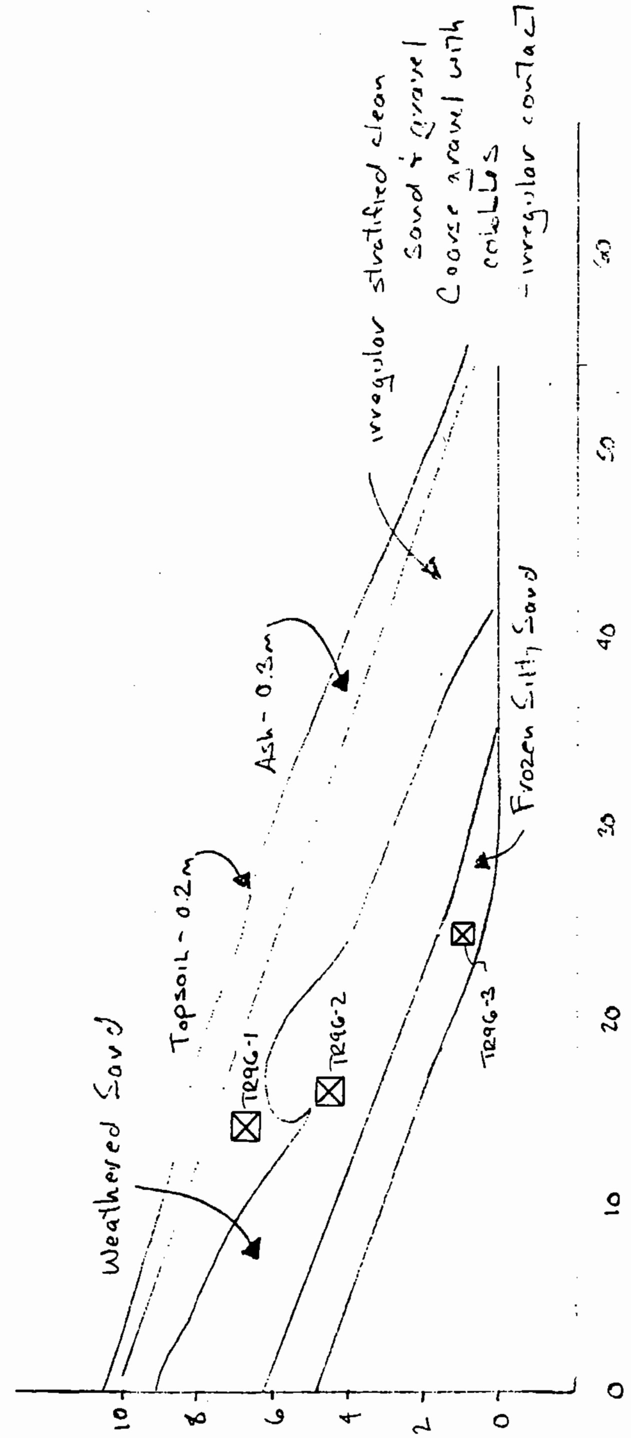


Knight Piésold Ltd.
CONSULTING ENGINEERS

Project: Carmacks Copper Project.
Calculations for: Trench Logging - TR96-2
Calculations by: LG. BB. RM.
Checked by: ______ Date: ______

Project No.: 1784.
Date: Feb 15/96
Sheet 1 of 1

TR96-2
Looking NE

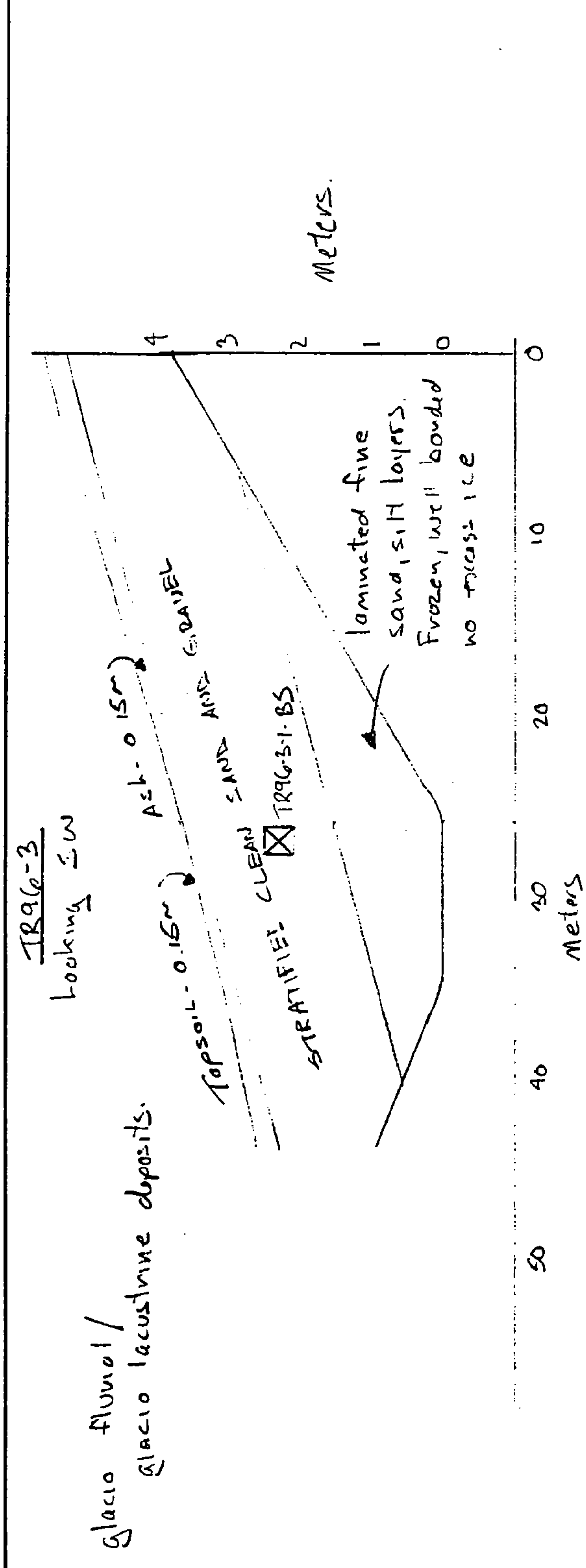


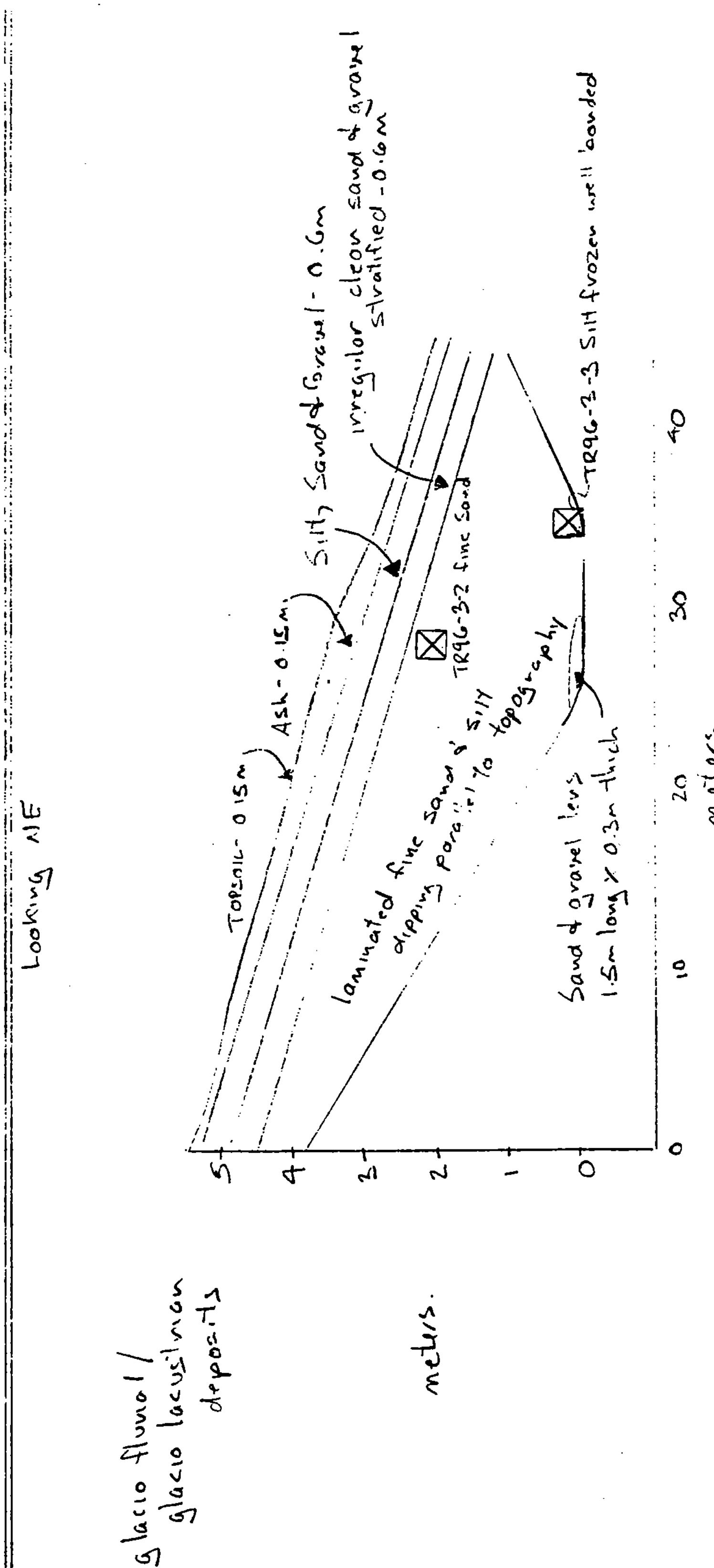
TR96-1 - Same as TR96-3-1-BS.
TR96-2 - same as TR96-3-2
TR96-3 - same as TR96-3-3

Knight Piésold Ltd.

CONSULTING ENGINEERS

Project: Carmacks Copper Project. | Project No.: 1784
Calculations for: Trench Logging - TR96-3 | Date: Feb 29/96
Calculations by: LG, BB. | Sheet 1 of 1
Checked by: | Date:

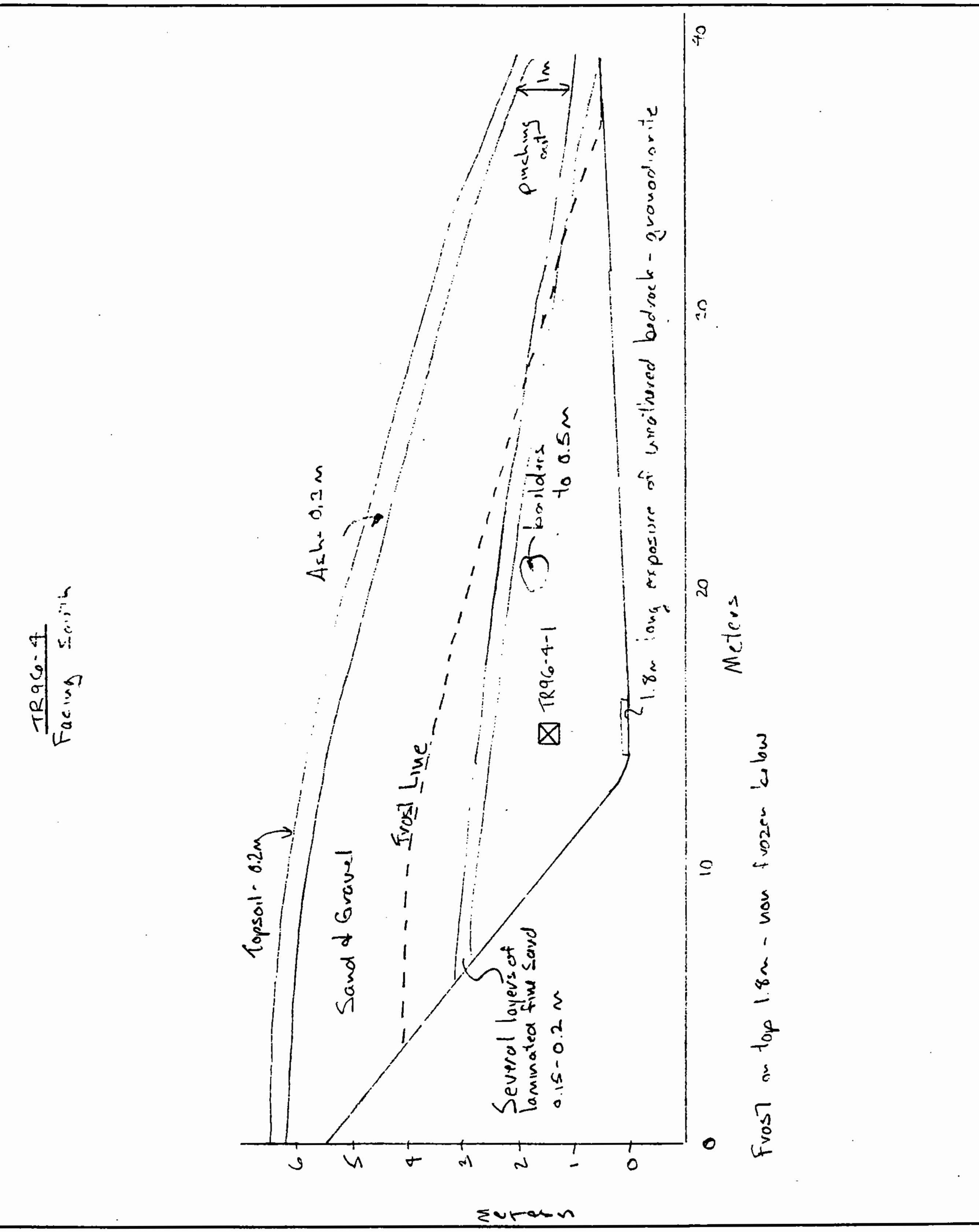




Knight Piésold Ltd.
CONSULTING ENGINEERS

Project: Carmacks Copper Project
Calculations for: Trench logging - TR96-4
Calculations by: LG, BB
Checked by: ______ Date: ______

Project No.: 1784
Date: Feb 20 96
Sheet 1 of 1

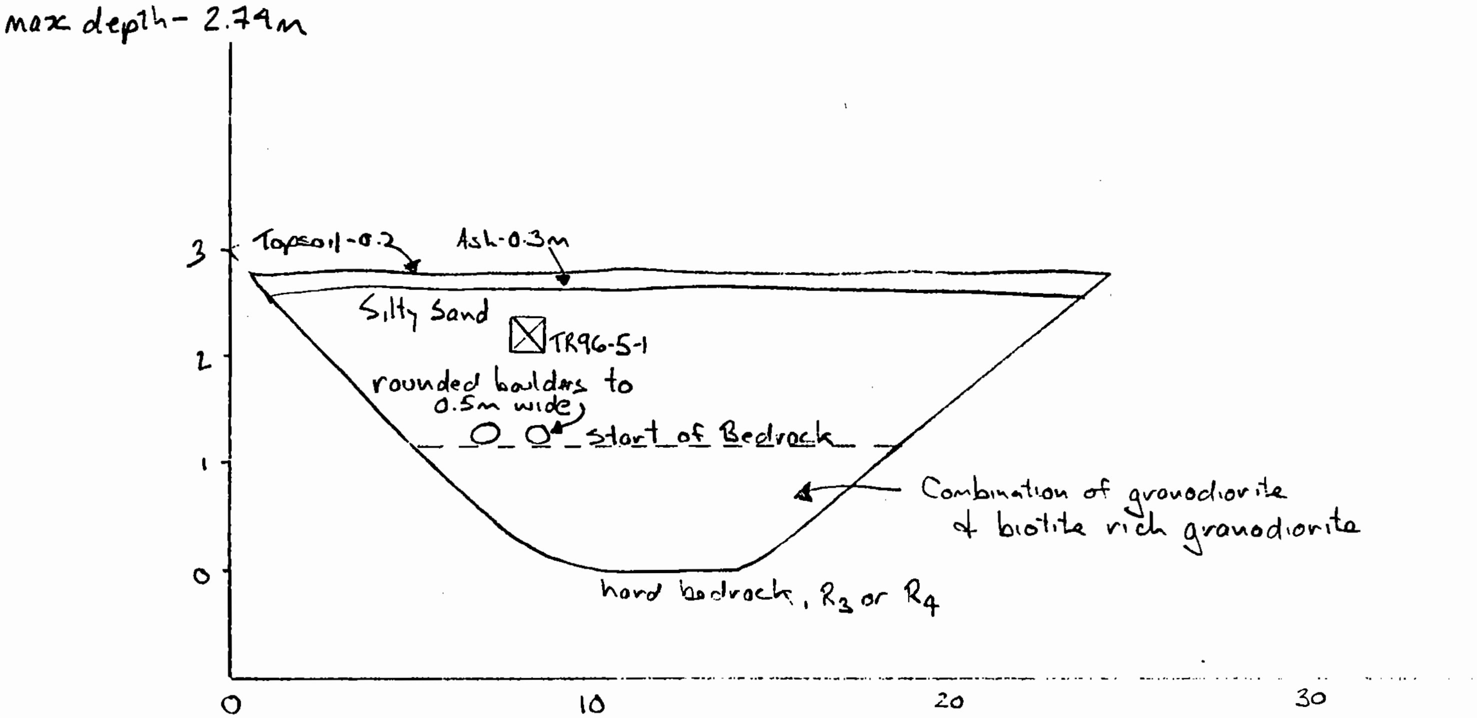


DNE Knight Piésold
CONSULTING ENGINEERS

Project: Carmacks Copper Project
Project No.: 1789
Calculations for: Trench Logging. TR96-5 – at millsite.
Date: March 2/96
Calculations by: LG, BB.
Sheet 1 of 1
Checked by:
Date:

TR96-5

Facing SE



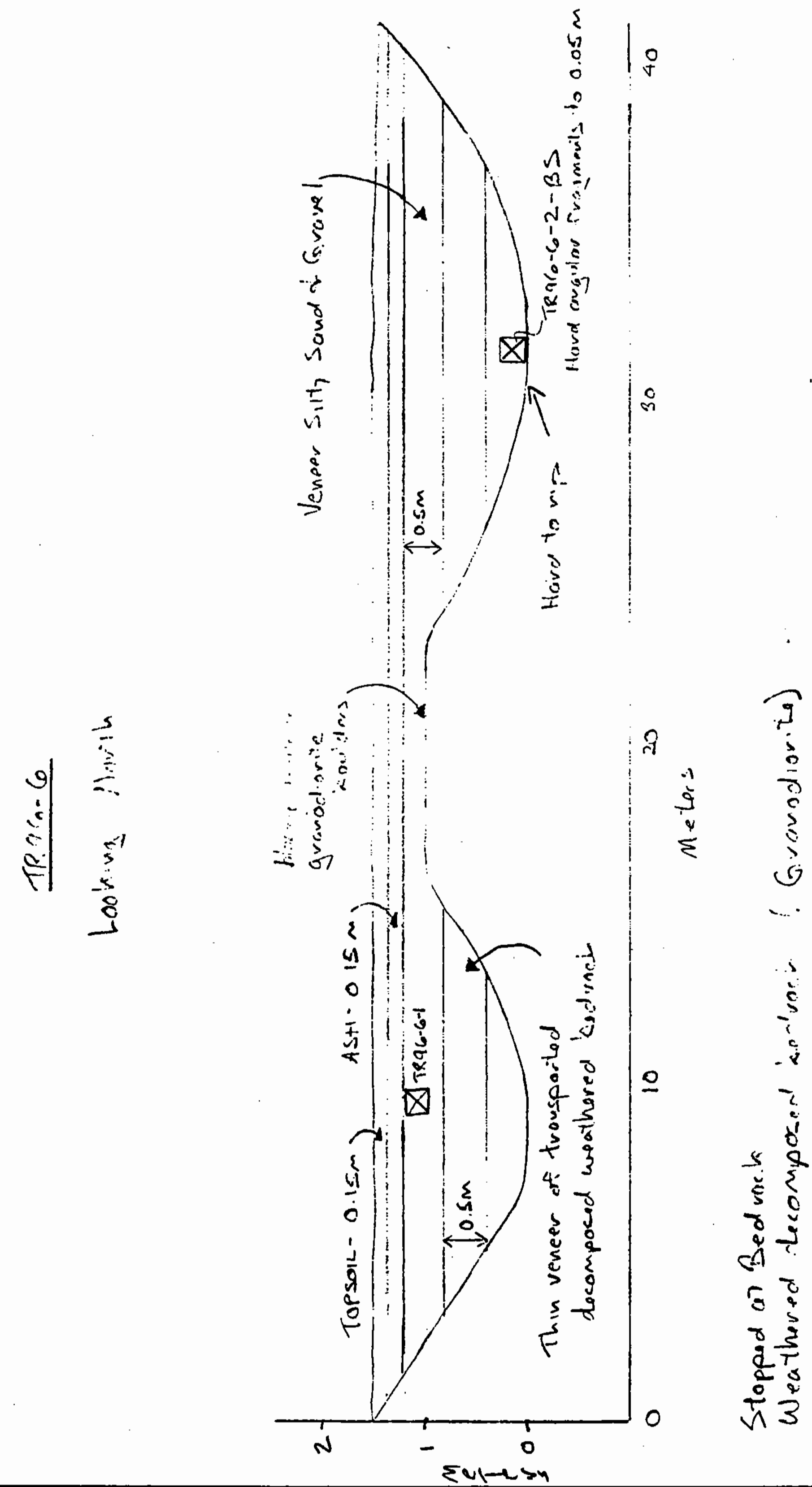
Weathered bedrock – highly fractured & easily broken with hammer. R1

Fracture spacing in bottom of trench generally 0.3m
Zone of highly fractured rock approx. 0.5m wide with a fracture spacing of 0.1 m.
Vertical discontinuities, rough,
Bottom of trench can't be ripped with D7

Biotite granodiorite – more competent, harder to break with rock hammer.

Knight Piésold Ltd.
CONSULTING ENGINEERS

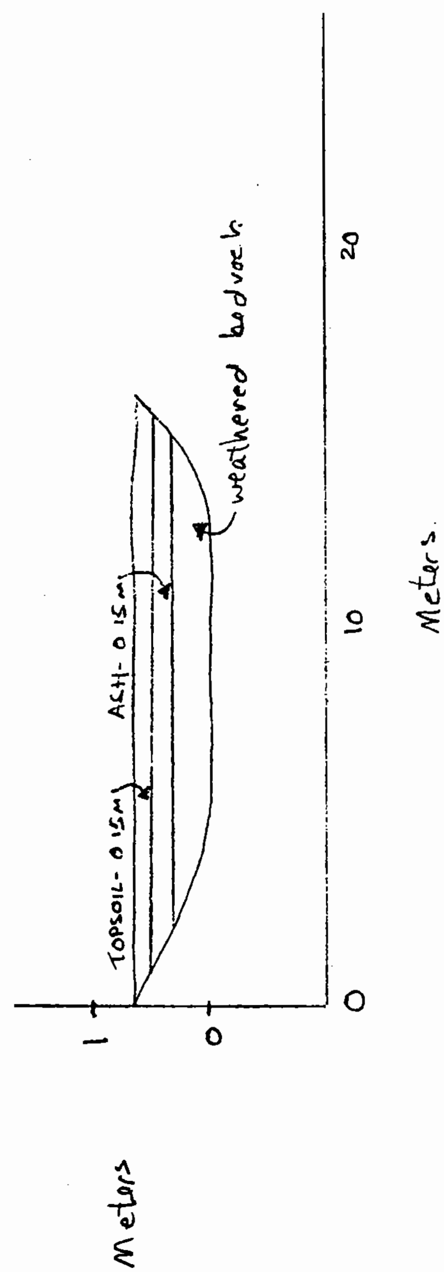
Project: Carmacks Copper Project.
Project No.: 1784
Calculations for: Trench logging - TR96-6
Date: Feb 29/96
Calculations by: LG. ZB.
Sheet 1 of 1
Checked by: ______
Date: ______



Project: Carmacks Copper Project
Calculations for: Trench logging TR96-7
Calculations by: LG, BB
Checked by: ______ Date: ______

Project No.: 1784
Date: Feb 29/96
Sheet 1 of 1

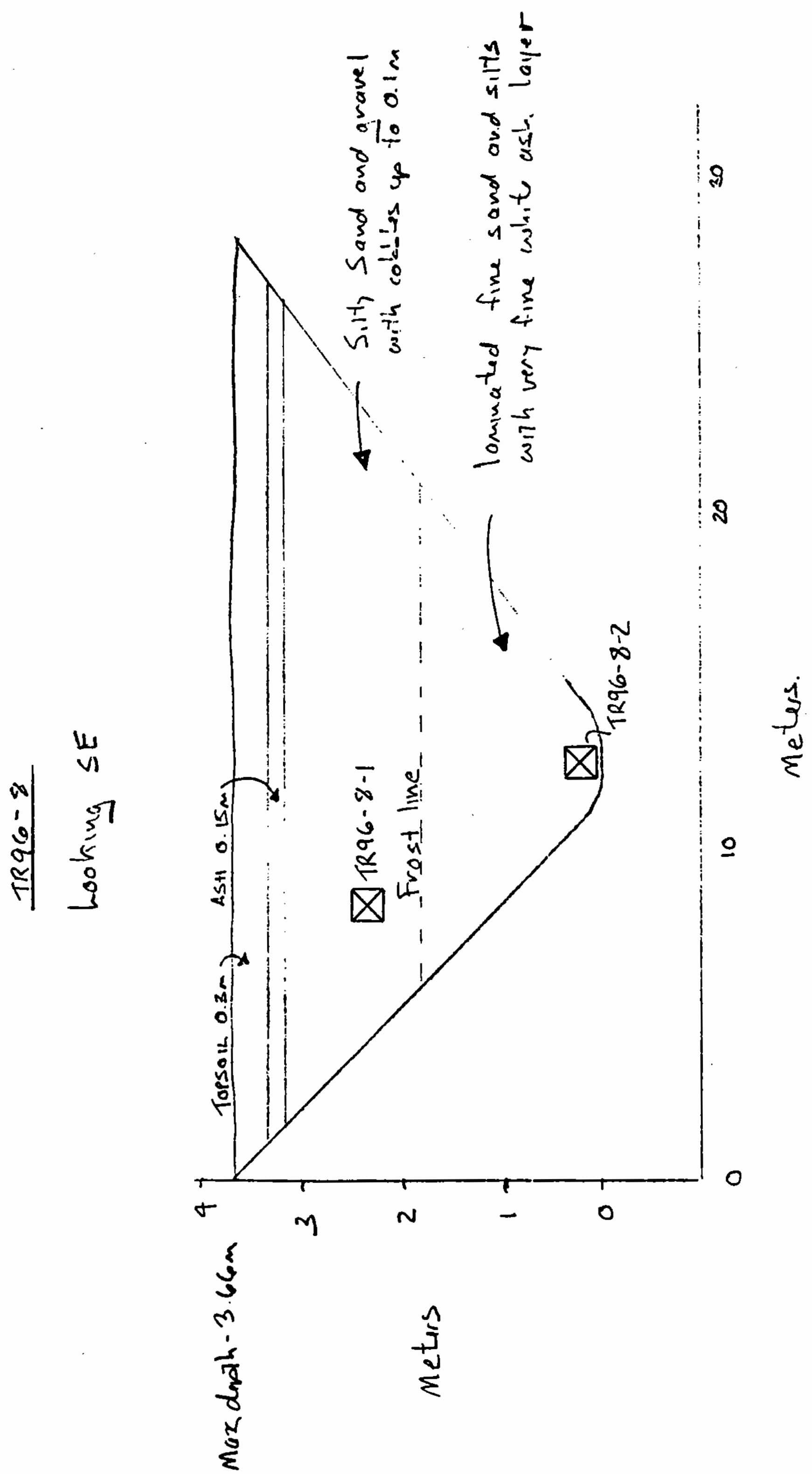
TR96-7
Looking North



Thin cover of rusty sand & gravel
angular granodiorite to 0.45m - hard to rip.

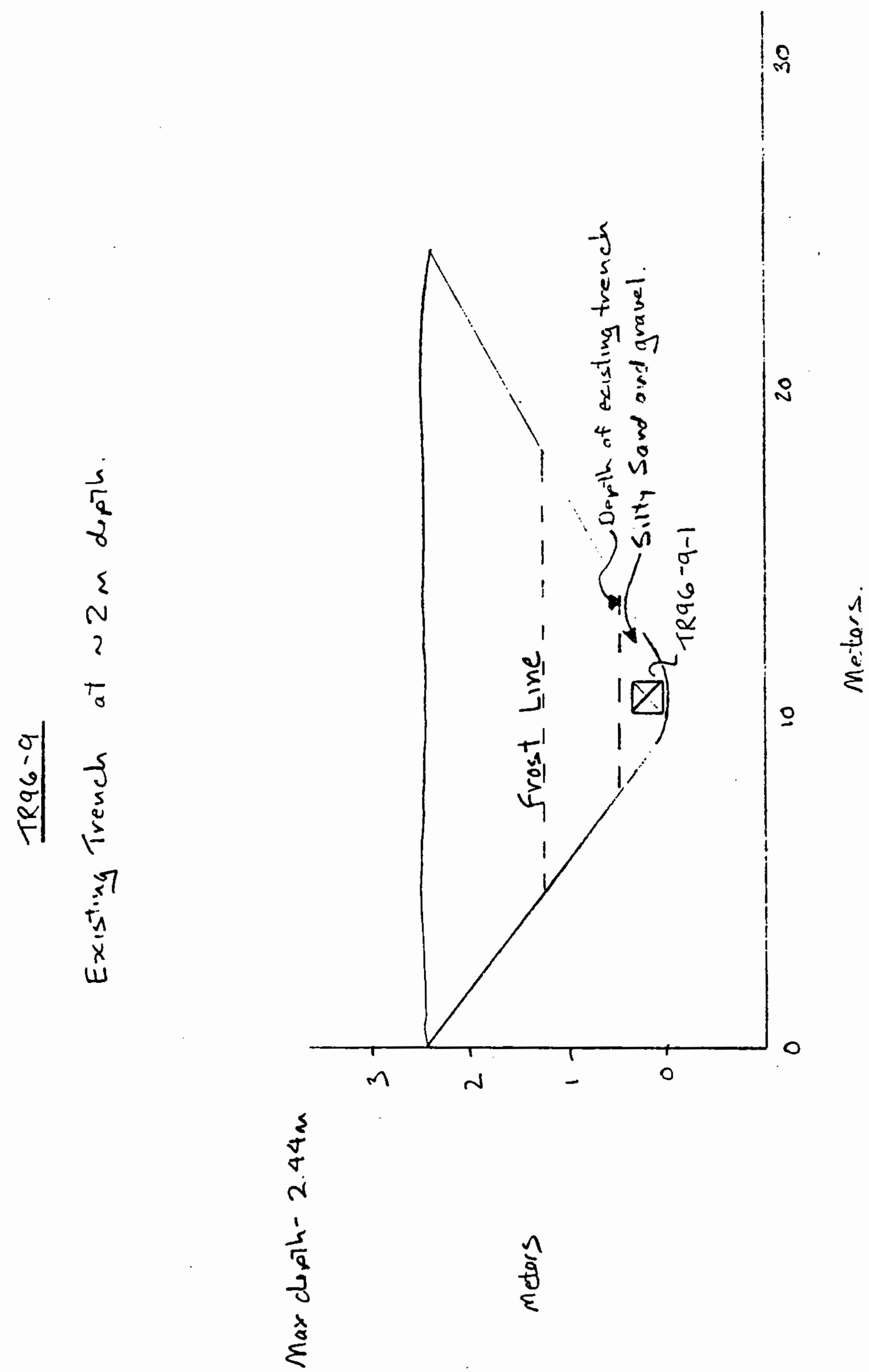
DNE Knight Piésold
CONSULTING ENGINEERS

Project:	Carmacks Copper Project	Project No.:	1784
Calculations for:	Trench logging - TR96-8	Date:	March 1/96
Calculations by:	L.G. B.B.	Sheet	1 of 1
Checked by:		Date:	



DNE Knight Piésold
CONSULTING ENGINEERS

Project: Carmacks Copper Project	Project No.: 1784
Calculations for: Trench logging TR96-9	Date: March 1/96
Calculations by: LG, BB	Sheet 1 of 1
Checked by:	Date:



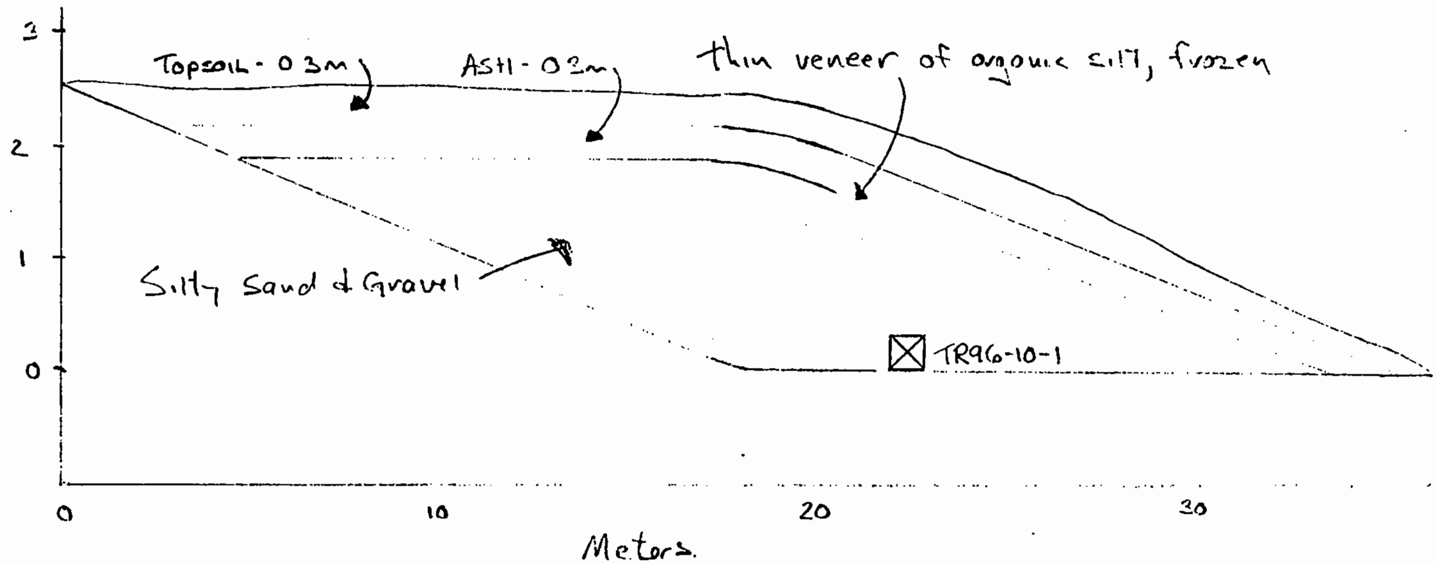
Knight Piésold Ltd.
CONSULTING ENGINEERS

Project: Carmacks Copper Project Project No.: 1789
Calculations for: Trench logging, TR96-10 Date: Feb 29/96
Calculations by: LG, BB Sheet 1 of 1
Checked by: ______ Date: ______

TR96-10
Looking North

Max depth 2.5m

Meters



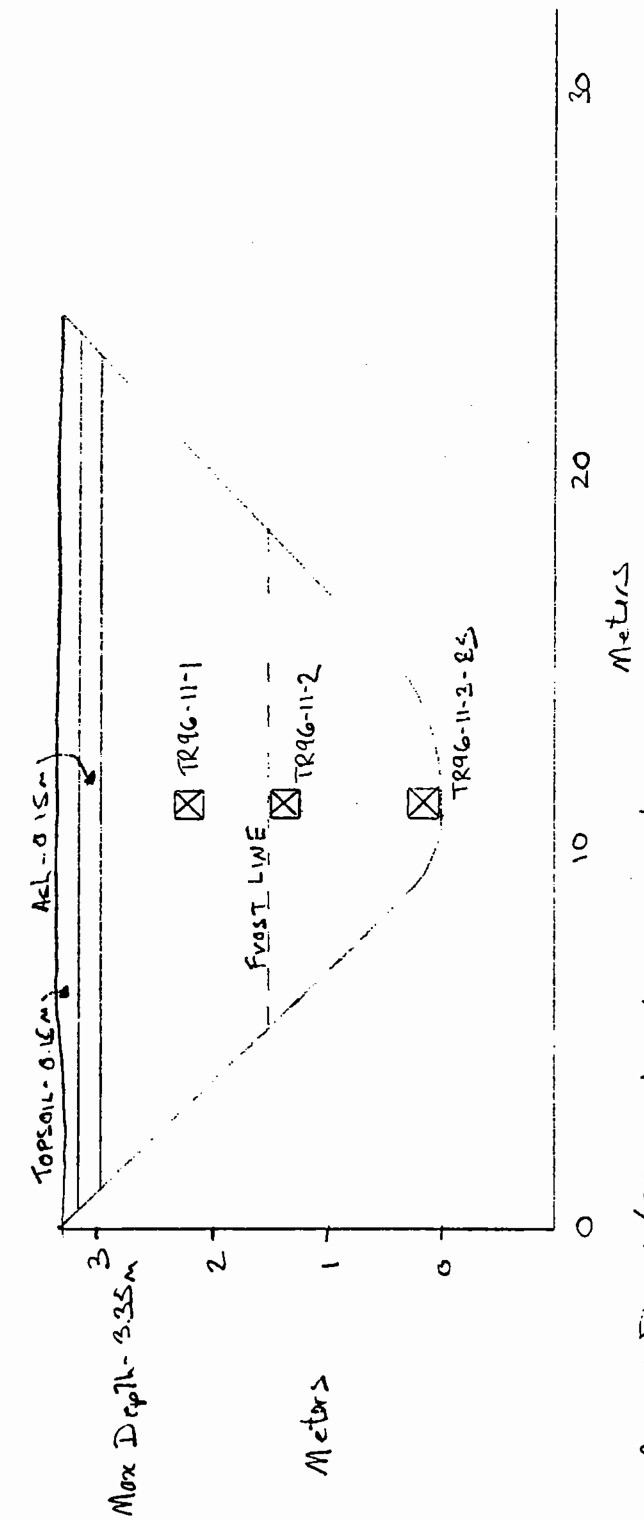
Very hard to rip for D7 - Permafrost
Broke ripper tooth
Frozen description - well bonded Nb

Knight Piésold Ltd.
CONSULTING ENGINEERS

Project: Carmacks Copper Project	Project No.: 1784
Calculations for: Trench logging - TR96-11	Date: Feb 29/96
Calculations by: LG. JB.	Sheet 1 of 1
Checked by: Date:	

TR96-11

Looking North.



Glacial Fluvial/Glacial lacustrian deposits

TR96-11-1 - Silt laminated frost susceptible
TR96-11-2 - Sandy silt, trace clay some gravel
TR96-11-3-BS - Clayey silt

DNE Knight Piésold
CONSULTING ENGINEERS

Project: Cormacks Copper Project

Project No.: 1784

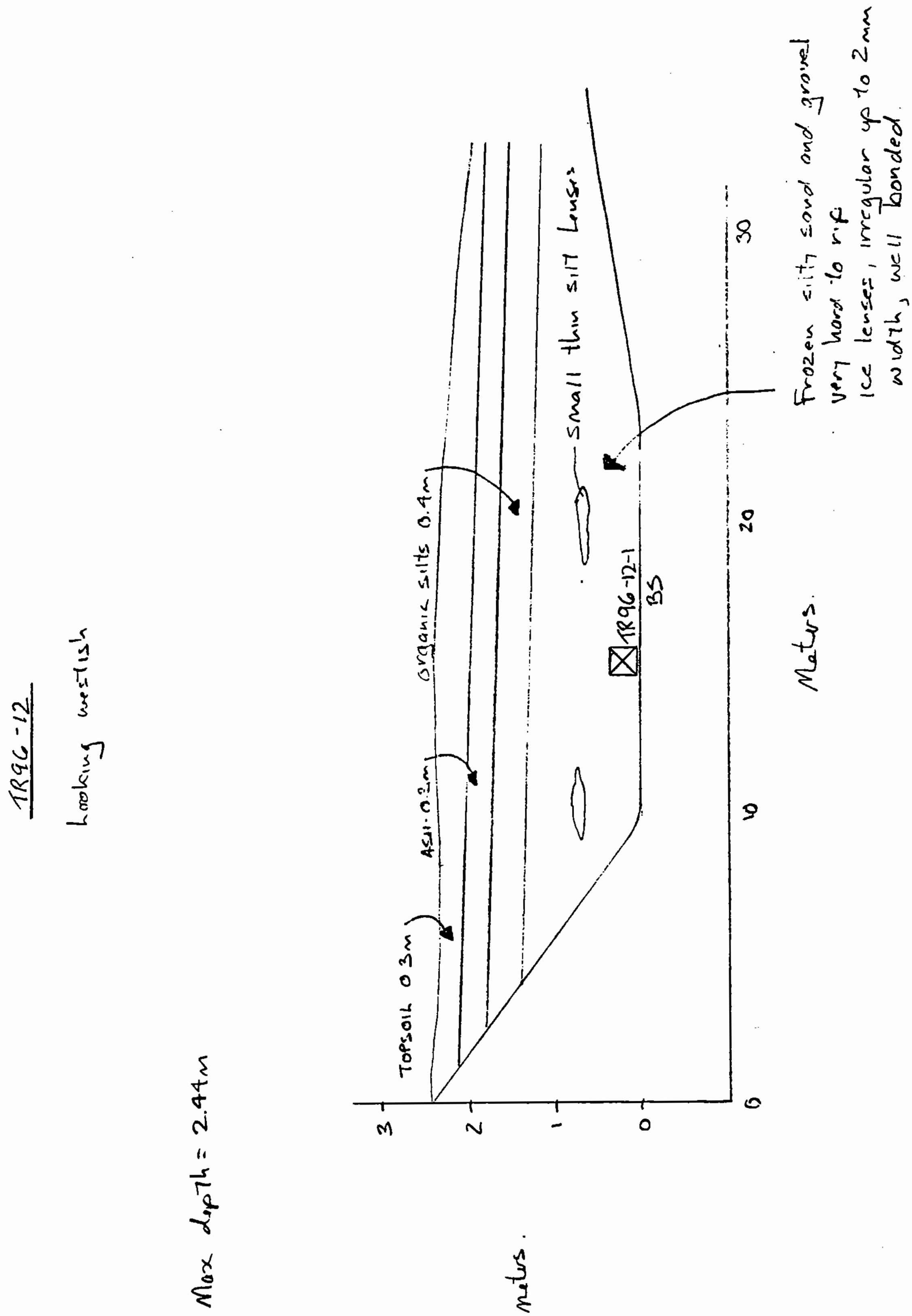
Calculations for: Trench logging - TR96-12

Date: March 1/96

Calculations by: LG, BB.

Sheet 1 of 1

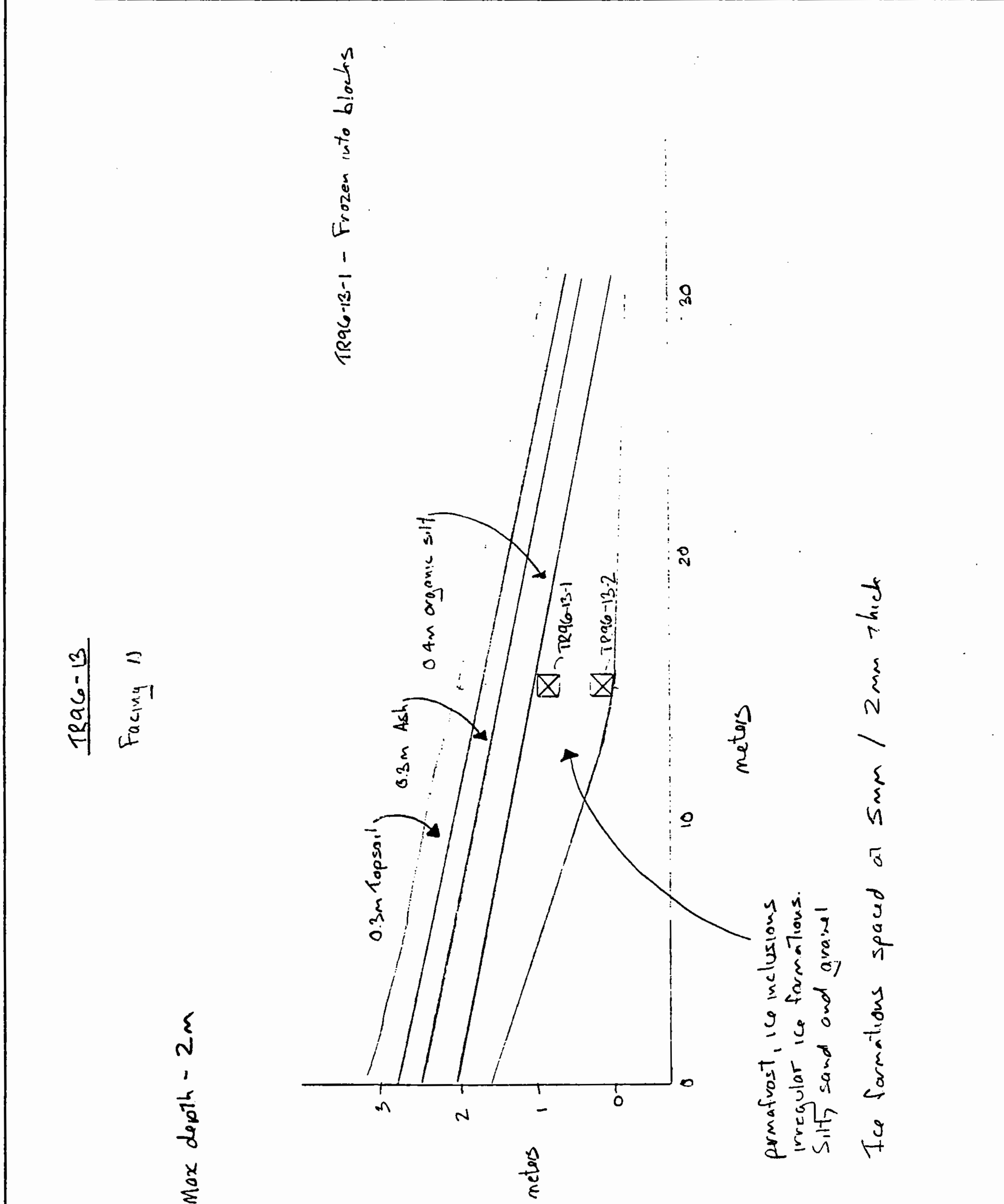
Checked by: ______ Date: ______



DNE Knight Piésold
CONSULTING ENGINEERS

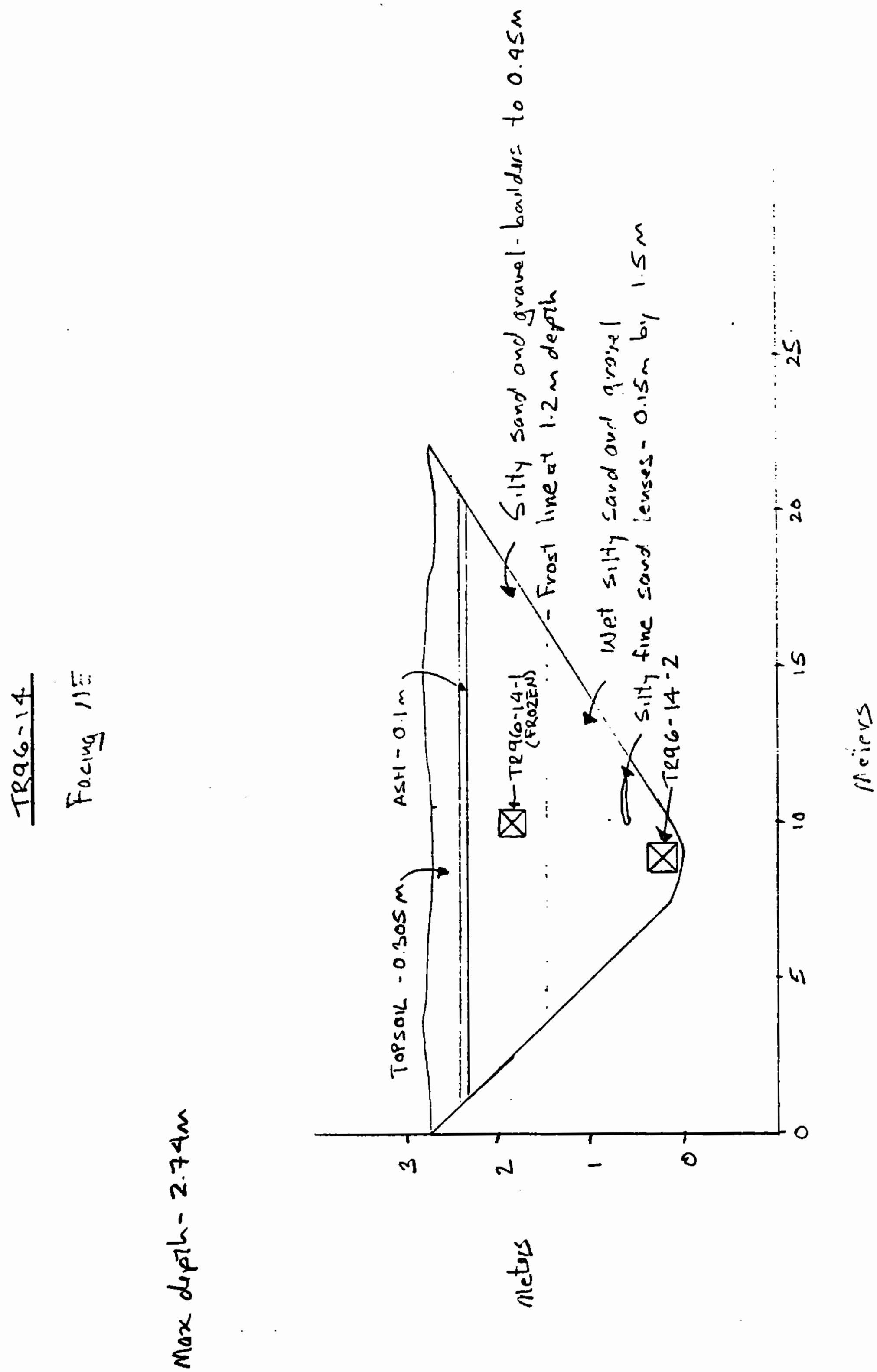
Project: Cormacks Copper Project
Calculations for: Trench logging TR96-13
Calculations by: LG, 88
Checked by: ______ Date: ______

Project No.: 1784
Date: March 1/96
Sheet 1 of 1



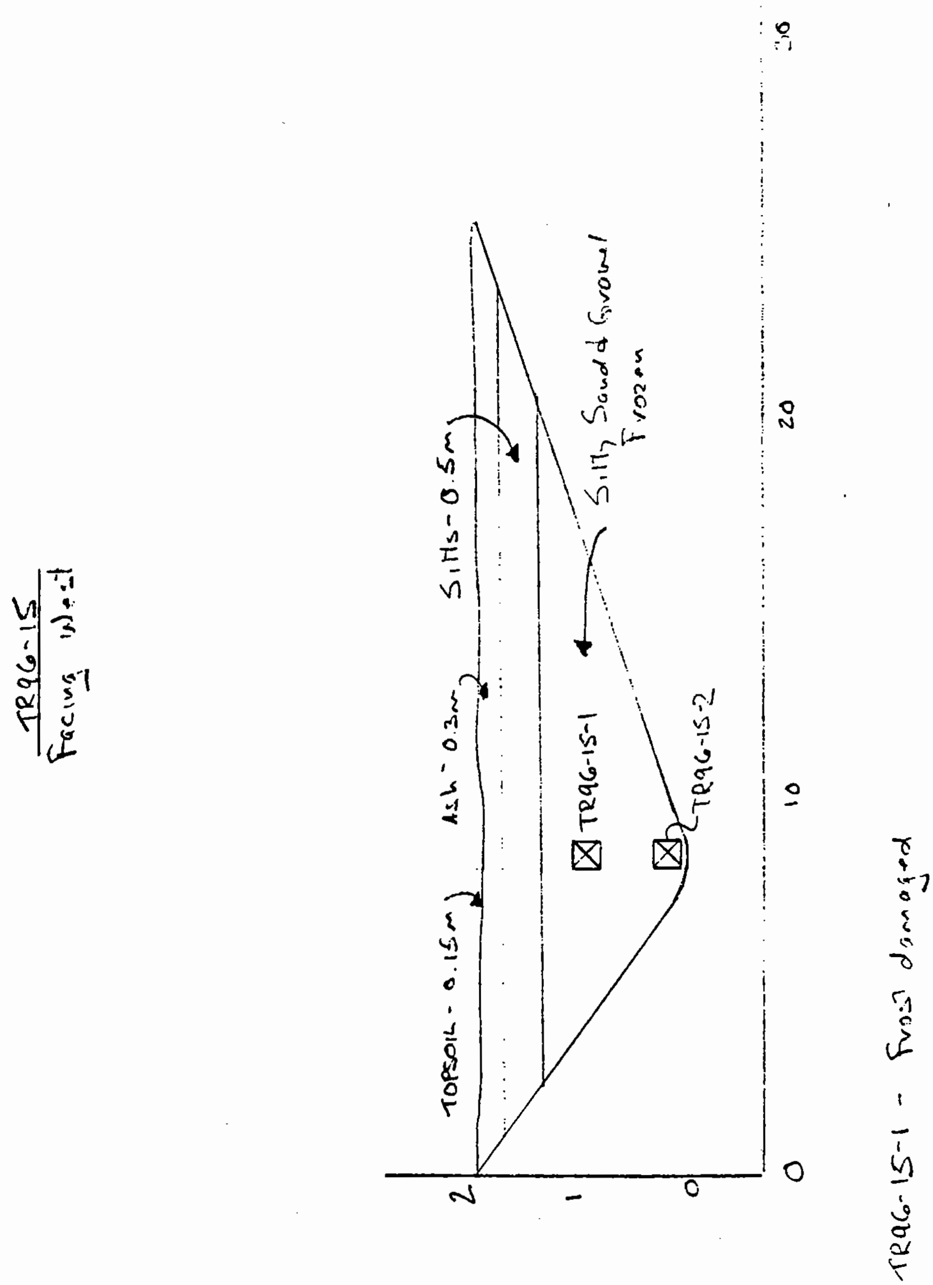
DNE Knight Piésold
CONSULTING ENGINEERS

Project: Carmacks Copper Project Project No.: 1784
Calculations for: Trench logging - TR96-14 Date: March 3/96
Calculations by: LG, BB Sheet 1 of 1
Checked by: Date:



Knight Piésold Ltd.
CONSULTING ENGINEERS

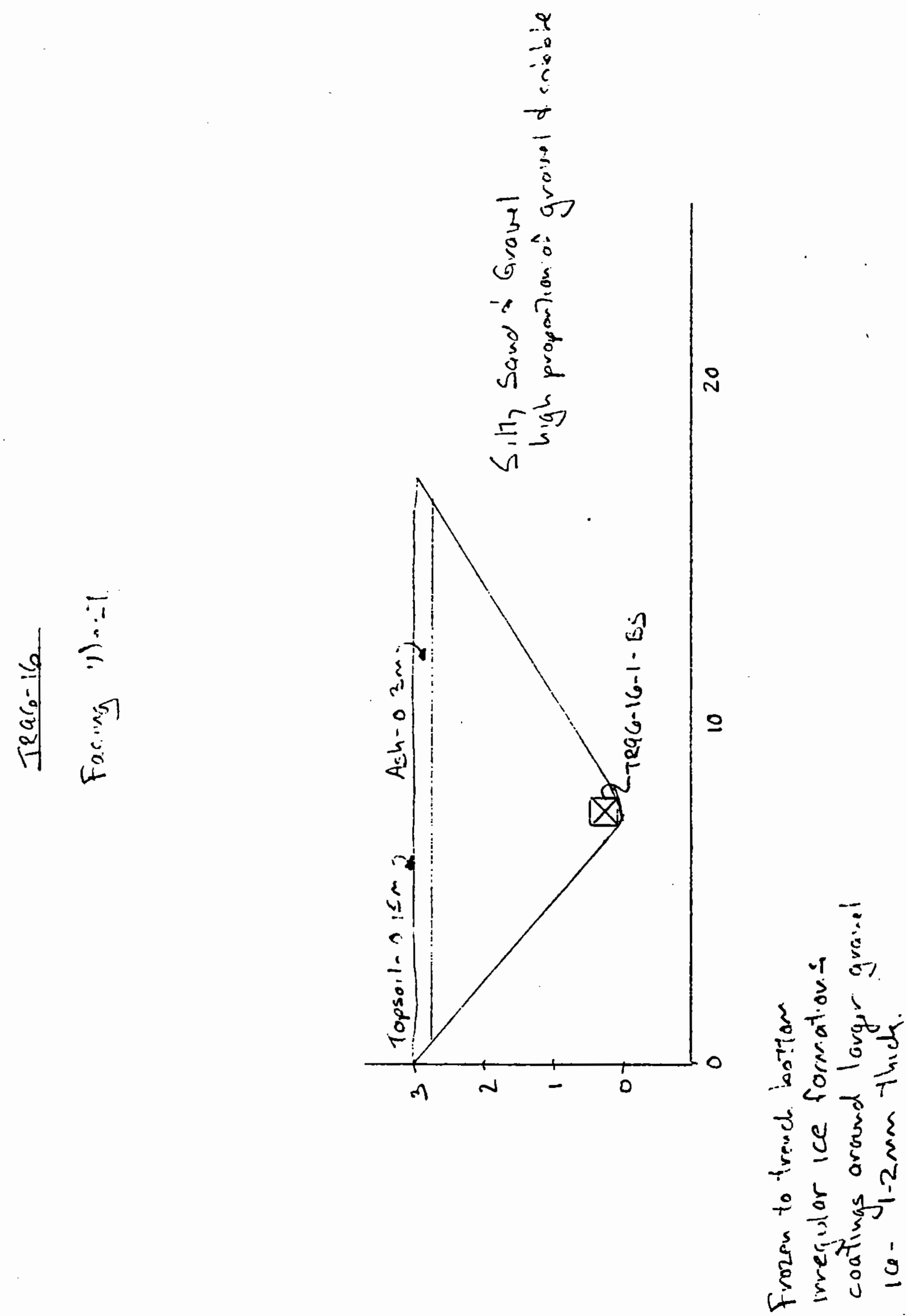
Project: Carmacks Copper Project — Project No.: 1789
Calculations for: Trench logging - TR96-15 — Date: March 3/96
Calculations by: LG, BB — Sheet 1 of 1
Checked by: ______ Date: ______



Knight Piésold Ltd.
CONSULTING ENGINEERS

Project: Carmacks Copper Project
Calculations for: Trench Logging - TR96-16
Calculations by: LG, BR
Checked by: ______ Date: ______

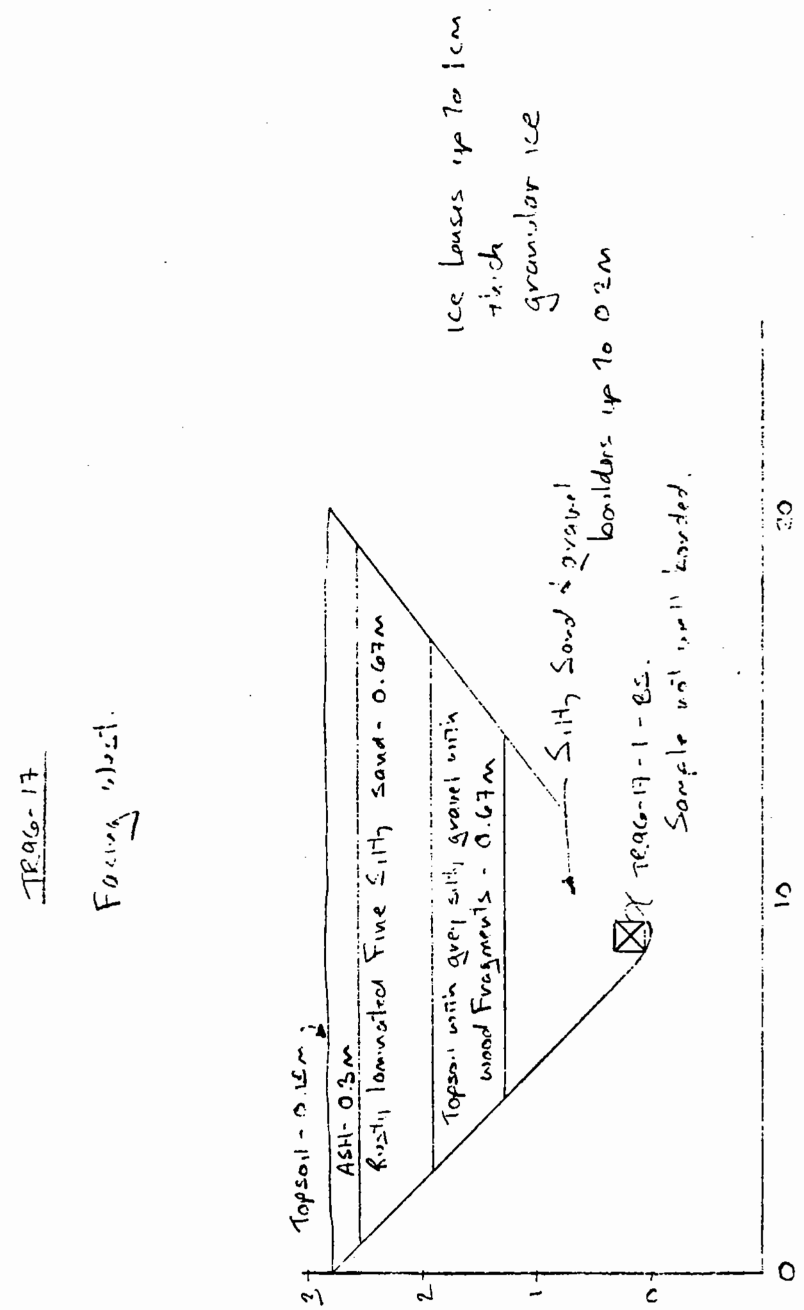
Project No.: 1784
Date: March 2/96
Sheet ____ of ____



Knight Piésold Ltd.
CONSULTING ENGINEERS

Project: Carmacks Copper Project
Calculations for: Trench logging - TR96-17
Calculations by: LG. SB
Checked by: __________ Date: __________

Project No.: 1784
Date: March 3/96
Sheet ____ of ____



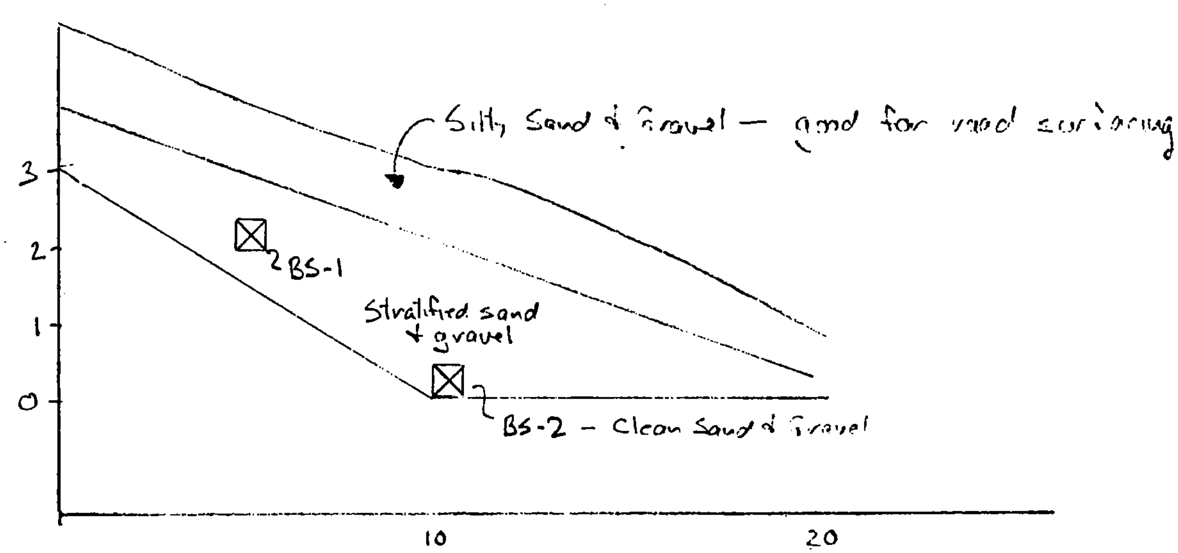
Knight Piésold Ltd.
CONSULTING ENGINEERS

Project: Carmacks Copper Project
Calculations for: Trench Logging - Concrete aggregate trench
Calculations by: LG, BR.
Checked by: ______ Date: ______
Project No.: 1784
Date: March 2/96
Sheet ____ of ____

Concrete Aggregate Trench

Looking North

Long linear feature at least 300m long by 100m wide



Bottom of Trench - Frozen Silty Sand.

Opposite side of trench has thin seams of sand & silt.

APPENDIX A3

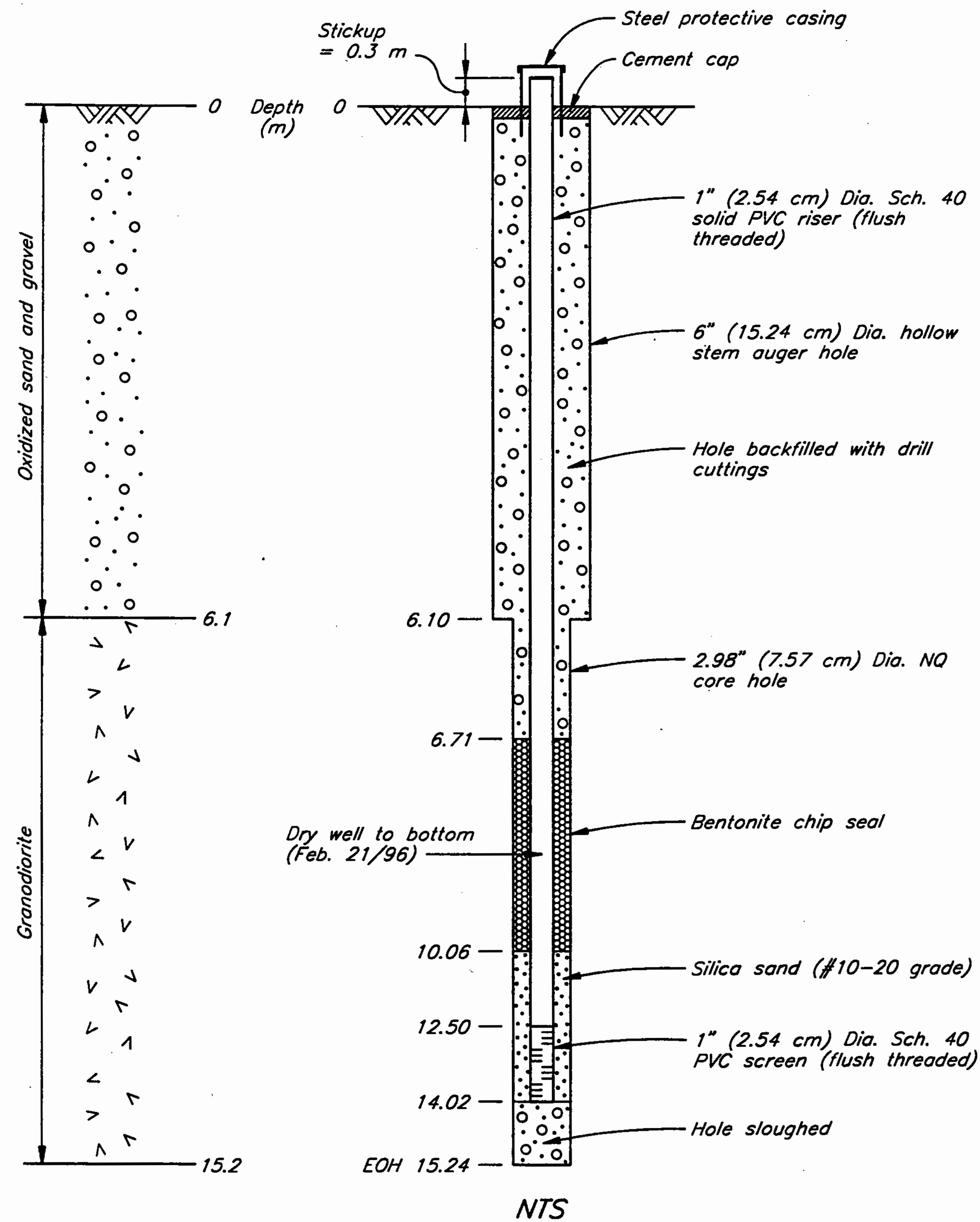
GROUNDWATER WELL COMPLETION DETAILS DH96-11, 12, 14, and 15 MW96-A TO K

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

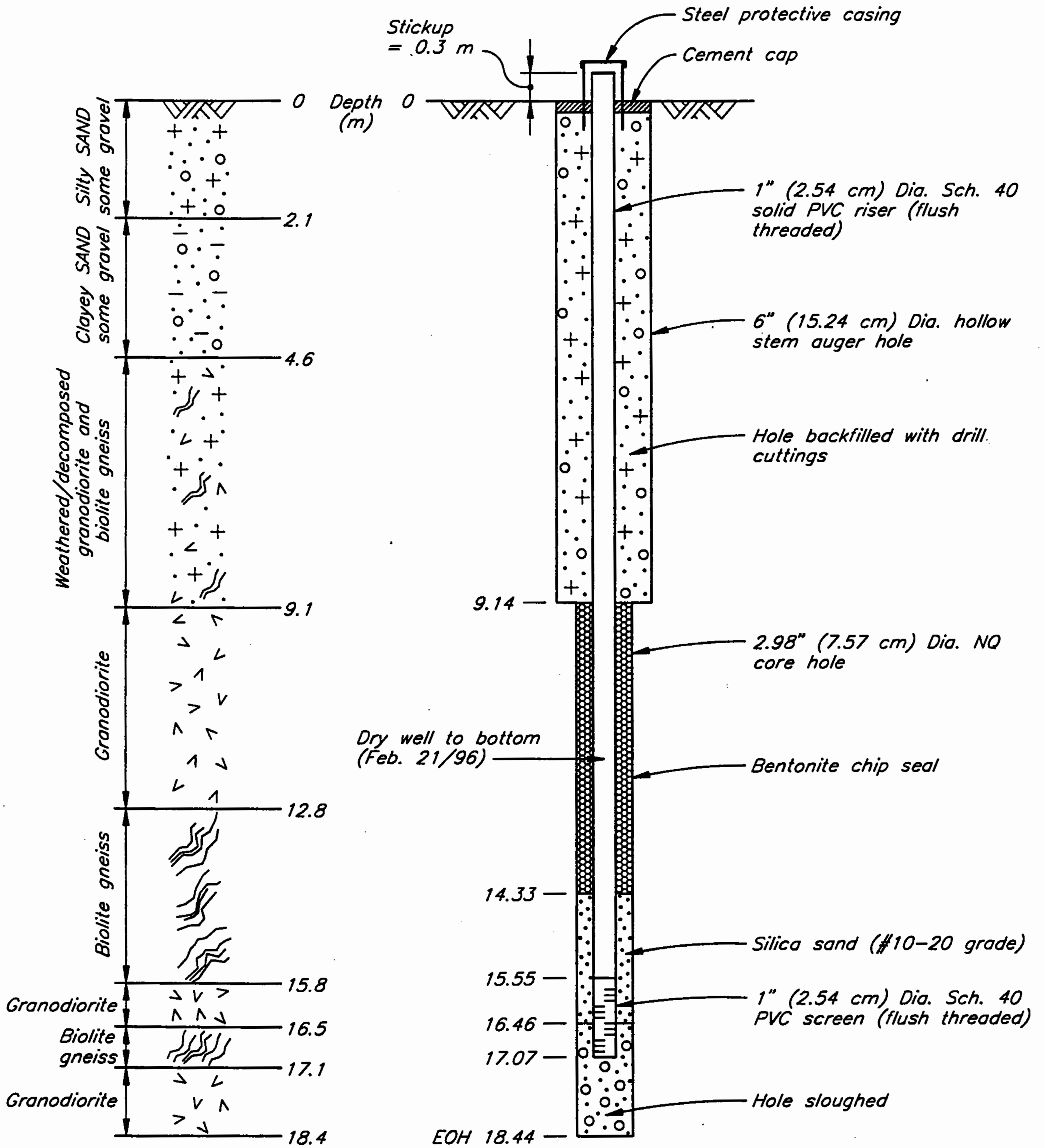
GROUNDWATER MONITORING WELL COMPLETION DETAILS

PROJECT: *Carmacks Copper Project*
LOCATION: *Process Plant Site*
N: *29929* E: *30230*
COMPLETION DATE: *Feb. 14, 1996*

PROJECT NO: *1784*
HOLE NO: *DH96-11*
GROUND ELEV: *766 m*



KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	GROUNDWATER MONITORING WELL COMPLETION DETAILS
PROJECT: *Carmacks Copper Project* LOCATION: *Process Plant Site* N: *29953* E: *30267* COMPLETION DATE: *Feb. 13, 1996*	PROJECT NO: *1784* HOLE NO: *DH96-12* GROUND ELEV: *769 m*



NTS

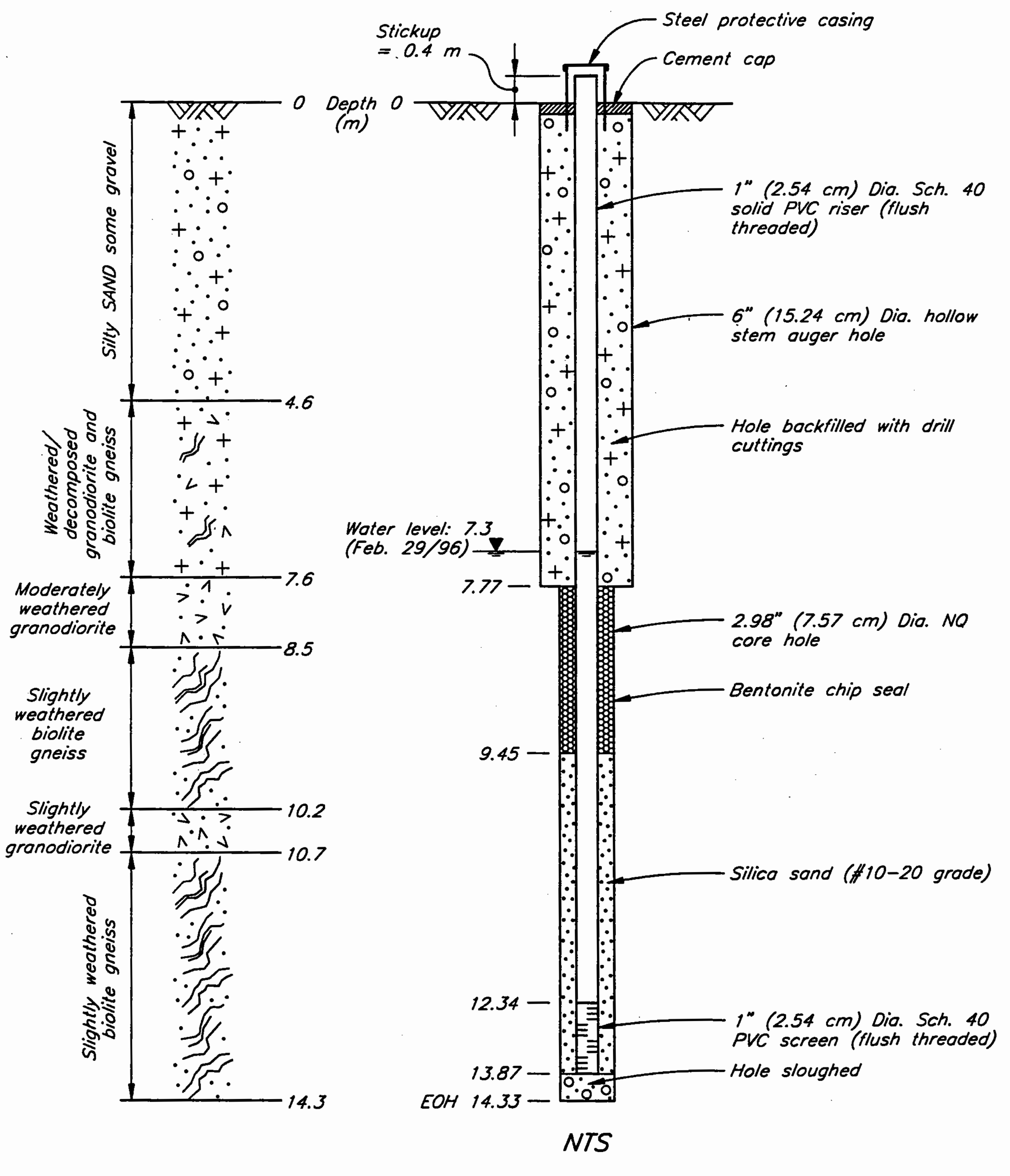
CAD FILE: \1784\FIG\A4 r-tol scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL COMPLETION DETAILS

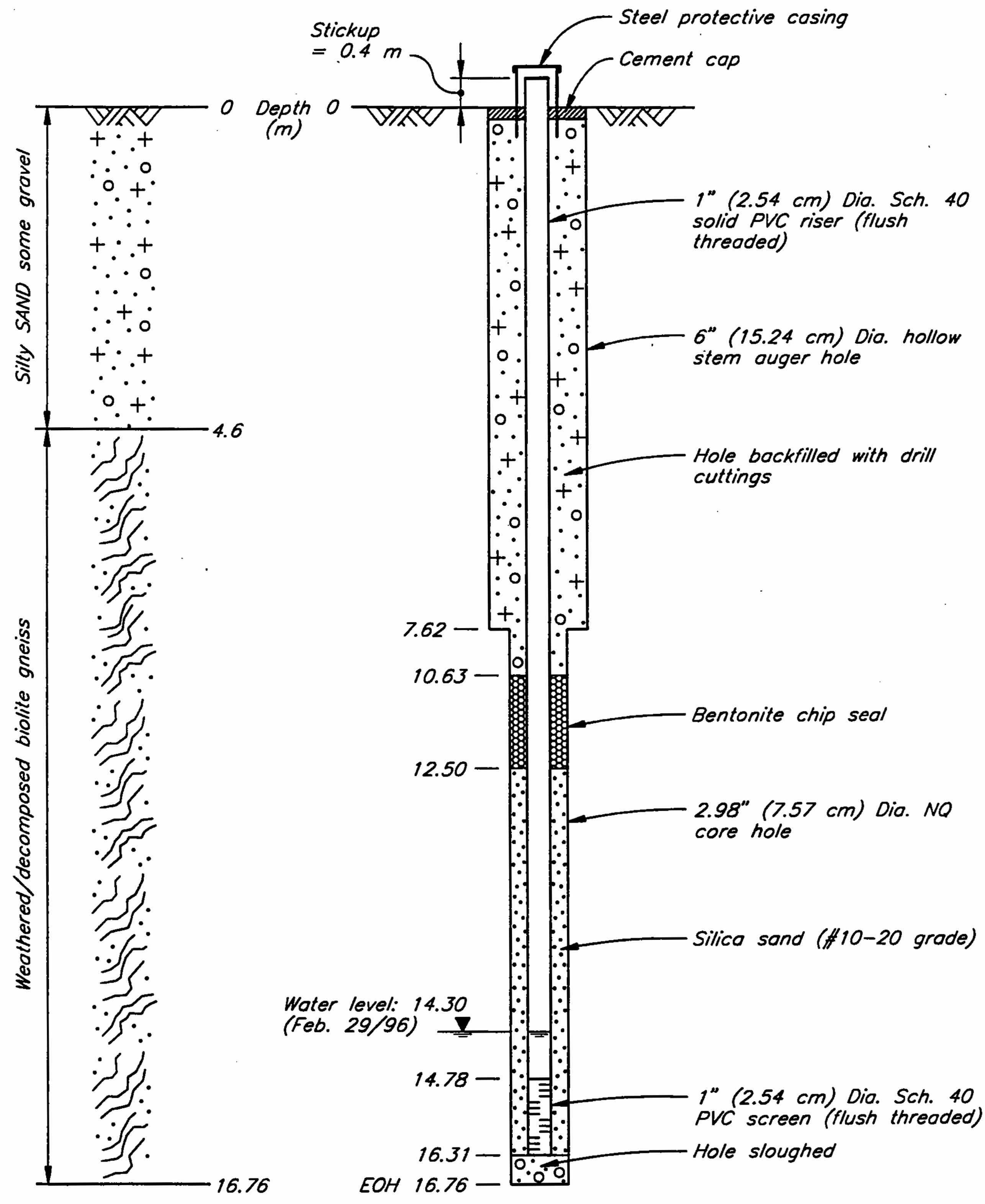
PROJECT: *Carmacks Copper Project*
LOCATION: *Process Plant Site*
N: *29964* E: *30239*
COMPLETION DATE: *Feb. 10, 1996*

PROJECT NO: *1784*
HOLE NO: *DH96-14*
GROUND ELEV: *768 m*



KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	GROUNDWATER MONITORING WELL COMPLETION DETAILS

PROJECT: *Carmacks Copper Project*	PROJECT NO: *1784*
LOCATION: *Process Plant Site*	HOLE NO: *DH96-15*
N: *29982* E: *30241*	GROUND ELEV: *769 m*
COMPLETION DATE: *Feb. 12, 1996*	



NTS

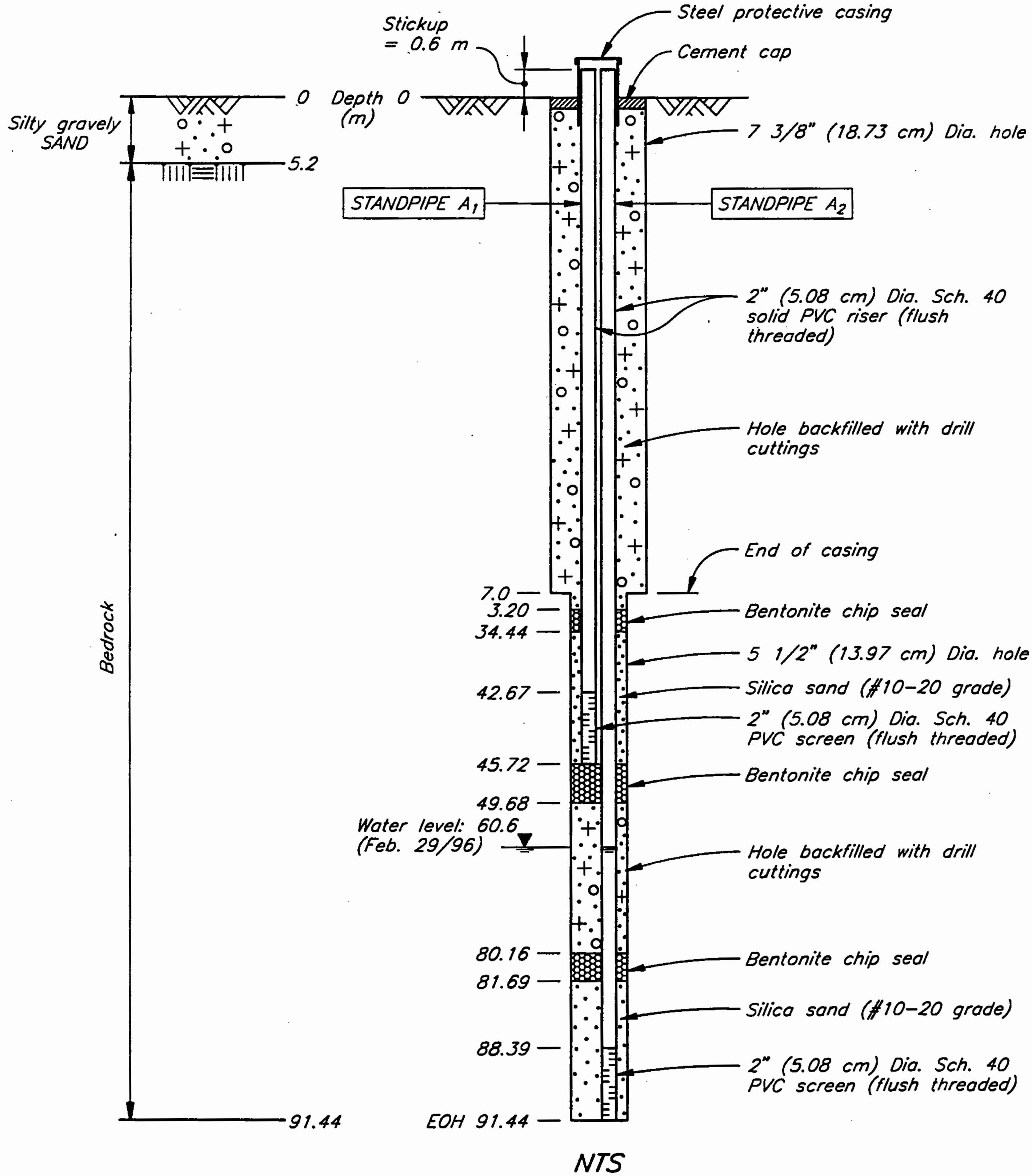
CAD FILE: \1784\FIG\.. plot scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL COMPLETION DETAILS

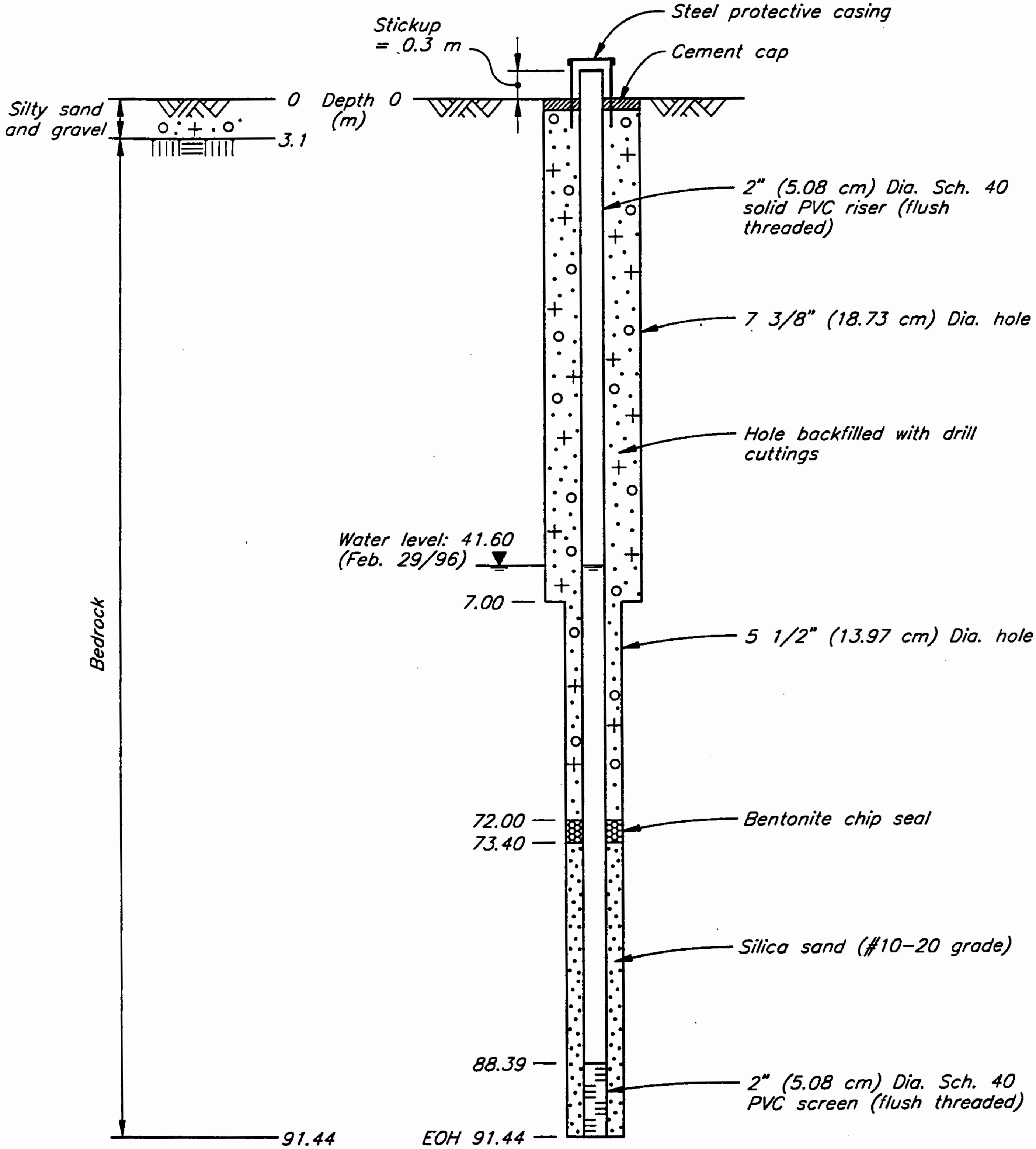
PROJECT: *Carmacks Copper Project*
LOCATION: *Heap Leach Pad Site*
N: *30755* E: *29835*
COMPLETION DATE: *Feb. 17, 1996*

PROJECT NO: *1784*
HOLE NO: *MW96-A*
GROUND ELEV: *861 m*



CAD FILE: \1784\F6\... scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	GROUNDWATER MONITORING WELL COMPLETION DETAILS
PROJECT: Carmacks Copper Project LOCATION: Heap Leach Pad Site N: 30470 E: 29974 COMPLETION DATE: Feb. 18, 1996	PROJECT NO: 1784 HOLE NO: MW96-B GROUND ELEV: 833

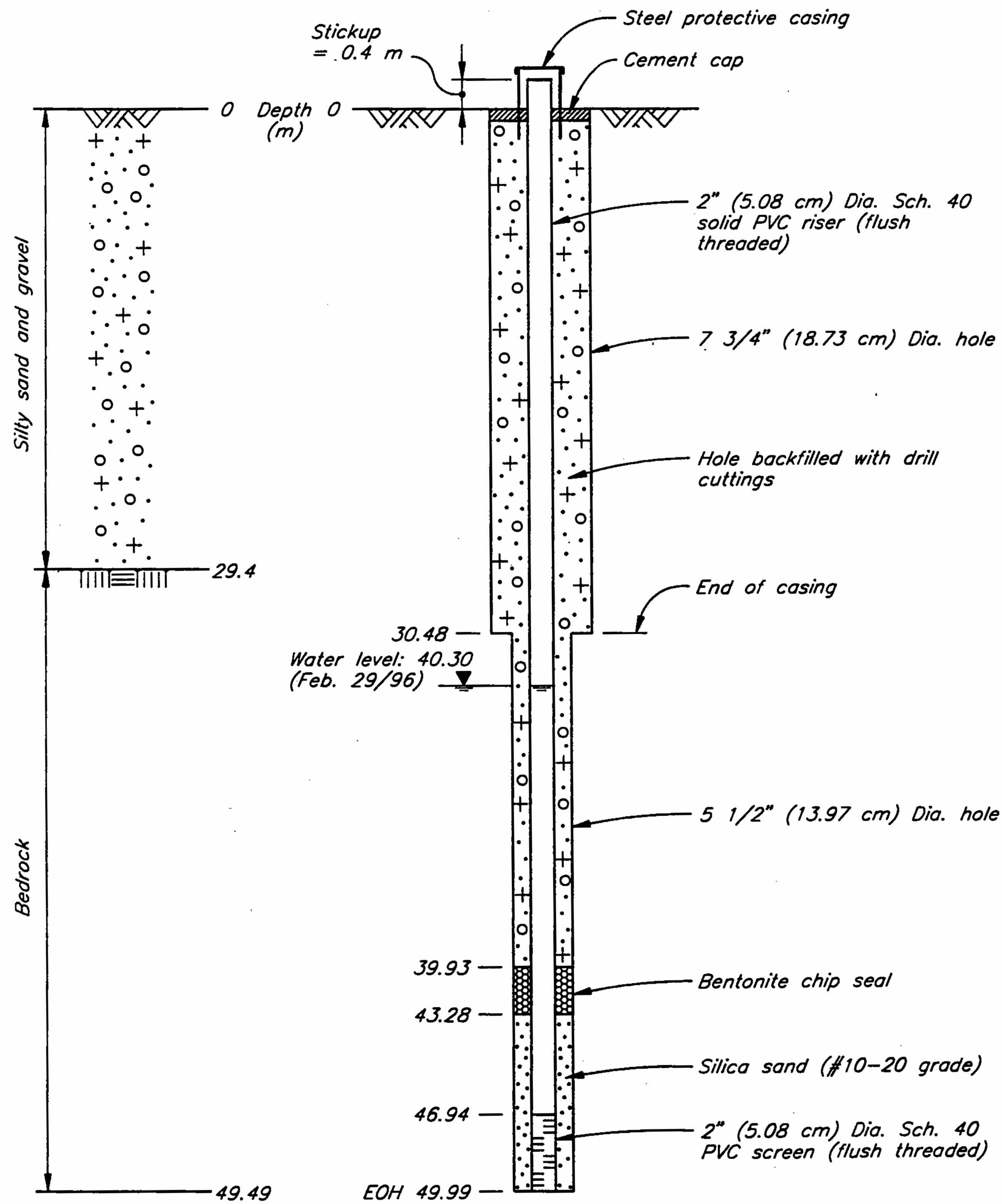


NTS

CAD FILE: \1784\FIG\AG ... scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	GROUNDWATER MONITORING WELL COMPLETION DETAILS

PROJECT: *Carmacks Copper Project*	PROJECT NO: *1784*
LOCATION: *Heap Leach Pad Site*	HOLE NO: *MW96-C*
N: *30094* E: *30382*	GROUND ELEV: *755 m*
COMPLETION DATE: *Feb. 26, 1996*	



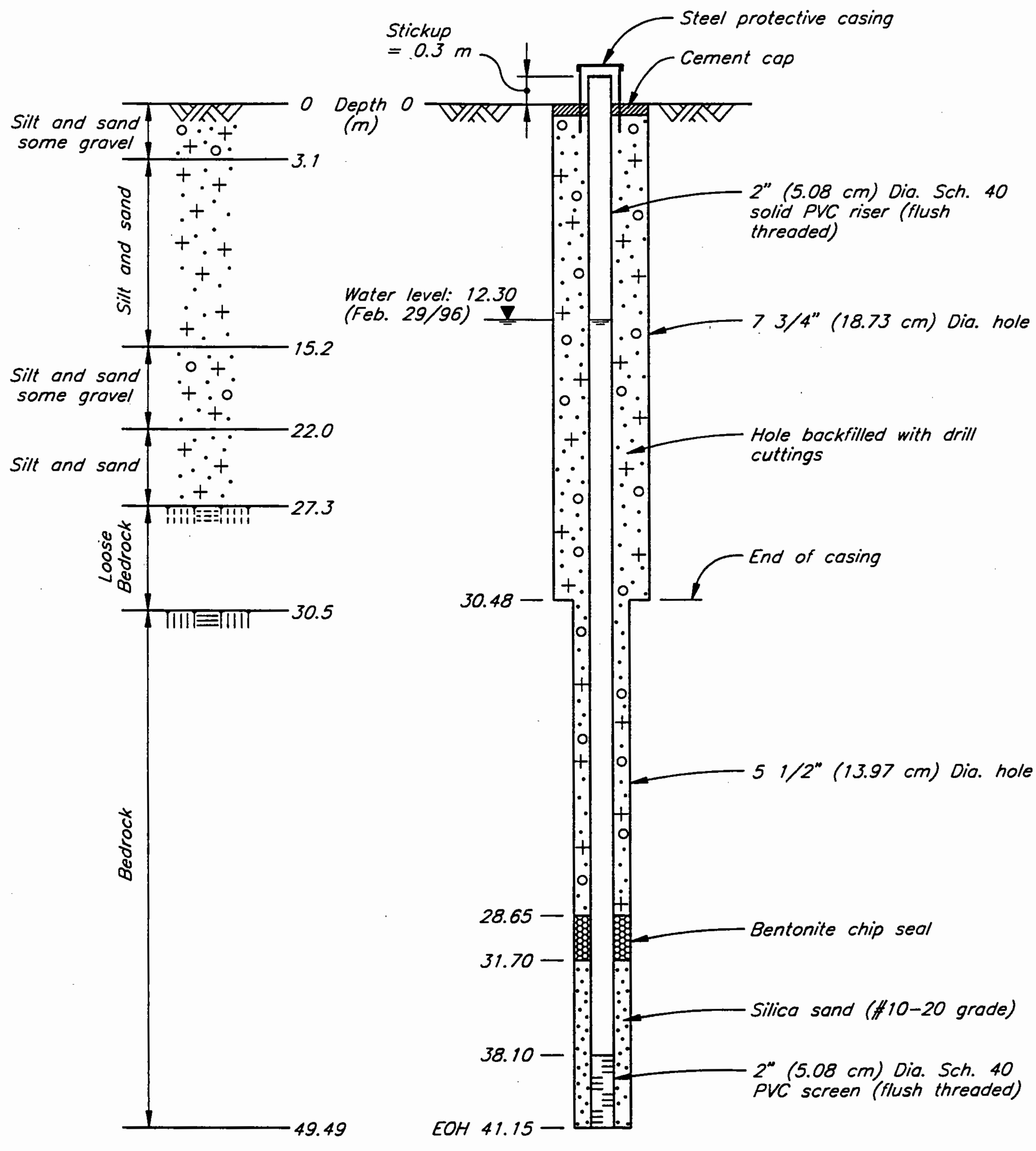
NTS

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL COMPLETION DETAILS

PROJECT: *Carmacks Copper Project*
LOCATION: *Heap Leach Pad Site*
N: *29875* E: *30605*
COMPLETION DATE: *Feb. 27, 1996*

PROJECT NO: *1784*
HOLE NO: *MW96-D*
GROUND ELEV: *717 m*



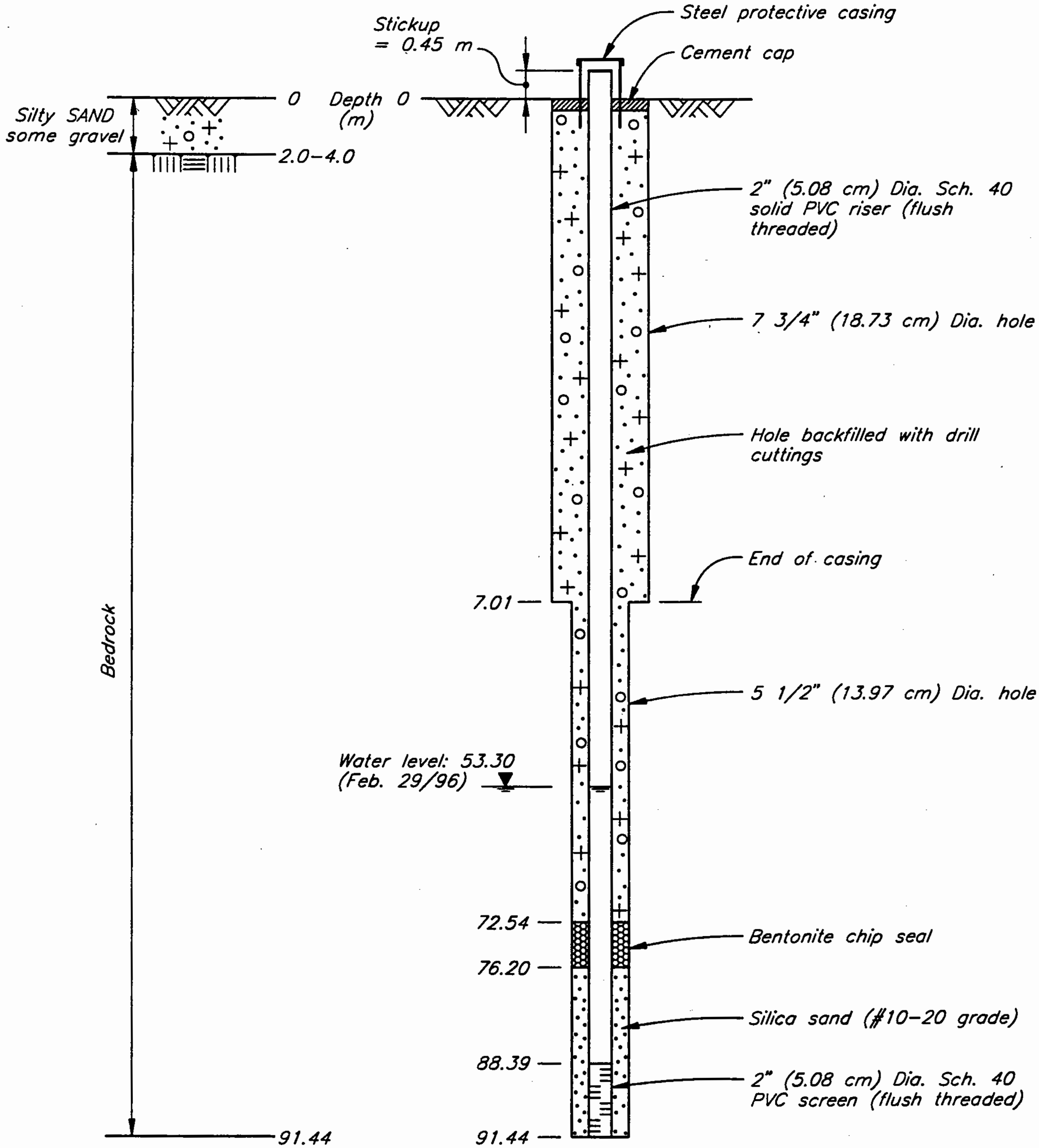
NTS

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL COMPLETION DETAILS

PROJECT: *Carmacks Copper Project*
LOCATION: *Heap Leach Pad Site*
N: *30300* E: *29827*
COMPLETION DATE: *Feb. 17, 1996*

PROJECT NO: *1784*
HOLE NO: *MW96-E*
GROUND ELEV: *831 m*



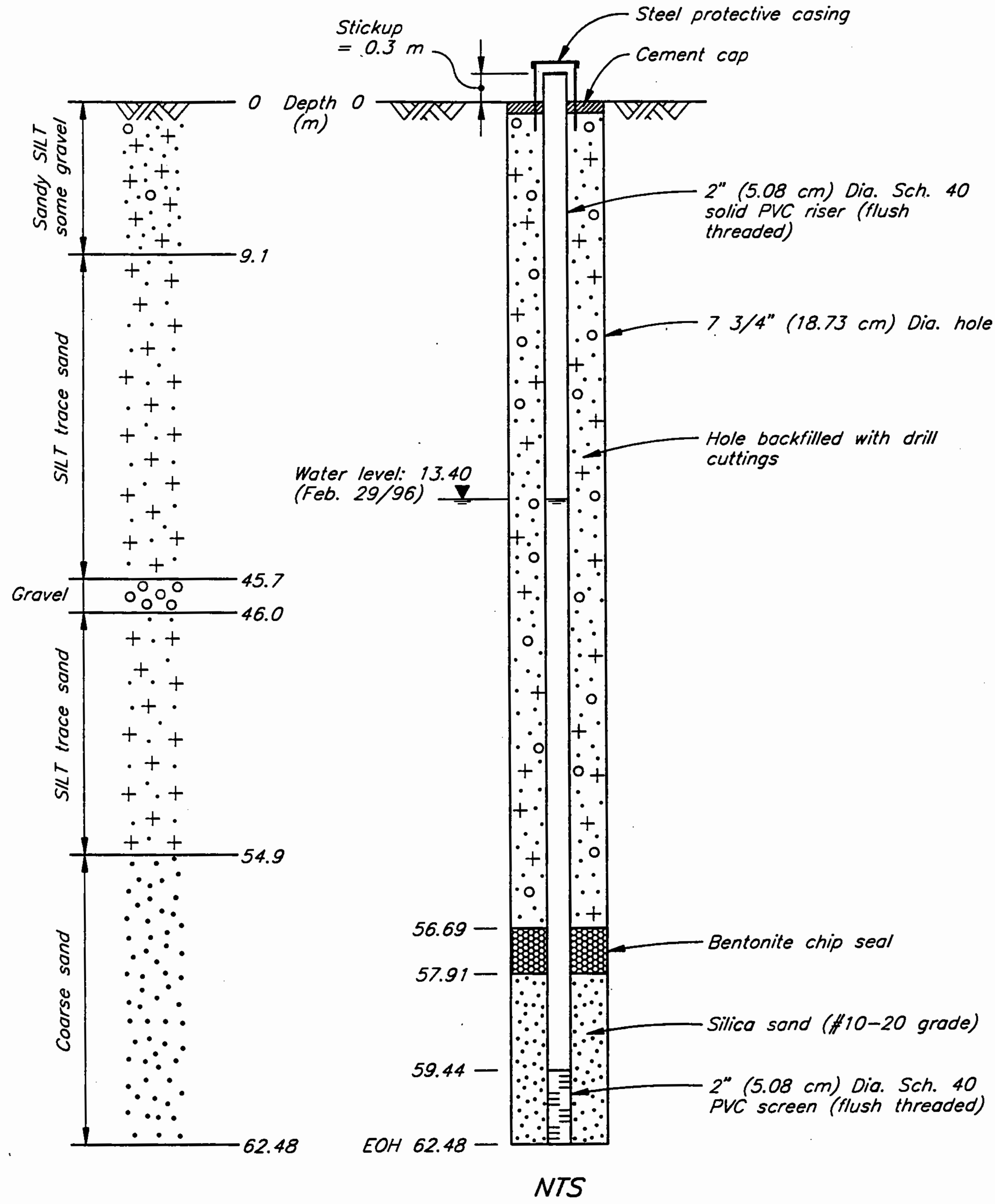
NTS

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL COMPLETION DETAILS

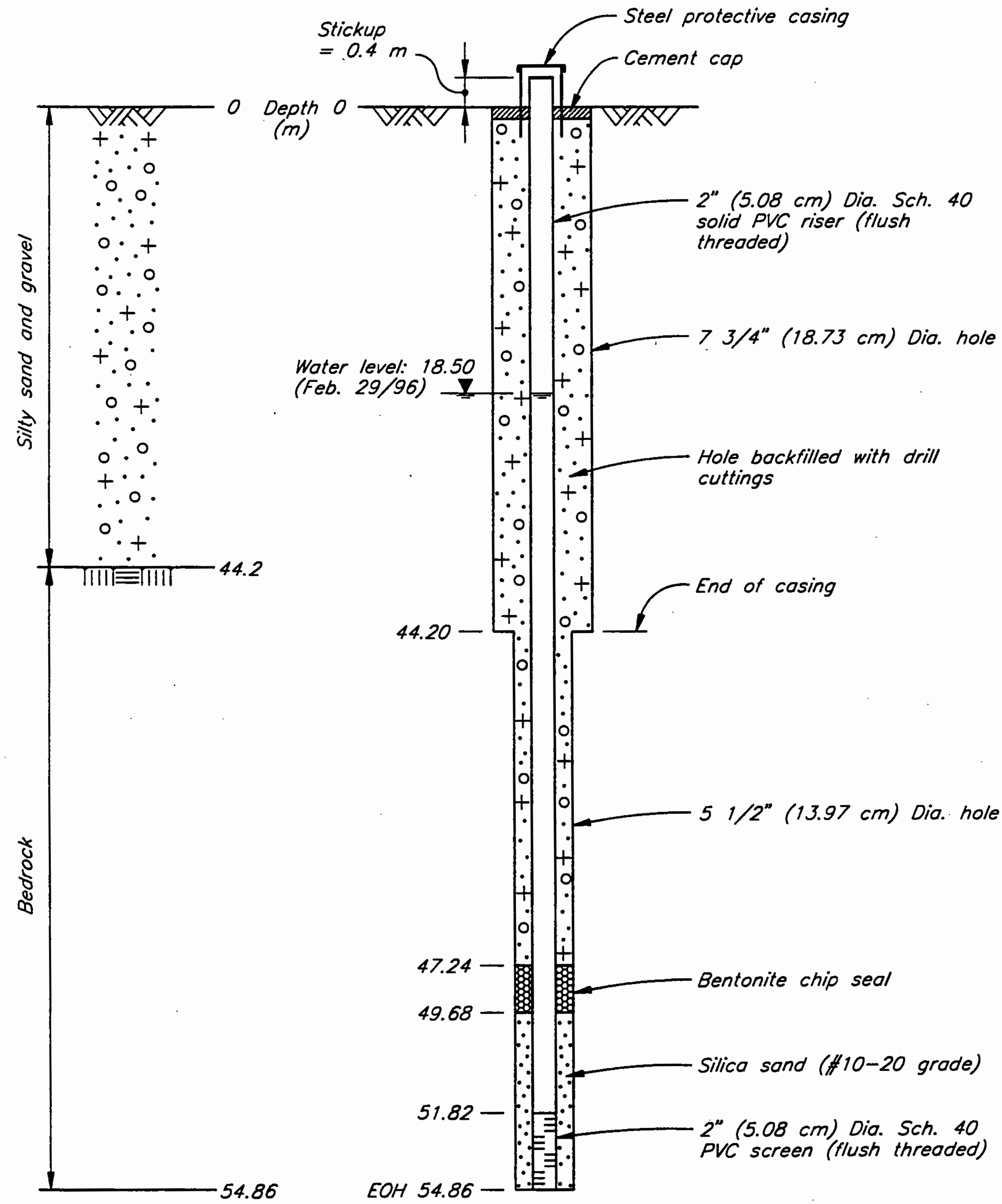
PROJECT: *Carmacks Copper Project*
LOCATION: *Heap Leach Pad Site*
N: *31745* E: *30185*
COMPLETION DATE: *Feb. 20, 1996*

PROJECT NO: *1784*
HOLE NO: *MW96-F*
GROUND ELEV: *785 m*



KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	GROUNDWATER MONITORING WELL COMPLETION DETAILS

PROJECT: *Carmacks Copper Project*	PROJECT NO: *1784*
LOCATION: *Waste Rock Storage Area*	HOLE NO: *MW96-1*
N: *31404* E: *31371*	GROUND ELEV: *715 m*
COMPLETION DATE: *Feb. 22, 1996*	



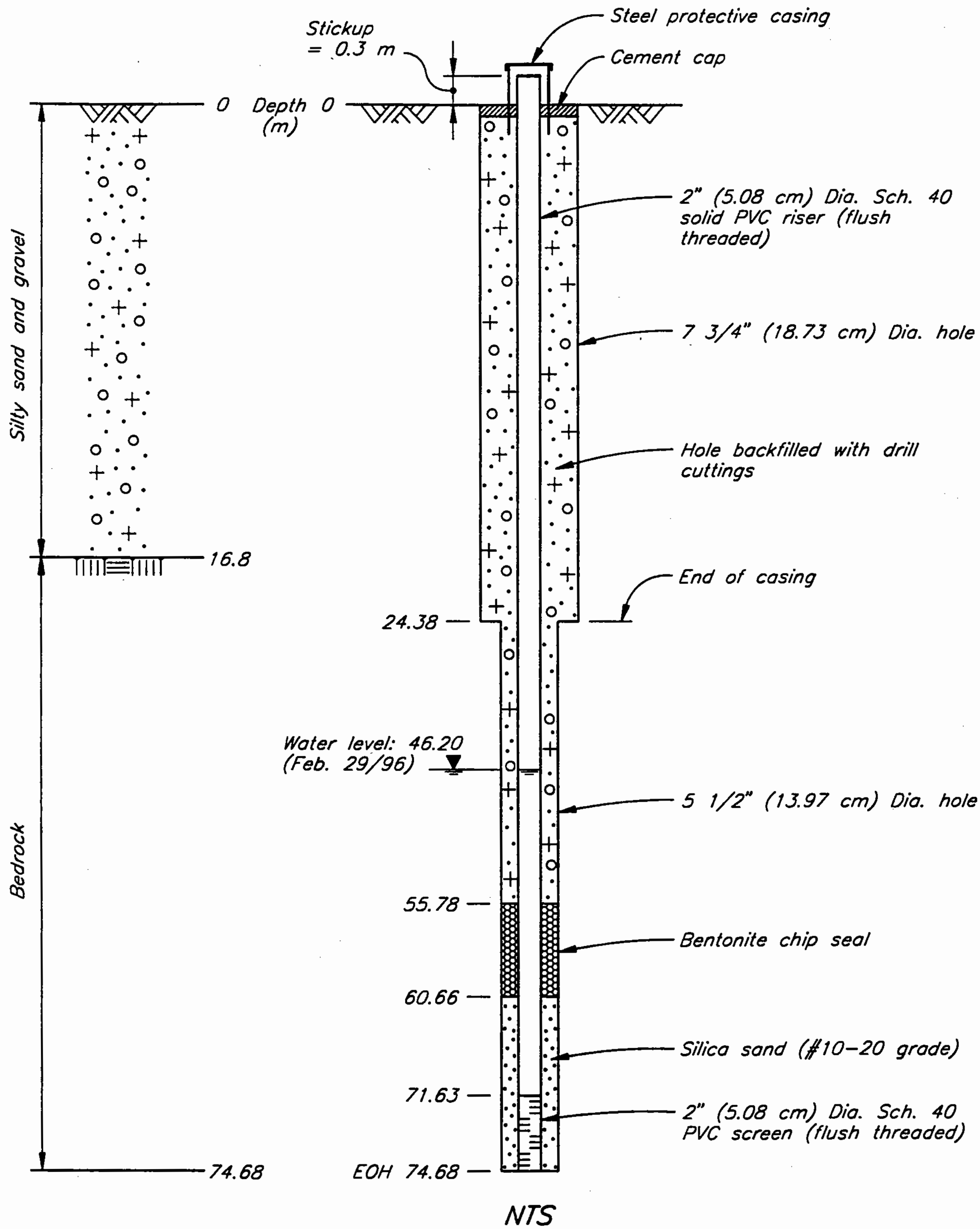
NTS

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

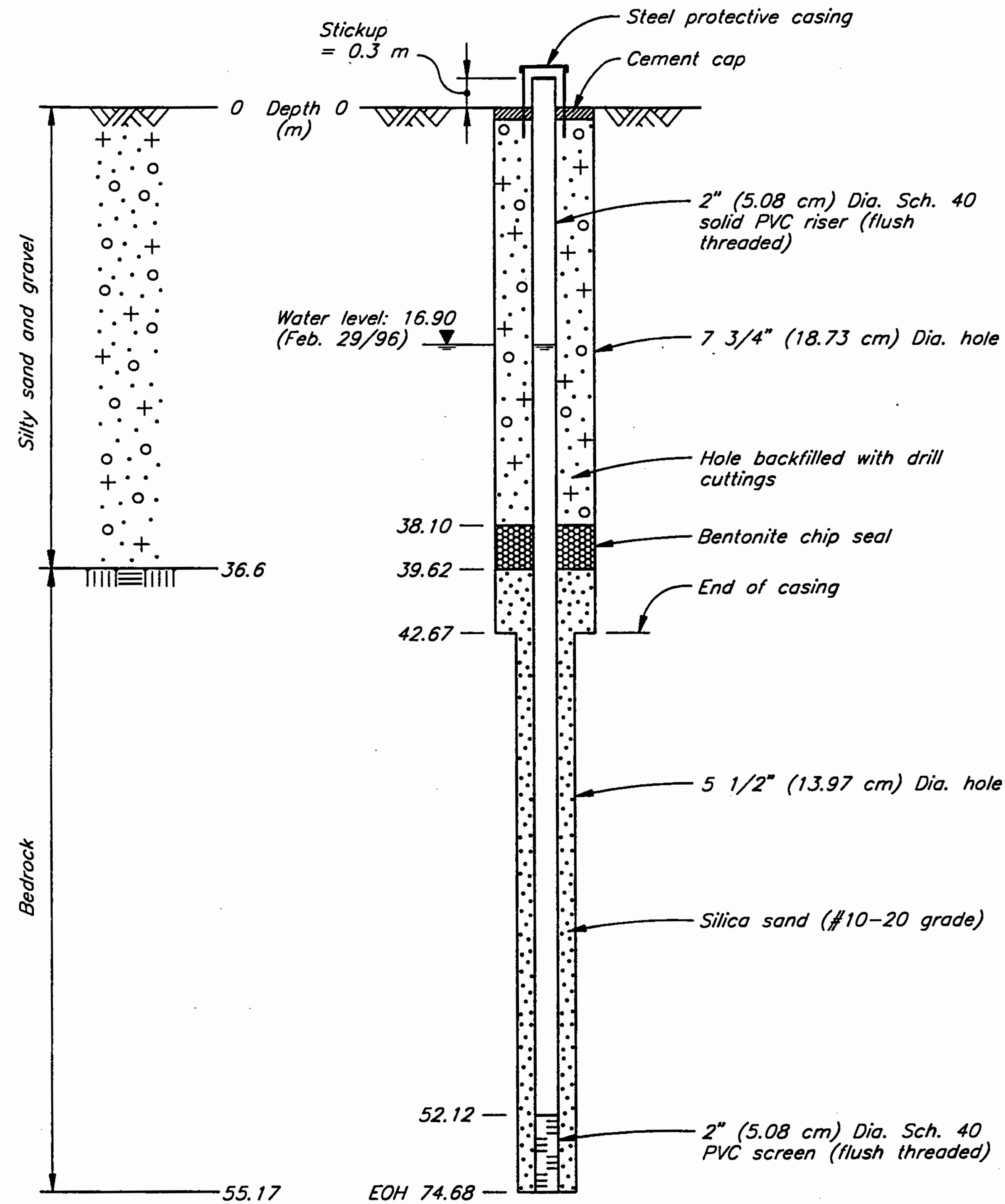
GROUNDWATER MONITORING WELL COMPLETION DETAILS

PROJECT: *Carmacks Copper Project*
LOCATION: *Waste Rock Storage Area*
N: *31341* E: *30655*
COMPLETION DATE: *Feb. 26, 1996*

PROJECT NO: *1784*
HOLE NO: *MW96-G*
GROUND ELEV: *777 m*



KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	GROUNDWATER MONITORING WELL COMPLETION DETAILS
PROJECT: Carmacks Copper Project LOCATION: Waste Rock Storage Area N: 31670 E: 30975 COMPLETION DATE: Feb. 29, 1996	PROJECT NO: 1784 HOLE NO: MW96-H GROUND ELEV: 738 m

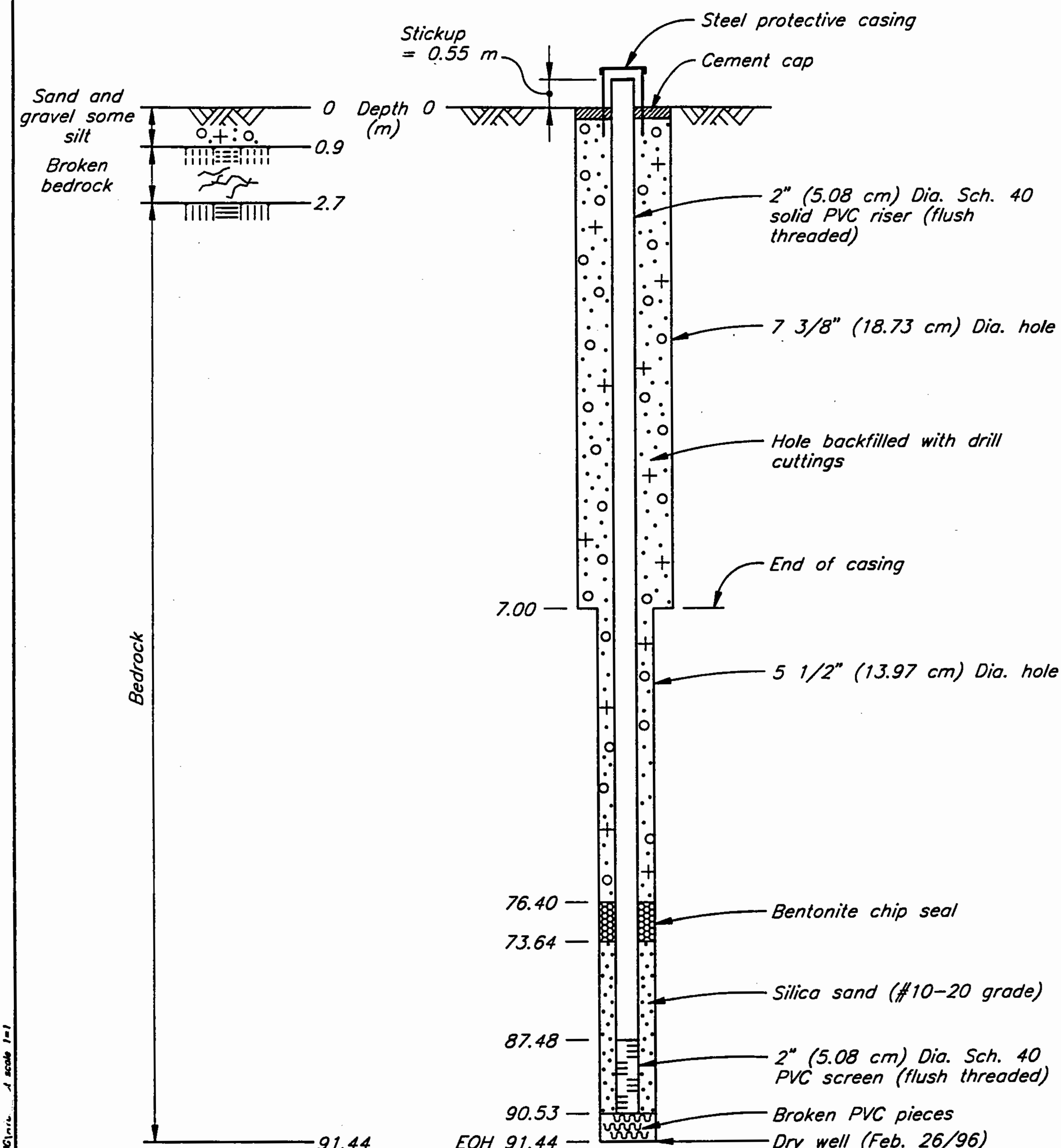


NTS

CAD FILE: \1784\F... at scale 1=1

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	GROUNDWATER MONITORING WELL COMPLETION DETAILS

PROJECT: *Carmacks Copper Project*	PROJECT NO: *1784*
LOCATION: *Open Pit*	HOLE NO: *MW96-J*
N: *30935* E: *30390*	GROUND ELEV: *846 m*
COMPLETION DATE: *Feb. 26, 1996*	



NTS

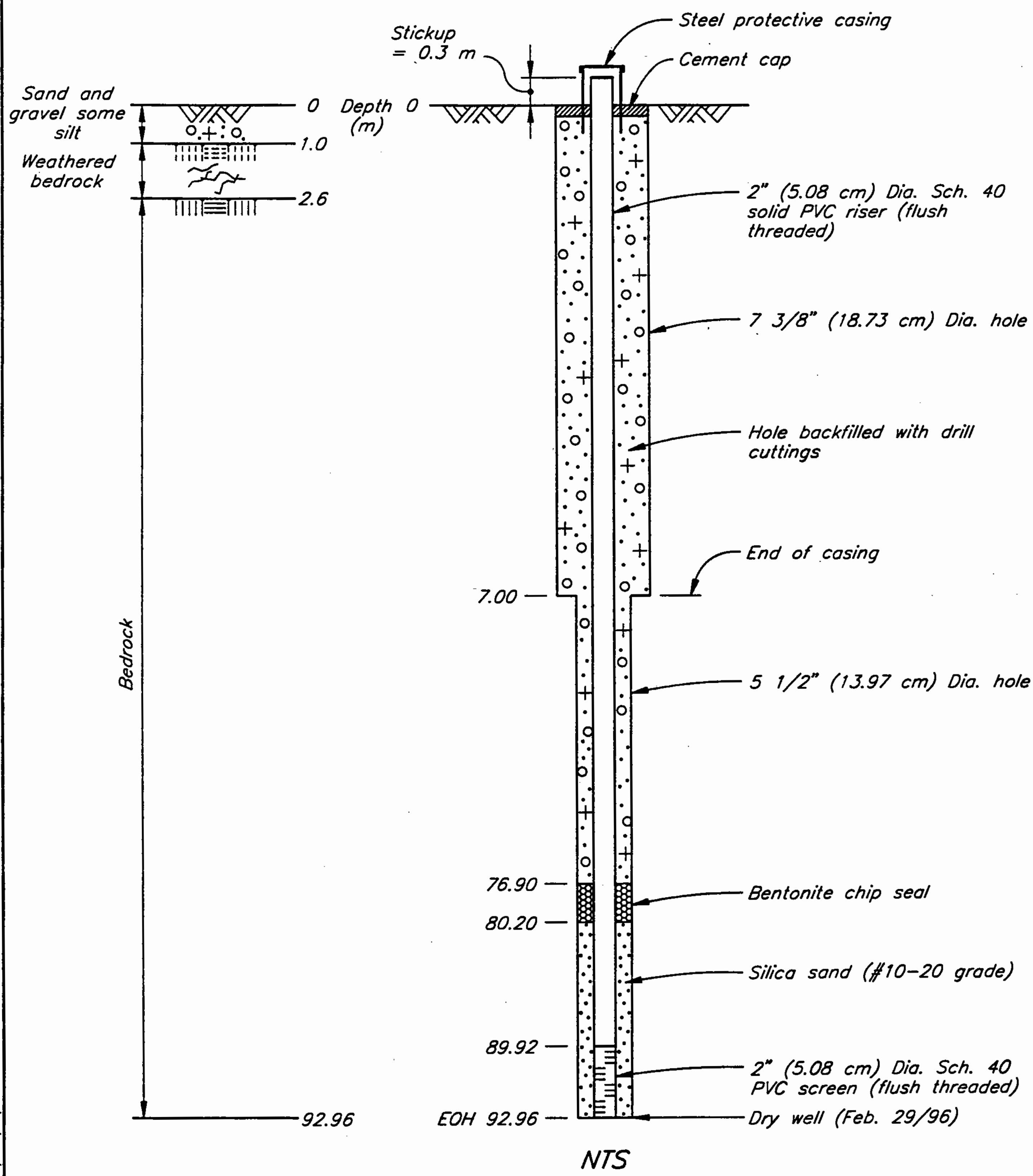
CAD FILE: \1784\FIG\... 1 scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL COMPLETION DETAILS

PROJECT: *Carmacks Copper Project*
LOCATION: *Open Pit*
N: *30515* E: *30545*
COMPLETION DATE: *Feb. 28, 1996*

PROJECT NO: *1784*
HOLE NO: *MW96-K*
GROUND ELEV: *849 m*



APPENDIX A4

PIEZOMETER RECORD SHEETS
DH96-11, 12, 14, 15
MW96-A TO K

Knight Piesold Ltd.
CONSULTING ENGINEERS

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	DH96-11
PIEZOMETER LOCATION	PROCESS PLANT SITE
SURVEY LOCATION (m)	29929 N 30230 E
GROUND ELEVATION (m)	766
DATE OF INSTALLATION	14-Feb-96
TOP OF WELL COMPLETION INTERVAL (m)	10.1
BOTTOM OF WELL COMPLETION INTERVAL (m)	15.2
WELL COMPLETION INTERVAL (m)	5.2
PIEZOMETER STICKUP ABOVE GROUND (m)	0.3
SIZE OF PIEZOMETER	1 inch (2.54 cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

J:\JOB\DATA\1784\SITEDATA\PIEZOM\PIEZOS.XLS 26-Apr-96 8:54

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION	COMMENTS
		(feet)	(meters)	(meters)	
15-Feb-96	2:30 PM	49.5	15.1	751.2	No groundwater was intersected.
16-Feb-96	4:00 PM		DW		The water level measurements were
17-Feb-96	9:30 AM		DW		monitoring drilling induced water.
19-Feb-96	8:30 AM		DW		
20-Feb-96	2:30 PM		DW		DW = DRY WELL
21-Feb-96	11:00 AM		DW		

Knight Piesold Ltd.
CONSULTING ENGINEERS

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	DH96-12
PIEZOMETER LOCATION	PROCESS PLANT SITE
SURVEY LOCATION (m)	29953 N 30267 E
GROUND ELEVATION (m)	769
DATE OF INSTALLATION	13-Feb-96
TOP OF WELL COMPLETION INTERVAL (m)	14.3
BOTTOM OF WELL COMPLETION INTERVAL (m)	18.4
WELL COMPLETION INTERVAL (m)	4.1
PIEZOMETER STICKUP ABOVE GROUND (m)	0.3
SIZE OF PIEZOMETER	1 inch (2.54 cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

J:\JOB\DATA\1784\SITEDATA\PIEZOM\PIEZOS.XLS 26-Apr-96 8:54

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION	COMMENTS
		(feet)	(meters)	(meters)	
14-Feb-96			DW		DW = DRY WELL
15-Feb-96			DW		
16-Feb-96			DW		
17-Feb-96			DW		
19-Feb-96			DW		
20-Feb-96			DW		
21-Feb-96			DW		

Knight Piesold Ltd. CONSULTING ENGINEERS	PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	DH96-14
PIEZOMETER LOCATION	PROCESS PLANT SITE
SURVEY LOCATION (m)	29964 N 30239 E
GROUND ELEVATION (m)	768
DATE OF INSTALLATION	10-Feb-96
TOP OF WELL COMPLETION INTERVAL (m)	9.5
BOTTOM OF WELL COMPLETION INTERVAL (m)	14.3
WELL COMPLETION INTERVAL (m)	4.9
PIEZOMETER STICKUP ABOVE GROUND (m)	0.3
SIZE OF PIEZOMETER	1 inch (2.54 cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

J:\JOB\DATA\1784\SITEDATA\PIEZOM\PIEZOS.XLS 26-Apr-96 8:54

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION	COMMENTS
		(feet)	(meters)	(meters)	
11-Feb-96	5:30 PM	16.4	5.0	763.3	No groundwater was intersected.
12-Feb-96	2:30 PM	17.4	5.3	763.0	The water level measurements were
13-Feb-96	6:30 PM	17.1	5.2	763.1	monitoring drilling induced water.
14-Feb-96	3:00 PM	17.9	5.5	762.8	
15-Feb-96	2:30 PM	18.7	5.7	762.6	
18-Feb-96	9:30 AM	20.7	6.3	762.0	
19-Feb-96	8:30 AM	21.7	6.6	761.7	
20-Feb-96	2:30 PM	22.6	6.9	761.4	
21-Feb-96	11:00 AM	23.6	7.2	761.1	
22-Feb-96	11:00 AM	24.0	7.3	761.0	
23-Feb-96	11:00 AM	24.0	7.3	761.0	

Knight Piesold Ltd.
CONSULTING ENGINEERS

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	DH96-15
PIEZOMETER LOCATION	PROCESS PLANT SITE
SURVEY LOCATION (m)	29982 N 30241 E
GROUND ELEVATION (m)	769
DATE OF INSTALLATION	12-Feb-96
TOP OF WELL COMPLETION INTERVAL (m)	12.5
BOTTOM OF WELL COMPLETION INTERVAL (m)	16.8
WELL COMPLETION INTERVAL (m)	4.3
PIEZOMETER STICKUP ABOVE GROUND (m)	0.3
SIZE OF PIEZOMETER	1 inch (2.54 cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

J:\JOB\DATA\1784\SITEDATA\PIEZOM\PIEZOS.XLS 26-Apr-96 8:54

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION	COMMENTS
		(feet)	(meters)	(meters)	
13-Feb-96	6:30 PM	35.1	10.7	758.6	No groundwater was intersected.
14-Feb-96	3:00 PM	37.2	11.4	758.0	The water level measurements were
15-Feb-96	2:30 PM	38.1	11.6	757.7	monitoring drilling induced water.
16-Feb-96	4:00 PM	43.0	13.1	756.2	
18-Feb-96	9:30 AM	43.3	13.2	756.1	
19-Feb-96	8:30 AM	44.3	13.5	755.8	
20-Feb-96	2:30 PM	45.6	13.9	755.4	
21-Feb-96	11:00 AM	46.9	14.3	755.0	
23-Feb-96	11:00 AM	46.9	14.3	755.0	

Knight Piesold Ltd. CONSULTING ENGINEERS	PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	MW96-A1
PIEZOMETER LOCATION	HEAP LEACH PAD SITE
SURVEY LOCATION (m)	30755 N 29835 E
GROUND ELEVATION (m)	861
DATE OF INSTALLATION	17-Feb-96
TOP OF WELL COMPLETION INTERVAL (m)	34.4
BOTTOM OF WELL COMPLETION INTERVAL (m)	45.7
WELL COMPLETION INTERVAL (m)	11.3
PIEZOMETER STICKUP ABOVE GROUND (m)	0.6
SIZE OF PIEZOMETER	2 inch (5.08 cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

J:\JOB\DATA\1784\SITEDATA\PIEZOM\PIEZOS.XLS 25-Apr-96 13:49

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC (feet)	DEPTH TO WATER FROM TOP OF PVC (meters)	WATER ELEVATION (meters)	COMMENTS
18-Feb-96	9:00 AM		DW		DW = Dry Well
19-Feb-96	9:00 AM		DW		
20-Feb-96	2:00 PM		DW		
21-Feb-96	11:00 AM		DW		
23-Feb-96	11:00 AM		DW		
27-Feb-96	6:00 PM		DW		
29-Feb-96	3:00 PM		DW		
3-Mar-96	11:30 AM	149.6	45.4	816.2	

Knight Piesold Ltd.
CONSULTING ENGINEERS

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	MW96-A2
PIEZOMETER LOCATION	HEAP LEACH PAD SITE
SURVEY LOCATION (m)	30755 N 29835 E
GROUND ELEVATION (m)	861
DATE OF INSTALLATION	17-Feb-96
TOP OF WELL COMPLETION INTERVAL (m)	81.7
BOTTOM OF WELL COMPLETION INTERVAL (m)	91.4
WELL COMPLETION INTERVAL (m)	9.7
PIEZOMETER STICKUP ABOVE GROUND (m)	0.6
SIZE OF PIEZOMETER	2 inch (5.08cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

J:\JOB\DATA\1784\SITEDATA\PIEZOM\PIEZOS.XLS 25-Apr-96 13:35

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION	COMMENTS
		(feet)	(meters)	(meters)	
18-Feb-96	9:00 AM		DW		DW = Dry Well
19-Feb-96	9:00 AM	218.5	66.6	795.0	
20-Feb-96	2:00 PM	194.9	59.4	802.2	
21-Feb-96	11:00 AM	198.2	60.4	801.2	
23-Feb-96	11:00 AM	198.2	60.4	801.2	
27-Feb-96	6:00 PM	198.8	60.6	801.0	
29-Feb-96	3:00 PM	198.8	60.6	801.0	
3-Mar-96	11:00 AM	198.8	60.6	801.0	

Knight Piesold Ltd.
CONSULTING ENGINEERS

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	MW96-B
PIEZOMETER LOCATION	HEAP LEACH PAD SITE
SURVEY LOCATION (m)	30470 N 29974 E
GROUND ELEVATION (m)	833
DATE OF INSTALLATION	18-Feb-96
TOP OF WELL COMPLETION INTERVAL (m)	73.4
BOTTOM OF WELL COMPLETION INTERVAL (m)	91.4
WELL COMPLETION INTERVAL (m)	18.0
PIEZOMETER STICKUP ABOVE GROUND (m)	0.3
SIZE OF PIEZOMETER	2 inch (5.08cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

J:\JOB\DATA\1784\SITEDATA\PIEZOM\PIEZOS.XLS 25-Apr-96 13:35

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC (feet)	DEPTH TO WATER FROM TOP OF PVC (meters)	WATER ELEVATION (meters)	COMMENTS
19-Feb-96	9:30 AM	144.4	44.0	789.3	
20-Feb-96	2:00 PM	135.5	41.3	792.0	
23-Feb-96	11:00 AM	135.5	41.3	792.0	
27-Feb-96	11:00 AM	136.2	41.5	791.8	
29-Feb-96	3:10 AM	136.5	41.6	791.7	
3-Mar-96	12:00 PM	136.5	41.6	791.7	

Knight Piesold Ltd. CONSULTING ENGINEERS	PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	MW96-C
PIEZOMETER LOCATION	HEAP LEACH PAD SITE
SURVEY LOCATION (m)	30095 N 30385 E
GROUND ELEVATION (m)	755
DATE OF INSTALLATION	26-Feb-96
TOP OF WELL COMPLETION INTERVAL (m)	43.3
BOTTOM OF WELL COMPLETION INTERVAL (m)	50.0
WELL COMPLETION INTERVAL (m)	6.7
PIEZOMETER STICKUP ABOVE GROUND (m)	0.4
SIZE OF PIEZOMETER	2 inch (5.08cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

J:\JOB\DATA\1784\SITEDATA\PIEZOM\PIEZOS.XLS 25-Apr-96 13:35

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION	COMMENTS
		(feet)	(meters)	(meters)	
27-Feb-96	3:00 PM	131.9	40.2	715.2	
29-Feb-96	3:30 PM	132.2	40.3	715.1	
3-Mar-96	2:00 PM	132.2	40.3	715.1	

Knight Piesold Ltd. CONSULTING ENGINEERS	PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	MW96-D
PIEZOMETER LOCATION	HEAP LEACH PAD SITE
SURVEY LOCATION (m)	29875 N 30605 E
GROUND ELEVATION (m)	717
DATE OF INSTALLATION	27-Feb-96
WELL COMPLETION INTERVAL (m)	31.7
WELL COMPLETION INTERVAL (m)	41.2
WELL COMPLETION INTERVAL (m)	9.5
PIEZOMETER STICKUP ABOVE GROUND (m)	0.3
SIZE OF PIEZOMETER	2 inch (5.08 cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

J:\JOB\DATA\1784\SITEDATA\PIEZOM\PIEZOS.XLS 25-Apr-96 13:35

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION	COMMENTS
		(feet)	(meters)	(meters)	
27-Feb-96	2:00 PM	40.0	12.2	705.1	
29-Feb-96	3:00 PM	40.4	12.3	705.0	
3-Mar-96	3:20 PM	40.7	12.4	704.9	

Knight Piesold Ltd.
CONSULTING ENGINEERS

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	MW96-E
PIEZOMETER LOCATION	HEAP LEACH PAD SITE
SURVEY LOCATION (m)	30300 N 29827 E
GROUND ELEVATION (m)	831
DATE OF INSTALLATION	17-Feb-96
TOP OF WELL COMPLETION INTERVAL (m)	76.2
BOTTOM OF WELL COMPLETION INTERVAL (m)	91.4
WELL COMPLETION INTERVAL (m)	15.2
PIEZOMETER STICKUP ABOVE GROUND (m)	0.45
SIZE OF PIEZOMETER	2 inch (5.08 cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

J:\JOB\DATA\1784\SITEDATA\PIEZOM\PIEZOS.XLS 25-Apr-96 13:35

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC (feet)	DEPTH TO WATER FROM TOP OF PVC (meters)	WATER ELEVATION (meters)	COMMENTS
19-Feb-96	9:00 AM	174.9	53.3	778.2	
20-Feb-96	2:00 PM	173.2	52.8	778.7	
23-Feb-96	11:00 AM	174.9	53.3	778.2	
27-Feb-96	3:00 PM	174.9	53.3	778.2	
29-Feb-96	11:45 AM	175.2	53.4	778.1	

Knight Piesold Ltd.
CONSULTING ENGINEERS

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	MW96-F
PIEZOMETER LOCATION	WASTE ROCK STORAGE AREA
SURVEY LOCATION (m)	31745 N 30185 E
GROUND ELEVATION (m)	785
DATE OF INSTALLATION	20-Feb-96
TOP OF WELL COMPLETION INTERVAL (m)	57.9
BOTTOM OF WELL COMPLETION INTERVAL (m)	62.5
WELL COMPLETION INTERVAL (m)	4.6
PIEZOMETER STICKUP ABOVE GROUND (m)	0.3
SIZE OF PIEZOMETER	2 inch (5.08 cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

J:\JOB\DATA\1784\SITEDATA\PIEZOM\PIEZOS.XLS 25-Apr-96 13:35

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC (feet)	DEPTH TO WATER FROM TOP OF PVC (meters)	WATER ELEVATION (meters)	COMMENTS
20-Feb-96	2:30 PM	36.1	11.0	774.3	
22-Feb-96	10:30 AM	44.6	13.6	771.7	
27-Feb-96	4:00 PM	44.0	13.4	771.9	
29-Feb-96	3:00 PM	44.0	13.4	771.9	
3-Mar-96	9:00 AM	44.0	13.4	771.9	

Knight Piesold Ltd.
CONSULTING ENGINEERS

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	MW96-G
PIEZOMETER LOCATION	WASTE ROCK STORAGE AREA
SURVEY LOCATION (m)	31341 N 30655 E
GROUND ELEVATION (m)	777
DATE OF INSTALLATION	25-Feb-96
TOP OF WELL COMPLETION INTERVAL (m)	60.7
BOTTOM OF WELL COMPLETION INTERVAL (m)	74.7
WELL COMPLETION INTERVAL (m)	14.0
PIEZOMETER STICKUP ABOVE GROUND (m)	0.3
SIZE OF PIEZOMETER	2 inch (5.08 cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

J:\JOB\DATA\1784\SITEDATA\PIEZOM\PIEZOS.XLS 25-Apr-96 13:35

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC (feet)	DEPTH TO WATER FROM TOP OF PVC (meters)	WATER ELEVATION (meters)	COMMENTS
27-Feb-96	4:00 PM		SLUSH		SLUSH - NO READING
29-Feb-96	2:00 PM	151.6	46.2	731.1	
3-Mar-96	10:30 AM	158.8	48.4	728.9	

Knight Piesold Ltd. CONSULTING ENGINEERS	# PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	MW96-H
PIEZOMETER LOCATION	WASTE ROCK STORAGE AREA
SURVEY LOCATION (m)	31670 N 30975 E
GROUND ELEVATION (m)	738
DATE OF INSTALLATION	24-Feb-96
TOP OF WELL COMPLETION INTERVAL (m)	39.6
BOTTOM OF WELL COMPLETION INTERVAL (m)	55.2
WELL COMPLETION INTERVAL (m)	15.6
PIEZOMETER STICKUP ABOVE GROUND (m)	0.3
SIZE OF PIEZOMETER	2 inch (5.08 cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

J:\JOB\DATA\1784\SITEDATA\PIEZOM\PIEZOS.XLS 25-Apr-96 13:35

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION	COMMENTS
		(feet)	(meters)	(meters)	
27-Feb-96	3:30 PM	55.4	16.9	721.4	
29-Feb-96	3:15 PM	55.4	16.9	721.4	
3-Mar-96	9:30 AM	55.4	16.9	721.4	

Knight Piesold Ltd. CONSULTING ENGINEERS	PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	MW96-I
PIEZOMETER LOCATION	WASTE ROCK STORAGE AREA
SURVEY LOCATION (m)	31404 N 31371 E
GROUND ELEVATION (m)	715
DATE OF INSTALLATION	22-Feb-96
TOP OF WELL COMPLETION INTERVAL (m)	49.7
BOTTOM OF WELL COMPLETION INTERVAL (m)	54.9
WELL COMPLETION INTERVAL (m)	5.2
PIEZOMETER STICKUP ABOVE GROUND (m)	0.3
SIZE OF PIEZOMETER	2 inch (5.08 cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

J:\JOB\DATA\1784\SITEDATA\PIEZOM\PIEZOS.XLS 25-Apr-96 13:35

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION	COMMENTS
		(feet)	(meters)	(meters)	
23-Feb-96			--		SLUSH
27-Feb-96			--		SLUSH
29-Feb-96		59.1	18.0	697.3	SLUSH
3-Mar-96	10:00 AM	59.1	18.0	697.3	SLUSH

Knight Piesold Ltd.
CONSULTING ENGINEERS

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	MW96-J
PIEZOMETER LOCATION	OPEN PIT
SURVEY LOCATION (m)	30935 N 30390 E
GROUND ELEVATION (m)	846
DATE OF INSTALLATION	26-Feb-96
TOP OF WELL COMPLETION INTERVAL (m)	78.6
BOTTOM OF WELL COMPLETION INTERVAL (m)	90.5
WELL COMPLETION INTERVAL (m)	11.9
PIEZOMETER STICKUP ABOVE GROUND (m)	0.55
SIZE OF PIEZOMETER	2 inch (5.08 cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

J:\JOB\DATA\1784\SITEDATA\PIEZOM\PIEZOS.XLS 25-Apr-96 13:35

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC (feet)	DEPTH TO WATER FROM TOP OF PVC (meters)	WATER ELEVATION (meters)	COMMENTS
29-Feb-96					DRY WELL
3-Mar-96					DRY WELL

Knight Piesold Ltd. CONSULTING ENGINEERS	PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	MW96-K
PIEZOMETER LOCATION	OPEN PIT
SURVEY LOCATION (m)	30515 N 30545 E
GROUND ELEVATION (m)	849
DATE OF INSTALLATION	29-Feb-96
TOP OF WELL COMPLETION INTERVAL (m)	76.9
BOTTOM OF WELL COMPLETION INTERVAL (m)	93.0
WELL COMPLETION INTERVAL (m)	16.1
PIEZOMETER STICKUP ABOVE GROUND (m)	0.3
SIZE OF PIEZOMETER	2 inch (5.08 cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

J:\JOB\DATA\1784\SITEDATA\PIEZOM\PIEZOS.XLS 25-Apr-96 13:35

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC (feet)	DEPTH TO WATER FROM TOP OF PVC (meters)	WATER ELEVATION (meters)	COMMENTS
29-Feb-96					DRY WELL
3-Mar-96					DRY WELL

APPENDIX A5

THERMISTOR RECORD SHEETS
TH1-5

Knight Piesold Ltd.
CONSULTING ENGINEERS

THERMISTOR RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

SUMMARY OF TEMPERATURE MEASUREMENTS

THERMISTOR NUMBER	Th-1
LOCATION	Drill Hole RC92-7
	31230 N 30180 E (scaled)
	vertical hole
INSTALLATION DATE	Sept. 07, 1992

J:\JOB\DATA\1784\SITEDATA\THERMIST\TH-1.XLS 26-Apr-96 11:08

CHANNEL #	1	2	3	4	5	6	7	8	9	10
DEPTH (ft)	0	7	9	11	13	17	20	25	45	65
DEPTH (m)	0.00	2.13	2.74	3.35	3.96	5.18	6.10	7.62	13.72	19.81

DATE	TEMPERATURE READING (degrees C)									
	CHANNEL NUMBER									
	1	2	3	4	5	6	7	8	9	10
29-Apr-93	0.0	0.0	0.0	0.1	0.0	0.0	0.0	-0.2	-0.3	-0.3
2-Aug-93	4.7	3.1	2.0	1.3	0.3	0.0	0.0	-0.2	-0.3	-0.3
2-Sep-93	5.0	3.8	2.9	2.1	0.7	0.0	0.0	-0.2	-0.3	-0.3
29-Oct-93	2.0	2.0	1.9	1.7	0.7	0.1	0.0	-0.2	-0.3	-0.3
15-Apr-94	0.0	0.0	0.0	0.1	0.0	0.0	0.0	-0.2	-0.3	-0.3
28-Mar-95	-0.1	-0.1	0.0	0.1	0.0	-0.1	0.0	-0.2	-0.3	-0.3
21-Apr-95	-0.2	0.0	0.0	0.1	0.0	0.0	0.0	-0.2	-0.3	-0.3
26-Oct-95	2.4	2.2	1.9	1.6	0.7	0.1	-0.1	-0.2	-0.3	-0.3
29-Feb-96	-0.5	0.0	0.1	0.2	0.1	0.0	-0.1	-0.1	0.1	-0.2

Knight Piesold Ltd.

CONSULTING ENGINEERS

THERMISTOR RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED

CARMACKS COPPER PROJECT

SUMMARY OF TEMPERATURE MEASUREMENTS

THERMISTOR NUMBER	TH-2
LOCATION	Drill Hole RC92-10
	29990 N 30740 E (scaled)
	inclined at 247°, -50°
INSTALLATION DATE	Sept. 11, 1992

J:\JOB\DATA\1784\SITEDATA\THERMIST\TH-1.XLS 26-Apr-96 11:08

CHANNEL #	1	2	3	4	5	6	7	8	9	10
DEPTH (ft)	0	5.3	6.9	8.4	10	13	15.3	19.2	34.4	49.9
DEPTH (m)	0.00	1.62	2.10	2.56	3.05	3.96	4.66	5.85	10.49	15.21

DATE	TEMPERATURE READING (degrees C)									
	CHANNEL NUMBER									
	1	2	3	4	5	6	7	8	9	10
29-Apr-93	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.2	-0.2
2-Aug-93	6.3	2.9	-0.0	-0.2	-0.3	-0.3	-0.3	-0.3	-0.2	-0.2
2-Sep-93	5.8	3.7	1.7	-0.1	-0.3	-0.3	-0.3	-0.3	-0.2	-0.3
29-Oct-93	1.2	1.0	0.6	0.3	-0.2	-0.3	-0.3	-0.3	-0.2	-0.3
15-Apr-94	0.0	0.0	-0.1	0.0	-0.1	-0.2	-0.2	-0.3	-0.2	-0.3
28-Mar-95	-0.1	-0.1	-0.1	-0.1	0.0	-0.1	-0.2	-0.3	-0.2	-0.4
21-Apr-95	-0.4	-0.1	-0.1	-0.1	0.0	-0.1	-0.2	-0.3	-0.2	-0.4
26-Oct-95	3.4	3.7	3.4	3.0	1.3	0.2	-0.1	-0.3	-0.2	-0.4
29-Feb-96	-1.4	-0.2	-0.1	0.0	0.0	0.0	0.0	-0.3	-0.1	-0.3

Knight Piesold Ltd.

CONSULTING ENGINEERS

THERMISTOR RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED

CARMACKS COPPER PROJECT

SUMMARY OF TEMPERATURE MEASUREMENTS

THERMISTOR NUMBER	Th-3
LOCATION	Drill Hole DH95-H
	30130 N 30300 E (scaled)
	vertical hole
INSTALLATION DATE	March 09, 1995

J:\JOB\DATA\1784\SITEDATA\THERMIST\TH-1.XLS 26-Apr-96 11:14

CHANNEL #	1	2	3	4	5	6	7	8	9	10
DEPTH (ft)	0	5	15	30	45	60	75	90	95	100
DEPTH (m)	0.00	1.52	4.57	9.14	13.72	18.29	22.86	27.43	28.96	30.48

DATE	TEMPERATURE READING (degrees C)									
	CHANNEL NUMBER									
	1	2	3	4	5	6	7	8	9	10
28-Mar-95	-0.4	0.0	-0.1	-0.2	-0.2	-0.1	-0.2	-0.1	-0.7	0.2
21-Apr-95	2.4	-0.1	-0.1	-0.2	-0.2	-0.1	-0.2	-0.1	-0.1	-0.1
26-Oct-95	0.0	-0.2	-0.2	-0.3	-0.2	-0.4	-0.4	-0.1	1.8	-0.4
29-Feb-96	0.2	-0.1	0.0	-0.2	-0.2	-0.3	-0.3	0.1	0.2	5.9

Knight Piesold Ltd.
CONSULTING ENGINEERS

THERMISTOR RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

SUMMARY OF TEMPERATURE MEASUREMENTS

THERMISTOR NUMBER	Th-4
LOCATION	DH96-13 at Proposed Process Plant Site 29963 N 30244 E vertical hole
INSTALLATION DATE	Feb. 12, 1996

J:\JOB\DATA\1784\SITEDATA\THERMIST\TH-1.XLS 26-Apr-96 11:08

CHANNEL #	1	2	3	4	5	6	7	8	9	10
DEPTH (ft)	0	3	6	9	12	16	20	25	40	60
DEPTH (m)	0.00	0.91	1.83	2.74	3.66	4.88	6.10	7.62	12.19	18.29

DATE	TEMPERATURE READING (degrees C)									
	CHANNEL NUMBER									
	1	2	3	4	5	6	7	8	9	10
29-Feb-96	-5.9	-6.8	-5.6	-1.9	0.0	0.0	0.0	0.0	0.0	0.0

Knight Piesold Ltd. CONSULTING ENGINEERS	**THERMISTOR RECORD SHEET**

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

SUMMARY OF TEMPERATURE MEASUREMENTS

THERMISTOR NUMBER	Th-5
LOCATION	DH96-16 at Proposed Process Plant Site
	30033 N 30243 E
	vertical hole
INSTALLATION DATE	Feb. 14, 1996

J:\JOB\DATA\1784\SITEDATA\THERMIST\TH-1.XLS 26-Apr-96 11:08

CHANNEL #	1	2	3	4	5	6	7	8	9	10
DEPTH (ft)	0	3	6	9	12	16	20	25	40	60
DEPTH (m)	0.00	0.91	1.83	2.74	3.66	4.88	6.10	7.62	12.19	18.29

DATE	TEMPERATURE READING (degrees C)									
	CHANNEL NUMBER									
	1	2	3	4	5	6	7	8	9	10
29-Feb-96	-4.6	-3.5	0.0	-0.3	0.0	0.0	-0.1	0.0	0.0	-0.1

Knight Piésold Ltd.
CONSULTING ENGINEERS

APPENDIX A6

FALLING HEAD CALCULATION SHEETS
MW96-A TO K

Knight Piésold Ltd.
CONSULTING ENGINEERS

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEV METHOD

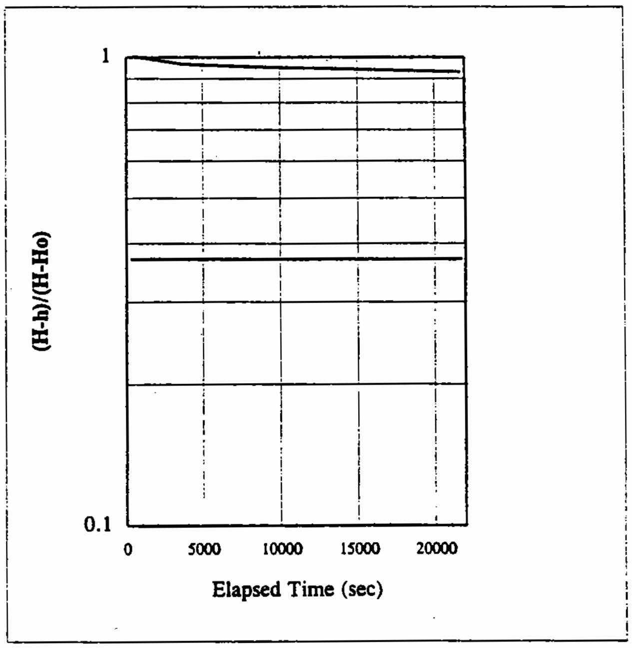
Hole number		MW96-A1
Hole diameter, D	D =	0.13335 m
Piezometer diameter, d	d =	0.0508 m
Top of test interval		34.3 m
Bottom of test interval		45.7 m
Length of test interval, L	L =	11.4 m
Static water level, H	H =	45.4 m
Water level at start of test, Ho	Ho =	41.8 m

J:\JOB\DATA\1784\SITEDATA\FALLHED.XLS

26-Apr-96 9:43

TEST DATA

Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
280	41.8	1.00	0.37
570	41.8	1.00	0.37
3721	42.0	0.97	0.37
9120	42.0	0.95	0.37
21720	42.1	0.93	0.37



$$k = \frac{d^2 \ln(2mL/D)}{8LT \sin\alpha}$$

$\sin\alpha = 1$

$m = 1$

T = time when (H-h)/(H-Ho) = 0.37

T= 370000

Permeability k, = 3.9E-08 cm/s

Note: Permeability estimated from extension of data from falling head test.

Association of Consulting Engineers of Canada

Association des Ingénieurs-Conseils du Canada

Knight Piésold Ltd.
CONSULTING ENGINEERS

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEV METHOD

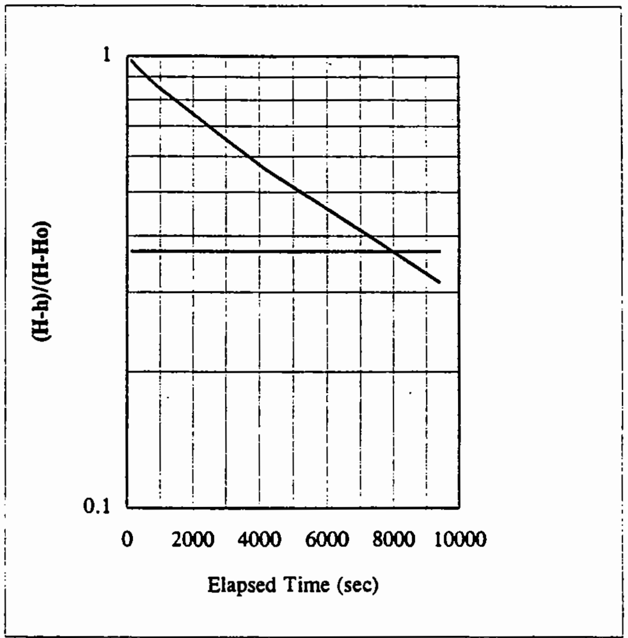
Hole number		MW96-A2
Hole diameter, D	D =	0.13335 m
Piezometer diameter, d	d =	0.0508 m
Top of test interval		81.7 m
Bottom of test interval		91.4 m
Length of test interval, L	L =	9.8 m
Static water level, H	H =	60.6 m
Water level at start of test, Ho	Ho =	48.1 m

J:\JOB\DATA\1784\SITEDATA\FALLHED.XLS

25-Apr-96 15:13

TEST DATA

Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
120	48.3	0.98	0.37
240	48.6	0.96	0.37
870	49.8	0.86	0.37
4200	53.6	0.56	0.37
9420	56.7	0.31	0.37



$$k = \frac{d^2 \ln(2mL/D)}{8LT \sin\alpha}$$

sin α = 1

m = 1

T = time when (H-h)/(H-Ho) = 0.37 T= 7950

Permeability k, = 2.1E-06 cm/s

Knight Piésold Ltd.
CONSULTING ENGINEERS

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEV METHOD

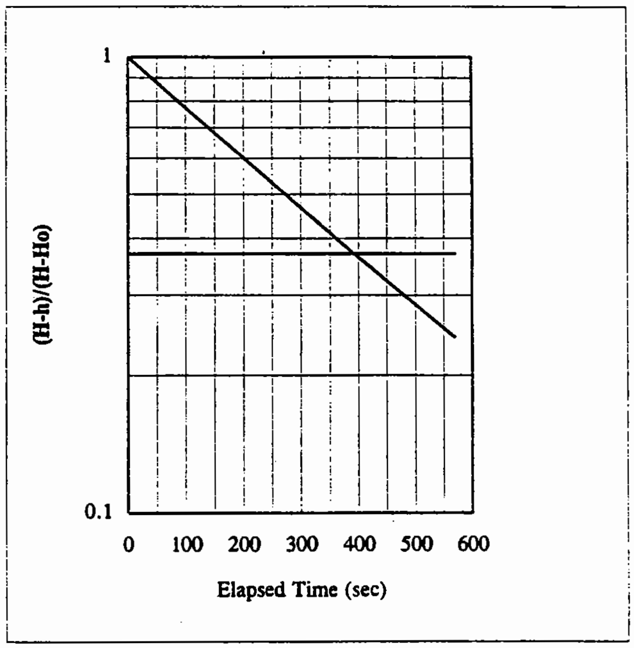
Hole number		MW96-B
Hole diameter, D	D =	0.13335 m
Piezometer diameter, d	d =	0.0508 m
Top of test interval		73.4 m
Bottom of test interval		91.4 m
Length of test interval, L	L =	18.0 m
Static water level, H	H =	41.6 m
Water level at start of test, Ho	Ho =	35.2 m

J:\JOB\DATA\1784\SITEDATA\FALLHED.XLS

25-Apr-96 15:21

TEST DATA

Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
0	35.2	1.00	0.37
90	36.5	0.79	0.37
390	39.2	0.37	0.37
570	40.1	0.24	0.37



$$k = \frac{d^2 \ln(2mL/D)}{8LT \sin\alpha}$$

$\sin\alpha = 1$

$m = 1$

T = time when (H-h)/(H-Ho) = 0.37 T= 390

Permeability k, =	2.6E-05 cm/s

Knight Piésold Ltd.
CONSULTING ENGINEERS

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEV METHOD

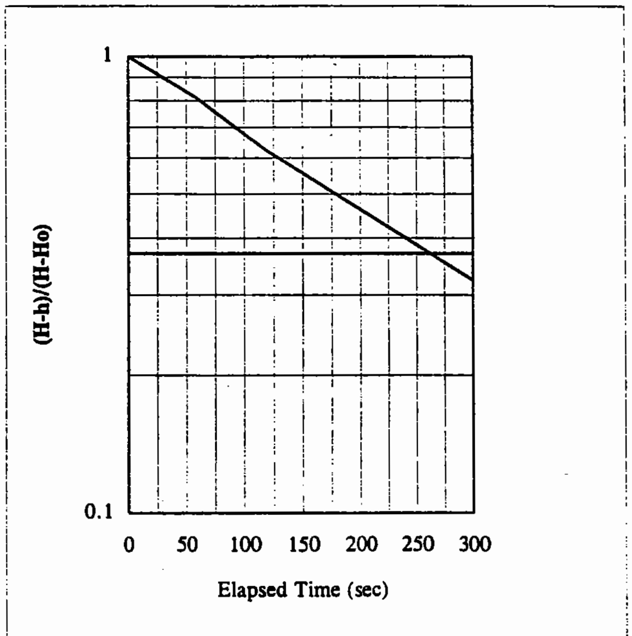
Hole number		MW96-D
Hole diameter, D	D =	0.13335 m
Piezometer diameter, d	d =	0.0508 m
Top of test interval		31.7 m
Bottom of test interval		41.2 m
Length of test interval, L	L =	9.5 m
Static water level, H	H =	12.4 m
Water level at start of test, Ho	Ho =	6.7 m

J:\JOB\DATA\1784\SITEDATA\FALLHED.XLS

25-Apr-96 15:29

TEST DATA

Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
0	6.7	1.00	0.37
60	7.8	0.81	0.37
120	8.9	0.62	0.37
180	9.6	0.50	0.37
300	10.6	0.32	0.37



$$k = \frac{d^2 \ln(2mL/D)}{8LT \sin\alpha}$$

$\sin\alpha = 1$

$m = 1$

T = time when (H-h)/(H-Ho) = 0.37 T= 260

Permeability k, = 6.5E-05 cm/s

Knight Piésold Ltd.
CONSULTING ENGINEERS

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEV METHOD

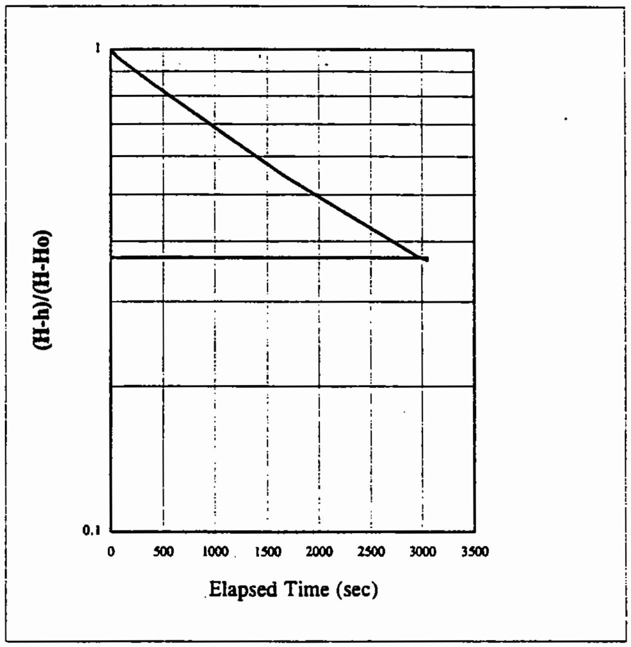
Hole number		MW96-E
Hole diameter, D	D =	0.13335 m
Piezometer diameter, d	d =	0.0508 m
Top of test interval		76.2 m
Bottom of test interval		91.4 m
Length of test interval, L	L =	15.2 m
Static water level, H	H =	53.4 m
Water level at start of test, Ho	Ho =	45.9 m

J:\JOB\DATA\1784\SITEDATA\FALLHED.XLS

25-Apr-96 15:34

TEST DATA

Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
0	45.9	1.00	0.37
60	46.2	0.97	0.37
120	46.4	0.94	0.37
420	47.1	0.84	0.37
1680	49.3	0.54	0.37
2550	50.3	0.42	0.37
2940	50.6	0.37	0.37
3060	50.7	0.36	0.37



$$k = \frac{d^2 \ln(2mL/D)}{8LT \sin\alpha}$$

$\sin\alpha = 1$

$m = 1$

T = time when (H-h)/(H-Ho) = 0.37 T= 2975

Permeability k, = 3.9E-06 cm/s

Knight Piésold Ltd.
CONSULTING ENGINEERS

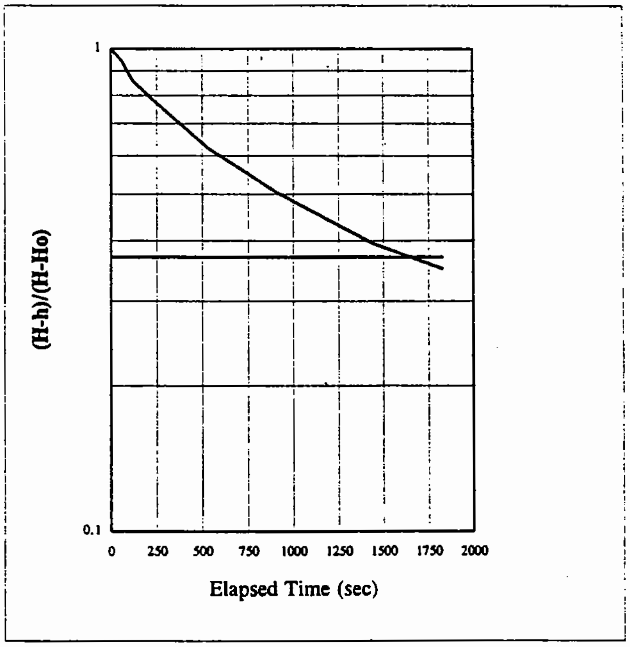
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEV METHOD

Hole number		MW96-F
Hole diameter, D	D =	0.13335 m
Piezometer diameter, d	d =	0.0508 m
Top of test interval		57.9 m
Bottom of test interval		62.5 m
Length of test interval, L	L =	4.6 m
Static water level, H	H =	13.4 m
Water level at start of test, Ho	Ho =	0.9 m

J:\JOB\DATA\1784\SITEDATA\FALLHED.XLS

25-Apr-96 15:39

TEST DATA			
Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
0	0.9	1.00	0.37
60	1.6	0.94	0.37
120	2.7	0.86	0.37
240	3.7	0.78	0.37
540	5.7	0.62	0.37
900	7.1	0.51	0.37
1440	8.5	0.39	0.37
1830	9.0	0.35	0.37



$$k = \frac{d^2 \ln(2mL/D)}{8LT \sin\alpha}$$

$\sin\alpha = 1$

$m = 1$

T = time when (H-h)/(H-Ho) = 0.37 T= 1625

Permeability k, = 1.8E-05 cm/s

Knight Piésold Ltd.
CONSULTING ENGINEERS

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEV METHOD

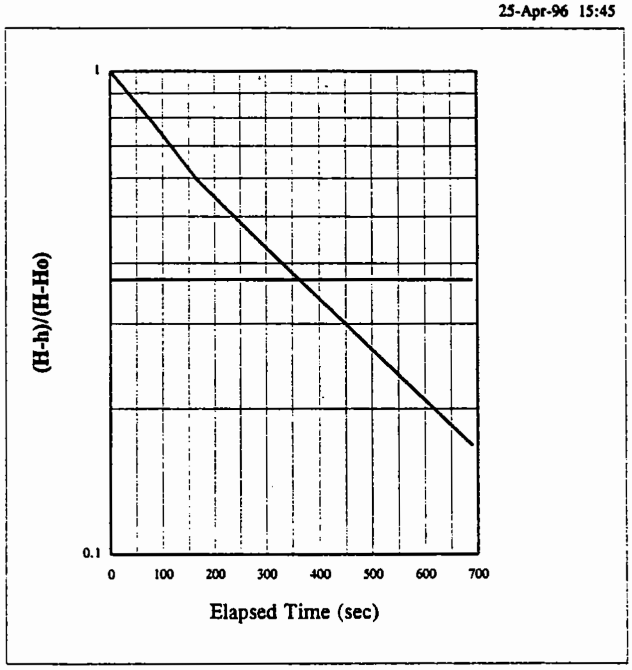
Hole number		MW96-G
Hole diameter, D	D =	0.13335 m
Piezometer diameter, d	d =	0.0508 m
Top of test interval		60.7 m
Bottom of test interval		74.7 m
Length of test interval, L	L =	14.0 m
Static water level, H	H =	48.4 m
Water level at start of test, Ho	Ho =	37.7 m

J:\JOB\DATA\1784\SITEDATA\FALLHED.XLS

25-Apr-96 15:45

TEST DATA

Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
0	37.7	1.00	0.37
90	40.2	0.76	0.37
165	42.0	0.60	0.37
240	43.1	0.50	0.37
360	44.4	0.37	0.37
690	46.6	0.17	0.37



$$k = \frac{d^2 \ln(2mL/D)}{8LT \sin\alpha}$$

$\sin\alpha = 1$

$m = 1$

T = time when (H-h)/(H-Ho) = 0.37 T= 360

Permeability k, = 3.4E-05 cm/s

Knight Piésold Ltd.
CONSULTING ENGINEERS

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEV METHOD

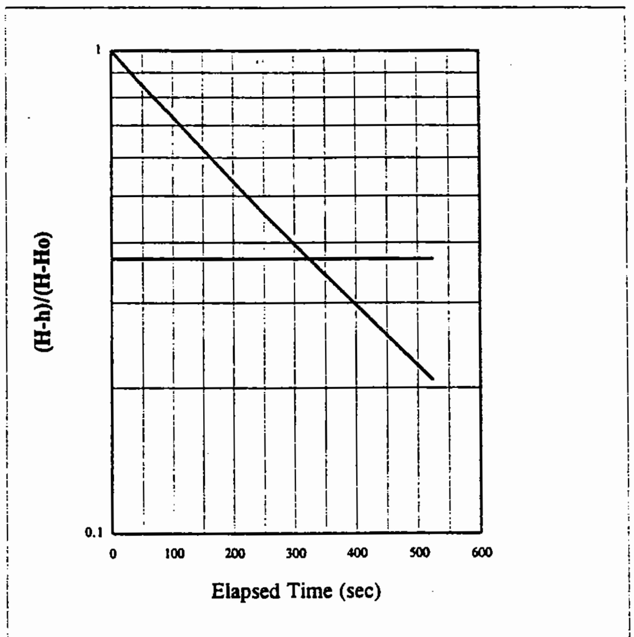
Hole number		MW96-H
Hole diameter, D	D =	0.13335 m
Piezometer diameter, d	d =	0.0508 m
Top of test interval		39.6 m
Bottom of test interval		55.2 m
Length of test interval, L	L =	15.6 m
Static water level, H	H =	16.9 m
Water level at start of test, Ho	Ho =	5.8 m

J:\JOB\DATA\1784\SITEDATA\FALLHED.XLS

25-Apr-96 15:51

TEST DATA

Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
0	5.8	1.00	0.37
45	7.4	0.86	0.37
105	8.9	0.72	0.37
255	11.9	0.45	0.37
525	14.6	0.21	0.37



$$k = \frac{d^2 \ln(2mL/D)}{8LT \sin\alpha}$$

$\sin\alpha = 1$

$m = 1$

T = time when (H-h)/(H-Ho) = 0.37 T= 325

Permeability k, =	**3.5E-05 cm/s**

Knight Piésold Ltd.
CONSULTING ENGINEERS

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
BOREHOLE PERMEABILITY USING HVORSLEV METHOD

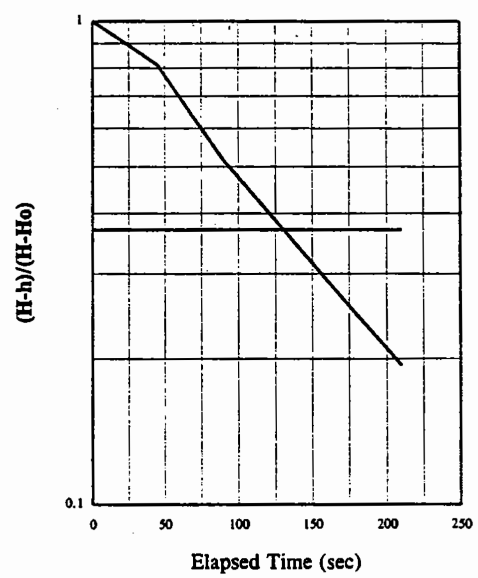
Hole number		MW96-I
Hole diameter, D	D =	0.13335 m
Piezometer diameter, d	d =	0.0508 m
Top of test interval		49.7 m
Bottom of test interval		54.9 m
Length of test interval, L	L =	5.2 m
Static water level, H	H =	18.0 m
Water level at start of test, Ho	Ho =	8.2 m

J:\JOB\DATA\1784\SITEDATA\FALLHED.XLS

25-Apr-96 15:56

TEST DATA

Elapsed Time (sec)	Water Depth, h (meters)	(H-h)/(H-Ho)	
0	8.2	1.00	0.37
45	10.1	0.81	0.37
90	13.0	0.52	0.37
210	16.1	0.19	0.37



$$k = \frac{d^2 \ln(2mL/D)}{8LT \sin\alpha}$$

$\sin\alpha = 1$

$m = 1$

T = time when (H-h)/(H-Ho) = 0.37 T= 130

Permeability k, = 2.1E-04 cm/s

Association of Consulting Engineers of Canada

Association des Ingénieurs-Conseils du Canada

APPENDIX B1

EBA WHITEHORSE TEST RESULTS

EBA Engineering Consultants Ltd.

SUMMARY OF LABORATORY TEST RESULTS

PROJECT: Knight Piesold Lab Testing PROJECT No: 0201-96-12188 DATE: April 11/96

BOREHOLE	DEPTH	MOISTURE CONTENT %	ATTERBERG LIMITS			GRAIN SIZE DISTRIBUTION				DESCRIPTION
			LL (%)	PL (%)	PI (%)	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	
BH2	BH2-1	20.4								
BH2	BH2-2	16.8								
BH2	BH2-3	17.7								
BH2	BH2-4	15.7								
BH2	BH2-5	13.4	19.7	14.2	5.5	13.5	15.7	50.3	20.5	
BH2	BH2-6	12.8	(Atterberg Limits and Grain Size Distribution completed on combined samples - BH2 samples 1 to 10)							
BH2	BH2-7	10.5								
BH2	BH2-8	9.9								
BH2	BH2-9	10.8								
BH2	BH2-10	10.6								
DH16	DH16-1	8.5								
DH16	DH16-2	14.1								
DH16	DH16-3	12.4	20.2	14.4	5.8	15.3	22.4	40.7	21.6	
DH16	DH16-4	13.8	(Atterberg Limits and Grain Size Distribution completed on combined samples - DH16 samples 1 to 7)							
DH16	DH16-5	14.9								
DH16	DH16-6	11.7								
DH16	DH16-7	12.3								
BH96	BH96-A-1	6.5				21.9		73.5	4.6	
BH96	BH96-C-1	8.1				16.8		82.8	0.4	
TR96	TR96-1-1	11.6	14.0	12.2	1.8	10.5	25.1	43.1	21.3	
TR96	TR96-3-2	4.6				5.0		95.0	0.0	

Reviewed by: M. Plant

eba

EBA Engineering Consultants Ltd.

SUMMARY OF LABORATORY TEST RESULTS

PROJECT: Knight Piesold Lab Testing PROJECT No: 0201-96-12188 DATE: April 11/96

BOREHOLE	DEPTH	MOISTURE CONTENT	ATTERBERG LIMITS			GRAIN SIZE DISTRIBUTION				DESCRIPTION
			LL (%)	PL (%)	PI (%)	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	
TR96	TR96-3-3	28.4	-	N/P	N/A	5.1	50.6	44.3	0.0	
TR96	TR96-4-1	7.9				27.8		44.6	27.6	
TR96	TR96-5-1	3.1				1.9		98.1	0.0	
TR96	TR96-6-1	4.5				11.5		74.6	13.9	
TR96	TR96-8-1	9.5	18	N/P	-	9.1	26.7	51.3	12.9	
TR96	TR96-8-2	19.7	22	N/P	-	14.5	52.9	32.6	0.0	
TR96	TR96-9-1	16.7	22.2	17.1	5.1	16.8	25.4	45.2	12.6	
TR96	TR96-10-1	12.8				11.6		70.3	18.1	
TR96	TR96-11-1	14.3	20.6	15.1	5.5	27.0	53.6	15.3	4.1	
TR96	TR96-11-2	10.1	18.6	13.9	4.7	14.2	26.7	32.7	26.4	
TR96	TR96-13-1	11.5	16.8	12.0	4.8	12.5	25.8	40.5	21.2	
TR96	TR96-13-2	5.7	16.3	12.5	3.8	10.1	13.7	30.6	45.6	
TR96	TR96-14-1	13.6	16.5	N/P	-	11.7	26.3	43.8	18.2	
TR96	TR96-14-2	13.2	23.5	15.9	7.6	14.8	23.5	35.4	26.3	
TR96	TR96-15-1	8.5	16.2	12.0	4.2	12.2	25.7	43.1	19.0	
TR96	TR96-15-2	8.6	16.7	N/P	-	11.1	21.6	44.6	22.7	
BH96	BH96-F-3	23.3				58.2		33.4	8.4	
BH96	BH96-F-4	57				71.2	25.9	2.9	0.0	
BH96	BH96-H-1	35.4				44.7	49.8	5.5	0.0	
BH96	BH96-I-1	8.8				16.9		60.8	22.3	

Reviewed by:

eba

MOISTURE CONTENT TEST RESULTS
ASTM Designation D2216

Project Number: 0201-96-12188
Borehole Number: AS LISTED BELOW
Project: KNIGHT PIESOLD LAB WORK
Address:
Date Tested: 96-03-07 By: M.P

SAMPLE BAG DESIGNATION

~~Depth (m)~~	Tare Number	Weight of Wet Soil (g)	Weight of Dry Soil (g)	Moisture Content %	Visual Description of Soil ASTM D2488 ☐ ASTM Standard Not Followed ☐	Pocket Pen. Reading
BH 2-1	MP 1	849.2	705.2	20.4		
BH 2-2	MP 2	404.6	346.4	16.8		
BH-2-3	MP 3	848.7	721.3	17.7		
BH 2-4	MP 4	1153.9	997.4	15.7		
BH 2-5	MP 5	1199.7	1057.5	13.4		
BH 2-6	MP 6	1202.7	1066.4	12.8		
BH 2-7	MP 7	629.4	569.5	10.5		
BH 2-8	MP 8	1019.0	927.1	9.9		
BH 2-9	MP 9	877.6	792.4	10.8		
BH 2-10	MP 10	351.2	317.6	10.6		
DH 16-1	MP 11	797.4	735.2	8.5		
DH 16-2	MP 12	579.9	508.1	14.1		
DH 16-3	MP 13	1049.1	933.7	12.4		
DH 16-4	MP 14	691.8	608.0	13.8		
DH 16-5	MP 15	714.2	621.6	14.9		
DH 16-6	MP 16	816.5	730.9	11.7		
DH 16-7	MP 17	694.1	618.0	12.3		
BH96-A-1	MP 18	581.8	546.2	6.5		
BH96-C-1	MP 19	601.5	556.5	8.1		
TR96-1-1	MP 20	885.6	793.9	11.6		
TR96-3-2	MP 21	664.6	635.4	4.6		
TR96-5-1	MP 22	687.6	666.7	3.1		
TR96-6-1	MP 23	944.4	903.5	4.5		
TR96-8-1	MP 24	956.3	873.6	9.5		
TR96-9-1	MP 25	1048.8	899.1	16.7		

INVOICED 96-03-07
M.P.

eba

2063

MOISTURE CONTENT TEST RESULTS
ASTM Designation D2216

Project Number: 0201-96-
Borehole Number: AS LISTED BELOW
Project: KNIGHT PIESOLD LAB WORK
Address:
Date Tested: 96-03-07 By: mP

SAMPLE BAG DESIGNATION

~~Depth (m)~~	Tare Number	Weight of Wet Soil (g)	Weight of Dry Soil (g)	Moisture Content %	Visual Description of Soil ASTM D2488 ☐ ASTM Standard Not Followed ☐	Pocket Pen. Reading
TR96-14-1	MP26	857.1	754.7	13.6		
TR96-14-2	MP27	1115.5	985.5	13.2		
TR96-15-1	MP28	915.1	843.5	8.5		
TR96-15-2	MP29	1026.5	945.0	8.6		
TR96-4-1	MP30	909.6	843.3	7.9		
TR96-11-1	MP31	940.5	822.6	14.3		
TR96-11-2	MP32	799.3	725.8	10.1		
TR96-13-1	MP33	1512.7	1356.9	11.5		
TR96-13-2	MP34	1219.3	1154.1	5.7		
TR96-3-3	MP35	1163.1	905.5	28.4		
TR96-8-2	MP36	1189.0	993.4	19.7		
TR96-10-1	MP37	1190.1	1055.2	12.8		
BH96F-3	MP38	787.6	638.9	23.3		
BH96F-4	MP39	887.3	565.1	57.0		
BH96H-1	MP40	752.4	555.6	35.4		
BH96I-1	MP41	911.2	837.2	8.8		

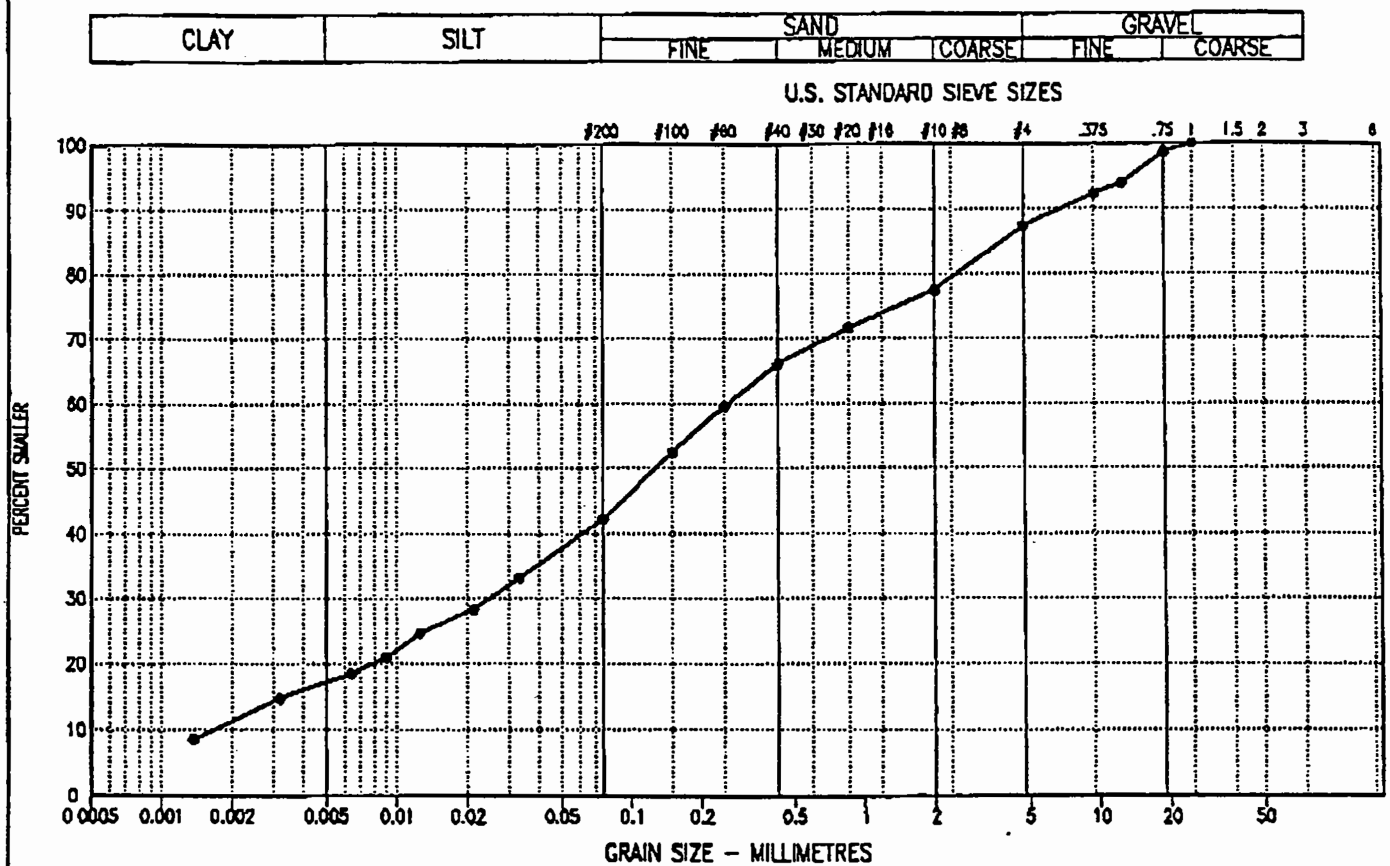
INVOICED 96-03-07
mP

eba

2063

EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
•——•	TR96-9-1	0.00	16.8	25.4	45.2	12.6	147.6	1.4	SM

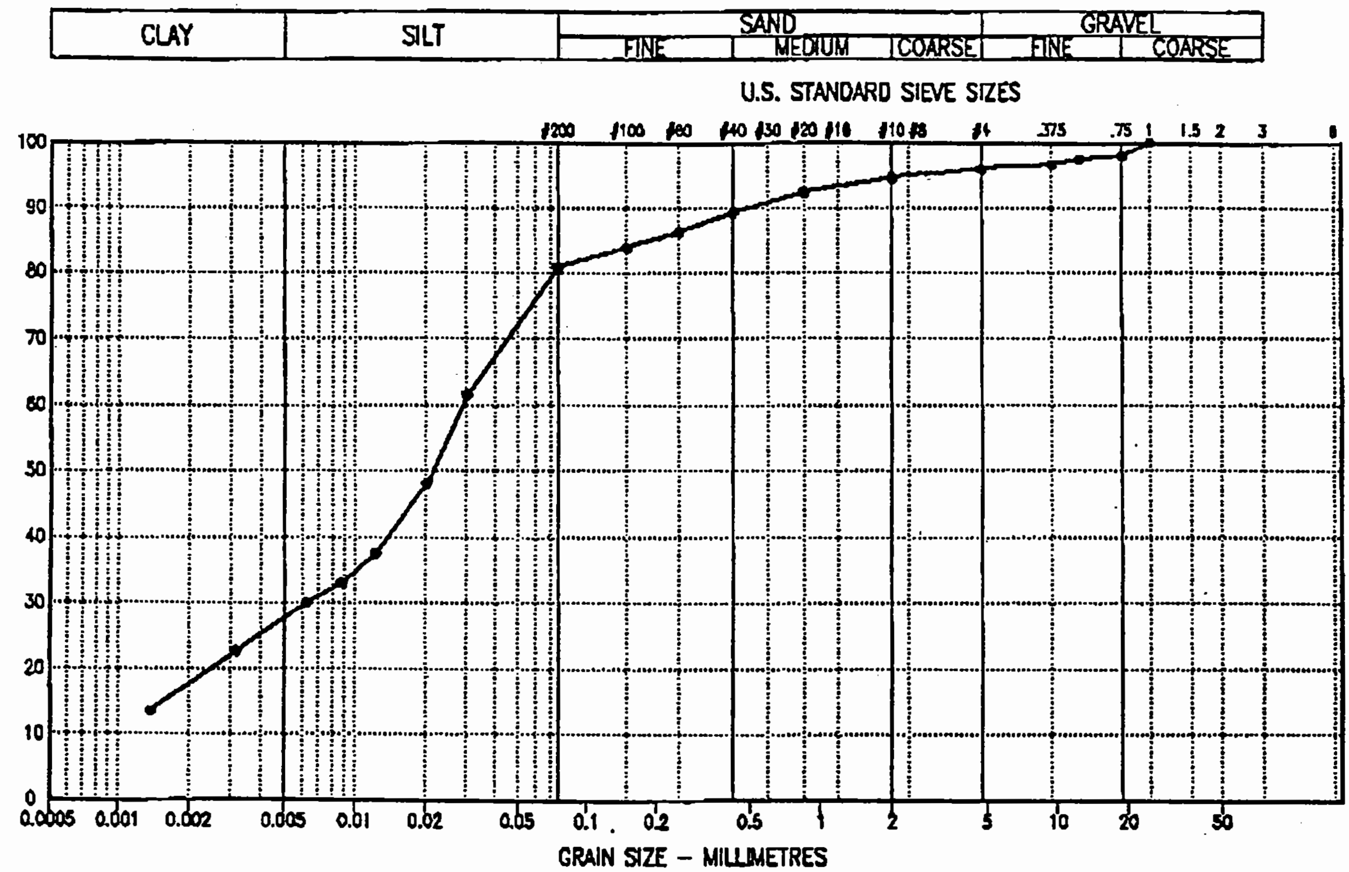
Project: 0201-96-12188 Date Tested: 96/03/25 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

03/28/96 16:19 403 668 4349
03/28/96 THU 16:17 FAX 403 6' 4349 EBA ENGINEERING, YU 005

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



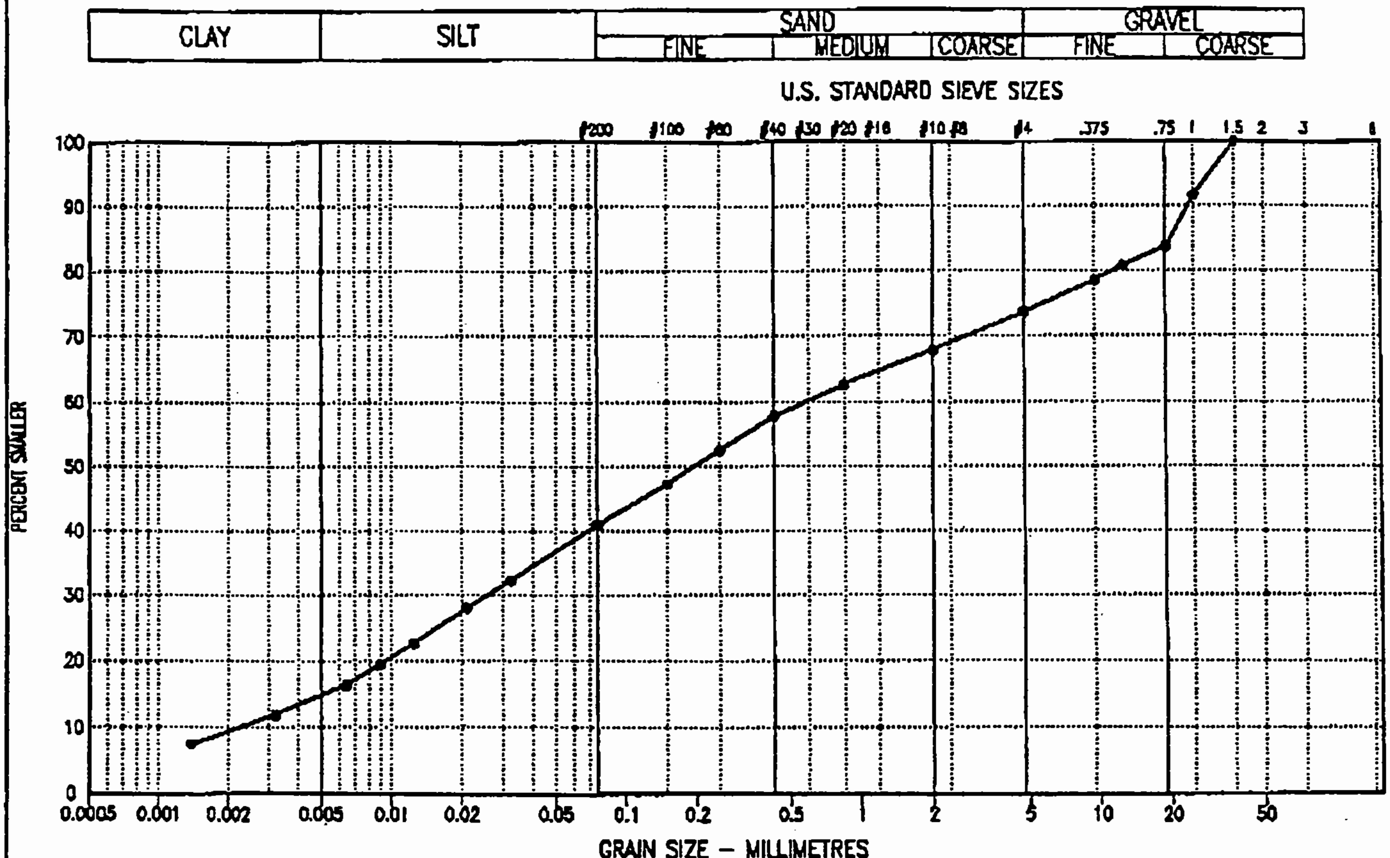
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
●——●	TR96-11-1	0.00	27.0	53.6	15.3	4.1	–	–	

Project: 0201-96-12188 Date Tested: 96/03/26 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



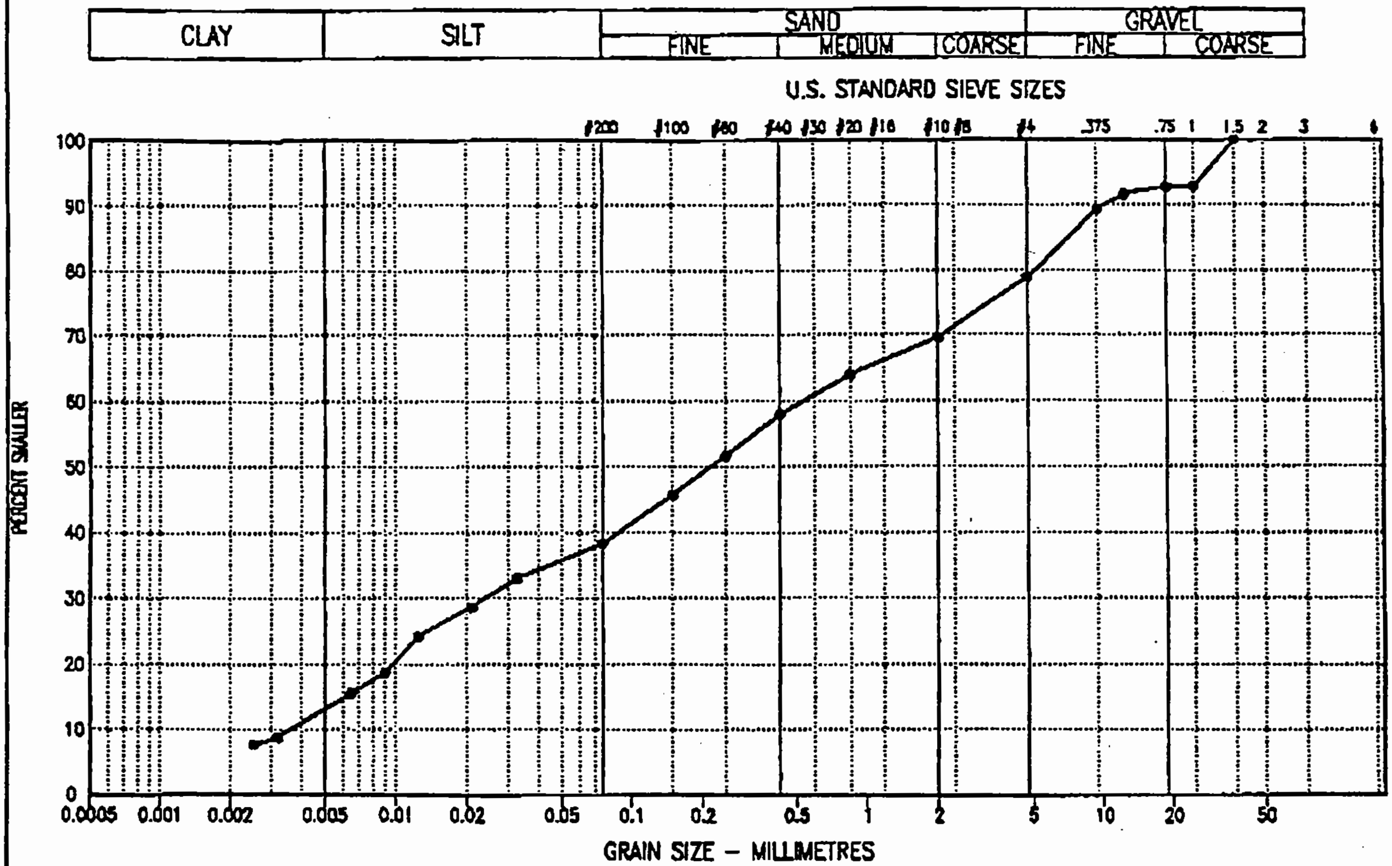
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
•——•	TR96-11-2	0.00	14.2	26.7	32.7	26.4	258.7	0.5	SM

Project: 0201-96-12188 Date Tested: 96/03/27 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



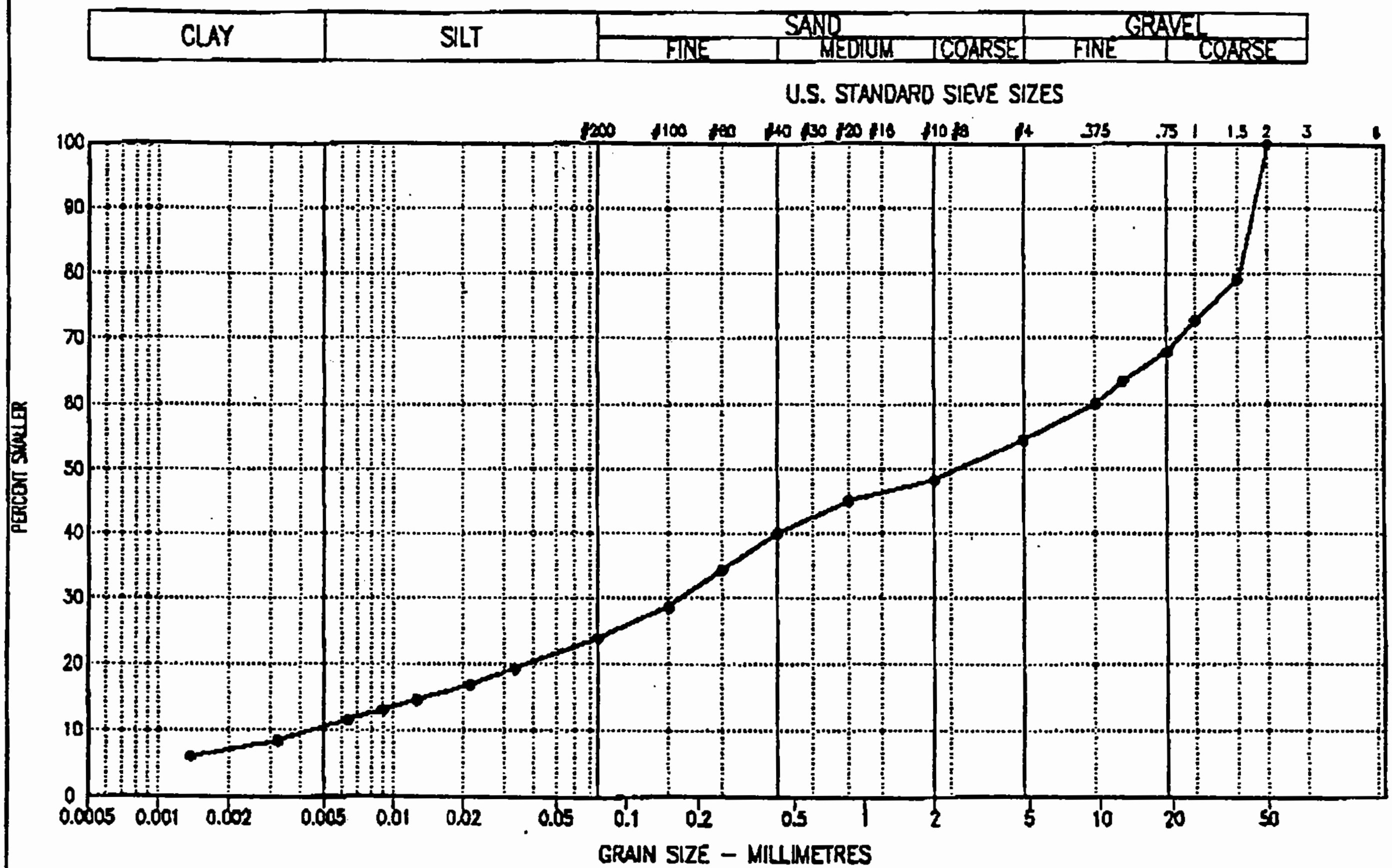
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●——●	TR96-13-1	0.00	12.5	25.8	40.5	21.2	152.7	0.3	SM

Project: 0201-96-12188 Date Tested: 96/03/22 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



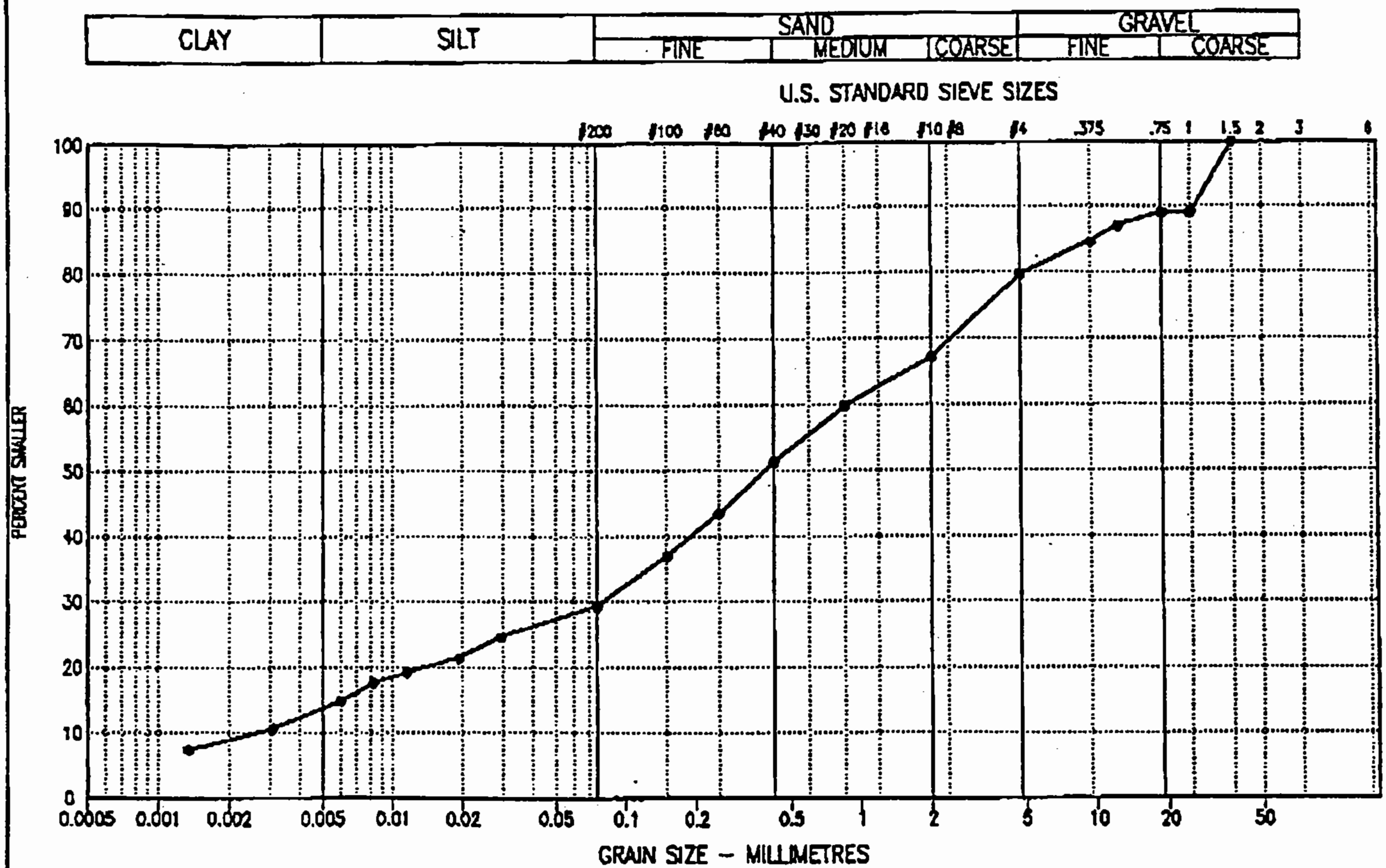
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
•—•	TR96-13-2	0.00	10.1	13.7	30.6	45.6	1968.7	0.7	GM

Project: 0201-96-12188 Date Tested: 96/03/27 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



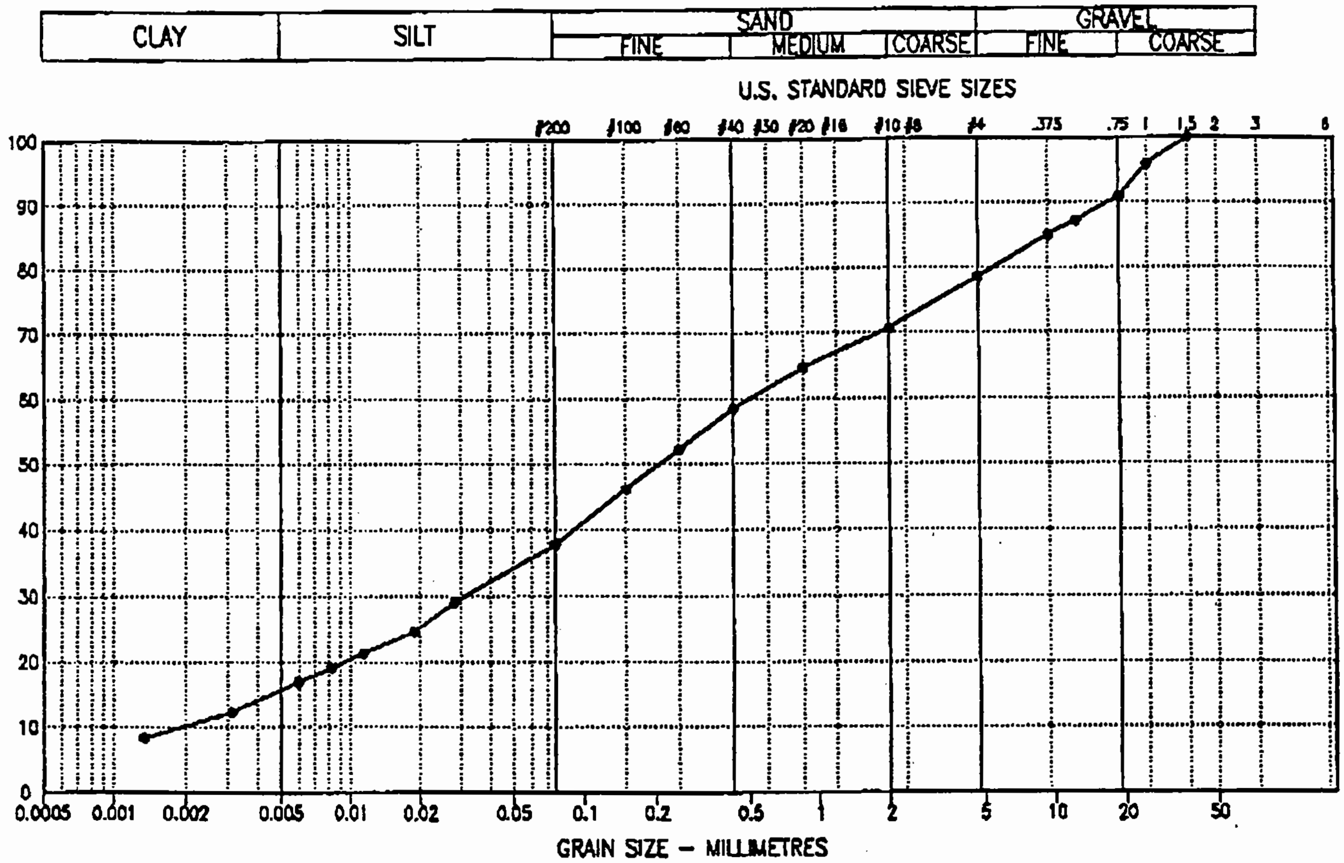
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
•——•	BH2-1TO10	0.00	13.5	15.7	50.3	20.5	325.4	2.8	SM

Project: 0201-96-12188 Date Tested: 96/03/19 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



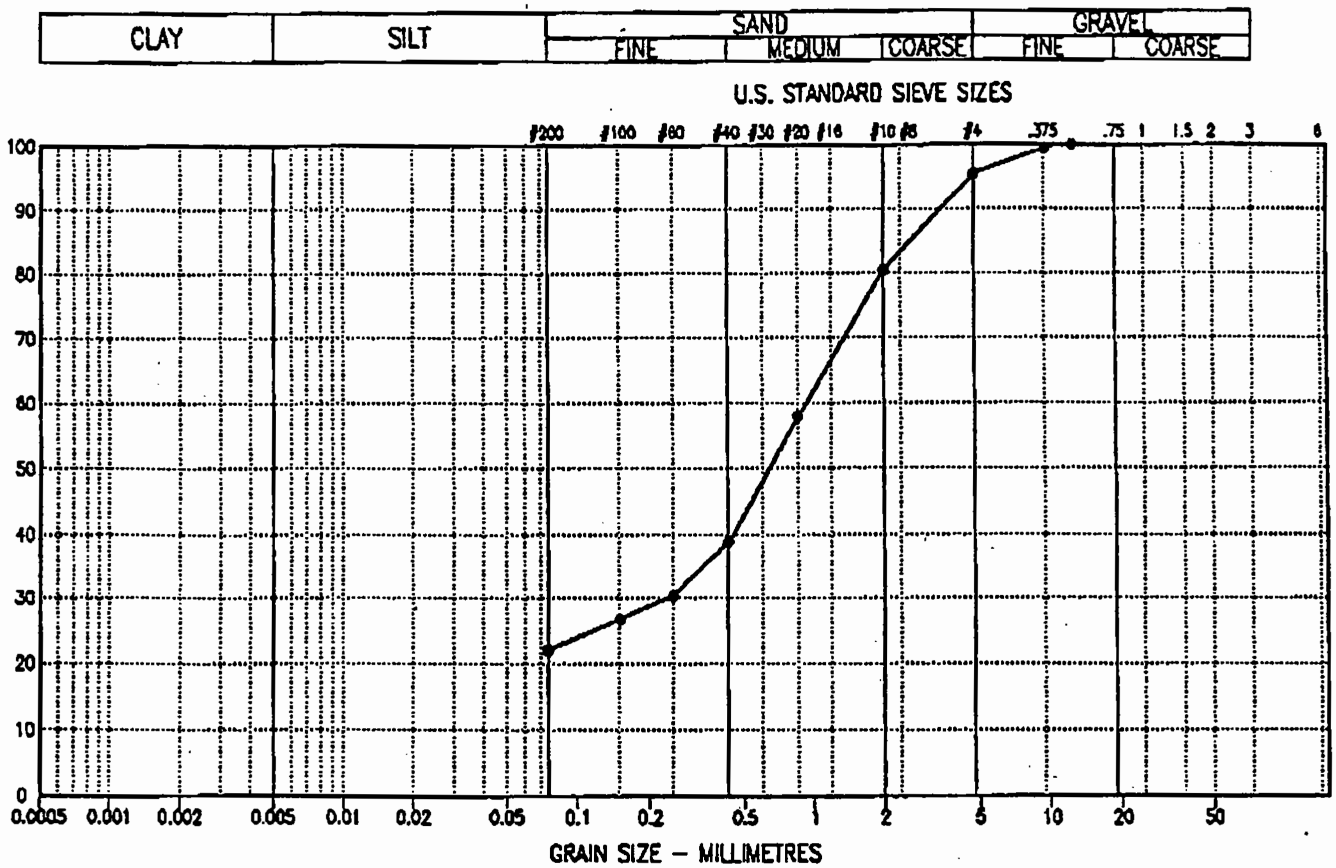
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
•——•	DH16-1T07	0.00	15.3	22.4	40.7	21.6	259.3	1.0	SM

Project: 0201-96-12188 Date Tested: 96/03/19 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
●——●	BH96-A-1	0.00	21.9	73.5	4.6	28.1	1.8	SM

Project: 0201-96-12188 Date Tested: 96/03/19 BY: MCP

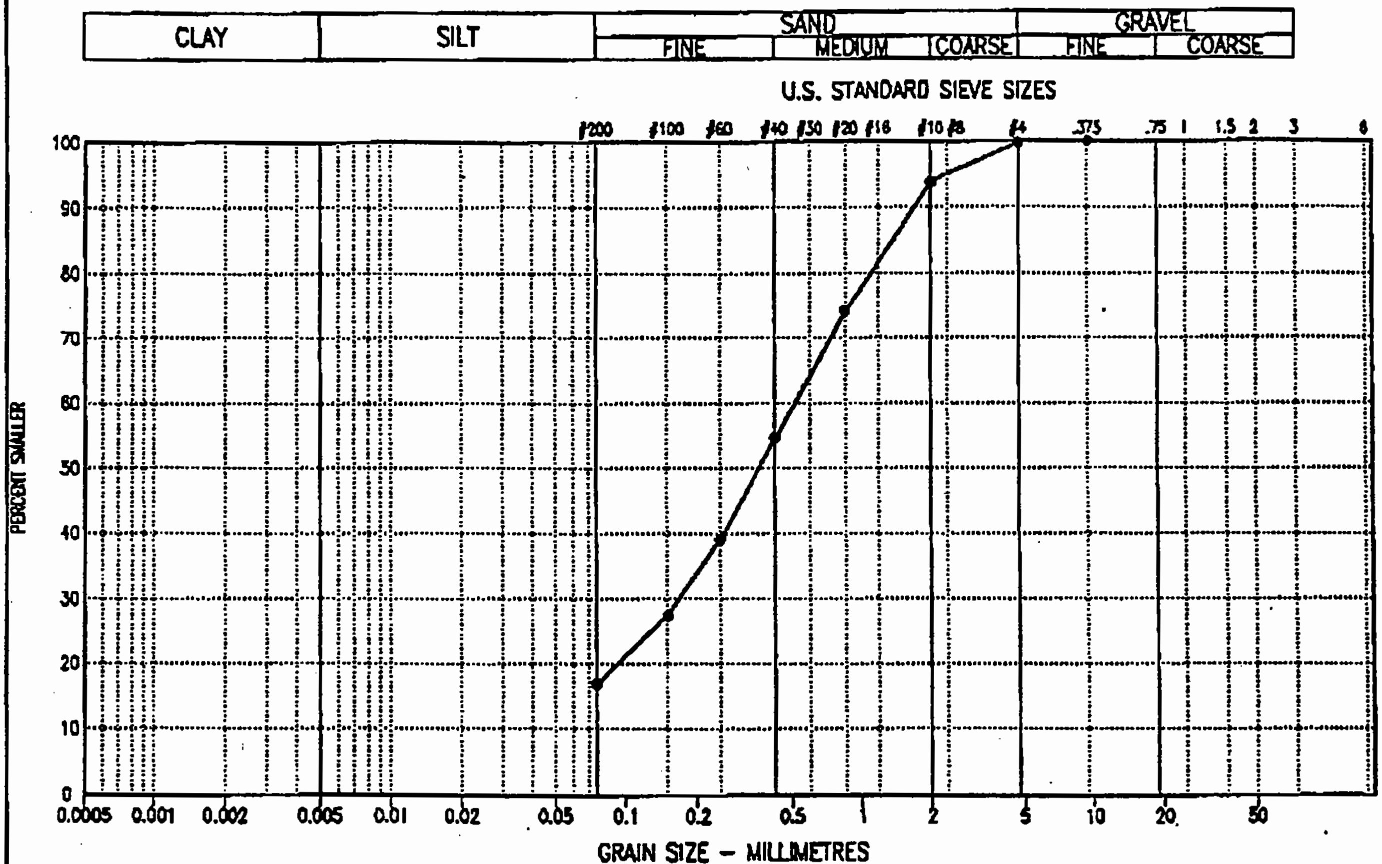
Tested in accordance with ASTM D422 unless otherwise noted.

Data presented hereon is for the sole use of the stipulated client. EBA is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of EBA

The testing services reported herein have been performed by an EBA technician to recognized industry standards, unless otherwise noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, EBA will provide it upon written request.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



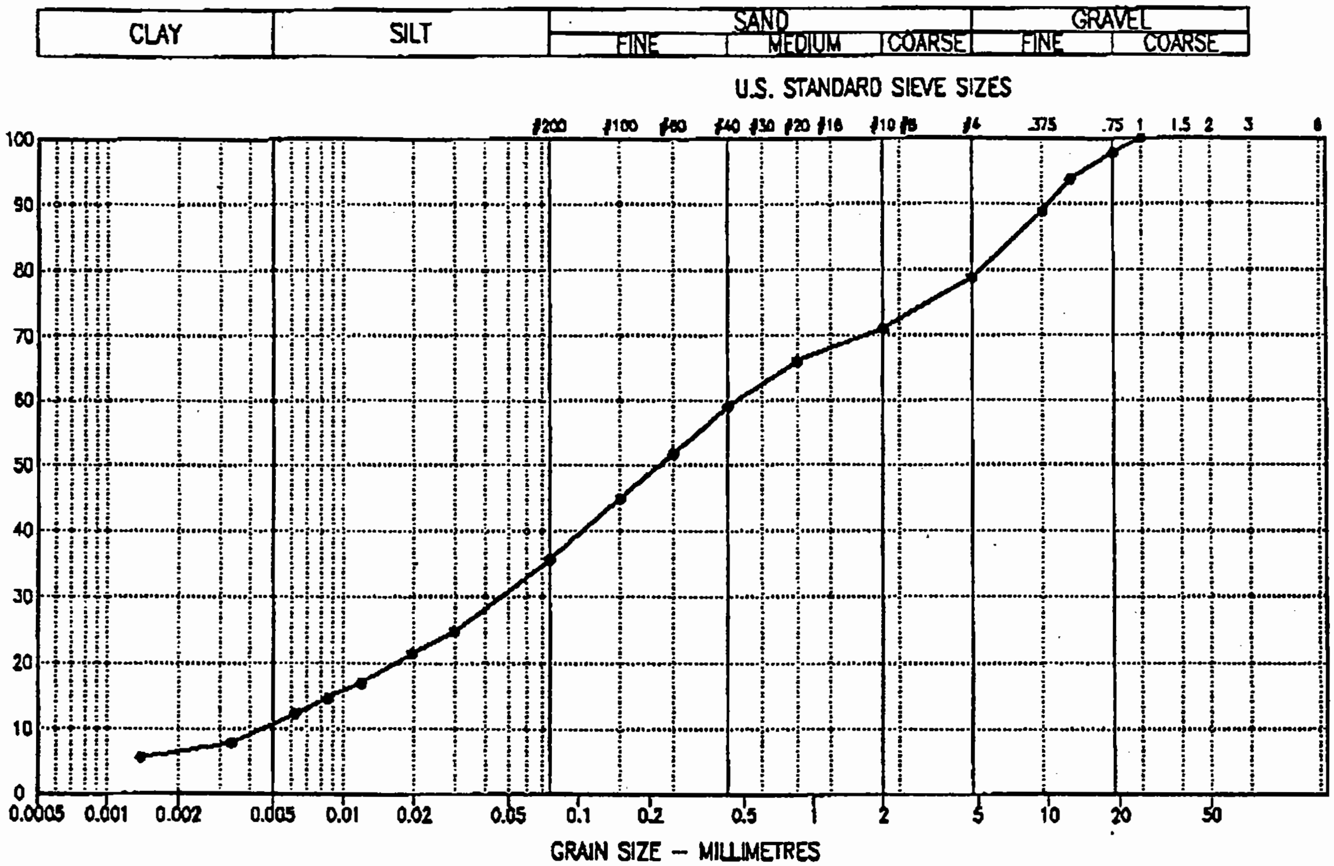
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
•——•	BH96-C-1	0.00	16.8	82.8	0.4	12.2	1.2	SM

Project: 0201-96-12188 Date Tested: 96/03/19 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



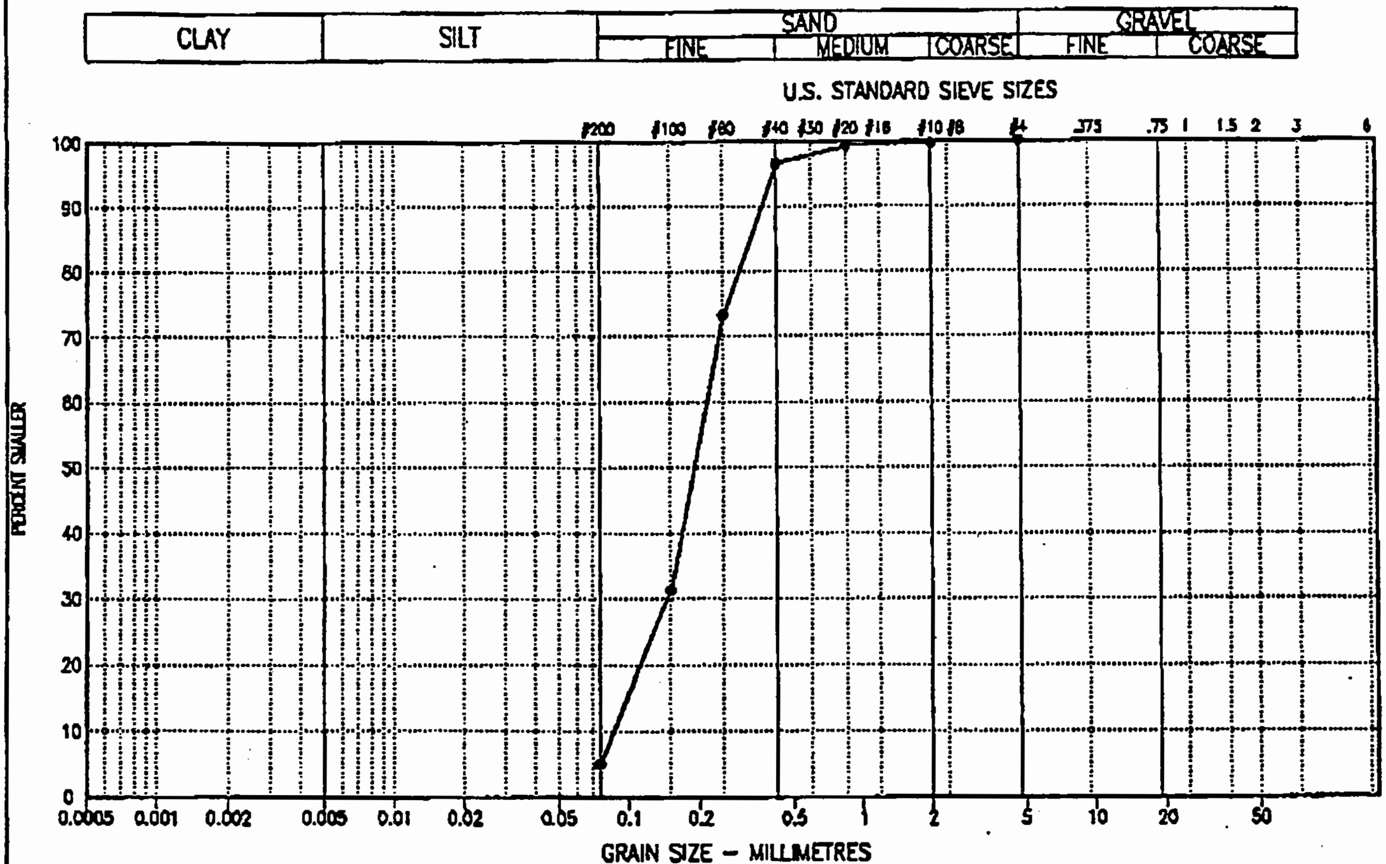
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
•—•	TR96-1-1	0.00	10.5	25.1	43.1	21.3	103.2	1.2	SM

Project: 0201-96-12188 Date Tested: 96/03/19 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



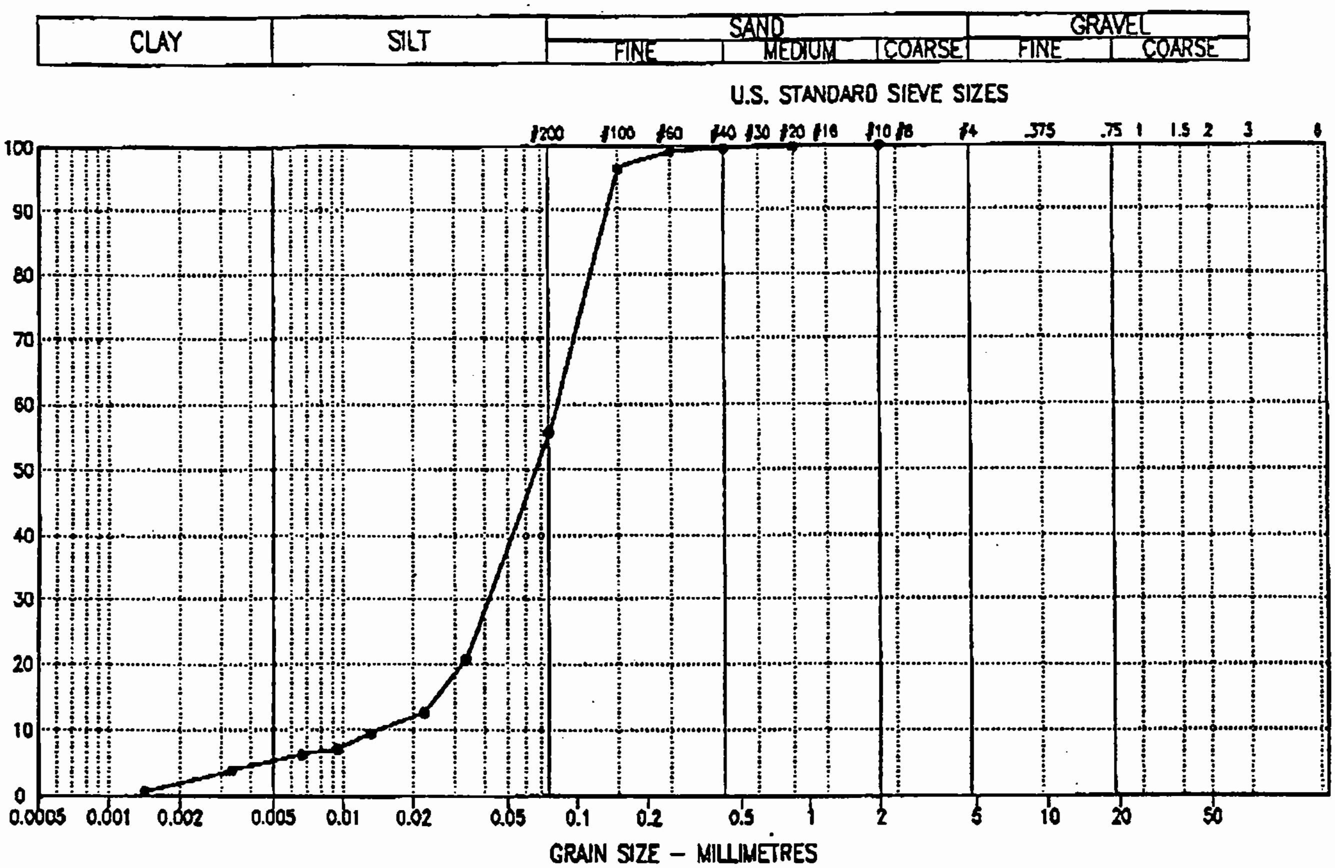
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY & SILT %	SAND %	GRAVEL %	Cu	Cg	U.S.C
•——•	TR96-3-2	0.00	5.0	95.0	0.0	2.5	1.1	S

Project: 0201-96-12188 Date Tested: 96/03/19 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



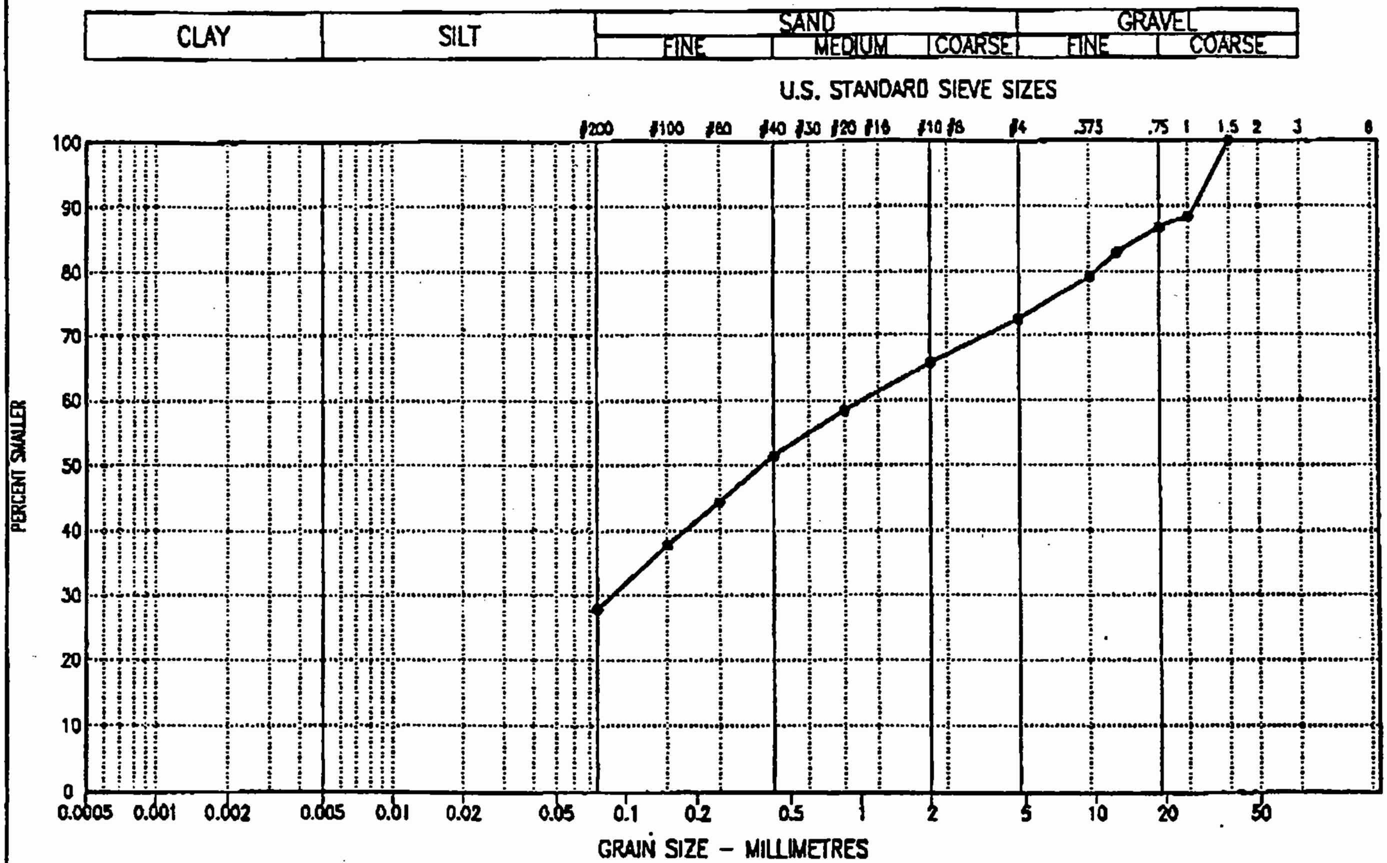
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
•———•	TR96-3-3	0.00	5.1	50.6	44.3	0.0	5.8	1.7	

Project: 0201-96-12188 Date Tested: 96/03/20 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



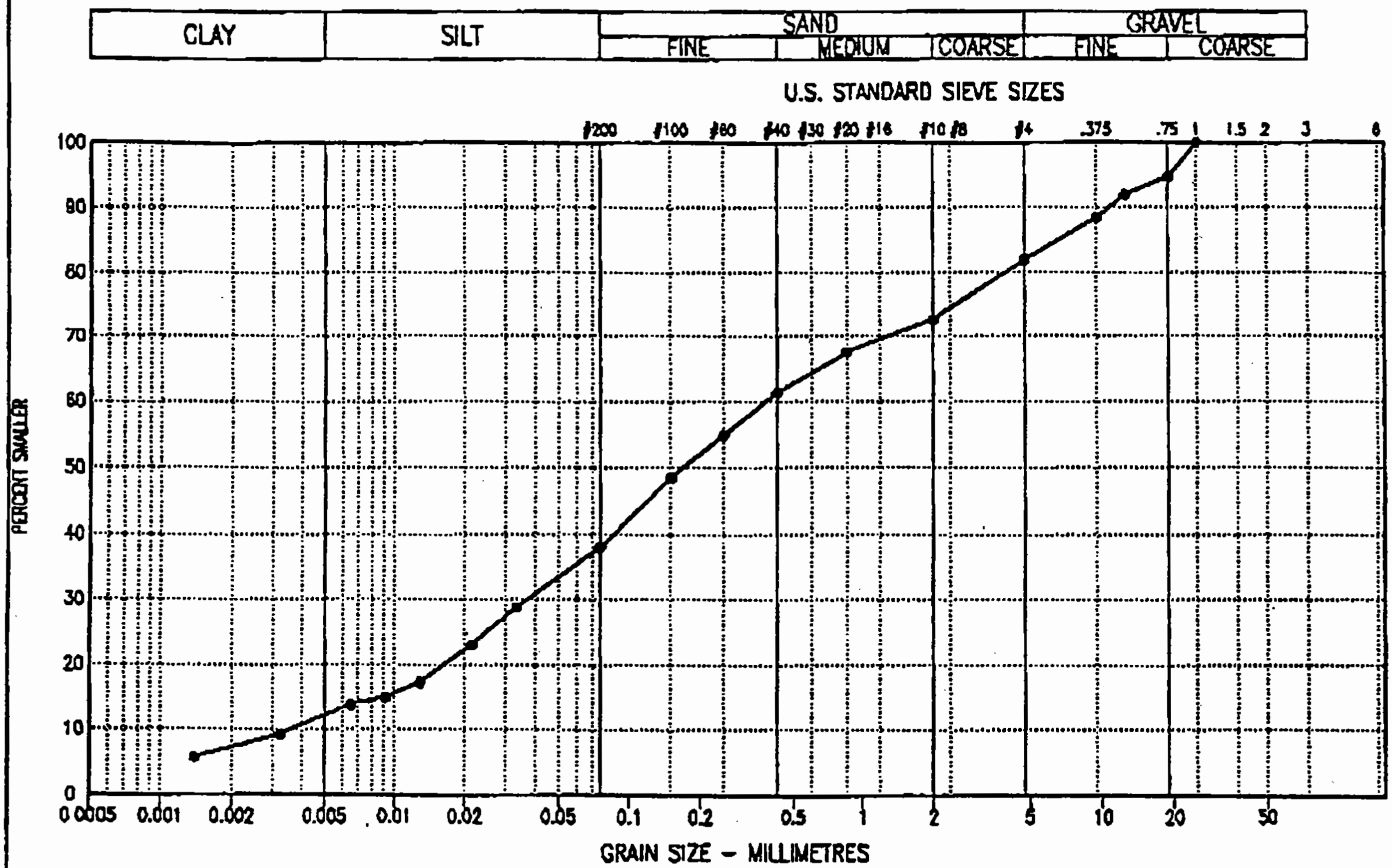
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
•——•	TR96-4-1	0.00	27.8	44.6	27.6	41.1	0.3	SM

Project: 0201-96-12188 Date Tested: 96/03/19 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



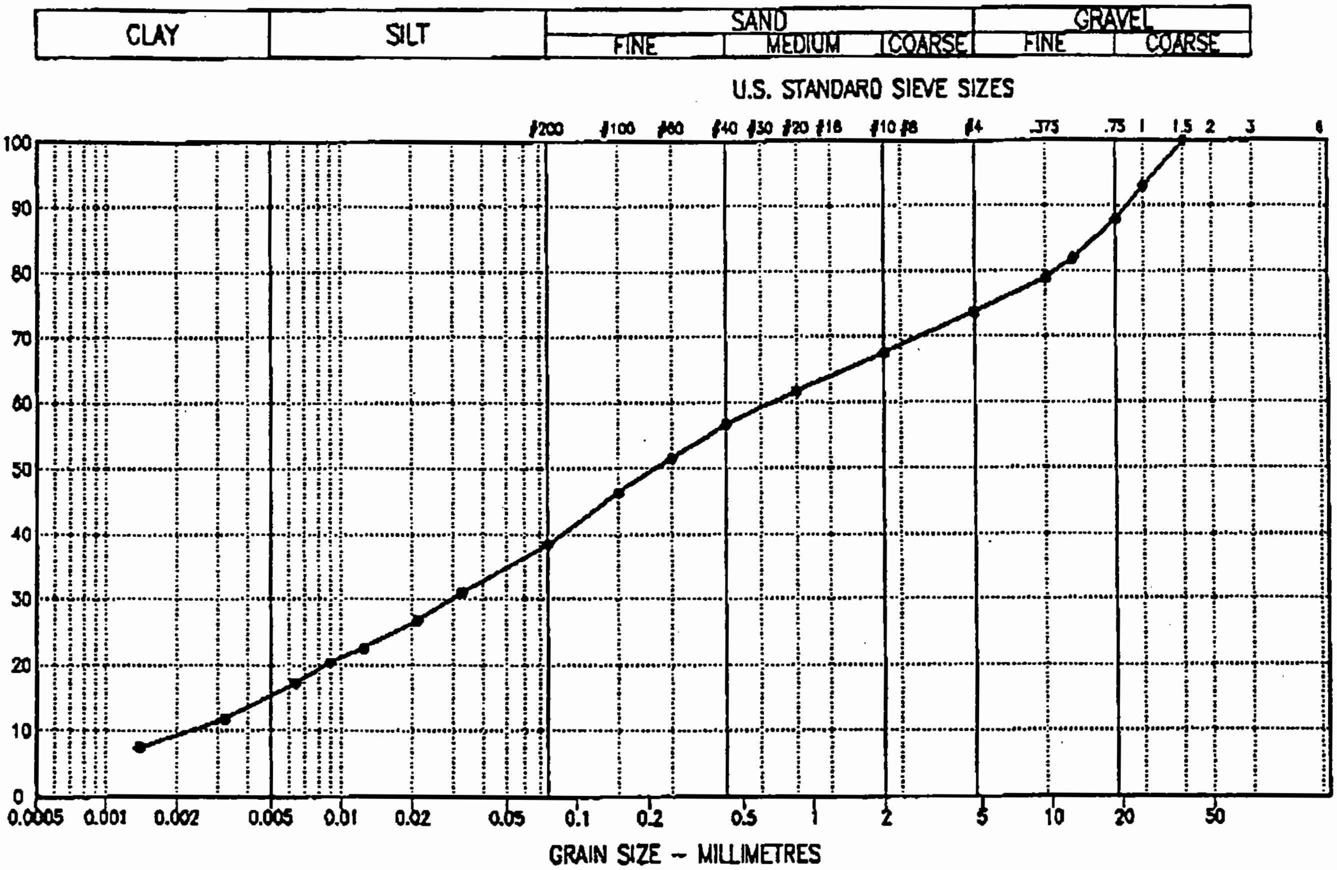
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
●——●	TR96-14-1	0.00	11.7	26.3	43.8	18.2	103.1	1.0	SM

Project: 0201-96-12188 Date Tested: 96/03/25 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



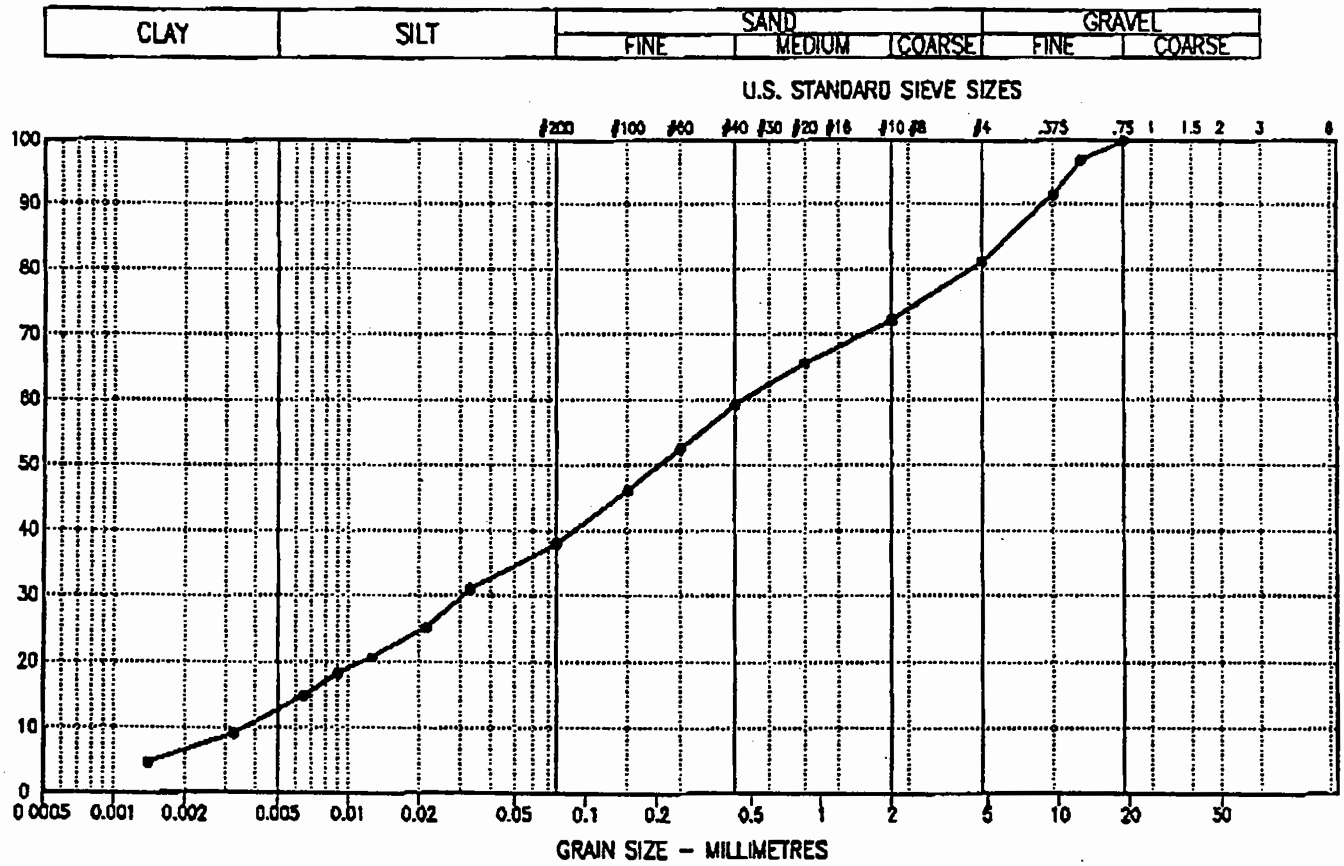
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
•—•	TR96-14-2	0.00	14.8	23.5	35.4	26.3	290.7	0.5	SM

Project: 0201-96-12188 Date Tested: 96/03/25 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



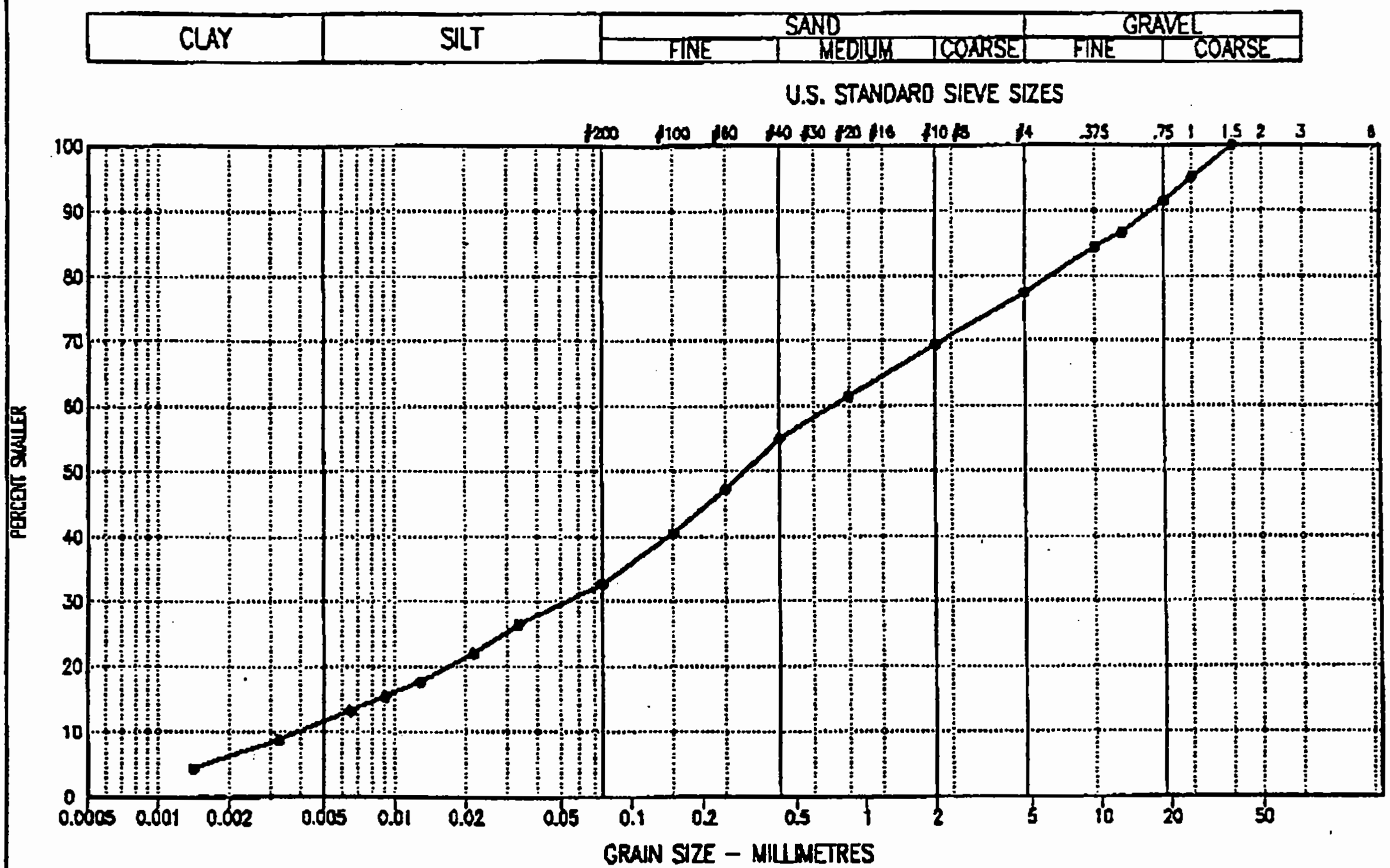
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
•——•	TR96-15-1	0.00	12.2	25.7	43.1	19.0	129.7	0.5	SM

Project: 0201-96-12188 Date Tested: 96/03/26 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



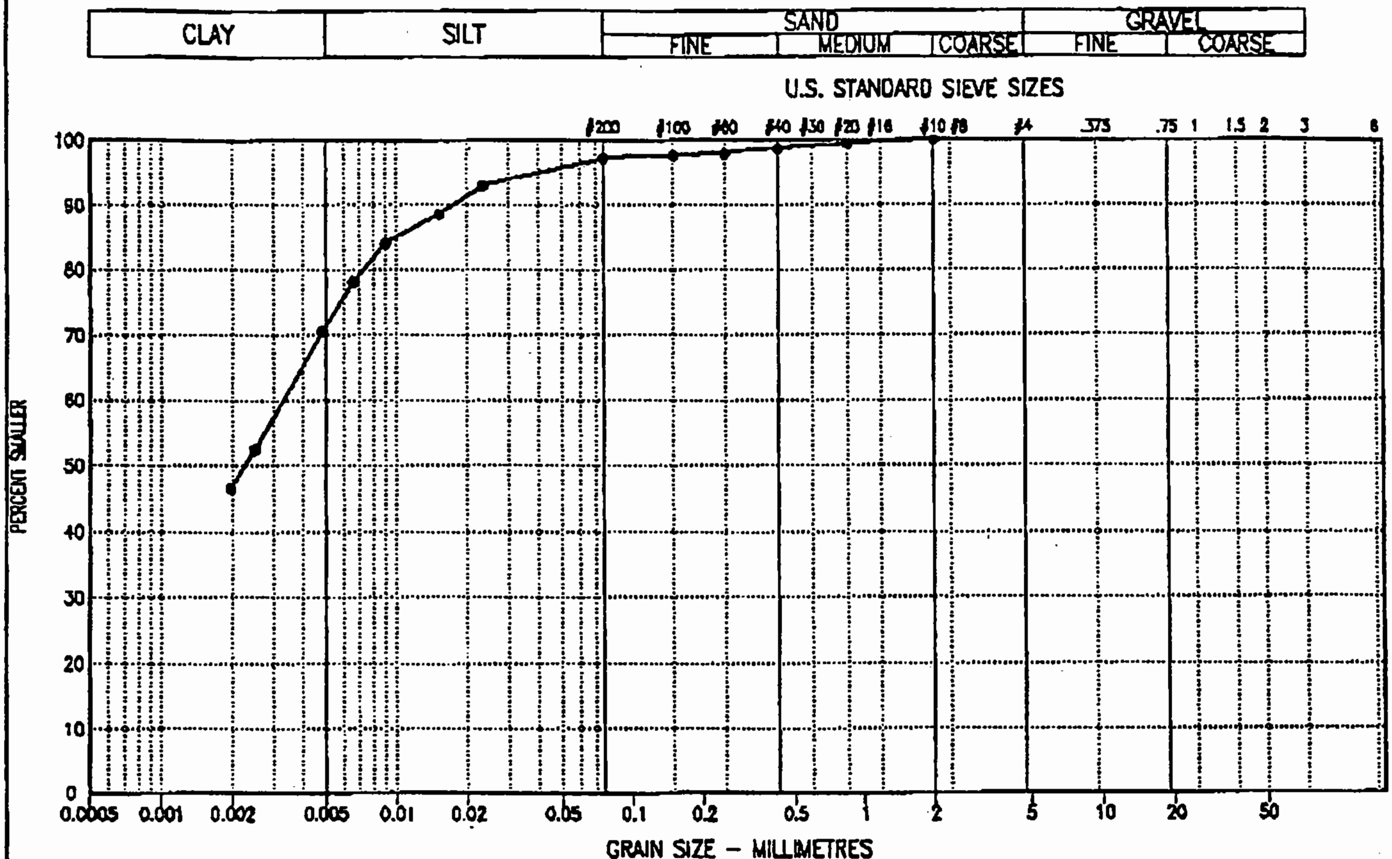
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
•——•	TR96-15-2	0.00	11.1	21.6	44.6	22.7	184.1	1.0	SM

Project: 0201-96-12188 Date Tested: 96/03/26 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



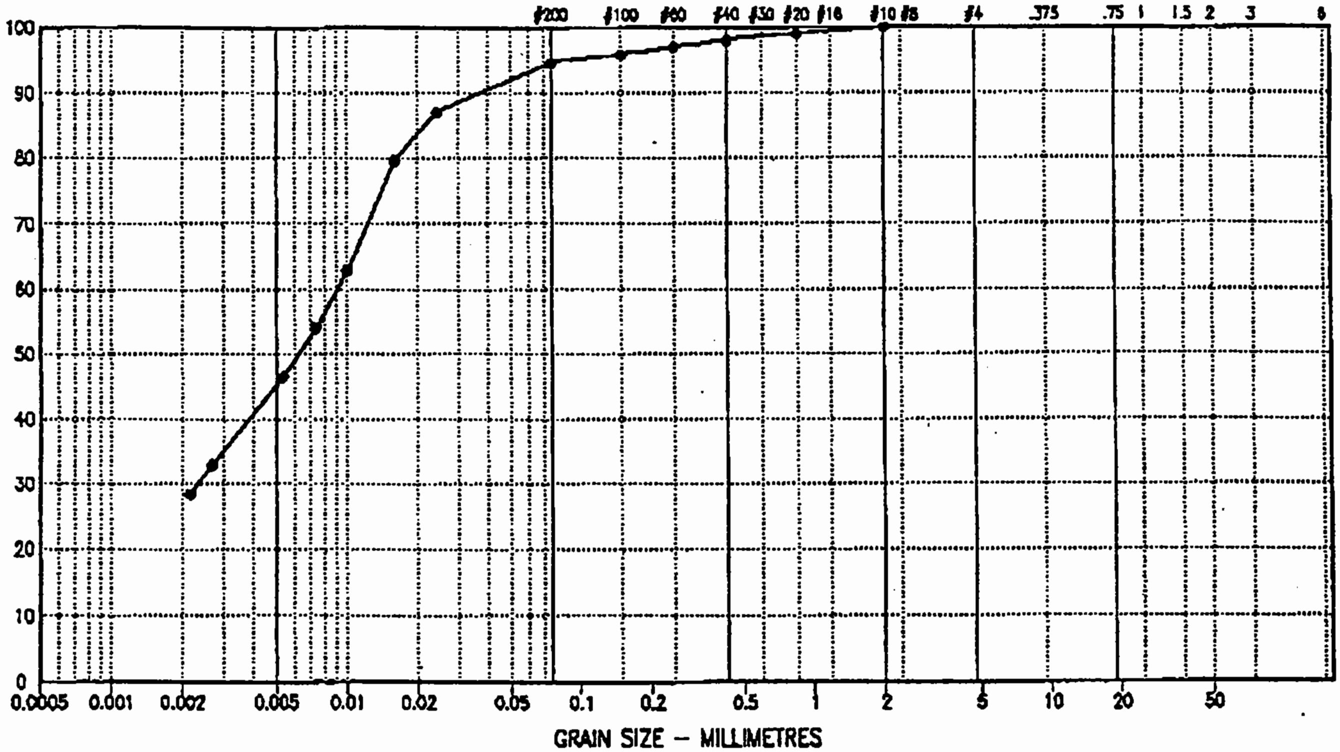
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
•——•	BH96-F-4	0.00	71.2	25.9	2.9	0.0	–	–	

Project: 0201-96-12188 Date Tested: 96/03/22 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS

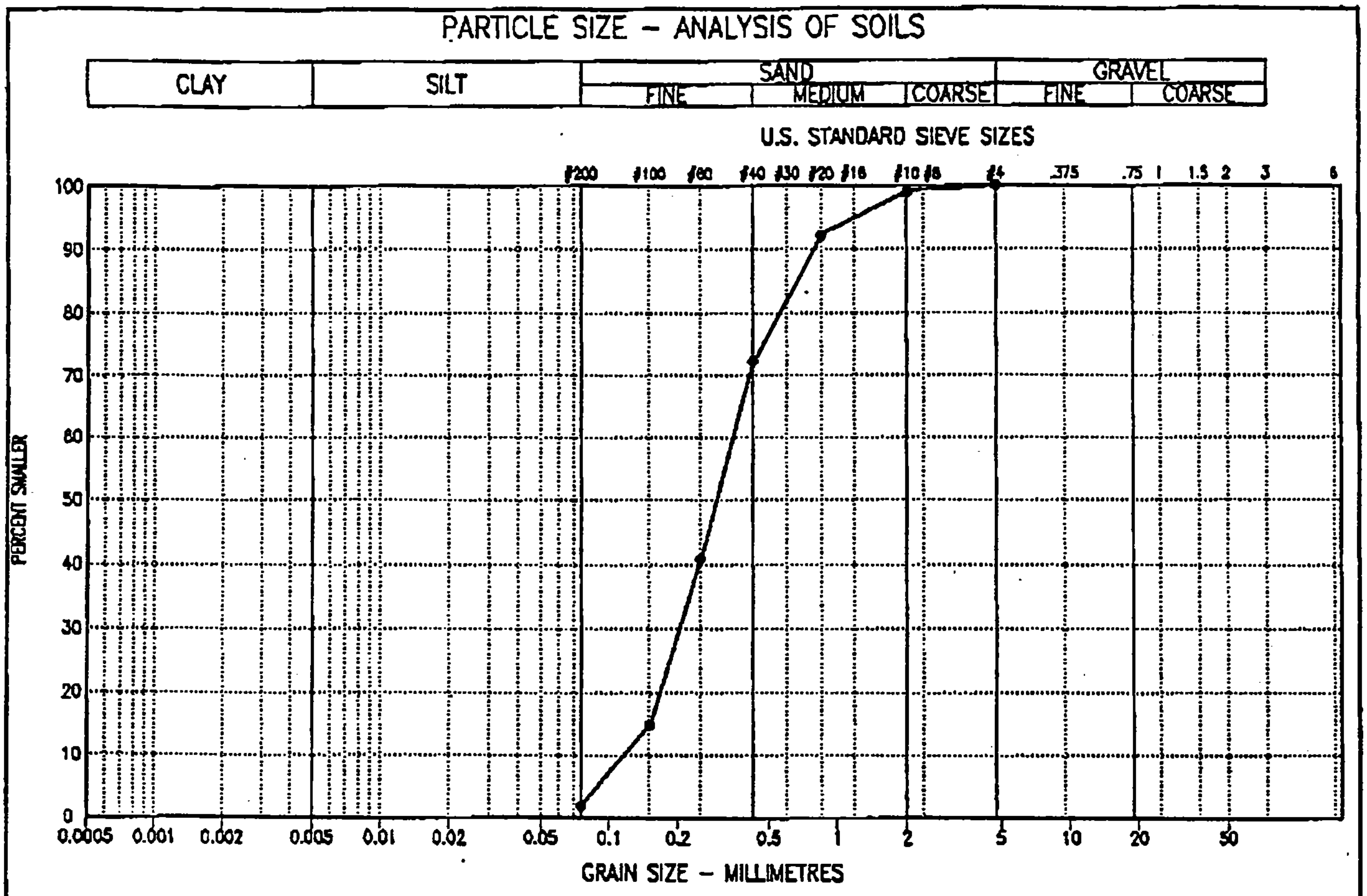


SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
●—●	BH96-H-1	0.00	44.7	49.8	5.5	0.0	–	–	

Project: 0201-96-12188 Date Tested: 96/03/22 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering



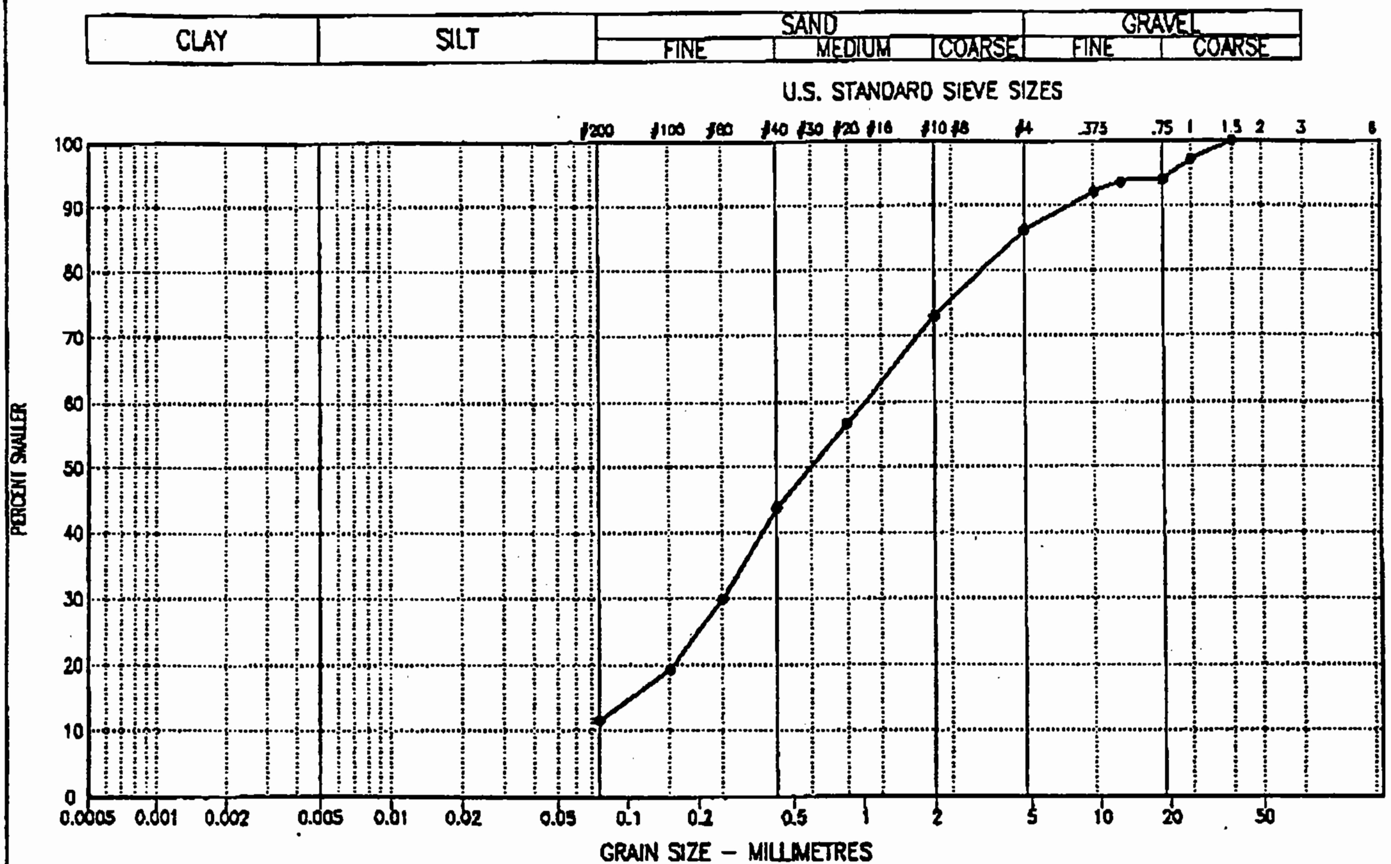
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY & SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
•——•	TR96-5-1	0.00	1.9	98.1	0.0	2.9	1.0	SP

Project: 0201-96-12188 Date Tested: 96/03/19 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



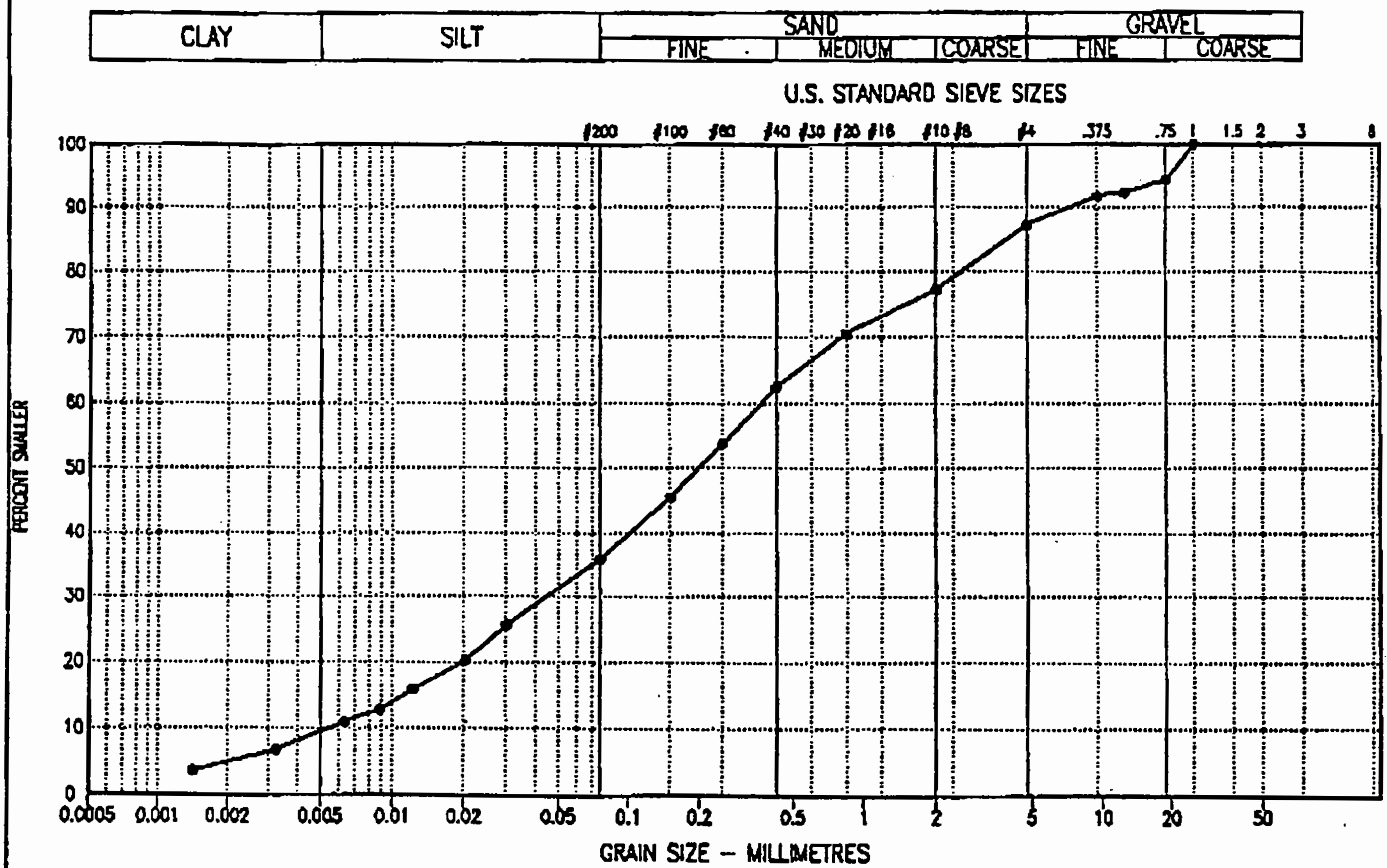
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY & SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
•——•	TR96-6-1	0.00	11.5	74.6	13.9	16.6	0.9	SP–SM

Project: 0201-96-12188 Date Tested: 96/03/19 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



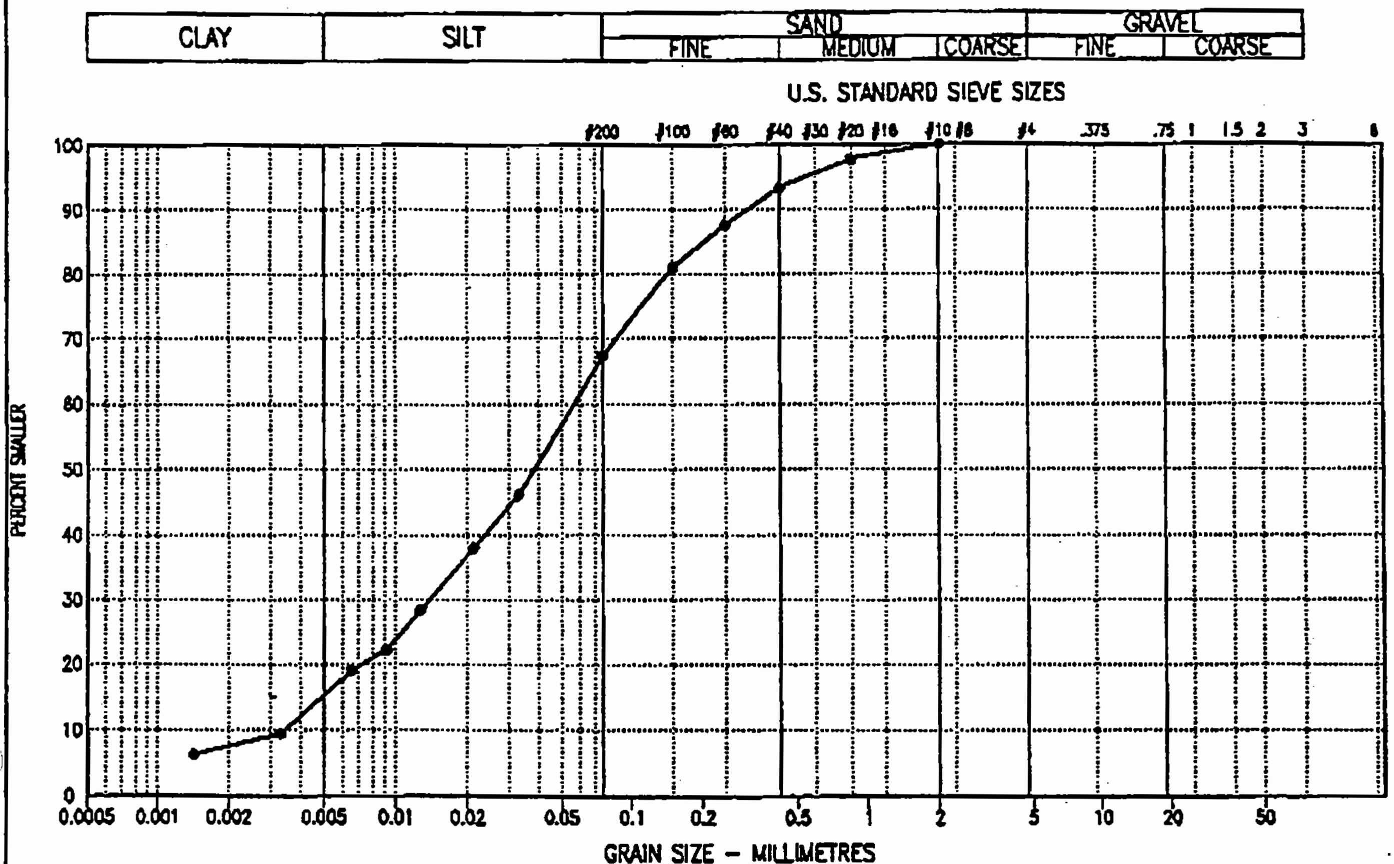
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
•——•	TR96-8-1	0.00	9.1	26.7	51.3	12.9	67.1	1.1	SM

Project: 0201-96-12188 Date Tested: 96/03/20 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



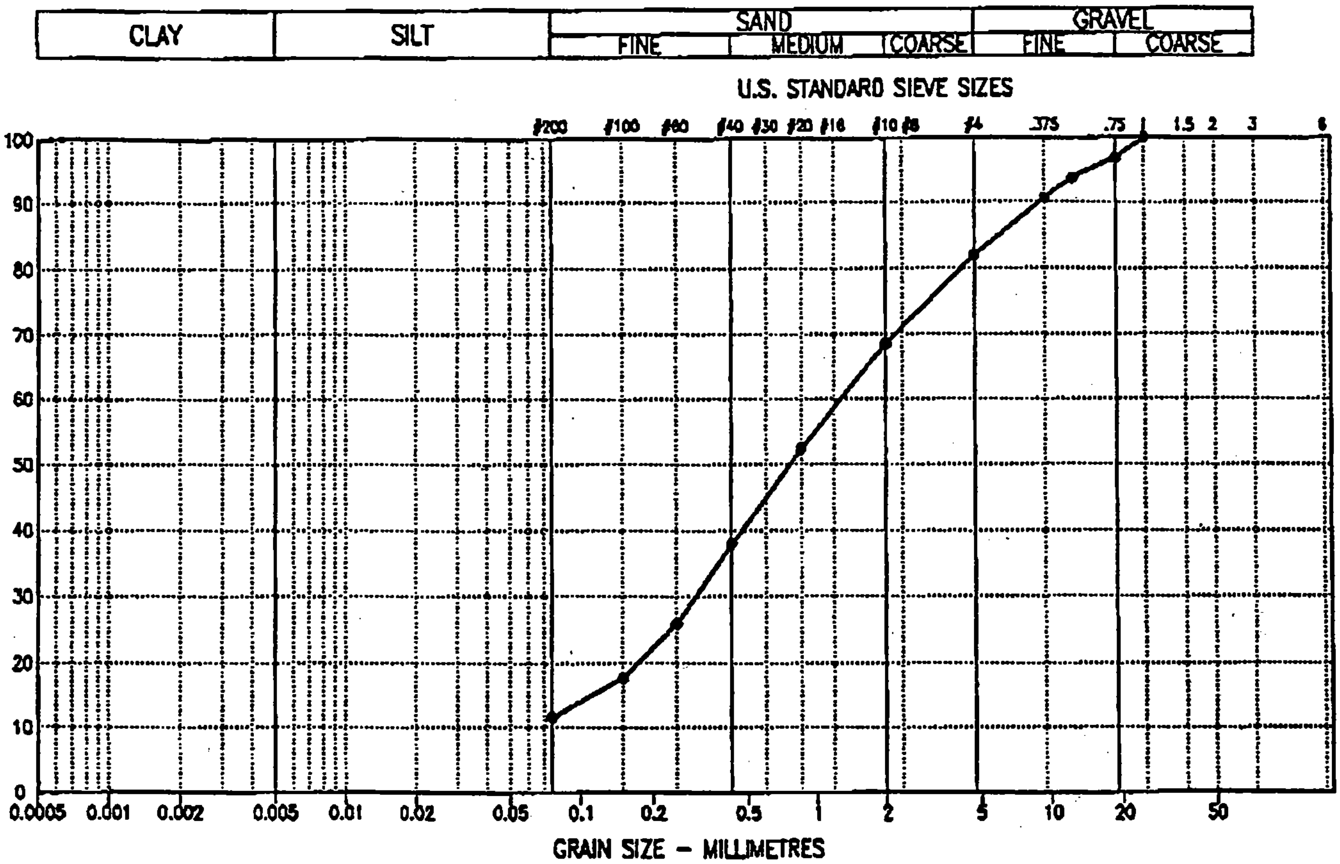
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
•——•	TR96-8-2	0.00	14.5	52.9	32.6	0.0	17.5	0.9	

Project: 0201-96-12188 Date Tested: 96/03/20 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



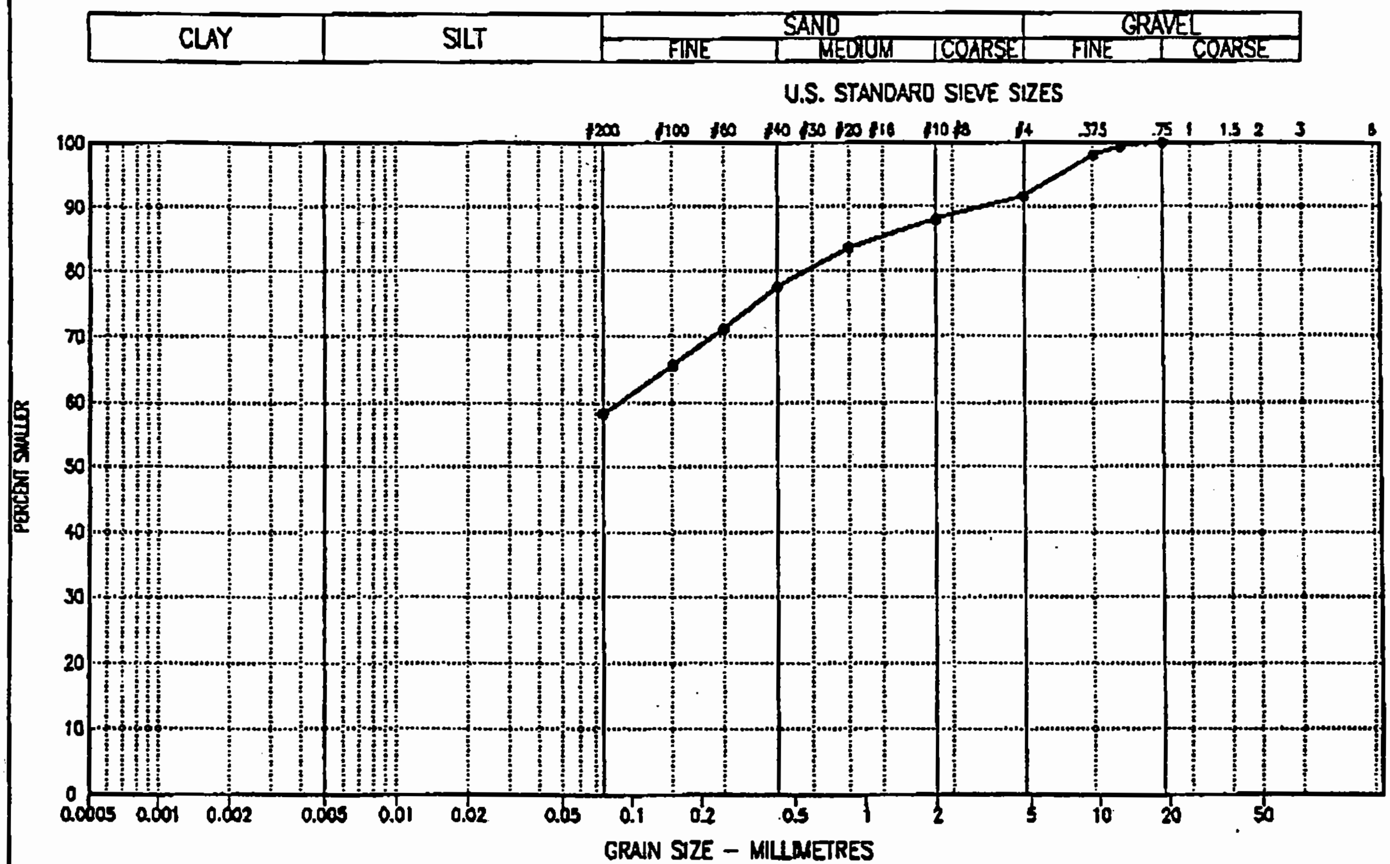
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
●——●	TR96-10-1	0.00	11.6	70.3	18.1	21.5	1.1	SW-SM

Project: 0201-96-12188 Date Tested: 96/03/21 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



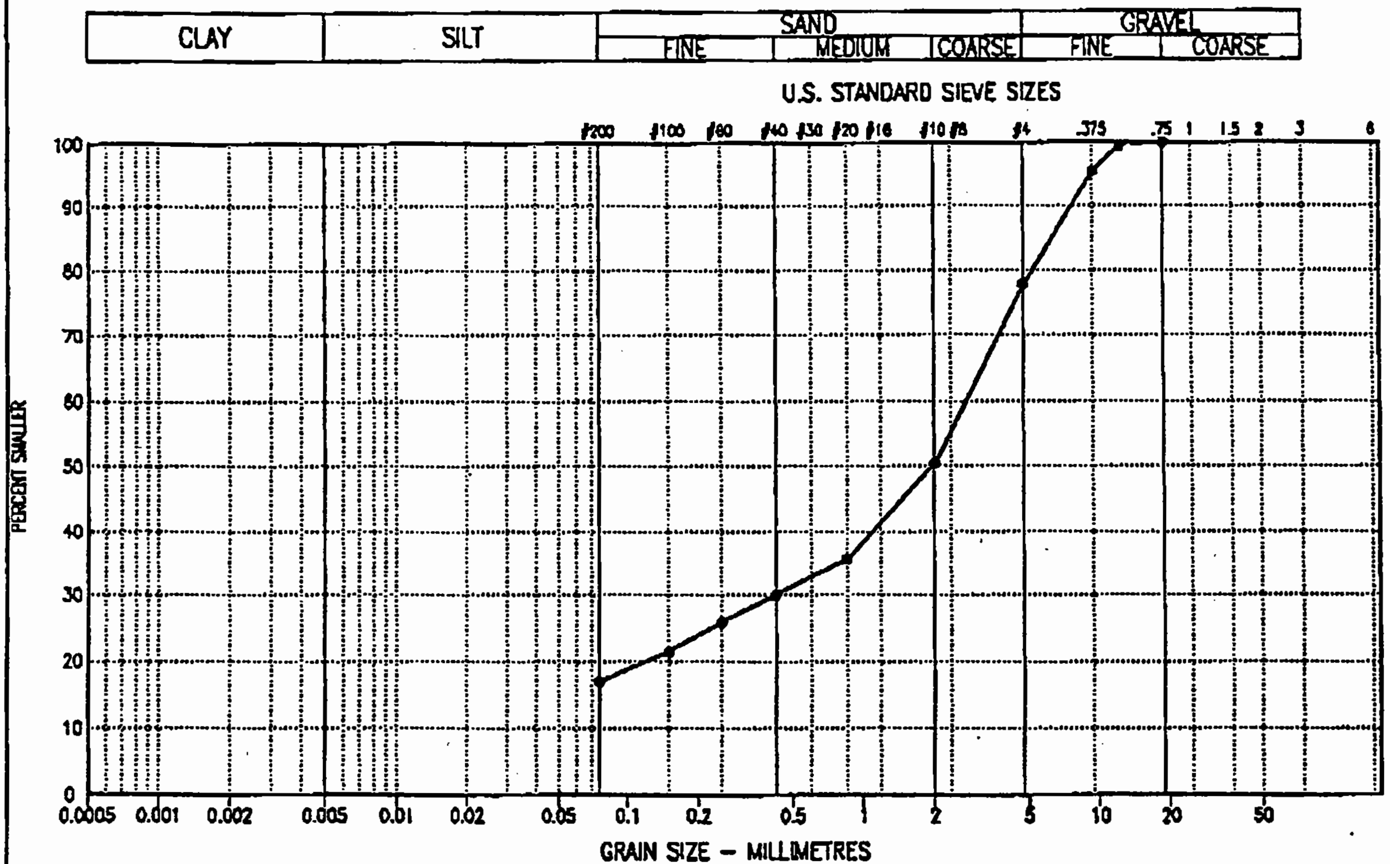
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
●——●	BH96-F-3	0.00	58.2	33.4	8.4	7.2	1.2	

Project: 0201-96-12188 Date Tested: 96/03/21 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION CLAY & SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
•——•	BH96-I-1	0.00	16.9	60.8	22.3	66.9	1.4	SM

Project: 0201-96-12188 Date Tested: 96/03/21 BY: MCP

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering Consultants Ltd.

SUMMARY OF LABORATORY TEST RESULTS

PROJECT: Knight Piesold Lab Testing PROJECT No: 0201-96-12188 DATE: April 8/96

BOREHOLE	SAMPLE DEPTH	MOISTURE CONTENT %	ATTERBERG LIMITS			GRAIN SIZE DISTRIBUTION				DESCRIPTION
			LL (%)	PL (%)	PI (%)	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	
BH 2	1-10		19.7	14.2	5.5					
DH 16	1-7		20.2	14.4	5.8					
TR 96	11-2		18.6	13.9	4.7					
TR 96	13-1		16.8	12.0	4.8					
TR 96	13-2		16.3	12.5	3.8					
TR 96	3-3		—	—	—					No plasticity – liquid or plastic limit test could not be completed
TR 96	8-2		22.0	—	—					Non plastic

eba

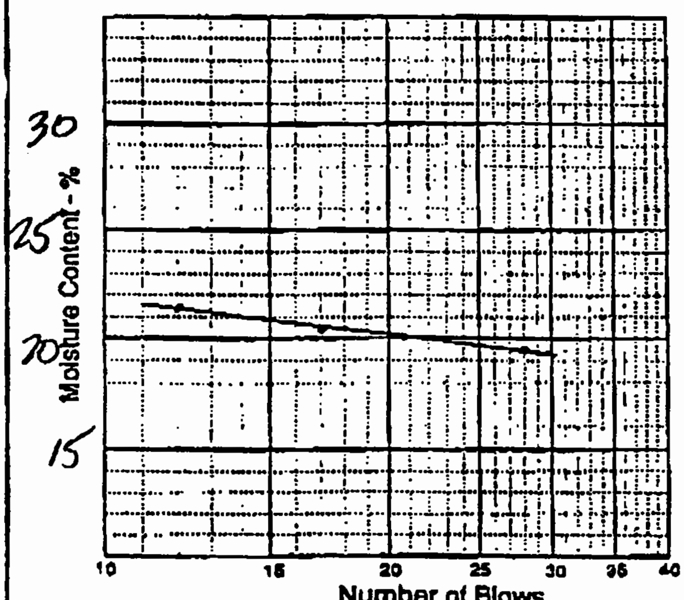
ATTERBERG LIMIT TEST RESULTS
(LABORATORY DATA REPORT)

Project: KNIGHT PIESOLD LAB TESTING
Address:
Project Number: 0201-96-12188
Date Tested: APRIL 4, 1996 By: JSB

Borehole Number:
Depth:
Sample Number: BH 2 1-10
Sample Description

LIQUID LIMIT
(ASTM Designation D 423)

Trial Number	1	2	3
Tare Number	9	12	5
Number of Blows	12	17	28
Mass of Wet Soil & Tare g	53.35	50.68	44.70
Mass of Dry Soil & Tare g	44.65	42.77	38.04
Mass of Tare g	3.80	3.80	3.87
Mass of Dry Soil g	40.85	38.97	34.17
Mass of Moisture g	8.70	7.91	6.66
MOISTURE CONTENT %	21.3	20.3	19.5



PLASTIC LIMIT
(ASTM Designation D 424)

Trial Number	1	2
Tare Number	9	12
Mass of Wet Soil & Tare g	11.68	9.99
Mass of Dry Soil & Tare g	10.73	9.21
Mass of Tare g	3.86	3.88
Mass of Dry Soil g	6.87	5.33
Mass of Moisture g	0.95	0.78
MOISTURE CONTENT %	13.8	14.6

SHRINKAGE LIMIT
(ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			

Remarks:

Liquid Limit: 19.7 %
Plastic Limit: 14.2 %
Plasticity Index: 5.5 %

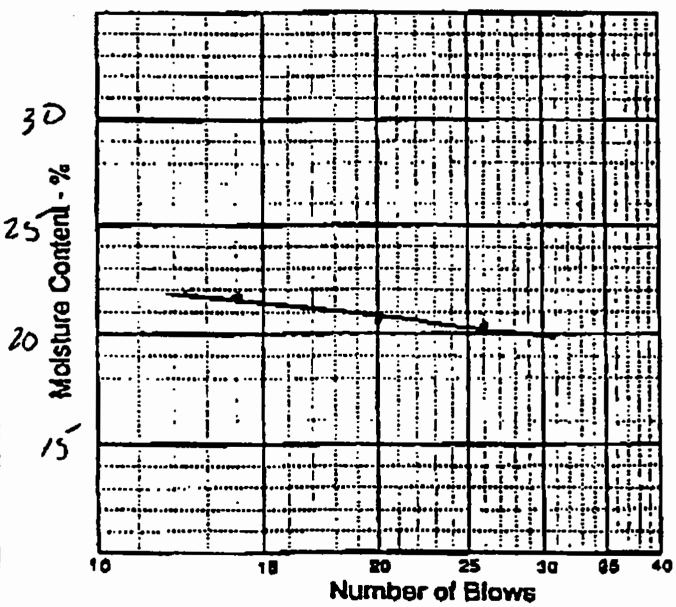
ATTERBERG LIMIT TEST RESULTS
(LABORATORY DATA REPORT)

Project: KNIGHT PIESOLD LAB TESTING
Address:
Project Number: 020196-12188
Date Tested: APRIL 4, 1996 By: JSB

Borehole Number:
Depth:
Sample Number: DH 16 1-7
Sample Description

LIQUID LIMIT
(ASTM Designation D 423)

Trial Number	1	2	3
Tare Number	N	O	P
Number of Blows	14	20	26
Mass of Wet Soil & Tare g	54.52	51.49	51.47
Mass of Dry Soil & Tare g	45.48	43.35	43.42
Mass of Tare g	3.90	3.84	3.88
Mass of Dry Soil g	41.58	39.51	39.54
Mass of Moisture g	9.04	8.14	8.05
MOISTURE CONTENT %	21.7	20.60	20.4



PLASTIC LIMIT
(ASTM Designation D 424)

Trial Number	1	2
Tare Number	N	O
Mass of Wet Soil & Tare g	10.38	10.55
Mass of Dry Soil & Tare g	9.58	9.69
Mass of Tare g	3.88	3.88
Mass of Dry Soil g	5.70	5.81
Mass of Moisture g	0.8	0.86
MOISTURE CONTENT %	14.0	14.8

SHRINKAGE LIMIT
(ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			

Remarks:

Liquid Limit: 20.2 %
Plastic Limit: 14.4 %
Plasticity Index: 5.8 %

eba

2061

ATTERBERG LIMIT TEST RESULTS
(LABORATORY DATA REPORT)

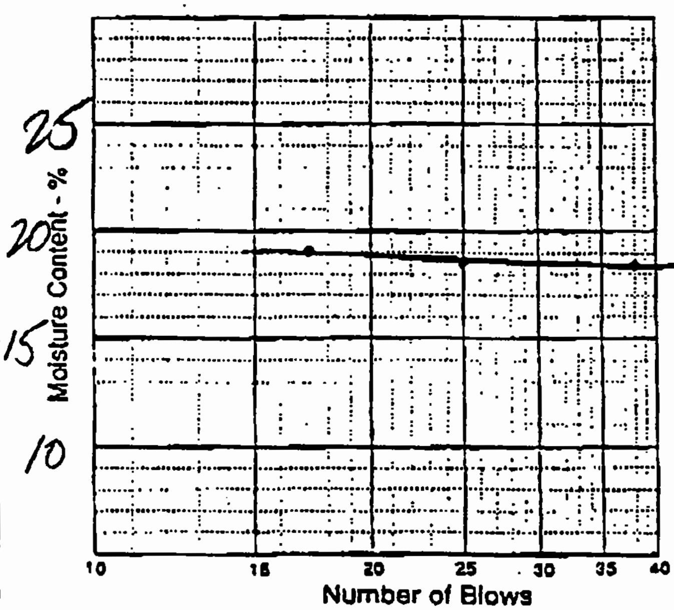
Project: KNIGHT PIESOLD LAB TESTING
Borehole Number:
Address:
Depth:
Sample Number: TR96 11-2
Project Number: 0201-96-12188
Sample Description
Date Tested: APRIL 4/96 By: JSB

LIQUID LIMIT
(ASTM Designation D 423)

Trial Number	1	2	3
Tare Number	A	B	C
Number of Blows	17	25	38
Mass of Wet Soil & Tare g	53.75	55.23	59.76
Mass of Dry Soil & Tare g	45.80	47.16	51.03
Mass of Tare g	3.90	3.84	3.88
Mass of Dry Soil g	41.90	43.32	47.15
Mass of Moisture g	7.95	8.07	8.73
MOISTURE CONTENT %	19.0	18.6	18.5

PLASTIC LIMIT
(ASTM Designation D 424)

Trial Number	1	2
Tare Number	A	B
Mass of Wet Soil & Tare g	11.04	9.79
Mass of Dry Soil & Tare g	10.16	9.07
Mass of Tare g	3.85	3.83
Mass of Dry Soil g	6.31	5.24
Mass of Moisture g	0.88	0.72
MOISTURE CONTENT %	14.0	13.7



SHRINKAGE LIMIT
(ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			

Remarks:

Liquid Limit: 18.6 %
Plastic Limit: 13.9 %
Plasticity Index: 4.7 %

ATTERBERG LIMIT TEST RESULTS
(LABORATORY DATA REPORT)

Project: KNIGHT PIESOLD LAB TESTING
Address:
Project Number: 0201-96-12188
Date Tested: APRIL 4, 1996 By: JSB

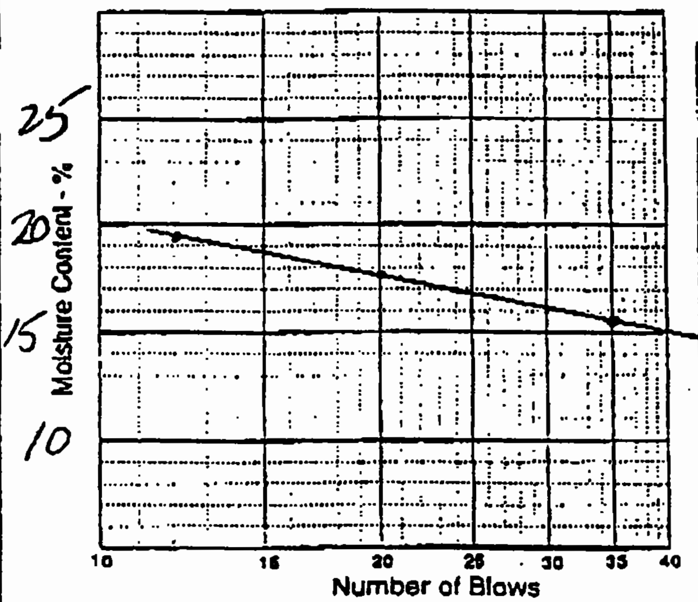
Borehole Number:
Depth:
Sample Number:
Sample Description TR96 13-1

LIQUID LIMIT
(ASTM Designation D 423)

Trial Number	1	2	3
Tare Number	D	E	F
Number of Blows	35	12	20
Mass of Wet Soil & Tare g	56.93	54.75	60.46
Mass of Dry Soil & Tare g	49.86	46.56	51.95
Mass of Tare g	3.89	3.90	3.92
Mass of Dry Soil g	45.97	42.66	48.03
Mass of Moisture g	7.07	8.20	8.51
MOISTURE CONTENT %	15.4	19.2	17.7

PLASTIC LIMIT
(ASTM Designation D 424)

Trial Number	1	2
Tare Number	D	E
Mass of Wet Soil & Tare g	11.10	11.73
Mass of Dry Soil & Tare g	10.32	10.89
Mass of Tare g	3.90	3.88
Mass of Dry Soil g	6.42	7.01
Mass of Moisture g	0.78	0.84
MOISTURE CONTENT %	12.1	12.0



SHRINKAGE LIMIT
(ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			

Remarks:

Liquid Limit: 16.8%
Plastic Limit: 12.0%
Plasticity Index: 4.8%

04/09/96 10:28 403 668 4349
04/09/96 TUE 11:25 FAX 403 66? ?349 EBA ENGINEERING. YUK? 007

ATTERBERG LIMIT TEST RESULTS
(LABORATORY DATA REPORT)

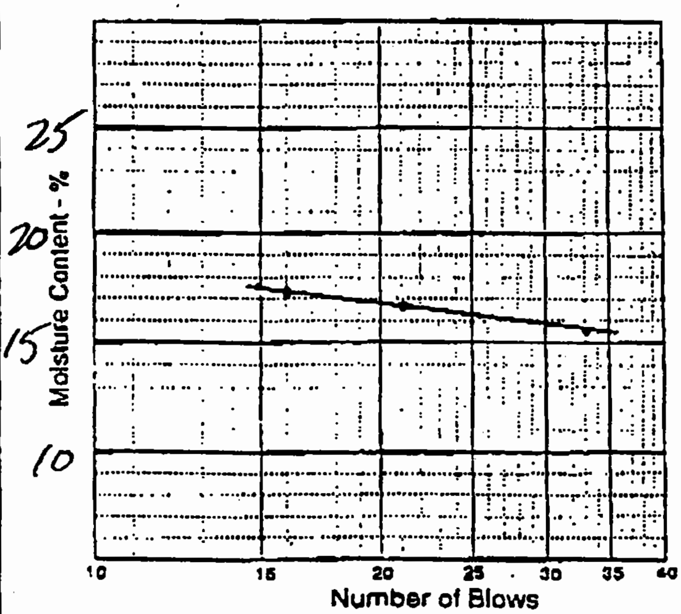
Project: KNIGHT PIESOLD LAB TESTING
Address: ______________________

Project Number: 0201-96-12188
Date Tested: APRIL 4, 1996 By: JSB

Borehole Number: ______________________
Depth: ______________________
Sample Number: TK96 13-2
Sample Description ______________________

LIQUID LIMIT
(ASTM Designation D 423)

Trial Number	1	2	3
Tare Number	G	H	I
Number of Blows	21	33	16
Mass of Wet Soil & Tare g	59.32	52.35	62.17
Mass of Dry Soil & Tare g	51.30	45.82	53.60
Mass of Tare g	3.88	3.89	3.88
Mass of Dry Soil g	47.42	41.93	49.72
Mass of Moisture g	8.02	6.53	8.57
MOISTURE CONTENT %	16.9	15.6	17.2



Remarks: ______________________

PLASTIC LIMIT
(ASTM Designation D 424)

Trial Number	1	2
Tare Number	G	H
Mass of Wet Soil & Tare g	9.97	10.97
Mass of Dry Soil & Tare g	9.30	10.17
Mass of Tare g	3.89	3.84
Mass of Dry Soil g	5.41	6.33
Mass of Moisture g	0.67	0.80
MOISTURE CONTENT %	12.4	12.6

SHRINKAGE LIMIT
(ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			

Liquid Limit: 16.3 %
Plastic Limit: 12.5 %
Plasticity Index: 3.8 %

eba

2081

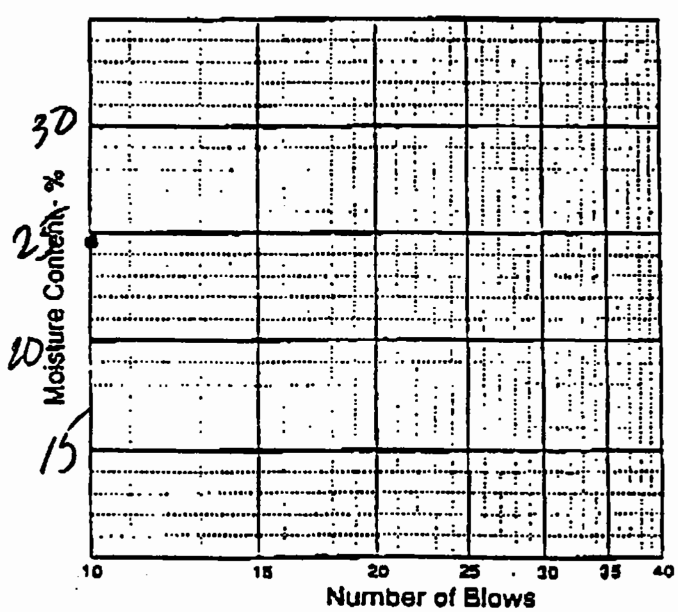
ATTERBERG LIMIT TEST RESULTS
(LABORATORY DATA REPORT)

Project: KNIGHT PIESOLD LAB TESTING
Address:
Project Number: 0201-96-12188
Date Tested: APRIL 4, 1996 By: JSB

Borehole Number:
Depth:
Sample Number: TR96 3-3
Sample Description

LIQUID LIMIT
(ASTM Designation D 423)

Trial Number	1	2	3
Tare Number	3		
Number of Blows	16		
Mass of Wet Soil & Tare g	53.21		
Mass of Dry Soil & Tare g	43.42		
Mass of Tare g	3.89		
Mass of Dry Soil g	39.53		
Mass of Moisture g	9.79		
MOISTURE CONTENT %	24.8		



PLASTIC LIMIT
(ASTM Designation D 424)

Trial Number	1	2
Tare Number		
Mass of Wet Soil & Tare g		
Mass of Dry Soil & Tare g		
Mass of Tare g	N/P	
Mass of Dry Soil g		
Mass of Moisture g		
MOISTURE CONTENT %		

SHRINKAGE LIMIT
(ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			

Remarks:
DRIER POINTS
CRUMBLED - COULD NOT
COMPLETE LIQUID OR
PLASTIC LIMIT TEST.

Liquid Limit: –
Plastic Limit: N/P
Plasticity Index: N/A

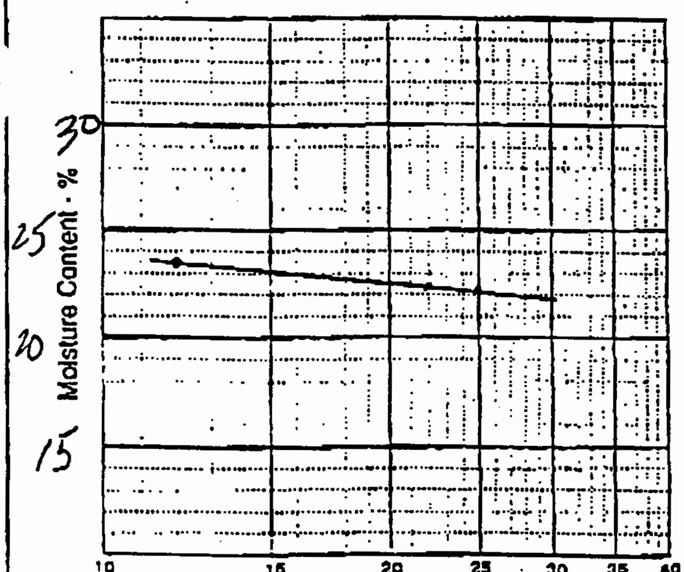
ATTERBERG LIMIT TEST RESULTS
(LABORATORY DATA REPORT)

Project: KNIGHT PIESOLD LAB TESTING
Address:
Project Number: 0201-96-12188
Date Tested: APRIL 4, 1996 By: JSB

Borehole Number:
Depth:
Sample Number: TR96 8-2
Sample Description

LIQUID LIMIT
(ASTM Designation D 423)

Trial Number	1	2	3
Tare Number	K	L	M
Number of Blows	12	22	25
Mass of Wet Soil & Tare g	55.05	54.94	48.82
Mass of Dry Soil & Tare g	45.34	45.64	40.70
Mass of Tare g	3.85	3.89	3.89
Mass of Dry Soil g	41.49	41.75	36.81
Mass of Moisture g	9.71	9.30	8.12
MOISTURE CONTENT %	23.4	22.3	22.1



PLASTIC LIMIT
(ASTM Designation D 424)

Trial Number	1	2
Tare Number	K	
Mass of Wet Soil & Tare g		
Mass of Dry Soil & Tare g		
Mass of Tare g	N/P	
Mass of Dry Soil g		
Mass of Moisture g		
MOISTURE CONTENT %		

SHRINKAGE LIMIT
(ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			

Remarks:

Liquid Limit: 22%
Plastic Limit: N/P
Plasticity Index: —

eba

2081

EBA Engineering Consultants Ltd.

Calcite Business Centre
Unit 6, 151 Industrial Road, Whitehorse, YT Y1A 2V3
•Phone (403) 668-3068 • FAX (403) 668-4349•

Calcite Business Centre
Unit 6, 151 Industrial Road, Whitehorse, YT Y1A 2V3
•Phone (403) 668-3068 • FAX (403) 668-4349•

SUMMARY OF Atterberg Limits ~~LABORATORY TEST~~ RESULTS

PROJECT: KNIGHT PIESOLD LAB TESTING PROJECT No.: 0201-96-12188 DATE: APRIL '96

BOREHOLE	SAMPLE ~~DEPTH~~ NUMBER	MOISTURE CONTENT (%)	ATTERBERG LIMITS LL (%)	PL (%)	PI (%)	GRAIN SIZE DISTRIBUTION Clay (%)	Silt (%)	Sand (%)	Gravel (%)	DESCRIPTION
TR 96	1-1		14	12.2	1.8					
TR 96	8-1		16	N/P	—					
TR 96	9-1		22.2	17.1	5.1					
TR 96	14-1		16.5	N/P	—					
TR 96	14-2		23.5	15.9	7.6					
TR 96	15-1		16.2	12.0	4.2					
TR 96	15-2		16.7	N/P	—					
TR 96	11-1		20.6	15.1	5.5					

2051

ATTERBERG LIMIT TEST RESULTS
(LABORATORY DATA REPORT)

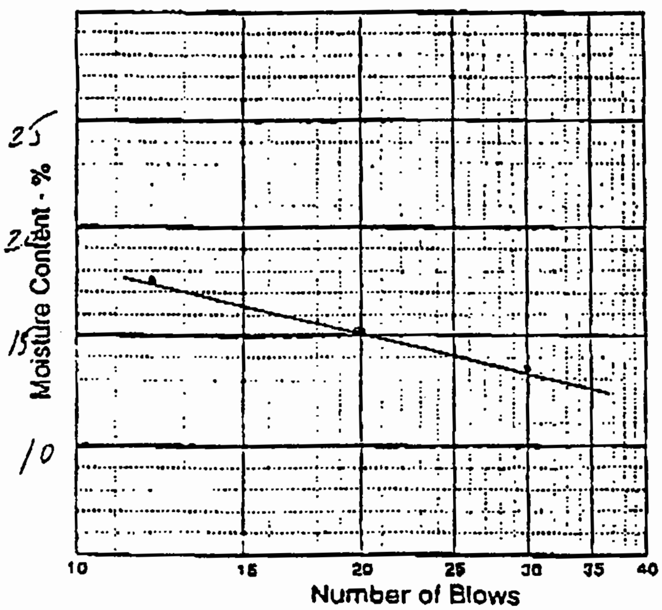
Project: KNIGHT PIESOLD LAB TESTING
Address:
Project Number: 0201-96-12133
Date Tested: APRIL 2 1996 By: JSS
Borehole Number:
Depth:
Sample Number: TR 96 1-1
Sample Description

LIQUID LIMIT
(ASTM Designation D 423)

Trial Number	1	2	3
Tare Number	D	E	F
Number of Blows	12	20	31
Mass of Wet Soil & Tare g	50.49	55.23	57.25
Mass of Dry Soil & Tare g	43.54	48.49	50.90
Mass of Tare g	3.91	3.90	3.88
Mass of Dry Soil g	39.63	44.59	47.02
Mass of Moisture g	6.95	6.74	6.35
MOISTURE CONTENT %	17.5	15.1	13.5

PLASTIC LIMIT
(ASTM Designation D 424)

Trial Number	1	2
Tare Number	D	E
Mass of Wet Soil & Tare g	15.53	13.73
Mass of Dry Soil & Tare g	14.31	12.62
Mass of Tare g	3.94	3.78
Mass of Dry Soil g	10.37	8.84
Mass of Moisture g	1.22	1.11
MOISTURE CONTENT %	11.8	12.6



SHRINKAGE LIMIT
(ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			

Remarks:

Liquid Limit: 14
Plastic Limit: 12.2
Plasticity Index: 1.8

ATTERBERG LIMIT TEST RESULTS
(LABORATORY DATA REPORT)

Project: KNIGHT PIESOLD LAB TESTING
Address: WHITEHORSE, Y.T.
Project Number: 0201-96-12188
Date Tested: APRIL 2, 1996 By: JSR

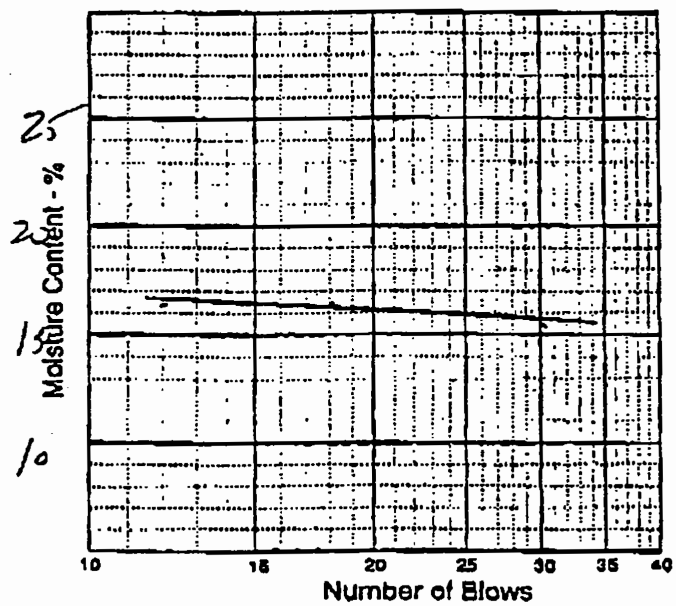
Borehole Number:
Depth:
Sample Number: TR96 8-1
Sample Description

LIQUID LIMIT
(ASTM Designation D 423)

Trial Number	1	2	3
Tare Number	A	B	C
Number of Blows	12	30	23
Mass of Wet Soil & Tare g	57.67	51.23	41.99
Mass of Dry Soil & Tare g	50.15	44.89	36.59
Mass of Tare g	3.89	3.91	3.85
Mass of Dry Soil g	46.26	40.98	32.74
Mass of Moisture g	7.52	6.34	5.4
MOISTURE CONTENT %	16.3	15.5	16.5

PLASTIC LIMIT
(ASTM Designation D 424)

Trial Number	1	2
Tare Number		
Mass of Wet Soil & Tare g		
Mass of Dry Soil & Tare g		
Mass of Tare g		N/P
Mass of Dry Soil g		
Mass of Moisture g		
MOISTURE CONTENT %		



SHRINKAGE LIMIT
(ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			

Remarks:

Liquid Limit: 16
Plastic Limit: N/P
Plasticity Index:

ATTERBERG LIMIT TEST RESULTS
(LABORATORY DATA REPORT)

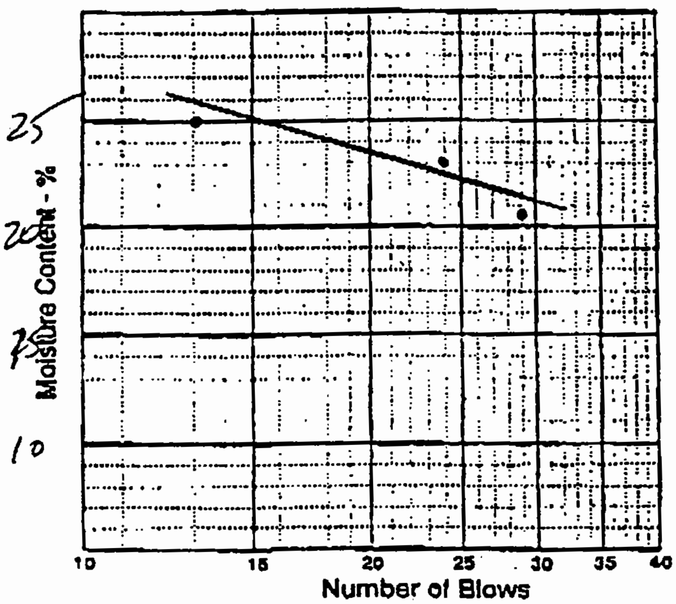
Project: KNIGHT PIESOLD LAB TESTING
Address:

Project Number: 0201-96-12188
Date Tested: APRIL 7, 1996 By: JSB

Borehole Number:
Depth:
Sample Number: TR26 9-1
Sample Description

LIQUID LIMIT
(ASTM Designation D 423)

Trial Number	1	2	3
Tare Number	G	H	I
Number of Blows	24	13	29
Mass of Wet Soil & Tare g	54.50	54.04	47.44
Mass of Dry Soil & Tare g	45.05	47.97	40.08
Mass of Tare g	3.90	3.98	3.90
Mass of Dry Soil g	41.15	43.99	36.18
Mass of Moisture g	9.45	11.07	7.36
MOISTURE CONTENT %	23.0	25.2	20.3



PLASTIC LIMIT
(ASTM Designation D 424)

Trial Number	1	2
Tare Number	G	H
Mass of Wet Soil & Tare g	12.95	
Mass of Dry Soil & Tare g	11.63	
Mass of Tare g	3.93	3.87
Mass of Dry Soil g	7.7	
Mass of Moisture g	1.32	
MOISTURE CONTENT %	17.1	

SHRINKAGE LIMIT
(ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			

Remarks:

Liquid Limit: 22.2
Plastic Limit: 17.1
Plasticity Index: 5.1

eba

1001

ATTERBERG LIMIT TEST RESULTS
(LABORATORY DATA REPORT)

Project: KNIGHT PIESOLD LAB TESTING
Address:
Project Number: 0201-96-12188
Date Tested: April 2/96 By: JSB

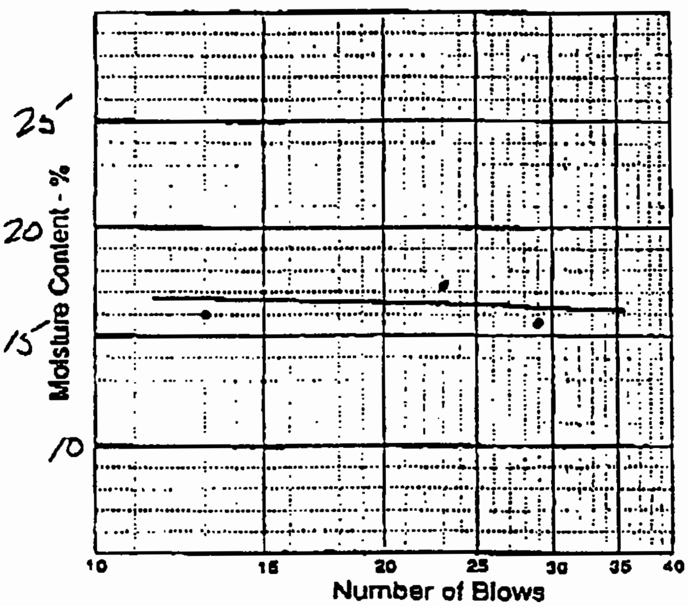
Borehole Number:
Depth:
Sample Number: TR 96 14-1
Sample Description

LIQUID LIMIT
(ASTM Designation D 423)

Trial Number	1	2	3
Tare Number	J	K	L
Number of Blows	13	23	29
Mass of Wet Soil & Tare g	47.59	56.71	51.88
Mass of Dry Soil & Tare g	41.55	48.97	45.36
Mass of Tare g	3.83	3.87	3.75
Mass of Dry Soil g	37.72	45.10	41.61
Mass of Moisture g	6.04	7.74	6.52
MOISTURE CONTENT %	16.0	17.2	15.7

PLASTIC LIMIT
(ASTM Designation D 424)

Trial Number	1	2
Tare Number		
Mass of Wet Soil & Tare g	N/P	
Mass of Dry Soil & Tare g		
Mass of Tare g		
Mass of Dry Soil g		
Mass of Moisture g		
MOISTURE CONTENT %		



SHRINKAGE LIMIT
(ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			

Remarks:

Liquid Limit: 16.5
Plastic Limit: N/P
Plasticity Index: —

eba

2061

ATTERBERG LIMIT TEST RESULTS
(LABORATORY DATA REPORT)

Project: KNIGHT PIESOLD LAB TESTING
Address:
Project Number: 0201-96-12188
Date Tested: APRIL 2/96 By: JSB

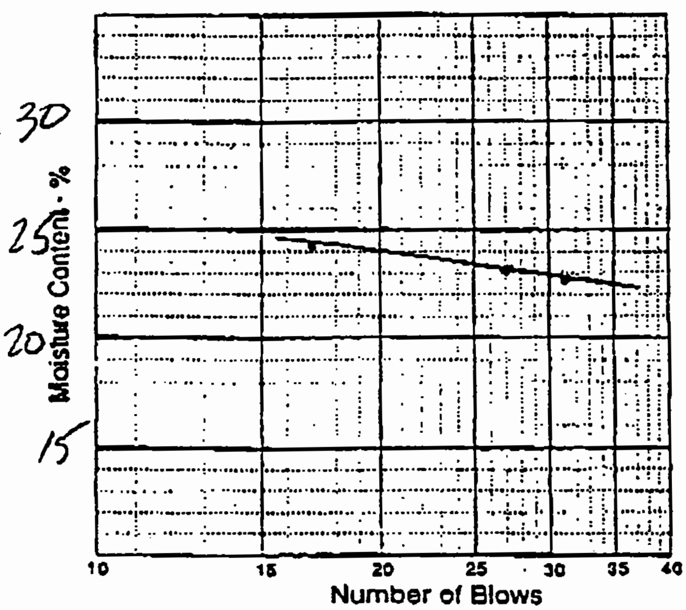
Borehole Number:
Depth:
Sample Number: TR96 14-2
Sample Description

LIQUID LIMIT
(ASTM Designation D 423)

Trial Number	1	2	3
Tare Number	H	N	O
Number of Blows	17	27	31
Mass of Wet Soil & Tare g	53.07	52.76	52.21
Mass of Dry Soil & Tare g	43.43	43.58	43.25
Mass of Tare g	3.84	3.85	3.79
Mass of Dry Soil g	39.59	39.73	39.46
Mass of Moisture g	9.64	9.18	8.96
MOISTURE CONTENT %	24.3	23.1	22.7

PLASTIC LIMIT
(ASTM Designation D 424)

Trial Number	1	2
Tare Number	1M	2M
Mass of Wet Soil & Tare g	10.51	10.66
Mass of Dry Soil & Tare g	9.65	9.68
Mass of Tare g	3.90	3.86
Mass of Dry Soil g	5.75	5.82
Mass of Moisture g	0.86	0.98
MOISTURE CONTENT %	15.0	16.8



SHRINKAGE LIMIT
(ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			

Remarks:

Liquid Limit: 23.5
Plastic Limit: 15.9
Plasticity Index: 7.6

Data presented hereon is for the sole use of the stipulated client. EBA is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of EBA.

The testing services reported herein have been performed by an EBA technician to recognized industry standards, unless otherwise noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, EBA will provide it upon written request.

eba

2081

ATTERBERG LIMIT TEST RESULTS
(LABORATORY DATA REPORT)

Project: KNIGHT PIESOLD LAB TESTING
Address: WHITEHORSE, Y.T.

Project Number: 0201-96-12188
Date Tested: APRIL 2, 1996 By: JSB

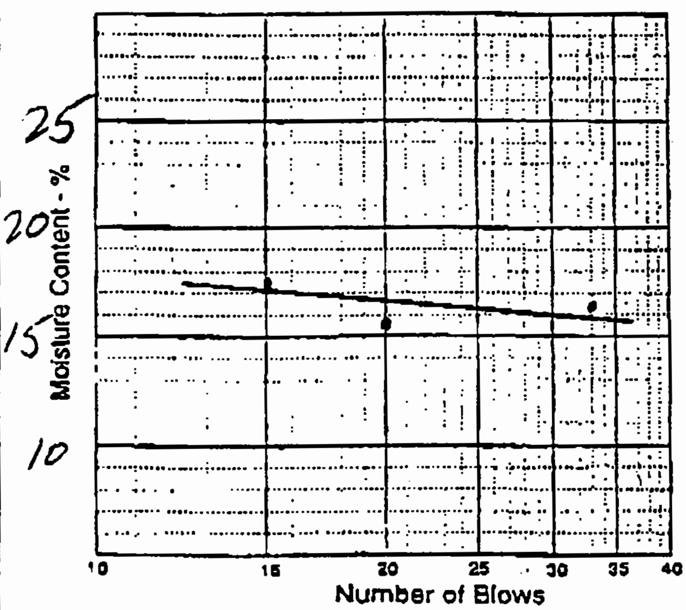
Borehole Number:
Depth:
Sample Number: 1 TR96 15-1
Sample Description

LIQUID LIMIT
(ASTM Designation D 423)

Trial Number	1	2	3
Tare Number	P	Q	R
Number of Blows	20	15	33
Mass of Wet Soil & Tare g	77.83	61.93	55.43
Mass of Dry Soil & Tare g	67.92	53.29	48.28
Mass of Tare g	3.83	3.72	3.90
Mass of Dry Soil g	64.09	49.57	44.38
Mass of Moisture g	9.91	8.64	7.15
MOISTURE CONTENT %	15.5	17.4	16.1

PLASTIC LIMIT
(ASTM Designation D 424)

Trial Number	1	2
Tare Number	3R	
Mass of Wet Soil & Tare g	9.67	
Mass of Dry Soil & Tare g	9.05	
Mass of Tare g	3.90	
Mass of Dry Soil g	5.15	
Mass of Moisture g	0.62	
MOISTURE CONTENT %	12.0	



SHRINKAGE LIMIT
(ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			

Remarks:

Liquid Limit: 16.2
Plastic Limit: 12.0
Plasticity Index: 4.2

2081

ATTERBERG LIMIT TEST RESULTS
(LABORATORY DATA REPORT)

Project: KNIGHT PIESOLD LAB TESTING

Address:

Project Number: 0221-96-12188

Date Tested: APRIL 2/96 By: JSB

Borehole Number:

Depth:

Sample Number: TR96 15-2

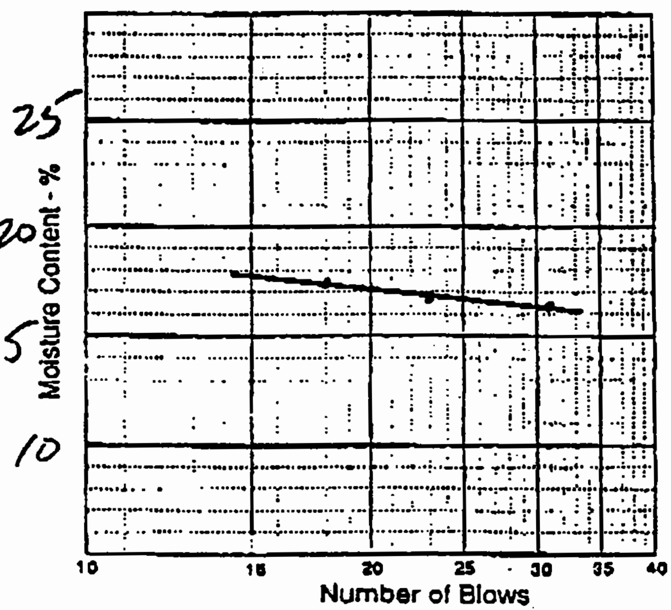
Sample Description

LIQUID LIMIT
(ASTM Designation D 423)

Trial Number	1	2	3
Tare Number	S	T	U
Number of Blows	23	18	31
Mass of Wet Soil & Tare g	65.16	61.23	61.37
Mass of Dry Soil & Tare g	56.33	52.79	53.27
Mass of Tare g	3.80	3.92	3.84
Mass of Dry Soil g	52.53	48.87	49.43
Mass of Moisture g	8.83	8.44	8.10
MOISTURE CONTENT %	16.8	17.3	16.4

PLASTIC LIMIT
(ASTM Designation D 424)

Trial Number	1	2
Tare Number		
Mass of Wet Soil & Tare g		
Mass of Dry Soil & Tare g	N/P	
Mass of Tare g		
Mass of Dry Soil g		
Mass of Moisture g		
MOISTURE CONTENT %		



SHRINKAGE LIMIT
(ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			

Remarks:

Liquid Limit: 16.7

Plastic Limit: N/P

Plasticity Index: —

eba

3081

EBA Engineering Consultants Ltd.

POINT LOAD STRENGTH INDEX

Project Knight Piesold Lab Testing
Date March 27, 1996
Tested By M.C.P.
Location Carmacks
Client Knight Piesold
Bore Hole DH-11 Depth Various
Attention Mr. Bruno Borntraeger
Sample No.
Project No. 0201-96-12188

Test Type D - Diametral : A - Axial : I - Irregular

Test Type	Specimen No.	D (in.)	P (lbs.)	D^2 (in²)	I_s (psi)	$I_s(50)$ (psi)	$I_s(50)$ (MPa)	Notes
D	21.5 ft	1.85	3540	3.42	1009	1009	7.0	One fracture noted in core
D	37.0 ft	1.85	700	3.42	205	205	1.4	Surface of core badly pitted
D	38.5 ft	1.85	700	3.42	205	205	1.4	Core badly pitted with two thin fractures also noted
D	47.5 ft	1.85	700	3.42	219	219	1.5	Surface of core very pitted

Median values of strength index, $I_s(50)$
Parallel to plane of weakness: ______ psi (______ MPa)
Perpendicular to plane of weakness: ______ psi (______ MPa)
Anisotropy index, $I_a(50)$ = ______ = ______
Remarks: Length: Diameter ratio >1.4 for all cores tested

Calcite Business Centre
Unit 6, 151 Industrial Road, Whitehorse, YT Y1A 2V3
•Phone (403) 668-3068 • FAX (403) 668-4349•

EBA Engineering Consultants Ltd.

POINT LOAD STRENGTH INDEX

Project Knight Piesold Lab Testing
Location Carmacks
Bore Hole DH-12 Depth Various
Sample No.

Date March 27, 1996
Tested By M.C.P.
Client Knight Piesold
Attention Mr. Bruno Borntraeger
Project No. 0201-96-12188

Test Type D - Diametral : A - Axial : I - Irregular

Test Type	Specimen No.	D (in.)	P (lbs.)	D^2 (in^2)	I_s (psi)	$I_s(50)$ (psi)	$I_s(50)$ (MPa)	Notes
D	42 ft	1.85	875	3.42	256	256	1.8	Perpendicular to Schistosity
D	42 ft	1.85	700	3.42	205	205	1.4	Parallel to Schistosity
D	52 ft	1.85	1875	3.42	534	534	3.7	Perpendicular to Schistosity
D	52 ft	1.85	1025	3.42	300	300	2.1	Parallel to Schistosity
D	58 ft	1.85	700	3.42	205	205	1.4	Perpendicular to Schistosity
D	58 ft	1.85	550	3.42	161	161	1.1	Parallel to Schistosity
D	59 ft	1.85	1450	3.42	424	424	2.9	Perpendicular to Schistosity
D	59 ft	1.85	700	3.42	205	205	1.4	Parallel to Schistosity

Median values of strength index, $I_s(50)$
Parallel to plane of weakness: ______ psi (______ MPa)
Perpendicular to plane of weakness: ______ psi (______ MPa)
Anisotropy index, $I_a(50)$ = ______ = ______
Remarks: Length: Diameter ratios for tests completed perpendicular to Schistosity >1.4 but for subsequent tests completed parallel to Schistosity L:D ratios varied from 1.2 to 1.5 depending upon length of leftover core.

Knight Piésold Ltd.
CONSULTING ENGINEERS

APPENDIX B2

KNIGHT PIÉSOLD DENVER
TEST RESULTS

Laboratory Compaction

Test Data

ASTM D 1557-91

Knight Piésold LLC

PROCTOR TEST REPORT

Curve No.:

Project No.: 1377A-L200 | Date: 3/24/96

Project: CARMACKS COPPER PROJECT

Location: TR96-17

TILL

Elev/Depth:

Remarks:

MATERIAL DESCRIPTION

Description: clayey SAND, some gravel

Classifications: USCS: SC AASHTO:

Nat. Moist. = 8.4%% Sp.G. =

Liquid Limit = 20 Plasticity Index = 8

%> 3/8 in = 8.5% %< No.200 = 36.6%

TEST RESULTS
Maximum dry density = 22.4 kN/cu.m
Optimum moisture = 6.5 %

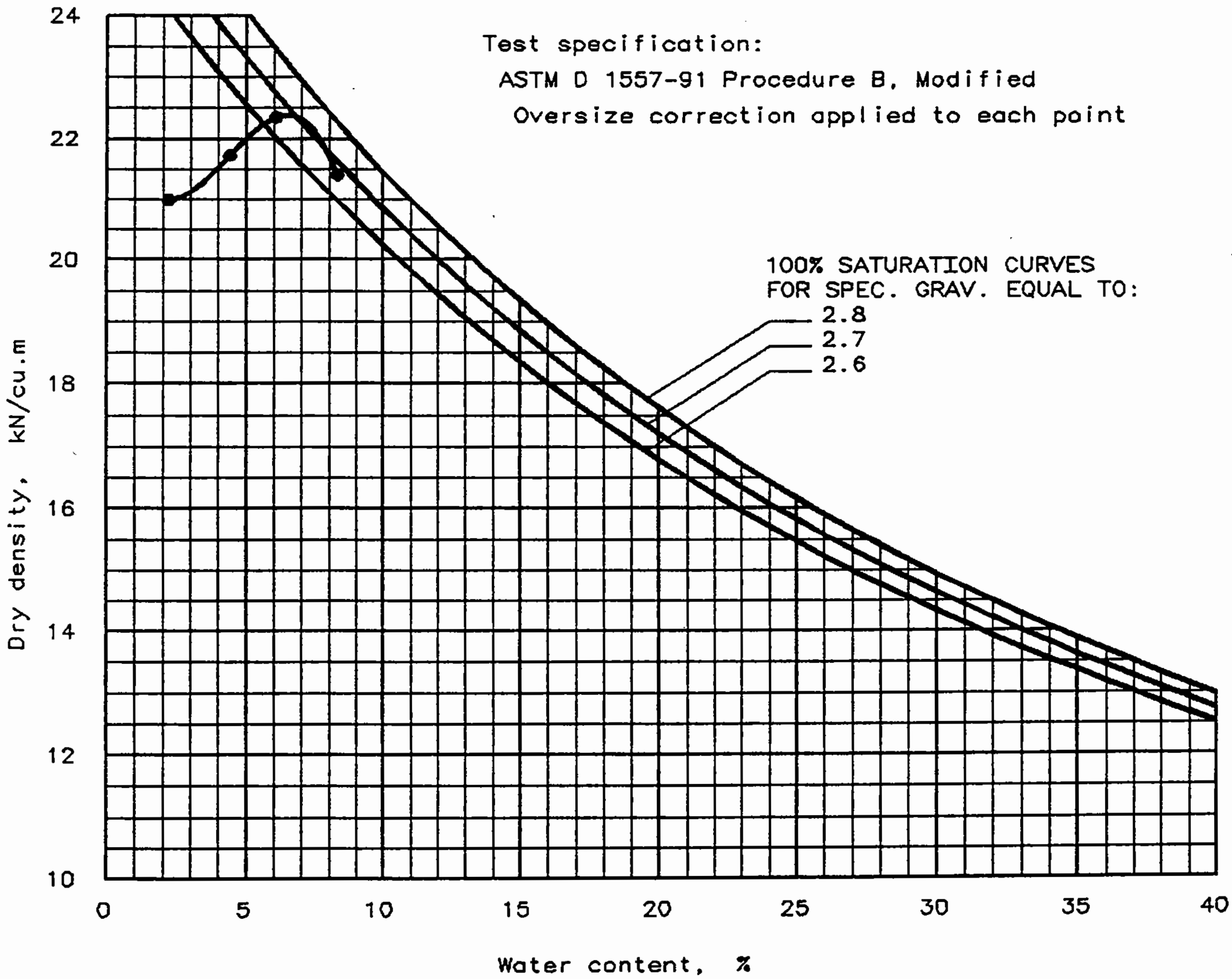


Plate No.

Knight Piesold LLC

PROCTOR TEST REPORT

Curve No.:

Project No.: 1377A-L200 Date: 3/24/96

Project: CARMACKS COPPER PROJECT

Location: TR96-12-1

FINE GRAINED SOIL

Elev/Depth:

Remarks:

MATERIAL DESCRIPTION

Description: silty/clayey SAND some gravel

Classifications: USCS: SC-SM AASHTO:

Nat. Moist. = 8.0%% Sp.G. =

Liquid Limit = 20 Plasticity Index = 7

%> 3/8 in = 10.9% %< No.200 = 34.9%

TEST RESULTS
Maximum dry density = 22.6 kN/cu.m
Optimum moisture = 5.7 %

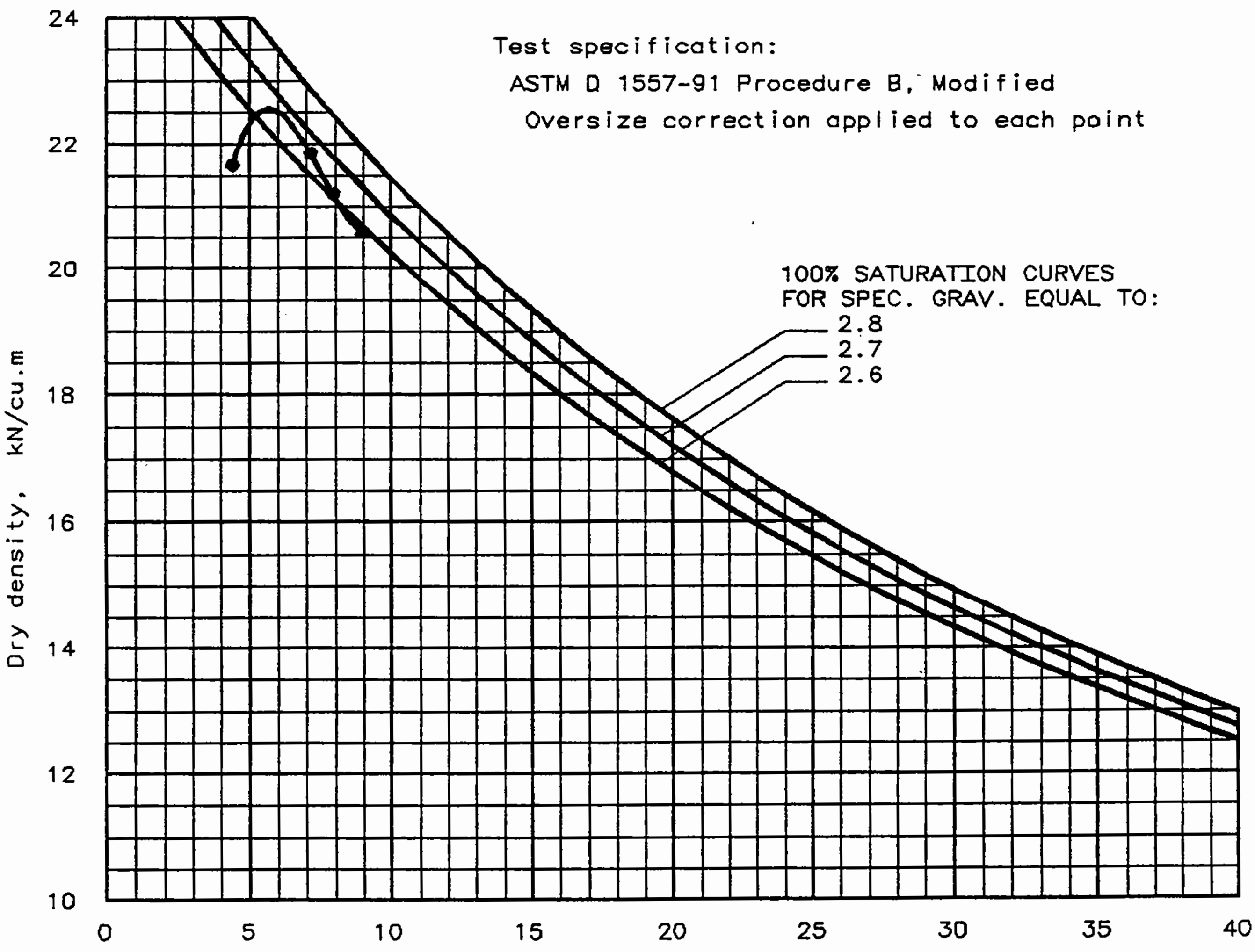


Plate No.

Knight Piesold LLC

PROCTOR TEST REPORT

Curve No.:

Project No.: 1377A-L200 Date: 3/24/96

Project: CARMACKS COPPER PROJECT

Location: TR96-1-2

TILL

Elev/Depth:

Remarks:

MATERIAL DESCRIPTION

Description: very clayey SAND some gravel

Classifications: USCS: SC AASHTO:

Nat. Moist. = 18.9% Sp.G. =

Liquid Limit = 26 Plasticity Index = 11

%> 3/8 in = 9.9% %< No.200 = 47.5%

TEST RESULTS
Maximum dry density = 21.3 kN/cu.m
Optimum moisture = 8.0 %

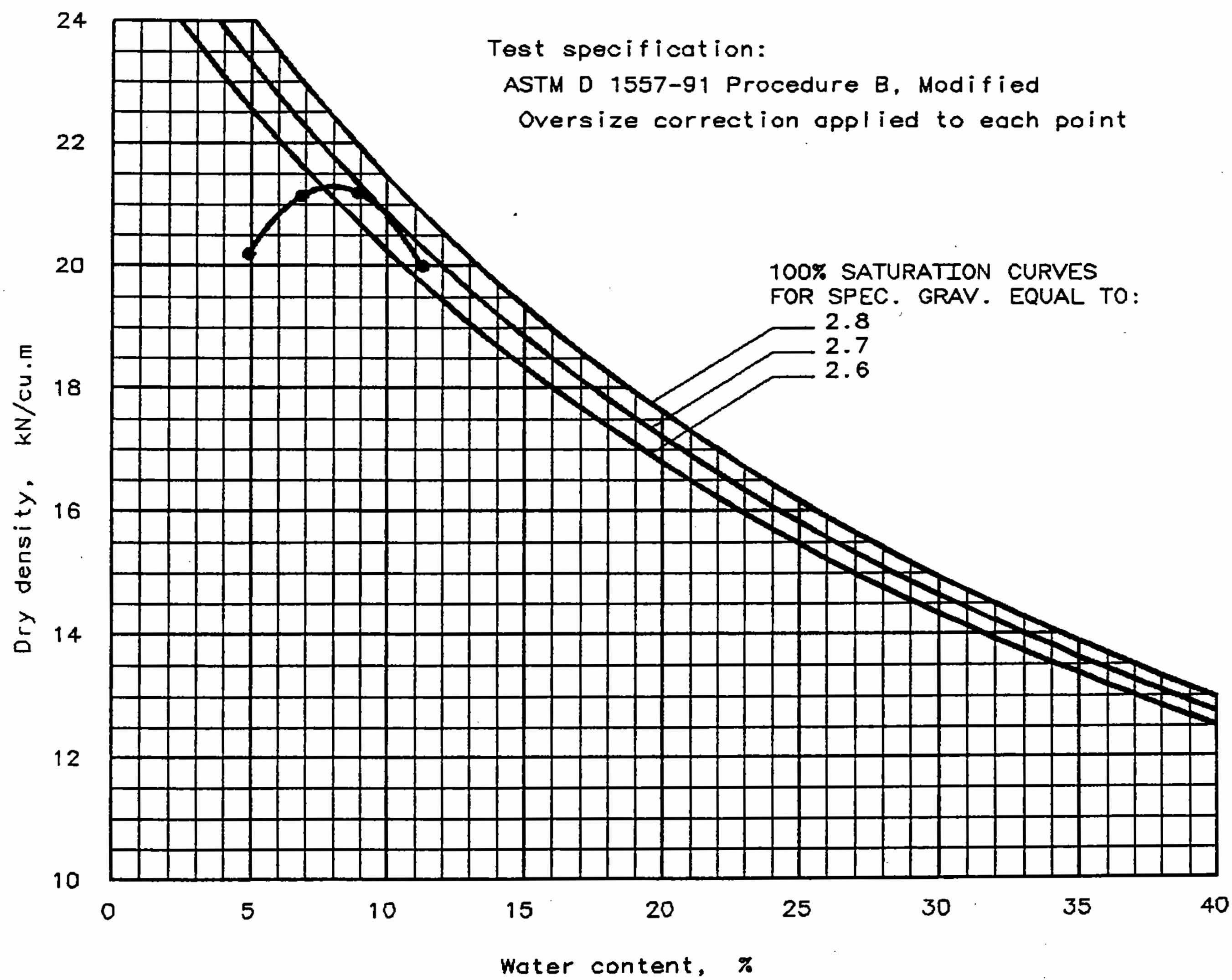


Plate No.

Knight Piesold LLC

PROCTOR TEST REPORT

Curve No.:

Project No.: 1377A-L200 Date: 3/24/96

Project: CARMACKS COPPER PROJECT

Location: TR96-16-1

TILL

Elev/Depth:

Remarks:

MATERIAL DESCRIPTION

Description: clayey SAND w/gravel

Classifications: USCS: SC AASHTO:

Nat. Moist. = 14.1% Sp.G. =

Liquid Limit = 25 Plasticity Index = 12

%> 3/8 in = 12.5% %< No.200 = 39.5%

TEST RESULTS
Maximum dry density = 22.0 kN/cu.m
Optimum moisture = 6.1 %

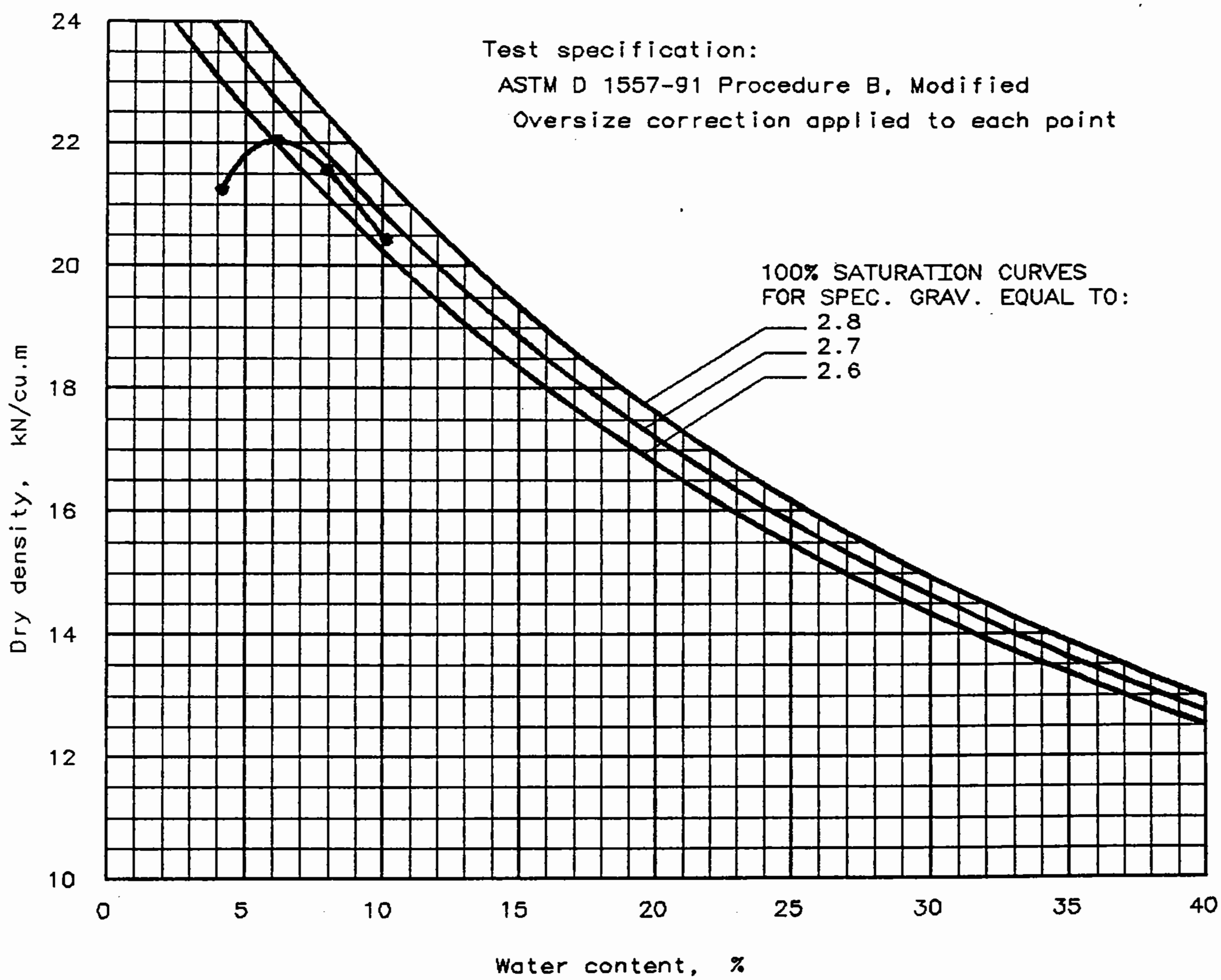


Plate No.

Knight Piesold LLC

PROCTOR TEST REPORT

Curve No.:

Project No.: 1377A-L200 Date: 3/24/96

Project: CARMACKS COPPER PROJECT

Location: TR96-6-2

SAND & GRAVEL

Elev/Depth:

Remarks:

MATERIAL DESCRIPTION

Description: gravely SAND slightly silty

Classifications: USCS: SW-SM AASHTO:

Nat. Moist. = 3.2% Sp.G. =

Liquid Limit = Plasticity Index =

%> 3/8 in = 17.5% %< No.200 = 5.2%

TEST RESULTS
Maximum dry density = 21.7 kN/cu.m
Optimum moisture = 5.8 %

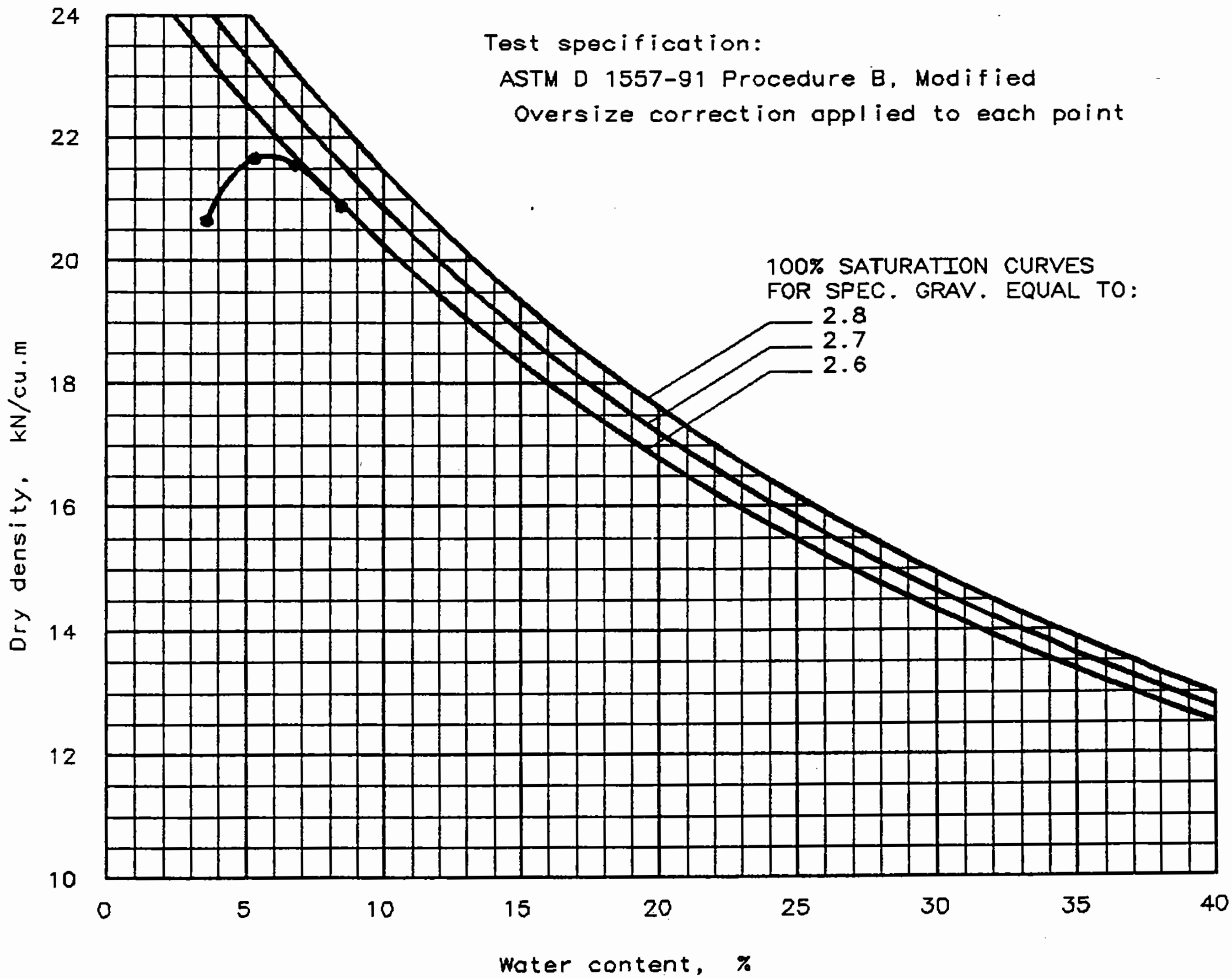


Plate No.

Knight Piesold LLC

PROCTOR TEST REPORT

Curve No.:

Project No.: 1377A-L200 Date: 3/24/96

Project: CARMACKS COPPER PROJECT

Location: TR96-11-3

FINE GRAINED SOIL

Elev/Depth:

Remarks:

MATERIAL DESCRIPTION

Description: sandy, gravelly CLAY

Classifications: USCS: CH AASHTO:

Nat. Moist. = 27.6% Sp.G. =

Liquid Limit = 59 Plasticity Index = 42

%> 3/8 in = 6.0% %< No.200 = 77.5%

TEST RESULTS
Maximum dry density = 17.3 kN/cu.m
Optimum moisture = 18.1 %

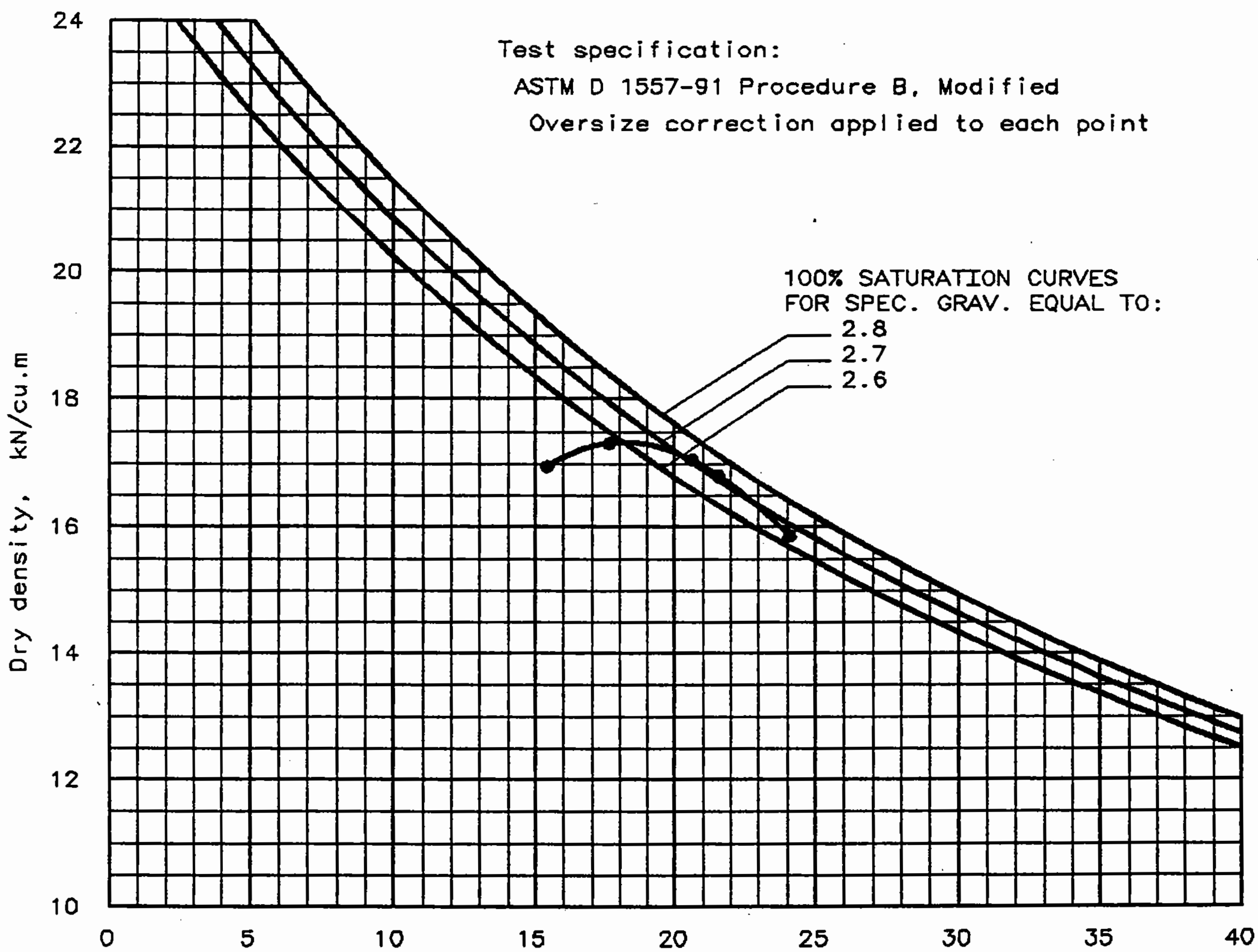


Plate No.

Knight Piesold LLC

MOISTURE-DENSITY TEST DATA   DATA FILE: 213

PROJECT DATA

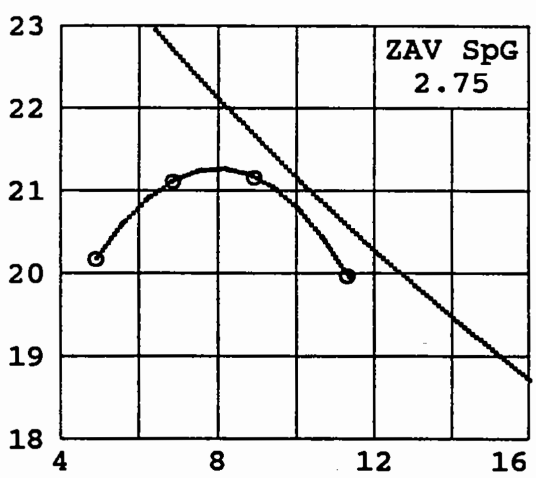
Date: 3/24/96
Project no.: 1377A-L200
Project: CARMACKS COPPER PROJECT
Location 1: TR96-1-2
2: TILL
Remarks 1:
2:
3:
Material 1: very clayey SAND
description 2: some gravel
Elevation or depth:
Fig no:

SPECIMEN DATA

USCS classification: SC   AASHTO classification:
Natural moisture: 18.9   Specific gravity:
Percent retained on 3/8 in sieve: 9.9
Percent passing No. 200 sieve: 47.5
Liquid limit: 26   Plastic limit: 15   Plasticity index: 11

TEST DATA AND RESULTS

Type of test: Modified, ASTM D 1557-91 Procedure B



POINT NO.	1	2	3	4
WM + WS	13.97	13.79	13.55	13.86
WM	9.15	9.15	9.15	9.15
WW+T #1	378.30	508.60	335.50	660.30
WD+T #1	354.50	465.00	324.00	621.80
TARE #1	113.10	116.90	112.10	114.20
MOIST #1	9.9	12.5	5.4	7.6
MOISTURE	8.9	11.3	4.9	6.8
DRY DEN	21.18	20.00	20.20	21.13

Max dry den= 21.3 kN/cu.m., Opt moisture= 8.0 %

ASTM D 4718 Correction Data:
Bulk Specific Gravity of Oversize Material = 2.726
Moisture of oversize material = 0.000 %
ASTM D 4718 Correction Applied to Each Point

MOISTURE-DENSITY TEST DATA DATA FILE: 211

PROJECT DATA

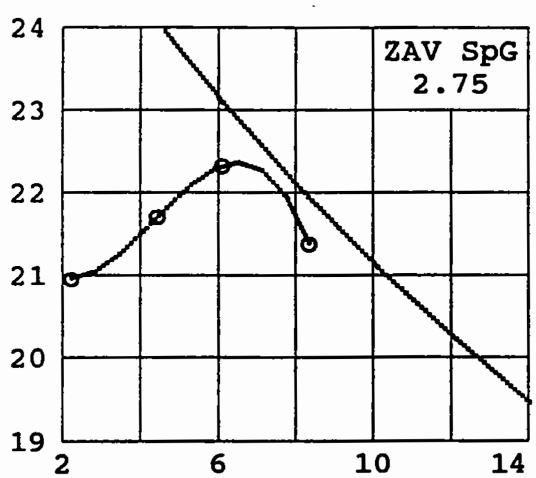
Date: 3/24/96
Project no.: 1377A-L200
Project: CARMACKS COPPER PROJECT
Location 1: TR96-17
2: TILL
Remarks 1:
2:
3:
Material 1: clayey SAND, some gravel
description 2:
Elevation or depth:
Fig no:

SPECIMEN DATA

USCS classification: SC AASHTO classification:
Natural moisture: 8.4% Specific gravity:
Percent retained on 3/8 in sieve: 8.5
Percent passing No. 200 sieve: 36.6
Liquid limit: 20 Plastic limit: 12 Plasticity index: 8

TEST DATA AND RESULTS

Type of test: Modified, ASTM D 1557-91 Procedure B



POINT NO.	1	2	3	4
WM + WS	14.13	14.01	13.62	13.90
WM	9.15	9.15	9.15	9.15
WW+T #1	283.50	290.00	354.10	345.70
WD+T #1	273.00	275.90	348.60	335.30
TARE #1	114.60	120.80	120.10	119.70
MOIST #1	6.6	9.1	2.4	4.8
MOISTURE	6.1	8.3	2.2	4.4
DRY DEN	22.34	21.40	20.98	21.72

Max dry den= 22.4 kN/cu.m., Opt moisture= 6.5 %

ASTM D 4718 Correction Data:
Bulk Specific Gravity of Oversize Material = 2.695
Moisture of oversize material = 0.00 %
ASTM D 4718 Correction Applied to Each Point

MOISTURE-DENSITY TEST DATA

DATA FILE: 212

PROJECT DATA

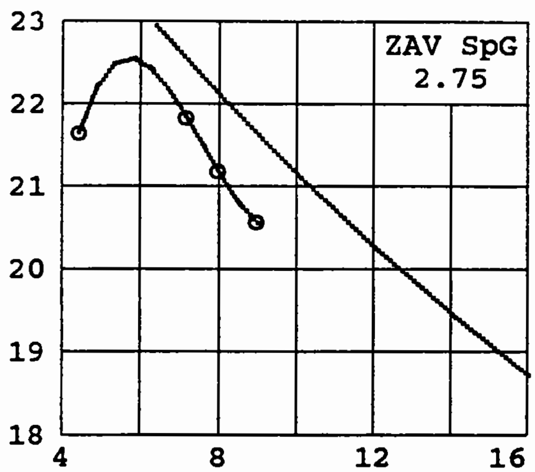
Date: 3/24/96
Project no.: 1377A-L200
Project: CARMACKS COPPER PROJECT
Location 1: TR96-12-1
2: FINE GRAINED SOIL
Remarks 1:
2:
3:
Material 1: silty/clayey SAND
description 2: some gravel
Elevation or depth:
Fig no:

SPECIMEN DATA

USCS classification: SC-SM
AASHTO classification:
Natural moisture: 8.0%
Specific gravity:
Percent retained on 3/8 in sieve: 10.9
Percent passing No. 200 sieve: 34.9
Liquid limit: 20
Plastic limit: 13
Plasticity index: 7

TEST DATA AND RESULTS

Type of test: Modified, ASTM D 1557-91 Procedure B



POINT NO.	1	2	3	4
WM + WS	13.92	13.82	13.86	14.04
WM	9.15	9.15	9.15	9.15
WW+T #1	352.40	313.60	301.40	278.30
WD+T #1	334.20	296.70	293.30	266.90
TARE #1	129.90	128.20	129.20	124.70
MOIST #1	8.9	10.0	4.9	8.0
MOISTURE	7.9	8.9	4.4	7.1
DRY DEN	21.20	20.58	21.66	21.85

Max dry den= 22.6 kN/cu.m., Opt moisture= 5.7 %

ASTM D 4718 Correction Data:
Bulk Specific Gravity of Oversize Material = 2.728
Moisture of oversize material = 0.000 %
TM D 4718 Correction Applied to Each Point

MOISTURE-DENSITY TEST DATA	DATA FILE: 214

PROJECT DATA

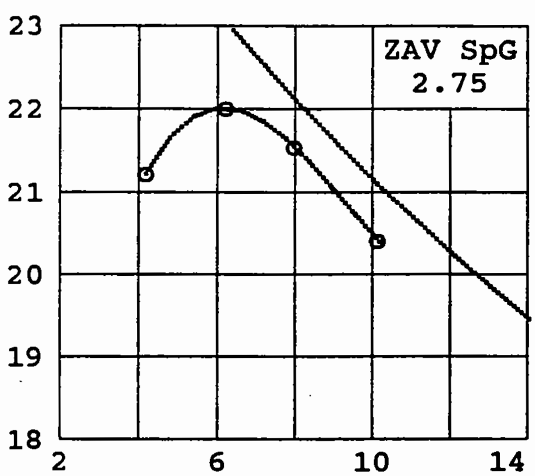
Date: 3/24/96
Project no.: 1377A-L200
Project: CARMACKS COPPER PROJECT
Location 1: TR96-16-1
2: TILL
Remarks 1:
2:
3:
Material 1: clayey SAND w/gravel
description 2:
Elevation or depth:
Fig no:

SPECIMEN DATA

USCS classification: SC   AASHTO classification:
Natural moisture: 14.1   Specific gravity:
Percent retained on 3/8 in sieve: 12.5
Percent passing No. 200 sieve: 39.5
Liquid limit: 25   Plastic limit: 13   Plasticity index: 12

TEST DATA AND RESULTS

Type of test: Modified, ASTM D 1557-91 Procedure B



POINT NO.	1	2	3	4
WM + WS	14.00	13.83	13.73	14.03
WM	9.15	9.15	9.15	9.15
WW+T #1	405.80	507.60	365.20	625.90
WD+T #1	381.70	466.90	353.80	592.00
TARE #1	116.70	114.70	113.40	112.60
MOIST #1	9.1	11.6	4.7	7.1
MOISTURE	8.0	10.1	4.1	6.2
DRY DEN	21.55	20.43	21.24	22.03

Max dry den= 22.0 kN/cu.m., Opt moisture= 6.1 %

ASTM D 4718 Correction Data:
Bulk Specific Gravity of Oversize Material = 2.723
Moisture of oversize material = 0.000 %
ASTM D 4718 Correction Applied to Each Point

Knight Piesold LLC

MOISTURE-DENSITY TEST DATA — DATA FILE: 215

PROJECT DATA

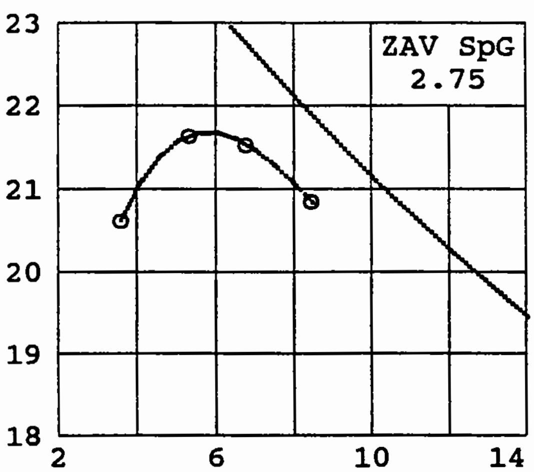
Date: 3/24/96
Project no.: 1377A-L200
Project: CARMACKS COPPER PROJECT
Location 1: TR96-6-2
2: SAND & GRAVEL
Remarks 1:
2:
3:
Material 1: gravely SAND
description 2: slightly silty
Elevation or depth:
Fig no:

SPECIMEN DATA

USCS classification: SW-SM — AASHTO classification:
Natural moisture: 3.2 — Specific gravity:
Percent retained on 3/8 in sieve: 17.5
Percent passing No. 200 sieve: 5.2
Liquid limit: — Plastic limit: — Plasticity index:

TEST DATA AND RESULTS

Type of test: Modified, ASTM D 1557-91 Procedure B



POINT NO.	1	2	3	4
WM + WS	13.51	13.85	13.90	13.81
WM	9.15	9.15	9.15	9.15
WW+T #1	433.00	649.20	1222.80	355.80
WD+T #1	419.80	616.90	1138.90	335.40
TARE #1	114.40	114.50	112.70	135.40
MOIST #1	4.3	6.4	8.2	10.2
MOISTURE	3.6	5.3	6.7	8.4
DRY DEN	20.64	21.65	21.55	20.88

Max dry den= 21.7 kN/cu.m., Opt moisture= 5.8 %

ASTM D 4718 Correction Data:
Bulk Specific Gravity of Oversize Material = 2.714
Moisture of oversize material = 0.000 %
ASTM D 4718 Correction Applied to Each Point

MOISTURE-DENSITY TEST DATA

DATA FILE: 216

PROJECT DATA

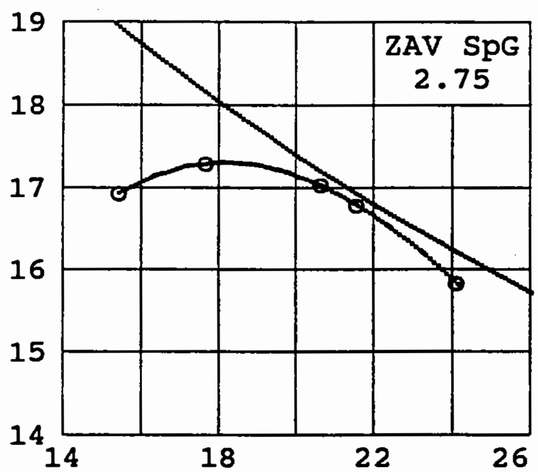
Date: 3/24/96
Project no.: 1377A-L200
Project: CARMACKS COPPER PROJECT
Location 1: TR96-11-3
2: FINE GRAINED SOIL
Remarks 1:
2:
3:
Material description 1: sandy, gravelly CLAY
description 2:
Elevation or depth:
Fig no:

SPECIMEN DATA

USCS classification: CH
AASHTO classification:
Natural moisture: 27.6
Specific gravity:
Percent retained on 3/8 in sieve: 6.0
Percent passing No. 200 sieve: 77.5
Liquid limit: 59
Plastic limit: 17
Plasticity index: 42

TEST DATA AND RESULTS

Type of test: Modified, ASTM D 1557-91 Procedure B



POINT NO.	1	2	3	4	5
WM + WS	13.43	13.46	13.42	13.27	13.24
WM	9.15	9.15	9.15	9.15	9.15
WW+T #1	311.70	231.20	226.50	243.00	292.30
WD+T #1	275.20	206.00	205.30	212.20	267.40
TARE #1	115.90	91.10	92.30	91.90	115.40
MOIST #1	22.9	21.9	18.8	25.6	16.4
MOISTURE	21.5	20.6	17.6	24.1	15.4
DRY DEN	16.80	17.05	17.31	15.86	16.95

Max dry den= 17.3 kN/cu.m., Opt moisture= 18.1 %

ASTM D 4718 Correction Data:
Bulk Specific Gravity of Oversize Material = 2.674
Moisture of oversize material = 0.000 %
ASTM D 4718 Correction Applied to Each Point

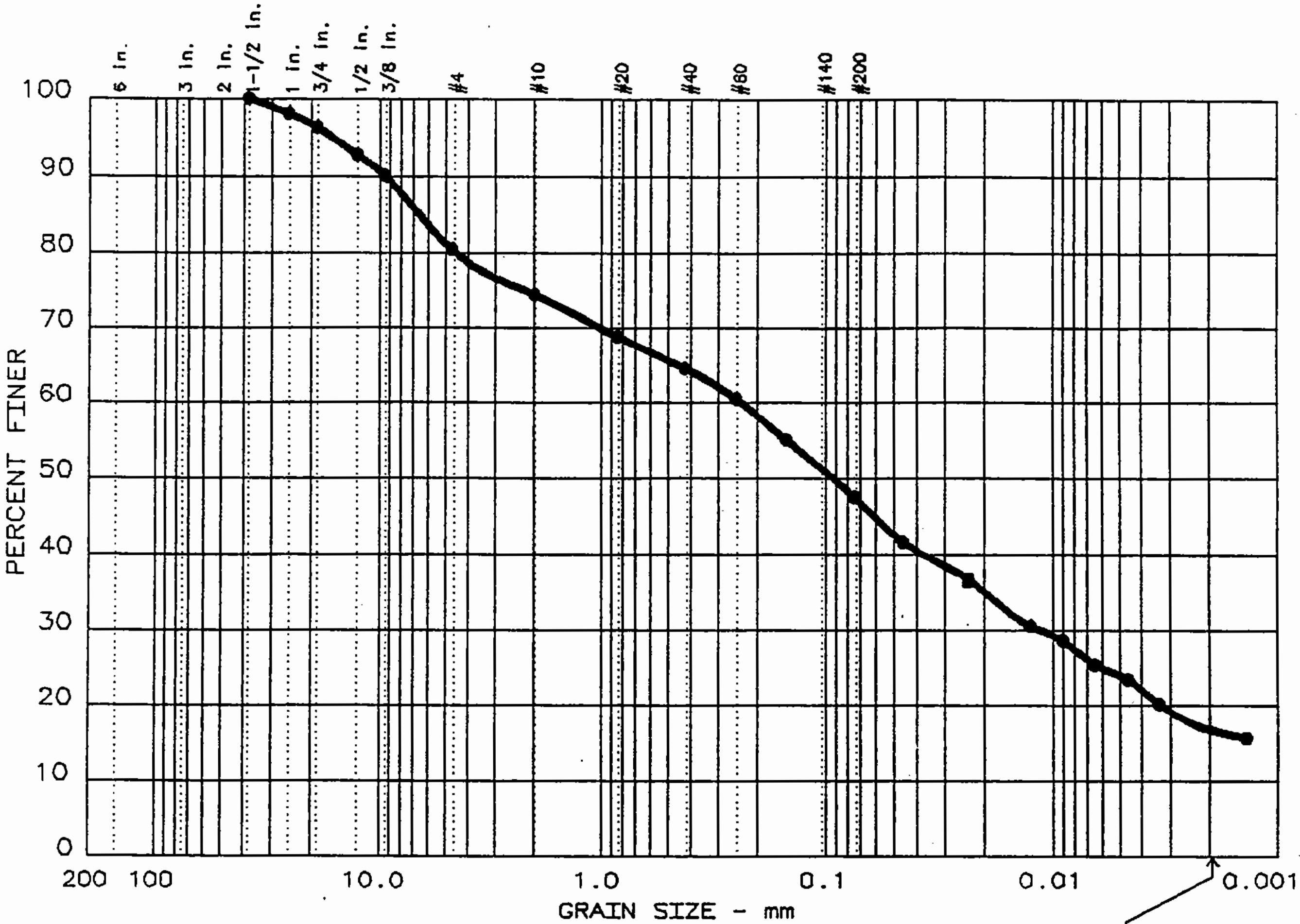
Grain Size Distribution

Test Data

ASTM D 422

Knight Piésold LLC

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	6	0.0	19.6	32.9	30.8	16.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	26	11	6.53	0.237	0.0923	0.0112				

MATERIAL DESCRIPTION	USCS	AASHTO
● very clayey SAND, some gravel	SC	

Project No.: 1377A
Project: CARMACKS COPPER PROJECT
● Location: TR96-1-2, TILL

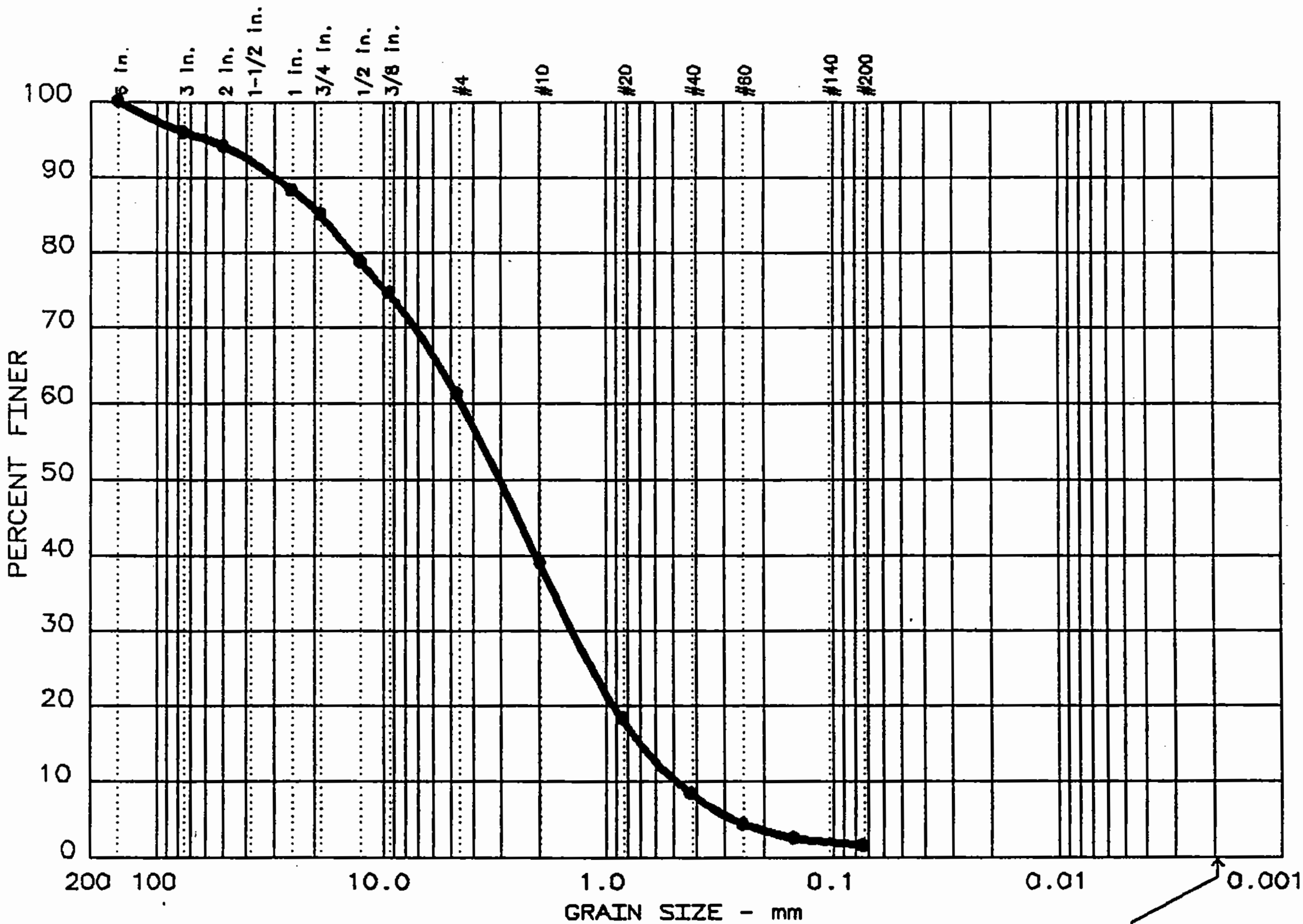
Date: 3/17/96

Remarks:
Natural Moisture Content
18.9%

GRAIN SIZE DISTRIBUTION TEST REPORT
Knight Piesold LLC

Figure No. ______

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	9	4.0	34.7	59.6	1.7	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			18.8	4.47	3.02	1.41	0.699	0.489	0.91	9.1

MATERIAL DESCRIPTION	USCS	AASHTO
● gravelly SAND, trace cobbles	SP	

Project No.: 1377A
Project: CARMACKS COPPER PROJECT
● Location: TR96-3-1, Sand & Gravel

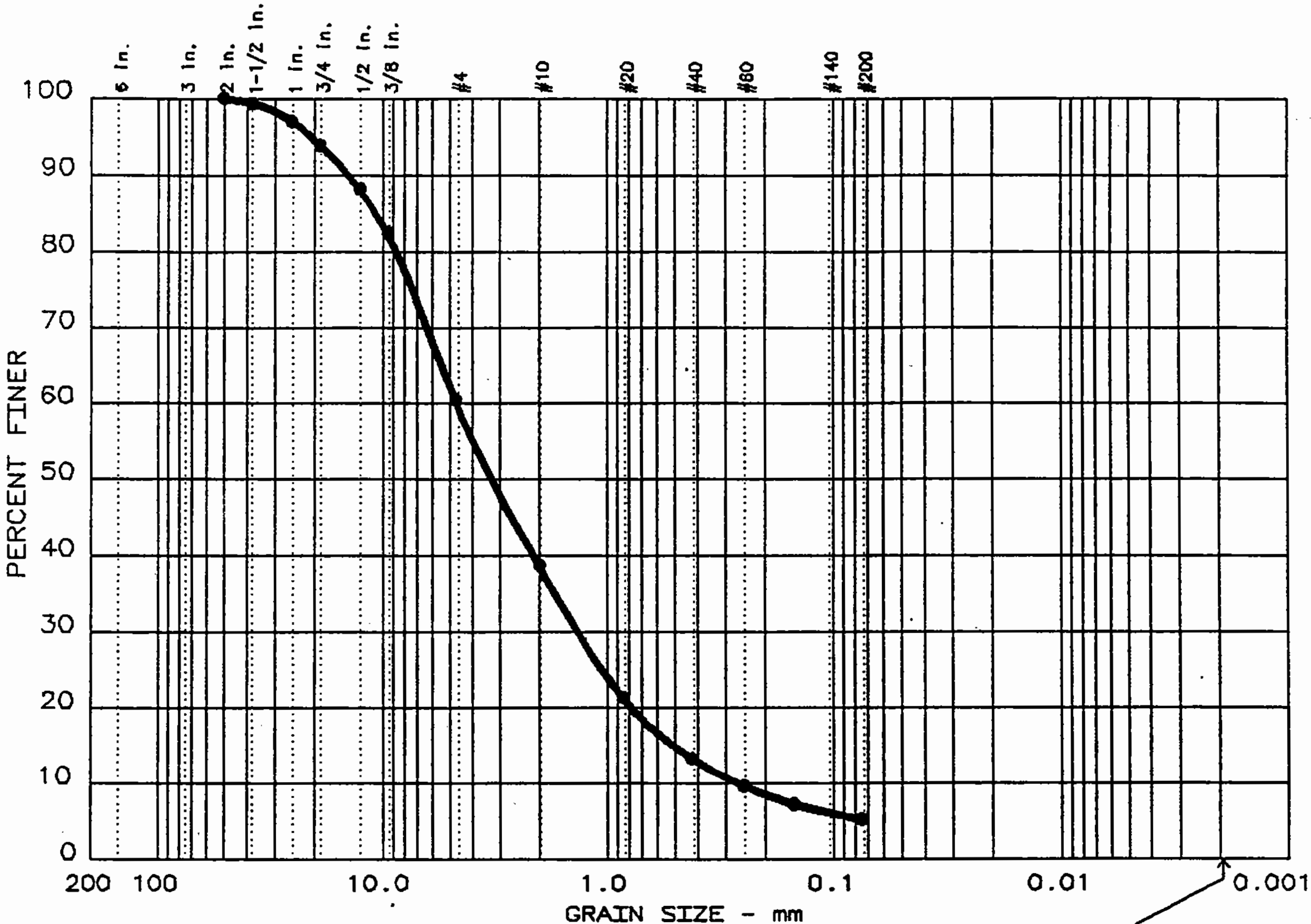
Date: 3/17/96

Remarks:
Natural Moisture Content
3.1%

GRAIN SIZE DISTRIBUTION TEST REPORT
Knight Piesold LLC

Figure No. ______

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	8	0.0	39.5	55.3	5.2	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			10.6	4.68	3.26	1.34	0.516	0.265	1.46	17.7

MATERIAL DESCRIPTION	USCS	AASHTO
● gravelly SAND, slightly silty	SW-SM	

Project No.: 1377A
Project: CARMACKS COPPER PROJECT
● Location: TR96-6-2, Sand & Gravel

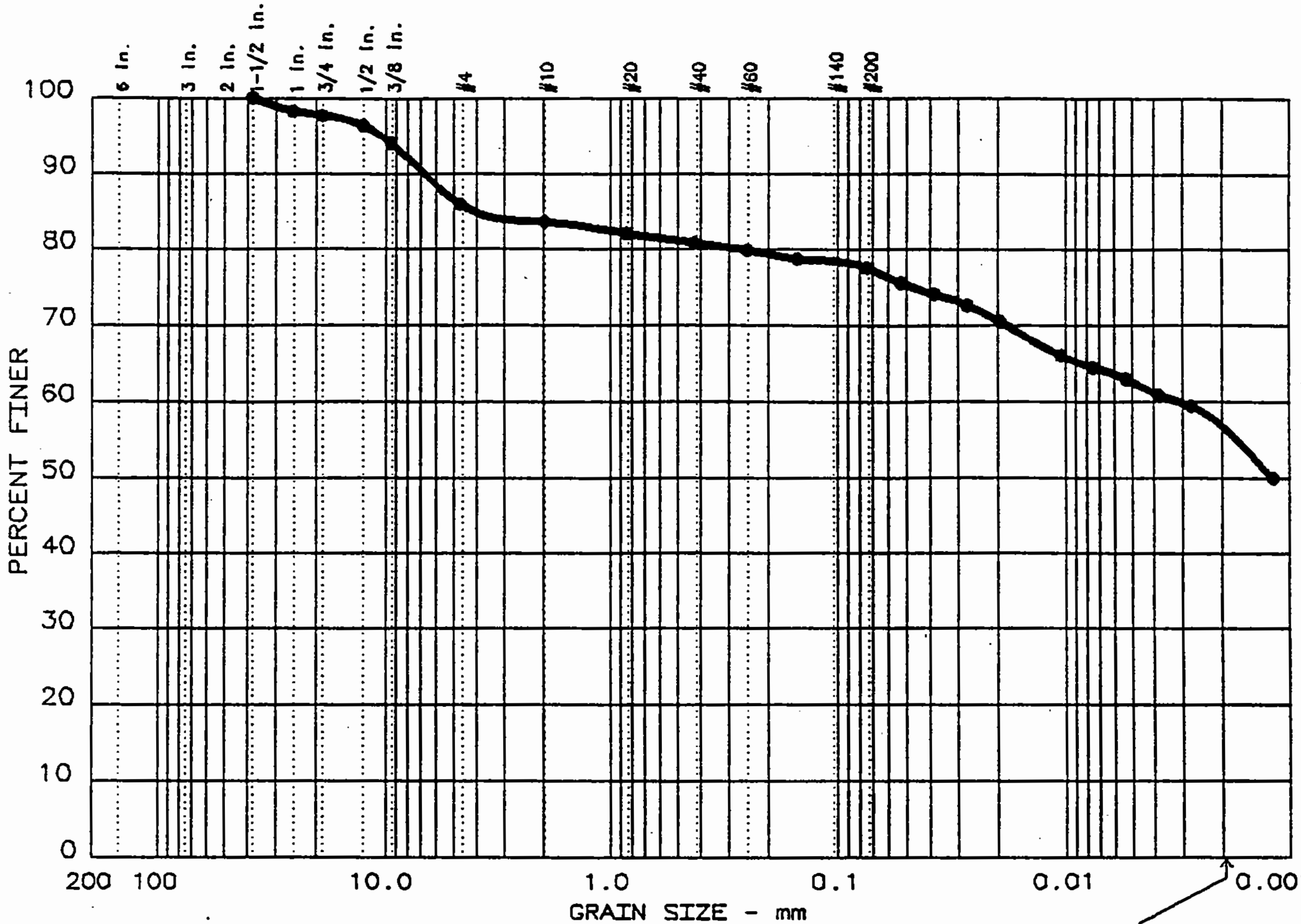
Date: 3/17/96

GRAIN SIZE DISTRIBUTION TEST REPORT
Knight Piesold LLC

Remarks:
Natural Moisture Content
3.2%

Figure No. ______

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	3	0.0	14.2	8.3	20.8	56.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	59	42	4.22		0.0012					

MATERIAL DESCRIPTION	USCS	AASHTO
● sandy, gravelly CLAY	CH	

Project No.: 1377A
Project: CARMACKS COPPER PROJECT
● Location: TR96-11-3, FINE GRAINED SOIL

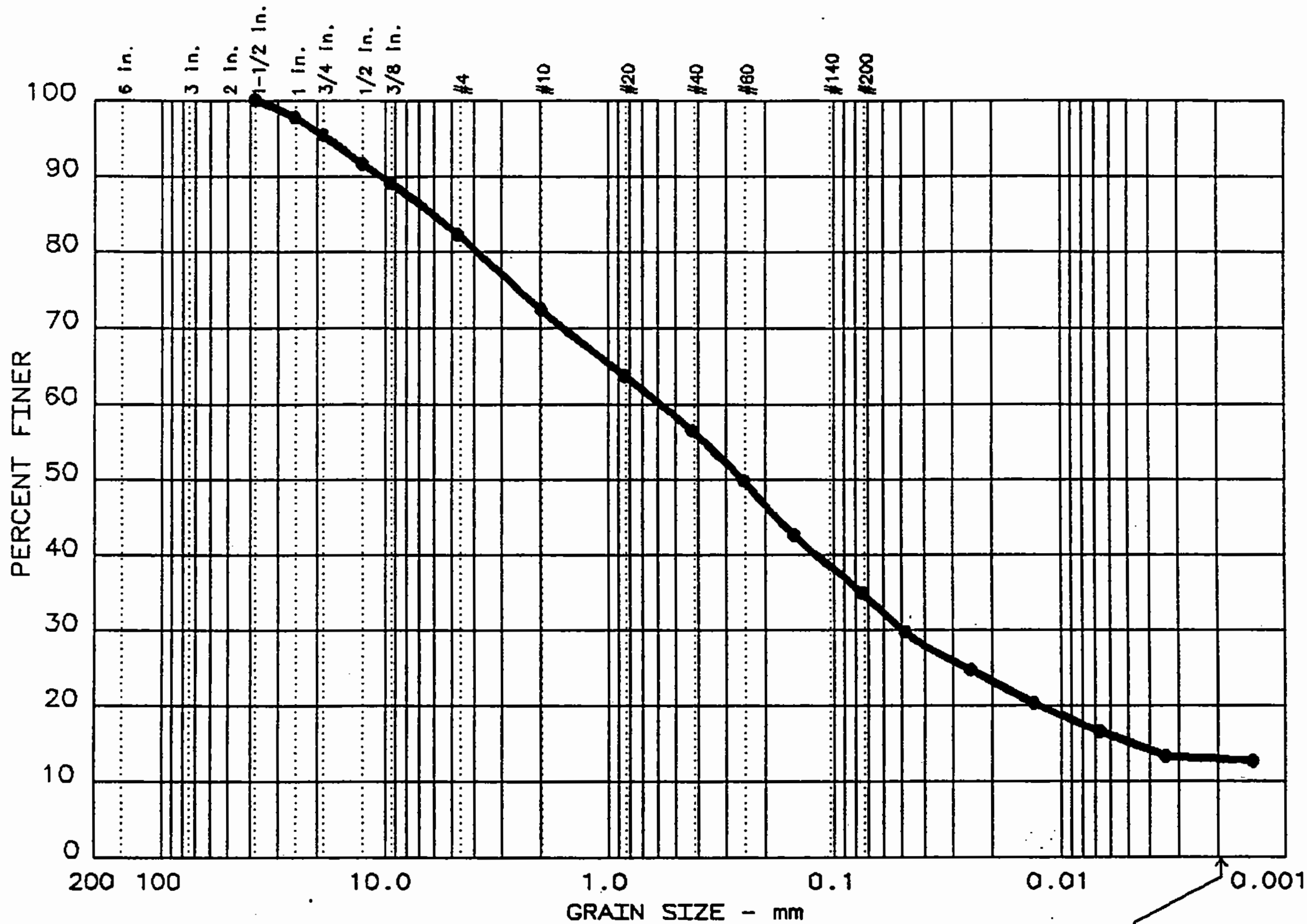
Date: 3/17/96

Remarks:
Natural Moisture Content
27.6%

GRAIN SIZE DISTRIBUTION TEST REPORT
Knight Piesold LLC

Figure No. ______

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	4	0.0	17.8	47.3	22.0	12.9

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	20	7	6.17	0.589	0.251	0.0495	0.0047			

MATERIAL DESCRIPTION	USCS	AASHTO
● silty/clayey SAND, some gravel	SC-SM	

Project No.: 1377A
Project: CARMACKS COPPER PROJECT
● Location: TR96-12-1, FINE GRAINED SOIL

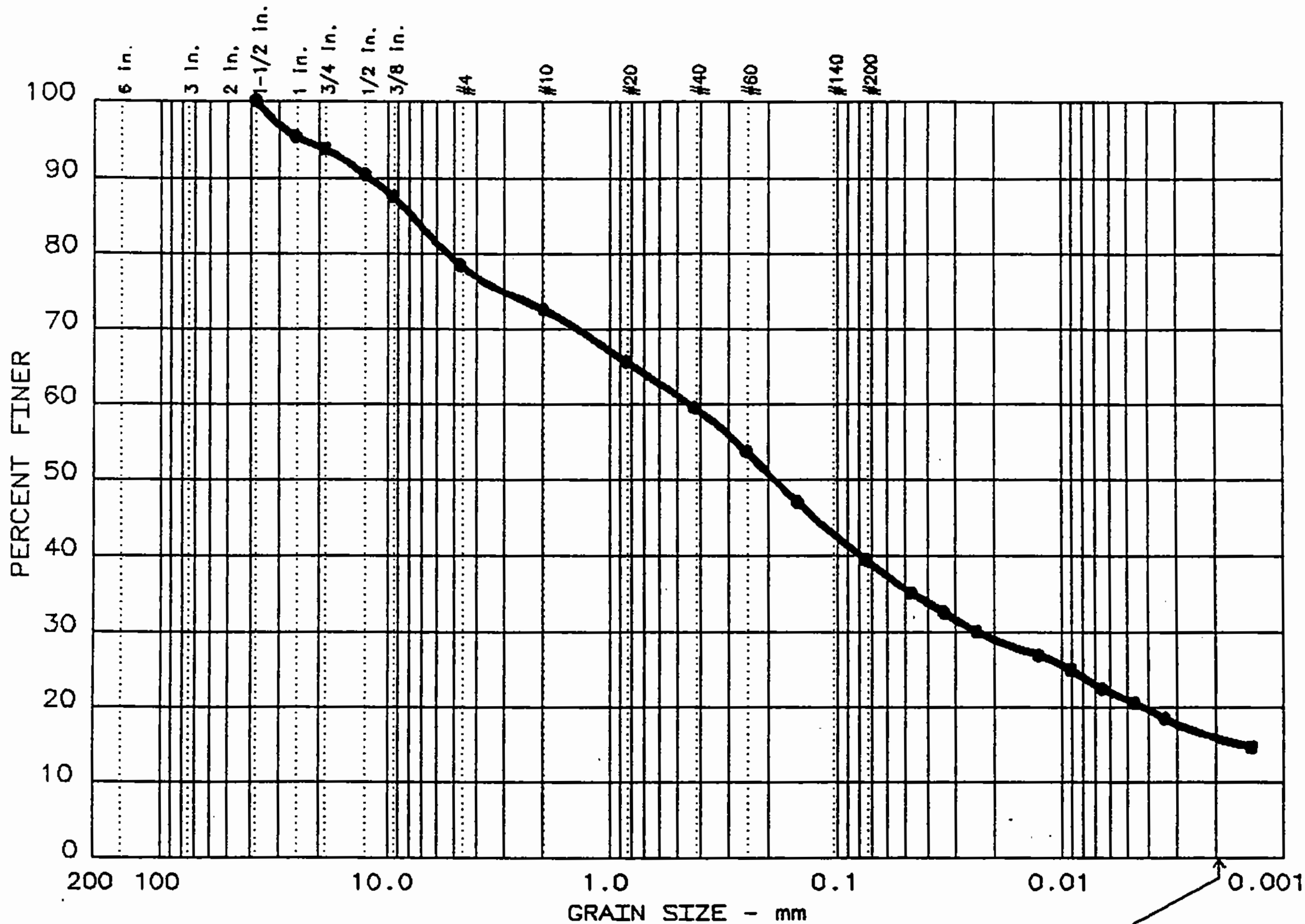
Date: 3/17/96

Remarks:
Natural Moisture Content
8.0%

GRAIN SIZE DISTRIBUTION TEST REPORT
Knight Piesold LLC

Figure No. ______

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	5	0.0	21.6	39.0	23.6	15.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	25	12	7.76	0.447	0.188	0.0240	0.0015			

MATERIAL DESCRIPTION	USCS	AASHTO
● clayey SAND w/gravel	SC	

Project No.: 1377A
Project: CARMACKS COPPER PROJECT
● Location: TR96-16-1, TILL

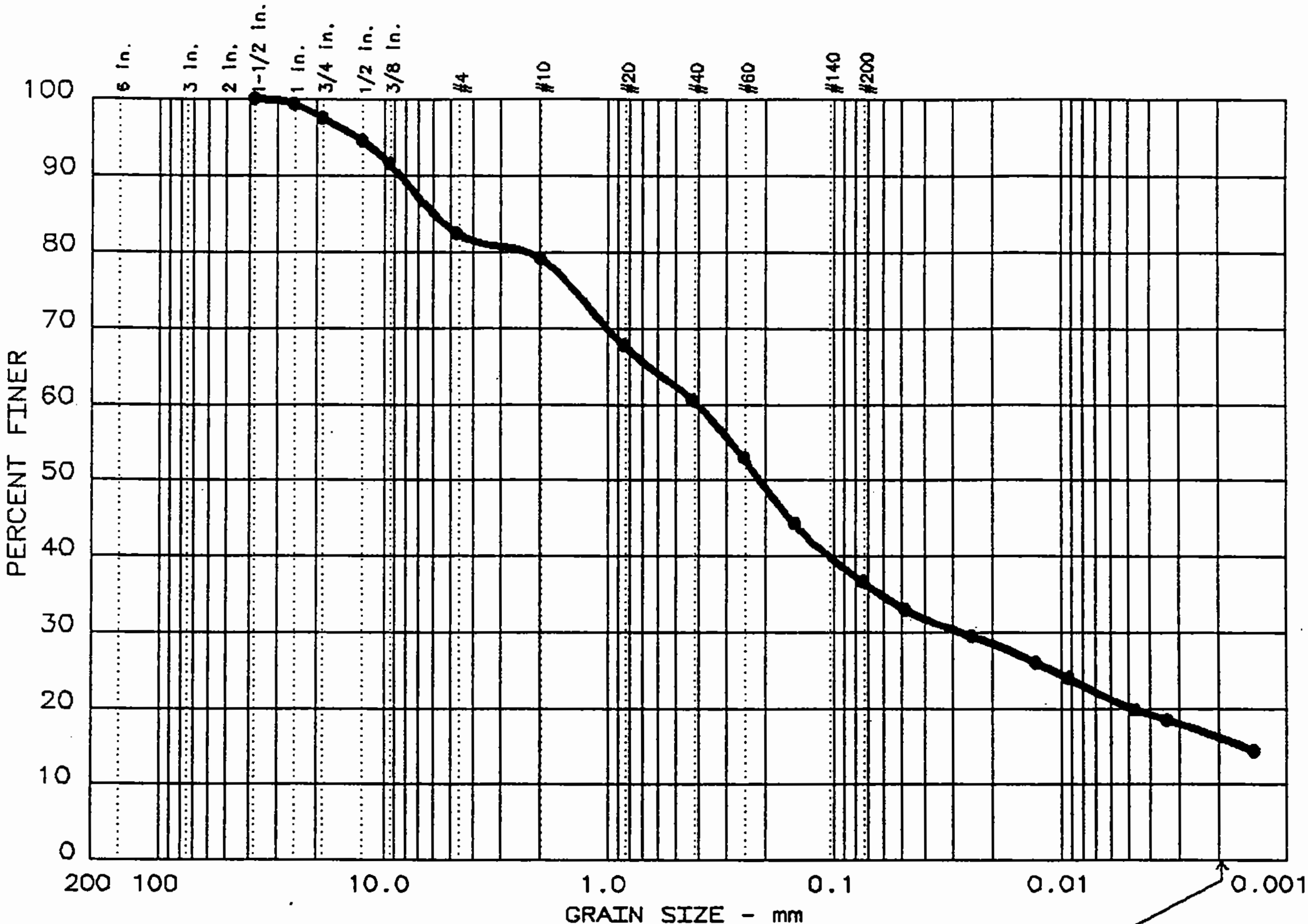
Date: 3/17/96

Remarks:
Natural Moisture Content
14.1%

GRAIN SIZE DISTRIBUTION TEST REPORT
Knight Piesold LLC

Figure No. ______

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	7	0.0	17.6	45.8	20.4	16.2

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	20	8	5.96	0.403	0.211	0.0272	0.0015			

MATERIAL DESCRIPTION	USCS	AASHTO
● clayey SAND, some gravel	SC	

Project No.: 1377A
Project: CARMACKS COPPER PROJECT
● Location: TR96-17, TILL

Date: 3/17/96

Remarks:
Natural Moisture Content
8.4%

GRAIN SIZE DISTRIBUTION TEST REPORT
Knight Piesold LLC

Figure No. ______

GRAIN SIZE DISTRIBUTION TEST DATA Test No.: 6

Date: 3/17/96
Project No.: 1377A
Project: CARMACKS COPPER PROJECT

Sample Data

Location of Sample: TR96-1-2, TILL
Sample Description: very clayey SAND, some gravel
USCS Class: SC Liquid limit: 26
AASHTO Class: Plasticity index: 11

Notes

Remarks: Natural Moisture Content 18.9%

Fig. No.:

Mechanical Analysis Data

	Initial
Dry sample and tare=	37.60
Tare =	0.00
Dry sample weight =	37.60

Sample split on number 4 sieve
Split sample data:
Sample and tare = 616.9 Tare = 117.1 Sample weight = 499.8
Cumulative weight retained tare= 0
Tare for cumulative weight retained= 0

Sieve	Cumul. Wt. retained	Percent finer
1.5 inches	0.00	100.0
1 inches	0.74	98.0
0.75 inches	1.41	96.2
0.5 inches	2.73	92.7
0.375 inches	3.72	90.1
# 4	7.37	80.4
# 10	37.30	74.4
# 20	72.30	68.8
# 40	98.60	64.5
# 60	124.30	60.4
# 100	158.10	55.0
# 200	204.50	47.5

Hydrometer Analysis Data

Separation sieve is number 10
Percent -# 10 based on complete sample= 74.4
Weight of hydrometer sample: 57.96
Calculated biased weight= 77.90
Automatic temperature correction
Composite correction at 20 deg C =-2

Meniscus correction only= 1
Specific gravity of solids= 2.6
Specific gravity correction factor= 1.012
Hydrometer type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.0	18.0	34.5	32.0	0.0142	35.5	10.5	0.0460	41.6
1.0	18.0	34.5	32.0	0.0142	35.5	10.5	0.0460	41.6
4.0	18.0	30.8	28.3	0.0142	31.8	11.1	0.0237	36.7
4.0	18.0	30.5	28.0	0.0142	31.5	11.1	0.0237	36.4
15.0	18.0	26.0	23.5	0.0142	27.0	11.9	0.0126	30.6
30.0	18.0	24.5	22.0	0.0142	25.5	12.1	0.0090	28.6
60.0	18.0	22.0	19.5	0.0142	23.0	12.5	0.0065	25.4
120.0	18.0	20.5	18.0	0.0142	21.5	12.8	0.0046	23.4
234.0	18.0	18.0	15.5	0.0142	19.0	13.2	0.0034	20.2
1445.0	18.0	14.5	12.0	0.0142	15.5	13.8	0.0014	15.6

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0   % GRAVEL = 19.6   % SAND = 32.9
% SILT = 30.8   % CLAY = 16.7

D85= 6.53   D60= 0.237   D50= 0.092
D30= 0.0112

GRAIN SIZE DISTRIBUTION TEST DATA   Test No.: 9

D : 3/17/96
E ,ect No.: 1377A
Project: CARMACKS COPPER PROJECT

Sample Data

Location of Sample: TR96-3-1, Sand & Gravel
Sample Description: gravelly SAND, trace cobbles
USCS Class: SP   Liquid limit:
AASHTO Class: Plasticity index:

Notes

Remarks: Natural Moisture Content 3.1%

Fig. No.:

Mechanical Analysis Data

	Initial
Dry sample and tare=	59.99
Tare =	0.00
Dry sample weight =	59.99

Sa le split on number 4 sieve
S t sample data:
ample and tare = 624.1 Tare = 118.6 Sample weight = 505.5
Cumulative weight retained tare= 0
Tare for cumulative weight retained= 0

Sieve		Cumul. Wt. retained	Percent finer
6	inches	0.00	100.0
3	inches	2.41	96.0
2	inches	3.48	94.2
1	inches	6.99	88.3
1	inches	6.99	88.3
0.75	inches	8.93	85.1
0.5	inches	12.72	78.8
0.375	inches	15.24	74.6
# 4		23.25	61.2
# 10		183.30	39.0
# 20		353.60	18.4
# 40		435.60	8.5
# 60		468.90	4.4
# 100		484.20	2.6
# 200		491.80	1.7

Fractional Components

Gr el/Sand based on #4 sieve

Sand/Fines based on #200 sieve
% + 3 in. = 4.0 % GRAVEL = 34.7 % SAND = 59.6
% FINES = 1.7

ι = 18.84 D60= 4.467 D50= 3.016
D30= 1.4109 D15= 0.69904 D10= 0.48922
Cc = 0.9110 Cu = 9.1306

GRAIN SIZE DISTRIBUTION TEST DATA   Test No.: 3

D : 3/17/96
Project No.: 1377A
Project: CARMACKS COPPER PROJECT

Sample Data

Location of Sample: TR96-11-3, FINE GRAINED SOIL
Sample Description: sandy, gravelly CLAY
USCS Class: CH   Liquid limit: 59
AASHTO Class: Plasticity index: 42

Notes

Remarks: Natural Moisture Content 27.6%

Fig. No.:

Mechanical Analysis Data

	Initial
Dry sample and tare=	24.11
Tare =	0.00
Dry sample weight =	24.11

Sample split on number 4 sieve
Split sample data:
Sample and tare = 637.4 Tare = 118.9 Sample weight = 518.5
Cumulative weight retained tare= 0
Tare for cumulative weight retained= 0

Sieve	Cumul. Wt. retained	Percent finer
1.5 inches	0.00	100.0
1 inches	0.44	98.2
0.75 inches	0.57	97.7
0.5 inches	0.89	96.3
0.375 inches	1.44	94.0
# 4	3.41	85.8
# 10	14.30	83.5
# 20	23.40	82.0
# 40	30.90	80.7
# 60	37.00	79.7
# 100	43.40	78.7
# 200	50.30	77.5

Hydrometer Analysis Data

ration sieve is number 10
.cent -# 10 based on complete sample= 83.5
Weight of hydrometer sample: 58.43
Calculated biased weight= 69.99
Automatic temperature correction
Composite correction at 20 deg C =-2

Meniscus correction only= 1
Specific gravity of solids= 2.6
Specific gravity correction factor= 1.012
Hydrometer type: 152H Effective depth L= 16.294964 - 0.164 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.5	18.7	54.5	52.2	0.0141	55.5	7.2	0.0534	75.4
1.0	18.7	53.5	51.2	0.0141	54.5	7.4	0.0382	74.0
2.0	18.7	52.5	50.2	0.0141	53.5	7.5	0.0273	72.6
4.0	18.7	51.0	48.7	0.0141	52.0	7.8	0.0196	70.4
15.0	18.3	48.0	45.6	0.0142	49.0	8.3	0.0105	65.9
30.0	18.1	47.0	44.6	0.0142	48.0	8.4	0.0075	64.4
60.0	18.0	46.0	43.5	0.0142	47.0	8.6	0.0054	62.9
120.0	18.0	44.5	42.0	0.0142	45.5	8.8	0.0039	60.8
240.0	18.0	43.5	41.0	0.0142	44.5	9.0	0.0028	59.3
1440.0	18.0	37.0	34.5	0.0142	38.0	10.1	0.0012	49.9

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 14.2 % SAND = 8.3
% SILT = 20.8 % CLAY = 56.7

D85= 4.22 D60= 0.003 D50= 0.001

GRAIN SIZE DISTRIBUTION TEST DATA Test No.: 4

ce: 3/17/96
oject No.: 1377A
Project: CARMACKS COPPER PROJECT

Sample Data

Location of Sample: TR96-12-1, FINE GRAINED SOIL
Sample Description: silty/clayey SAND, some gravel
USCS Class: SC-SM Liquid limit: 20
AASHTO Class: Plasticity index: 7

Notes

Remarks: Natural Moisture Content 8.0%

Fig. No.:

Mechanical Analysis Data

		Initial
Dry sample and tare	=	38.68
Tare	=	0.00
Dry sample weight	=	38.68

ple split on number 4 sieve
it sample data:
Sample and tare = 687.1 Tare = 114.5 Sample weight = 572.6
Cumulative weight retained tare= 0
Tare for cumulative weight retained= 0

Sieve		Cumul. Wt. retained	Percent finer
1.5	inches	0.00	100.0
1	inches	0.89	97.7
0.75	inches	1.77	95.4
0.5	inches	3.26	91.6
0.375	inches	4.22	89.1
# 4		6.87	82.2
# 10		68.40	72.4
# 20		128.80	63.7
# 40		179.60	56.4
# 60		225.60	49.8
# 100		276.00	42.6
# 200		329.50	34.9

Hydrometer Analysis Data

aration sieve is number 10
rcent -# 10 based on complete sample= 72.4
Weight of hydrometer sample: 58.18
Calculated biased weight= 80.35
Automatic temperature correction
Composite correction at 20 deg C =-2

Meniscus correction only= 1
Specific gravity of solids= 2.6
Specific gravity correction factor= 1.012
Hydrometer type: 152H Effective depth L= 16.294964 - 0.164 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.0	18.3	26.0	23.6	0.0142	27.0	11.9	0.0488	29.7
1.0	18.3	26.0	23.6	0.0142	27.0	11.9	0.0488	29.7
4.0	18.3	22.0	19.6	0.0142	23.0	12.5	0.0250	24.7
4.0	18.3	22.0	19.6	0.0142	23.0	12.5	0.0250	24.7
15.0	18.5	18.5	16.1	0.0141	19.5	13.1	0.0132	20.3
60.0	18.5	15.5	13.1	0.0141	16.5	13.6	0.0067	16.6
60.0	18.5	15.5	13.1	0.0141	16.5	13.6	0.0067	16.6
240.0	18.0	13.0	10.5	0.0142	14.0	14.0	0.0034	13.3
240.0	18.0	13.0	10.5	0.0142	14.0	14.0	0.0034	13.3
1447.0	18.0	12.5	10.0	0.0142	13.5	14.1	0.0014	12.6

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 17.8 % SAND = 47.3
% SILT = 22.0 % CLAY = 12.9

D85= 6.17 D60= 0.589 D50= 0.251
D30= 0.0495 D15= 0.00473

GRAIN SIZE DISTRIBUTION TEST DATA   Test No.: 5

e: 3/17/96
oject No.: 1377A
Project: CARMACKS COPPER PROJECT

Sample Data

Location of Sample: TR96-16-1, TILL
Sample Description: clayey SAND w/gravel
USCS Class: SC   Liquid limit: 25
AASHTO Class: Plasticity index: 12

Notes

Remarks: Natural Moisture Content 14.1%

Fig. No.:

Mechanical Analysis Data

	Initial
Dry sample and tare=	35.69
Tare =	0.00
Drv sample weight =	35.69

ple split on number 4 sieve
it sample data:
Sample and tare = 644.7 Tare = 114.4 Sample weight = 530.3
Cumulative weight retained tare= 0
Tare for cumulative weight retained= 0

Sieve		Cumul. Wt. retained	Percent finer
1.5	inches	0.00	100.0
1	inches	1.69	95.3
0.75	inches	2.23	93.8
0.5	inches	3.44	90.4
0.375	inches	4.45	87.5
# 4		7.70	78.4
# 10		39.40	72.6
# 20		86.60	65.6
# 40		128.00	59.5
# 60		167.50	53.7
# 100		212.40	47.0
# 200		263.50	39.5

Hydrometer Analysis Data

paration sieve is number 10
..rcent -# 10 based on complete sample= 72.6
Weight of hydrometer sample: 57.9
Calculated biased weight= 79.74
Automatic temperature correction
Composite correction at 20 deg C =-2

Meniscus correction only= 1
Specific gravity of solids= 2.6
Specific gravity correction factor= 1.012
Hydrometer type: 152H Effective depth L= 16.294964 - 0.164 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.0	18.7	30.0	27.7	0.0141	31.0	11.2	0.0472	35.1
1.0	18.7	30.0	27.7	0.0141	31.0	11.2	0.0472	35.1
2.0	18.7	28.0	25.7	0.0141	29.0	11.5	0.0338	32.6
4.0	18.7	26.0	23.7	0.0141	27.0	11.9	0.0243	30.1
15.0	18.7	23.5	21.2	0.0141	24.5	12.3	0.0127	26.9
30.0	18.7	22.0	19.7	0.0141	23.0	12.5	0.0091	25.0
60.0	18.7	20.0	17.7	0.0141	21.0	12.9	0.0065	22.4
120.0	18.7	18.5	16.2	0.0141	19.5	13.1	0.0047	20.5
232.0	18.0	17.0	14.5	0.0142	18.0	13.3	0.0034	18.5
1440.0	18.0	14.0	11.5	0.0142	15.0	13.8	0.0014	14.6

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. = 0.0 % GRAVEL = 21.6 % SAND = 39.0
% SILT = 23.6 % CLAY = 15.8

D85= 7.76 D60= 0.447 D50= 0.188
D30= 0.0240 D15= 0.00151

GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 7

..e: 3/17/96
..oject No.: 1377A
Project: CARMACKS COPPER PROJECT

Sample Data

Location of Sample: TR96-17, TILL
Sample Description: clayey SAND, some gravel
USCS Class: SC — Liquid limit: 20
AASHTO Class: — Plasticity index: 8

Notes

Remarks: Natural Moisture Content 8.4%

Fig. No.:

Mechanical Analysis Data

	Initial
Dry sample and tare =	33.63
Tare =	0.00
Drv sample weight =	33.63

..ple split on number 4 sieve
..it sample data:
Sample and tare = 627.1 Tare = 113 Sample weight = 514.1
Cumulative weight retained tare= 0
Tare for cumulative weight retained= 0

Sieve		Cumul. Wt. retained	Percent finer
1.5	inches	0.00	100.0
1	inches	0.23	99.3
0.75	inches	0.86	97.4
0.5	inches	1.85	94.5
0.375	inches	2.86	91.5
# 4		5.91	82.4
# 10		20.50	79.1
# 20		91.60	67.7
# 40		136.50	60.5
# 60		184.50	52.8
# 100		237.80	44.3
# 200		285.70	36.6

Hydrometer Analysis Data

aration sieve is number 10
. .rcent -# 10 based on complete sample= 79.1
Weight of hydrometer sample: 58.52
Calculated biased weight= 73.94
Automatic temperature correction
Composite correction at 20 deg C =-2

Meniscus correction only= 1
Specific gravity of solids= 2.6
Specific gravity correction factor= 1.012
Hydrometer type: 152H Effective depth L= 16.294964 - 0.164 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.0	18.0	26.5	24.0	0.0142	27.5	11.8	0.0488	32.9
4.0	18.0	24.0	21.5	0.0142	25.0	12.2	0.0248	29.5
15.0	18.0	21.5	19.0	0.0142	22.5	12.6	0.0130	26.1
30.0	18.0	20.0	17.5	0.0142	21.0	12.9	0.0093	24.0
120.0	18.0	17.0	14.5	0.0142	18.0	13.3	0.0047	19.9
236.0	18.0	16.0	13.5	0.0142	17.0	13.5	0.0034	18.5
1440.0	18.0	13.0	10.5	0.0142	14.0	14.0	0.0014	14.4

Fractional Components

Gravel/Sand based on #4 sieve
f d/Fines based on #200 sieve
3 in. = 0.0 % GRAVEL = 17.6 % SAND = 45.8
% SILT = 20.4 % CLAY = 16.2

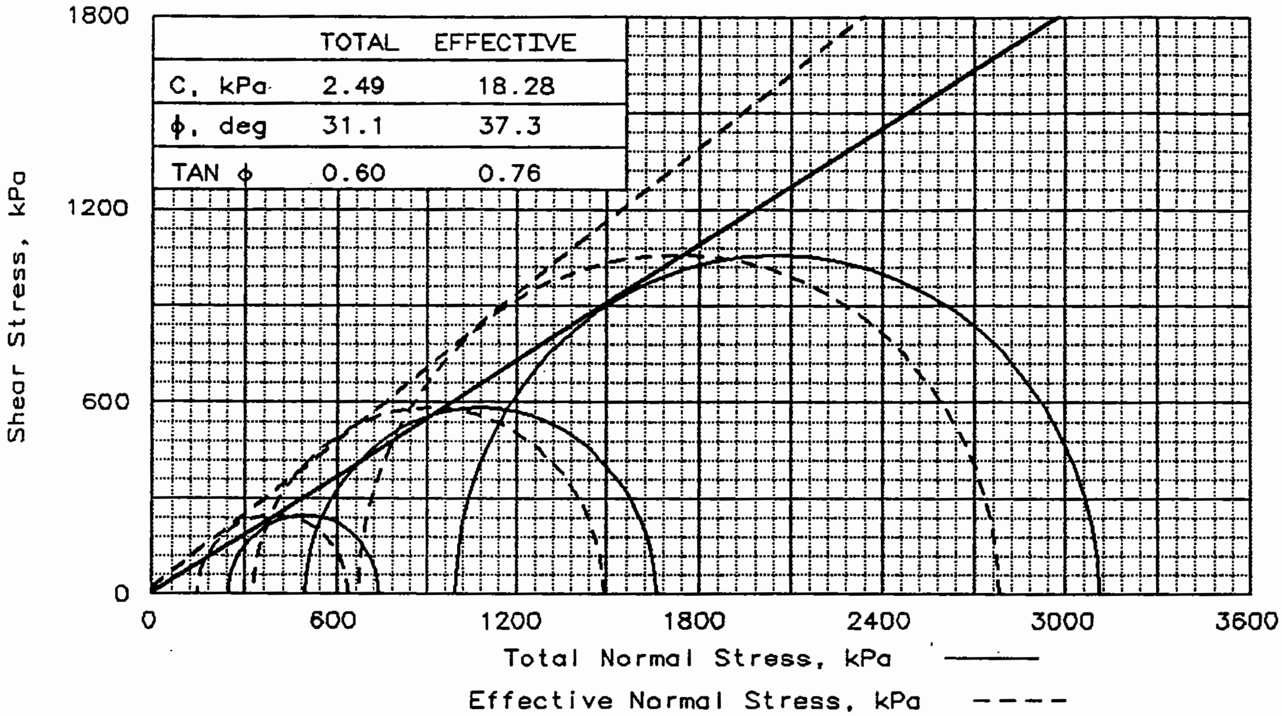
D85= 5.96 D60= 0.403 D50= 0.211
D30= 0.0272 D15= 0.00151

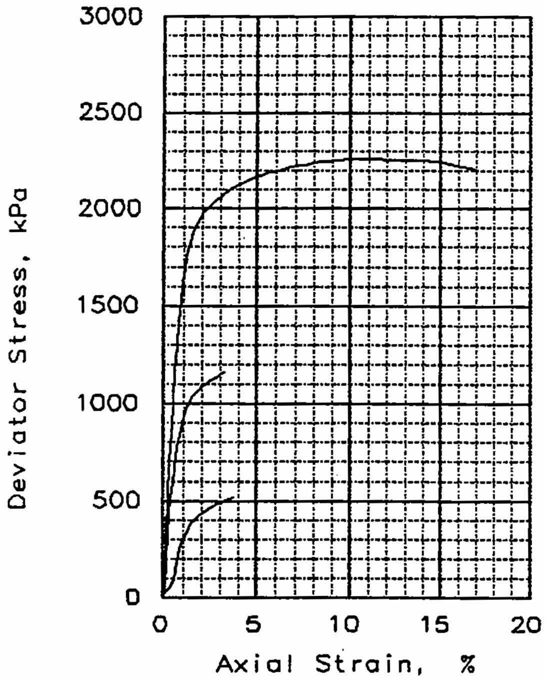
Triaxial Compression

Test Data

Consolidated-Undrained
w/pore pressure measurments

Knight Piésold LLC





SAMPLE NO.:		1	2	3
INITIAL	WATER CONTENT, %	6.7	6.7	6.7
	DRY DENSITY, kN/cu.m	21.23	21.23	21.23
	SATURATION, %	68.9	68.9	68.9
	VOID RATIO	0.267	0.267	0.267
	DIAMETER, cm	7.26	7.26	7.26
	HEIGHT, cm	15.75	15.75	15.75
AT TEST	WATER CONTENT, %	8.7	8.4	8.3
	DRY DENSITY, kN/cu.m	21.73	21.85	21.92
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.238	0.231	0.227
	DIAMETER, cm	7.22	7.30	7.39
	HEIGHT, cm	15.57	15.11	14.73
Strain rate, cm/min		0.0127	0.0102	0.0102
BACK PRESSURE, kPa		372	310	310
CELL PRESSURE, kPa		623	810	1310
FAILURE STRESS, kPa		490	1162	2113
TOTAL PORE PR., kPa		473	479	638
ULTIMATE STRESS, kPa				
TOTAL PORE PR., kPa				
$\bar{\sigma}_1$ FAILURE, kPa		640	1493	2785
$\bar{\sigma}_3$ FAILURE, kPa		150	331	672

TYPE OF TEST:
CU with Pore Pressures

CLIENT:

PROJECT: CARMACKS COPPER PROJECT

SAMPLE LOCATION: TR96-17

PROJ. NO.: 1377A DATE: 4/05/96

TRIAXIAL SHEAR TEST REPORT

Knight Piésold LLC

SAMPLE TYPE: REMOLDED

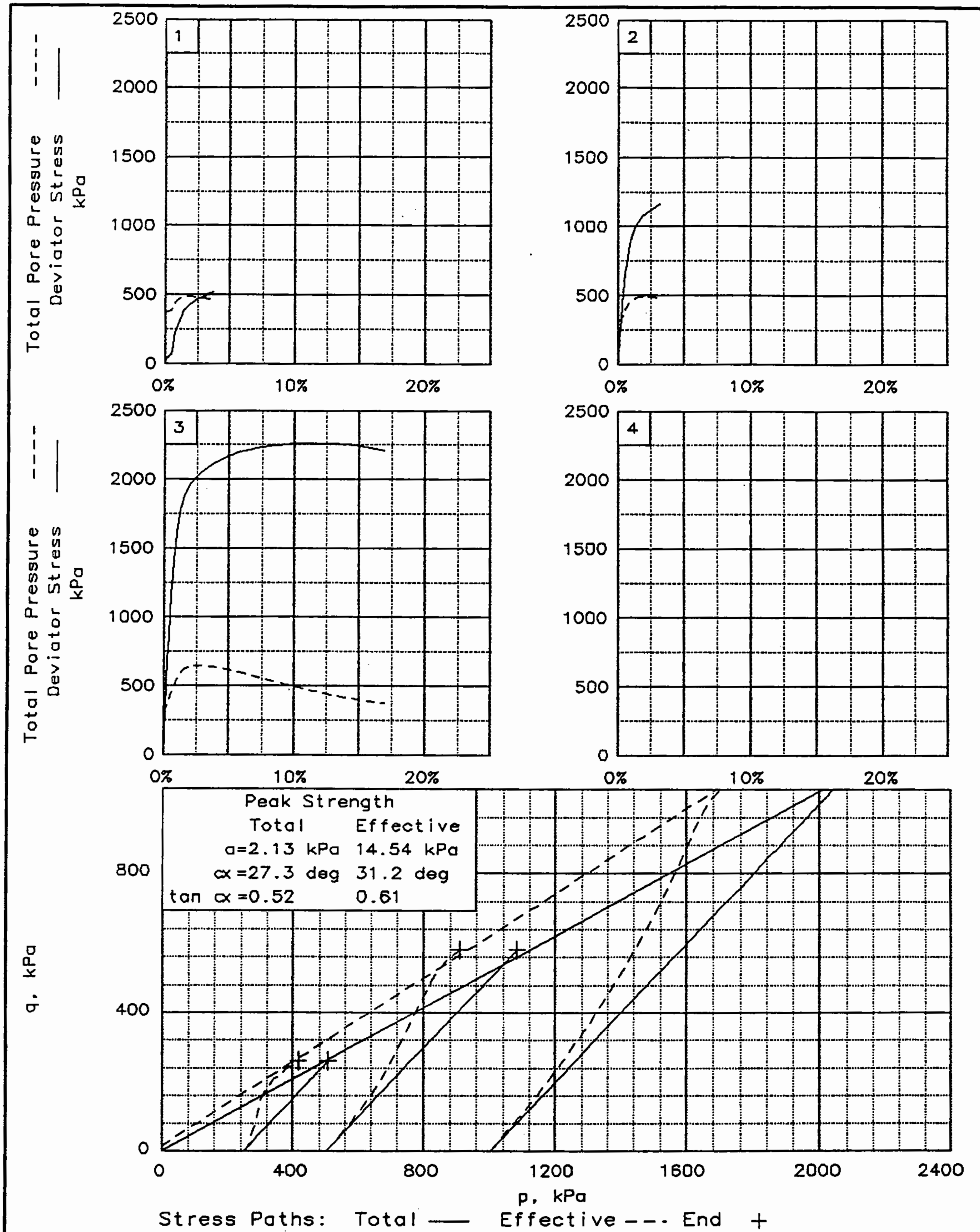
DESCRIPTION: clayey SAND some gravel (SC)

LL= 20 PL= 12 PI= 8

SPECIFIC GRAVITY= 2.743

REMARKS: Failure criteria: Peak principal stress ratio. Specific gravity estimated. Multi-staged test.

Fig. No.: ______



Client:

Project: CARMACKS COPPER PROJECT

Location: TR96-17

File: 1377A-17 Project No.: 1377A Fig. No.: ____

TRIAXIAL COMPRESSION TEST 4-18-1996
CU with Pore Pressures 8:43 am

Project and Sample Data

Date: 4/05/96
Client:
Project: CARMACKS COPPER PROJECT
Sample location: TR96-17
Sample description: clayey SAND some gravel (SC)
Remarks: Failure criteria: Peak principal stress ratio.
Specific gravity estimated. Multi-staged test.
Fig no.: 2nd page Fig no. (if applicable):
Type of sample: REMOLDED
Specific gravity= 2.74 LL= 20 PL= 12 PI= 8
Test method: ASTM - Method A (staged method triaxial test)

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Wt. moist soil and tare:	1505.000			1646.000
Wt. dry soil and tare:	1410.300			1529.200
Wt. of tare:	0.000			118.900
Weight, gms:	1505.0			
Diameter, cm:	7.258	7.258	7.215	
Area, cm²:	41.374	41.374	40.889	
Height, cm:	15.748	15.748	15.568	
Net decrease in height, cm:		0.000	0.180	
Net decrease in water volume, cc:			15.000	
% Moisture:	6.7	9.7	8.7	8.3
Wet density, kN/cu.m:	22.65	23.29	23.61	
Dry density, kN/cu.m:	21.23	21.23	21.73	
Void ratio:	0.2673	0.2673	0.2381	
% Saturation:	68.9	100.0	100.0	

Test Readings Data for Specimen No. 1

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 622.8 kPa
Consolidation back pressure = 372.4 kPa
Consolidation effective confining stress = 250.4 kPa
Strain rate, in/min = 0.0127
FAIL. STRESS = 490.2 kPa at reading no. 24
ULT. STRESS = not selected

Test Readings Data for Specimen No. 1

No.	Def. Dial nits	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Effective Stresses Major kPa	Effective Stresses 1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0000	0.000	15.00	0.0	0.0	0.0	251.1	251.1	1.00	371.7	251.1	0.0
1	0.0050	0.013	38.00	23.0	0.1	25.0	250.4	275.4	1.10	372.4	262.9	12.5
2	0.0100	0.025	47.00	32.0	0.2	34.8	249.0	283.7	1.14	373.8	266.3	17.4
3	0.0150	0.038	53.00	38.0	0.2	41.2	246.9	288.1	1.17	375.9	267.5	20.6
4	0.0200	0.051	57.00	42.0	0.3	45.5	245.6	291.1	1.19	377.2	268.3	22.8
5	0.0250	0.064	65.00	50.0	0.4	54.2	242.1	296.2	1.22	380.7	269.1	27.1
6	0.0300	0.076	74.00	59.0	0.5	63.9	238.7	302.5	1.27	384.1	270.6	31.9
7	0.0350	0.089	98.00	83.0	0.6	89.8	229.4	319.1	1.39	393.4	274.2	44.9
8	0.0400	0.102	143.00	128.0	0.7	138.3	215.2	353.5	1.64	407.6	284.3	69.2
9	0.0450	0.114	187.00	172.0	0.7	185.7	197.3	383.0	1.94	425.5	290.1	92.9
10	0.0500	0.127	218.00	203.0	0.8	219.0	184.2	403.2	2.19	438.6	293.7	109.5
11	0.0600	0.152	269.00	254.0	1.0	273.6	163.5	437.1	2.67	459.3	300.3	136.8
12	0.0700	0.178	303.00	288.0	1.1	309.7	152.5	462.2	3.03	470.3	307.3	154.9
13	0.0830	0.211	345.00	330.0	1.4	354.1	143.5	497.6	3.47	479.3	320.5	177.1
14	0.0900	0.229	368.00	353.0	1.5	378.4	140.7	519.0	3.69	482.1	329.8	189.2
15	0.1000	0.254	387.00	372.0	1.6	398.1	138.7	536.7	3.87	484.1	337.7	199.0
16	0.1100	0.279	401.00	386.0	1.8	412.4	138.0	550.3	3.99	484.8	344.2	206.2
17	0.1200	0.305	414.00	399.0	2.0	425.6	138.0	563.5	4.08	484.8	350.7	212.8
18	0.1300	0.330	427.00	412.0	2.1	438.7	138.7	577.4	4.16	484.1	358.0	219.3
19	0.1400	0.356	435.00	420.0	2.3	446.5	140.0	586.4	4.19	482.8	363.2	223.2
20	0.1500	0.381	446.00	431.0	2.4	457.4	141.4	598.8	4.24	481.4	370.1	228.7
21	0.1650	0.419	460.00	445.0	2.7	471.1	144.9	615.9	4.25	477.9	380.4	235.5
22	0.1700	0.432	465.00	450.0	2.8	476.0	145.6	621.5	4.27	477.2	383.5	238.0
[illegible]	0.1850	0.470	477.00	462.0	3.0	487.4	149.0	636.4	4.27	473.8	392.7	243.7
[illegible]	0.1900	0.483	480.00	465.0	3.1	490.2	149.7	639.8	4.28	473.1	394.7	245.1
[illegible]	0.2000	0.508	488.00	473.0	3.3	497.8	152.5	650.2	4.26	470.3	401.3	248.9
26	0.2100	0.533	495.00	480.0	3.4	504.3	154.5	658.7	4.26	468.3	406.6	252.1
27	0.2200	0.559	503.00	488.0	3.6	511.8	157.3	669.1	4.25	465.5	413.2	255.9
28	0.2300	0.584	510.00	495.0	3.8	518.3	159.4	677.6	4.25	463.4	418.5	259.1

Specimen Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
. moist soil and tare:	1505.000			1646.000
Wt. dry soil and tare:	1410.300			1529.200
Wt. of tare:	0.000			118.900
Weight, gms:	1505.0			
Diameter, cm:	7.258		7.305	
Area, cm²:	41.374		41.909	
Height, cm:	15.748		15.105	
Net decrease in height, cm:		0.765	-0.122	
Net decrease in water volume, cc:			3.500	
% Moisture:	6.7		8.4	8.3
Wet density, kN/cu.m:	22.65		23.69	
Dry density, kN/cu.m:	21.23		21.85	
Void ratio:	0.2673		0.2313	
% Saturation:	68.9		100.0	

Test Readings Data for Specimen No. 2

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 810.3 kPa
Consolidation back pressure = 310.3 kPa
Consolidation effective confining stress = 500.0 kPa
St-ain rate, in/min = 0.0102
F . STRESS = 1162.1 kPa at reading no. 24
L . STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0050	0.000	18.00	0.0	0.0	0.0	503.4	503.4	1.00	306.9	503.4	0.0
1	0.0100	0.013	59.00	41.0	0.1	43.5	504.1	547.6	1.09	306.2	525.8	21.7
2	0.0150	0.025	209.00	191.0	0.2	202.4	494.4	696.8	1.41	315.9	595.6	101.2
3	0.0200	0.038	330.00	312.0	0.3	330.3	480.0	810.3	1.69	330.3	645.2	165.2
4	0.0250	0.051	424.00	406.0	0.3	429.5	464.1	893.6	1.93	346.2	678.8	214.7
5	0.0300	0.064	508.00	490.0	0.4	517.9	445.5	963.4	2.16	364.8	704.4	258.9
6	0.0350	0.076	577.00	559.0	0.5	590.3	428.9	1019.2	2.38	381.4	724.1	295.2
7	0.0400	0.089	648.00	630.0	0.6	664.7	410.3	1075.0	2.62	400.0	742.7	332.4
8	0.0450	0.102	705.00	687.0	0.7	724.3	395.8	1120.1	2.83	414.5	757.9	362.1
9	0.0500	0.114	756.00	738.0	0.8	777.4	382.0	1159.4	3.04	428.3	770.7	388.7
10	0.0600	0.140	843.00	825.0	0.9	867.6	361.3	1228.9	3.40	449.0	795.1	433.8
11	0.0700	0.165	910.00	892.0	1.1	936.4	344.8	1281.2	3.72	465.5	813.0	468.2
12	0.0800	0.191	952.00	934.0	1.3	978.8	335.1	1313.9	3.92	475.2	824.5	489.4
13	0.0900	0.216	986.00	968.0	1.4	1012.7	328.9	1341.6	4.08	481.4	835.3	506.4
14	0.1000	0.241	1012.00	994.0	1.6	1038.2	325.5	1363.7	4.19	484.8	844.6	519.1
15	0.1120	0.272	1038.00	1020.0	1.8	1063.1	322.7	1385.8	4.29	487.6	854.3	531.6
16	0.1200	0.292	1052.00	1034.0	1.9	1076.3	322.0	1398.3	4.34	488.3	860.1	538.1
17	0.1300	0.318	1068.00	1050.0	2.1	1091.0	321.3	1412.3	4.40	489.0	866.8	545.5
18	[illegible]00	0.343	1080.00	1062.0	2.3	1101.6	322.0	1423.6	4.42	488.3	872.8	550.8
1	[illegible]500	0.368	1095.00	1077.0	2.4	1115.3	322.7	1438.0	4.46	487.6	880.3	557.6
20	0.1650	0.406	1111.00	1093.0	2.7	1128.9	324.8	1453.7	4.48	485.5	889.2	564.4
21	0.1740	0.429	1120.00	1102.0	2.8	1136.4	325.5	1461.9	4.49	484.8	893.7	568.2
22	0.1820	0.450	1130.00	1112.0	3.0	1145.1	327.5	1472.6	4.50	482.8	900.1	572.6

Test Readings Data for Specimen No. 2

No.	Def. Dial 'nits	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Effective Stresses Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
23	0.1900	0.470	1138.00	1120.0	3.1	1151.8	328.9	1480.7	4.50	481.4	904.8	575.9
24	0.2000	0.495	1150.00	1132.0	3.3	1162.1	331.0	1493.1	4.51	479.3	912.1	581.1

Specimen Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
. moist soil and tare:	1505.000			1646.000
Wt. dry soil and tare:	1410.300			1529.200
Wt. of tare:	0.000			118.900
Weight, gms:	1505.0			
Diameter, cm:	7.258		7.385	
Area, cm²:	41.374		42.836	
Height, cm:	15.748		14.730	
Net decrease in height, cm:		1.138	-0.119	
Net decrease in water volume, cc:			2.100	
% Moisture:	6.7		8.3	8.3
Wet density, kN/cu.m:	22.65		23.74	
Dry density, kN/cu.m:	21.23		21.92	
Void ratio:	0.2673		0.2272	
% Saturation:	68.9		100.0	

Test Readings Data for Specimen No. 3

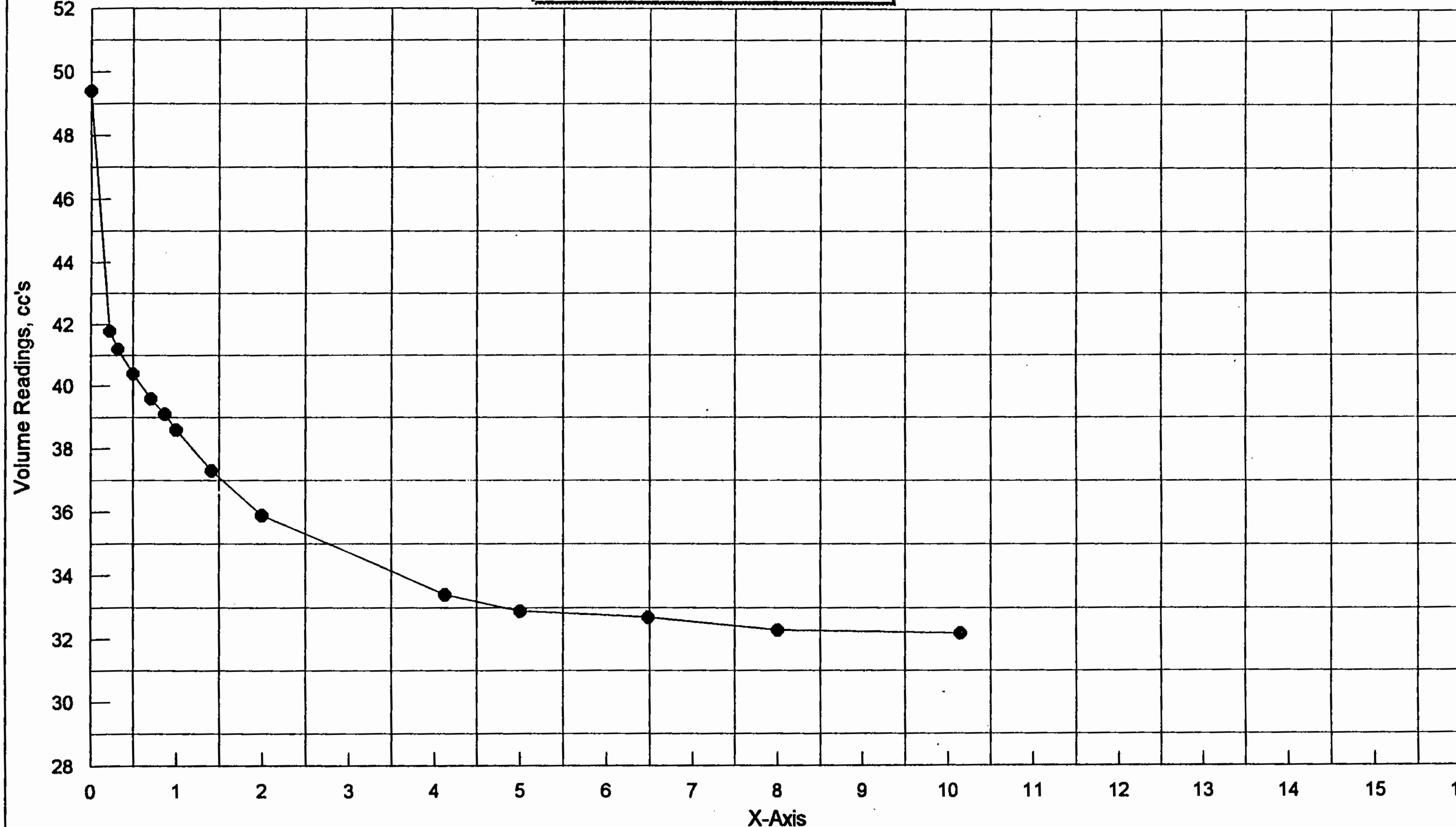
Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 1310.3 kPa
Consolidation back pressure = 310.3 kPa
Consolidation effective confining stress = 1000.0 kPa
S in rate, in/min = 0.0102
. STRESS = 2112.6 kPa at reading no. 25
..T. STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0000	0.000	36.00	0.0	0.0	0.0	1002.7	1002.7	1.00	307.6	1002.7	0.0
1	0.0060	0.015	175.00	139.0	0.1	144.2	997.2	1141.4	1.14	313.1	1069.3	72.1
2	0.0090	0.023	351.00	315.0	0.2	326.6	984.8	1311.4	1.33	325.5	1148.1	163.3
3	0.0140	0.036	538.00	502.0	0.2	520.0	965.5	1485.5	1.54	344.8	1225.5	260.0
4	0.0190	0.048	706.00	670.0	0.3	693.5	944.1	1637.6	1.73	366.2	1290.8	346.7
5	0.0250	0.064	870.00	834.0	0.4	862.3	917.9	1780.2	1.94	392.4	1349.1	431.2
6	0.0310	0.079	1018.00	982.0	0.5	1014.3	892.4	1906.7	2.14	417.9	1399.5	507.1
7	0.0360	0.091	1160.00	1124.0	0.6	1159.9	864.8	2024.7	2.34	445.5	1444.8	580.0
8	0.0420	0.107	1289.00	1253.0	0.7	1291.7	837.9	2129.6	2.54	472.4	1483.8	645.9
9	0.0480	0.122	1412.00	1376.0	0.8	1417.1	811.0	2228.1	2.75	499.3	1519.5	708.5
10	0.0550	0.140	1514.00	1478.0	0.9	1520.2	786.2	2306.4	2.93	524.1	1546.3	760.1
11	0.0600	0.152	1606.00	1570.0	1.0	1613.5	763.4	2376.9	3.11	546.9	1570.1	806.7
12	0.0670	0.170	1682.00	1646.0	1.2	1689.5	744.1	2433.6	3.27	566.2	1588.9	844.8
13	0.0730	0.185	1745.00	1709.0	1.3	1752.3	726.9	2479.2	3.41	583.4	1603.1	876.2
14	0.0800	0.203	1794.00	1758.0	1.4	1800.4	713.1	2513.5	3.52	597.2	1613.3	900.2
15	0.0930	0.236	1873.00	1837.0	1.6	1877.0	693.7	2570.7	3.71	616.6	1632.2	938.5
16	0.1070	0.272	1928.00	1892.0	1.8	1928.5	680.6	2609.1	3.83	629.7	1644.8	964.2
17	1130	0.287	1950.00	1914.0	1.9	1948.8	676.5	2625.3	3.88	633.8	1650.9	974.4
	1200	0.305	1970.00	1934.0	2.1	1966.8	673.1	2639.9	3.92	637.2	1656.5	983.4
	.1270	0.323	1988.00	1952.0	2.2	1982.6	670.3	2652.9	3.96	640.0	1661.6	991.3
20	0.1410	0.358	2018.00	1982.0	2.4	2008.1	666.9	2675.0	4.01	643.4	1671.0	1004.1
21	0.1470	0.373	2030.00	1994.0	2.5	2018.1	666.2	2684.3	4.03	644.1	1675.3	1009.1
22	0.1610	0.409	2057.00	2021.0	2.8	2040.4	665.5	2705.9	4.07	644.8	1685.7	1020.2

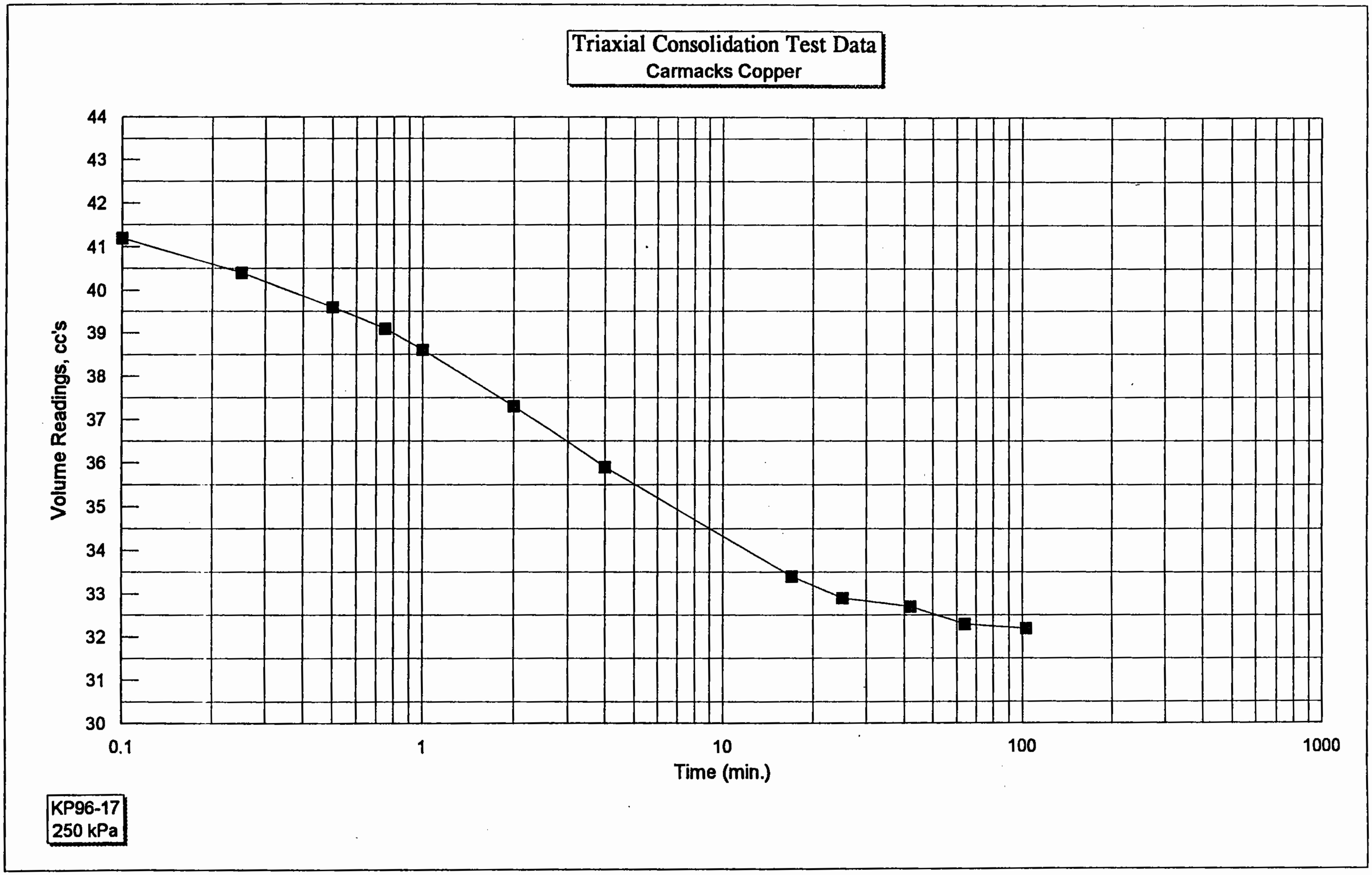
Test Readings Data for Specimen No. 3

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
23	0.1810	0.460	2094.00	2058.0	3.1	2070.4	666.2	2736.6	4.11	644.1	1701.4	1035.2
24	0.2090	0.531	2134.00	2098.0	3.6	2100.1	670.3	2770.4	4.13	640.0	1720.4	1050.1
25	0.2210	0.561	2151.00	2115.0	3.8	2112.6	672.4	2785.0	4.14	637.9	1728.7	1056.3
26	0.2490	0.632	2186.00	2150.0	4.3	2136.8	680.0	2816.8	4.14	630.3	1748.4	1068.4
27	0.2630	0.668	2203.00	2167.0	4.5	2148.2	684.1	2832.3	4.14	626.2	1758.2	1074.1
28	0.2760	0.701	2220.00	2184.0	4.8	2160.0	688.9	2848.9	4.14	621.4	1768.9	1080.0
29	0.2900	0.737	2235.00	2199.0	5.0	2169.3	693.7	2863.0	4.13	616.6	1778.4	1084.7
30	0.3040	0.772	2248.00	2212.0	5.2	2176.6	698.6	2875.2	4.12	611.7	1786.9	1088.3
31	0.3310	0.841	2275.00	2239.0	5.7	2192.3	709.6	2901.9	4.09	600.7	1805.8	1096.2
32	0.3580	0.909	2298.00	2262.0	6.2	2203.9	720.6	2924.5	4.06	589.7	1822.6	1102.0
33	0.3850	0.978	2320.00	2284.0	6.6	2214.3	732.4	2946.7	4.02	577.9	1839.6	1107.2
34	0.4120	1.046	2342.00	2306.0	7.1	2224.5	744.8	2969.3	3.99	565.5	1857.0	1112.2
35	0.4400	1.118	2360.00	2324.0	7.6	2230.2	756.5	2986.7	3.95	553.8	1871.6	1115.1
36	0.4670	1.186	2381.00	2345.0	8.1	2239.0	768.9	3007.9	3.91	541.4	1888.4	1119.5
37	0.4940	1.255	2399.00	2363.0	8.5	2244.8	780.6	3025.4	3.88	529.7	1903.0	1122.4
38	0.5090	1.293	2407.00	2371.0	8.8	2246.0	786.9	3032.9	3.85	523.4	1909.9	1123.0
39	0.5430	1.379	2427.00	2391.0	9.4	2250.4	800.6	3051.0	3.81	509.7	1925.8	1125.2
40	0.5840	1.483	2454.00	2418.0	10.1	2258.1	817.9	3076.0	3.76	492.4	1946.9	1129.0
41	0.6250	1.588	2474.00	2438.0	10.8	2258.8	833.1	3091.9	3.71	477.2	1962.5	1129.4
42	0.6660	1.692	2493.00	2457.0	11.5	2258.4	847.5	3105.9	3.66	462.8	1976.7	1129.2
43	0.7070	1.796	2511.00	2475.0	12.2	2256.8	862.0	3118.8	3.62	448.3	1990.4	1128.4
44	0.7540	1.915	2534.00	2498.0	13.0	2256.7	877.9	3134.6	3.57	432.4	2006.3	1128.4
45	0.8100	2.057	2557.00	2521.0	14.0	2252.2	895.1	3147.3	3.52	415.2	2021.2	1126.1
	0.8650	2.197	2577.00	2541.0	14.9	2245.1	910.3	3155.4	3.47	400.0	2032.8	1122.5
	0.9250	2.350	2587.00	2551.0	16.0	2226.5	925.5	3152.0	3.41	384.8	2038.7	1113.2
[illegible]	0.9860	2.504	2595.00	2559.0	17.0	2205.5	939.3	3144.8	3.35	371.0	2042.1	1102.8

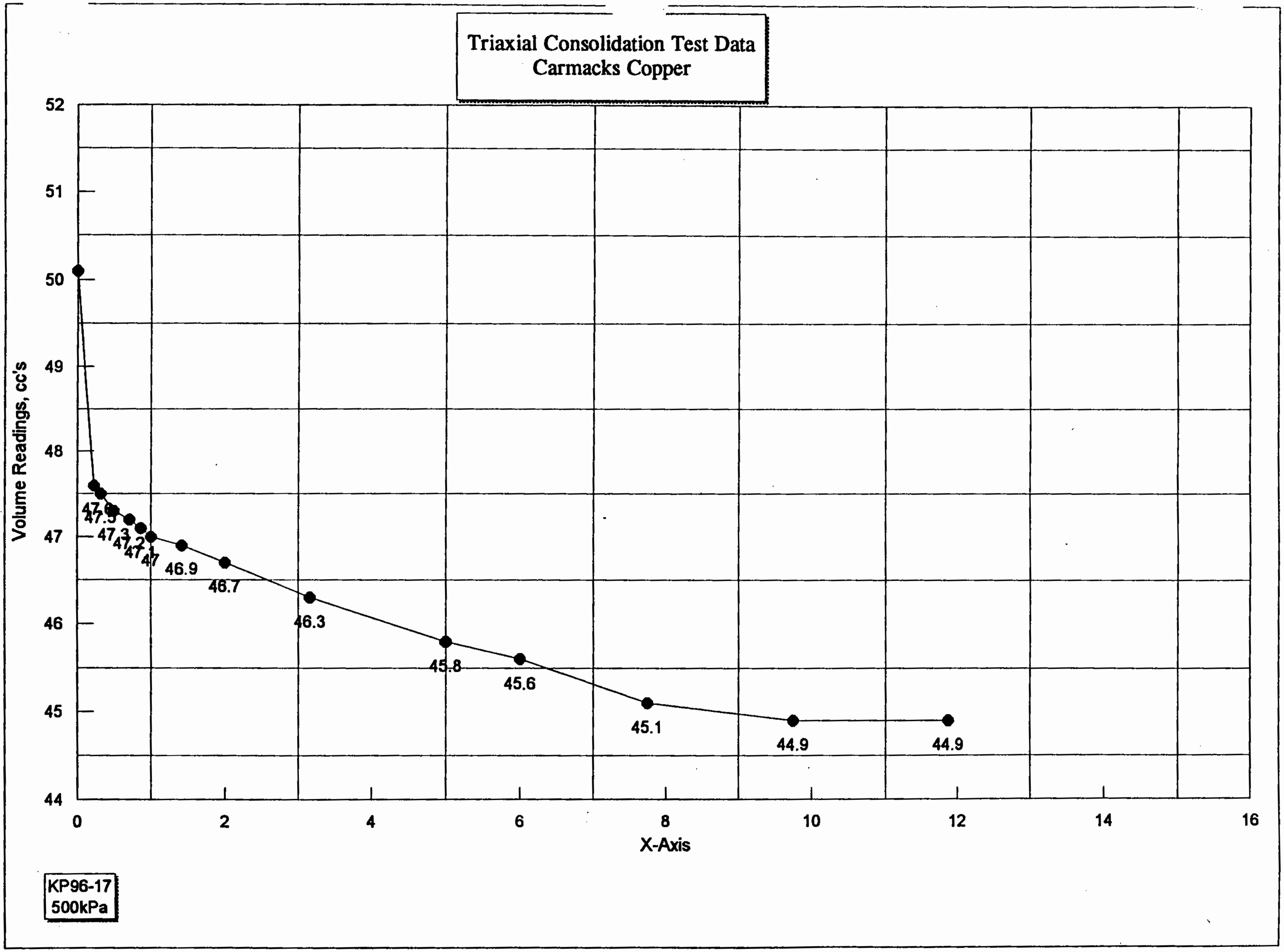
Triaxial Consolidation Test Data
Carmacks Copper

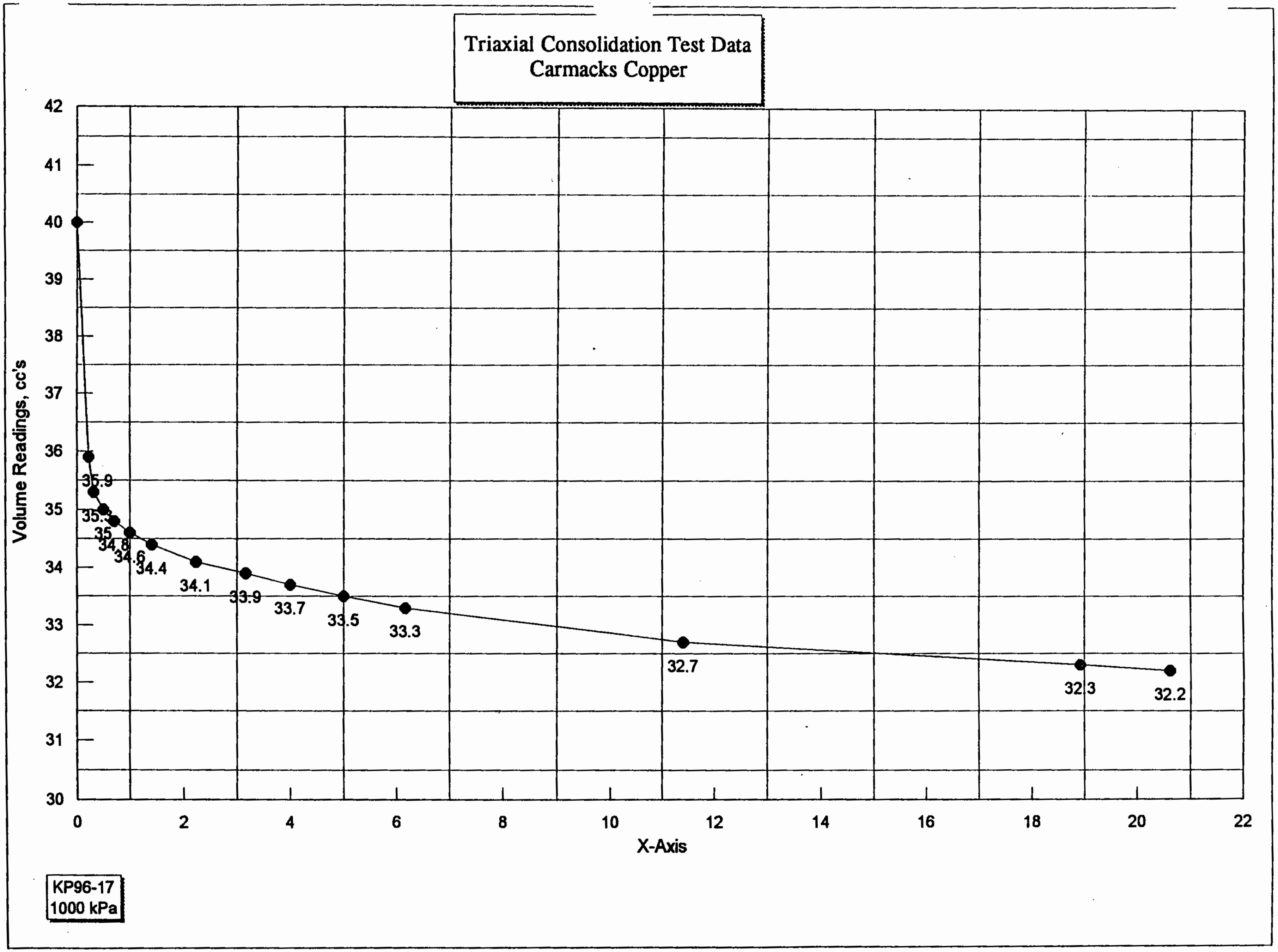


KP96-17
250 kPa

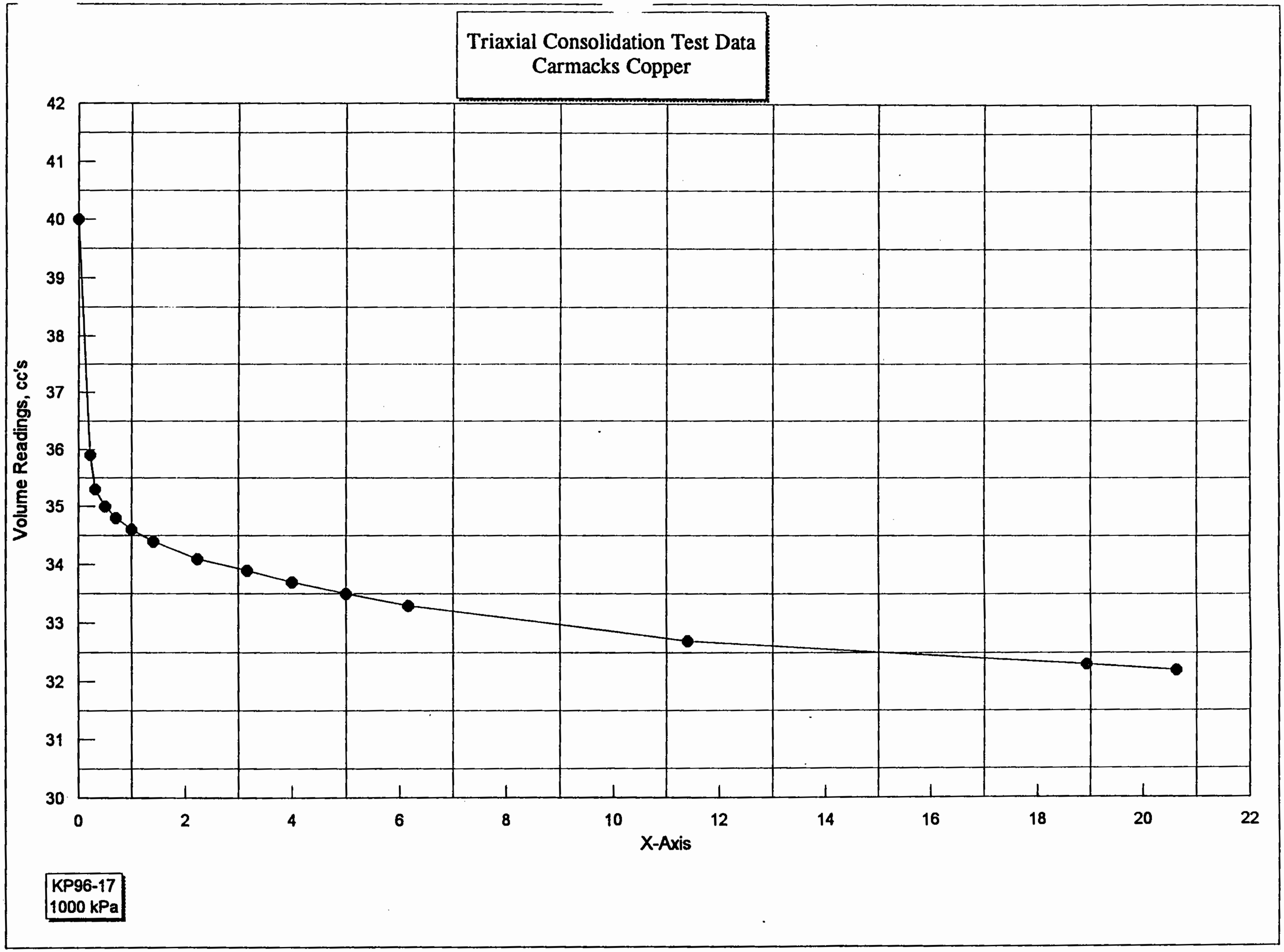


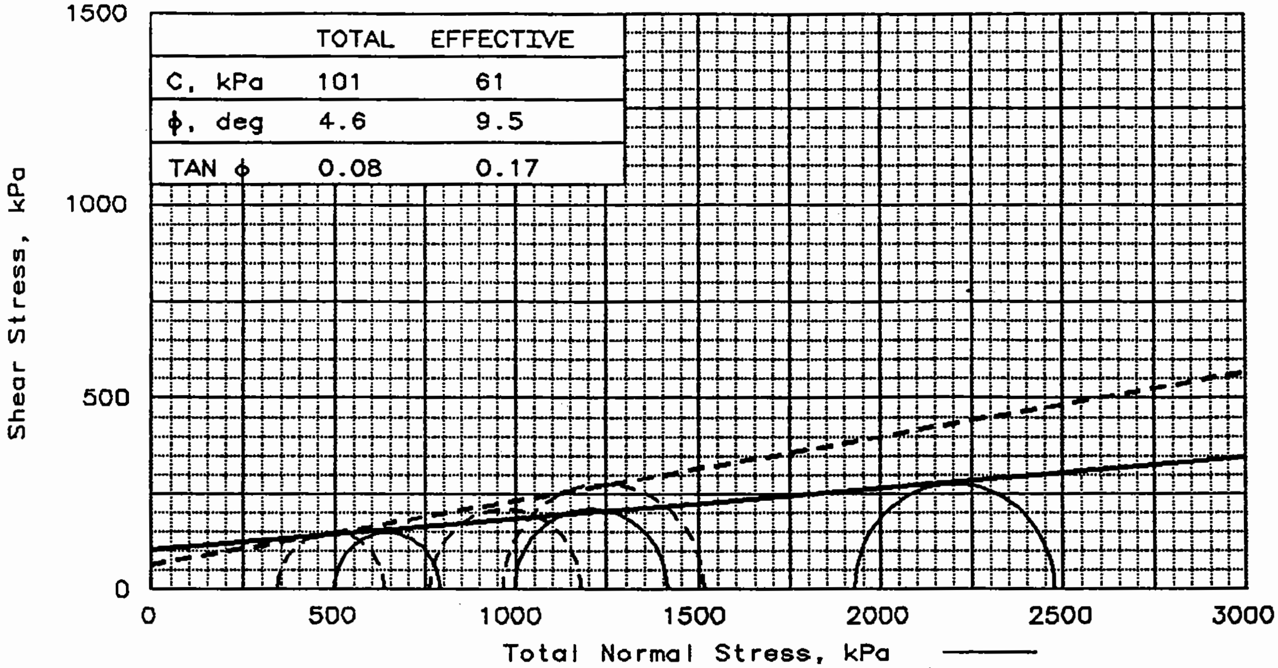
Triaxial Consolidation Test Data
Carmacks Copper
Volume Readings, cc's
44
43
42
41
40
39
38
37
36
35
34
33
32
31
30
0.1
1
10
100
1000
Time (min.)
KP96-17
250 kPa


Triaxial Consolidation Test Data
Carmacks Copper
Volume Readings, cc's
52
51
50
49
48
47
46
45
44
47.6
47.5
47.3
47.2
47.1
47
46.9
46.7
46.3
45.8
45.6
45.1
44.9
44.9
0
2
4
6
8
10
12
14
16
X-Axis
KP96-17
500kPa

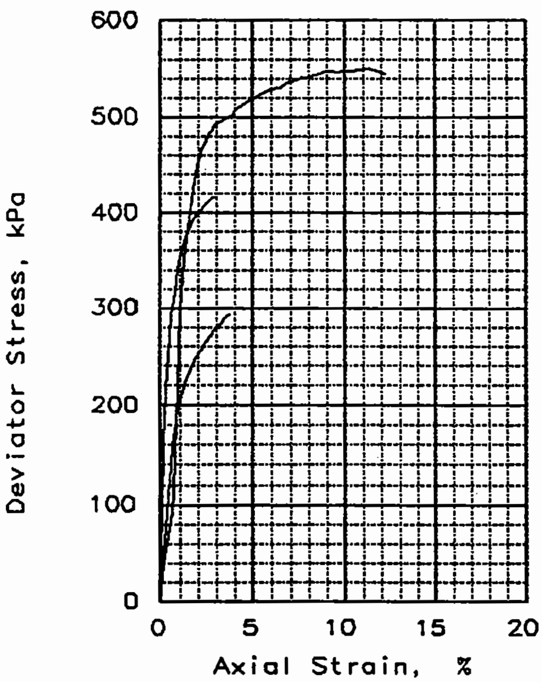


137717.WK4 Knight Piésold LLC 04/05/96


Triaxial Consolidation Test Data
Carmacks Copper
Volume Readings, cc's
42
41
40
39
38
37
36
35
34
33
32
31
30
0
2
4
6
8
10
12
14
16
18
20
22
X-Axis
KP96-17
1000 kPa



	TOTAL	EFFECTIVE
C, kPa	101	61
ϕ, deg	4.6	9.5
TAN ϕ	0.08	0.17



SAMPLE NO.:		1	2	3
INITIAL	WATER CONTENT, %	26.0	26.0	27.0
	DRY DENSITY, kN/cu.m	15.57	15.57	15.45
	SATURATION, %	95.4	95.4	99.6
	VOID RATIO	0.764	0.764	0.746
	DIAMETER, cm	7.30	7.30	7.30
	HEIGHT, cm	15.55	15.55	15.55
AT TEST	WATER CONTENT, %	25.2	23.2	26.7
	DRY DENSITY, kN/cu.m	16.10	16.66	16.84
	SATURATION, %	100.0	100.0	122.1
	VOID RATIO	0.705	0.649	0.601
	DIAMETER, cm	7.21	7.20	7.27
	HEIGHT, cm	15.42	14.94	14.38
Strain rate, cm/min		0.0127	0.0127	0.0102
BACK PRESSURE, kPa		276	276	276
CELL PRESSURE, kPa		776	1276	2207
FAILURE STRESS, kPa		292	416	548
TOTAL PORE PR., kPa		430	510	1239
ULTIMATE STRESS, kPa				
TOTAL PORE PR., kPa				
$\bar{\sigma}_1$ FAILURE, kPa		638	1182	1516
$\bar{\sigma}_3$ FAILURE, kPa		346	766	968

TYPE OF TEST:
CU with Pore Pressures

CLIENT:

PROJECT: CARMACKS COPPER PROJECT

SAMPLE LOCATION: TR96-11-3

PROJ. NO.: 1377A DATE: 4/12/96

TRIAXIAL SHEAR TEST REPORT

Knight Piésold LLC

SAMPLE TYPE: REMOLDED

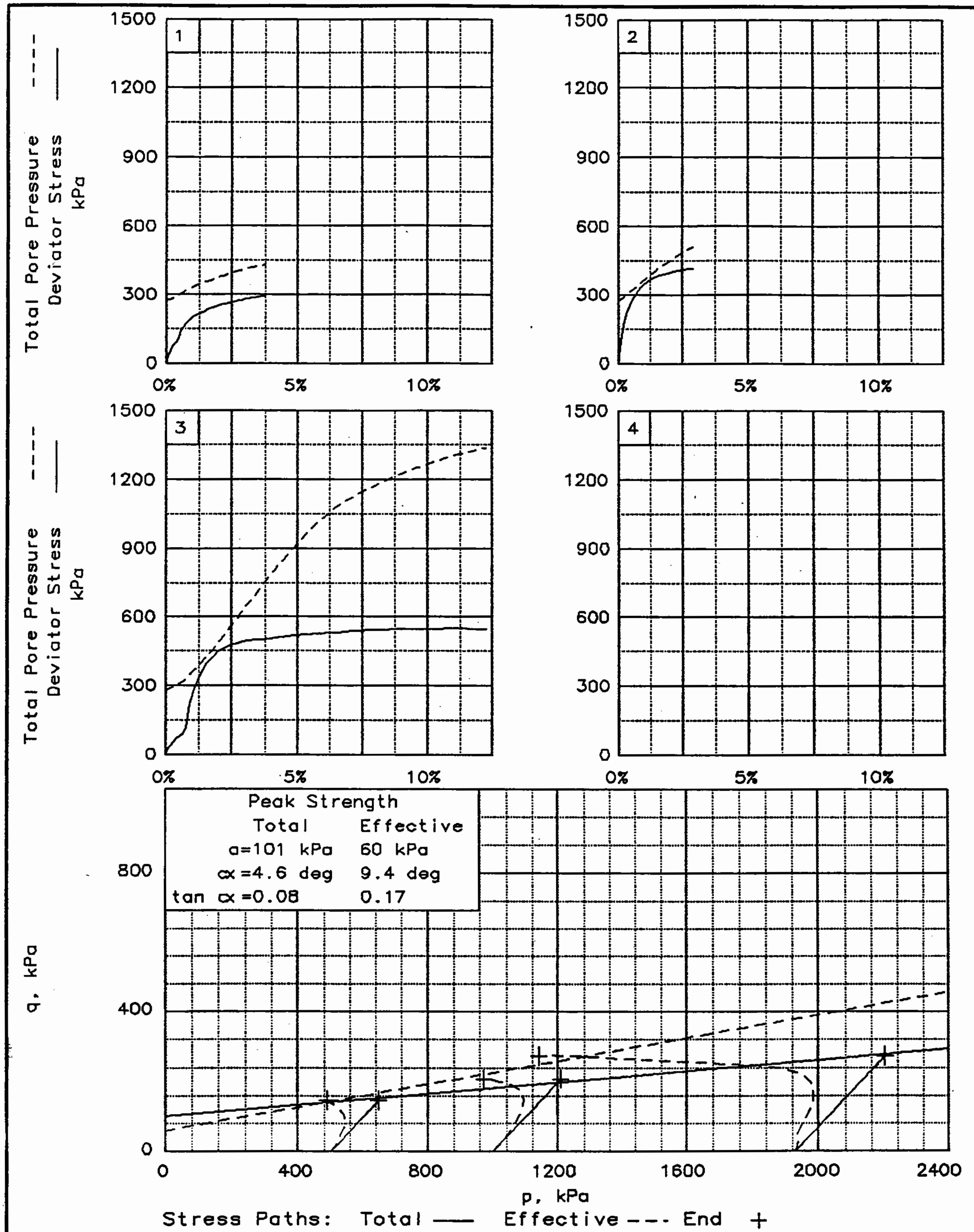
DESCRIPTION: sandy, gravelly CLAY (CH)

LL= 59 PL= 17 PI= 42

SPECIFIC GRAVITY= 2.8

REMARKS: Failure Criteria: Peak principal stress ratio.
Specific gravity estimated.
Multi-staged test.

Fig. No.:



Client:

Project: CARMACKS COPPER PROJECT

Location: TR96-11-3

File: 1377A113 Project No.: 1377A Fig. No.: ____

TRIAXIAL COMPRESSION TEST 4-17-1996
CU with Pore Pressures 5:31 pm

Project and Sample Data

Date: 4/12/96
Client:
Project: CARMACKS COPPER PROJECT
Sample location: TR96-11-3
Sample description: sandy, gravelly CLAY (CH)
Remarks: Failure Criteria: Peak principal stress ratio.
Specific gravity estimated. Multi-staged test.
Fig no.: 2nd page Fig no. (if applicable):
Type of sample: REMOLDED
Specific gravity= 2.80 LL= 59 PL= 17 PI= 42
Test method: ASTM - Method A (staged method triaxial test)

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Wt. moist soil and tare:	1303.000			1377.000
Wt. dry soil and tare:	1034.100			1146.900
Wt. of tare:	0.000			112.800
Weight, gms:	1303.0			
Diameter, cm:	7.304	7.304	7.212	
Area, cm^2:	41.900	41.900	40.850	
Height, cm:	15.545	15.545	15.418	
Net decrease in height, cm:		0.000	0.127	
N decrease in water volume, cc:			21.500	
oisture:	26.0	27.3	25.2	22.3
Wet density, kN/cu.m:	19.62	19.82	20.16	
Dry density, kN/cu.m:	15.57	15.57	16.10	
Void ratio:	0.7636	0.7636	0.7054	
% Saturation:	95.4	100.0	100.0	

Test Readings Data for Specimen No. 1

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 775.9 kPa
Consolidation back pressure = 275.9 kPa
Consolidation effective confining stress = 500.0 kPa
Strain rate, in/min = 0.0127
FAIL. STRESS = 292.4 kPa at reading no. 38
ULT. STRESS = not selected

Test Readings Data for Specimen No. 1

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Effective Stresses Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0240	0.000	30.00	0.0	0.0	0.0	504.2	504.2	1.00	271.7	504.2	0.0
1	0.0300	0.015	55.00	25.0	0.1	27.2	500.7	527.9	1.05	275.2	514.3	13.6
2	0.0360	0.030	78.00	48.0	0.2	52.2	498.7	550.9	1.10	277.2	524.8	26.1
3	0.0420	0.046	100.00	70.0	0.3	76.0	489.7	565.7	1.16	286.2	527.7	38.0
4	0.0480	0.061	114.00	84.0	0.4	91.1	486.9	578.0	1.19	289.0	532.5	45.6
5	0.0540	0.076	132.00	102.0	0.5	110.5	481.4	591.9	1.23	294.5	536.7	55.3
6	0.0600	0.091	159.00	129.0	0.6	139.6	473.8	613.4	1.29	302.1	543.6	69.8
7	0.0660	0.107	177.00	147.0	0.7	159.0	466.2	625.2	1.34	309.7	545.7	79.5
8	0.0720	0.122	192.00	162.0	0.8	175.0	460.0	635.0	1.38	315.9	547.5	87.5
9	0.0780	0.137	202.00	172.0	0.9	185.6	454.5	640.1	1.41	321.4	547.3	92.8
10	0.0840	0.152	212.00	182.0	1.0	196.2	447.6	643.8	1.44	328.3	545.7	98.1
11	0.0900	0.168	219.00	189.0	1.1	203.6	442.8	646.4	1.46	333.1	544.6	101.8
12	0.0960	0.183	225.00	195.0	1.2	209.8	437.3	647.1	1.48	338.6	542.2	104.9
13	0.1020	0.198	232.00	202.0	1.3	217.1	432.5	649.6	1.50	343.4	541.1	108.6
14	0.1080	0.213	237.00	207.0	1.4	222.3	427.6	649.9	1.52	348.3	538.7	111.1
15	0.1140	0.229	241.00	211.0	1.5	226.4	422.8	649.2	1.54	353.1	536.0	113.2
16	0.1200	0.244	247.00	217.0	1.6	232.6	418.7	651.3	1.56	357.2	535.0	116.3
17	0.1260	0.259	251.00	221.0	1.7	236.6	414.5	651.1	1.57	361.4	532.8	118.3
18	0.1320	0.274	255.00	225.0	1.8	240.6	410.4	651.0	1.59	365.5	530.7	120.3
19	0.1380	0.290	259.00	229.0	1.9	244.7	405.6	650.3	1.60	370.3	527.9	122.3
20	0.1440	0.305	262.00	232.0	2.0	247.6	402.1	649.7	1.62	373.8	525.9	123.8
21	0.1500	0.320	266.00	236.0	2.1	251.6	398.0	649.6	1.63	377.9	523.8	125.8
22	0.1560	0.335	269.00	239.0	2.2	254.6	394.5	649.1	1.65	381.4	521.8	127.3
23	0.1620	0.351	272.00	242.0	2.3	257.5	391.1	648.6	1.66	384.8	519.9	128.8
[illegible]	1680	0.366	275.00	245.0	2.4	260.5	387.6	648.1	1.67	388.3	517.8	130.2
[illegible]	.1740	0.381	278.00	248.0	2.5	263.4	384.2	647.6	1.69	391.7	515.9	131.7
26	0.1800	0.396	280.00	250.0	2.6	265.2	380.8	646.0	1.70	395.1	513.4	132.6
27	0.1860	0.411	284.00	254.0	2.7	269.2	377.3	646.5	1.71	398.6	511.9	134.6
28	0.1920	0.427	286.00	256.0	2.8	271.0	373.8	644.8	1.73	402.1	509.3	135.5
29	0.1980	0.442	289.00	259.0	2.9	273.9	371.1	645.0	1.74	404.8	508.1	137.0
30	0.2040	0.457	292.00	262.0	3.0	276.8	367.6	644.4	1.75	408.3	506.0	138.4
31	0.2100	0.472	294.00	264.0	3.1	278.7	364.9	643.6	1.76	411.0	504.2	139.3
32	0.2160	0.488	296.00	266.0	3.2	280.5	361.4	641.9	1.78	414.5	501.6	140.2
33	0.2220	0.503	299.00	269.0	3.3	283.4	358.7	642.1	1.79	417.2	500.4	141.7
34	0.2280	0.518	300.00	270.0	3.4	284.1	355.9	640.0	1.80	420.0	498.0	142.1
35	0.2340	0.533	304.00	274.0	3.5	288.0	353.1	641.1	1.82	422.8	497.1	144.0
36	0.2400	0.549	306.00	276.0	3.6	289.8	350.4	640.2	1.83	425.5	495.3	144.9
37	0.2460	0.564	308.00	278.0	3.7	291.6	348.3	639.9	1.84	427.6	494.1	145.8
38	0.2520	0.579	309.00	279.0	3.8	292.4	345.6	638.0	1.85	430.3	491.8	146.2

Test Readings Data for Specimen No. 3

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Effective Stresses Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
23	0.2490	0.632	567.00	500.0	4.4	511.9	1365.5	1877.4	1.37	841.4	1621.5	256.0
24	0.2760	0.701	574.00	507.0	4.9	516.5	1302.8	1819.3	1.40	904.1	1561.1	258.3
25	0.3030	0.770	582.00	515.0	5.4	522.0	1244.1	1766.1	1.42	962.8	1505.1	261.0
26	0.3300	0.838	590.00	523.0	5.8	527.5	1192.4	1719.9	1.44	1014.5	1456.1	263.7
27	0.3580	0.909	595.00	528.0	6.3	529.7	1144.8	1674.5	1.46	1062.1	1409.7	264.9
28	0.3720	0.945	597.00	530.0	6.6	530.3	1123.5	1653.8	1.47	1083.4	1388.7	265.2
29	0.3890	0.988	604.00	537.0	6.9	535.6	1102.1	1637.7	1.49	1104.8	1369.9	267.8
30	0.4060	1.031	607.00	540.0	7.2	536.8	1082.8	1619.6	1.50	1124.1	1351.2	268.4
31	0.4240	1.077	610.00	543.0	7.5	538.0	1063.5	1601.5	1.51	1143.4	1332.5	269.0
32	0.4400	1.118	614.00	547.0	7.8	540.3	1046.2	1586.5	1.52	1160.7	1316.3	270.1
33	0.4580	1.163	617.00	550.0	8.1	541.4	1029.0	1570.4	1.53	1177.9	1299.7	270.7
34	0.4750	1.207	621.00	554.0	8.4	543.5	1013.1	1556.6	1.54	1193.8	1284.9	271.8
35	0.4930	1.252	624.00	557.0	8.7	544.6	997.9	1542.5	1.55	1209.0	1270.2	272.3
36	0.5110	1.298	629.00	562.0	9.0	547.6	982.1	1529.7	1.56	1224.8	1255.9	273.8
37	0.5280	1.341	631.00	564.0	9.3	547.7	968.3	1516.0	1.57	1238.6	1242.1	273.8
38	0.5460	1.387	632.00	565.0	9.6	546.7	955.9	1502.6	1.57	1251.0	1229.3	273.4
39	0.5630	1.430	634.00	567.0	9.9	546.9	943.5	1490.4	1.58	1263.4	1216.9	273.4
40	0.5890	1.496	637.00	570.0	10.4	546.9	926.2	1473.1	1.59	1280.7	1199.7	273.5
41	0.6150	1.562	642.00	575.0	10.9	548.9	909.7	1458.6	1.60	1297.2	1184.2	274.5
42	0.6420	1.631	646.00	579.0	11.3	549.8	895.2	1445.0	1.61	1311.7	1170.1	274.9
43	0.6690	1.699	647.00	580.0	11.8	547.8	881.4	1429.2	1.62	1325.5	1155.3	273.9
44	0.6950	1.765	647.00	580.0	12.3	544.9	869.7	1414.6	1.63	1337.2	1142.2	272.5

Specimen Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Wt. moist soil and tare:	1303.000			1377.000
Wt. dry soil and tare:	1034.100			1146.900
Wt. of tare:	0.000			112.800
Weight, gms:	1303.0			
Diameter, cm:	7.304		7.203	
Area, cm²:	41.900		40.750	
Height, cm:	15.545		14.940	
Net decrease in height, cm:		0.706	-0.102	
Net decrease in water volume, cc:			21.000	
% Moisture:	26.0		23.2	22.3
Wet density, kN/cu.m:	19.62		20.51	
Dry density, kN/cu.m:	15.57		16.66	
Void ratio:	0.7636		0.6485	
% Saturation:	95.4		100.0	

Test Readings Data for Specimen No. 2

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 1275.9 kPa
Consolidation back pressure = 275.9 kPa
Consolidation effective confining stress = 1000.0 kPa
Strain rate, in/min = 0.0127
F .. STRESS = 416.4 kPa at reading no. 18
L . STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Effective Stresses Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0000	0.000	42.00	0.0	0.0	0.0	1002.1	1002.1	1.00	273.8	1002.1	0.0
1	0.0060	0.015	130.00	88.0	0.1	96.0	996.6	1092.6	1.10	279.3	1044.6	48.0
2	0.0120	0.030	192.00	150.0	0.2	163.4	987.6	1151.0	1.17	288.3	1069.3	81.7
3	0.0190	0.048	240.00	198.0	0.3	215.4	976.6	1192.0	1.22	299.3	1084.3	107.7
4	0.0260	0.066	274.00	232.0	0.4	252.1	965.6	1217.7	1.26	310.3	1091.7	126.1
5	0.0370	0.094	311.00	269.0	0.6	291.8	949.0	1240.8	1.31	326.9	1094.9	145.9
6	0.0460	0.117	334.00	292.0	0.8	316.2	933.8	1250.0	1.34	342.1	1091.9	158.1
7	0.0570	0.145	357.00	315.0	1.0	340.5	915.9	1256.4	1.37	360.0	1086.2	170.3
8	0.0680	0.173	375.00	333.0	1.2	359.3	898.7	1258.0	1.40	377.2	1078.3	179.6
9	0.0800	0.203	389.00	347.0	1.4	373.6	879.3	1252.9	1.42	396.6	1066.1	186.8
10	0.0890	0.226	396.00	354.0	1.5	380.6	866.9	1247.5	1.44	409.0	1057.2	190.3
11	0.0980	0.249	403.00	361.0	1.7	387.5	854.5	1242.0	1.45	421.4	1048.2	193.7
12	0.1080	0.274	409.00	367.0	1.8	393.3	840.0	1233.3	1.47	435.9	1036.6	196.6
13	0.1220	0.310	416.00	374.0	2.1	399.8	822.8	1222.6	1.49	453.1	1022.7	199.9
14	0.1310	0.333	420.00	378.0	2.2	403.4	811.1	1214.5	1.50	464.8	1012.8	201.7
15	0.1390	0.353	424.00	382.0	2.4	407.1	802.1	1209.2	1.51	473.8	1005.7	203.6
16	0.1520	0.386	428.00	386.0	2.6	410.5	786.2	1196.7	1.52	489.7	991.5	205.2
17	0.1640	0.417	433.00	391.0	2.8	414.9	773.8	1188.7	1.54	502.1	981.3	207.5
1'	1720	0.437	435.00	393.0	2.9	416.4	765.6	1182.0	1.54	510.3	973.8	208.2

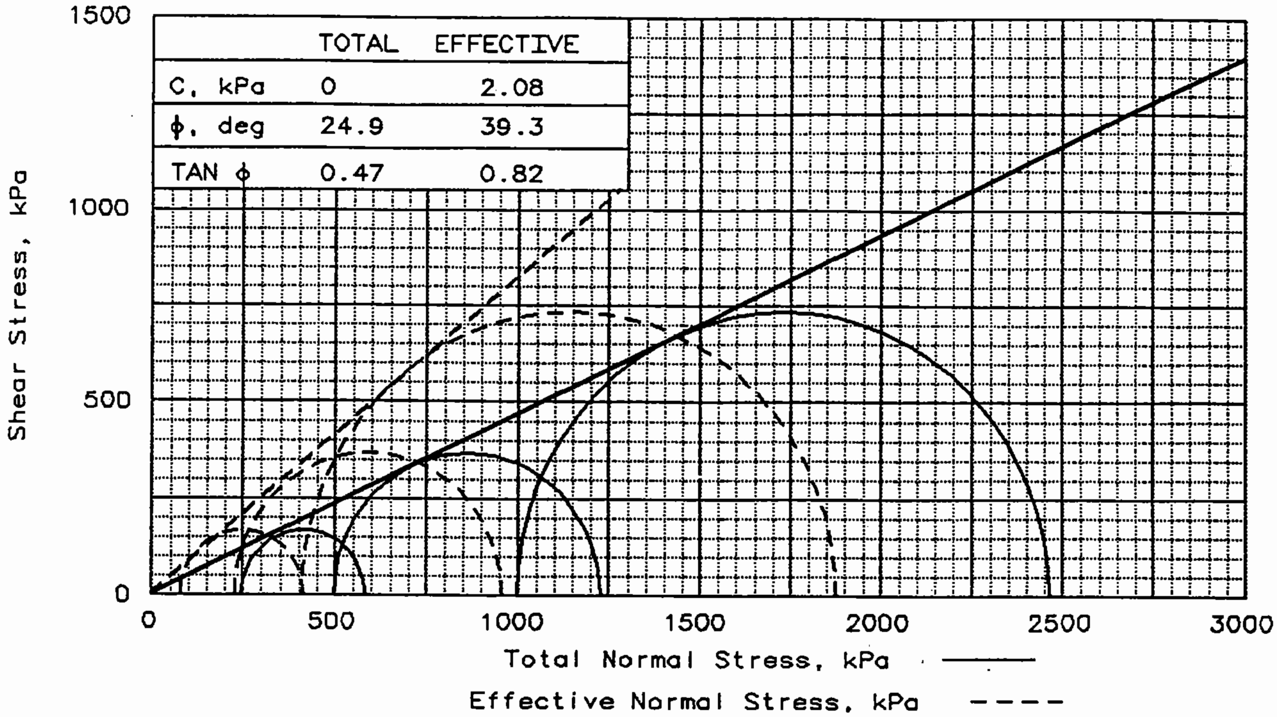
Specimen Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
moist soil and tare:	1303.000			1300.000
Wt. dry soil and tare:	1026.000			1026.000
Wt. of tare:	0.000			0.000
Weight, gms:	1303.0			
Diameter, cm:	7.304		7.272	
Area, cm²:	41.900		41.536	
Height, cm:	15.545		14.384	
Net decrease in height, cm:		1.103	0.058	
Net decrease in water volume, cc:			9.400	
% Moisture:	27.0		26.7	26.7
Wet density, kN/cu.m:	19.62		21.34	
Dry density, kN/cu.m:	15.45		16.84	
Void ratio:	0.7458		0.6013	
% Saturation:	99.6		122.1	

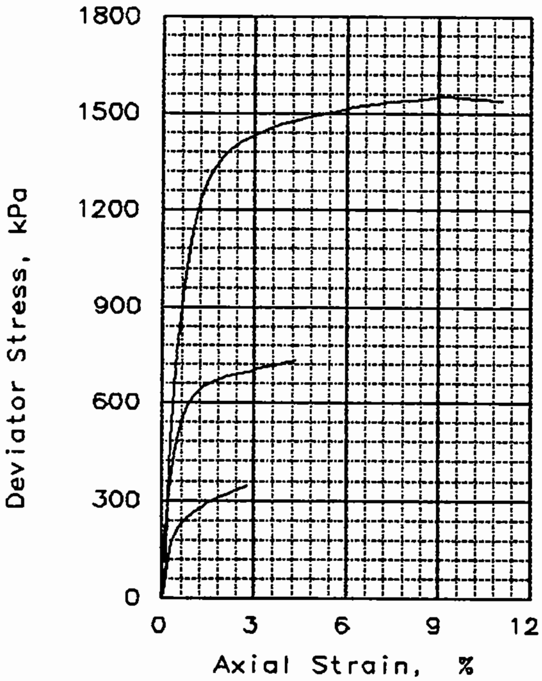
Test Readings Data for Specimen No. 3

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 2206.9 kPa
Consolidation back pressure = 275.9 kPa
Consolidation effective confining stress = 1931.0 kPa
Strain rate, in/min = 0.0102
L. STRESS = 547.7 kPa at reading no. 37
. STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0000	0.000	67.00	0.0	0.0	0.0	1929.7	1929.7	1.00	277.2	1929.7	0.0
1	0.0060	0.015	91.00	24.0	0.1	25.7	1924.1	1949.8	1.01	282.8	1936.9	12.8
2	0.0120	0.030	104.00	37.0	0.2	39.5	1917.9	1957.4	1.02	289.0	1937.7	19.8
3	0.0190	0.048	118.00	51.0	0.3	54.4	1911.7	1966.1	1.03	295.2	1938.9	27.2
4	0.0250	0.064	131.00	64.0	0.4	68.2	1904.8	1973.0	1.04	302.1	1938.9	34.1
5	0.0380	0.097	153.00	86.0	0.7	91.5	1889.7	1981.2	1.05	317.2	1935.4	45.7
6	0.0440	0.112	173.00	106.0	0.8	112.6	1882.1	1994.7	1.06	324.8	1938.4	56.3
7	0.0530	0.135	275.00	208.0	0.9	220.7	1860.7	2081.4	1.12	346.2	1971.0	110.3
8	0.0640	0.163	346.00	279.0	1.1	295.4	1837.2	2132.6	1.16	369.7	1984.9	147.7
9	0.0760	0.193	399.00	332.0	1.3	350.8	1810.3	2161.1	1.19	396.6	1985.7	175.4
10	0.0890	0.226	441.00	374.0	1.6	394.2	1781.4	2175.6	1.22	425.5	1978.5	197.1
11	0.1030	0.262	471.00	404.0	1.8	424.8	1750.3	2175.1	1.24	456.6	1962.7	212.4
12	0.1150	0.292	495.00	428.0	2.0	449.1	1717.2	2166.3	1.26	489.7	1941.7	224.5
13	0.1280	0.325	510.00	443.0	2.3	463.7	1682.8	2146.5	1.28	524.1	1914.7	231.9
14	0.1410	0.358	523.00	456.0	2.5	476.2	1647.6	2123.8	1.29	559.3	1885.7	238.1
15	0.1550	0.394	532.00	465.0	2.7	484.4	1611.7	2096.1	1.30	595.2	1853.9	242.2
16	0.1610	0.409	535.00	468.0	2.8	487.0	1594.5	2081.5	1.31	612.4	1838.0	243.5
17	0.1680	0.427	540.00	473.0	3.0	491.5	1575.2	2066.7	1.31	631.7	1821.0	245.8
	0.1750	0.445	542.00	475.0	3.1	493.0	1557.9	2050.9	1.32	649.0	1804.4	246.5
	0.1960	0.498	548.00	481.0	3.5	497.3	1504.1	2001.4	1.33	702.8	1752.7	248.6
20	0.2090	0.531	552.00	485.0	3.7	500.2	1468.3	1968.5	1.34	738.6	1718.4	250.1
21	0.2220	0.564	555.00	488.0	3.9	502.1	1433.1	1935.2	1.35	773.8	1684.2	251.1
22	0.2360	0.599	562.00	495.0	4.2	508.0	1399.3	1907.3	1.36	807.6	1653.3	254.0



	TOTAL	EFFECTIVE
C, kPa	0	2.08
ϕ, deg	24.9	39.3
TAN ϕ	0.47	0.82



	SAMPLE NO.:	1	2	3
INITIAL	WATER CONTENT, %	7.8	7.8	7.8
	DRY DENSITY, kN/cu.m	20.58	20.58	20.58
	SATURATION, %	66.7	66.7	66.7
	VOID RATIO	0.325	0.325	0.325
	DIAMETER, cm	7.29	7.29	7.29
	HEIGHT, cm	15.53	15.53	15.53
AT TEST	WATER CONTENT, %	10.4	10.0	9.4
	DRY DENSITY, kN/cu.m	21.14	21.31	21.60
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.289	0.279	0.262
	DIAMETER, cm	7.21	7.27	7.35
	HEIGHT, cm	15.44	15.06	14.53
	Strain rate, cm/min	0.0102	0.0102	0.0102
	BACK PRESSURE, kPa	345	345	345
	CELL PRESSURE, kPa	595	845	1345
	FAILURE STRESS, kPa	335	731	1466
	TOTAL PORE PR., kPa	514	615	932
	ULTIMATE STRESS, kPa			
	TOTAL PORE PR., kPa			
	$\bar{\sigma}_1$ FAILURE, kPa	416	960	1879
	$\bar{\sigma}_3$ FAILURE, kPa	81	230	413

TYPE OF TEST:
CU with Pore Pressures

CLIENT:

PROJECT: CARMACKS COPPER PROJECT

SAMPLE LOCATION: TR96-16-1

PROJ. NO.: 1377A DATE: 4/10/96

TRIAXIAL SHEAR TEST REPORT

Knight Piésold LLC

SAMPLE TYPE: REMOLDED

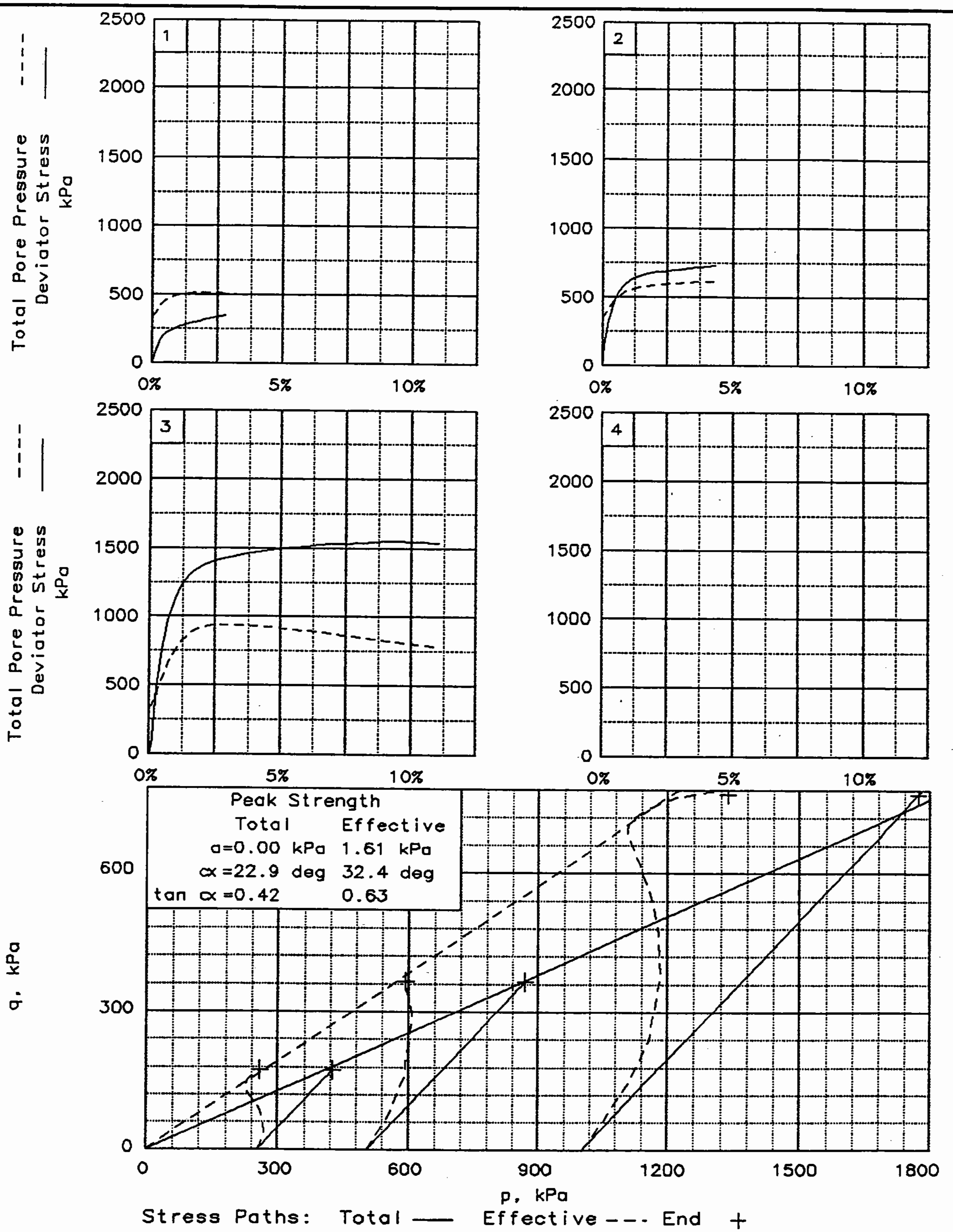
DESCRIPTION: clayey SAND w/gravel (SC)

LL= 25 PL= 13 PI= 12

SPECIFIC GRAVITY= 2.78

REMARKS: Failure criteria: Peak principal stress ratio.
Specific gravity estimated.
Multi-stage test.

Fig. No.:



Client:

Project: CARMACKS COPPER PROJECT

Location: TR96-16-1

File: 1377A16A Project No.: 1377A Fig. No.: ____

Project and Sample Data

Date: 4/10/96
Client:
Project: CARMACKS COPPER PROJECT
Sample location: TR96-16-1
Sample description: clayey SAND w/gravel (SC)
Remarks: Failure criteria: Peak principal stress ratio.
Specific gravity estimated. Multi-stage test.
Fig no.: 2nd page Fig no. (if applicable):
Type of sample: REMOLDED
Specific gravity= 2.78 LL= 25 PL= 13 PI= 12
Test method: ASTM - Method A (staged method triaxial test)

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Wt. moist soil and tare:	1464.800			1626.700
Wt. dry soil and tare:	1358.800			1499.300
Wt. of tare:	0.000			146.700
Weight, gms:	1464.8			
Diameter, cm:	7.287	7.287	7.209	
Area, cm^2:	41.708	41.708	40.822	
Height, cm:	15.527	15.527	15.438	
Net decrease in height, cm:		0.000	0.089	
decrease in water volume, cc:			17.400	
oisture:	7.8	11.7	10.4	9.4
Wet density, kN/cu.m:	22.18	22.98	23.34	
Dry density, kN/cu.m:	20.58	20.58	21.14	
Void ratio:	0.3250	0.3250	0.2894	
% Saturation:	66.7	100.0	100.0	

Test Readings Data for Specimen No. 1

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 595.2 kPa
Consolidation back pressure = 345.2 kPa
Consolidation effective confining stress = 250.0 kPa
Strain rate, in/min = 0.0102
FAIL. STRESS = 334.8 kPa at reading no. 17
ULT. STRESS = not selected

Test Readings Data for Specimen No. 1

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Effective Stresses Major kPa	Effective Stresses 1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0100	0.000	18.00	0.0	0.0	0.0	253.8	253.8	1.00	341.4	253.8	0.0
1	0.0150	0.013	38.00	20.0	0.1	21.8	250.4	272.1	1.09	344.8	261.3	10.9
2	0.0200	0.025	88.00	70.0	0.2	76.2	232.4	308.5	1.33	362.8	270.4	38.1
3	0.0250	0.038	136.00	118.0	0.2	128.3	201.4	329.6	1.64	393.8	265.5	64.1
4	0.0300	0.051	174.00	156.0	0.3	169.4	177.3	346.7	1.96	417.9	262.0	84.7
5	0.0400	0.076	210.00	192.0	0.5	208.2	143.5	351.7	2.45	451.7	247.6	104.1
6	0.0500	0.102	231.00	213.0	0.7	230.6	123.5	354.0	2.87	471.7	238.8	115.3
7	0.0600	0.127	245.00	227.0	0.8	245.3	109.7	355.0	3.24	485.5	232.3	122.7
8	0.0700	0.152	258.00	240.0	1.0	258.9	100.7	359.6	3.57	494.5	230.1	129.5
9	0.0800	0.178	268.00	250.0	1.2	269.3	94.5	363.7	3.85	500.7	229.1	134.6
10	0.0900	0.203	278.00	260.0	1.3	279.6	89.7	369.3	4.12	505.5	229.5	139.8
11	0.1000	0.229	287.00	269.0	1.5	288.8	86.2	375.0	4.35	509.0	230.6	144.4
12	0.1100	0.254	295.00	277.0	1.6	296.9	84.2	381.0	4.53	511.0	232.6	148.4
13	0.1200	0.279	303.00	285.0	1.8	304.9	82.1	387.0	4.72	513.1	234.5	152.5
14	0.1300	0.305	311.00	293.0	2.0	313.0	80.7	393.6	4.88	514.5	237.2	156.5
15	0.1400	0.330	318.00	300.0	2.1	319.9	80.7	400.6	4.97	514.5	240.6	160.0
16	0.1500	0.356	325.00	307.0	2.3	326.8	80.7	407.5	5.05	514.5	244.1	163.4
17	0.1600	0.381	333.00	315.0	2.5	334.8	81.4	416.1	5.11	513.8	248.8	167.4
18	0.1700	0.406	338.00	320.0	2.6	339.5	83.5	423.0	5.07	511.7	253.2	169.8
19	0.1800	0.432	345.00	327.0	2.8	346.4	86.2	432.5	5.02	509.0	259.3	173.2

Specimen Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
moist soil and tare:	1464.800			1626.700
Wt. dry soil and tare:	1358.800			1499.300
Wt. of tare:	0.000			146.700
Weight, gms:	1464.8			
Diameter, cm:	7.287		7.271	
Area, cm²:	41.708		41.522	
Height, cm:	15.527		15.057	
Net decrease in height, cm:		0.521	-0.051	
Net decrease in water volume, cc:			5.000	
% Moisture:	7.8		10.0	9.4
Wet density, kN/cu.m:	22.18		23.45	
Dry density, kN/cu.m:	20.58		21.31	
Void ratio:	0.3250		0.2791	
% Saturation:	66.7		100.0	

Test Readings Data for Specimen No. 2

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 844.8 kPa
Consolidation back pressure = 344.8 kPa
Consolidation effective confining stress = 500.0 kPa
Strain rate, in/min = 0.0102
[illegible]. STRESS = 730.6 kPa at reading no. 27
[illegible].. STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Effective Stresses Major kPa	Effective Stresses 1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0000	0.000	26.00	0.0	0.0	0.0	504.8	504.8	1.00	340.0	504.8	0.0
1	0.0050	0.013	162.00	136.0	0.1	145.6	481.4	627.0	1.30	363.4	554.2	72.8
2	0.0100	0.025	259.00	233.0	0.2	249.2	451.7	700.9	1.55	393.1	576.3	124.6
3	0.0150	0.038	332.00	306.0	0.3	327.0	430.3	757.3	1.76	414.5	593.8	163.5
4	0.0200	0.051	390.00	364.0	0.3	388.6	400.7	789.3	1.97	444.1	595.0	194.3
5	0.0250	0.064	439.00	413.0	0.4	440.6	380.0	820.6	2.16	464.8	600.3	220.3
6	0.0300	0.076	478.00	452.0	0.5	481.8	362.7	844.5	2.33	482.1	603.6	240.9
7	0.0400	0.102	538.00	512.0	0.7	544.8	335.1	879.9	2.63	509.7	607.5	272.4
8	0.0500	0.127	579.00	553.0	0.8	587.4	314.5	901.9	2.87	530.3	608.2	293.7
9	0.0620	0.157	610.00	584.0	1.0	619.1	296.5	915.6	3.09	548.3	606.0	309.5
10	0.0740	0.188	630.00	604.0	1.2	639.0	284.1	923.1	3.25	560.7	603.6	319.5
11	0.0800	0.203	639.00	613.0	1.3	647.8	279.3	927.1	3.32	565.5	603.2	323.9
12	0.0920	0.234	651.00	625.0	1.6	659.2	271.0	930.2	3.43	573.8	600.6	329.6
13	0.1040	0.264	662.00	636.0	1.8	669.4	264.8	934.2	3.53	580.0	599.5	334.7
14	0.1160	0.295	670.00	644.0	2.0	676.4	260.0	936.4	3.60	584.8	598.2	338.2
15	0.1280	0.325	678.00	652.0	2.2	683.4	256.5	939.9	3.66	588.3	598.2	341.7
16	0.1400	0.356	682.00	656.0	2.4	686.2	253.1	939.3	3.71	591.7	596.2	343.1
17	0.1520	0.386	690.00	664.0	2.6	693.1	248.2	941.3	3.79	596.6	594.7	346.5
1[illegible]	0.1640	0.417	695.00	669.0	2.8	696.9	245.5	942.4	3.84	599.3	593.9	348.4
[illegible]	0.1760	0.447	701.00	675.0	3.0	701.7	243.4	945.1	3.88	601.4	594.2	350.8
20	0.1880	0.478	707.00	681.0	3.2	706.4	240.0	946.4	3.94	604.8	593.2	353.2
21	0.2010	0.511	714.00	688.0	3.4	712.1	237.2	949.3	4.00	607.6	593.2	356.0
22	0.2160	0.549	720.00	694.0	3.6	716.4	234.5	950.9	4.05	610.3	592.7	358.2

Test Readings Data for Specimen No. 2

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
23	0.2280	0.579	726.00	700.0	3.8	721.1	233.1	954.2	4.09	611.7	593.6	360.5
24	0.2340	0.594	728.00	702.0	3.9	722.4	232.4	954.8	4.11	612.4	593.6	361.2
25	0.2460	0.625	734.00	708.0	4.1	727.0	230.3	957.3	4.16	614.5	593.8	363.5
26	0.2520	0.640	737.00	711.0	4.3	729.3	229.6	958.9	4.18	615.2	594.3	364.7
27	0.2580	0.655	739.00	713.0	4.4	730.6	229.6	960.2	4.18	615.2	594.9	365.3

Specimen Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
moist soil and tare:	1464.800			1626.700
Wt. dry soil and tare:	1358.800			1499.300
Wt. of tare:	0.000			146.700
Weight, gms:	1464.8			
Diameter, cm:	7.287		7.352	
Area, cm²:	41.708		42.454	
Height, cm:	15.527		14.529	
Net decrease in height, cm:		1.125	-0.127	
Net decrease in water volume, cc:			8.400	
% Moisture:	7.8		9.4	9.4
Wet density, kN/cu.m:	22.18		23.64	
Dry density, kN/cu.m:	20.58		21.60	
Void ratio:	0.3250		0.2619	
% Saturation:	66.7		100.0	

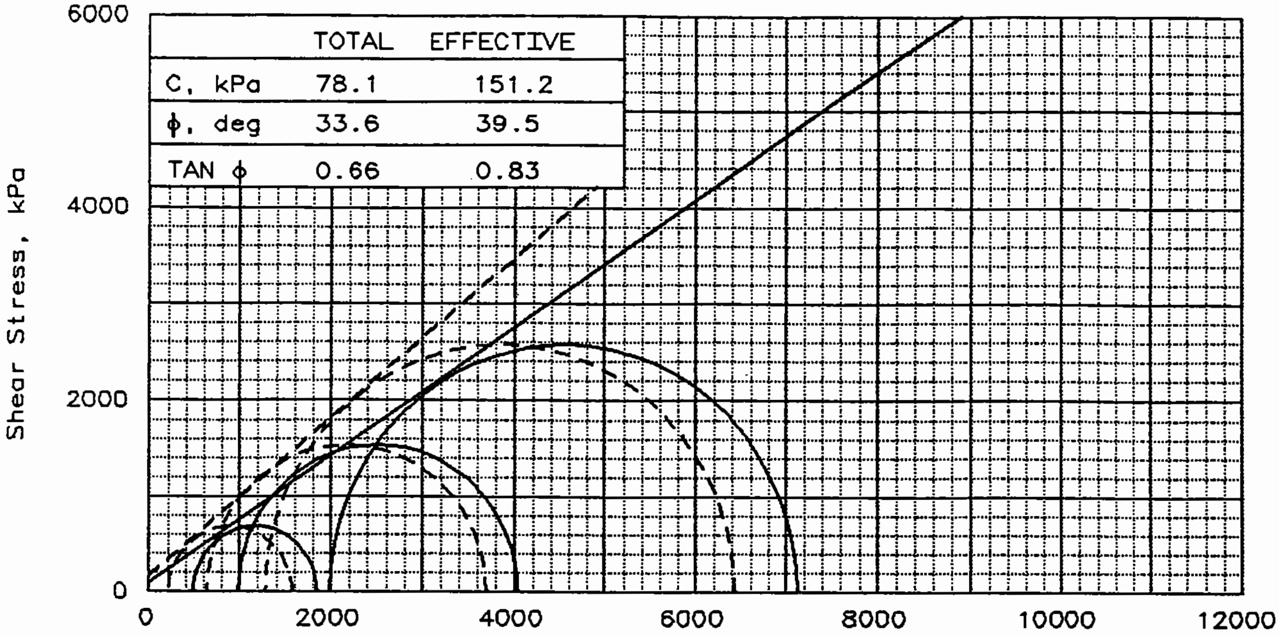
Test Readings Data for Specimen No. 3

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 1344.8 kPa
Consolidation back pressure = 344.8 kPa
Consolidation effective confining stress = 1000.0 kPa
Strain rate, in/min = 0.0102
L. STRESS = 1465.8 kPa at reading no. 20
. STRESS = not selected

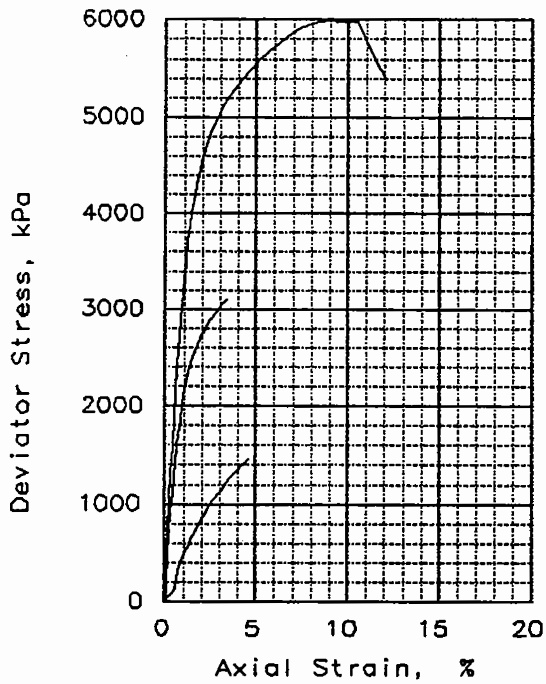
No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0000	0.000	36.00	0.0	0.0	0.0	1003.4	1003.4	1.00	341.4	1003.4	0.0
1	0.0040	0.010	55.00	19.0	0.1	19.9	1002.0	1021.9	1.02	342.8	1011.9	9.9
2	0.0080	0.020	141.00	105.0	0.1	109.9	992.4	1102.3	1.11	352.4	1047.3	54.9
3	0.0120	0.030	324.00	288.0	0.2	301.1	964.8	1265.9	1.31	380.0	1115.4	150.6
4	0.0160	0.041	492.00	456.0	0.3	476.5	920.7	1397.2	1.52	424.1	1158.9	238.2
5	0.0280	0.071	763.00	727.0	0.5	758.0	806.9	1564.9	1.94	537.9	1185.9	379.0
6	0.0420	0.107	970.00	934.0	0.7	971.4	693.8	1665.2	2.40	651.0	1179.5	485.7
7	0.0570	0.145	1124.00	1088.0	1.0	1128.6	594.5	1723.1	2.90	750.3	1158.8	564.3
8	0.0720	0.183	1229.00	1193.0	1.3	1234.3	521.4	1755.7	3.37	823.4	1138.5	617.1
9	0.0880	0.224	1299.00	1263.0	1.5	1303.0	471.7	1774.7	3.76	873.1	1123.2	651.5
10	0.0960	0.244	1323.00	1287.0	1.7	1325.9	453.8	1779.7	3.92	891.0	1116.7	662.9
11	0.1120	0.284	1362.00	1326.0	2.0	1362.2	429.6	1791.8	4.17	915.2	1110.7	681.1
12	0.1280	0.325	1390.00	1354.0	2.2	1386.9	415.8	1802.7	4.34	929.0	1109.3	693.5
13	0.1440	0.366	1413.00	1377.0	2.5	1406.5	408.9	1815.4	4.44	935.9	1112.1	703.2
14	0.1600	0.406	1432.00	1396.0	2.8	1421.8	405.5	1827.3	4.51	939.3	1116.4	710.9
15	0.1770	0.450	1450.00	1414.0	3.1	1435.7	405.5	1841.2	4.54	939.3	1123.4	717.9
16	0.1860	0.472	1457.00	1421.0	3.3	1440.5	406.2	1846.7	4.55	938.6	1126.4	720.2
17	0.1940	0.493	1466.00	1430.0	3.4	1447.5	407.6	1855.1	4.55	937.2	1131.4	723.8
	0.2030	0.516	1473.00	1437.0	3.5	1452.2	408.9	1861.1	4.55	935.9	1135.0	726.1
	0.2110	0.536	1481.00	1445.0	3.7	1458.2	411.0	1869.2	4.55	933.8	1140.1	729.1
20	0.2240	0.569	1492.00	1456.0	3.9	1465.8	413.1	1878.9	4.55	931.7	1146.0	732.9
21	0.2370	0.602	1501.00	1465.0	4.1	1471.4	415.8	1887.2	4.54	929.0	1151.5	735.7
22	0.2640	0.671	1521.00	1485.0	4.6	1484.1	423.4	1907.5	4.51	921.4	1165.5	742.1

Test Readings Data for Specimen No. 3

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Effective Stresses Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
23	0.2910	0.739	1540.00	1504.0	5.1	1495.7	431.7	1927.4	4.46	913.1	1179.5	747.8
24	0.3180	0.808	1557.00	1521.0	5.6	1505.1	440.7	1945.8	4.42	904.1	1193.2	752.5
25	0.3450	0.876	1573.00	1537.0	6.0	1513.3	449.6	1962.9	4.37	895.2	1206.3	756.7
26	0.3710	0.942	1592.00	1556.0	6.5	1524.6	459.3	1983.9	4.32	885.5	1221.6	762.3
27	0.3980	1.011	1604.00	1568.0	7.0	1528.6	469.6	1998.2	4.26	875.2	1233.9	764.3
28	0.4240	1.077	1617.00	1581.0	7.4	1533.7	480.7	2014.4	4.19	864.1	1247.6	766.9
29	0.4650	1.181	1634.00	1598.0	8.1	1538.2	497.2	2035.4	4.09	847.6	1266.3	769.1
30	0.4920	1.250	1649.00	1613.0	8.6	1544.7	508.2	2052.9	4.04	836.6	1280.5	772.3
31	0.5190	1.318	1662.00	1626.0	9.1	1549.1	519.3	2068.4	3.98	825.5	1293.9	774.6
32	0.5330	1.354	1668.00	1632.0	9.3	1550.6	524.8	2075.4	3.95	820.0	1300.1	775.3
33	0.5900	1.499	1678.00	1642.0	10.3	1543.0	548.9	2091.9	3.81	795.9	1320.4	771.5
34	0.6330	1.608	1689.00	1653.0	11.1	1540.3	566.9	2107.2	3.72	777.9	1337.1	770.2



	TOTAL	EFFECTIVE
C, kPa	78.1	151.2
ϕ, deg	33.6	39.5
TAN ϕ	0.66	0.83



	SAMPLE NO.:	1	2	3
INITIAL	WATER CONTENT, %	8.2	8.2	8.2
	DRY DENSITY, kN/cu.m	21.40	21.40	21.40
	SATURATION, %	82.1	82.1	82.1
	VOID RATIO	0.276	0.276	0.276
	DIAMETER, cm	7.26	7.26	7.26
	HEIGHT, cm	15.68	15.68	15.68
AT TEST	WATER CONTENT, %	7.9	7.7	7.4
	DRY DENSITY, kN/cu.m	22.35	22.46	22.62
	SATURATION, %	99.7	99.7	99.7
	VOID RATIO	0.222	0.216	0.207
	DIAMETER, cm	7.15	7.28	7.35
	HEIGHT, cm	15.46	14.87	14.49
	Strain rate, cm/min	0.0127	0.0127	0.0127
	BACK PRESSURE, kPa	310	276	276
	CELL PRESSURE, kPa	810	1276	2276
	FAILURE STRESS, kPa	1363	3051	5142
	TOTAL PORE PR., kPa	585	621	976
	ULTIMATE STRESS, kPa			
	TOTAL PORE PR., kPa			
	$\bar{\sigma}_1$ FAILURE, kPa	1589	3705	6442
	$\bar{\sigma}_3$ FAILURE, kPa	226	655	1300

TYPE OF TEST:
CU with Pore Pressures

CLIENT:

PROJECT: CARMACKS COPPER PROJECT

SAMPLE LOCATION: TR96-12-1

PROJ. NO.: 1377A DATE: 4/10/96

TRIAXIAL SHEAR TEST REPORT

Knight Piésold LLC

SAMPLE TYPE: REMOLDED

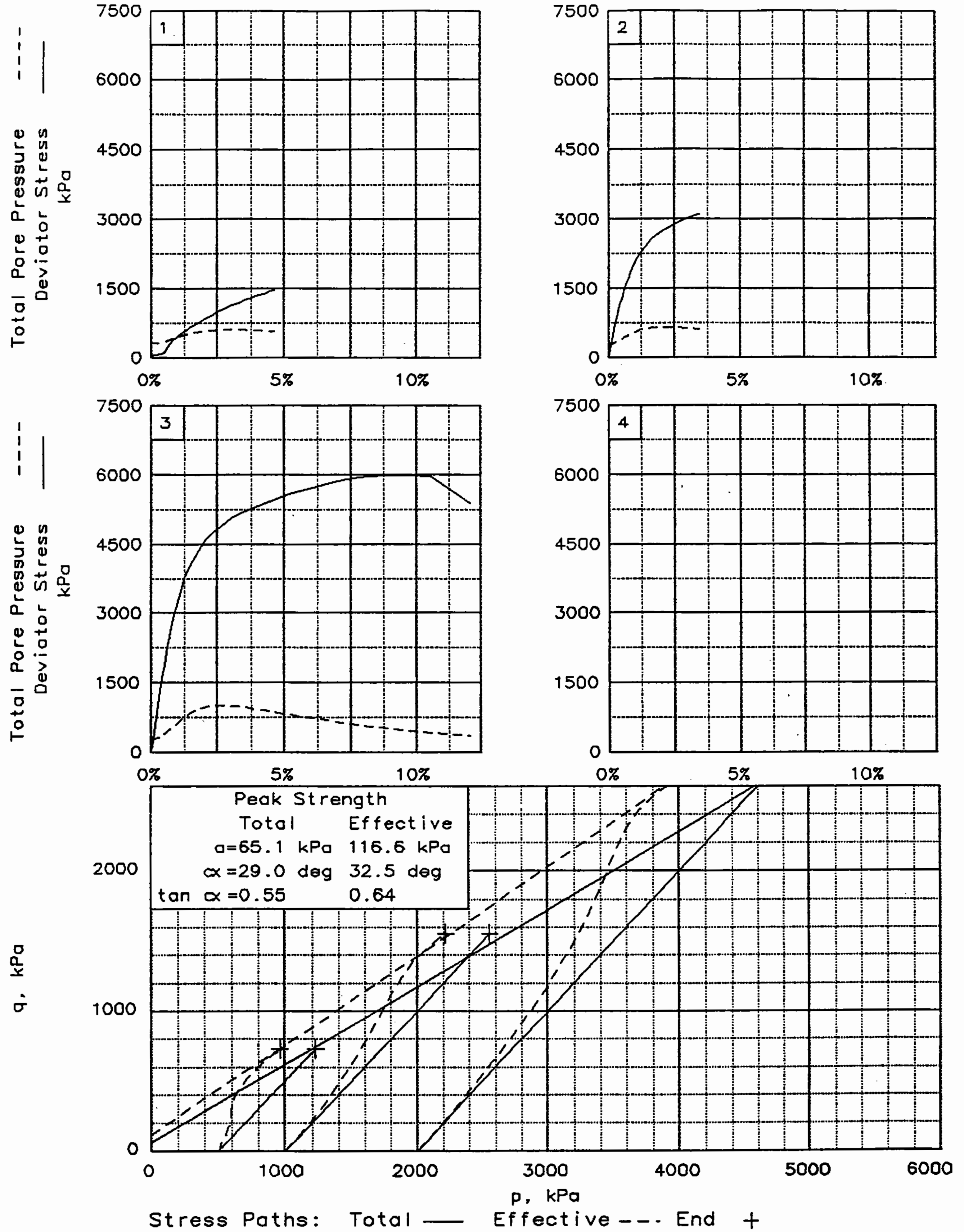
DESCRIPTION: silty/clayey SAND some gravel (SC-SM)

LL= 20 PL= 13 PI= 7

SPECIFIC GRAVITY= 2.785

REMARKS: Failure Criteria: Peak principal stress ratio. Specific gravity estimated. Multi-staged test.

Fig. No.: ______



Client:

Project: CARMACKS COPPER PROJECT

Location: TR96-12-1

File: 1377A-12 Project No.: 1377A

Fig. No.: ____

TRIAXIAL COMPRESSION TEST 4-18-1996
CU with Pore Pressures 8:45 am

Project and Sample Data

Date: 4/10/96
Client:
Project: CARMACKS COPPER PROJECT
Sample location: TR96-12-1
Sample description: silty/clayey SAND some gravel (SC-SM)
Remarks: Failure Criteria: Peak principal stress ratio.
Specific gravity estimated. Multi-staged test.
Fig no.: 2nd page Fig no. (if applicable):
Type of sample: REMOLDED
Specific gravity= 2.79 LL= 20 PL= 13 PI= 7
Test method: ASTM - Method A (staged method triaxial test)

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Wt. moist soil and tare:	1532.500			1641.000
Wt. dry soil and tare:	1417.000			1535.800
Wt. of tare:	0.000			118.800
Weight, gms:	1532.5			
Diameter, cm:	7.262	7.262	7.155	
Area, cm²:	41.418	41.418	40.205	
Height, cm:	15.679	15.679	15.463	
Net decrease in height, cm:		0.000	0.216	
decrease in water volume, cc:			27.700	
noisture:	8.2	9.9	7.9	7.4
Wet density, kN/cu.m:	23.14	23.52	24.13	
Dry density, kN/cu.m:	21.40	21.40	22.35	
Void ratio:	0.2763	0.2763	0.2219	
% Saturation:	82.1	99.8	99.7	

Test Readings Data for Specimen No. 1

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 810.3 kPa
Consolidation back pressure = 310.3 kPa
Consolidation effective confining stress = 500.0 kPa
Strain rate, in/min = 0.0127
FAIL. STRESS = 1363.3 kPa at reading no. 34
ULT. STRESS = not selected

Test Readings Data for Specimen No. 1

No.	Def. Dial its	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0000	0.000	27.00	0.0	0.0	0.0	504.8	504.8	1.00	305.5	504.8	0.0
1	0.0050	0.013	57.00	30.0	0.1	33.2	502.0	535.2	1.07	308.3	518.6	16.6
2	0.0100	0.025	70.00	43.0	0.2	47.5	498.6	546.1	1.10	311.7	522.3	23.7
3	0.0150	0.038	76.00	49.0	0.2	54.1	494.4	548.5	1.11	315.9	521.4	27.0
4	0.0200	0.051	85.00	58.0	0.3	64.0	489.6	553.6	1.13	320.7	521.6	32.0
5	0.0250	0.064	100.00	73.0	0.4	80.4	482.7	563.1	1.17	327.6	522.9	40.2
6	0.0320	0.081	129.00	102.0	0.5	112.3	471.7	584.0	1.24	338.6	527.8	56.1
7	0.0350	0.089	156.00	129.0	0.6	141.9	464.1	606.0	1.31	346.2	535.1	71.0
8	0.0400	0.102	240.00	213.0	0.7	234.1	444.1	678.2	1.53	366.2	561.2	117.1
9	0.0450	0.114	308.00	281.0	0.7	308.6	422.0	730.6	1.73	388.3	576.3	154.3
10	0.0500	0.127	359.00	332.0	0.8	364.3	405.5	769.8	1.90	404.8	587.6	182.1
11	0.0580	0.147	421.00	394.0	1.0	431.8	380.6	812.4	2.13	429.7	596.5	215.9
12	0.0660	0.168	471.00	444.0	1.1	485.9	357.2	843.1	2.36	453.1	600.2	243.0
13	0.0740	0.188	525.00	498.0	1.2	544.3	329.6	873.9	2.65	480.7	601.7	272.1
14	0.0820	0.208	567.00	540.0	1.3	589.4	308.9	898.3	2.91	501.4	603.6	294.7
15	0.0900	0.229	612.00	585.0	1.5	637.7	290.3	928.0	3.20	520.0	609.1	318.8
16	0.0980	0.249	661.00	634.0	1.6	690.2	271.0	961.2	3.55	539.3	616.1	345.1
17	0.1060	0.269	704.00	677.0	1.7	736.0	256.5	992.5	3.87	553.8	624.5	368.0
18	0.1140	0.290	746.00	719.0	1.9	780.6	243.4	1024.0	4.21	566.9	633.7	390.3
19	0.1220	0.310	791.00	764.0	2.0	828.3	232.4	1060.7	4.56	577.9	646.6	414.2
20	0.1300	0.330	832.00	805.0	2.1	871.6	224.1	1095.7	4.89	586.2	659.9	435.8
21	0.1380	0.351	872.00	845.0	2.3	913.7	217.9	1131.6	5.19	592.4	674.7	456.8
22	0.1460	0.371	910.00	883.0	2.4	953.5	213.1	1166.6	5.47	597.2	689.8	476.7
23	0.1540	0.391	950.00	923.0	2.5	995.4	208.9	1204.3	5.76	601.4	706.6	497.7
	.1620	0.411	982.00	955.0	2.7	1028.5	206.9	1235.4	5.97	603.4	721.1	514.2
	0.1700	0.432	1019.00	992.0	2.8	1066.9	205.5	1272.4	6.19	604.8	738.9	533.4
26	0.1780	0.452	1057.00	1030.0	2.9	1106.2	204.8	1311.0	6.40	605.5	757.9	553.1
27	0.1940	0.493	1110.00	1083.0	3.2	1160.0	205.5	1365.5	6.64	604.8	785.5	580.0
28	0.2020	0.513	1141.00	1114.0	3.3	1191.6	207.5	1399.1	6.74	602.8	803.3	595.8
29	0.2100	0.533	1173.00	1146.0	3.4	1224.2	209.6	1433.8	6.84	600.7	821.7	612.1
30	0.2180	0.554	1202.00	1175.0	3.6	1253.4	212.4	1465.8	6.90	597.9	839.1	626.7
31	0.2260	0.574	1229.00	1202.0	3.7	1280.5	215.1	1495.6	6.95	595.2	855.3	640.2
32	0.2340	0.594	1258.00	1231.0	3.8	1309.6	217.9	1527.5	7.01	592.4	872.7	654.8
33	0.2420	0.615	1285.00	1258.0	4.0	1336.5	222.0	1558.5	7.02	588.3	890.2	668.2
34	0.2500	0.635	1312.00	1285.0	4.1	1363.3	225.5	1588.8	7.05	584.8	907.2	681.7
35	0.2580	0.655	1338.00	1311.0	4.2	1389.0	229.6	1618.6	7.05	580.7	924.1	694.5
36	0.2660	0.676	1360.00	1333.0	4.4	1410.4	233.7	1644.1	7.03	576.6	938.9	705.2
37	0.2740	0.696	1383.00	1356.0	4.5	1432.7	237.2	1669.9	7.04	573.1	953.6	716.4
38	0.2820	0.716	1407.00	1380.0	4.6	1456.1	242.0	1698.1	7.02	568.3	970.0	728.0

Specimen Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
moist soil and tare:	1532.500			1641.000
Wt. dry soil and tare:	1417.000			1535.800
Wt. of tare:	0.000			118.800
Weight, gms:	1532.5			
Diameter, cm:	7.262		7.277	
Area, cm²:	41.418		41.590	
Height, cm:	15.679		14.874	
Net decrease in height, cm:		0.932	-0.127	
Net decrease in water volume, cc:			3.100	
% Moisture:	8.2		7.7	7.4
Wet density, kN/cu.m:	23.14		24.20	
Dry density, kN/cu.m:	21.40		22.46	
Void ratio:	0.2763		0.2158	
% Saturation:	82.1		99.7	

Test Readings Data for Specimen No. 2

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 1275.9 kPa
Consolidation back pressure = 275.9 kPa
Consolidation effective confining stress = 1000.0 kPa
Strain rate, in/min = 0.0127
. STRESS = 3050.8 kPa at reading no. 27
. STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Effective Stresses Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0000	0.000	41.00	0.0	0.0	0.0	1006.2	1006.2	1.00	269.7	1006.2	0.0
1	0.0050	0.013	209.00	168.0	0.1	179.5	1000.7	1180.2	1.18	275.2	1090.5	89.8
2	0.0100	0.025	483.00	442.0	0.2	471.9	982.8	1454.7	1.48	293.1	1218.8	236.0
3	0.0150	0.038	703.00	662.0	0.3	706.2	960.0	1666.2	1.74	315.9	1313.1	353.1
4	0.0200	0.051	909.00	868.0	0.3	925.2	932.5	1857.7	1.99	343.4	1395.1	462.6
5	0.0250	0.064	1090.00	1049.0	0.4	1117.2	903.5	2020.7	2.24	372.4	1462.1	558.6
6	0.0300	0.076	1239.00	1198.0	0.5	1274.8	879.3	2154.1	2.45	396.6	1516.7	637.4
7	0.0350	0.089	1382.00	1341.0	0.6	1425.7	853.8	2279.5	2.67	422.1	1566.6	712.8
8	0.0400	0.102	1526.00	1485.0	0.7	1577.4	825.6	2403.0	2.91	450.3	1614.3	788.7
9	0.0450	0.114	1648.00	1607.0	0.8	1705.6	800.7	2506.3	3.13	475.2	1653.5	852.8
10	0.0500	0.127	1767.00	1726.0	0.9	1830.3	775.2	2605.5	3.36	500.7	1690.3	915.1
11	0.0580	0.147	1957.00	1916.0	1.0	2029.0	735.2	2764.2	3.76	540.7	1749.7	1014.5
12	0.0660	0.168	2094.00	2053.0	1.1	2171.0	704.2	2875.2	4.08	571.7	1789.7	1085.5
13	0.0740	0.188	2218.00	2177.0	1.3	2299.0	678.0	2977.0	4.39	597.9	1827.5	1149.5
14	0.0820	0.208	2317.00	2276.0	1.4	2400.2	658.7	3058.9	4.64	617.2	1858.8	1200.1
15	0.0900	0.229	2406.00	2365.0	1.5	2490.6	644.2	3134.8	4.87	631.7	1889.5	1245.3
16	0.0980	0.249	2479.00	2438.0	1.7	2563.9	634.5	3198.4	5.04	641.4	1916.5	1282.0
17	0.1060	0.269	2545.00	2504.0	1.8	2629.7	627.6	3257.3	5.19	648.3	1942.4	1314.8
	0.1140	0.290	2605.00	2564.0	1.9	2688.9	624.2	3313.1	5.31	651.7	1968.7	1344.5
	0.1220	0.310	2659.00	2618.0	2.1	2741.7	623.5	3365.2	5.40	652.4	1994.4	1370.9
20	0.1300	0.330	2707.00	2666.0	2.2	2788.1	624.2	3412.3	5.47	651.7	2018.3	1394.1
21	0.1380	0.351	2754.00	2713.0	2.4	2833.3	626.2	3459.5	5.52	649.7	2042.8	1416.6
22	0.1460	0.371	2808.00	2767.0	2.5	2885.6	629.7	3515.3	5.58	646.2	2072.5	1442.8

Test Readings Data for Specimen No. 2

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
23	0.1540	0.391	2838.00	2797.0	2.6	2912.8	632.5	3545.3	5.61	643.4	2088.9	1456.4
24	0.1620	0.411	2878.00	2837.0	2.8	2950.4	638.0	3588.4	5.62	637.9	2113.2	1475.2
25	0.1700	0.432	2919.00	2878.0	2.9	2988.8	643.5	3632.3	5.64	632.4	2137.9	1494.4
26	0.1780	0.452	2955.00	2914.0	3.0	3021.9	649.3	3671.2	5.65	626.6	2160.3	1511.0
27	0.1860	0.472	2987.00	2946.0	3.2	3050.8	654.5	3705.3	5.66	621.4	2179.9	1525.4
28	0.1940	0.493	3019.00	2978.0	3.3	3079.6	661.4	3741.0	5.66	614.5	2201.2	1539.8
29	0.2020	0.513	3051.00	3010.0	3.4	3108.3	669.0	3777.3	5.65	606.9	2223.1	1554.1

Specimen Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
[illegible] moist soil and tare:	1532.500			1641.000
Wt. dry soil and tare:	1417.000			1535.800
Wt. of tare:	0.000			118.800
Weight, gms:	1532.5			
Diameter, cm:	7.262		7.348	
Area, cm²:	41.418		42.401	
Height, cm:	15.679		14.488	
Net decrease in height, cm:		1.318	-0.127	
Net decrease in water volume, cc:			4.300	
% Moisture:	8.2		7.4	7.4
Wet density, kN/cu.m:	23.14		24.30	
Dry density, kN/cu.m:	21.40		22.62	
Void ratio:	0.2763		0.2073	
% Saturation:	82.1		99.7	

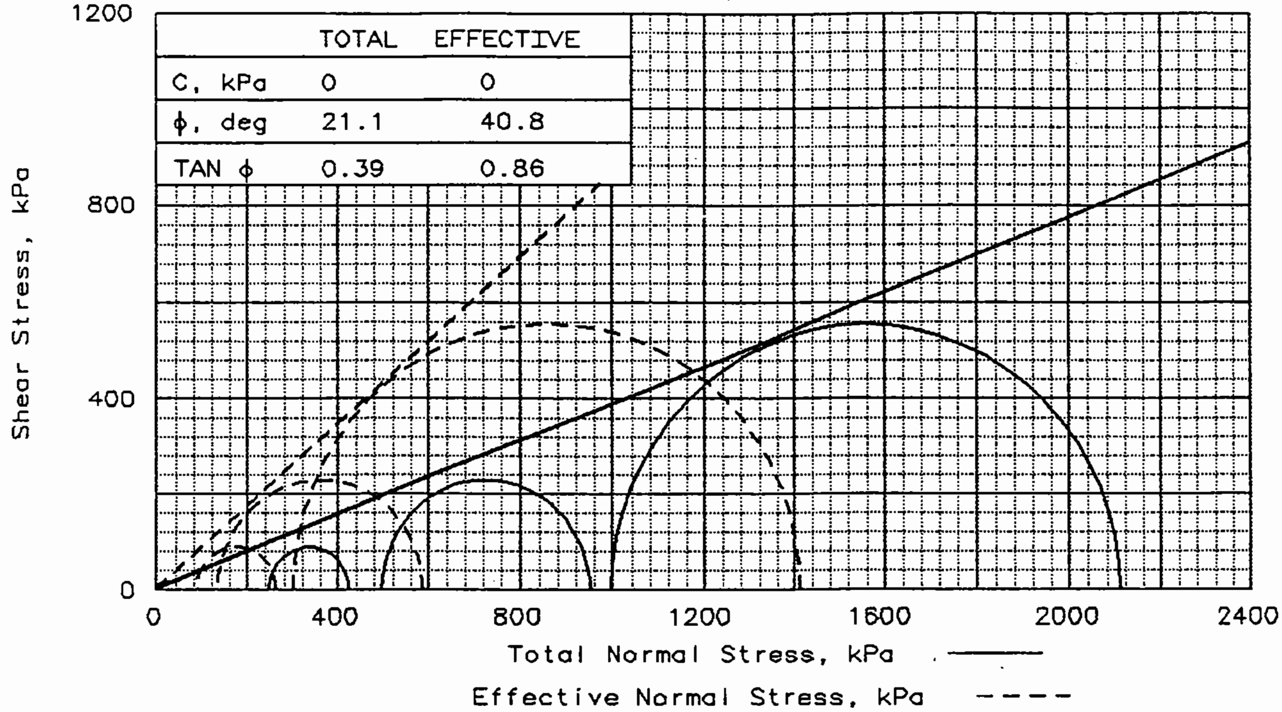
Test Readings Data for Specimen No. 3

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 2275.9 kPa
Consolidation back pressure = 275.9 kPa
Consolidation effective confining stress = 2000.0 kPa
Strain rate, in/min = 0.0127
[illegible]. STRESS = 5141.6 kPa at reading no. 25
[illegible]. STRESS = not selected

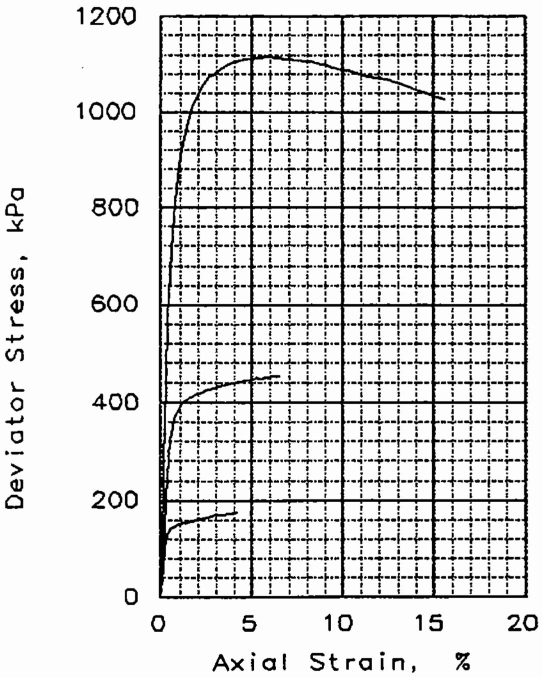
No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Effective Stresses Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0000	0.000	62.00	0.0	0.0	0.0	2006.2	2006.2	1.00	269.7	2006.2	0.0
1	0.0010	0.003	66.00	4.0	0.0	4.2	2005.6	2009.8	1.00	270.3	2007.7	2.1
2	0.0050	0.013	186.00	124.0	0.1	130.0	2002.8	2132.8	1.06	273.1	2067.8	65.0
3	0.0080	0.020	460.00	398.0	0.1	416.9	1995.2	2412.1	1.21	280.7	2203.7	208.5
4	0.0120	0.030	755.00	693.0	0.2	725.5	1982.1	2707.6	1.37	293.8	2344.8	362.7
5	0.0160	0.041	1046.00	984.0	0.3	1029.4	1964.9	2994.3	1.52	311.0	2479.6	514.7
6	0.0200	0.051	1316.00	1254.0	0.4	1310.9	1944.9	3255.8	1.67	331.0	2600.4	655.5
7	0.0250	0.064	1591.00	1529.0	0.4	1597.0	1918.7	3515.7	1.83	357.2	2717.2	798.5
8	0.0300	0.076	1863.00	1801.0	0.5	1879.4	1887.6	3767.0	2.00	388.3	2827.3	939.7
9	0.0350	0.089	2121.00	2059.0	0.6	2146.8	1853.8	4000.6	2.16	422.1	2927.2	1073.4
10	0.0400	0.102	2360.00	2298.0	0.7	2393.9	1817.3	4211.2	2.32	458.6	3014.2	1196.9
11	0.0500	0.127	2843.00	2781.0	0.9	2891.9	1729.7	4621.6	2.67	546.2	3175.7	1446.0
12	0.0610	0.155	3272.00	3210.0	1.1	3331.5	1634.5	4966.0	3.04	641.4	3300.3	1665.8
13	0.0720	0.183	3641.00	3579.0	1.3	3707.2	1537.3	5244.5	3.41	738.6	3390.9	1853.6
14	0.0780	0.198	3799.00	3737.0	1.4	3866.8	1493.1	5359.9	3.59	782.8	3426.5	1933.4
15	0.0840	0.213	3936.00	3874.0	1.5	4004.3	1453.8	5458.1	3.75	822.1	3455.9	2002.1
16	0.0910	0.231	4068.00	4006.0	1.6	4135.5	1416.6	5552.1	3.92	859.3	3484.4	2067.8
17	0.1030	0.262	4300.00	4238.0	1.8	4365.7	1357.3	5723.0	4.22	918.6	3540.1	2182.8
[illegible]	0.1090	0.277	4395.00	4333.0	1.9	4458.8	1335.2	5794.0	4.34	940.7	3564.6	2229.4
[illegible]	[illegible].1150	0.292	4488.00	4426.0	2.0	4549.6	1316.3	5865.9	4.46	959.6	3591.1	2274.8
20	0.1220	0.310	4568.00	4506.0	2.1	4626.0	1302.1	5928.1	4.55	973.8	3615.1	2313.0
21	0.1340	0.340	4707.00	4645.0	2.3	4758.5	1284.2	6042.7	4.71	991.7	3663.4	2379.2
22	0.1490	0.378	4831.00	4769.0	2.6	4872.3	1278.0	6150.3	4.81	997.9	3714.2	2436.2

Test Readings Data for Specimen No. 3

No.	Def. Dial its	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
23	0.1620	0.411	4938.00	4876.0	2.8	4970.0	1280.0	6250.0	4.88	995.9	3765.0	2485.0
24	0.1750	0.445	5041.00	4979.0	3.1	5063.1	1288.3	6351.4	4.93	987.6	3819.8	2531.5
25	0.1890	0.480	5131.00	5069.0	3.3	5141.6	1300.0	6441.6	4.96	975.9	3870.8	2570.8
26	0.2160	0.549	5289.00	5227.0	3.8	5275.9	1335.9	6611.8	4.95	940.0	3973.8	2637.9
27	0.2440	0.620	5433.00	5371.0	4.3	5393.5	1378.7	6772.2	4.91	897.2	4075.5	2696.8
28	0.2710	0.688	5564.00	5502.0	4.8	5497.8	1425.6	6923.4	4.86	850.3	4174.5	2748.9
29	0.2980	0.757	5684.00	5622.0	5.2	5589.8	1472.5	7062.3	4.80	803.4	4267.4	2794.9
30	0.3260	0.828	5795.00	5733.0	5.7	5670.6	1520.0	7190.6	4.73	755.9	4355.3	2835.3
31	0.3550	0.902	5912.00	5850.0	6.2	5755.1	1561.4	7316.5	4.69	714.5	4439.0	2877.6
32	0.3830	0.973	6021.00	5959.0	6.7	5831.7	1602.8	7434.5	4.64	673.1	4518.6	2915.8
33	0.4200	1.067	6142.00	6080.0	7.4	5908.7	1657.3	7566.0	4.57	618.6	4611.7	2954.4
34	0.4650	1.181	6256.00	6194.0	8.2	5968.2	1719.3	7687.5	4.47	556.6	4703.4	2984.1
35	0.5110	1.298	6333.00	6271.0	9.0	5989.4	1775.9	7765.3	4.37	500.0	4770.6	2994.7
36	0.5580	1.417	6382.00	6320.0	9.8	5981.5	1823.5	7805.0	4.28	452.4	4814.3	2990.8
37	0.6040	1.534	6430.00	6368.0	10.6	5973.1	1864.2	7837.3	4.20	411.7	4850.7	2986.5
38	0.6280	1.595	6279.00	6217.0	11.0	5804.0	1883.5	7687.5	4.08	392.4	4785.5	2902.0
39	0.6600	1.676	6083.00	6021.0	11.6	5585.6	1904.9	7490.5	3.93	371.0	4697.7	2792.8
40	0.6900	1.753	5914.00	5852.0	12.1	5396.5	1924.2	7320.7	3.80	351.7	4622.5	2698.3



	TOTAL	EFFECTIVE
C, kPa	0	0
ϕ, deg	21.1	40.8
TAN ϕ	0.39	0.86



	SAMPLE NO.:	1	2	3
INITIAL	WATER CONTENT, %	18.4	18.4	18.4
	DRY DENSITY, kN/cu.m	16.71	16.71	16.71
	SATURATION, %	86.6	86.6	86.6
	VOID RATIO	0.567	0.567	0.567
	DIAMETER, cm	7.45	7.45	7.45
	HEIGHT, cm	15.19	15.19	15.19
AT TEST	WATER CONTENT, %	13.0	12.3	11.5
	DRY DENSITY, kN/cu.m	19.46	19.71	20.03
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.346	0.329	0.307
	DIAMETER, cm	7.09	7.18	7.39
	HEIGHT, cm	14.41	13.86	12.86
	Strain rate, cm/min	0.0127	0.0127	0.0127
	BACK PRESSURE, kPa	345	345	345
	CELL PRESSURE, kPa	595	845	1345
	FAILURE STRESS, kPa	176	453	1111
	TOTAL PORE PR., kPa	506	708	1041
	ULTIMATE STRESS, kPa			
	TOTAL PORE PR., kPa			
	$\bar{\sigma}_1$ FAILURE, kPa	265	590	1415
	$\bar{\sigma}_3$ FAILURE, kPa	89	137	303

TYPE OF TEST:
CU with Pore Pressures

CLIENT:

PROJECT: CARMACKS COPPER PROJECT

SAMPLE LOCATION: TR96-1-2

PROJ. NO.: 1377A DATE: 4/05/96

TRIAXIAL SHEAR TEST REPORT

Knight Piésold LLC

SAMPLE TYPE: REMOLDED

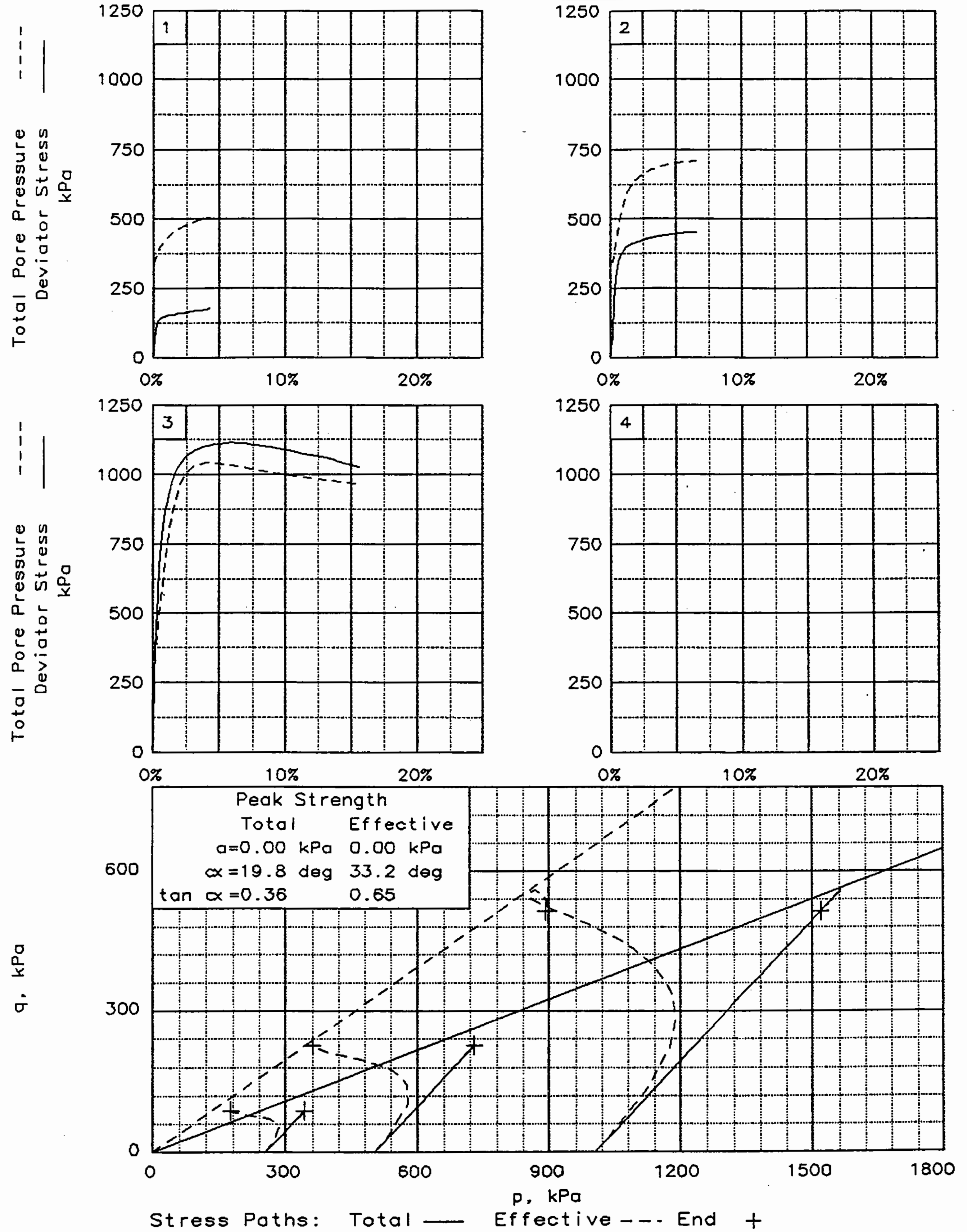
DESCRIPTION: very clayey SAND some gravel (SC)

LL= 26 PL= 15 PI= 11

SPECIFIC GRAVITY= 2.67

REMARKS: Failure criteria: Peak pricipal stress ratio.
Specific gravity estimated.
Multi-staged test.

Fig. No.:



Client:

Project: CARMACKS COPPER PROJECT

Location: TR96-1-2

File: 1377A-1 Project No.: 1377A Fig. No.: ____

TRIAXIAL COMPRESSION TEST
CU with Pore Pressures

4-18-1996
8:46 am

Project and Sample Data

Date: 4/05/96
Client:
Project: CARMACKS COPPER PROJECT
Sample location: TR96-1-2
Sample description: very clayey SAND some gravel (SC)
Remarks: Failure criteria: Peak pricipal stress ratio.
Specific gravity estimated. Multi-staged test.
Fig no.: 2nd page Fig no. (if applicable):
Type of sample: REMOLDED
Specific gravity= 2.67 LL= 26 PL= 15 PI= 11
Test method: ASTM - Method A (staged method triaxial test)

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Wt. moist soil and tare:	1334.500			1404.200
Wt. dry soil and tare:	1127.100			1274.400
Wt. of tare:	0.000			147.300
Weight, gms:	1334.5			
Diameter, cm:	7.447	7.447	7.086	
Area, cm²:	43.560	43.560	39.435	
Height, cm:	15.189	15.189	14.407	
Net decrease in height, cm:		0.000	0.782	
decrease in water volume, cc:			93.500	
oisture:	18.4	21.2	13.0	11.5
Wet density, kN/cu.m:	19.78	20.26	21.98	
Dry density, kN/cu.m:	16.71	16.71	19.46	
Void ratio:	0.5673	0.5673	0.3459	
% Saturation:	86.6	100.0	100.0	

Test Readings Data for Specimen No. 1

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 595.2 kPa
Consolidation back pressure = 344.9 kPa
Consolidation effective confining stress = 250.3 kPa
Strain rate, in/min = 0.0127
FAIL. STRESS = 176.1 kPa at reading no. 29
ULT. STRESS = not selected

Test Readings Data for Specimen No. 1

No.	Def. Dial [illegible]ts	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0000	0.000	23.00	0.0	0.0	0.0	255.2	255.2	1.00	340.0	255.2	0.0
1	0.0050	0.013	53.00	30.0	0.1	33.8	251.8	285.6	1.13	343.4	268.7	16.9
2	0.0100	0.025	78.00	55.0	0.2	61.9	246.2	308.1	1.25	349.0	277.2	31.0
3	0.0150	0.038	116.00	93.0	0.3	104.6	231.8	336.4	1.45	363.4	284.1	52.3
4	0.0230	0.058	137.00	114.0	0.4	128.1	213.1	341.2	1.60	382.1	277.1	64.0
5	0.0270	0.069	142.00	119.0	0.5	133.6	205.5	339.1	1.65	389.7	272.3	66.8
6	0.0300	0.076	145.00	122.0	0.5	136.9	200.7	337.6	1.68	394.5	269.1	68.4
7	0.0350	0.089	150.00	127.0	0.6	142.4	192.4	334.8	1.74	402.8	263.6	71.2
8	0.0400	0.102	152.00	129.0	0.7	144.5	186.2	330.7	1.78	409.0	258.4	72.2
9	0.0450	0.114	154.00	131.0	0.8	146.6	180.0	326.6	1.81	415.2	253.3	73.3
10	0.0500	0.127	156.00	133.0	0.9	148.7	174.5	323.2	1.85	420.7	248.8	74.3
11	0.0600	0.152	158.00	135.0	1.1	150.7	164.2	314.9	1.92	431.0	239.5	75.3
12	0.0700	0.178	160.00	137.0	1.2	152.6	155.2	307.8	1.98	440.0	231.5	76.3
13	0.0800	0.203	162.00	139.0	1.4	154.6	148.3	302.9	2.04	446.9	225.6	77.3
14	0.0900	0.229	163.00	140.0	1.6	155.4	142.1	297.5	2.09	453.1	219.8	77.7
15	0.1000	0.254	165.00	142.0	1.8	157.3	135.9	293.2	2.16	459.3	214.6	78.7
16	0.1100	0.279	168.00	145.0	1.9	160.4	130.4	290.8	2.23	464.8	210.6	80.2
17	0.1200	0.305	169.00	146.0	2.1	161.2	125.5	286.7	2.28	469.7	206.1	80.6
18	0.1300	0.330	170.00	147.0	2.3	162.0	120.7	282.7	2.34	474.5	201.7	81.0
19	0.1400	0.356	172.00	149.0	2.5	163.9	118.0	281.9	2.39	477.2	200.0	82.0
20	0.1500	0.381	173.00	150.0	2.6	164.7	113.1	277.8	2.46	482.1	195.5	82.4
21	0.1600	0.406	175.00	152.0	2.8	166.6	109.7	276.3	2.52	485.5	193.0	83.3
22	0.1700	0.432	177.00	154.0	3.0	168.5	106.9	275.4	2.58	488.3	191.2	84.3
23	0.1800	0.457	178.00	155.0	3.2	169.3	103.5	272.8	2.64	491.7	188.1	84.6
	[illegible]900	0.483	179.00	156.0	3.3	170.1	101.4	271.5	2.68	493.8	186.4	85.0
	[illegible].2000	0.508	180.00	157.0	3.5	170.8	98.6	269.4	2.73	496.6	184.0	85.4
26	0.2100	0.533	181.00	158.0	3.7	171.6	95.9	267.5	2.79	499.3	181.7	85.8
27	0.2200	0.559	183.00	160.0	3.9	173.5	93.8	267.3	2.85	501.4	180.5	86.7
28	0.2300	0.584	184.00	161.0	4.1	174.2	91.8	266.0	2.90	503.4	178.9	87.1
29	0.2400	0.610	186.00	163.0	4.2	176.1	89.0	265.1	2.98	506.2	177.0	88.0

Specimen Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
moist soil and tare:	1334.500			1404.200
Wt. dry soil and tare:	1127.100			1274.400
Wt. of tare:	0.000			147.300
Weight, gms:	1334.5			
Diameter, cm:	7.447		7.178	
Area, cm^2:	43.560		40.462	
Height, cm:	15.189		13.861	
Net decrease in height, cm:		1.392	-0.064	
Net decrease in water volume, cc:			7.300	
% Moisture:	18.4		12.3	11.5
Wet density, kN/cu.m:	19.78		22.13	
Dry density, kN/cu.m:	16.71		19.71	
Void ratio:	0.5673		0.3286	
% Saturation:	86.6		100.0	

Test Readings Data for Specimen No. 2

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 844.8 kPa
Consolidation back pressure = 344.8 kPa
Consolidation effective confining stress = 500.0 kPa
Strain rate, in/min = 0.0127
[illegible]. STRESS = 453.4 kPa at reading no. 45
[illegible]. STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Effective Stresses Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0000	0.000	33.00	0.0	0.0	0.0	503.4	503.4	1.00	341.4	503.4	0.0
1	0.0050	0.013	67.00	34.0	0.1	37.3	501.4	538.7	1.07	343.4	520.1	18.7
2	0.0110	0.028	99.00	66.0	0.2	72.4	497.9	570.3	1.15	346.9	534.1	36.2
3	0.0170	0.043	220.00	187.0	0.3	204.9	476.5	681.4	1.43	368.3	579.0	102.5
4	0.0235	0.060	294.00	261.0	0.4	285.7	435.1	720.8	1.66	409.7	577.9	142.8
5	0.0300	0.076	330.00	297.0	0.5	324.7	397.9	722.6	1.82	446.9	560.3	162.4
6	0.0360	0.091	353.00	320.0	0.7	349.5	365.5	715.0	1.96	479.3	540.2	174.7
7	0.0420	0.107	368.00	335.0	0.8	365.4	337.9	703.3	2.08	506.9	520.6	182.7
8	0.0490	0.124	381.00	348.0	0.9	379.1	308.9	688.0	2.23	535.9	498.5	189.6
9	0.0650	0.165	399.00	366.0	1.2	397.6	262.0	659.6	2.52	582.8	460.8	198.8
10	0.0730	0.185	405.00	372.0	1.3	403.5	245.5	649.0	2.64	599.3	447.2	201.7
11	0.0790	0.201	408.00	375.0	1.4	406.3	235.8	642.1	2.72	609.0	438.9	203.1
12	0.0860	0.218	412.00	379.0	1.6	410.1	225.5	635.6	2.82	619.3	430.5	205.0
13	0.0930	0.236	414.00	381.0	1.7	411.7	217.2	628.9	2.90	627.6	423.1	205.9
14	0.1000	0.254	416.00	383.0	1.8	413.3	209.6	622.9	2.97	635.2	416.3	206.7
15	0.1070	0.272	419.00	386.0	2.0	416.0	203.4	619.4	3.05	641.4	411.4	208.0
16	0.1150	0.292	422.00	389.0	2.1	418.6	197.2	615.8	3.12	647.6	406.5	209.3
17	0.1220	0.310	424.00	391.0	2.2	420.2	191.7	611.9	3.19	653.1	401.8	210.1
[illegible]	0.1300	0.330	427.00	394.0	2.4	422.8	186.9	609.7	3.26	657.9	398.3	211.4
[illegible]	0.1370	0.348	429.00	396.0	2.5	424.4	183.4	607.8	3.31	661.4	395.6	212.2
20	0.1440	0.366	431.00	398.0	2.6	426.0	179.3	605.3	3.38	665.5	392.3	213.0
21	0.1510	0.384	433.00	400.0	2.8	427.6	175.8	603.4	3.43	669.0	389.6	213.8
22	0.1570	0.399	435.00	402.0	2.9	429.2	173.8	603.0	3.47	671.0	388.4	214.6

Test Readings Data for Specimen No. 2

No.	Def. Dial ts	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
23	0.1630	0.414	437.00	404.0	3.0	430.9	171.0	601.9	3.52	673.8	386.4	215.4
24	0.1700	0.432	438.50	405.5	3.1	431.9	168.2	600.1	3.57	676.6	384.1	215.9
25	0.1780	0.452	440.00	407.0	3.3	432.8	165.5	598.3	3.62	679.3	381.9	216.4
26	0.1850	0.470	442.50	409.5	3.4	434.9	163.4	598.3	3.66	681.4	380.9	217.5
27	0.1930	0.490	444.00	411.0	3.5	435.9	160.7	596.6	3.71	684.1	378.6	217.9
28	0.2010	0.511	446.00	413.0	3.7	437.3	158.6	595.9	3.76	686.2	377.3	218.7
29	0.2090	0.531	448.00	415.0	3.8	438.8	155.8	594.6	3.82	689.0	375.2	219.4
30	0.2170	0.551	450.00	417.0	4.0	440.2	153.8	594.0	3.86	691.0	373.9	220.1
31	0.2250	0.572	451.00	418.0	4.1	440.6	151.7	592.3	3.90	693.1	372.0	220.3
32	0.2320	0.589	453.00	420.0	4.3	442.1	150.3	592.4	3.94	694.5	371.3	221.0
33	0.2400	0.610	454.00	421.0	4.4	442.5	148.2	590.7	3.99	696.6	369.4	221.2
34	0.2520	0.640	457.00	424.0	4.6	444.6	146.2	590.8	4.04	698.6	368.5	222.3
35	0.2600	0.660	458.00	425.0	4.8	445.0	144.8	589.8	4.07	700.0	367.3	222.5
36	0.2680	0.681	460.00	427.0	4.9	446.4	142.7	589.1	4.13	702.1	365.9	223.2
37	0.2780	0.706	462.00	429.0	5.1	447.6	142.0	589.6	4.15	702.8	365.8	223.8
38	0.2850	0.724	463.00	430.0	5.2	448.0	140.7	588.7	4.18	704.1	364.7	224.0
39	0.2920	0.742	465.00	432.0	5.4	449.5	140.0	589.5	4.21	704.8	364.8	224.8
40	0.2990	0.759	465.00	432.0	5.5	448.9	139.3	588.2	4.22	705.5	363.7	224.4
41	0.3060	0.777	466.00	433.0	5.6	449.3	138.6	587.9	4.24	706.2	363.3	224.7
42	0.3130	0.795	468.00	435.0	5.7	450.8	137.9	588.7	4.27	706.9	363.3	225.4
43	0.3270	0.831	470.00	437.0	6.0	451.6	137.9	589.5	4.28	706.9	363.7	225.8
44	0.3340	0.848	472.00	439.0	6.1	453.1	137.2	590.3	4.30	707.6	363.7	226.5
45	0.3420	0.869	473.00	440.0	6.3	453.4	136.5	589.9	4.32	708.3	363.2	226.7
46	0.3500	0.889	473.00	440.0	6.4	452.7	136.5	589.2	4.32	708.3	362.8	226.3
	3570	0.907	474.00	441.0	6.5	453.1	135.8	588.9	4.34	709.0	362.3	226.5

Specimen Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
moist soil and tare:	1334.500			1404.200
Wt. dry soil and tare:	1127.100			1274.400
Wt. of tare:	0.000			147.300
Weight, gms:	1334.5			
Diameter, cm:	7.447		7.391	
Area, cm²:	43.560		42.902	
Height, cm:	15.189		12.865	
Net decrease in height, cm:		2.235	0.089	
Net decrease in water volume, cc:			8.900	
% Moisture:	18.4		11.5	11.5
Wet density, kN/cu.m:	19.78		22.33	
Dry density, kN/cu.m:	16.71		20.03	
Void ratio:	0.5673		0.3075	
% Saturation:	86.6		100.0	

Test Readings Data for Specimen No. 3

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Consolidation cell pressure = 1344.8 kPa
Consolidation back pressure = 344.8 kPa
Consolidation effective confining stress = 1000.0 kPa
Strain rate, in/min = 0.0127
. STRESS = 1111.4 kPa at reading no. 24
.. STRESS = not selected

No.	Def. Dial Units	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
0	0.0000	0.000	46.00	0.0	0.0	0.0	1006.2	1006.2	1.00	338.6	1006.2	0.0
1	0.0040	0.010	122.00	76.0	0.1	78.7	1004.1	1082.8	1.08	340.7	1043.5	39.4
2	0.0100	0.025	309.00	263.0	0.2	272.1	989.6	1261.7	1.28	355.2	1125.7	136.1
3	0.0150	0.038	478.00	432.0	0.3	446.6	954.5	1401.1	1.47	390.3	1177.8	223.3
4	0.0210	0.053	597.00	551.0	0.4	568.9	905.5	1474.4	1.63	439.3	1190.0	284.5
5	0.0270	0.069	695.00	649.0	0.5	669.3	847.6	1516.9	1.79	497.2	1182.3	334.7
6	0.0340	0.086	772.00	726.0	0.7	747.7	784.8	1532.5	1.95	560.0	1158.6	373.8
7	0.0420	0.107	836.00	790.0	0.8	812.3	722.0	1534.3	2.13	622.8	1128.2	406.2
8	0.0490	0.124	887.00	841.0	1.0	863.5	662.7	1526.2	2.30	682.1	1094.5	431.8
9	0.0570	0.145	931.00	885.0	1.1	907.3	604.8	1512.1	2.50	740.0	1058.4	453.6
10	0.0720	0.183	996.00	950.0	1.4	971.0	506.2	1477.2	2.92	838.6	991.7	485.5
11	0.0880	0.224	1038.00	992.0	1.7	1010.7	435.8	1446.5	3.32	909.0	941.1	505.3
12	0.1040	0.264	1068.00	1022.0	2.1	1037.9	386.9	1424.8	3.68	957.9	905.8	518.9
13	0.1200	0.305	1091.00	1045.0	2.4	1057.8	353.8	1411.6	3.99	991.0	882.7	528.9
14	0.1280	0.325	1100.00	1054.0	2.5	1065.2	342.0	1407.2	4.11	1002.8	874.6	532.6
15	0.1360	0.345	1109.00	1063.0	2.7	1072.6	332.4	1405.0	4.23	1012.4	868.7	536.3
16	0.1440	0.366	1115.00	1069.0	2.8	1076.9	324.8	1401.7	4.32	1020.0	863.2	538.4
17	0.1510	0.384	1121.00	1075.0	3.0	1081.4	318.6	1400.0	4.39	1026.2	859.3	540.7
1[illegible]	[illegible].1590	0.404	1127.00	1081.0	3.1	1085.6	313.8	1399.4	4.46	1031.0	856.6	542.8
[illegible]	[illegible].1670	0.424	1134.00	1088.0	3.3	1090.9	310.3	1401.2	4.52	1034.5	855.7	545.4
20	0.1760	0.447	1139.00	1093.0	3.5	1093.9	307.6	1401.5	4.56	1037.2	854.5	546.9
21	0.1910	0.485	1148.00	1102.0	3.8	1099.5	304.1	1403.6	4.62	1040.7	853.8	549.7
22	0.2070	0.526	1157.00	1111.0	4.1	1104.8	302.7	1407.5	4.65	1042.1	855.1	552.4

Test Readings Data for Specimen No. 3

No.	Def. Dial its	Def. cm	Load Dial Units	Load lbs	Strain %	Deviator Stress kPa	Effective Stresses Minor kPa	Major kPa	1:3 Ratio	Pore Pres. kPa	P kPa	Q kPa
23	0.2230	0.566	1163.00	1117.0	4.4	1107.1	302.7	1409.8	4.66	1042.1	856.3	553.6
24	0.2390	0.607	1171.00	1125.0	4.7	1111.4	303.4	1414.8	4.66	1041.4	859.1	555.7
25	0.2560	0.650	1175.00	1129.0	5.1	1111.4	305.5	1416.9	4.64	1039.3	861.2	555.7
26	0.2720	0.691	1181.00	1135.0	5.4	1113.6	306.9	1420.5	4.63	1037.9	863.7	556.8
27	0.3040	0.772	1192.00	1146.0	6.0	1116.9	311.7	1428.6	4.58	1033.1	870.1	558.4
28	0.3210	0.815	1193.00	1147.0	6.3	1113.9	314.5	1428.4	4.54	1030.3	871.4	556.9
29	0.3530	0.897	1199.00	1153.0	7.0	1112.1	319.3	1431.4	4.48	1025.5	875.4	556.1
30	0.3850	0.978	1202.00	1156.0	7.6	1107.5	325.5	1433.0	4.40	1019.3	879.2	553.7
31	0.4010	1.019	1204.00	1158.0	7.9	1105.6	328.2	1433.8	4.37	1016.6	881.0	552.8
32	0.4170	1.059	1207.00	1161.0	8.2	1104.7	331.0	1435.7	4.34	1013.8	883.3	552.3
33	0.4500	1.143	1212.00	1166.0	8.9	1101.5	336.5	1438.0	4.27	1008.3	887.3	550.8
34	0.4660	1.184	1212.00	1166.0	9.2	1097.7	339.3	1437.0	4.24	1005.5	888.2	548.9
35	0.4820	1.224	1211.00	1165.0	9.5	1093.0	342.0	1435.0	4.20	1002.8	888.5	546.5
36	0.5240	1.331	1214.00	1168.0	10.3	1085.7	348.2	1433.9	4.12	996.6	891.1	542.9
37	0.5770	1.466	1215.00	1169.0	11.4	1074.0	355.1	1429.1	4.02	989.7	892.1	537.0
38	0.6280	1.595	1222.00	1176.0	12.4	1068.1	360.7	1428.8	3.96	984.1	894.8	534.1
39	0.6810	1.730	1223.00	1177.0	13.4	1056.3	366.9	1423.2	3.88	977.9	895.0	528.1
40	0.7330	1.862	1221.00	1175.0	14.5	1042.0	372.4	1414.4	3.80	972.4	893.4	521.0
41	0.7910	2.009	1220.00	1174.0	15.6	1027.1	378.6	1405.7	3.71	966.2	892.2	513.6

Flexible Wall Permeability

Test Data

ASTM D 5084

Knight Piésold LLC

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-11-3	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	04/08/96
SAMPLE TYPE	Remolded	TEST FINISHED :	04/14/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST
Wt. Soil + Moisture (g)	1303.00	1264.20
Wt. Wet Soil & Pan (g)	1303.00	1377.00
Wt. Dry Soil & Pan (g)	1034.10	1146.90
Wt. Moisture Lost (g)	268.90	230.10
Wt. of Pan Only (g)	0.00	112.80
Wt. of Dry Soil (g)	1034.10	1034.10
Moisture Content %	26.0	22.3
Wet Density (pcf)	124.9	125.3
Dry Density (pcf)	99.1	102.5

Init. Diameter (in)	2.876	(cm)	7.304
Init. Area (sq in)	6.495	(sq cm)	41.900
Init. Height (in)	6.120	(cm)	15.545
Height Change (in)	0.050	(cm)	0.127
Consol. Height (in)	6.070	(cm)	15.418
Area After Consol. (sq in)	6.331	(sq cm)	40.851

Vol. Before Consol. (cu ft)			0.02300	Specific Gravity	2.8
Vol. Before Consol. (cc)			651.327	Assumed?	NO
Change in Vol. (cc)			21.500		
Cell Exp. (cc)			0.000	Init. Saturation	95.4
Vol. After Consol. (cc)			629.827	Init. Void Ratio	0.764
Vol. After Consol. (cu ft)			0.02224	Final Saturation	100.0
Effective Porosity %			43.30	Final Void Ratio	0.705
Pressure Difference (psi):			0.00		
C =			0.000904		
M1	0.03018	M2	1.040953	Head Constant	12.6
S =	0.377419			Trial Constant, T	0.05304

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-11-3	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	04/08/96
SAMPLE TYPE	Remolded	TEST FINISHED :	04/14/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

Permeability Test Trials

Time min.	Inflow Buret cm	Annulus Buret cm	Elevation Head cm Z1	Chg. in Head cm Zp	Permeability k cm/sec
0.000	20.2	0.6	19.6		
7.000	19.8	0.6	19.2	0.400	4.6E-08
9.000	19.5	0.6	18.8	0.748	6.8E-08
21.000	18.7	0.7	18.1	1.500	5.9E-08
27.000	18.2	0.7	17.5	2.000	6.3E-08
52.000	16.8	0.7	16.1	3.450	5.9E-08
79.000	15.6	0.7	14.9	4.600	5.3E-08
		Average of Last 5 Readings			6.0E-08

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-12-1	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	4/3/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/9/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

Permeability Test Trials

Time min.	Cap Elevation cm	Pedestal Elevation cm	Elevation Head cm	Total Head cm	Permeability k cm/sec
0.000	55.3	2.2	53.2	334.4	
31.000	55.2	2.3	53.0	334.2	1.8E-08
21.000	55.1	2.3	52.8	334.1	2.0E-08
87.000	54.9	2.5	52.5	333.7	1.1E-08
803.000	53.2	3.8	49.5	330.7	1.1E-08
283.000	52.6	4.2	48.4	329.7	1.1E-08
207.000	52.2	4.6	47.6	328.8	1.2E-08

Average of Last 6 Readings 1.4E-08

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-12-1	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	4/3/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/9/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST
Wt. Soil + Moisture (g)	1532.50	1533.20
Wt. Wet Soil & Pan (g)	1532.50	1652.00
Wt. Dry Soil & Pan (g)	1417.00	1535.80
Wt. Moisture Lost (g)	115.50	116.20
Wt. of Pan Only (g)	0.00	118.80
Wt. of Dry Soil (g)	1417.00	1417.00
Moisture Content %	8.2	8.2
Wet Density (pcf)	147.3	147.5
Dry Density (pcf)	136.2	136.4

Init. Diameter (in)	2.859	(cm)	7.262
Init. Area (sq in)	6.420	(sq cm)	41.418
Init. Height (in)	6.173	(cm)	15.679
Height Change (in)	0.085	(cm)	0.216
Consol. Height (in)	6.088	(cm)	15.464
Area After Consol. (sq in)	6.502	(sq cm)	41.951

Vol. Before Consol. (cu ft)	0.02293	Specific Gravity	2.8
Vol. Before Consol. (cc)	649.404	Assumed?	YES
Change in Vol. (cc)	0.700		
Cell Exp. (cc)	0.000	Init. Saturation	80.6
Vol. After Consol. (cc)	648.704	Init. Void Ratio	0.283
Vol. After Consol. (cu ft)	0.02291	Final Saturation	81.5
Effective Porosity %	22.07	Final Void Ratio	0.282
Pressure Difference (psi):	4.00		
C =	0.132373		

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-12-1	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	4/3/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/9/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

Permeability Test Trials

Time min.	Cap Elevation cm	Pedestal Elevation cm	Elevation Head cm	Total Head cm	Permeability k cm/sec
0.000	55.3	2.2	53.2	334.4	
31.000	55.2	2.3	53.0	334.2	1.8E-08
21.000	55.1	2.3	52.8	334.1	2.0E-08
87.000	54.9	2.5	52.5	333.7	1.1E-08
803.000	53.2	3.8	49.5	330.7	1.1E-08
283.000	52.6	4.2	48.4	329.7	1.1E-08
207.000	52.2	4.6	47.6	328.8	1.2E-08

Average of Last 6 Readings 1.4E-08

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-17	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	3/28/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/7/96
CONF. PRESSURE. (kPa)	250	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST
Wt. Soil + Moisture (g)	1505.00	1532.70
Wt. Wet Soil & Pan (g)	1505.00	1651.60
Wt. Dry Soil & Pan (g)	1410.30	1529.20
Wt. Moisture Lost (g)	94.70	122.40
Wt. of Pan Only (g)	0.00	118.90
Wt. of Dry Soil (g)	1410.30	1410.30
Moisture Content %	6.7	8.7
Wet Density (pcf)	144.2	150.3
Dry Density (pcf)	135.1	138.3

Init. Diameter (in)	2.858	(cm)	7.258
Init. Area (sq in)	6.413	(sq cm)	41.374
Init. Height (in)	6.200	(cm)	15.748
Height Change (in)	0.071	(cm)	0.180
Consol. Height (in)	6.129	(cm)	15.568
Area After Consol. (sq in)	6.338	(sq cm)	40.890

Vol. Before Consol. (cu ft)	0.02301	Specific Gravity	2.743
Vol. Before Consol. (cc)	651.561	Assumed?	YES
Change in Vol. (cc)	15.000		
Cell Exp. (cc)	0.000	Init. Saturation	68.9
Vol. After Consol. (cc)	636.561	Init. Void Ratio	0.267
Vol. After Consol. (cu ft)	0.02248	Final Saturation	100.0
Effective Porosity %	21.09	Final Void Ratio	0.238
Pressure Difference (psi):	0.00		
C =	0.136722		

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-17	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	3/28/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/7/96
CONF. PRESSURE. (kPa)	250	SATURATED TEST:	YES

Permeability Test Trials

Time min.	Cap Elevation cm	Pedestal Elevation cm	Elevation Head cm	Total Head cm	Permeability k cm/sec
0.000	60.1	2.1	58.1	58.1	
15.000	60.0	2.1	57.9	57.9	1.7E-07
26.000	59.9	2.2	57.7	57.7	1.3E-07
82.000	59.6	2.4	57.2	57.2	1.1E-07
74.000	59.3	2.6	56.7	56.7	1.2E-07
159.000	58.6	2.9	55.7	55.7	1.1E-07
869.000	55.6	4.6	51.0	51.0	1.0E-07
286.000	54.8	5.3	49.5	49.5	1.0E-07
900.000	52.1	7.0	45.1	45.1	1.0E-07
			Average of Last 5 Readings		1.1E-07

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-17	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	2	TEST STARTED :	3/28/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/7/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST
Wt. Soil + Moisture (g)	1505.00	1529.20
Wt. Wet Soil & Pan (g)	1505.00	1648.10
Wt. Dry Soil & Pan (g)	1410.30	1529.20
Wt. Moisture Lost (g)	94.70	118.90
Wt. of Pan Only (g)	0.00	118.90
Wt. of Dry Soil (g)	1410.30	1410.30
Moisture Content %	6.7	8.4
Wet Density (pcf)	144.2	150.8
Dry Density (pcf)	135.1	139.1

Init. Diameter (in)	2.858	(cm)	7.258
Init. Area (sq in)	6.413	(sq cm)	41.374
Init. Height (in)	6.200	(cm)	15.748
Height Change (in)	0.253	(cm)	0.643
Consol. Height (in)	5.947	(cm)	15.105
Area After Consol. (sq in)	6.496	(sq cm)	41.910

Vol. Before Consol. (cu ft)	0.02301	Specific Gravity	2.743
Vol. Before Consol. (cc)	651.561	Assumed?	YES
Change in Vol. (cc)	18.500		
Cell Exp. (cc)	0.000	Init. Saturation	68.9
Vol. After Consol. (cc)	633.061	Init. Void Ratio	0.267
Vol. After Consol. (cu ft)	0.02236	Final Saturation	100.0
Effective Porosity %	21.09	Final Void Ratio	0.231
Pressure Difference (psi):	4.00		
C =	0.129434		

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-17	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	2	TEST STARTED :	3/28/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/7/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

Permeability Test Trials

Time min.	Cap Elevation cm	Pedestal Elevation cm	Elevation Head cm	Total Head cm	Permeability k cm/sec
0.000	55.3	1.8	53.5	334.8	
25.000	55.2	2.0	53.2	334.5	3.4E-08
12.000	55.1	2.1	53.1	334.3	3.5E-08
36.000	55.0	2.3	52.7	334.0	2.7E-08
37.000	54.9	2.5	52.4	333.6	2.7E-08
31.000	54.8	2.6	52.2	333.5	1.4E-08
33.000	54.6	2.8	51.8	333.1	3.4E-08
35.000	54.5	3.0	51.6	332.8	2.0E-08
40.000	54.3	3.2	51.2	332.4	2.8E-08
704.000	51.3	6.0	45.3	326.6	2.4E-08
96.000	50.8	6.3	44.5	325.8	2.4E-08
43.000	50.6	6.5	44.2	325.4	2.3E-08
			Average of Last 5 Readings		2.4E-08

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-1-2	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	3/29/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/6/96
CONF. PRESSURE. (kPa)	250	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST
Wt. Soil + Moisture (g)	1334.50	1273.10
Wt. Wet Soil & Pan (g)	1334.50	1420.40
Wt. Dry Soil & Pan (g)	1127.10	1274.40
Wt. Moisture Lost (g)	207.40	146.00
Wt. of Pan Only (g)	0.00	147.30
Wt. of Dry Soil (g)	1127.10	1127.10
Moisture Content %	18.4	13.0
Wet Density (pcf)	125.9	139.9
Dry Density (pcf)	106.3	123.8

Init. Diameter (in)	2.932	(cm)	7.447
Init. Area (sq in)	6.752	(sq cm)	43.560
Init. Height (in)	5.980	(cm)	15.189
Height Change (in)	0.308	(cm)	0.782
Consol. Height (in)	5.672	(cm)	14.407
Area After Consol. (sq in)	6.112	(sq cm)	39.434

Vol. Before Consol. (cu ft)	0.02337	Specific Gravity	2.67
Vol. Before Consol. (cc)	661.637	Assumed?	YES
Change in Vol. (cc)	93.500		
Cell Exp. (cc)	0.000	Init. Saturation	86.6
Vol. After Consol. (cc)	568.137	Init. Void Ratio	0.567
Vol. After Consol. (cu ft)	0.02006	Final Saturation	100.0
Effective Porosity %	36.20	Final Void Ratio	0.346
Pressure Difference (psi):	4.00		
C =	0.131199		

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-1-2	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	3/29/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/6/96
CONF. PRESSURE. (kPa)	250	SATURATED TEST:	YES

Permeability Test Trials

Time min.	Cap Elevation cm	Pedestal Elevation cm	Elevation Head cm	Total Head cm	Permeability k cm/sec
0.000	58.6	1.5	57.1	338.4	
18.000	58.5	1.6	57.0	338.2	2.3E-08
49.000	58.4	1.7	56.7	338.0	1.4E-08
106.000	58.2	2.0	56.2	337.5	1.3E-08
97.000	58.0	2.2	55.8	337.1	1.2E-08
0.000	54.0	0.8	53.2	334.5	RESET
48.000	53.9	1.1	52.8	334.1	2.4E-08

Average of Last 5 Readings 1.7E-08

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-1-2	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	2	TEST STARTED :	3/29/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/6/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

Permeability Test Trials

Time min.	Cap Elevation cm	Pedestal Elevation cm	Elevation Head cm	Total Head cm	Permeability k cm/sec
0.000	58.9	1.8	57.1	338.4	
15.000	58.9	1.9	57.0	338.3	1.8E-08
43.000	59.1	2.2	56.9	338.2	6.1E-09
0.000	59.7	1.5	58.2	339.5	RESET
36.000	59.8	1.7	58.1	339.4	7.3E-09
812.000	59.1	3.3	55.8	337.1	7.5E-09
380.000	58.7	3.8	55.0	336.2	5.9E-09
125.000	58.6	3.9	54.7	336.0	5.3E-09
937.000	57.4	4.8	52.6	333.9	6.0E-09

Average of Last 5 Reading 6.4E-09

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-1-2	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	2	TEST STARTED :	3/29/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/6/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST
Wt. Soil + Moisture (g)	1334.50	1265.80
Wt. Wet Soil & Pan (g)	1334.50	1413.10
Wt. Dry Soil & Pan (g)	1127.10	1274.40
Wt. Moisture Lost (g)	207.40	138.70
Wt. of Pan Only (g)	0.00	147.30
Wt. of Dry Soil (g)	1127.10	1127.10
Moisture Content %	18.4	12.3
Wet Density (pcf)	125.9	140.9
Dry Density (pcf)	106.3	125.5

Init. Diameter (in)	2.932	(cm)	7.447
Init. Area (sq in)	6.752	(sq cm)	43.560
Init. Height (in)	5.980	(cm)	15.189
Height Change (in)	0.523	(cm)	1.328
Consol. Height (in)	5.457	(cm)	13.862
Area After Consol. (sq in)	6.271	(sq cm)	40.460

Vol. Before Consol. (cu ft)	0.02337	Specific Gravity	2.67
Vol. Before Consol. (cc)	661.637	Assumed?	YES
Change in Vol. (cc)	100.800		
Cell Exp. (cc)	0.000	Init. Saturation	86.6
Vol. After Consol. (cc)	560.837	Init. Void Ratio	0.567
Vol. After Consol. (cu ft)	0.01981	Final Saturation	100.0
Effective Porosity %	36.20	Final Void Ratio	0.329
Pressure Difference (psi):	4.00		
C =	0.123032		

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-16-1	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	3/29/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/5/96
CONF. PRESSURE. (kPa)	250	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST
Wt. Soil + Moisture (g)	1464.80	1494.60
Wt. Wet Soil & Pan (g)	1464.80	1641.30
Wt. Dry Soil & Pan (g)	1352.60	1499.30
Wt. Moisture Lost (g)	112.20	142.00
Wt. of Pan Only (g)	0.00	146.70
Wt. of Dry Soil (g)	1352.60	1352.60
Moisture Content %	8.3	10.5
Wet Density (pcf)	141.3	148.2
Dry Density (pcf)	130.5	134.1

Init. Diameter (in)	2.868	(cm)	7.285
Init. Area (sq in)	6.460	(sq cm)	41.679
Init. Height (in)	6.113	(cm)	15.527
Height Change (in)	0.031	(cm)	0.079
Consol. Height (in)	6.082	(cm)	15.448
Area After Consol. (sq in)	6.318	(sq cm)	40.765

Vol. Before Consol. (cu ft)	0.02285	Specific Gravity	2.78
Vol. Before Consol. (cc)	647.148	Assumed?	YES
Change in Vol. (cc)	17.400		
Cell Exp. (cc)	0.000	Init. Saturation	69.9
Vol. After Consol. (cc)	629.748	Init. Void Ratio	0.330
Vol. After Consol. (cu ft)	0.02224	Final Saturation	99.2
Effective Porosity %	24.82	Final Void Ratio	0.294
Pressure Difference (psi):	4.00		
C =	0.136089		

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-16-1	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	1	TEST STARTED :	3/29/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/5/96
CONF. PRESSURE. (kPa)	250	SATURATED TEST:	YES

Permeability Test Trials

Time min.	Cap Elevation cm	Pedestal Elevation cm	Elevation Head cm	Total Head cm	Permeability k cm/sec
0.000	66.7	2.4	64.4	345.6	
6.000	66.6	2.4	64.2	345.5	7.1E-08
4.000	66.5	2.5	64.1	345.3	1.1E-07
25.000	66.4	2.5	63.9	345.1	2.3E-08
17.000	66.3	2.6	63.7	345.0	2.5E-08
34.000	66.2	2.7	63.5	344.8	1.7E-08
758.000	63.3	4.7	58.6	339.9	1.9E-08
69.000	63.1	4.9	58.3	339.5	1.5E-08

Average of Last 5 Readings 2.0E-08

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-16-1	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	2	TEST STARTED :	3/29/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/5/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST
Wt. Soil + Moisture (g)	1464.80	1489.60
Wt. Wet Soil & Pan (g)	1464.80	1636.30
Wt. Dry Soil & Pan (g)	1352.60	1499.30
Wt. Moisture Lost (g)	112.20	137.00
Wt. of Pan Only (g)	0.00	146.70
Wt. of Dry Soil (g)	1352.60	1352.60
Moisture Content %	8.3	10.1
Wet Density (pcf)	141.3	149.1
Dry Density (pcf)	130.5	135.4

Init. Diameter (in)	2.868	(cm)	7.285
Init. Area (sq in)	6.460	(sq cm)	41.679
Init. Height (in)	6.113	(cm)	15.527
Height Change (in)	0.185	(cm)	0.470
Consol. Height (in)	5.928	(cm)	15.057
Area After Consol. (sq in)	6.418	(sq cm)	41.412

Vol. Before Consol. (cu ft)	0.02285	Specific Gravity	2.78
Vol. Before Consol. (cc)	647.148	Assumed?	YES
Change in Vol. (cc)	23.600		
Cell Exp. (cc)	0.000	Init. Saturation	69.9
Vol. After Consol. (cc)	623.548	Init. Void Ratio	0.330
Vol. After Consol. (cu ft)	0.02202	Final Saturation	100.0
Effective Porosity %	24.82	Final Void Ratio	0.282
Pressure Difference (psi):	4.00		
C =	0.13057		

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-91
Increasing Tailwater Pressure - Method C

CLIENT:		PROJECT NAME:	Carmacks Copper
		PROJECT NO. :	1377A
BORING NO.	TR96-16-1	LAB NO. :	L96031
DEPTH			
SAMPLE NO.	2	TEST STARTED :	3/29/96
SAMPLE TYPE	Remolded	TEST FINISHED :	4/5/96
CONF. PRESSURE. (kPa)	500	SATURATED TEST:	YES

Permeability Test Trials

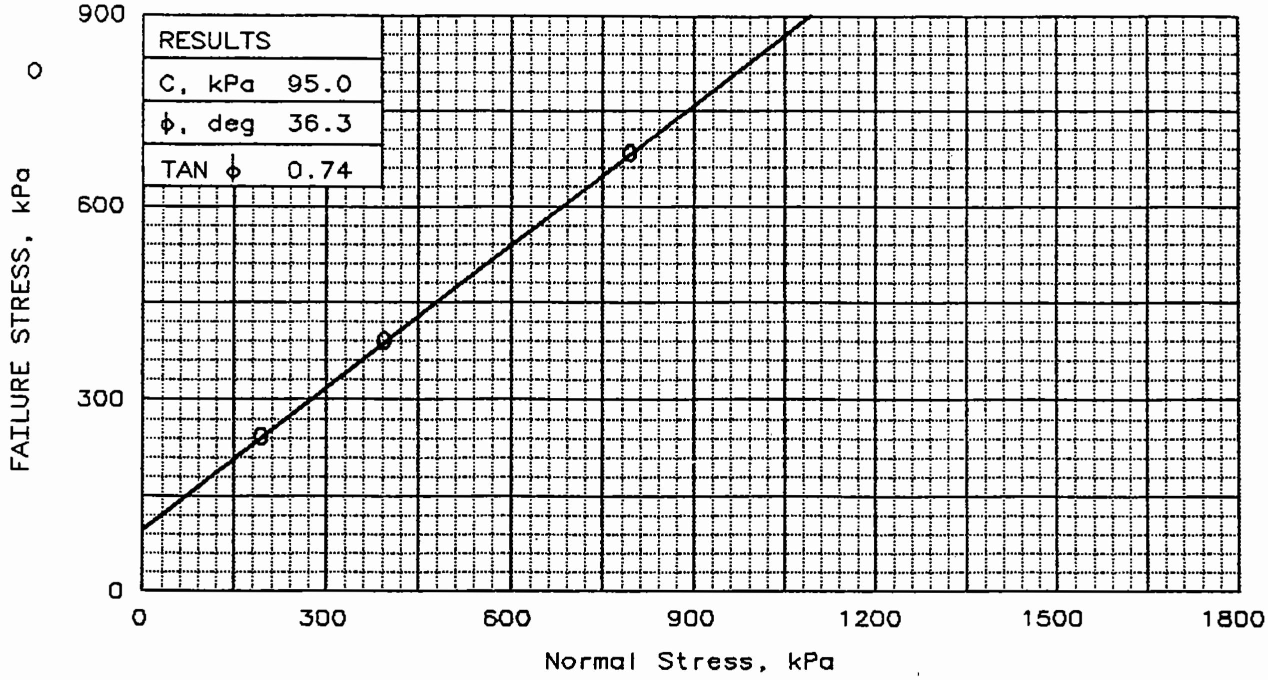
Time min.	Cap Elevation cm	Pedestal Elevation cm	Elevation Head cm	Total Head cm	Permeability k cm/sec
0.000	54.9	1.3	53.6	334.9	
10.000	54.9	1.4	53.5	334.8	2.8E-08
33.000	54.8	1.5	53.3	334.6	1.7E-08
31.000	54.7	1.6	53.1	334.4	1.8E-08
41.000	54.7	1.7	53.0	334.2	1.0E-08
679.000	53.0	2.5	50.5	331.8	1.0E-08

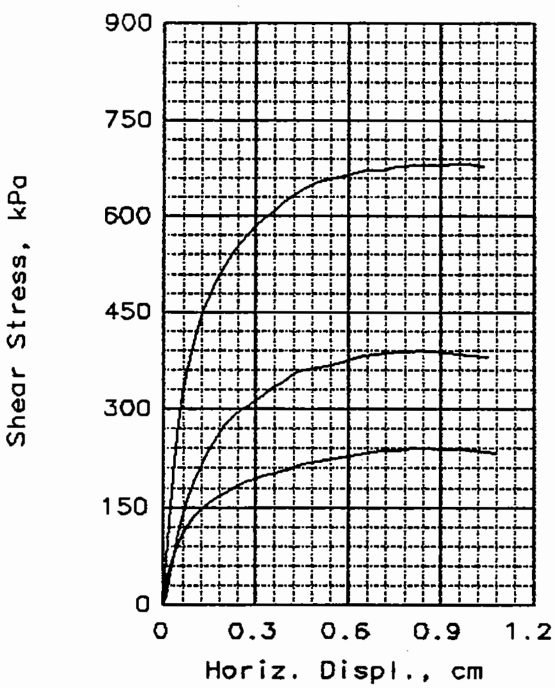
Average of Last 4 Readings 1.4E-08

Direct Shear

Test Data

Knight Piésold LLC





SAMPLE NO.:		1	2	3
INITIAL	WATER CONTENT, %	3.7	3.8	3.7
	DRY DENSITY, kN/cu.m	18.4	18.4	18.4
	SATURATION, %	24.1	24.4	24.0
	VOID RATIO	0.410	0.411	0.410
	SIDE LENGTH, cm	10.16	10.16	10.16
	HEIGHT, cm	2.54	2.54	2.54
AT TEST	WATER CONTENT, %	13.6	13.5	13.3
	DRY DENSITY, kN/cu.m	19.1	19.2	19.2
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.359	0.356	0.353
	SIDE LENGTH, cm	10.16	10.16	10.16
	HEIGHT, cm	2.45	2.44	2.44
NORMAL STRESS, kPa		200	400	800
FAILURE STRESS, kPa		242	390	683
DISPLACEMENT, cm		0.83	0.83	0.97
ULTIMATE STRESS, kPa				
DISPLACEMENT, cm				
Strain rate, cm/min		0.0203	0.0203	0.0203

CLIENT:

PROJECT: CARMACKS COPPER PROJECT

SAMPLE LOCATION: TR96-6-2

PROJ. NO.: 1377A-L200 DATE: 3/30/96

DIRECT SHEAR TEST REPORT

Knight Piésold LLC

SAMPLE TYPE: REMOLDED

DESCRIPTION: gravelly SAND, slightly silty (SW-SM)

SPECIFIC GRAVITY= 2.65

REMARKS: Some difficulty experienced in attaining desired compactive effort.

Fig. No.:

DIRECT SHEAR TEST 4-18-1996

Project and Sample Data

Date: 3/30/96
Client:
Project: CARMACKS COPPER PROJECT
Sample location: TR96-6-2
Sample description: gravelly SAND, slightly silty (SW-SM)
Remarks: Some difficulty exper- ienced in attaining desired compactive effort.
Fig no.: 2nd page Fig no. (if applicable):
Type of sample: REMOLDED
Specific gravity= 2.65 LL= NP PL= PI=

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Wt. moist soil and tare:	511.100		678.450
Wt. dry soil and tare:	492.700		611.600
Wt. of tare:	0.000		118.900
Weight, gms:	511.1		
Side length, cm:	10.160	10.160	
Area, cm^2:	103.226	103.226	
Height, cm:	2.540	2.449	
Net decrease in height, cm:		0.091	
% Moisture:	3.7	13.6	13.6
density, kN/cu.m:	19.12	21.71	
density, kN/cu.m:	18.43	19.12	
Void ratio:	0.4102	0.3595	
% Saturation:	24.1	100.0	

Test Readings Data for Specimen No. 1

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Normal Stress = 200.0 kPa
Strain rate, in/min = 0.0203
FAILURE STRESS = 241.6 kPa at reading no. 31
ULTIMATE STRESS = not selected

No.	HORIZONTAL Dial Reading	Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa
0	0.0000	0.000	1.00	0.0	0.0	0.0
1	0.0050	0.013	82.90	81.9	0.1	35.3
2	0.0100	0.025	139.70	138.7	0.3	59.8
3	0.0150	0.038	181.80	180.8	0.4	77.9
4	0.0200	0.051	217.60	216.6	0.5	93.3
5	0.0250	0.064	245.40	244.4	0.6	105.3
	0.0300	0.076	273.30	272.3	0.8	117.3
7	0.0400	0.102	316.50	315.5	1.0	136.0
8	0.0500	0.127	344.10	343.1	1.3	147.8
9	0.0600	0.152	365.30	364.3	1.5	157.0

Test Readings Data for Specimen No. 1

No.	HORIZONTAL Dial Reading	HORIZONTAL Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa
10	0.0700	0.178	382.10	381.1	1.8	164.2
11	0.0800	0.203	400.00	399.0	2.0	171.9
12	0.0900	0.229	415.90	414.9	2.3	178.8
13	0.1000	0.254	430.20	429.2	2.5	185.0
14	0.1100	0.279	443.10	442.1	2.8	190.5
15	0.1200	0.305	450.90	449.9	3.0	193.9
16	0.1300	0.330	462.90	461.9	3.3	199.0
17	0.1400	0.356	467.70	466.7	3.5	201.1
18	0.1500	0.381	476.30	475.3	3.8	204.8
19	0.1600	0.406	482.50	481.5	4.0	207.5
20	0.1700	0.432	493.40	492.4	4.3	212.2
21	0.1800	0.457	502.40	501.4	4.5	216.1
22	0.1900	0.483	508.30	507.3	4.8	218.6
23	0.2000	0.508	513.80	512.8	5.0	221.0
24	0.2200	0.559	522.70	521.7	5.5	224.8
25	0.2400	0.610	533.20	532.2	6.0	229.3
26	0.2600	0.660	542.40	541.4	6.5	233.3
27	0.2800	0.711	548.00	547.0	7.0	235.7
28	0.3000	0.762	550.70	549.7	7.5	236.9
29	0.3100	0.787	555.50	554.5	7.8	238.9
30	0.3200	0.813	558.60	557.6	8.0	240.3
31	0.3260	0.828	561.70	560.7	8.2	241.6
32	0.3300	0.838	561.60	560.6	8.3	241.6
33	0.3400	0.864	559.90	558.9	8.5	240.8
	0.3500	0.889	554.10	553.1	8.8	238.3
	0.3750	0.953	555.50	554.5	9.4	238.9
36	0.4000	1.016	549.10	548.1	10.0	236.2
37	0.4250	1.080	543.30	542.3	10.6	233.7

Specimen Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
moist soil and tare:	511.100		673.150
Wt. dry soil and tare:	492.500		606.900
Wt. of tare:	0.000		114.400
Weight, gms:	511.1		
Side length, cm:	10.160	10.160	
Area, cm^2:	103.226	103.226	
Height, cm:	2.540	2.442	
Net decrease in height, cm:		0.098	
% Moisture:	3.8	13.5	13.5
Wet density, kN/cu.m:	19.12	21.74	
Dry density, kN/cu.m:	18.42	19.16	
Void ratio:	0.4108	0.3565	
% Saturation:	24.4	100.0	

Test Readings Data for Specimen No. 2

Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Normal Stress = 400.0 kPa
Strain rate, in/min = 0.0203
FAILURE STRESS = 389.8 kPa at reading no. 30
ULTIMATE STRESS = not selected

	HORIZONTAL Dial Reading	HORIZONTAL Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa	VERTICAL Dial Reading	VERTICAL Def. cm
0	0.0100	0.000	-3.50	0.0	0.0	0.0	0.0433	0.0000
1	0.0150	0.013	27.70	31.2	0.1	13.4	0.0438	0.0013
2	0.0200	0.025	107.90	111.4	0.3	48.0	0.0447	0.0036
3	0.0250	0.038	178.60	182.1	0.4	78.5	0.0456	0.0058
4	0.0300	0.051	254.10	257.6	0.5	111.0	0.0468	0.0089
5	0.0400	0.076	358.80	362.3	0.8	156.1	0.0486	0.0135
6	0.0500	0.102	433.40	436.9	1.0	188.3	0.0494	0.0155
7	0.0600	0.127	493.40	496.9	1.3	214.1	0.0497	0.0163
8	0.0700	0.152	550.10	553.6	1.5	238.6	0.0502	0.0175
9	0.0800	0.178	598.70	602.2	1.8	259.5	0.0504	0.0180
10	0.0900	0.203	636.10	639.6	2.0	275.6	0.0504	0.0180
11	0.1000	0.229	665.60	669.1	2.3	288.3	0.0504	0.0180
12	0.1100	0.254	687.70	691.2	2.5	297.9	0.0504	0.0180
13	0.1200	0.279	704.60	708.1	2.8	305.1	0.0502	0.0175
14	0.1300	0.305	724.10	727.6	3.0	313.5	0.0497	0.0163
15	0.1400	0.330	745.90	749.4	3.3	322.9	0.0491	0.0147
16	0.1500	0.356	765.30	768.8	3.5	331.3	0.0483	0.0127
17	0.1600	0.381	781.80	785.3	3.8	338.4	0.0477	0.0112
18	0.1700	0.406	799.80	803.3	4.0	346.2	0.0470	0.0094
19	0.1800	0.432	821.90	825.4	4.3	355.7	0.0461	0.0071
20	0.1900	0.457	830.70	834.2	4.5	359.5	0.0456	0.0058
21	0.2000	0.483	836.70	840.2	4.8	362.1	0.0445	0.0030
	0.2200	0.533	847.60	851.1	5.3	366.8	0.0429	-0.0010
23	0.2400	0.584	859.90	863.4	5.8	372.1	0.0401	-0.0081
24	0.2600	0.635	878.50	882.0	6.3	380.1	0.0381	-0.0132
25	0.2800	0.686	886.90	890.4	6.8	383.7	0.0363	-0.0178

Test Readings Data for Specimen No. 2

No.	HORIZONTAL Dial Reading	HORIZONTAL Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa	VERTICAL Dial Reading	VERTICAL Def. cm
26	0.3000	0.737	892.20	895.7	7.3	386.0	0.0345	-0.0224
27	0.3100	0.762	894.90	898.4	7.5	387.1	0.0335	-0.0249
28	0.3200	0.787	895.80	899.3	7.8	387.5	0.0326	-0.0272
29	0.3300	0.813	898.20	901.7	8.0	388.6	0.0315	-0.0300
30	0.3370	0.831	901.00	904.5	8.2	389.8	0.0307	-0.0320
31	0.3400	0.838	900.70	904.2	8.3	389.6	0.0305	-0.0325
32	0.3500	0.864	897.80	901.3	8.5	388.4	0.0293	-0.0356
33	0.3750	0.927	890.40	893.9	9.1	385.2	0.0268	-0.0419
34	0.4000	0.991	883.60	887.1	9.8	382.3	0.0245	-0.0478
35	0.4250	1.054	878.30	881.8	10.4	380.0	0.0232	-0.0511

Specimen Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
moist soil and tare:	511.100		672.950
Wt. dry soil and tare:	492.800		607.300
Wt. of tare:	0.000		114.500
Weight, gms:	511.1		
Side length, cm:	10.160	10.160	
Area, cm^2:	103.226	103.226	
Height, cm:	2.540	2.438	
Net decrease in height, cm:		0.102	
% Moisture:	3.7	13.3	13.3
Wet density, kN/cu.m:	19.12	21.76	
Dry density, kN/cu.m:	18.43	19.21	
Void ratio:	0.4099	0.3531	
% Saturation:	24.0	100.0	

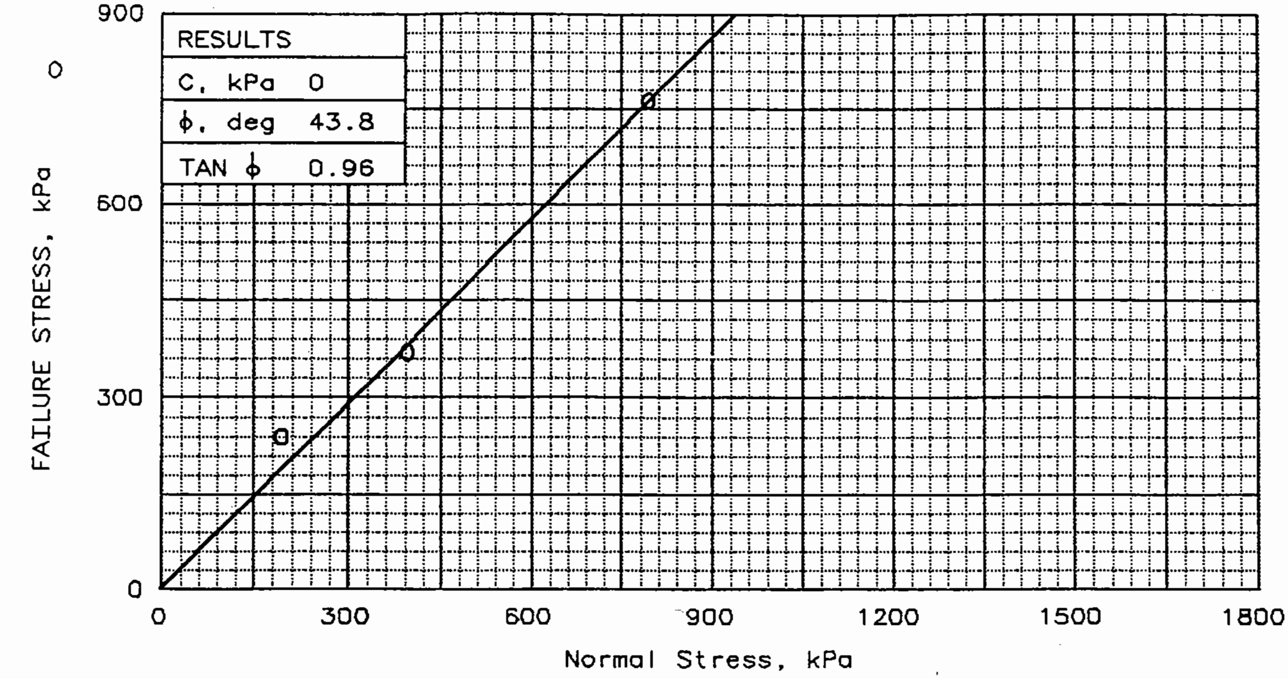
Test Readings Data for Specimen No. 3

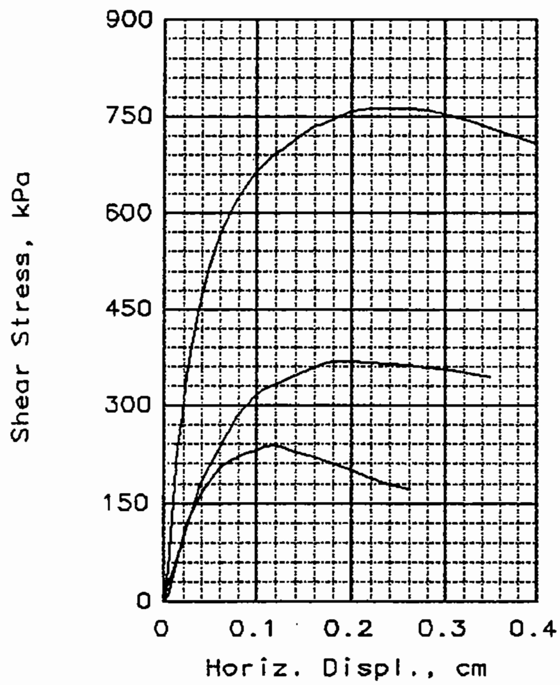
Deformation dial constant= 3 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Normal Stress = 800.0 kPa
Strain rate, in/min = 0.0203
FAILURE STRESS = 682.9 kPa at reading no. 32
ULTIMATE STRESS = not selected

	HORIZONTAL Dial Reading	Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa	VERTICAL Dial Reading	Def. cm
0	0.0000	0.000	1.20	0.0	0.0	0.0	0.0414	0.0000
1	0.0050	0.013	165.10	163.9	0.1	70.6	0.0422	0.0020
2	0.0100	0.025	350.80	349.6	0.3	150.7	0.0439	0.0064
3	0.0150	0.038	513.80	512.6	0.4	220.9	0.0454	0.0102
4	0.0200	0.051	647.20	646.0	0.5	278.4	0.0468	0.0137
5	0.0250	0.064	749.00	747.8	0.6	322.2	0.0479	0.0165
6	0.0300	0.076	819.00	817.8	0.8	352.4	0.0487	0.0185
7	0.0400	0.102	937.00	935.8	1.0	403.3	0.0496	0.0208
8	0.0500	0.127	1038.00	1036.8	1.3	446.8	0.0505	0.0231
9	0.0600	0.152	1105.70	1104.5	1.5	476.0	0.0512	0.0249
10	0.0700	0.178	1169.80	1168.6	1.8	503.6	0.0516	0.0259
11	0.0900	0.229	1260.70	1259.5	2.3	542.7	0.0519	0.0267
12	0.1000	0.254	1299.30	1298.1	2.5	559.4	0.0520	0.0269
13	0.1100	0.279	1332.50	1331.3	2.8	573.7	0.0520	0.0269
14	0.1200	0.305	1361.40	1360.2	3.0	586.1	0.0520	0.0269
15	0.1440	0.366	1420.10	1418.9	3.6	611.4	0.0518	0.0264
16	0.1520	0.386	1439.50	1438.3	3.8	619.8	0.0516	0.0259
17	0.1600	0.406	1455.20	1454.0	4.0	626.6	0.0514	0.0254
18	0.1700	0.432	1472.50	1471.3	4.3	634.0	0.0510	0.0244
19	0.1800	0.457	1490.50	1489.3	4.5	641.8	0.0505	0.0231
20	0.1900	0.483	1506.00	1504.8	4.8	648.5	0.0501	0.0221
	0.2000	0.508	1519.40	1518.2	5.0	654.2	0.0498	0.0213
	0.2200	0.559	1533.40	1532.2	5.5	660.3	0.0490	0.0193
23	0.2400	0.610	1547.50	1546.3	6.0	666.3	0.0484	0.0178
24	0.2600	0.660	1558.70	1557.5	6.5	671.2	0.0473	0.0150
25	0.2800	0.711	1561.10	1559.9	7.0	672.2	0.0465	0.0130

Test Readings Data for Specimen No. 3

No.	HORIZONTAL Dial Reading	HORIZONTAL Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa	VERTICAL Dial Reading	VERTICAL Def. cm
26	0.3000	0.762	1573.30	1572.1	7.5	677.5	0.0458	0.0112
27	0.3100	0.787	1573.80	1572.6	7.8	677.7	0.0452	0.0097
28	0.3200	0.813	1579.00	1577.8	8.0	679.9	0.0446	0.0081
29	0.3300	0.838	1577.30	1576.1	8.3	679.2	0.0441	0.0069
30	0.3580	0.909	1581.20	1580.0	9.0	680.9	0.0433	0.0048
31	0.3750	0.953	1585.90	1584.7	9.4	682.9	0.0419	0.0013
32	0.3800	0.965	1586.00	1584.8	9.5	682.9	0.0417	0.0008
33	0.3900	0.991	1582.60	1581.4	9.8	681.5	0.0412	-0.0005
34	0.4000	1.016	1578.40	1577.2	10.0	679.6	0.0410	-0.0010
35	0.4100	1.041	1576.40	1575.2	10.3	678.8	0.0406	-0.0020





SAMPLE NO.:		1	2	3
INITIAL	WATER CONTENT, %	3.5	3.4	3.5
	DRY DENSITY, kN/cu.m	19.5	19.6	19.5
	SATURATION, %	29.7	29.3	30.0
	VOID RATIO	0.305	0.304	0.305
	SIDE LENGTH, cm	10.16	10.16	10.16
	HEIGHT, cm	2.54	2.54	2.54
AT TEST	WATER CONTENT, %	10.6	9.5	6.7
	DRY DENSITY, kN/cu.m	20.0	20.4	21.7
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.275	0.248	0.173
	SIDE LENGTH, cm	10.16	10.16	10.16
	HEIGHT, cm	2.48	2.43	2.28
NORMAL STRESS, kPa		200	400	800
FAILURE STRESS, kPa		238	369	762
DISPLACEMENT, cm		0.12	0.20	0.22
ULTIMATE STRESS, kPa				
DISPLACEMENT, cm				
Strain rate, cm/min		0.0203	0.0203	0.0203

CLIENT:

PROJECT: CARMACKS COPPER PROJECT

SAMPLE LOCATION: TR96-3-1

PROJ. NO.: 1377A-L200 DATE: 4/3/96

DIRECT SHEAR TEST REPORT

Knight Piésold LLC

SAMPLE TYPE: REMOLDED

DESCRIPTION: gravelly SAND trace cobbles (SP)

SPECIFIC GRAVITY= 2.6

REMARKS:

Fig. No.:

DIRECT SHEAR TEST	4-18-1996

Project and Sample Data

..ce: 4/3/96
Client:
Project: CARMACKS COPPER PROJECT
Sample location: TR96-3-1
Sample description: gravelly SAND trace cobbles (SP)
Remarks:

Fig no.: 2nd page Fig no. (if applicable):
Type of sample: REMOLDED
Specific gravity= 2.60 LL= PL= PI=

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Wt. moist soil and tare:	540.700		691.800
Wt. dry soil and tare:	522.500		636.500
Wt. of tare:	0.000		114.000
Weight, gms:	540.7		
Side length, cm:	10.160	10.160	
Area, cm^2:	103.226	103.226	
Height, cm:	2.540	2.482	
Net decrease in height, cm:		0.058	
% Moisture:	3.5	10.6	10.6
W.. density, kN/cu.m:	20.22	22.11	
density, kN/cu.m:	19.54	20.00	
Void ratio:	0.3047	0.2751	
% Saturation:	29.7	100.0	

Test Readings Data for Specimen No. 1

Deformation dial constant= 1 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Normal Stress = 200.0 kPa
Strain rate, in/min = 0.0203
FAILURE STRESS = 238.2 kPa at reading no. 15
ULTIMATE STRESS = not selected

No.	HORIZONTAL Dial Reading	Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa
0	0.0000	0.000	13.00	0.0	0.0	0.0
1	0.0050	0.005	34.70	21.7	0.0	9.4
2	0.0100	0.010	107.20	94.2	0.1	40.6
3	0.0150	0.015	167.40	154.4	0.1	66.5
4	0.0200	0.020	229.10	216.1	0.2	93.1
5	0.0250	0.025	287.60	274.6	0.2	118.3
	0.0300	0.030	321.20	308.2	0.3	132.8
,	0.0400	0.040	389.60	376.6	0.4	162.3
8	0.0500	0.050	438.70	425.7	0.5	183.4
9	0.0600	0.060	482.70	469.7	0.6	202.4

Test Readings Data for Specimen No. 1

No.	HORIZONTAL Dial Reading	HORIZONTAL Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa
10	0.0700	0.070	505.90	492.9	0.7	212.4
11	0.0800	0.080	524.40	511.4	0.8	220.4
12	0.0900	0.090	539.10	526.1	0.9	226.7
13	0.1000	0.100	547.80	534.8	1.0	230.5
14	0.1100	0.110	560.00	547.0	1.1	235.7
15	0.1200	0.120	565.80	552.8	1.2	238.2
16	0.1300	0.130	557.80	544.8	1.3	234.8
17	0.1400	0.140	545.30	532.3	1.4	229.4
18	0.1500	0.150	536.50	523.5	1.5	225.6
19	0.1600	0.160	524.20	511.2	1.6	220.3
20	0.1800	0.180	502.30	489.3	1.8	210.8
21	0.2000	0.200	479.60	466.6	2.0	201.1
22	0.2200	0.220	453.20	440.2	2.2	189.7
23	0.2400	0.240	427.90	414.9	2.4	178.8
24	0.2600	0.260	408.00	395.0	2.6	170.2

Specimen Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
Wt. moist soil and tare:	540.800		691.380
Wt. dry soil and tare:	522.900		641.500
Wt. of tare:	0.000		118.600
Weight, gms:	540.8		
Side length, cm:	10.160	10.160	
Area, cm²:	103.226	103.226	
Height, cm:	2.540	2.432	
Net decrease in height, cm:		0.108	
% Moisture:	3.4	9.5	9.5
Wet density, kN/cu.m:	20.23	22.38	
Dry density, kN/cu.m:	19.56	20.43	
Void ratio:	0.3037	0.2480	
% Saturation:	29.3	100.0	

Test Readings Data for Specimen No. 2

Deformation dial constant= 1 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Normal Stress = 400.0 kPa
Strain rate, in/min = 0.0203
FAILURE STRESS = 368.8 kPa at reading no. 23
ULTIMATE STRESS = not selected

	HORIZONTAL Dial Reading	Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa	VERTICAL Dial Reading	Def. cm
0	0.0000	0.000	20.10	0.0	0.0	0.0	0.0000	0.0000
1	0.0050	0.005	83.10	63.0	0.0	27.1	0.0007	0.0018
2	0.0100	0.010	134.40	114.3	0.1	49.3	0.0017	0.0043
3	0.0150	0.015	177.90	157.8	0.1	68.0	0.0027	0.0069
4	0.0200	0.020	229.60	209.5	0.2	90.3	0.0036	0.0091
5	0.0250	0.025	279.50	259.4	0.2	111.8	0.0046	0.0117
6	0.0300	0.030	332.70	312.6	0.3	134.7	0.0054	0.0137
7	0.0400	0.040	438.30	418.2	0.4	180.2	0.0070	0.0178
8	0.0500	0.050	500.40	480.3	0.5	207.0	0.0077	0.0196
9	0.0600	0.060	558.10	538.0	0.6	231.8	0.0079	0.0201
10	0.0700	0.070	620.90	600.8	0.7	258.9	0.0081	0.0206
11	0.0800	0.080	677.90	657.8	0.8	283.5	0.0082	0.0208
12	0.0900	0.090	719.10	699.0	0.9	301.2	0.0082	0.0208
13	0.1000	0.100	752.40	732.3	1.0	315.6	0.0078	0.0198
14	0.1100	0.110	775.40	755.3	1.1	325.5	0.0075	0.0191
15	0.1200	0.120	792.60	772.5	1.2	332.9	0.0061	0.0155
16	0.1300	0.130	805.90	785.8	1.3	338.6	0.0050	0.0127
17	0.1400	0.140	822.80	802.7	1.4	345.9	0.0039	0.0099
18	0.1500	0.150	839.10	819.0	1.5	352.9	0.0028	0.0071
19	0.1600	0.160	851.90	831.8	1.6	358.4	0.0013	0.0033
20	0.1700	0.170	863.90	843.8	1.7	363.6	0.0002	0.0005
21	0.1800	0.180	872.80	852.7	1.8	367.4	-0.0012	-0.0030
	0.1900	0.190	874.60	854.5	1.9	368.2	-0.0025	-0.0064
23	0.2000	0.200	875.90	855.8	2.0	368.8	-0.0037	-0.0094
24	0.2200	0.220	871.30	851.2	2.2	366.8	-0.0064	-0.0163
25	0.2400	0.240	866.10	846.0	2.4	364.6	-0.0088	-0.0224

Test Readings Data for Specimen No. 2

No.	HORIZONTAL Dial Reading	HORIZONTAL Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa	VERTICAL Dial Reading	VERTICAL Def. cm
26	0.2600	0.260	861.80	841.7	2.6	362.7	-0.0113	-0.0287
27	0.2800	0.280	849.80	829.7	2.8	357.5	-0.0131	-0.0333
28	0.3000	0.300	846.30	826.2	3.0	356.0	-0.0154	-0.0391
29	0.3250	0.325	832.70	812.6	3.2	350.2	-0.0173	-0.0439
30	0.3500	0.350	818.60	798.5	3.4	344.1	-0.0193	-0.0490

Specimen Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
moist soil and tare:	540.800		673.950
Wt. dry soil and tare:	522.400		639.200
Wt. of tare:	0.000		116.800
Weight, gms:	540.8		
Side length, cm:	10.160	10.160	
Area, cm^2:	103.226	103.226	
Height, cm:	2.540	2.283	
Net decrease in height, cm:		0.257	
% Moisture:	3.5	6.7	6.7
Wet density, kN/cu.m:	20.23	23.18	
Dry density, kN/cu.m:	19.54	21.74	
Void ratio:	0.3049	0.1729	
% Saturation:	30.0	100.0	

Test Readings Data for Specimen No. 3

Deformation dial constant= 1 cm per input unit
Primary load ring constant= 1 lbs per input unit
Secondary load ring constant= 1 lbs per input unit
Crossover reading for secondary load ring= 1 input units
Normal Stress = 800.0 kPa
Strain rate, in/min = 0.0203
FAILURE STRESS = 762.3 kPa at reading no. 24
ULTIMATE STRESS = not selected

No.	HORIZONTAL Dial Reading	HORIZONTAL Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa	VERTICAL Dial Reading	VERTICAL Def. cm
0	0.0000	0.000	21.40	0.0	0.0	0.0	0.1013	0.0000
1	0.0050	0.005	136.30	114.9	0.0	49.5	0.1026	0.0033
2	0.0100	0.010	376.70	355.3	0.1	153.1	0.1042	0.0074
3	0.0150	0.015	566.20	544.8	0.1	234.8	0.1056	0.0109
4	0.0200	0.020	688.20	666.8	0.2	287.3	0.1066	0.0135
5	0.0250	0.025	822.40	801.0	0.2	345.2	0.1075	0.0157
6	0.0300	0.030	931.60	910.2	0.3	392.2	0.1082	0.0175
7	0.0400	0.040	1097.50	1076.1	0.4	463.7	0.1090	0.0196
8	0.0500	0.050	1228.00	1206.6	0.5	520.0	0.1093	0.0203
9	0.0600	0.060	1327.70	1306.3	0.6	562.9	0.1093	0.0203
10	0.0700	0.070	1402.50	1381.1	0.7	595.1	0.1093	0.0203
11	0.0800	0.080	1465.60	1444.2	0.8	622.3	0.1090	0.0196
12	0.0900	0.090	1517.80	1496.4	0.9	644.8	0.1081	0.0173
13	0.1000	0.100	1562.20	1540.8	1.0	664.0	0.1072	0.0150
14	0.1100	0.110	1596.10	1574.7	1.1	678.6	0.1061	0.0122
15	0.1200	0.120	1629.30	1607.9	1.2	692.9	0.1049	0.0091
16	0.1300	0.130	1647.50	1626.1	1.3	700.7	0.1036	0.0058
17	0.1400	0.140	1678.30	1656.9	1.4	714.0	0.1022	0.0023
18	0.1500	0.150	1700.60	1679.2	1.5	723.6	0.1012	-0.0003
19	0.1600	0.160	1722.80	1701.4	1.6	733.2	0.0998	-0.0038
20	0.1700	0.170	1733.60	1712.2	1.7	737.8	0.0989	-0.0061
21	0.1800	0.180	1752.20	1730.8	1.8	745.8	0.0977	-0.0091
	0.1900	0.190	1766.40	1745.0	1.9	752.0	0.0965	-0.0122
23	0.2000	0.200	1780.20	1758.8	2.0	757.9	0.0952	-0.0155
24	0.2200	0.220	1790.40	1769.0	2.2	762.3	0.0926	-0.0221
25	0.2400	0.240	1789.60	1768.2	2.4	762.0	0.0903	-0.0279

Test Readings Data for Specimen No. 3

No.	HORIZONTAL Dial Reading	Def. cm	Load Dial Units	Load lbs	Strain %	Shear Stress kPa	VERTICAL Dial Reading	Def. cm
26	0.2600	0.260	1788.30	1766.9	2.6	761.4	0.0883	-0.0330
27	0.2800	0.280	1785.70	1764.3	2.8	760.3	0.0862	-0.0384
28	0.3000	0.300	1772.60	1751.2	3.0	754.6	0.0843	-0.0432
29	0.3250	0.325	1747.40	1726.0	3.2	743.8	0.0822	-0.0485
30	0.3500	0.350	1717.70	1696.3	3.4	731.0	0.0804	-0.0531
31	0.3750	0.375	1692.80	1671.4	3.7	720.2	0.0786	-0.0577
32	0.4000	0.400	1664.70	1643.3	3.9	708.1	0.0764	-0.0632

Time Consolidation

Test Data

ASTM D 2435

Knight Piésold LLC

TIME CONSOLIDATION TEST DATA - ASTM D 2435

Project	**CARMACKS COPPER PROJECT**	**Date In**	**03/31/96**
Project No.	**1377A-L200**	**Date Out**	**04/09/96**
Lab No.	**L96038**	**Tested By**	**jat**
Eng.	**BB**	**Checked By**	**SPB**
Sample No.	**TR96-12-1**	**Depth / Elev.**	
Sample Description	**silty/clayey SAND, some gravel (SC-SM)**		

Specimen Data

		Before Test US	*Before Test* Metric			*After Test* US	*After Test* Metric
Diameter	*(in. / cm)*	*2.415*	*6.121*	*Diameter*	*(in. / cm)*	*2.415*	*6.121*
Height	*(in. / cm)*	*1.000*	*2.540*	*Height*	*(in. / cm)*	*0.972*	*2.540*
Area	*(in.² / cm²)*	*4.581*	*29.552*	*Area*	*(in.² / cm²)*	*4.581*	*29.552*
Volume	*(in.³ / cm³)*	*4.581*	*75.063*	*Volume*	*(in.³ / cm³)*	*4.451*	*72.946*
Ring + Wet Soil	*(g)*	*215.80*		*Ring + Wet Soil*	*(g)*	*350.70*	*tare*
Ring Wt.	*(g)*	*39.70*		*Ring + Dry Soil*	*(g)*	*336.80*	*172.2*
Wet Soil Wt.	*(g)*	*176.10*		*Wet Soil Wt.*	*(g)*	*178.50*	
Dry Soil Wt.	*(g)*	*164.60*		*Dry Soil Wt.*	*(g)*	*164.60*	
Wet Density	*(pcf / kg/m³)*	*146.5*	*2.35*	*Wet Density*	*(pcf / kg/m³)*	*152.8*	*2.45*
Moisture Content	*(%)*	*7.0*		*Moisture Content*	*(%)*	*8.4*	
Dry Density	*(pcf / kg/m³)*	*136.9*	*2.19*	*Dry Density*	*(pcf / kg/m³)*	*140.9*	*2.26*

Sample Properties

Specific Gravity (Gs)	*2.7*	*Frame No.*	*4*
Gs Assumed (Y / N)	*Yes*		
Initial Solids Height (cm)	*2.0629*	*Frame Type:*	*Dead Load / Pneumatic*
Initial Voids Height (cm)	*0.4771*		*(0.1 - 3.2 ksf / 3.2 - 102 ksf)*
Initial Void Ratio (e)	*0.2313*	*Atterberg Limits*	*(LL, PL, PI)* *20, 13, 7*

Test Data Summary

Applied Pressure (psf)	Log Pressure (psf)	Measured Deflection (0.0000 in.)	Machine Deflection (0.0000 in.)	Net Deflection (0.0000 in.)	Consolidation (0.0000 in.)	Void Ratio (e)	Corrected Sample Height (in.)
100	2.000	0.0815	0.00000	0.0000	0.0000	0.2313	1.0000
100	2.000	0.0814	-0.00018	0.0001	0.0001	0.2312	0.9999
200	2.301	0.0827	0.00056	0.0006	0.0006	0.2306	0.9994
400	2.602	0.0862	0.00260	0.0021	0.0021	0.2287	0.9979
800	2.903	0.0904	0.00450	0.0044	0.0044	0.2259	0.9956
1600	3.204	0.0954	0.00700	0.0069	0.0069	0.2228	0.9931
3200	3.505	0.1026	0.01069	0.0104	0.0104	0.2185	0.9896
6400	3.806	0.1102	0.01414	0.0145	0.0145	0.2134	0.9855
12800	4.107	0.1162	0.01660	0.0181	0.0181	0.2090	0.9819
25600	4.408	0.1228	0.01974	0.0216	0.0216	0.2047	0.9784
51200	4.709	0.1321	0.02239	0.0282	0.0282	0.1966	0.9718

General Test Notes
*Initial Height of Solids Calculated as Ws / (A * Gs)*
Specimen innundated with fluid other than tap water? *NO* *Type:*

Sample No. TR96-12-1
Normal Load 6400 psf

Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.1058	0.5000
0.25	0.5	0.1088	0.4970
0.5	0.7	0.1090	0.4968
0.75	0.9	0.1091	0.4968
1	1.0	0.1091	0.4967
2	1.4	0.1092	0.4966
4	2.0	0.1094	0.4964
9	3.0	0.1095	0.4963
16	4.0	0.1096	0.4962
25	5.0	0.1097	0.4962
36	6.0	0.1097	0.4961
49	7.0	0.1097	0.4961
64	8.0	0.1098	0.4960
90	9.5	0.1098	0.4960
120	11.0	0.1100	0.4959
251	15.8	0.1101	0.4958
480	21.9	0.1101	0.4957
1440	37.9	0.1102	0.4957

Sample No. TR96-12-1
Normal Load 12800 psf

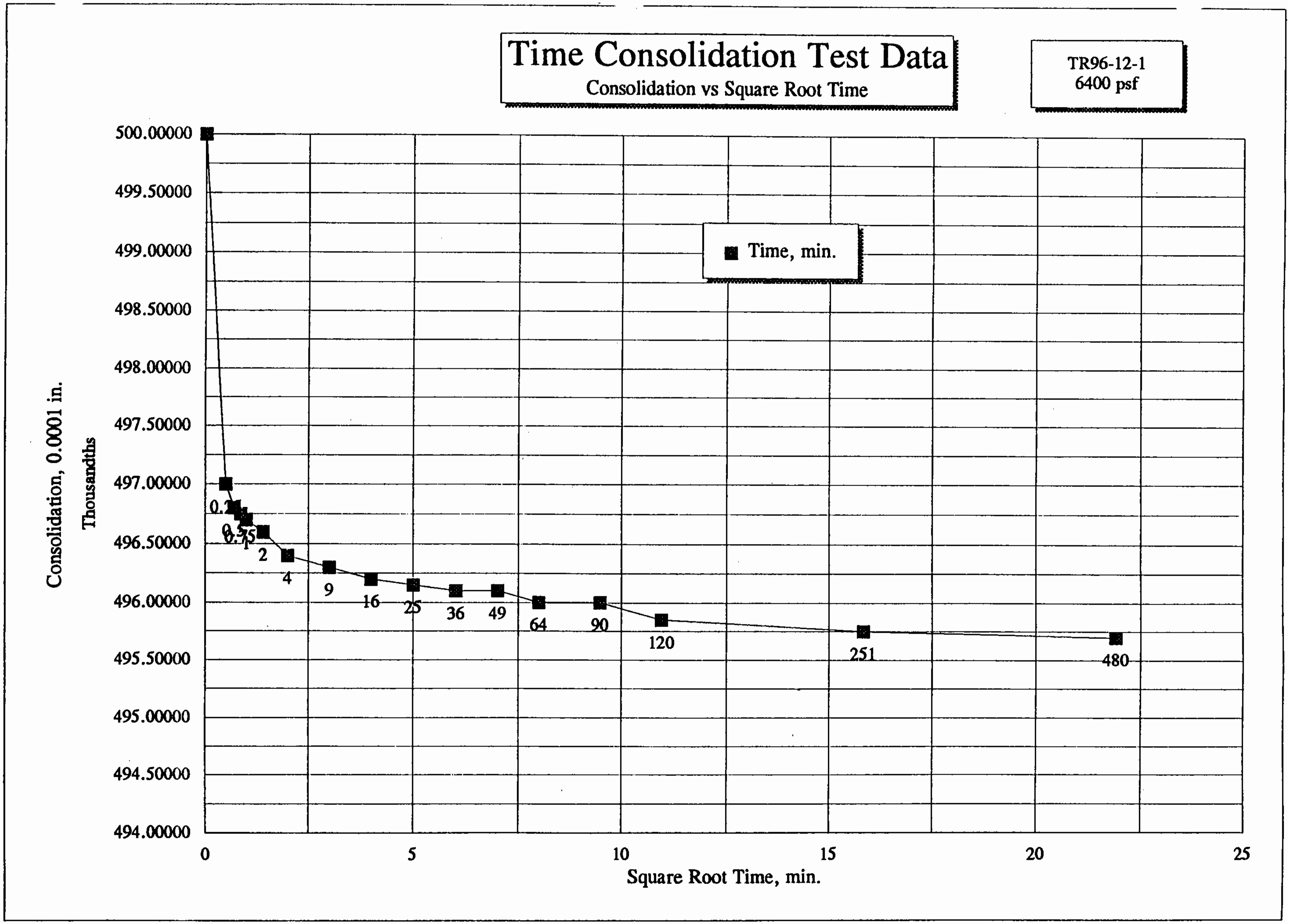
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.1102	0.5000
0.1	0.3	0.1140	0.4962
0.25	0.5	0.1143	0.4959
0.5	0.7	0.1144	0.4958
0.75	0.9	0.1145	0.4957
1	1.0	0.1146	0.4956
2	1.4	0.1147	0.4955
4	2.0	0.1148	0.4954
9	3.0	0.1150	0.4952
16	4.0	0.1151	0.4951
25	5.0	0.1152	0.4950
36	6.0	0.1153	0.4949
49	7.0	0.1153	0.4949
64	8.0	0.1154	0.4948
90	9.5	0.1155	0.4947
120	11.0	0.1155	0.4947
240	15.5	0.1156	0.4946
480	21.9	0.1159	0.4943
1440	37.9	0.1162	0.4940

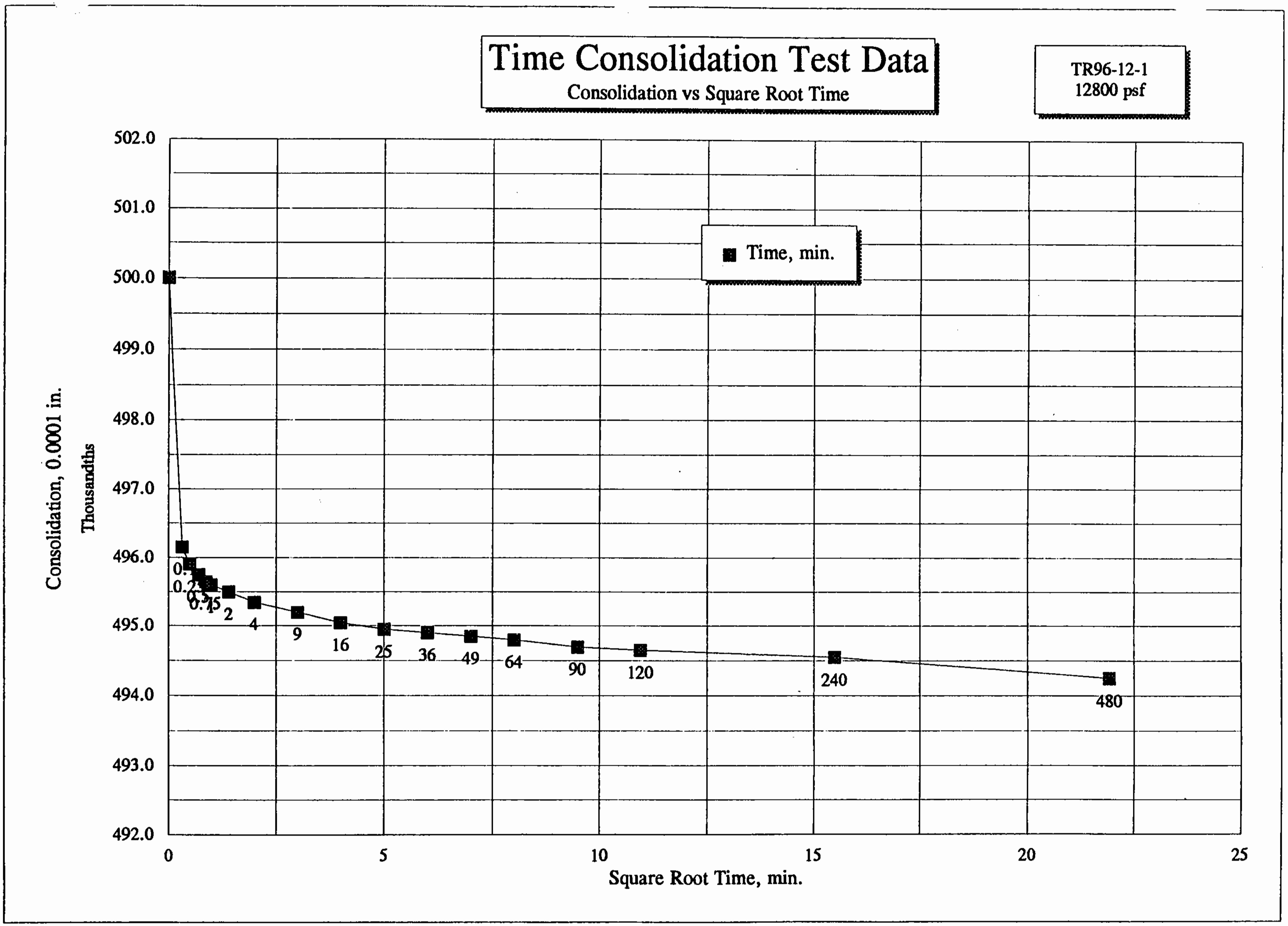
Sample No. TR96-12-1
Normal Load 25600 psf

Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.1162	0.5000
0.1	0.3	0.1204	0.4958
0.25	0.5	0.1207	0.4955
0.5	0.7	0.1209	0.4953
0.75	0.9	0.1210	0.4952
1	1.0	0.1211	0.4952
2	1.4	0.1213	0.4950
4	2.0	0.1214	0.4948
9	3.0	0.1216	0.4946
16	4.0	0.1217	0.4945
25	5.0	0.1218	0.4944
36	6.0	0.1219	0.4943
49	7.0	0.1220	0.4942
64	8.0	0.1221	0.4942
90	9.5	0.1221	0.4941
120	11.0	0.1222	0.4940
240	15.5	0.1224	0.4938
480	21.9	0.1227	0.4935
1440	37.9	0.1228	0.4934

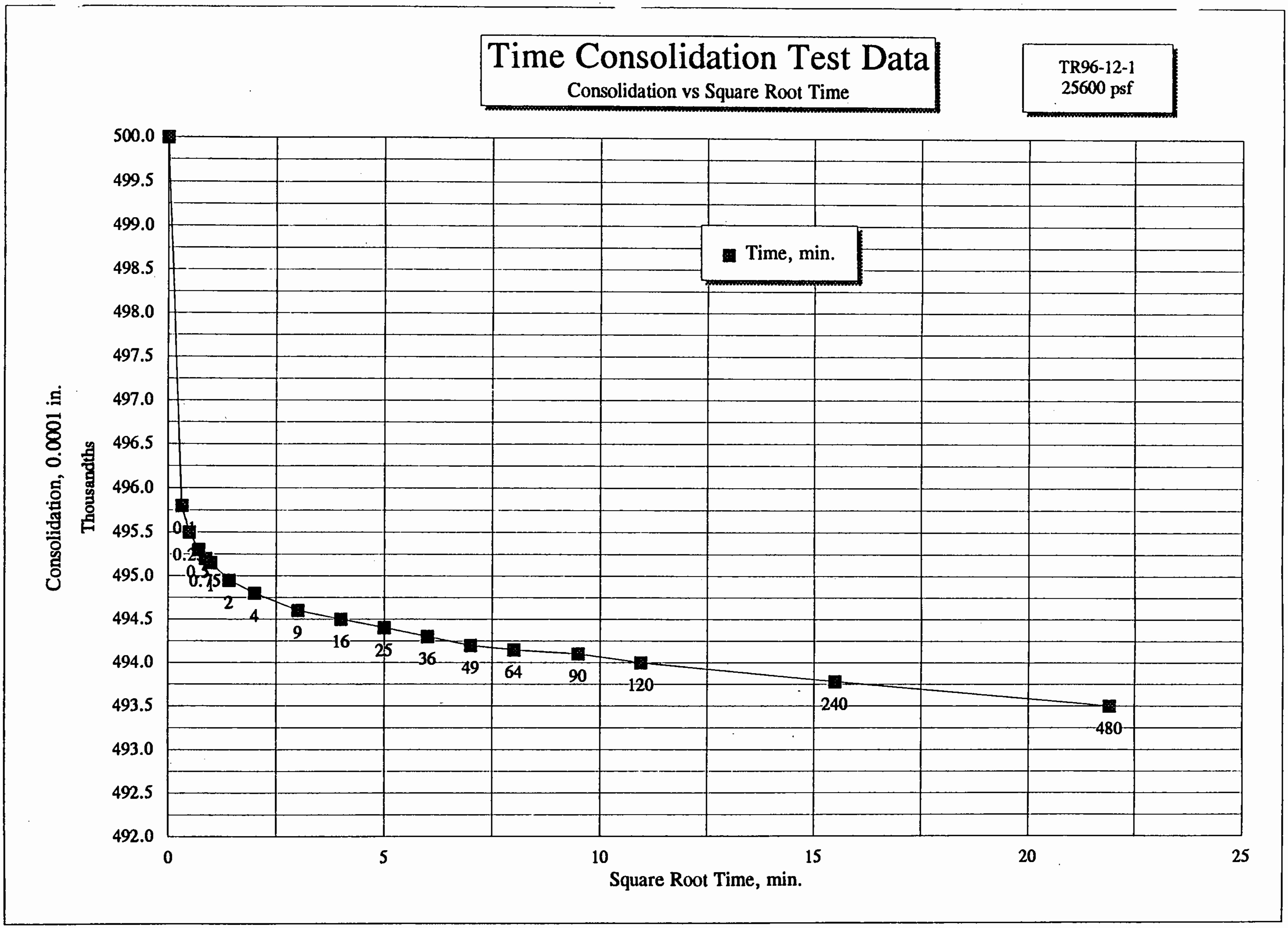
Sample No. TR96-12-1
Normal Load 51200 psf

Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.1228	0.5000
0.1	0.3	0.1291	0.4937
0.25	0.5	0.1294	0.4934
0.5	0.7	0.1296	0.4932
0.75	0.9	0.1298	0.4931
1	1.0	0.1300	0.4928
2	1.4	0.1302	0.4927
4	2.0	0.1303	0.4926
9	3.0	0.1305	0.4924
16	4.0	0.1307	0.4922
25	5.0	0.1308	0.4920
36	6.0	0.1309	0.4919
49	7.0	0.1310	0.4918
64	8.0	0.1311	0.4917
90	9.5	0.1312	0.4917
120	11.0	0.1313	0.4916
240	15.5	0.1315	0.4913
480	21.9	0.1319	0.4910
1440	37.9	0.1321	0.4907

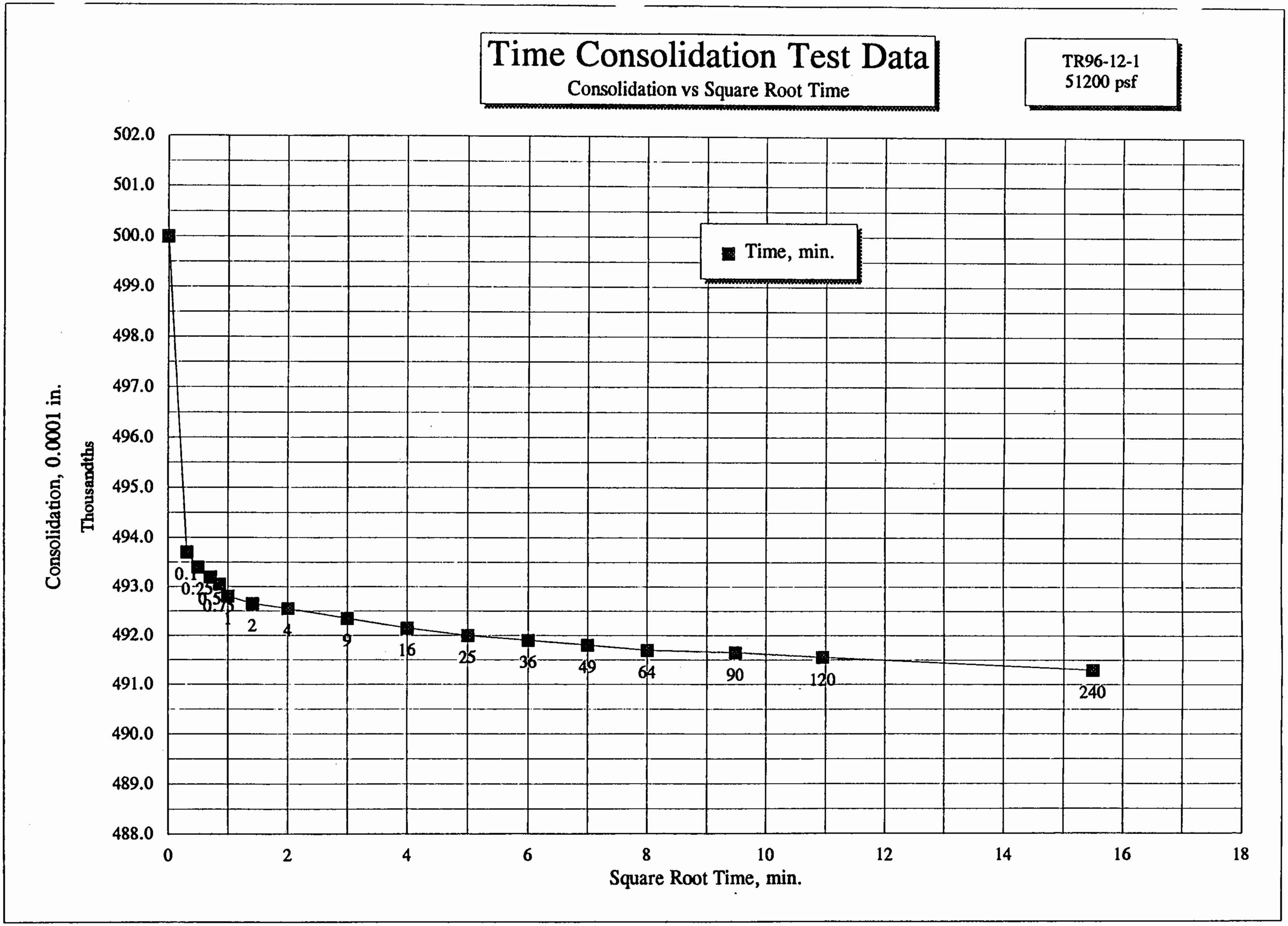

Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-12-1
6400 psf
Time, min.
Consolidation, 0.0001 in.
Thousandths
500.00000
499.50000
499.00000
498.50000
498.00000
497.50000
497.00000
496.50000
496.00000
495.50000
495.00000
494.50000
494.00000
0
5
10
15
20
25
Square Root Time, min.
2
4
9
16
25
36
49
64
90
120
251
480

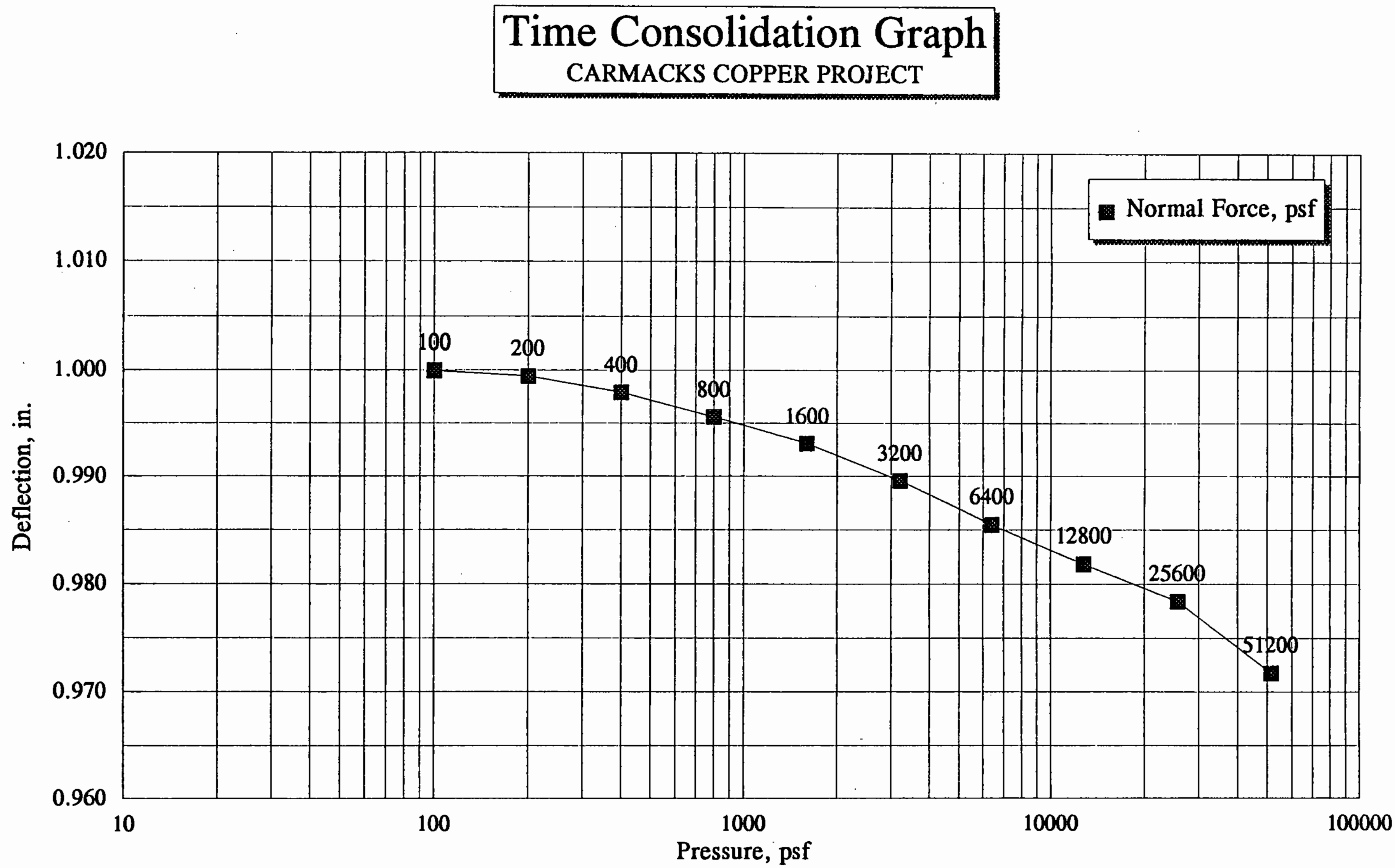


Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-12-1
12800 psf
Time, min.
Consolidation, 0.0001 in.
Thousandths
502.0
501.0
500.0
499.0
498.0
497.0
496.0
495.0
494.0
493.0
492.0
0
5
10
15
20
25
Square Root Time, min.
2
4
9
16
25
36
49
64
90
120
240
480



Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-12-1
25600 psf
Time, min.
Consolidation, 0.0001 in.
Thousandths
500.0
499.5
499.0
498.5
498.0
497.5
497.0
496.5
496.0
495.5
495.0
494.5
494.0
493.5
493.0
492.5
492.0
0
5
10
15
20
25
Square Root Time, min.
2
4
9
16
25
36
49
64
90
120
240
480

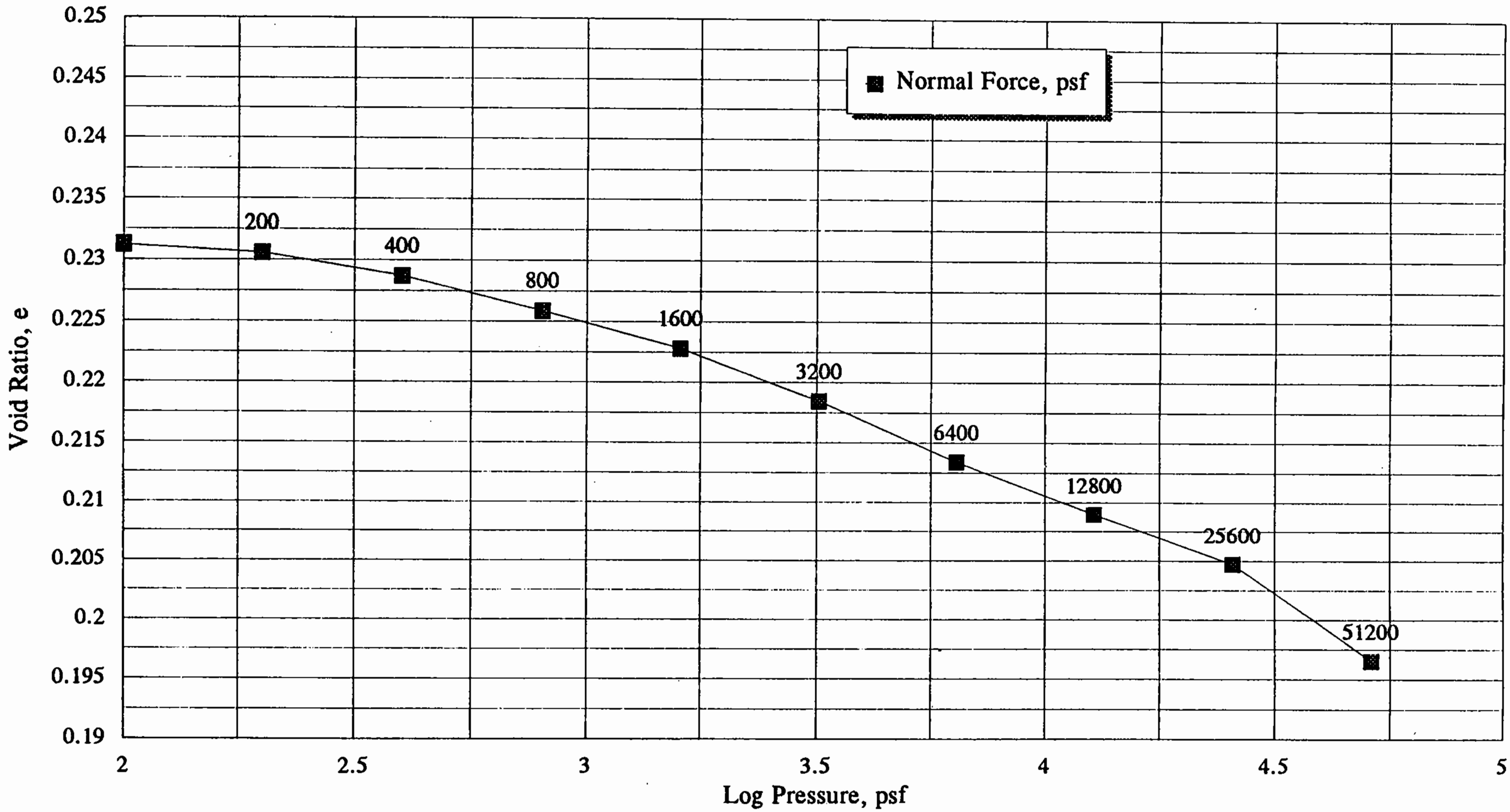

Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-12-1
51200 psf
Time, min.
Consolidation, 0.0001 in.
Thousandths
502.0
501.0
500.0
499.0
498.0
497.0
496.0
495.0
494.0
493.0
492.0
491.0
490.0
489.0
488.0
0
2
4
6
8
10
12
14
16
18
Square Root Time, min.
0.1
0.25
0.5
0.75
1
2
4
9
16
25
36
49
64
90
120
240


Time Consolidation Graph
CARMACKS COPPER PROJECT
Normal Force, psf
Deflection, in.
1.020
1.010
1.000
0.990
0.980
0.970
0.960
10
100
1000
10000
100000
Pressure, psf
100
200
400
800
1600
3200
6400
12800
25600
51200

TR96-12-1

VOID RATIO vs LOG PRESSURE

CARMACKS COPPER PROJECT



TR96-12-1

TIME CONSOLIDATION TEST DATA - ASTM D 2435

Project	**CARMACKS COPPER PROJECT**	**Date In**	**04/08/96**
Project No.	**1377A-L200**	**Date Out**	**04/18/96**
Lab No.	**L96038**	**Tested By**	**jat**
Eng.	**BB**	**Checked By**	**SPB**
Sample No.	**TR96-16-1**	**Depth / Elev.**	
Sample Description	**clayey SAND w/gravel (SC)**		

Specimen Data

Before Test		US	Metric	After Test		US	Metric
Diameter	(in. / cm)	2.415	6.121	Diameter	(in. / cm)	2.415	6.121
Height	(in. / cm)	1.000	2.540	Height	(in. / cm)	0.981	2.540
Area	($in.^2$ / cm^2)	4.581	29.552	Area	($in.^2$ / cm^2)	4.581	29.552
Volume	($in.^3$ / cm^3)	4.581	75.063	Volume	($in.^3$ / cm^3)	4.495	73.667
Ring + Wet Soil	(g)	806.90		Ring + Wet Soil	(g)	306.30	tare
Ring Wt.	(g)	673.10		Ring + Dry Soil	(g)	288.80	169.1
Wet Soil Wt.	(g)	133.80		Wet Soil Wt.	(g)	137.20	
Dry Soil Wt.	(g)	119.70		Dry Soil Wt.	(g)	119.70	
Wet Density	(pcf / kg/m^3)	111.3	1.78	Wet Density	(pcf / kg/m^3)	116.3	1.86
Moisture Content	(%)	11.8		Moisture Content	(%)	14.6	
Dry Density	(pcf / kg/m^3)	99.6	1.59	Dry Density	(pcf / kg/m^3)	101.4	1.63

Sample Properties

Specific Gravity (Gs)	2.7	Frame No.	1
Gs Assumed (Y / N)	Yes		
Initial Solids Height (cm)	1.5002	Frame Type:	Dead Load / Pneumatic
Initial Voids Height (cm)	1.0398		(0.1 - 3.2 ksf / 3.2 - 102 ksf)
Initial Void Ratio (e)	0.6931	Atterberg Limits (LL, PL, PI)	25, 13, 12

Test Data Summary

Applied Pressure (psf)	Log Pressure (psf)	Measured Deflection (0.0000 in.)	Machine Deflection (0.0000 in.)	Net Deflection (0.0000 in.)	Consolidation (0.0000 in.)	Void Ratio (e)	Corrected Sample Height (in.)
100	2.000	0.0676	0.00000	0.0000	0.0000	0.6931	1.0000
100	2.000	0.0609	-0.00015	-0.0066	-0.0066	0.7042	1.0066
200	2.301	0.0620	0.00056	-0.0062	-0.0062	0.7036	1.0062
400	2.602	0.0657	0.00226	-0.0042	-0.0042	0.7002	1.0042
800	2.903	0.0701	0.00450	-0.0020	-0.0020	0.6965	1.0020
1600	3.204	0.0766	0.00770	0.0013	0.0013	0.6909	0.9987
3200	3.505	0.0827	0.01069	0.0044	0.0044	0.6858	0.9956
6400	3.806	0.0887	0.01414	0.0070	0.0070	0.6814	0.9930
12800	4.107	0.0944	0.01490	0.0119	0.0119	0.6731	0.9882
25600	4.408	0.1044	0.01815	0.0187	0.0187	0.6616	0.9814

General Test Notes

Initial Height of Solids Calculated as Ws / (A * Gs)

Specimen innundated with fluid other than tap water? NO Type:

TIME CONSOLIDATION TEST DATA - ASTM D 2435

Project	**CARMACKS COPPER PROJECT**	**Date In**	**03/31/96**
Project No.	**1377A-L200**	**Date Out**	**04/09/96**
Lab No.	**L96038**	**Tested By**	**jat**
Eng.	**BB**	**Checked By**	**SPB**
Sample No.	**TR96-11-3**	**Depth / Elev.**	
Sample Description	**sandy, gravelly CLAY (CH)**		

Specimen Data

		Before Test				*After Test*	
		US	*Metric*			*US*	*Metric*
Diameter	*(in. / cm)*	*2.415*	*6.121*	*Diameter*	*(in. / cm)*	*2.415*	*6.121*
Height	*(in. / cm)*	*1.000*	*2.540*	*Height*	*(in. / cm)*	*0.893*	*2.540*
Area	*(in.² / cm²)*	*4.581*	*29.552*	*Area*	*(in.² / cm²)*	*4.581*	*29.552*
Volume	*(in.³ / cm³)*	*4.581*	*75.063*	*Volume*	*(in.³ / cm³)*	*4.092*	*67.061*
Ring + Wet Soil	*(g)*	*188.75*		*Ring + Wet Soil*	*(g)*	*318.30*	*tare*
Ring Wt.	*(g)*	*39.02*		*Ring + Dry Soil*	*(g)*	*289.20*	*170.92*
Wet Soil Wt.	*(g)*	*149.73*		*Wet Soil Wt.*	*(g)*	*147.38*	
Dry Soil Wt.	*(g)*	*118.28*		*Dry Soil Wt.*	*(g)*	*118.28*	
Wet Density	*(pcf / kg/m³)*	*124.5*	*1.99*	*Wet Density*	*(pcf / kg/m³)*	*137.2*	*2.20*
Moisture Content	*(%)*	*26.6*		*Moisture Content*	*(%)*	*24.6*	
Dry Density	*(pcf / kg/m³)*	*98.4*	*1.58*	*Dry Density*	*(pcf / kg/m³)*	*110.1*	*1.76*

Sample Properties

Specific Gravity (Gs)	*2.7*	*Frame No.*	*2*
Gs Assumed (Y / N)	*Yes*		
Initial Solids Height (cm)	*1.4824*	*Frame Type:*	*Dead Load / Pneumatic*
Initial Voids Height (cm)	*1.0576*		*(0.1 - 3.2 ksf / 3.2 - 102 ksf)*
Initial Void Ratio (e)	*0.7135*	*Atterberg Limits*	*(LL, PL, PI)* *59, 17, 42*

Test Data Summary

Applied Pressure (psf)	Log Pressure (psf)	Measured Deflection (0.0000 in.)	Machine Deflection (0.0000 in.)	Net Deflection (0.0000 in.)	Consolidation (0.0000 in.)	Void Ratio (e)	Corrected Sample Height (in.)
100	2.000	0.1175	0.00000	0.0000	0.0000	0.7135	1.0000
100	2.000	0.0668	-0.00035	-0.0503	-0.0503	0.7997	1.0503
200	2.301	0.0674	0.00020	-0.0503	-0.0503	0.7996	1.0503
400	2.602	0.0715	0.00240	-0.0484	-0.0484	0.7963	1.0484
800	2.903	0.0813	0.00400	-0.0402	-0.0402	0.7823	1.0402
1600	3.204	0.0955	0.00640	-0.0284	-0.0284	0.7621	1.0284
3200	3.505	0.1164	0.00900	-0.0100	-0.0100	0.7307	1.0101
6400	3.806	0.1395	0.01195	0.0101	0.0101	0.6962	0.9899
12800	4.107	0.1703	0.01445	0.0384	0.0384	0.6478	0.9617
25600	4.408	0.2039	0.01710	0.0694	0.0694	0.5946	0.9307
51200	4.709	0.2414	0.01730	0.1067	0.1067	0.5307	0.8934

General Test Notes
*Initial Height of Solids Calculated as Ws / (A * Gs)*
Specimen innundated with fluid other than tap water? *NO* *Type:*

Sample No. TR96-16-1
Normal Load 6400 psf

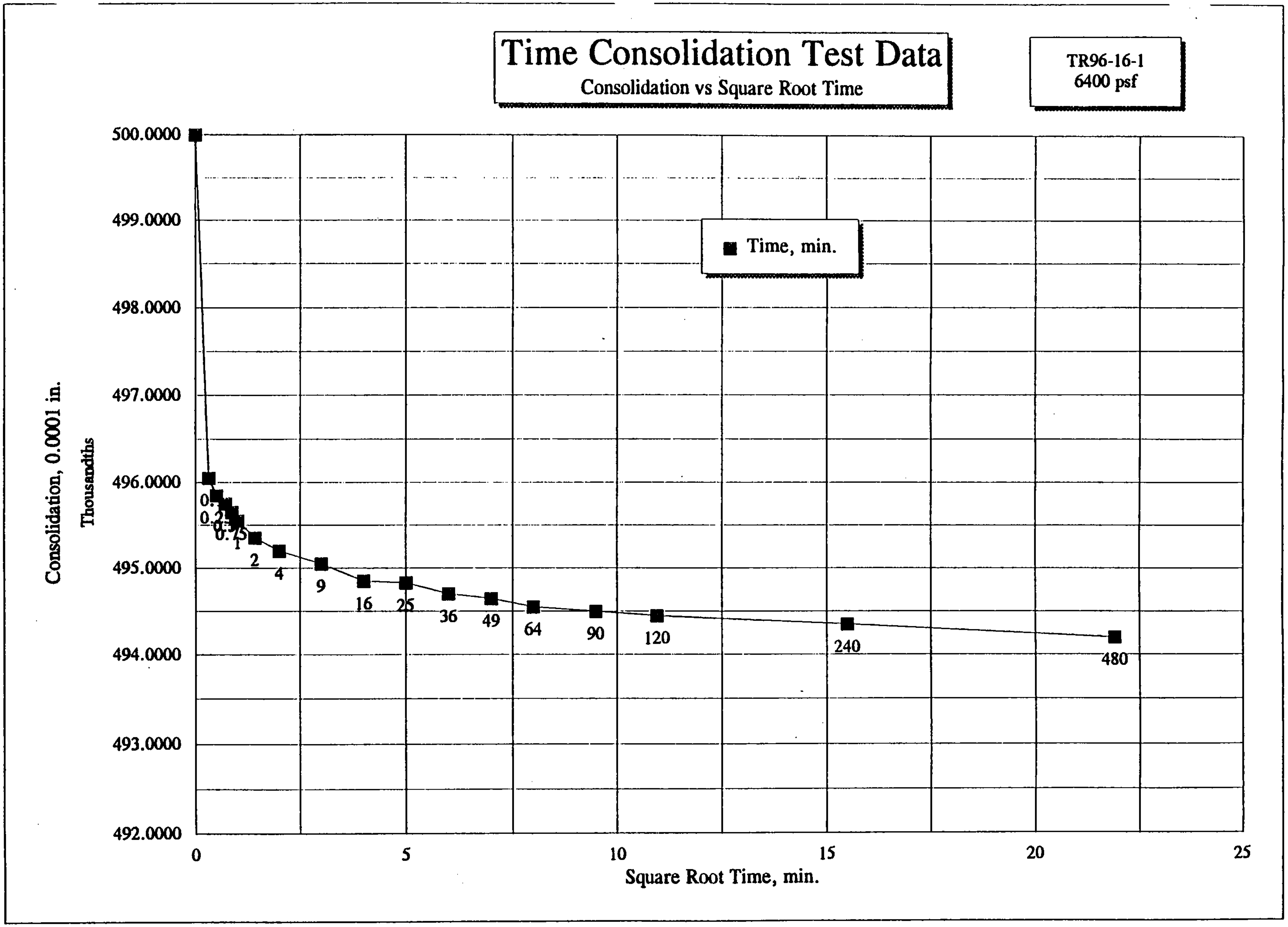
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.0827	0.5000
0.1	0.3	0.0866	0.4961
0.25	0.5	0.0868	0.4959
0.5	0.7	0.0869	0.4958
0.75	0.9	0.0870	0.4957
1	1.0	0.0871	0.4956
2	1.4	0.0873	0.4954
4	2.0	0.0875	0.4952
9	3.0	0.0876	0.4951
16	4.0	0.0878	0.4949
25	5.0	0.0878	0.4948
36	6.0	0.0880	0.4947
49	7.0	0.0880	0.4947
64	8.0	0.0881	0.4946
90	9.5	0.0882	0.4945
120	11.0	0.0882	0.4945
240	15.5	0.0883	0.4944
480	21.9	0.0885	0.4942
1440	37.9	0.0887	0.4940

Sample No. TR96-16-1
Normal Load 12800 psf

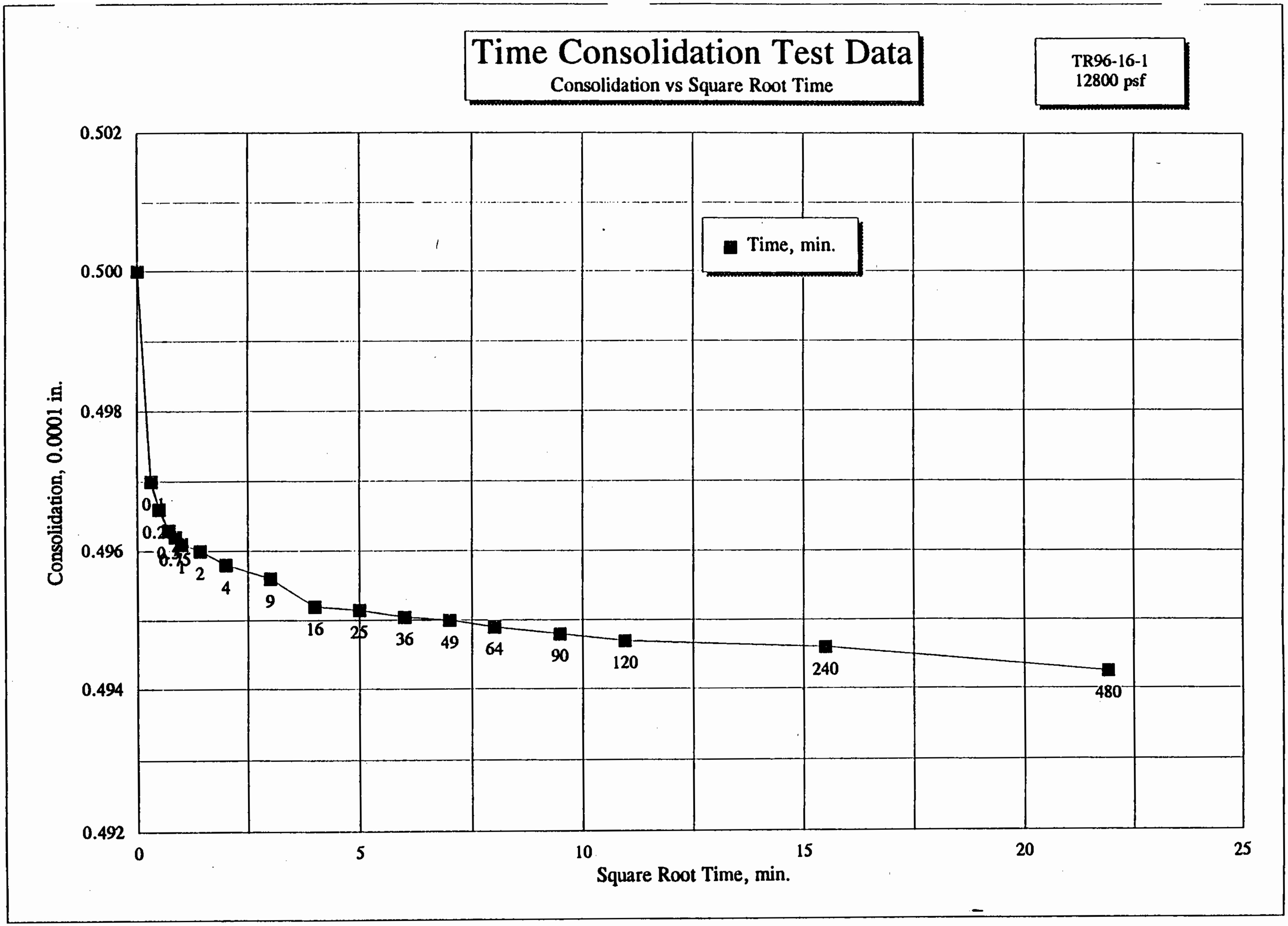
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.0886	0.5000
0.1	0.3	0.0916	0.4970
0.25	0.5	0.0920	0.4966
0.5	0.7	0.0923	0.4963
0.75	0.9	0.0924	0.4962
1	1.0	0.0925	0.4961
2	1.4	0.0926	0.4960
4	2.0	0.0928	0.4958
9	3.0	0.0930	0.4956
16	4.0	0.0934	0.4952
25	5.0	0.0935	0.4952
36	6.0	0.0936	0.4951
49	7.0	0.0936	0.4950
64	8.0	0.0937	0.4949
90	9.5	0.0938	0.4948
120	11.0	0.0939	0.4947
240	15.5	0.0940	0.4946
480	21.9	0.0944	0.4943
1440	37.9	0.0944	0.4943

Sample No. TR96-16-1
Normal Load 25600 psf

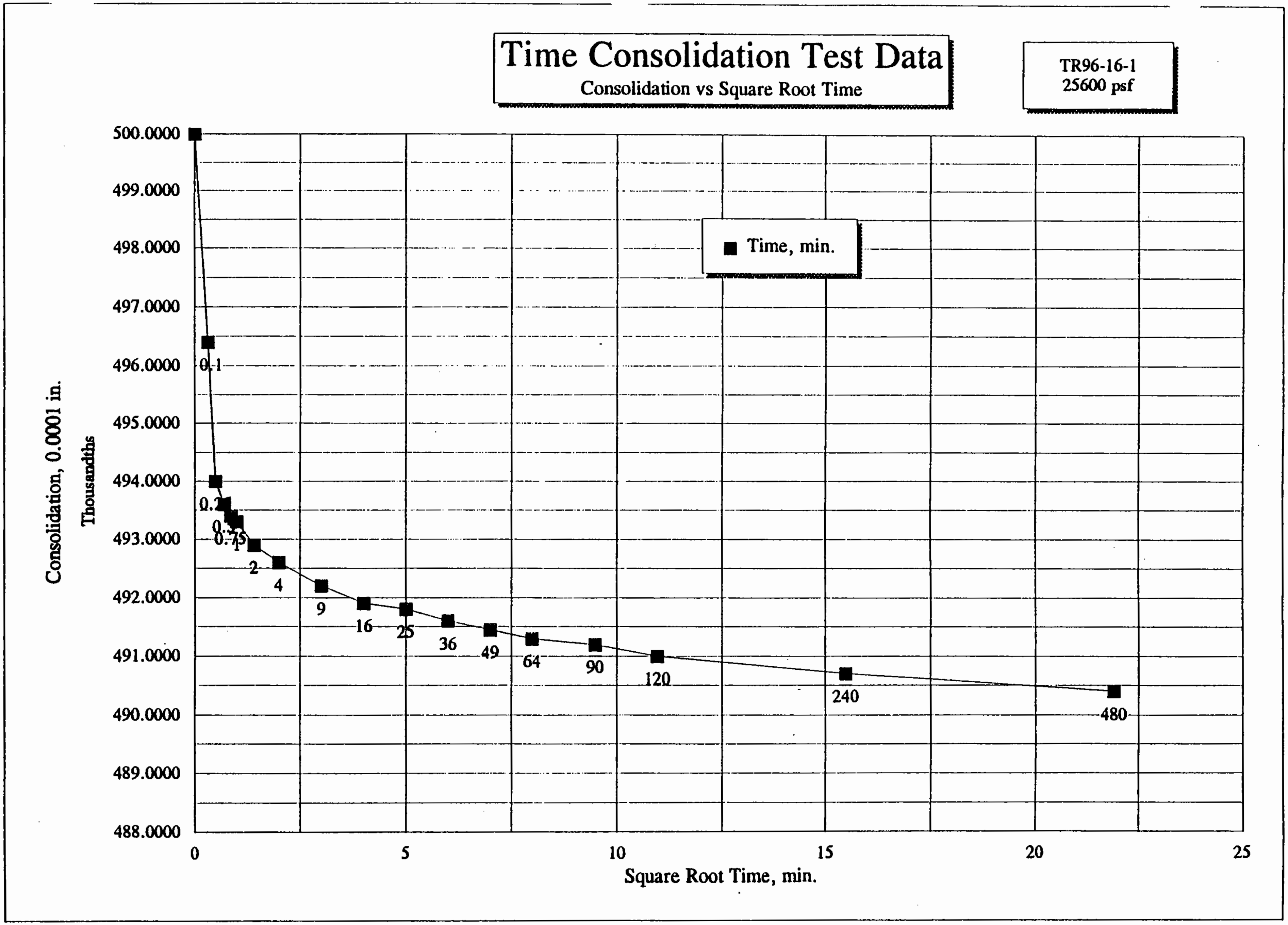
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.0944	0.5000
0.1	0.3	0.0980	0.4964
0.25	0.5	0.1004	0.4940
0.5	0.7	0.1008	0.4936
0.75	0.9	0.1010	0.4934
1	1.0	0.1011	0.4933
2	1.4	0.1015	0.4929
4	2.0	0.1018	0.4926
9	3.0	0.1022	0.4922
16	4.0	0.1025	0.4919
25	5.0	0.1026	0.4918
36	6.0	0.1028	0.4916
49	7.0	0.1030	0.4915
64	8.0	0.1031	0.4913
90	9.5	0.1032	0.4912
120	11.0	0.1034	0.4910
240	15.5	0.1037	0.4907
480	21.9	0.1040	0.4904
1440	37.9	0.1044	0.4900



Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-16-1
6400 psf
Time, min.
Consolidation, 0.0001 in.
Thousandths
500.0000
499.0000
498.0000
497.0000
496.0000
495.0000
494.0000
493.0000
492.0000
0
5
10
15
20
25
Square Root Time, min.
2
4
9
16
25
36
49
64
90
120
240
480

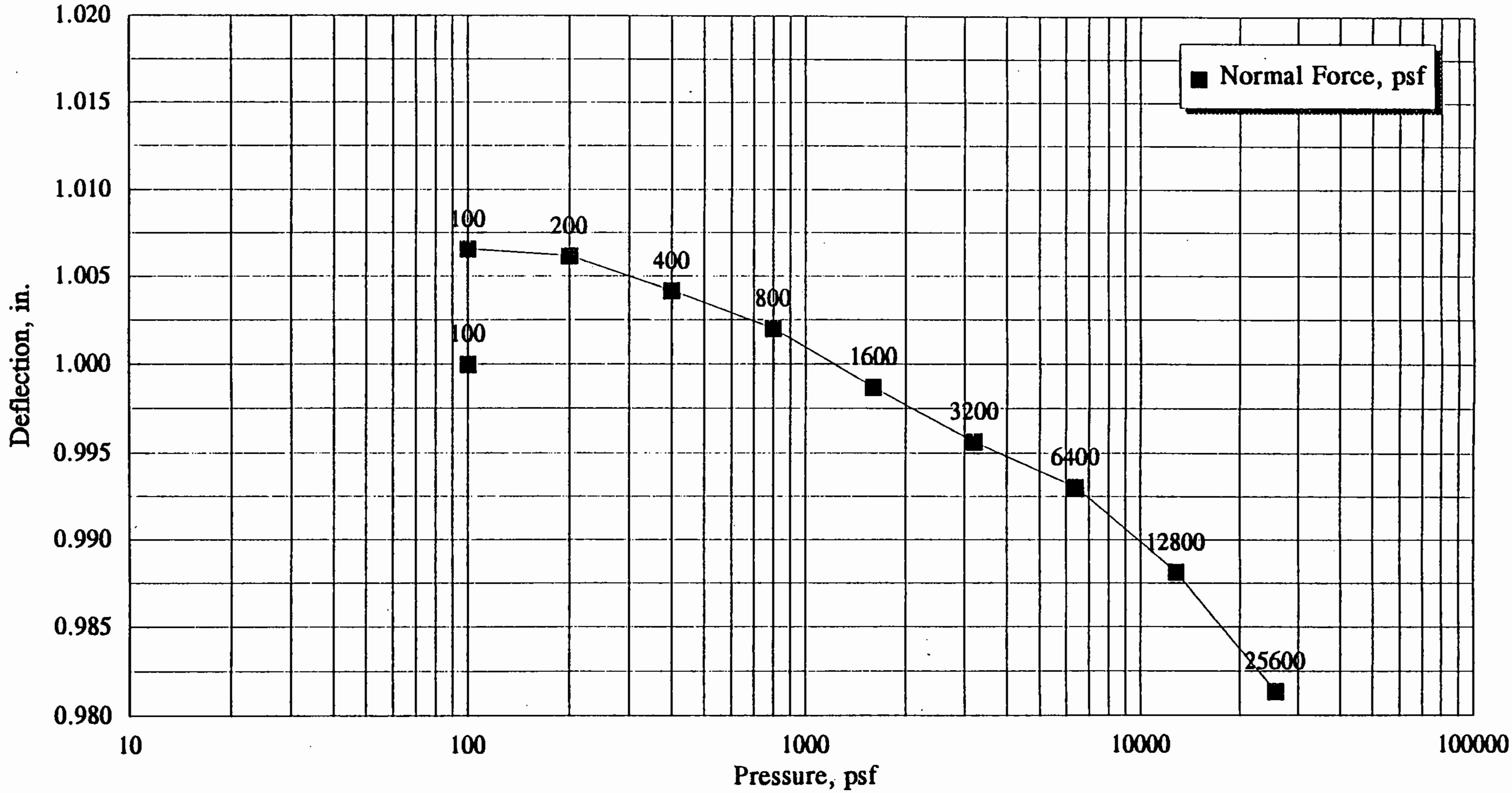


Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-16-1
12800 psf
Time, min.
Consolidation, 0.0001 in.
Square Root Time, min.
0.502
0.500
0.498
0.496
0.494
0.492
0
5
10
15
20
25
2
4
9
16
25
36
49
64
90
120
240
480

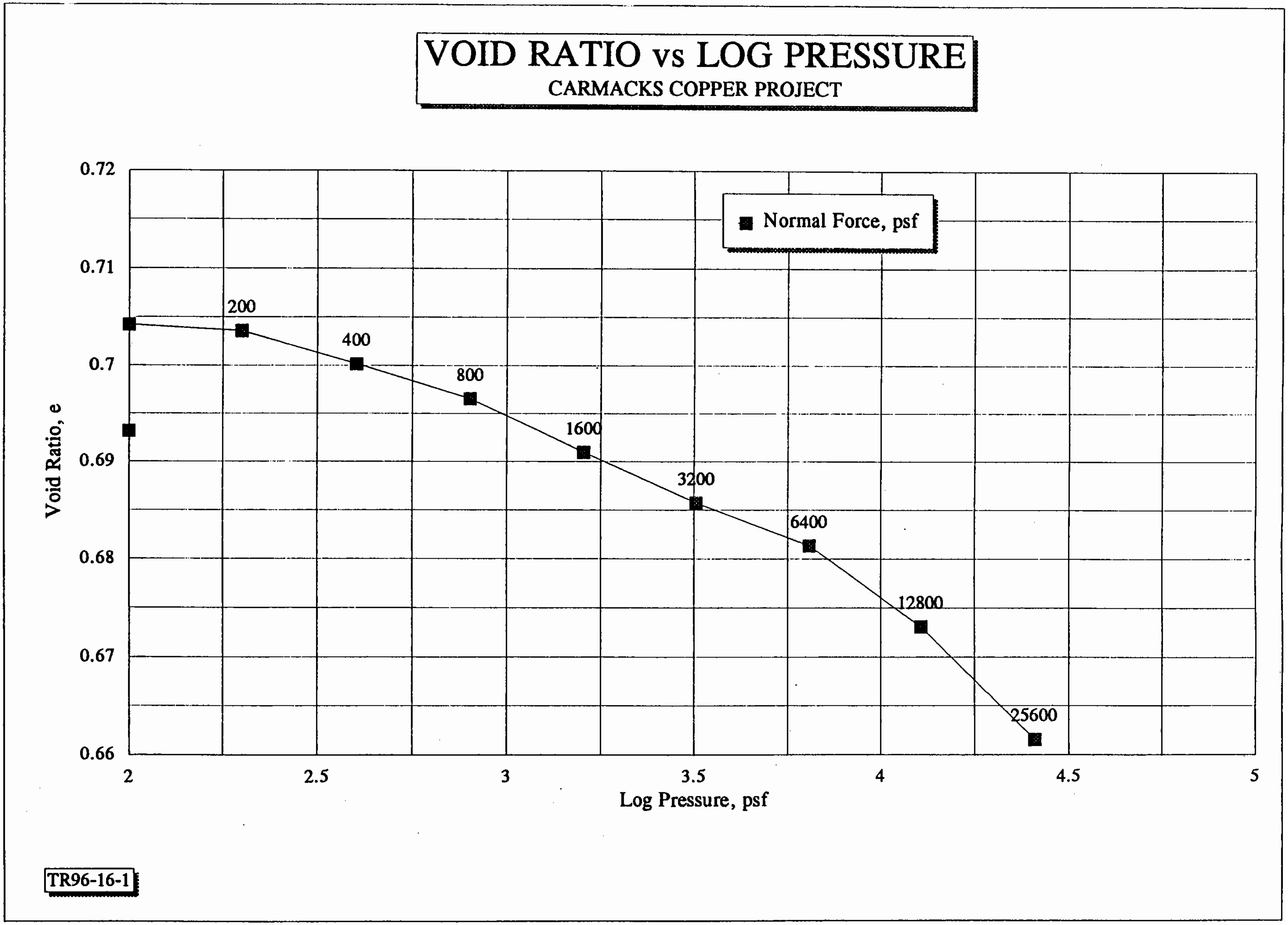

Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-16-1
25600 psf
Time, min.
Consolidation, 0.0001 in.
Thousandths
Square Root Time, min.
500.0000
499.0000
498.0000
497.0000
496.0000
495.0000
494.0000
493.0000
492.0000
491.0000
490.0000
489.0000
488.0000
0
5
10
15
20
25
0.1
2
4
9
16
25
36
49
64
90
120
240
480

Time Consolidation Graph

CARMACKS COPPER PROJECT



TR96-16-1


VOID RATIO vs LOG PRESSURE
CARMACKS COPPER PROJECT
Normal Force, psf
Void Ratio, e
Log Pressure, psf
0.72
0.71
0.7
0.69
0.68
0.67
0.66
2
2.5
3
3.5
4
4.5
5
200
400
800
1600
3200
6400
12800
25600
TR96-16-1

TIME CONSOLIDATION TEST DATA - ASTM D 2435

Project	CARMACKS COPPER PROJECT	Date In	04/05/96
Project No.	1377A-L200	Date Out	04/14/96
Lab No.	L96038	Tested By	jat
Eng.	BB	Checked By	SPB
Sample No.	TR96-17	Depth / Elev.	
Sample Description	clayey SAND, some GRAVEL, TILL (SC)		

Specimen Data

		Before Test US	Before Test Metric			After Test US	After Test Metric
Diameter	(in. / cm)	2.415	6.121	Diameter	(in. / cm)	2.415	6.121
Height	(in. / cm)	1.000	2.540	Height	(in. / cm)	0.946	2.403
Area	(in.^{2} / cm^2)	4.581	29.552	Area	(in.^{2} / cm^2)	4.581	29.552
Volume	(in.^{3} / cm^3)	4.581	75.063	Volume	(in.^{3} / cm^3)	4.333	71.002
Ring + Wet Soil	(g)	216.20		Ring + Wet Soil	(g)	306.60	tare
Ring Wt.	(g)	39.70		Ring + Dry Soil	(g)	293.30	129.9
Wet Soil Wt.	(g)	176.50		Wet Soil Wt.	(g)	176.70	
Dry Soil Wt.	(g)	163.40		Dry Soil Wt.	(g)	163.40	
Wet Density	(pcf / kg/m^3)	146.8	2.35	Wet Density	(pcf / kg/m^3)	155.4	2.49
Moisture Content	(%)	8.0		Moisture Content	(%)	8.1	
Dry Density	(pcf / kg/m^3)	135.9	2.18	Dry Density	(pcf / kg/m^3)	143.7	2.30

Sample Properties

Specific Gravity (Gs)	2.7	Frame No.	1	
Gs Assumed (Y / N)	Yes			
Initial Solids Height (cm)	2.0478	Frame Type:	Dead Load / Pneumatic	
Initial Voids Height (cm)	0.4922		(0.1 - 3.2 ksf / 3.2 - 102 ksf)	
Initial Void Ratio (e)	0.2403	Atterberg Limits	(LL, PL, PI)	20, 12, 8

Test Data Summary

Applied Pressure (psf)	Log Pressure (psf)	Measured Deflection (0.0000 in.)	Machine Deflection (0.0000 in.)	Net Deflection (0.0000 in.)	Consolidation (0.0000 in.)	Void Ratio (e)	Corrected Sample Height (in.)
100	2.000	0.0817	0.00000	0.0000	0.0000	0.2403	1.0000
100	2.000	0.0807	-0.00015	-0.0009	-0.0009	0.2414	1.0009
200	2.301	0.0813	0.00005	-0.0004	-0.0004	0.2409	1.0005
400	2.602	0.0846	0.00135	0.0015	0.0015	0.2385	0.9985
800	2.903	0.0902	0.00340	0.0050	0.0050	0.2341	0.9950
1600	3.204	0.0979	0.00645	0.0098	0.0098	0.2282	0.9903
3200	3.505	0.1070	0.00935	0.0160	0.0160	0.2205	0.9841
6400	3.806	0.1195	0.01265	0.0252	0.0252	0.2091	0.9749
12800	4.107	0.1349	0.01490	0.0383	0.0383	0.1928	0.9617
25600	4.408	0.1540	0.01815	0.0541	0.0541	0.1732	0.9459

General Test Notes
Initial Height of Solids Calculated as Ws / (A * Gs)
Specimen innundated with fluid other than tap water? NO Type:

Sample No. TR96-17
Normal Load 6400 psf

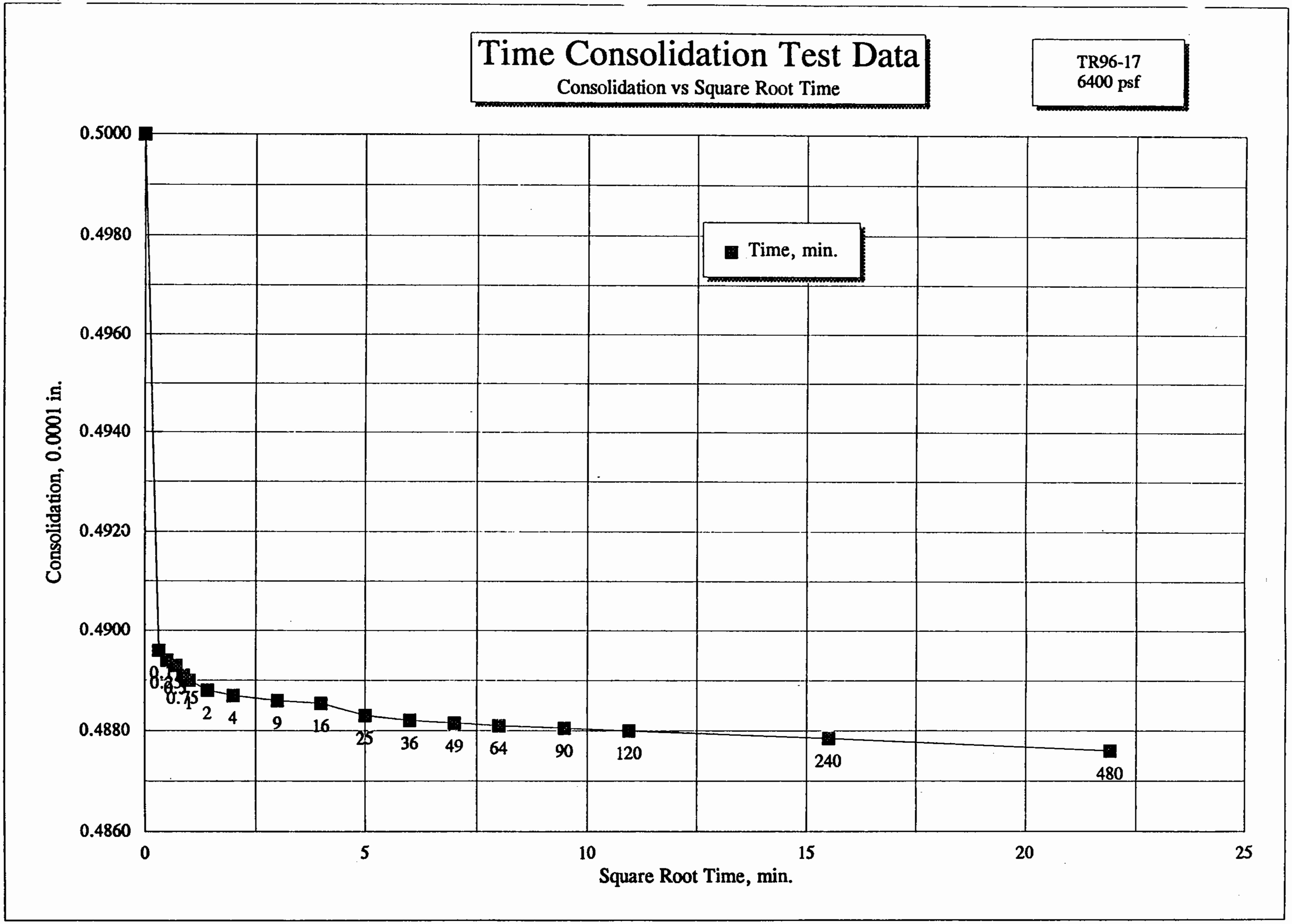
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.1070	0.5000
0.1	0.3	0.1174	0.4896
0.25	0.5	0.1176	0.4894
0.5	0.7	0.1177	0.4893
0.75	0.9	0.1179	0.4891
1	1.0	0.1180	0.4890
2	1.4	0.1182	0.4888
4	2.0	0.1183	0.4887
9	3.0	0.1184	0.4886
16	4.0	0.1185	0.4886
25	5.0	0.1187	0.4883
36	6.0	0.1188	0.4882
49	7.0	0.1189	0.4882
64	8.0	0.1189	0.4881
90	9.5	0.1190	0.4881
120	11.0	0.1190	0.4880
240	15.5	0.1192	0.4879
480	21.9	0.1194	0.4876
1440	37.9	0.1195	0.4875

Sample No. TR96-17
Normal Load 12800 psf

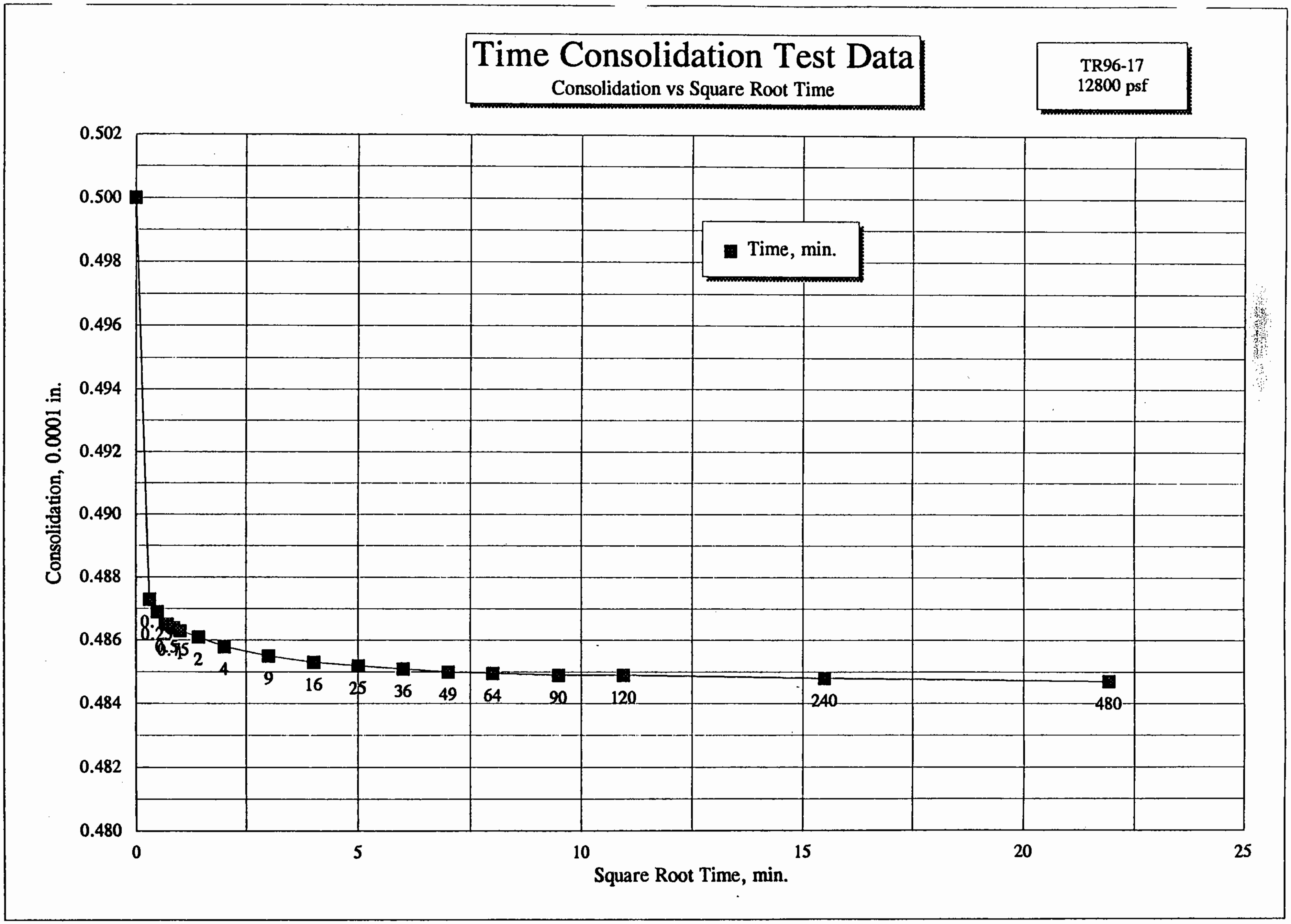
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.1195	0.5000
0.1	0.3	0.1322	0.4873
0.25	0.5	0.1326	0.4869
0.5	0.7	0.1330	0.4865
0.75	0.9	0.1331	0.4864
1	1.0	0.1332	0.4863
2	1.4	0.1334	0.4861
4	2.0	0.1337	0.4858
9	3.0	0.1340	0.4855
16	4.0	0.1342	0.4853
25	5.0	0.1343	0.4852
36	6.0	0.1344	0.4851
49	7.0	0.1345	0.4850
64	8.0	0.1346	0.4850
90	9.5	0.1346	0.4849
120	11.0	0.1346	0.4849
240	15.5	0.1347	0.4848
480	21.9	0.1348	0.4847
1440	37.9	0.1349	0.4846

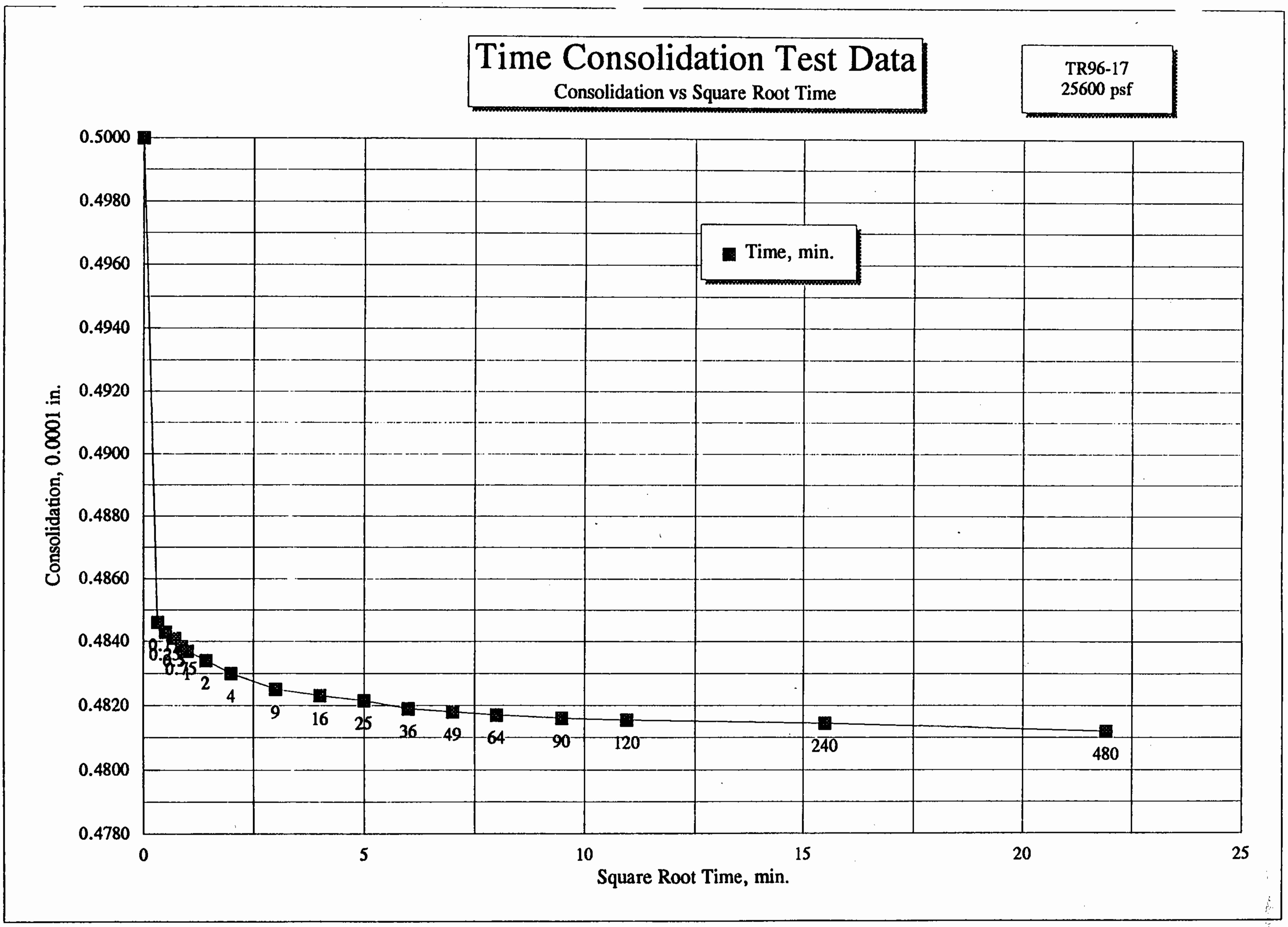
Sample No. TR96-17
Normal Load 25600 psf

Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.1349	0.5000
0.1	0.3	0.1503	0.4846
0.25	0.5	0.1506	0.4843
0.5	0.7	0.1508	0.4841
0.75	0.9	0.1511	0.4839
1	1.0	0.1512	0.4837
2	1.4	0.1515	0.4834
4	2.0	0.1519	0.4830
9	3.0	0.1524	0.4825
16	4.0	0.1526	0.4823
25	5.0	0.1528	0.4822
36	6.0	0.1530	0.4819
49	7.0	0.1531	0.4818
64	8.0	0.1532	0.4817
90	9.5	0.1533	0.4816
120	11.0	0.1534	0.4816
240	15.5	0.1535	0.4815
480	21.9	0.1537	0.4812
1440	37.9	0.1540	0.4810



Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-17
6400 psf
Time, min.
Consolidation, 0.0001 in.
0.5000
0.4980
0.4960
0.4940
0.4920
0.4900
0.4880
0.4860
0
5
10
15
20
25
Square Root Time, min.
2
4
9
16
25
36
49
64
90
120
240
480

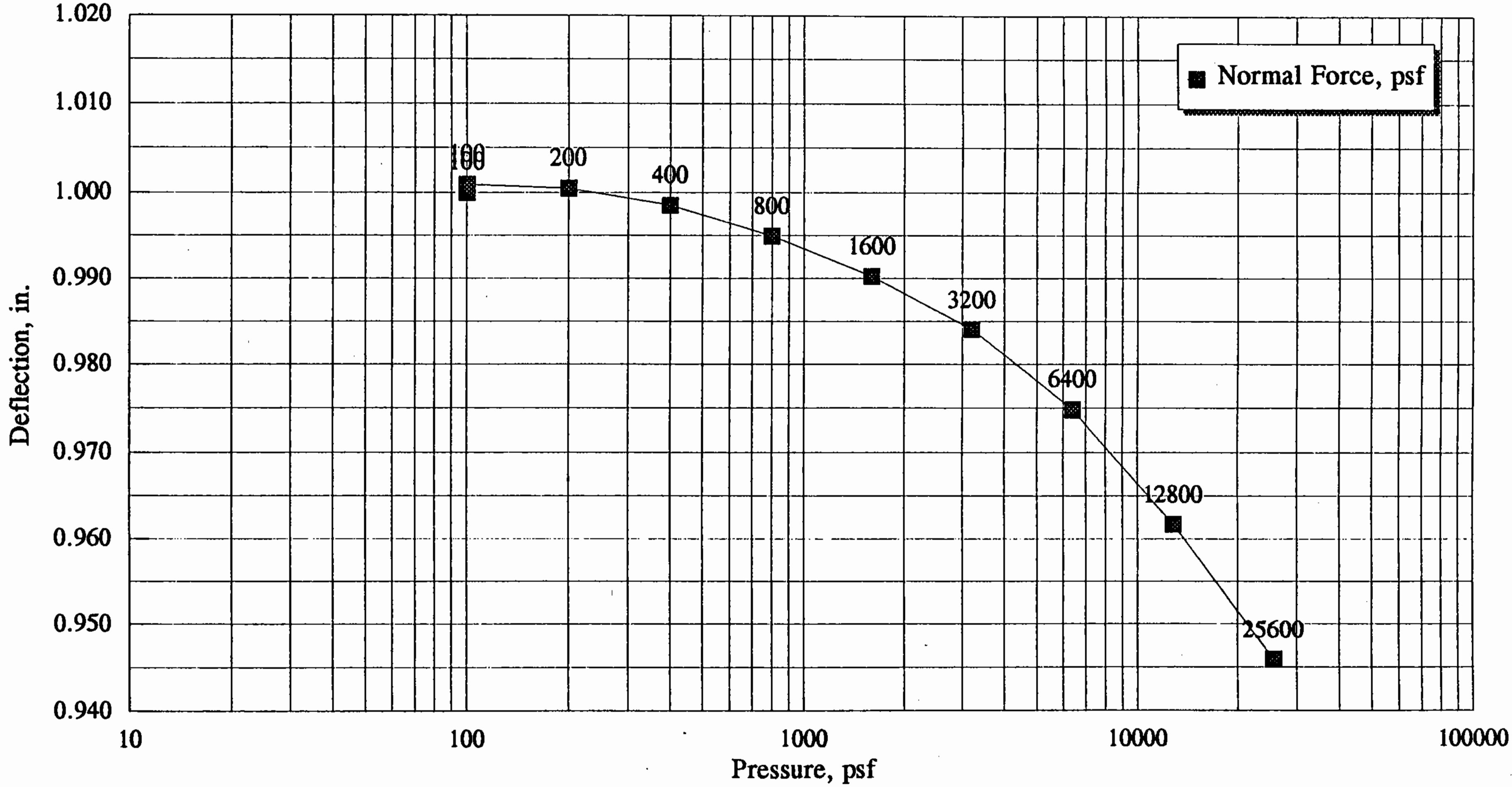

Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-17
12800 psf
Time, min.
Consolidation, 0.0001 in.
0.502
0.500
0.498
0.496
0.494
0.492
0.490
0.488
0.486
0.484
0.482
0.480
0
5
10
15
20
25
Square Root Time, min.
2
4
9
16
25
36
49
64
90
120
240
480



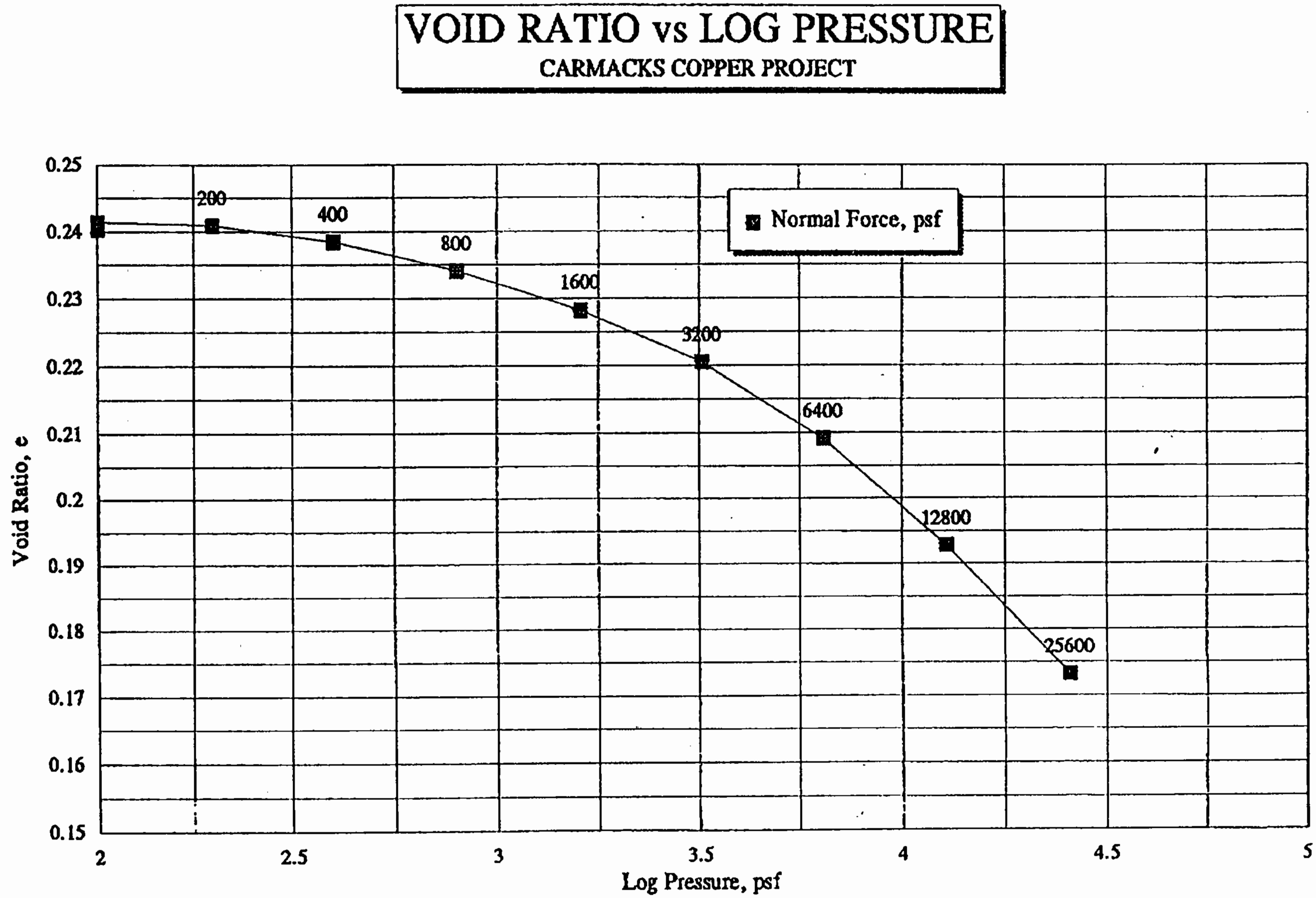
Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-17
25600 psf
Time, min.
Consolidation, 0.0001 in.
0.5000
0.4980
0.4960
0.4940
0.4920
0.4900
0.4880
0.4860
0.4840
0.4820
0.4800
0.4780
0
5
10
15
20
25
Square Root Time, min.
2
4
9
16
25
36
49
64
90
120
240
480

Time Consolidation Graph

CARMACKS COPPER PROJECT



TR96-17


VOID RATIO vs LOG PRESSURE
CARMACKS COPPER PROJECT
Normal Force, psf
Void Ratio, e
0.25
0.24
0.23
0.22
0.21
0.2
0.19
0.18
0.17
0.16
0.15
2
2.5
3
3.5
4
4.5
5
Log Pressure, psf
200
400
800
1600
3200
6400
12800
25600

TR96-17

Sample No.	TR96-11-3		
Normal Load	6400 psf		

Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.1164	0.5000
0.25	0.5	0.1217	0.4947
0.5	0.7	0.1225	0.4939
0.75	0.9	0.1231	0.4933
1	1.0	0.1238	0.4926
2	1.4	0.1252	0.4912
4	2.0	0.1269	0.4895
9	3.0	0.1286	0.4878
16	4.0	0.1306	0.4859
25	5.0	0.1323	0.4841
36	6.0	0.1332	0.4833
49	7.0	0.1344	0.4821
64	8.0	0.1354	0.4810
90	9.5	0.1367	0.4797
120	11.0	0.1375	0.4789
256	16.0	0.1388	0.4776
480	21.9	0.1395	0.4769
1440	37.9	0.1401	0.4763

Sample No.	TR96-11-3		
Normal Load	12800 psf		

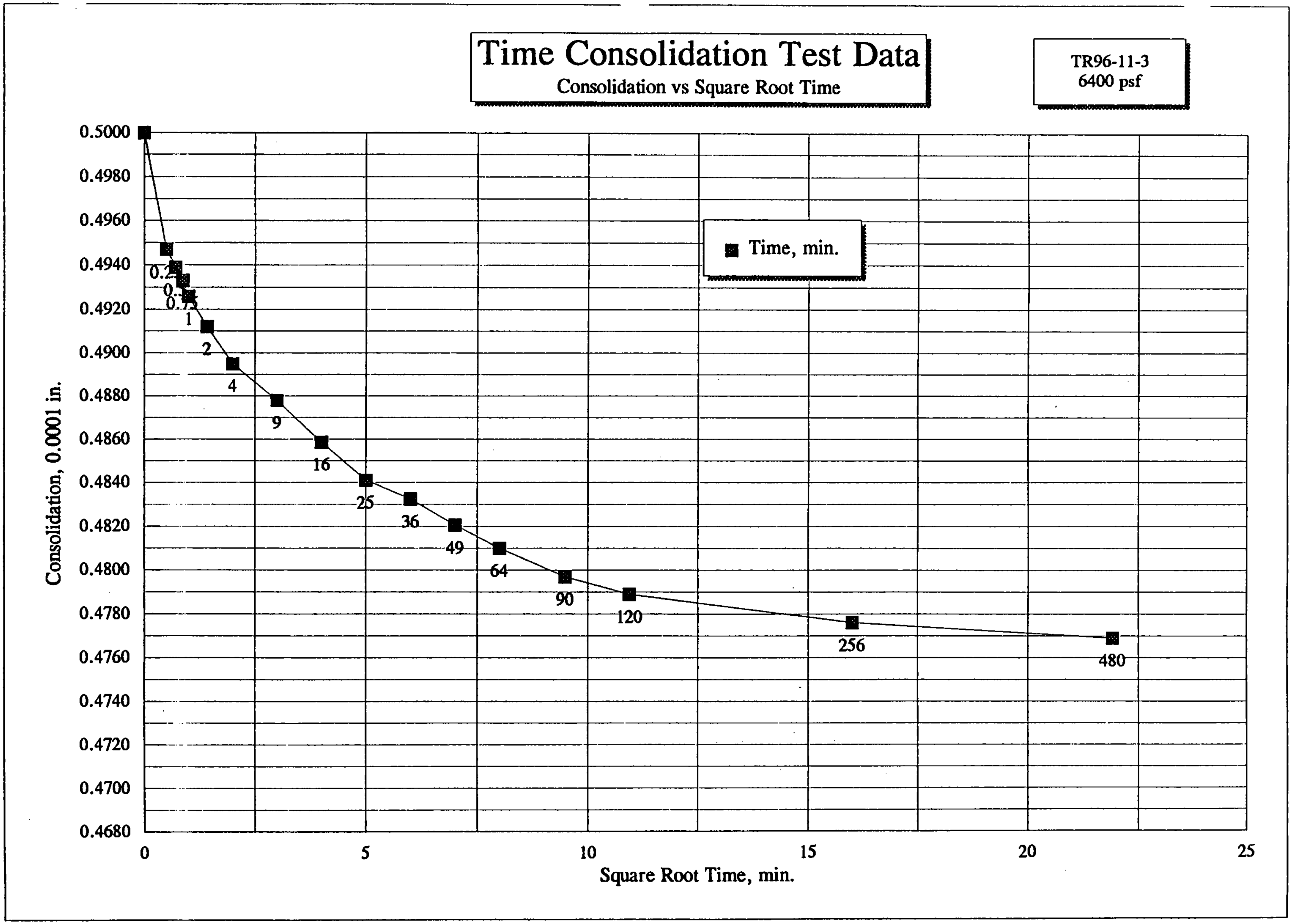
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.1401	0.5000
0.1	0.3	0.1454	0.4947
0.25	0.5	0.1462	0.4939
0.5	0.7	0.1471	0.4931
0.75	0.9	0.1476	0.4925
1	1.0	0.1481	0.4920
2	1.4	0.1495	0.4906
4	2.0	0.1514	0.4888
9	3.0	0.1544	0.4857
16	4.0	0.1571	0.4830
25	5.0	0.1593	0.4808
36	6.0	0.1614	0.4787
49	7.0	0.1632	0.4770
64	8.0	0.1643	0.4758
90	9.5	0.1658	0.4743
120	11.0	0.1669	0.4733
240	15.5	0.1681	0.4720
480	21.9	0.1692	0.4709
1440	37.9	0.1703	0.4699

Sample No.	TR96-11-3		
Normal Load	25600 psf		

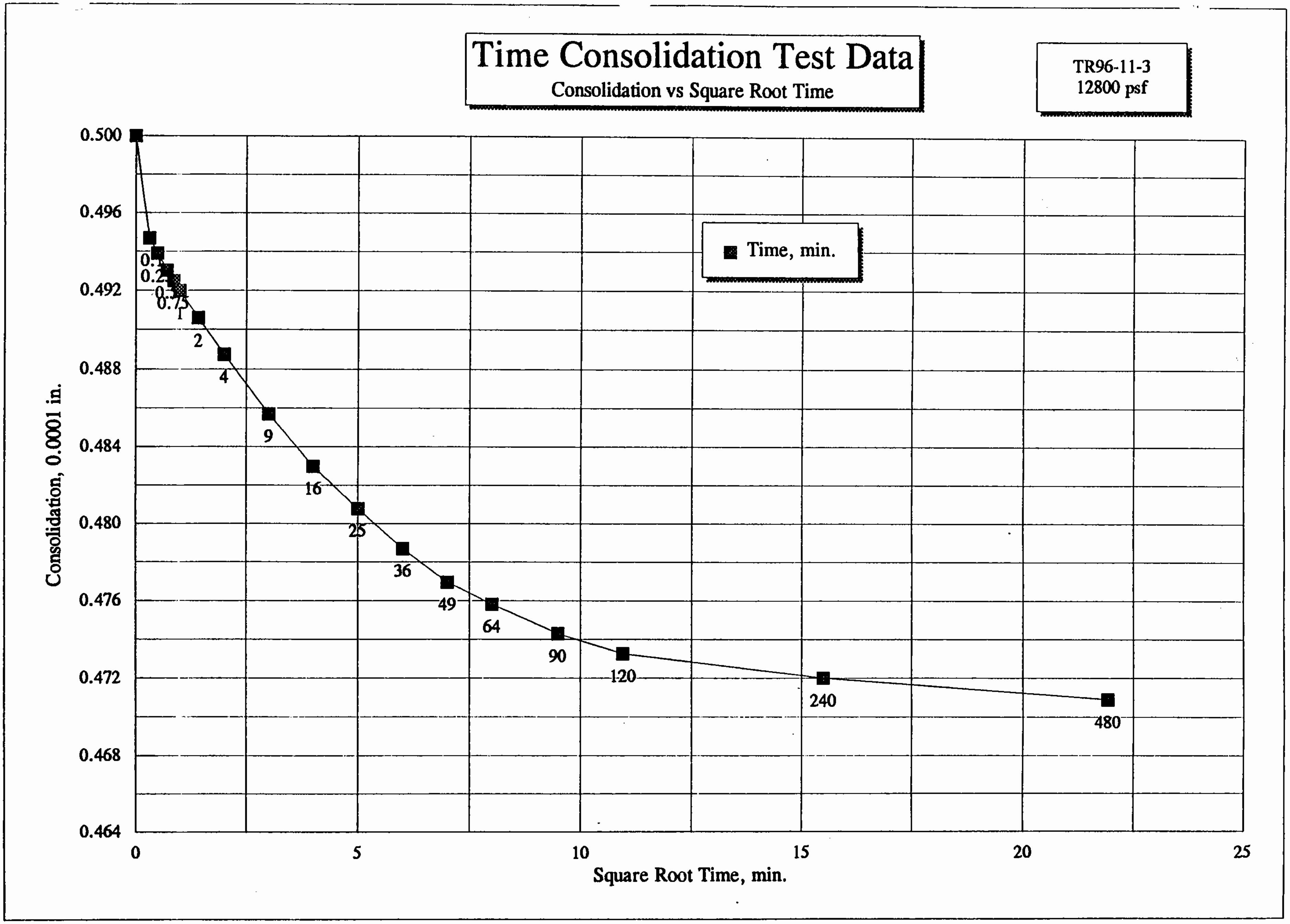
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.1703	0.5000
0.1	0.3	0.1749	0.4954
0.25	0.5	0.1758	0.4945
0.5	0.7	0.1768	0.4935
0.75	0.9	0.1774	0.4929
1	1.0	0.1780	0.4923
2	1.4	0.1798	0.4905
4	2.0	0.1821	0.4882
9	3.0	0.1858	0.4845
16	4.0	0.1893	0.4810
25	5.0	0.1919	0.4784
36	6.0	0.1949	0.4754
49	7.0	0.1967	0.4736
64	8.0	0.1978	0.4725
90	9.5	0.1994	0.4709
120	11.0	0.2003	0.4700
240	15.5	0.2019	0.4684
480	21.9	0.2030	0.4673
1440	37.9	0.2039	0.4664

Sample No.	TR96-11-3		
Normal Load	51200 psf		

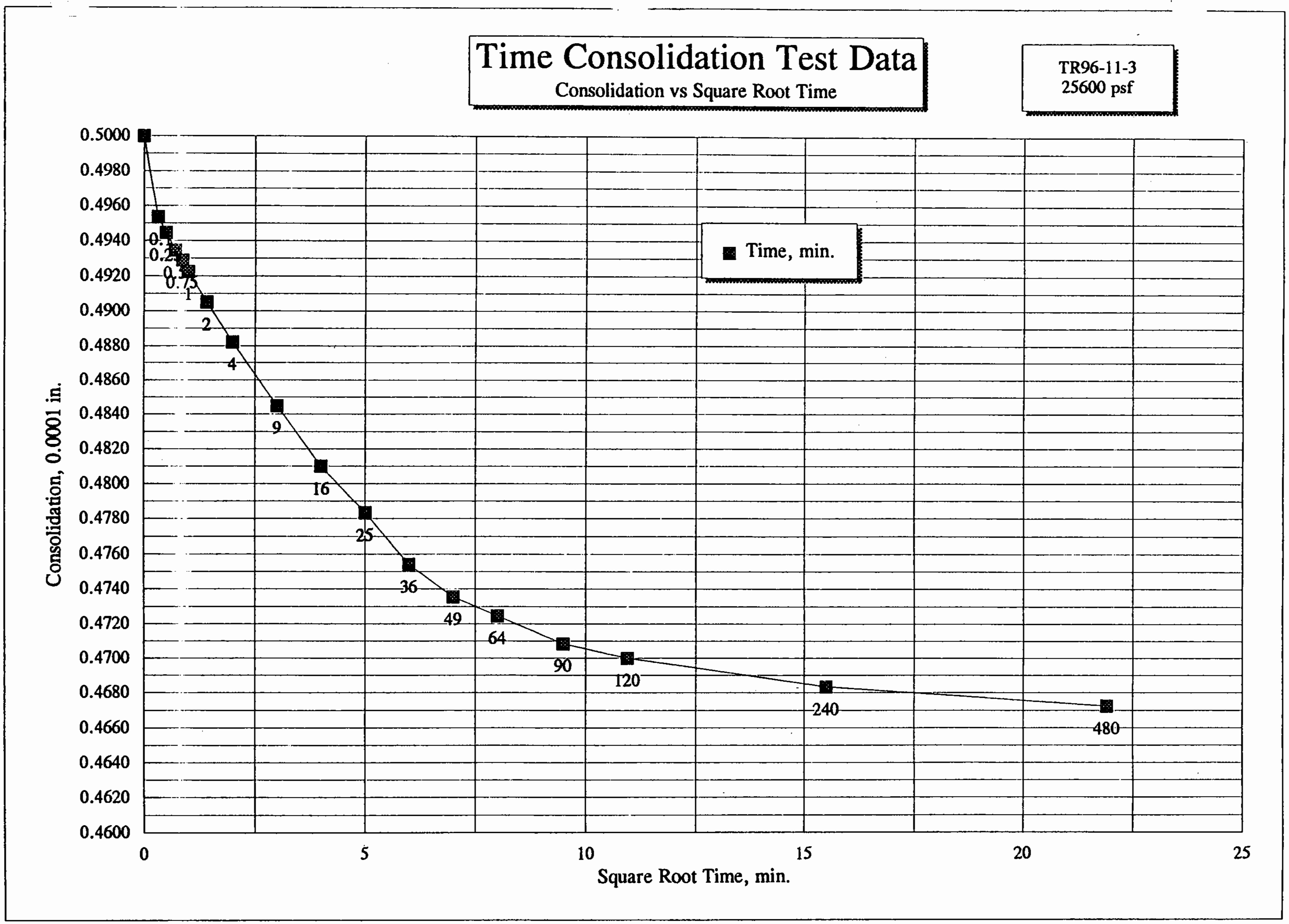
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.2039	0.5000
0.1	0.3	0.2065	0.4974
0.25	0.5	0.2098	0.4941
0.5	0.7	0.2101	0.4938
0.75	0.9	0.2116	0.4923
1	1.0	0.2121	0.4918
2	1.4	0.2140	0.4899
4	2.0	0.2176	0.4863
9	3.0	0.2216	0.4823
16	4.0	0.2252	0.4787
25	5.0	0.2289	0.4751
36	6.0	0.2327	0.4712
49	7.0	0.2348	0.4691
64	8.0	0.2362	0.4677
90	9.5	0.2374	0.4666
120	11.0	0.2381	0.4658
240	15.5	0.2387	0.4652
480	21.9	0.2405	0.4634
1440	37.9	0.2414	0.4625

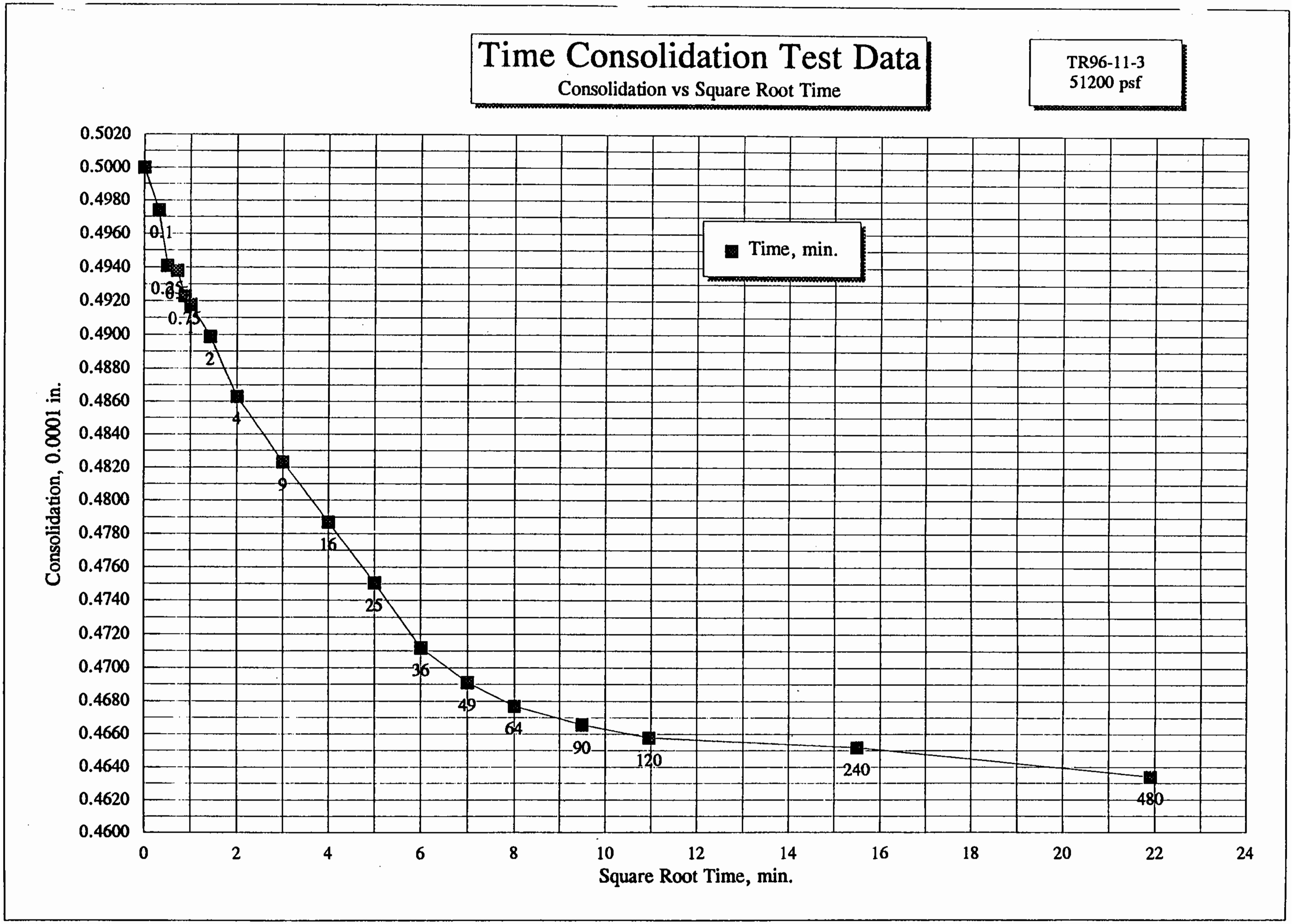


Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-11-3
6400 psf
Time, min.
Consolidation, 0.0001 in.
Square Root Time, min.
0.5000
0.4980
0.4960
0.4940
0.4920
0.4900
0.4880
0.4860
0.4840
0.4820
0.4800
0.4780
0.4760
0.4740
0.4720
0.4700
0.4680
0
5
10
15
20
25
1
2
4
9
16
25
36
49
64
90
120
256
480

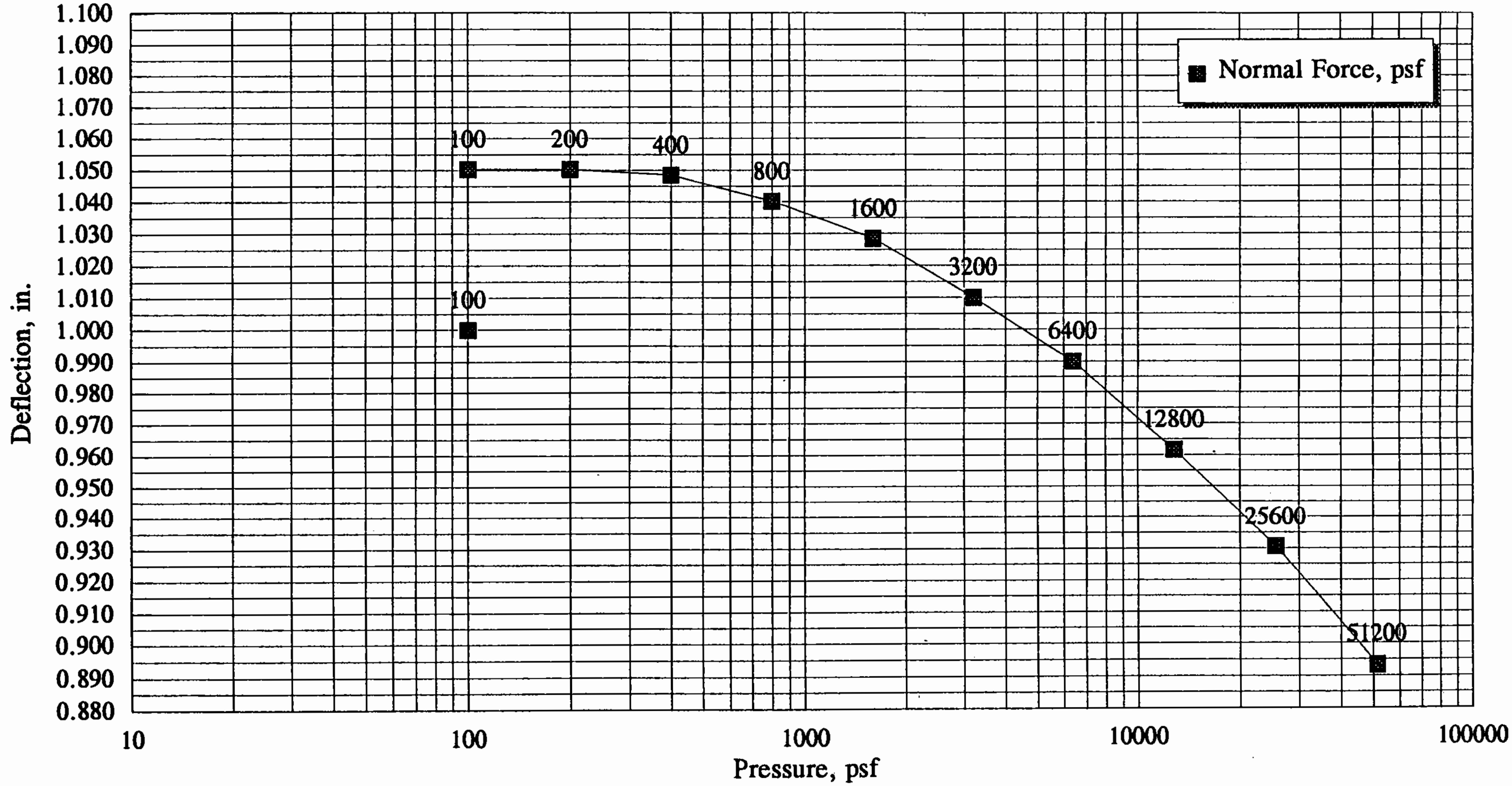


Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-11-3
12800 psf
Time, min.
Consolidation, 0.0001 in.
Square Root Time, min.
0.500
0.496
0.492
0.488
0.484
0.480
0.476
0.472
0.468
0.464
0
5
10
15
20
25
0.75
1
2
4
9
16
25
36
49
64
90
120
240
480


Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-11-3
25600 psf
Time, min.
Consolidation, 0.0001 in.
Square Root Time, min.
0.5000
0.4980
0.4960
0.4940
0.4920
0.4900
0.4880
0.4860
0.4840
0.4820
0.4800
0.4780
0.4760
0.4740
0.4720
0.4700
0.4680
0.4660
0.4640
0.4620
0.4600
0
5
10
15
20
25
1
2
4
9
16
25
36
49
64
90
120
240
480

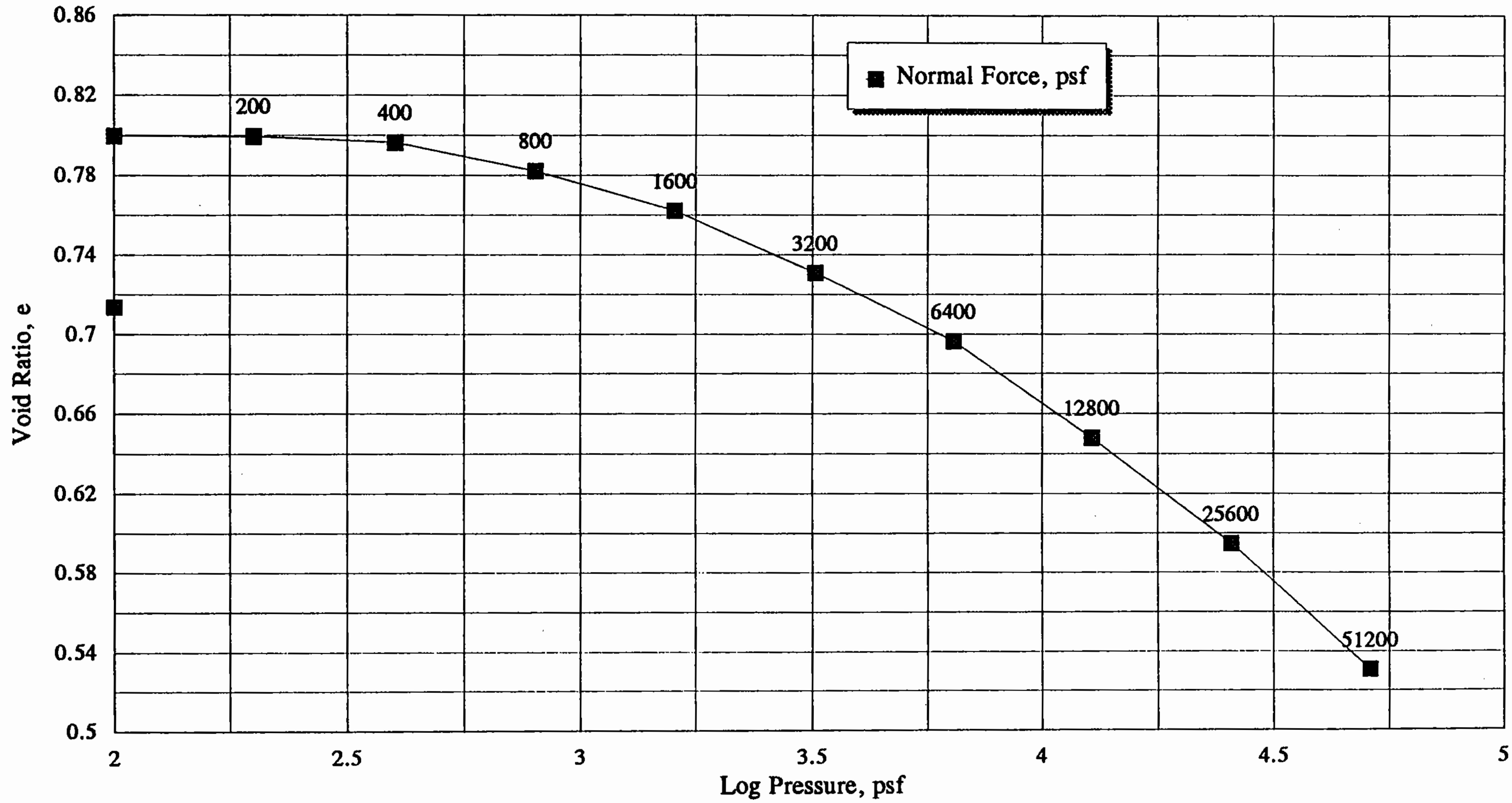

Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-11-3
51200 psf
Time, min.
Consolidation, 0.0001 in.
Square Root Time, min.
0.5020
0.5000
0.4980
0.4960
0.4940
0.4920
0.4900
0.4880
0.4860
0.4840
0.4820
0.4800
0.4780
0.4760
0.4740
0.4720
0.4700
0.4680
0.4660
0.4640
0.4620
0.4600
0
2
4
6
8
10
12
14
16
18
20
22
24
0.1
2
4
9
16
25
36
49
64
90
120
240
480

Time Consolidation Graph
CARMACKS COPPER PROJECT



TR96-11-3

VOID RATIO vs LOG PRESSURE
CARMACKS COPPER PROJECT



TR96-11-3

TIME CONSOLIDATION TEST DATA - ASTM D 2435

Project	CARMACKS COPPER PROJECT	Date In	03/31/96
Project No.	1377A-L200	Date Out	04/08/96
Lab No.	L96038	Tested By	jat
Eng.	BB	Checked By	SPB
Sample No.	TR96-1-2	Depth / Elev.	Till
Sample Description	very clayey SAND, some gravel (SC)		

Specimen Data

		Before Test				*After Test*	
		US	*Metric*			*US*	*Metric*
Diameter	*(in. / cm)*	*2.415*	*6.121*	*Diameter*	*(in. / cm)*	*2.415*	*6.121*
Height	*(in. / cm)*	*1.000*	*2.540*	*Height*	*(in. / cm)*	*0.869*	*2.208*
Area	*(in.^{2} / cm^2)*	*4.581*	*29.552*	*Area*	*(in.^{2} / cm^2)*	*4.581*	*29.552*
Volume	*(in.^{3} / cm^3)*	*4.581*	*75.063*	*Volume*	*(in.^{3} / cm^3)*	*3.981*	*65.245*
Ring + Wet Soil	*(g)*	*200.40*		*Ring + Wet Soil*	*(g)*	*284.20*	*tare*
Ring Wt.	*(g)*	*39.10*		*Ring + Dry Soil*	*(g)*	*266.90*	*129.4*
Wet Soil Wt.	*(g)*	*161.30*		*Wet Soil Wt.*	*(g)*	*154.80*	
Dry Soil Wt.	*(g)*	*137.50*		*Dry Soil Wt.*	*(g)*	*137.50*	
Wet Density	*(pcf / kg/m^3)*	*134.2*	*2.15*	*Wet Density*	*(pcf / kg/m^3)*	*148.1*	*2.37*
Moisture Content	*(%)*	*17.3*		*Moisture Content*	*(%)*	*12.6*	
Dry Density	*(pcf / kg/m^3)*	*114.4*	*1.83*	*Dry Density*	*(pcf / kg/m^3)*	*131.6*	*2.11*

Sample Properties

Specific Gravity (Gs)	*2.7*	*Frame No.*	*1*
Gs Assumed (Y / N)	*Yes*		
Initial Solids Height (cm)	*1.7232*	*Frame Type:*	*Dead Load / Pneumatic*
Initial Voids Height (cm)	*0.8168*		*(0.1 - 3.2 ksf / 3.2 - 102 ksf)*
Initial Void Ratio (e)	*0.4740*	*Atterberg Limits*	*(LL, PL, PI)* *26, 15, 11*

Test Data Summary

Applied Pressure (psf)	Log Pressure (psf)	Measured Deflection (0.0000 in.)	Machine Deflection (0.0000 in.)	Net Deflection (0.0000 in.)	Consolidation (0.0000 in.)	Void Ratio (e)	Corrected Sample Height (in.)
100	2.000	0.0726	0.00000	0.0000	0.0000	0.4740	1.0000
100	2.000	0.0819	-0.00015	0.0094	0.0094	0.4601	0.9906
200	2.301	0.0874	0.00005	0.0148	0.0148	0.4522	0.9853
400	2.602	0.0977	0.00135	0.0237	0.0237	0.4390	0.9763
800	2.903	0.1127	0.00340	0.0367	0.0367	0.4199	0.9633
1600	3.204	0.1306	0.00645	0.0515	0.0515	0.3981	0.9485
3200	3.505	0.1533	0.00935	0.0713	0.0713	0.3688	0.9287
6400	3.806	0.1752	0.01265	0.0900	0.0900	0.3414	0.9101
12800	4.107	0.1993	0.01490	0.1118	0.1118	0.3092	0.8883
25600	4.408	0.2216	0.01815	0.1309	0.1309	0.2811	0.8692

General Test Notes
*Initial Height of Solids Calculated as Ws / (A * Gs)*
Specimen innundated with fluid other than tap water? *NO* *Type:*

Sample No. TR96-1-2
Normal Load 6400 psf

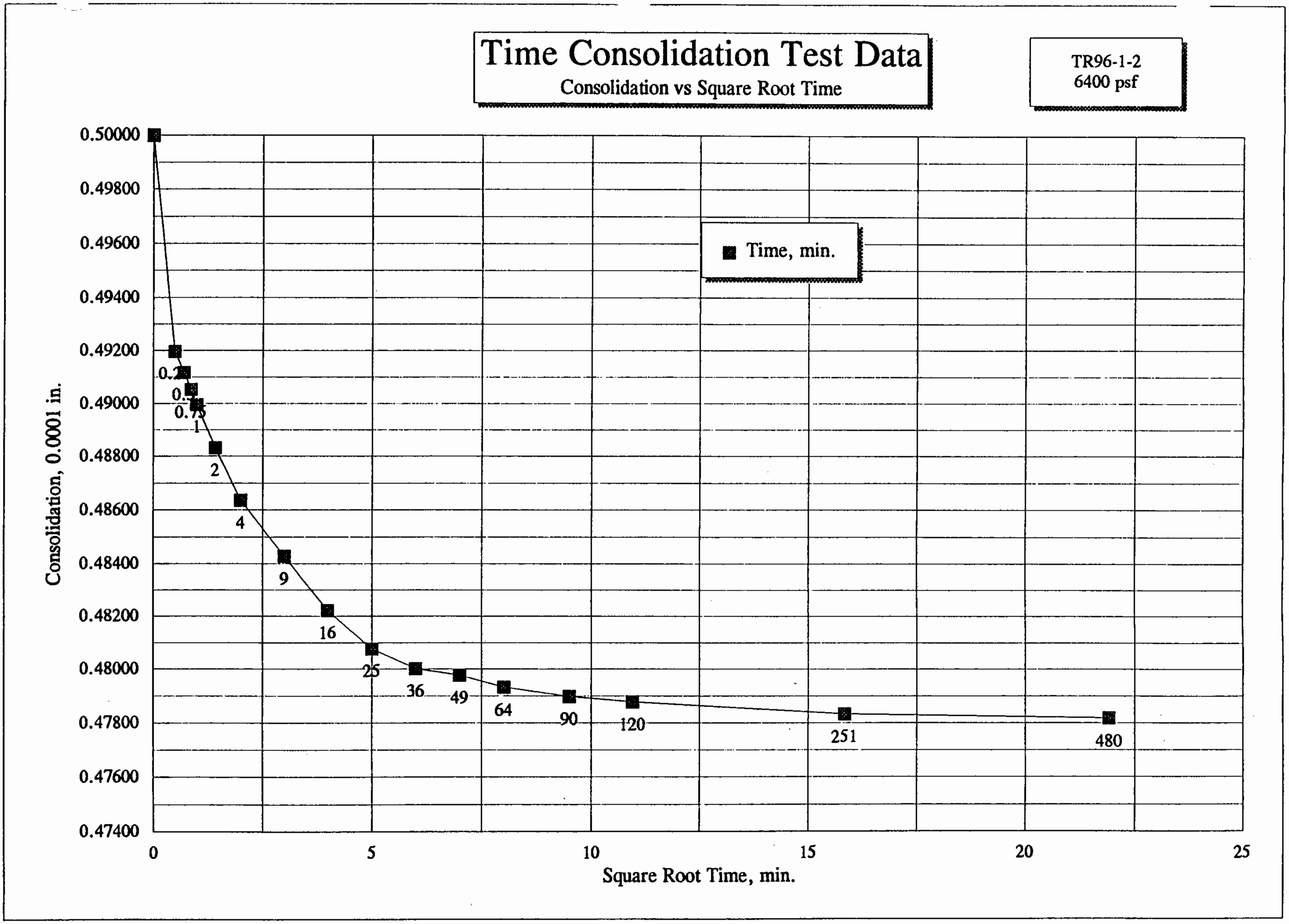
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.1533	0.5000
0.25	0.5	0.1613	0.4920
0.5	0.7	0.1621	0.4912
0.75	0.9	0.1628	0.4905
1	1.0	0.1633	0.4900
2	1.4	0.1650	0.4883
4	2.0	0.1669	0.4864
9	3.0	0.1690	0.4843
16	4.0	0.1711	0.4822
25	5.0	0.1725	0.4808
36	6.0	0.1733	0.4800
49	7.0	0.1735	0.4798
64	8.0	0.1740	0.4793
90	9.5	0.1743	0.4790
120	11.0	0.1745	0.4788
251	15.8	0.1750	0.4783
480	21.9	0.1751	0.4782
1440	37.9	0.1752	0.4781

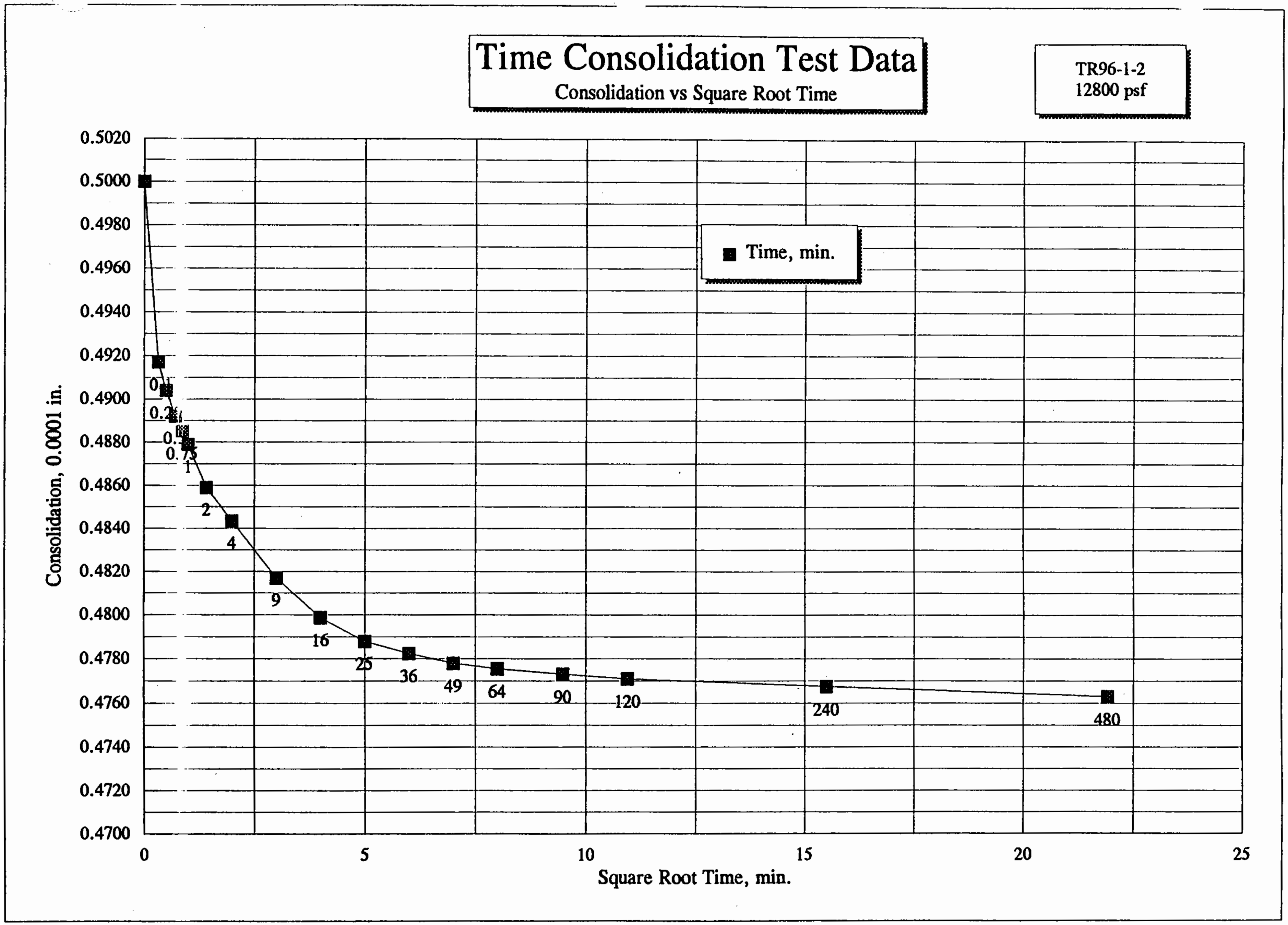
Sample No. TR96-1-2
Normal Load 12800 psf

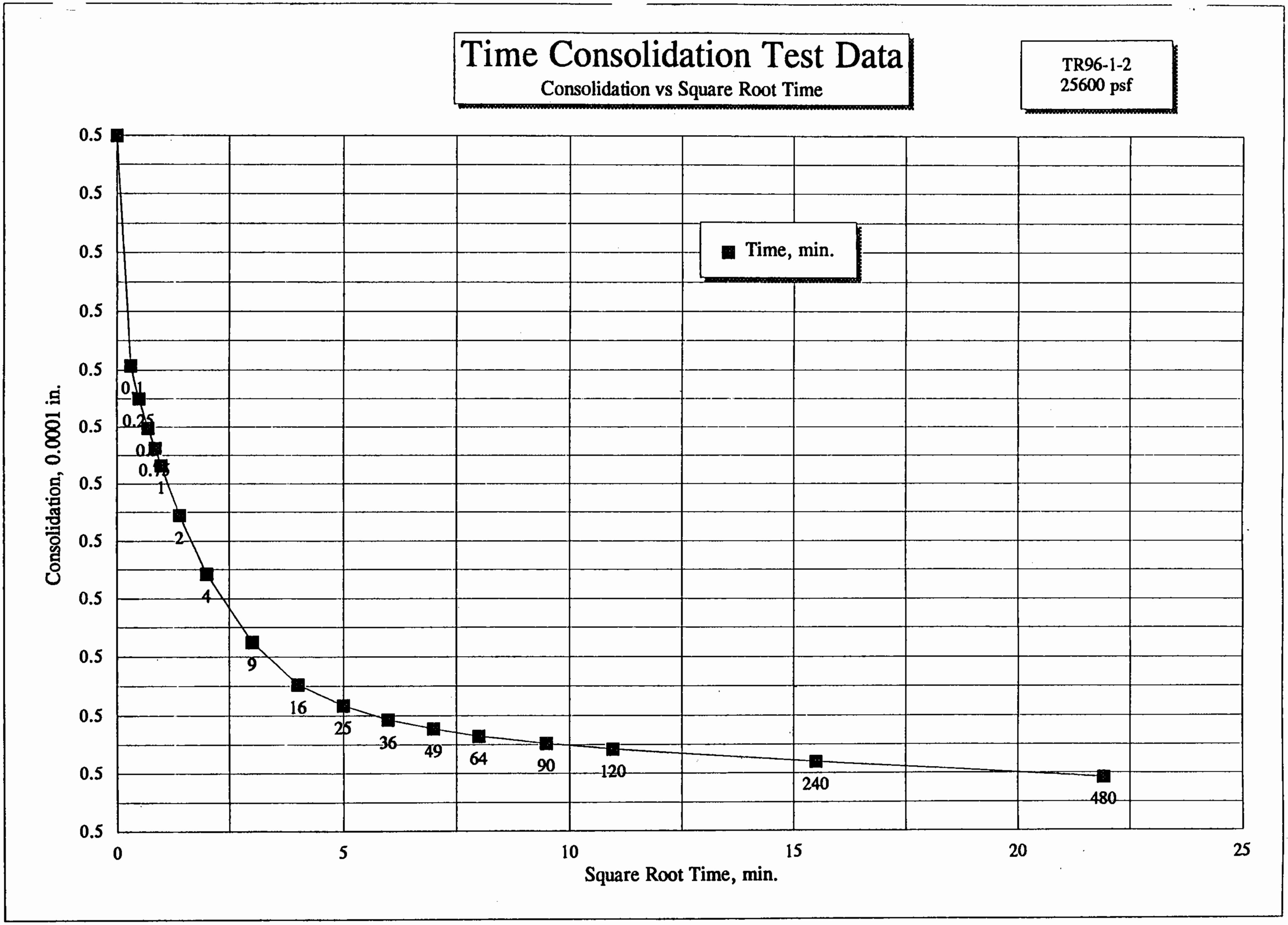
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.1752	0.5000
0.1	0.3	0.1835	0.4917
0.25	0.5	0.1848	0.4904
0.5	0.7	0.1860	0.4892
0.75	0.9	0.1867	0.4885
1	1.0	0.1873	0.4879
2	1.4	0.1893	0.4859
4	2.0	0.1909	0.4844
9	3.0	0.1935	0.4817
16	4.0	0.1953	0.4799
25	5.0	0.1964	0.4788
36	6.0	0.1970	0.4783
49	7.0	0.1974	0.4778
64	8.0	0.1977	0.4776
90	9.5	0.1979	0.4773
120	11.0	0.1981	0.4771
240	15.5	0.1985	0.4768
480	21.9	0.1989	0.4763
1440	37.9	0.1993	0.4760

Sample No. TR96-1-2
Normal Load 25600 psf

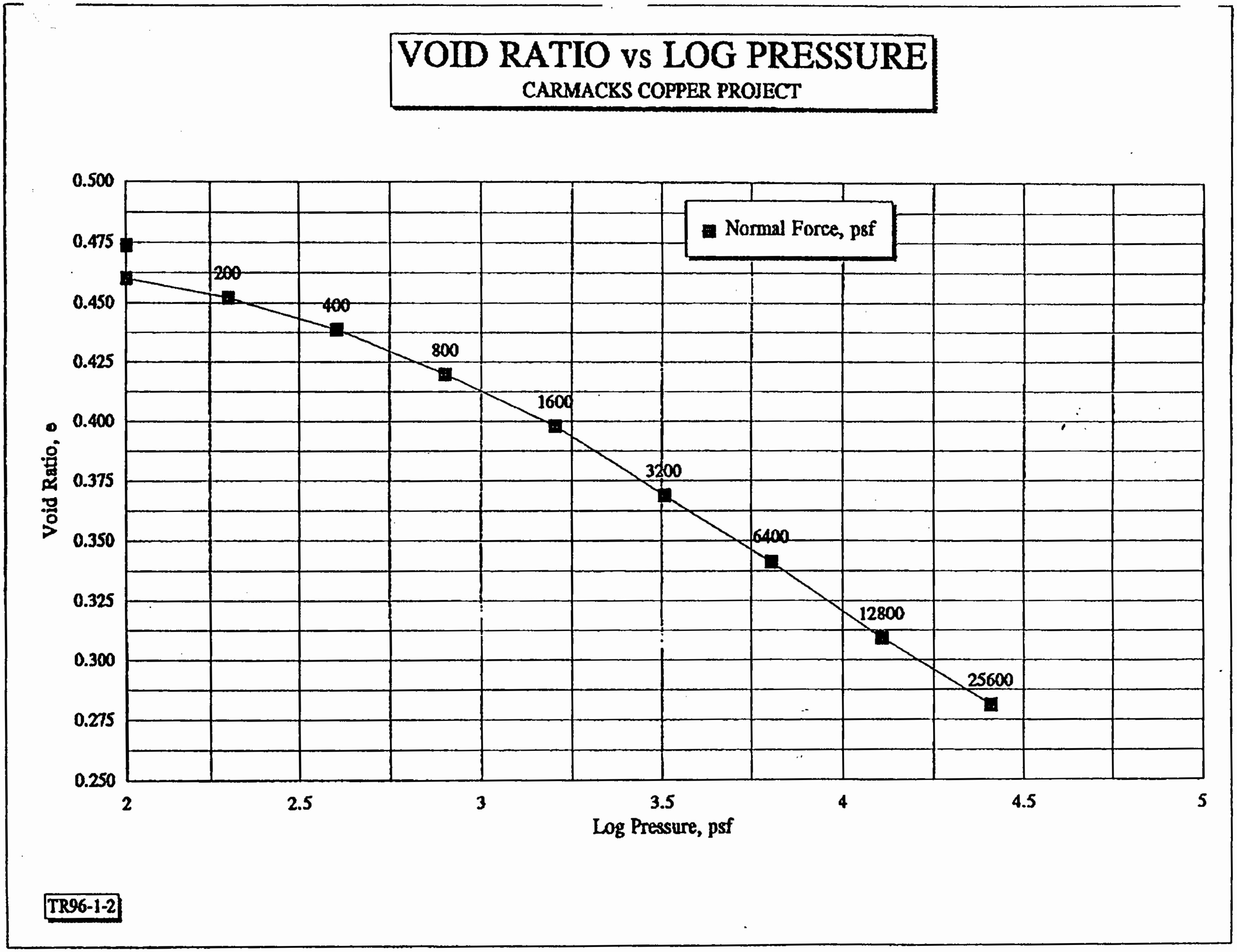
Elapsed Time min.	Square Root Time min.	Dial Gauge Reading (0.0001)	Dial Gauge Reading (0.0001)
0	0.0	0.1993	0.5000
0.1	0.3	0.2071	0.4922
0.25	0.5	0.2083	0.4910
0.5	0.7	0.2093	0.4900
0.75	0.9	0.2100	0.4893
1	1.0	0.2106	0.4887
2	1.4	0.2124	0.4869
4	2.0	0.2144	0.4849
9	3.0	0.2168	0.4825
16	4.0	0.2182	0.4811
25	5.0	0.2189	0.4804
36	6.0	0.2194	0.4799
49	7.0	0.2197	0.4796
64	8.0	0.2200	0.4793
90	9.5	0.2202	0.4791
120	11.0	0.2204	0.4789
240	15.5	0.2209	0.4784
480	21.9	0.2214	0.4779
1440	37.9	0.2216	0.4777


Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-1-2
6400 psf
Time, min.
0.50000
0.49800
0.49600
0.49400
0.49200
0.49000
0.48800
0.48600
0.48400
0.48200
0.48000
0.47800
0.47600
0.47400
Consolidation, 0.0001 in.
2
4
9
16
25
36
49
64
90
120
251
480
0
5
10
15
20
25
Square Root Time, min.


Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-1-2
12800 psf
Time, min.
Consolidation, 0.0001 in.
0.5020
0.5000
0.4980
0.4960
0.4940
0.4920
0.4900
0.4880
0.4860
0.4840
0.4820
0.4800
0.4780
0.4760
0.4740
0.4720
0.4700
0
5
10
15
20
25
Square Root Time, min.
2
4
9
16
25
36
49
64
90
120
240
480

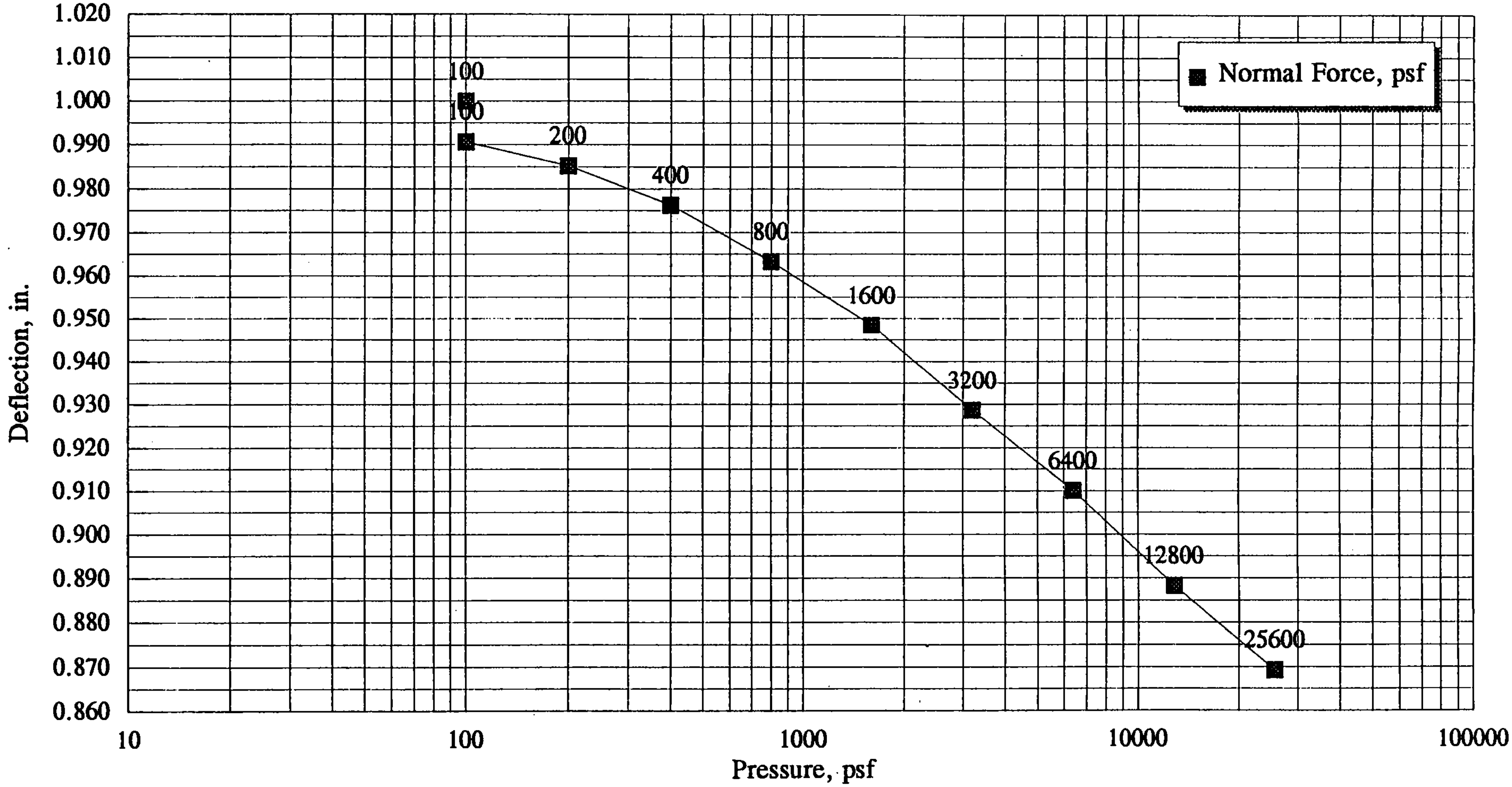


Time Consolidation Test Data
Consolidation vs Square Root Time
TR96-1-2
25600 psf
Time, min.
Consolidation, 0.0001 in.
Square Root Time, min.
0.5
0
5
10
15
20
25
0.1
0.25
1
2
4
9
16
25
36
49
64
90
120
240
480


VOID RATIO vs LOG PRESSURE
CARMACKS COPPER PROJECT
Normal Force, psf
Void Ratio, e
0.500
0.475
0.450
0.425
0.400
0.375
0.350
0.325
0.300
0.275
0.250
200
400
800
1600
3200
6400
12800
25600
2
2.5
3
3.5
4
4.5
5
Log Pressure, psf
TR96-1-2

Time Consolidation Graph

CARMACKS COPPER PROJECT



TR96-1-2

Knight Piésold Ltd.
CONSULTING ENGINEERS

APPENDIX B2

KNIGHT PIESOLD DENVER TEST RESULTS

Association of Consulting Engineers of Canada
Association des Ingenieurs-Conseils du Canada

Geosynthetic / Geosynthetic Interface Test Report

Project CARMACKS COPPER PROJECT
Project No. 1377A
Lab No. ______ Date Tested 07/21/96
Tested By RB/SPB
Test Description 60 mil HF (GSE) smooth vs. PN3000 geonet
Checked By SPB

Normal Stress Range, psf 2160 4320 6480 8640
Total No. of Points Requested 4

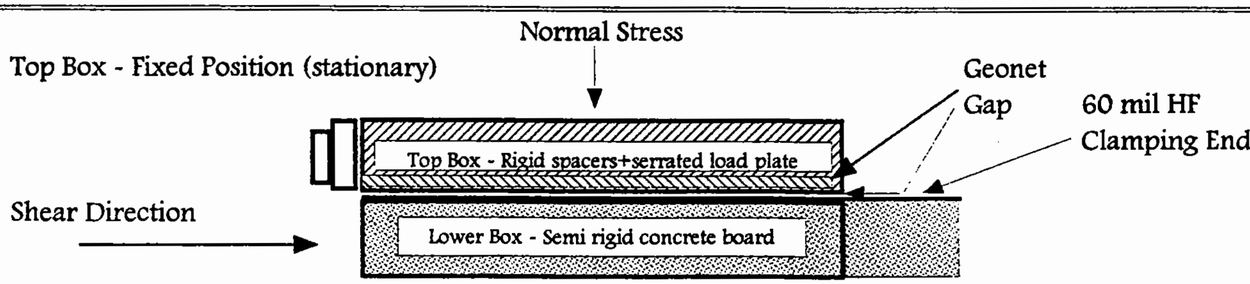
Geomembrane Data 60 mil (HF), SMOOTH
Manufacturer GSE, 5/96
Lot No. UNK
Roll No. ______ Textured? No
Peak to Peak Thickness, mil 0.062
Specified Thickness, mil 60

Test Parameters Moisture Content, % NA Dry Density, pcf NA

Observations: Test performed with the geonet held in place by a serrated load plate in the top half.
This method allows the true "critical" interface friction to be tested.
The 60 mil liner coupon was fastened to the lower box.

Substrate Material Description 60 mil HF supported by semi rigid concrete board

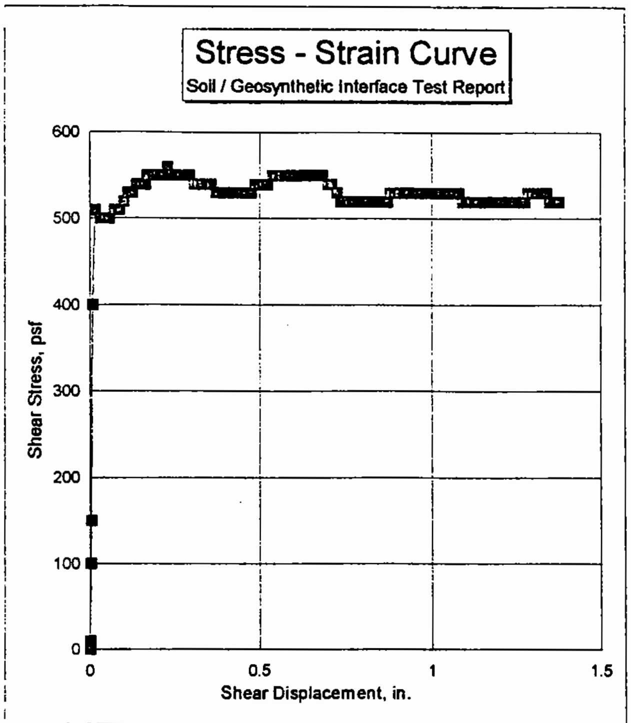
Superstrate Material Description PN3000 GEONET

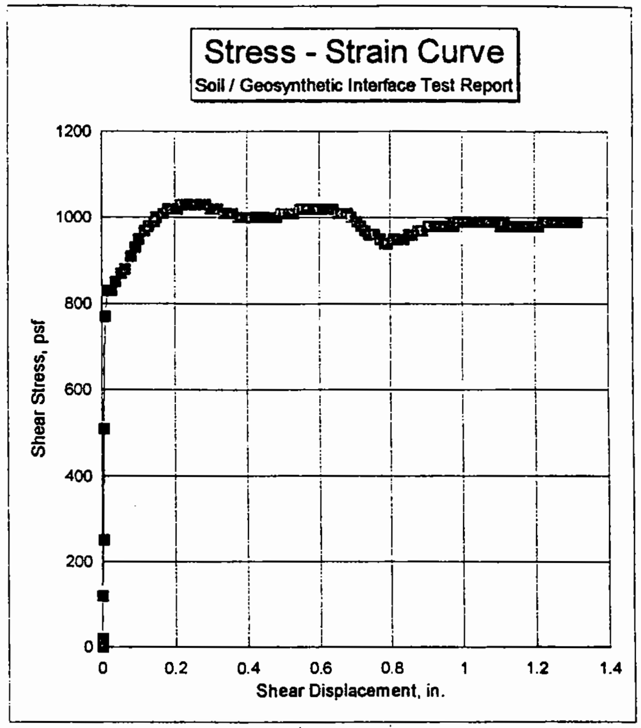


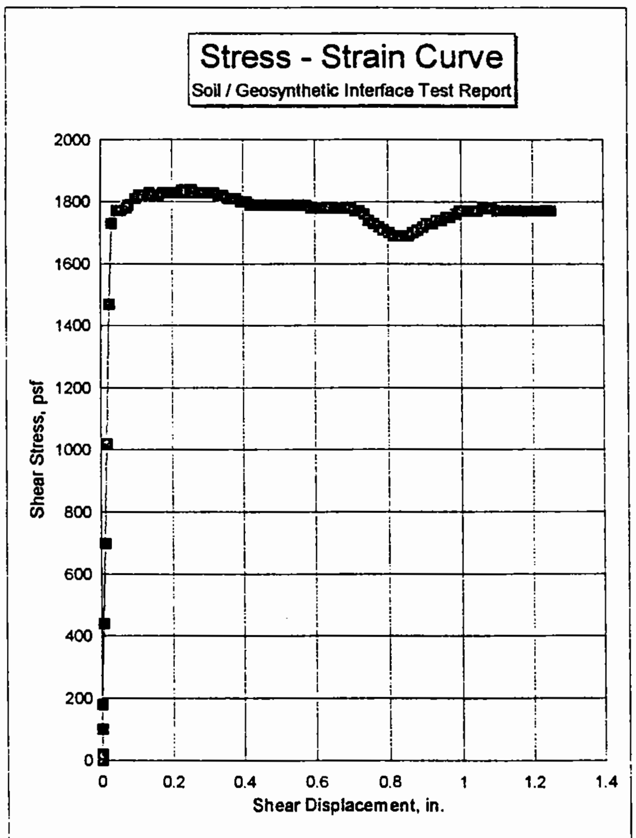
Default Test Descriptions (unless noted otherwise)

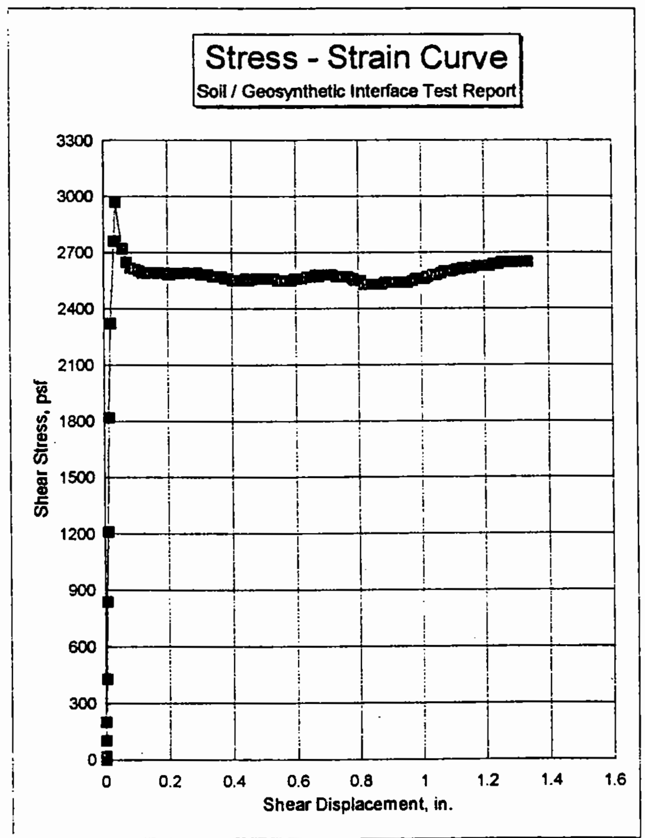
1) The test was performed in a Boart Longyear 300mm Shear Box, Model LG-115
2) The rate of displacement was 0.2 in./min. (procedure A)
3) The lower (traveling box) container was inundated with tap water 0.5 hr. prior to shearing.
4) The interface zone was submerged at the time of test.
5) The liner was fixed at the lower box half.
6) Load increments were recorded in 10 lbf increments.
7) The Geosynthetic coupons are available for inspection at the lab.
8) The geonet was fixed at the top half of the shear box.

Project	CARMACKS COPPER PROJECT	Project No.	1377A
Lab No.	Date Tested 07/21/96	Tested By	RB/SPB
Test Description	60 mil HF (GSE) smooth vs. PN3000 geonet	Checked By	SPB







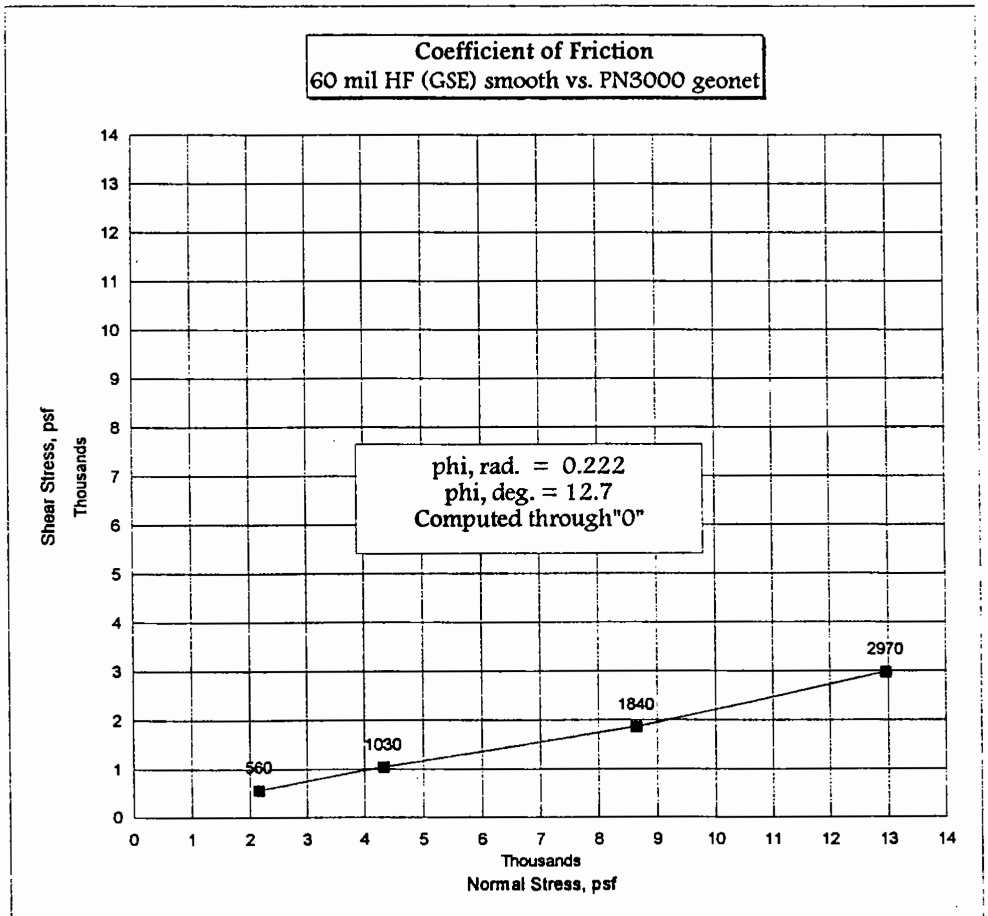


Geosynthetic / Geosynthetic Interface Test Report

Project	CARMACKS COPPER PROJECT	Project No.	1377A
Lab No.	Date Tested 07/21/96	Tested By	RB/SFB
Test Description	60 mil HF (GSE) smooth vs. PN3000 geonet	Checked By	SFB

Test Specimen Parameters

	Initial Data 1	2	3	4	At Test Data 1	2	3	4
Tare ID								
Wet Soil + Tare								
Dry Soil + Tare								
Tare								
Wt. of Water								
Wt. of Dry Solids								
Moisture Content, %								



Peak Strength Parameters

Shear Stress psf	Normal Stress psf
560	2160
1030	4320
1840	8640
2970	12960

FILE NAME: TEST-12A.TXT
TEST NAME: 1377A15
START DATE: 07/23/96 17:11

CHANNEL 1 TRANSDUCER TYPE: Load
TRANSDUCER 0 - 500 Lbs

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCER 0 - 4.000 In

	COUNTS	INTERVAL:
	======	=========
TIME PROFILE	-1	000:00:04
	25	000:02:00
	25	000:03:00
	25	000:04:00
	-1	000:05:00

FILE NAME: TEST-12B.TXT
TEST NAME: 1377A30
START DATE 07/23/96 16:48

CHANNEL 1 TRANSDUCER TYPE: Load
TRANSDUCE 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCE 0 - 4.000 In

	COUNTS	INTERVAL:
	======	=========
TIME PROFIL	-1	000:00:04
	25	000:02:00
	25	000:03:00
	25	000:04:00
	-1	000:05:00

FILE NAME: TEST-12C.TXT
TEST NAME: 1377A60
START DATE 07/23/96 16:25

CHANNEL 1 TRANSDUCER TYPE: Load
TRANSDUCE 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCE 0 - 4.000 In

	COUNTS	INTERVAL:
	======	=========
TIME PROFIL	-1	000:00:04
	25	000:02:00
	25	000:03:00
	25	000:04:00
	-1	000:05:00

FILE NAME: TEST-12D.TXT
TEST NAME: 1377A90
START DATE 07/23/96 15:49

CHANNEL 1 TRANSDUCER TYPE: Load
TRANSDUCE 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCE 0 - 4.000 In

	COUNTS	INTERVAL:
	======	=========
TIME PROFIL	-1	000:00:04
	25	000:02:00
	25	000:03:00
	25	000:04:00
	-1	000:05:00

RUN TIME	CHANNEL 1	CHANNEL 3		RUN TIME	CHANNEL 1	CHANNEL 3		RUN TIME	CHANNEL 1	CHANNEL 3		RUN TIME	CHANNEL 1	CHANNEL 3	
							-10				-10				-10
							0				0				0
							0				0				0
							0				0				0
000:00:00	0	0	0	000:00:00	0	0	0	000:00:00	0	0	0	000:00:00	0	0	0
000:00:04	0	0	0	000:00:04	0	0	0	000:00:04	0	0	0	000:00:04	0	0	0
000:00:08	0	0	0	000:00:08	0	0	0	000:00:08	0	0	0	000:00:08	2	0	20
000:00:12	1	0	10	000:00:12	2	0.001	20	000:00:12	2	0	20	000:00:12	10	0	100
000:00:16	10	0.002	100	000:00:16	12	0.004	120	000:00:16	10	0.001	100	000:00:16	20	0.001	200
000:00:20	15	0.004	150	000:00:20	25	0.006	250	000:00:20	18	0.001	180	000:00:20	43	0.004	430
000:00:24	40	0.008	400	000:00:24	51	0.01	510	000:00:24	44	0.006	440	000:00:24	84	0.007	840
000:00:28	51	0.016	510	000:00:28	77	0.017	770	000:00:28	70	0.011	700	000:00:28	121	0.01	1210
000:00:32	50	0.032	500	000:00:32	83	0.027	830	000:00:32	102	0.017	1020	000:00:32	182	0.016	1820
000:00:36	50	0.045	500	000:00:36	83	0.038	830	000:00:36	147	0.024	1470	000:00:36	232	0.021	2320
000:00:40	50	0.057	500	000:00:40	85	0.054	850	000:00:40	173	0.031	1730	000:00:40	276	0.032	2760
000:00:44	51	0.072	510	000:00:44	87	0.065	870	000:00:44	177	0.045	1770	000:00:44	297	0.037	2970
000:00:48	51	0.087	510	000:00:48	88	0.08	880	000:00:48	177	0.058	1770	000:00:48	272	0.059	2720
000:00:52	52	0.099	520	000:00:52	91	0.092	910	000:00:52	178	0.073	1780	000:00:52	265	0.071	2650
000:00:56	53	0.11	530	000:00:56	93	0.102	930	000:00:56	179	0.079	1790	000:00:56	262	0.083	2620
000:01:00	53	0.125	530	000:01:00	95	0.117	950	000:01:00	181	0.098	1810	000:01:00	261	0.098	2610
000:01:04	54	0.136	540	000:01:04	97	0.128	970	000:01:04	182	0.109	1820	000:01:04	260	0.109	2600
000:01:08	54	0.151	540	000:01:08	98	0.144	980	000:01:08	182	0.121	1820	000:01:08	259	0.123	2590
000:01:12	54	0.162	540	000:01:12	99	0.15	990	000:01:12	183	0.136	1830	000:01:12	259	0.135	2590
000:01:16	55	0.169	550	000:01:16	100	0.169	1000	000:01:16	182	0.147	1820	000:01:16	259	0.146	2590
000:01:20	55	0.189	550	000:01:20	101	0.181	1010	000:01:20	182	0.162	1820	000:01:20	259	0.161	2590
000:01:24	55	0.2	550	000:01:24	102	0.192	1020	000:01:24	183	0.174	1830	000:01:24	259	0.172	2590
000:01:28	55	0.212	550	000:01:28	102	0.208	1020	000:01:28	183	0.189	1830	000:01:28	259	0.187	2590
000:01:32	56	0.228	560	000:01:32	102	0.218	1020	000:01:32	183	0.201	1830	000:01:32	258	0.199	2580
000:01:36	55	0.238	550	000:01:36	103	0.234	1030	000:01:36	183	0.215	1830	000:01:36	258	0.206	2580
000:01:40	55	0.254	550	000:01:40	103	0.246	1030	000:01:40	184	0.227	1840	000:01:40	259	0.224	2590
000:01:44	55	0.265	550	000:01:44	103	0.258	1030	000:01:44	183	0.24	1830	000:01:44	259	0.239	2590
000:01:48	55	0.282	550	000:01:48	103	0.273	1030	000:01:48	184	0.255	1840	000:01:48	259	0.249	2590
000:01:52	55	0.292	550	000:01:52	103	0.284	1030	000:01:52	183	0.265	1830	000:01:52	259	0.264	2590
000:01:56	54	0.307	540	000:01:56	103	0.299	1030	000:01:56	183	0.28	1830	000:01:56	259	0.278	2590
000:02:00	54	0.318	540	000:02:00	102	0.309	1020	000:02:00	183	0.288	1830	000:02:00	259	0.289	2590
000:02:04	54	0.331	540	000:02:04	102	0.317	1020	000:02:04	183	0.303	1830	000:02:04	258	0.303	2580
000:02:08	54	0.346	540	000:02:08	102	0.335	1020	000:02:08	183	0.318	1830	000:02:08	258	0.314	2580
000:02:12	54	0.355	540	000:02:12	101	0.35	1010	000:02:12	182	0.328	1820	000:02:12	258	0.325	2580
000:02:16	53	0.37	530	000:02:16	101	0.359	1010	000:02:16	182	0.343	1820	000:02:16	257	0.339	2570
000:02:20	53	0.378	530	000:02:20	101	0.374	1010	000:02:20	181	0.354	1810	000:02:20	257	0.35	2570
000:02:24	53	0.394	530	000:02:24	100	0.384	1000	000:02:24	181	0.367	1810	000:02:24	257	0.366	2570
000:02:28	53	0.409	530	000:02:28	100	0.399	1000	000:02:28	181	0.38	1810	000:02:28	256	0.376	2560
000:02:32	53	0.42	530	000:02:32	100	0.411	1000	000:02:32	180	0.392	1800	000:02:32	256	0.387	2560
000:02:36	53	0.436	530	000:02:36	100	0.427	1000	000:02:36	180	0.408	1800	000:02:36	255	0.402	2550
000:02:40	53	0.448	530	000:02:40	100	0.439	1000	000:02:40	179	0.419	1790	000:02:40	255	0.411	2550
000:02:44	53	0.46	530	000:02:44	100	0.453	1000	000:02:44	179	0.43	1790	000:02:44	255	0.43	2550
000:02:48	53	0.474	530	000:02:48	100	0.465	1000	000:02:48	179	0.445	1790	000:02:48	256	0.441	2560
000:02:52	54	0.485	540	000:02:52	100	0.481	1000	000:02:52	179	0.454	1790	000:02:52	255	0.452	2550
000:02:56	54	0.5	540	000:02:56	100	0.492	1000	000:02:56	179	0.473	1790	000:02:56	256	0.468	2560
000:03:00	54	0.512	540	000:03:00	101	0.503	1010	000:03:00	179	0.484	1790	000:03:00	256	0.48	2560
000:03:04	54	0.522	540	000:03:04	101	0.517	1010	000:03:04	179	0.494	1790	000:03:04	256	0.494	2560
000:03:08	55	0.537	550	000:03:08	101	0.526	1010	000:03:08	179	0.51	1790	000:03:08	256	0.504	2560
000:03:12	55	0.546	550	000:03:12	101	0.545	1010	000:03:12	179	0.521	1790	000:03:12	256	0.519	2560
000:03:16	55	0.566	550	000:03:16	102	0.556	1020	000:03:16	179	0.536	1790	000:03:16	256	0.531	2560
000:03:20	55	0.578	550	000:03:20	102	0.567	1020	000:03:20	179	0.548	1790	000:03:20	255	0.543	2550
000:03:24	55	0.588	550	000:03:24	102	0.583	1020	000:03:24	179	0.563	1790	000:03:24	255	0.558	2550
000:03:28	55	0.603	550	000:03:28	102	0.596	1020	000:03:28	179	0.574	1790	000:03:28	255	0.57	2550
000:03:32	55	0.616	550	000:03:32	102	0.611	1020	000:03:32	178	0.586	1780	000:03:32	255	0.585	2550
000:03:36	55	0.631	550	000:03:36	102	0.622	1020	000:03:36	178	0.602	1780	000:03:36	256	0.596	2560
000:03:40	55	0.643	550	000:03:40	102	0.638	1020	000:03:40	178	0.614	1780	000:03:40	256	0.608	2560
000:03:44	55	0.658	550	000:03:44	102	0.65	1020	000:03:44	178	0.63	1780	000:03:44	256	0.619	2560
000:03:48	55	0.671	550	000:03:48	101	0.663	1010	000:03:48	178	0.642	1780	000:03:48	257	0.635	2570
000:03:52	55	0.684	550	000:03:52	101	0.678	1010	000:03:52	178	0.655	1780	000:03:52	257	0.651	2570
000:03:56	54	0.7	540	000:03:56	101	0.689	1010	000:03:56	178	0.665	1780	000:03:56	258	0.663	2580
000:04:00	54	0.71	540	000:04:00	100	0.705	1000	000:04:00	178	0.681	1780	000:04:00	257	0.673	2570
000:04:04	53	0.725	530	000:04:04	99	0.717	990	000:04:04	178	0.697	1780	000:04:04	258	0.688	2580
000:04:08	52	0.737	520	000:04:08	98	0.729	980	000:04:08	177	0.708	1770	000:04:08	258	0.7	2580
000:04:12	52	0.749	520	000:04:12	97	0.739	970	000:04:12	177	0.72	1770	000:04:12	258	0.715	2580
000:04:16	52	0.759	520	000:04:16	96	0.755	960	000:04:16	176	0.734	1760	000:04:16	257	0.727	2570
000:04:20	52	0.775	520	000:04:20	96	0.771	960	000:04:20	174	0.746	1740	000:04:20	257	0.738	2570
000:04:24	52	0.791	520	000:04:24	95	0.783	950	000:04:24	173	0.761	1730	000:04:24	257	0.752	2570
000:04:28	52	0.803	520	000:04:28	94	0.793	940	000:04:28	172	0.774	1720	000:04:28	257	0.765	2570.
000:04:32	52	0.814	520	000:04:32	94	0.809	940	000:04:32	171	0.785	1710	000:04:32	256	0.78	2560
000:04:36	52	0.83	520	000:04:36	95	0.822	950	000:04:36	170	0.801	1700	000:04:36	255	0.787	2550
000:04:40	52	0.843	520	000:04:40	95	0.837	950	000:04:40	169	0.813	1690	000:04:40	255	0.807	2550
000:04:44	52	0.859	520	000:04:44	95	0.85	950	000:04:44	169	0.829	1690	000:04:44	253	0.819	2530
000:04:48	52	0.871	520	000:04:48	96	0.86	960	000:04:48	169	0.836	1690	000:04:48	253	0.831	2530
000:04:52	53	0.881	530	000:04:52	96	0.876	960	000:04:52	169	0.854	1690	000:04:52	253	0.847	2530
000:04:56	53	0.896	530	000:04:56	97	0.888	970	000:04:56	170	0.866	1700	000:04:56	253	0.857	2530
000:05:00	53	0.907	530	000:05:00	97	0.903	970	000:05:00	171	0.879	1710	000:05:00	253	0.872	2530
000:05:04	53	0.922	530	000:05:04	98	0.909	980	000:05:04	172	0.894	1720	000:05:04	254	0.885	2540
000:05:08	53	0.929	530	000:05:08	98	0.928	980	000:05:08	173	0.904	1730	000:05:08	254	0.896	2540
000:05:12	53	0.949	530	000:05:12	98	0.939	980	000:05:12	173	0.919	1730	000:05:12	254	0.911	2540
000:05:16	53	0.96	530	000:05:16	98	0.952	980	000:05:16	174	0.93	1740	000:05:16	254	0.92	2540
000:05:20	53	0.972	530	000:05:20	98	0.967	980	000:05:20	174	0.945	1740	000:05:20	254	0.936	2540
000:05:24	53	0.987	530	000:05:24	99	0.977	990	000:05:24	175	0.957	1750	000:05:24	254	0.948	2540

FILE NAME: TEST-12A.TXT
TEST NAME: 1377A15
START DATE: 07/23/96 17:11

CHANNEL 1 TRANSDUCER TYPE: Load
TRANSDUCER 0 - 500 Lbs

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCER 0 - 4.000 In

	COUNTS	INTERVAL:
	======	=========
TIME PROFILE	-1	000:00:04
	25	000:02:00
	25	000:03:00
	25	000:04:00
	-1	000:05:00

RUN TIME	CHANNEL 1	CHANNEL 3	
000:05:28	53	0.998	530
000:05:32	53	1.013	530
000:05:36	53	1.025	530
000:05:40	53	1.041	530
000:05:44	53	1.052	530
000:05:48	53	1.066	530
000:05:52	53	1.078	530
000:05:56	52	1.09	520
000:06:00	52	1.104	520
000:06:04	52	1.113	520
000:06:08	52	1.128	520
000:06:12	52	1.136	520
000:06:16	52	1.152	520
000:06:20	52	1.167	520
000:06:24	52	1.177	520
000:06:28	52	1.193	520
000:06:32	52	1.205	520
000:06:36	52	1.218	520
000:06:40	52	1.232	520
000:06:44	52	1.244	520
000:06:48	52	1.259	520
000:06:52	52	1.271	520
000:06:56	53	1.282	530
000:07:00	53	1.297	530
000:07:04	53	1.307	530
000:07:08	53	1.326	530
000:07:12	53	1.337	530
000:07:16	52	1.347	520
000:07:20	52	1.362	520
000:07:24	52	1.374	520
*** RUN CANCELLED ***			

FILE NAME: TEST-12B.TXT
TEST NAME: 1377A30
START DATE 07/23/96 16:48

CHANNEL 1 TRANSDUCER TYPE: Load
TRANSDUCE 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCE 0 - 4.000 In

	COUNTS	INTERVAL:
	======	=========
TIME PROFIL	-1	000:00:04
	25	000:02:00
	25	000:03:00
	25	000:04:00
	-1	000:05:00

			-10
			0
RUN TIME	CHANNEL 1	CHANNEL 3	0
========	========	========	0
000:05:28	98	0.993	980
000:05:32	99	1.004	990
000:05:36	99	1.016	990
000:05:40	99	1.031	990
000:05:44	99	1.042	990
000:05:48	99	1.057	990
000:05:52	99	1.07	990
000:05:56	99	1.076	990
000:06:00	99	1.094	990
000:06:04	99	1.105	990
000:06:08	98	1.117	980
000:06:12	99	1.131	990
000:06:16	98	1.141	980
000:06:20	98	1.156	980
000:06:24	98	1.168	980
000:06:28	98	1.184	980
000:06:32	98	1.196	980
000:06:36	98	1.21	980
000:06:40	98	1.222	980
000:06:44	99	1.235	990
000:06:48	99	1.251	990
000:06:52	99	1.261	990
000:06:56	99	1.276	990
000:07:00	99	1.285	990
000:07:04	99	1.3	990
000:07:08	99	1.315	990
000:07:12	99	1.315	990
*** RUN CANCELLED ***			0

FILE NAME: TEST-12C.TXT
TEST NAME: 1377A60
START DATE 07/23/96 16:25

CHANNEL 1 TRANSDUCER TYPE: Load
TRANSDUCE 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCE 0 - 4.000 In

	COUNTS	INTERVAL:
	======	=========
TIME PROFIL	-1	000:00:04
	25	000:02:00
	25	000:03:00
	25	000:04:00
	-1	000:05:00

			-10
			0
RUN TIME	CHANNEL 1	CHANNEL 3	0
========	========	========	0
000:05:28	175	0.968	1750
000:05:32	176	0.983	1760
000:05:36	177	0.994	1770
000:05:40	177	1.001	1770
000:05:44	177	1.02	1770
000:05:48	177	1.035	1770
000:05:52	177	1.044	1770
000:05:56	178	1.06	1780
000:06:00	178	1.074	1780
000:06:04	178	1.084	1780
000:06:08	177	1.098	1770
000:06:12	177	1.11	1770
000:06:16	177	1.121	1770
000:06:20	177	1.134	1770
000:06:24	177	1.146	1770
000:06:28	177	1.162	1770
000:06:32	177	1.174	1770
000:06:36	177	1.184	1770
000:06:40	177	1.2	1770
000:06:44	177	1.208	1770
000:06:48	177	1.227	1770
000:06:52	177	1.239	1770
000:06:56	177	1.251	1770
*** RUN CANCELLED ***			0

FILE NAME: TEST-12D.TXT
TEST NAME: 1377A90
START DATE 07/23/96 15:49

CHANNEL 1 TRANSDUCER TYPE: Load
TRANSDUCE 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCE 0 - 4.000 In

	COUNTS	INTERVAL:
	======	=========
TIME PROFIL	-1	000:00:04
	25	000:02:00
	25	000:03:00
	25	000:04:00
	-1	000:05:00

			-10
			0
RUN TIME	CHANNEL 1	CHANNEL 3	0
========	========	========	0
000:05:28	254	0.955	2540
000:05:32	255	0.973	2550
000:05:36	256	0.983	2560
000:05:40	256	0.996	2560
000:05:44	256	1.011	2560
000:05:48	257	1.021	2570
000:05:52	258	1.037	2580
000:05:56	258	1.049	2580
000:06:00	259	1.063	2590
000:06:04	260	1.074	2600
000:06:08	260	1.088	2600
000:06:12	260	1.099	2600
000:06:16	261	1.114	2610
000:06:20	261	1.124	2610
000:06:24	262	1.135	2620
000:06:28	262	1.15	2620
000:06:32	262	1.158	2620
000:06:36	263	1.177	2630
000:06:40	263	1.189	2630
000:06:44	263	1.199	2630
000:06:48	263	1.215	2630
000:06:52	264	1.227	2640
000:06:56	264	1.242	2640
000:07:00	265	1.254	2650
000:07:04	265	1.269	2650
000:07:08	265	1.281	2650
000:07:12	265	1.292	2650
000:07:16	265	1.307	2650
000:07:20	265	1.317	2650
000:07:24	265	1.333	2650
*** RUN CANCELLED ***			0

APPENDIX B2

KNIGHT PIESOLD DENVER TEST RESULTS

Knight Piésold LLC
Geotechnical Laboratory

Direct Shear Test
ASTM D 5321

Geosynthetic / Geosynthetic Interface Test Report

Project	CARMACKS COPPER PROJECT	Project No.	1377A
Lab No.	Date Tested 07/21/96	Tested By	RB/SFB
Test Description	60 mil HF (GSE) smooth vs. PN3000 geonet	Checked By	SFB

Normal Stress Range, psf: 2160 4320 6480 8640 — Total No. of Points Requested: 4

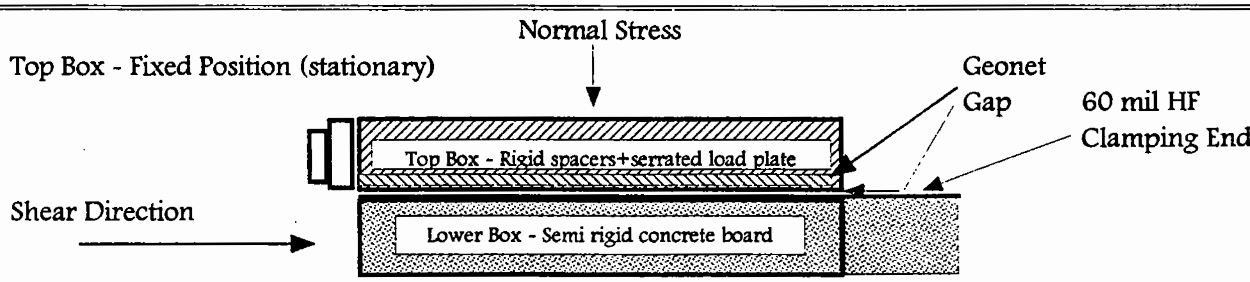
Geomembrane Data	60 mil (HF), SMOOTH		
Manufacturer	GSE, 5/96		
Lot No.	UNK		
Roll No.	Textured? No	Peak to Peak Thickness, mil	0.062
Specified Thickness, mil	60		

Test Parameters Moisture Content, % NA Dry Density, pcf NA

Observations: Test performed with the geonet held in place by a serrated load plate in the top half. This method allows the true "critical" interface friction to be tested. The 60 mil liner coupon was fastened to the lower box.

Substrate Material Description: 60 mil HF supported by semi rigid concrete board

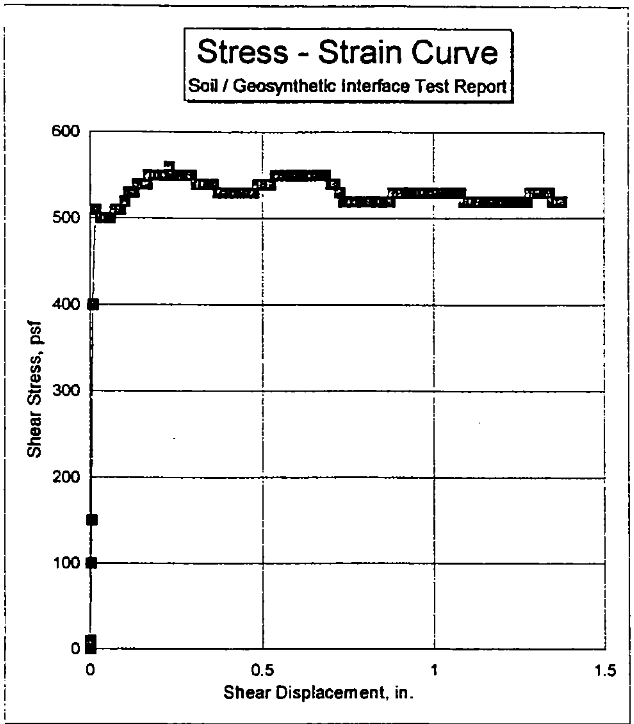
Superstrate Material Description: PN3000 GEONET

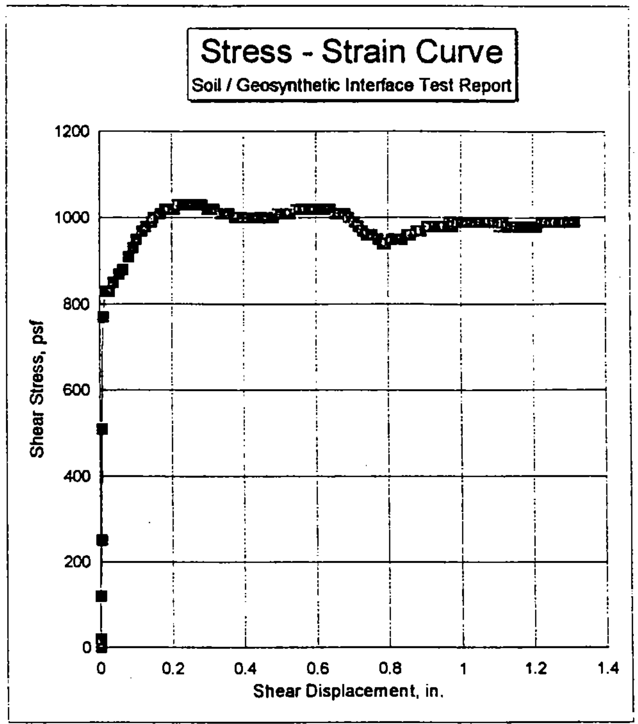


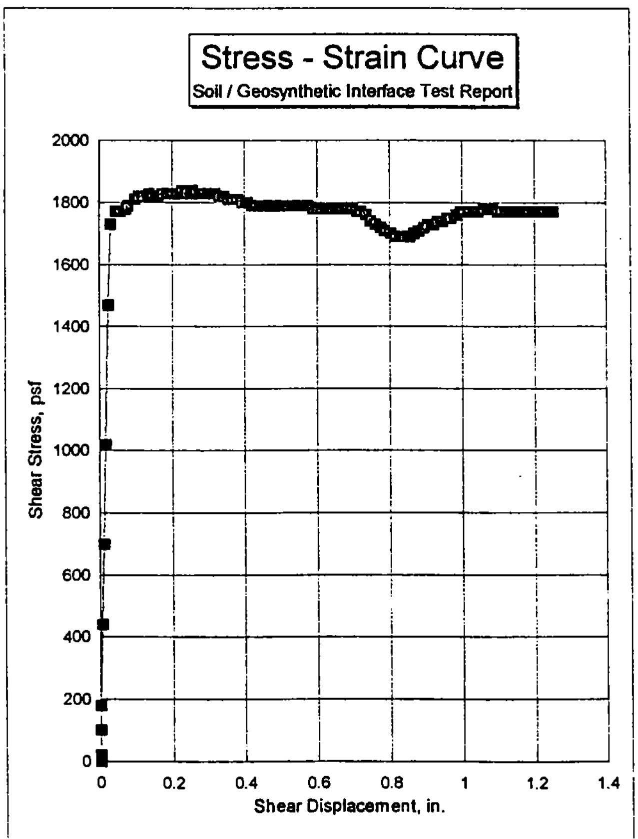
Default Test Descriptions (unless noted otherwise)

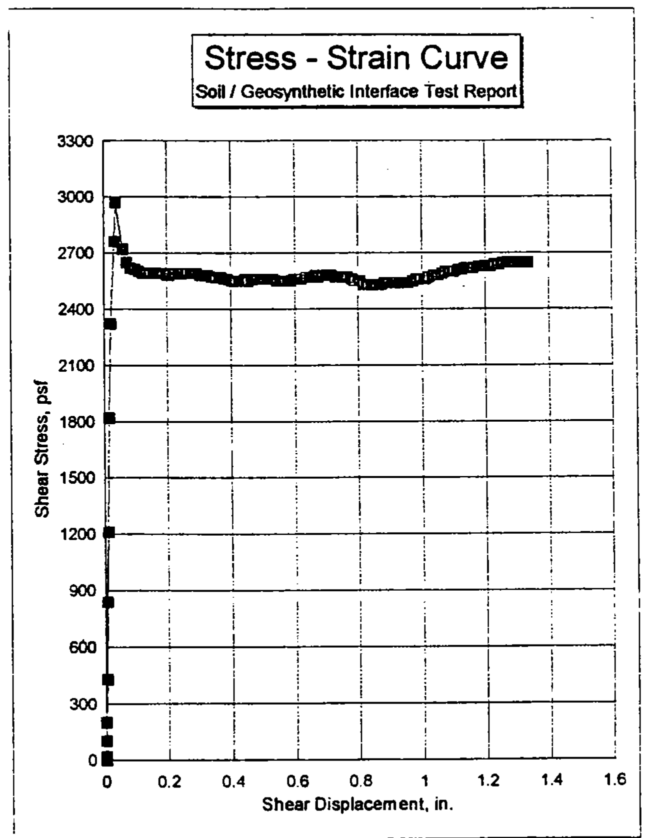
1) The test was performed in a Boart Longyear 300mm Shear Box, Model LG-115
2) The rate of displacement was 0.2 in./min. (procedure A)
3) The lower (traveling box) container was inundated with tap water 0.5 hr. prior to shearing.
4) The interface zone was submerged at the time of test.
5) The liner was fixed at the lower box half.
6) Load increments were recorded in 10 lbf increments.
7) The Geosynthetic coupons are available for inspection at the lab.
8) The geonet was fixed at the top half of the shear box.

Project	CARMACKS COPPER PROJECT	Project No.	1377A
Lab No.	Date Tested 07/21/96	Tested By	RB/SFB
Test Description	60 mil HF (GSE) smooth vs. FN3000 geonet	Checked By	SFB







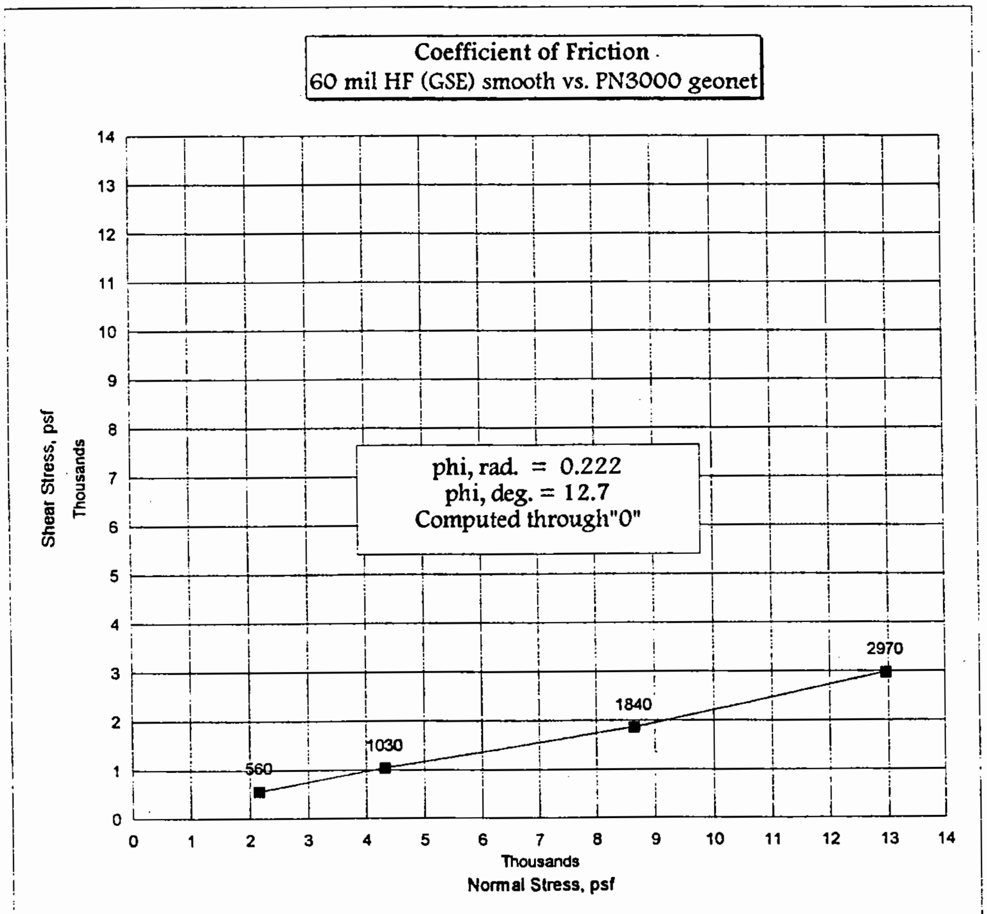


Geosynthetic / Geosynthetic Interface Test Report

Project CARMACKS COPPER PROJECT — Project No. 1377A
Lab No. ______ Date Tested 07/21/96 — Tested By RB/SFB
Test Description 60 mil HF (GSE) smooth vs. PN3000 geonet — Checked By SFB

Test Specimen Parameters

	Initial Data 1	2	3	4	At Test Data 1	2	3	4
Tare ID								
Wet Soil + Tare								
Dry Soil + Tare								
Tare								
Wt. of Water								
Wt. of Dry Solids								
Moisture Content, %								



Peak Strength Parameters

Shear Stress psf	Normal Stress psf
560	2160
1030	4320
1840	8640
2970	12960

FILE NAME:	TEST-12A.TXT			FILE NAME:	TEST-12B.TXT			FILE NAME:	TEST-12C.TXT			FILE NAME:	TEST-12D.TXT		
TEST NAME:	1377A15			TEST NAME:	1377A30			TEST NAME:	1377A60			TEST NAME:	1377A90		
START DATE:	07/23/96	17:11		START DATE	07/23/96	16:48		START DATE	07/23/96	16:25		START DATE	07/23/96	15:49	
CHANNEL 1 TRANSDUCER TYPE: Load TRANSDUCER	0 - 500 Lbs			CHANNEL 1 TRANSDUCER TYPE: Load TRANSDUCE	0 - 4.000 In			CHANNEL 1 TRANSDUCER TYPE: Load TRANSDUCE	0 - 4.000 In			CHANNEL 1 TRANSDUCER TYPE: Load TRANSDUCE	0 - 4.000 In		
CHANNEL 3 TRANSDUCER TYPE: Travel TRANSDUCER	0 - 4.000 In			CHANNEL 3 TRANSDUCER TYPE: Travel TRANSDUCE	0 - 4.000 In			CHANNEL 3 TRANSDUCER TYPE: Travel TRANSDUCE	0 - 4.000 In			CHANNEL 3 TRANSDUCER TYPE: Travel TRANSDUCE	0 - 4.000 In		
	COUNTS	INTERVAL:			COUNTS	INTERVAL:			COUNTS	INTERVAL:			COUNTS	INTERVAL:	
	======	=========			======	=========			======	=========			======	=========	
TIME PROFILE	-1	000:00:04		TIME PROFIL	-1	000:00:04		TIME PROFIL	-1	000:00:04		TIME PROFIL	-1	000:00:04	
	25	000:02:00			25	000:02:00			25	000:02:00			25	000:02:00	
	25	000:03:00			25	000:03:00			25	000:03:00			25	000:03:00	
	25	000:04:00			25	000:04:00			25	000:04:00			25	000:04:00	
	-1	000:05:00			-1	000:05:00	-10		-1	000:05:00	-10		-1	000:05:00	-10
							0				0				0
RUN TIME	CHANNEL 1	CHANNEL 3		RUN TIME	CHANNEL 1	CHANNEL 3	0	RUN TIME	CHANNEL 1	CHANNEL 3	0	RUN TIME	CHANNEL 1	CHANNEL 3	0
==========	==========	==========		==========	==========	==========	0	==========	==========	==========	0	==========	==========	==========	0
000:00:00	0	0	0	000:00:00	0	0	0	000:00:00	0	0	0	000:00:00	0	0	0
000:00:04	0	0	0	000:00:04	0	0	0	000:00:04	0	0	0	000:00:04	0	0	0
000:00:08	0	0	0	000:00:08	0	0	0	000:00:08	0	0	0	000:00:08	2	0	20
000:00:12	1	0	10	000:00:12	2	0.001	20	000:00:12	2	0	20	000:00:12	10	0	100
000:00:16	10	0.002	100	000:00:16	12	0.004	120	000:00:16	10	0.001	100	000:00:16	20	0.001	200
000:00:20	15	0.004	150	000:00:20	25	0.006	250	000:00:20	18	0.001	180	000:00:20	43	0.004	430
000:00:24	40	0.008	400	000:00:24	51	0.01	510	000:00:24	44	0.006	440	000:00:24	84	0.007	840
000:00:28	51	0.016	510	000:00:28	77	0.017	770	000:00:28	70	0.011	700	000:00:28	121	0.01	1210
000:00:32	50	0.032	500	000:00:32	83	0.027	830	000:00:32	102	0.017	1020	000:00:32	182	0.016	1820
000:00:36	50	0.045	500	000:00:36	83	0.038	830	000:00:36	147	0.024	1470	000:00:36	232	0.021	2320
000:00:40	50	0.057	500	000:00:40	85	0.054	850	000:00:40	173	0.031	1730	000:00:40	276	0.032	2760
000:00:44	51	0.072	510	000:00:44	87	0.065	870	000:00:44	177	0.045	1770	000:00:44	297	0.037	2970
000:00:48	51	0.087	510	000:00:48	88	0.08	880	000:00:48	177	0.058	1770	000:00:48	272	0.059	2720
000:00:52	52	0.099	520	000:00:52	91	0.092	910	000:00:52	178	0.073	1780	000:00:52	265	0.071	2650
000:00:56	53	0.11	530	000:00:56	93	0.102	930	000:00:56	179	0.079	1790	000:00:56	262	0.083	2620
000:01:00	53	0.125	530	000:01:00	95	0.117	950	000:01:00	181	0.098	1810	000:01:00	261	0.098	2610
000:01:04	54	0.136	540	000:01:04	97	0.128	970	000:01:04	182	0.109	1820	000:01:04	260	0.109	2600
000:01:08	54	0.151	540	000:01:08	98	0.144	980	000:01:08	182	0.121	1820	000:01:08	259	0.123	2590
000:01:12	54	0.162	540	000:01:12	99	0.15	990	000:01:12	183	0.136	1830	000:01:12	259	0.135	2590
000:01:16	55	0.169	550	000:01:16	100	0.169	1000	000:01:16	182	0.147	1820	000:01:16	259	0.146	2590
000:01:20	55	0.189	550	000:01:20	101	0.181	1010	000:01:20	182	0.162	1820	000:01:20	259	0.161	2590
000:01:24	55	0.2	550	000:01:24	102	0.192	1020	000:01:24	183	0.174	1830	000:01:24	259	0.172	2590
000:01:28	55	0.212	550	000:01:28	102	0.208	1020	000:01:28	183	0.189	1830	000:01:28	259	0.187	2590
000:01:32	56	0.228	560	000:01:32	102	0.218	1020	000:01:32	183	0.201	1830	000:01:32	258	0.199	2580
000:01:36	55	0.238	550	000:01:36	103	0.234	1030	000:01:36	183	0.215	1830	000:01:36	258	0.206	2580
000:01:40	55	0.254	550	000:01:40	103	0.246	1030	000:01:40	184	0.227	1840	000:01:40	259	0.224	2590
000:01:44	55	0.265	550	000:01:44	103	0.258	1030	000:01:44	183	0.24	1830	000:01:44	259	0.239	2590
000:01:48	55	0.282	550	000:01:48	103	0.273	1030	000:01:48	184	0.255	1840	000:01:48	259	0.249	2590
000:01:52	55	0.292	550	000:01:52	103	0.284	1030	000:01:52	183	0.265	1830	000:01:52	259	0.264	2590
000:01:56	54	0.307	540	000:01:56	103	0.299	1030	000:01:56	183	0.28	1830	000:01:56	259	0.278	2590
000:02:00	54	0.318	540	000:02:00	102	0.309	1020	000:02:00	183	0.288	1830	000:02:00	259	0.289	2590
000:02:04	54	0.331	540	000:02:04	102	0.317	1020	000:02:04	183	0.303	1830	000:02:04	258	0.303	2580
000:02:08	54	0.346	540	000:02:08	102	0.335	1020	000:02:08	183	0.318	1830	000:02:08	258	0.314	2580
000:02:12	54	0.355	540	000:02:12	101	0.35	1010	000:02:12	182	0.328	1820	000:02:12	258	0.325	2580
000:02:16	53	0.37	530	000:02:16	101	0.359	1010	000:02:16	182	0.343	1820	000:02:16	257	0.339	2570
000:02:20	53	0.378	530	000:02:20	101	0.374	1010	000:02:20	181	0.354	1810	000:02:20	257	0.35	2570
000:02:24	53	0.394	530	000:02:24	100	0.384	1000	000:02:24	181	0.367	1810	000:02:24	257	0.366	2570
000:02:28	53	0.409	530	000:02:28	100	0.399	1000	000:02:28	181	0.38	1810	000:02:28	256	0.376	2560
000:02:32	53	0.42	530	000:02:32	100	0.411	1000	000:02:32	180	0.392	1800	000:02:32	256	0.387	2560
000:02:36	53	0.436	530	000:02:36	100	0.427	1000	000:02:36	180	0.408	1800	000:02:36	255	0.402	2550
000:02:40	53	0.448	530	000:02:40	100	0.439	1000	000:02:40	179	0.419	1790	000:02:40	255	0.411	2550
000:02:44	53	0.46	530	000:02:44	100	0.453	1000	000:02:44	179	0.43	1790	000:02:44	255	0.43	2550
000:02:48	53	0.474	530	000:02:48	100	0.465	1000	000:02:48	179	0.445	1790	000:02:48	256	0.441	2560
000:02:52	54	0.485	540	000:02:52	100	0.481	1000	000:02:52	179	0.454	1790	000:02:52	255	0.452	2550
000:02:56	54	0.5	540	000:02:56	100	0.492	1000	000:02:56	179	0.473	1790	000:02:56	256	0.468	2560
000:03:00	54	0.512	540	000:03:00	101	0.503	1010	000:03:00	179	0.484	1790	000:03:00	256	0.48	2560
000:03:04	54	0.522	540	000:03:04	101	0.517	1010	000:03:04	179	0.494	1790	000:03:04	256	0.494	2560
000:03:08	55	0.537	550	000:03:08	101	0.526	1010	000:03:08	179	0.51	1790	000:03:08	256	0.504	2560
000:03:12	55	0.546	550	000:03:12	101	0.545	1010	000:03:12	179	0.521	1790	000:03:12	256	0.519	2560
000:03:16	55	0.566	550	000:03:16	102	0.556	1020	000:03:16	179	0.536	1790	000:03:16	256	0.531	2560
000:03:20	55	0.578	550	000:03:20	102	0.567	1020	000:03:20	179	0.548	1790	000:03:20	255	0.543	2550
000:03:24	55	0.588	550	000:03:24	102	0.583	1020	000:03:24	179	0.563	1790	000:03:24	255	0.558	2550
000:03:28	55	0.603	550	000:03:28	102	0.596	1020	000:03:28	179	0.574	1790	000:03:28	255	0.57	2550
000:03:32	55	0.616	550	000:03:32	102	0.611	1020	000:03:32	178	0.586	1780	000:03:32	255	0.585	2550
000:03:36	55	0.631	550	000:03:36	102	0.622	1020	000:03:36	178	0.602	1780	000:03:36	256	0.596	2560
000:03:40	55	0.643	550	000:03:40	102	0.638	1020	000:03:40	178	0.614	1780	000:03:40	256	0.608	2560
000:03:44	55	0.658	550	000:03:44	102	0.65	1020	000:03:44	178	0.63	1780	000:03:44	256	0.619	2560
000:03:48	55	0.671	550	000:03:48	101	0.663	1010	000:03:48	178	0.642	1780	000:03:48	257	0.635	2570
000:03:52	55	0.684	550	000:03:52	101	0.678	1010	000:03:52	178	0.655	1780	000:03:52	257	0.651	2570
000:03:56	54	0.7	540	000:03:56	101	0.689	1010	000:03:56	178	0.665	1780	000:03:56	258	0.663	2580
000:04:00	54	0.71	540	000:04:00	100	0.705	1000	000:04:00	178	0.681	1780	000:04:00	257	0.673	2570
000:04:04	53	0.725	530	000:04:04	99	0.717	990	000:04:04	178	0.697	1780	000:04:04	258	0.688	2580
000:04:08	52	0.737	520	000:04:08	98	0.729	980	000:04:08	177	0.708	1770	000:04:08	258	0.7	2580
000:04:12	52	0.749	520	000:04:12	97	0.739	970	000:04:12	177	0.72	1770	000:04:12	258	0.715	2580
000:04:16	52	0.759	520	000:04:16	96	0.755	960	000:04:16	176	0.734	1760	000:04:16	257	0.727	2570
000:04:20	52	0.775	520	000:04:20	96	0.771	960	000:04:20	174	0.746	1740	000:04:20	257	0.738	2570
000:04:24	52	0.791	520	000:04:24	95	0.783	950	000:04:24	173	0.761	1730	000:04:24	257	0.752	2570
000:04:28	52	0.803	520	000:04:28	94	0.793	940	000:04:28	172	0.774	1720	000:04:28	257	0.765	2570
000:04:32	52	0.814	520	000:04:32	94	0.809	940	000:04:32	171	0.785	1710	000:04:32	256	0.78	2560
000:04:36	52	0.83	520	000:04:36	95	0.822	950	000:04:36	170	0.801	1700	000:04:36	255	0.787	2550
000:04:40	52	0.843	520	000:04:40	95	0.837	950	000:04:40	169	0.813	1690	000:04:40	255	0.807	2550
000:04:44	52	0.859	520	000:04:44	95	0.85	950	000:04:44	169	0.829	1690	000:04:44	253	0.819	2530
000:04:48	52	0.871	520	000:04:48	96	0.86	960	000:04:48	169	0.836	1690	000:04:48	253	0.831	2530
000:04:52	53	0.881	530	000:04:52	96	0.876	960	000:04:52	169	0.854	1690	000:04:52	253	0.847	2530
000:04:56	53	0.896	530	000:04:56	97	0.888	970	000:04:56	170	0.866	1700	000:04:56	253	0.857	2530
000:05:00	53	0.907	530	000:05:00	97	0.903	970	000:05:00	171	0.879	1710	000:05:00	253	0.872	2530
000:05:04	53	0.922	530	000:05:04	98	0.909	980	000:05:04	172	0.894	1720	000:05:04	254	0.885	2540
000:05:08	53	0.929	530	000:05:08	98	0.928	980	000:05:08	173	0.904	1730	000:05:08	254	0.896	2540
000:05:12	53	0.949	530	000:05:12	98	0.939	980	000:05:12	173	0.919	1730	000:05:12	254	0.911	2540
000:05:16	53	0.96	530	000:05:16	98	0.952	980	000:05:16	174	0.93	1740	000:05:16	254	0.92	2540
000:05:20	53	0.972	530	000:05:20	98	0.967	980	000:05:20	174	0.945	1740	000:05:20	254	0.936	2540
000:05:24	53	0.987	530	000:05:24	99	0.977	990	000:05:24	175	0.957	1750	000:05:24	254	0.948	2540

FILE NAME: TEST-12A.TXT
TEST NAME: 1377A15
START DATE: 07/23/96 17:11

CHANNEL 1 TRANSDUCER TYPE: Load
TRANSDUCER 0 - 500 Lbs

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCER 0 - 4.000 In

	COUNTS	INTERVAL:
TIME PROFILE	-1	000:00:04
	25	000:02:00
	25	000:03:00
	25	000:04:00
	-1	000:05:00

RUN TIME	CHANNEL 1	CHANNEL 3	
000:05:28	53	0.998	530
000:05:32	53	1.013	530
000:05:36	53	1.025	530
000:05:40	53	1.041	530
000:05:44	53	1.052	530
000:05:48	53	1.066	530
000:05:52	53	1.078	530
000:05:56	52	1.09	520
000:06:00	52	1.104	520
000:06:04	52	1.113	520
000:06:08	52	1.128	520
000:06:12	52	1.136	520
000:06:16	52	1.152	520
000:06:20	52	1.167	520
000:06:24	52	1.177	520
000:06:28	52	1.193	520
000:06:32	52	1.205	520
000:06:36	52	1.218	520
000:06:40	52	1.232	520
000:06:44	52	1.244	520
000:06:48	52	1.259	520
000:06:52	52	1.271	520
000:06:56	53	1.282	530
000:07:00	53	1.297	530
000:07:04	53	1.307	530
000:07:08	53	1.326	530
000:07:12	53	1.337	530
000:07:16	52	1.347	520
000:07:20	52	1.362	520
000:07:24	52	1.374	520

*** RUN CANCELLED ***

FILE NAME: TEST-12B.TXT
TEST NAME: 1377A30
START DATE 07/23/96 16:48

CHANNEL 1 TRANSDUCER TYPE: Load
TRANSDUCE 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCE 0 - 4.000 In

	COUNTS	INTERVAL:	
TIME PROFIL	-1	000:00:04	
	25	000:02:00	
	25	000:03:00	
	25	000:04:00	
	-1	000:05:00	-10
			0

RUN TIME	CHANNEL 1	CHANNEL 3	0
			0
000:05:28	98	0.993	980
000:05:32	99	1.004	990
000:05:36	99	1.016	990
000:05:40	99	1.031	990
000:05:44	99	1.042	990
000:05:48	99	1.057	990
000:05:52	99	1.07	990
000:05:56	99	1.076	990
000:06:00	99	1.094	990
000:06:04	99	1.105	990
000:06:08	98	1.117	980
000:06:12	99	1.131	990
000:06:16	98	1.141	980
000:06:20	98	1.156	980
000:06:24	98	1.168	980
000:06:28	98	1.184	980
000:06:32	98	1.196	980
000:06:36	98	1.21	980
000:06:40	98	1.222	980
000:06:44	99	1.235	990
000:06:48	99	1.251	990
000:06:52	99	1.261	990
000:06:56	99	1.276	990
000:07:00	99	1.285	990
000:07:04	99	1.3	990
000:07:08	99	1.315	990
000:07:12	99	1.315	990
*** RUN CANCELLED ***			0

FILE NAME: TEST-12C.TXT
TEST NAME: 1377A60
START DATE 07/23/96 16:25

CHANNEL 1 TRANSDUCER TYPE: Load
TRANSDUCE 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCE 0 - 4.000 In

	COUNTS	INTERVAL:	
TIME PROFIL	-1	000:00:04	
	25	000:02:00	
	25	000:03:00	
	25	000:04:00	
	-1	000:05:00	-10
			0

RUN TIME	CHANNEL 1	CHANNEL 3	0
			0
000:05:28	175	0.968	1750
000:05:32	176	0.983	1760
000:05:36	177	0.994	1770
000:05:40	177	1.001	1770
000:05:44	177	1.02	1770
000:05:48	177	1.035	1770
000:05:52	177	1.044	1770
000:05:56	178	1.06	1780
000:06:00	178	1.074	1780
000:06:04	178	1.084	1780
000:06:08	177	1.098	1770
000:06:12	177	1.11	1770
000:06:16	177	1.121	1770
000:06:20	177	1.134	1770
000:06:24	177	1.146	1770
000:06:28	177	1.162	1770
000:06:32	177	1.174	1770
000:06:36	177	1.184	1770
000:06:40	177	1.2	1770
000:06:44	177	1.208	1770
000:06:48	177	1.227	1770
000:06:52	177	1.239	1770
000:06:56	177	1.251	1770
*** RUN CANCELLED ***			0

FILE NAME: TEST-12D.TXT
TEST NAME: 1377A90
START DATE 07/23/96 15:49

CHANNEL 1 TRANSDUCER TYPE: Load
TRANSDUCE 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCE 0 - 4.000 In

	COUNTS	INTERVAL:	
TIME PROFIL	-1	000:00:04	
	25	000:02:00	
	25	000:03:00	
	25	000:04:00	
	-1	000:05:00	-10
			0

RUN TIME	CHANNEL 1	CHANNEL 3	0
			0
000:05:28	254	0.955	2540
000:05:32	255	0.973	2550
000:05:36	256	0.983	2560
000:05:40	256	0.996	2560
000:05:44	256	1.011	2560
000:05:48	257	1.021	2570
000:05:52	258	1.037	2580
000:05:56	258	1.049	2580
000:06:00	259	1.063	2590
000:06:04	260	1.074	2600
000:06:08	260	1.088	2600
000:06:12	260	1.099	2600
000:06:16	261	1.114	2610
000:06:20	261	1.124	2610
000:06:24	262	1.135	2620
000:06:28	262	1.15	2620
000:06:32	262	1.158	2620
000:06:36	263	1.177	2630
000:06:40	263	1.189	2630
000:06:44	263	1.199	2630
000:06:48	263	1.215	2630
000:06:52	264	1.227	2640
000:06:56	264	1.242	2640
000:07:00	265	1.254	2650
000:07:04	265	1.269	2650
000:07:08	265	1.281	2650
000:07:12	265	1.292	2650
000:07:16	265	1.307	2650
000:07:20	265	1.317	2650
000:07:24	265	1.333	2650
*** RUN CANCELLED ***			0

Soil / Geosynthetic Interface Test Report

oject CARMACKS COPPER PROJECT
Lab No. Date Tested 06/23/96
Test Description 60 mil HF (GSE) smooth vs TR96-1-2

Project No. 1377A
Tested By RB/SFB
Checked By SFB

Normal Stress Range, psf 2160 4320 8640 12960
Total No. of Points Requested 4

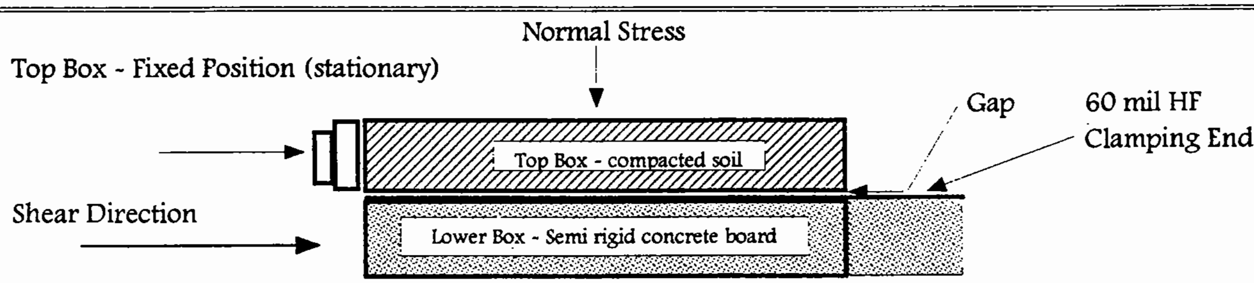
Geomembrane Data 60 mil HDPE (HF), SMOOTH
Manufacturer GSE, 5/96
Lot No. UNK
Roll No. Textured? No
Peak to Peak Thickness, mil 0.062
Specified Thickness, mil 60

Test Parameters Moisture Content, % 10.2 Dry Density, kN/m³ 20.2

Observations: The soil sample was remolded in the top box half. The geomembrane was fixed at the lower container half. The soil sample was removed, re-conditioned and recompacted at the end of each trial. The liner did not appear to have stretched during the shearing cycles.

Substrate Material Description 60 mil HF supported by semi rigid concrete board

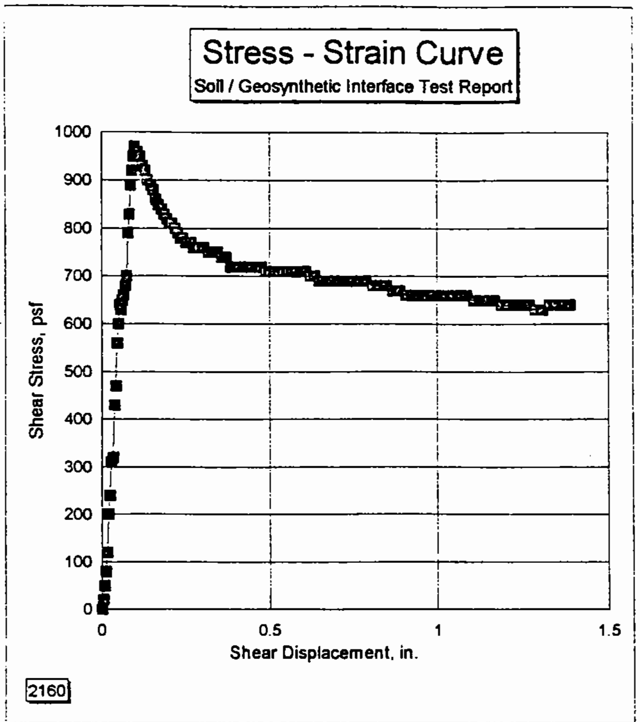
uperstrate Material Description compacted soil sample of TR96-1-2

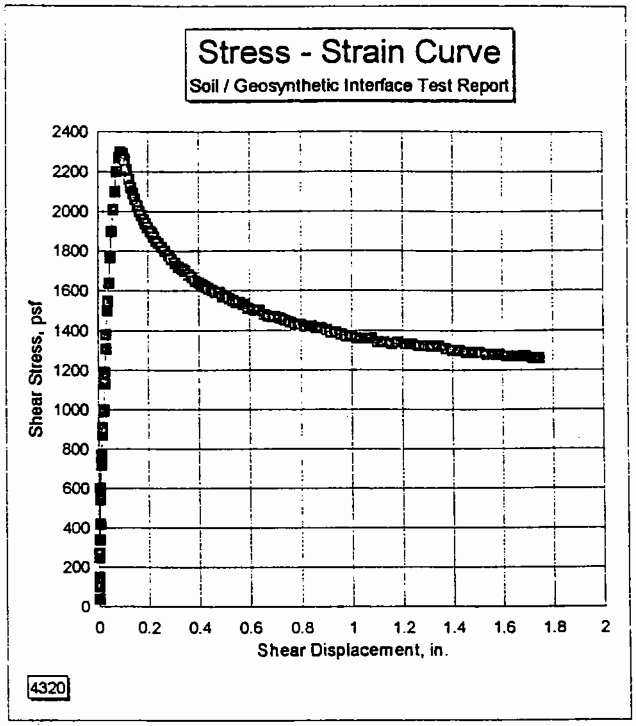


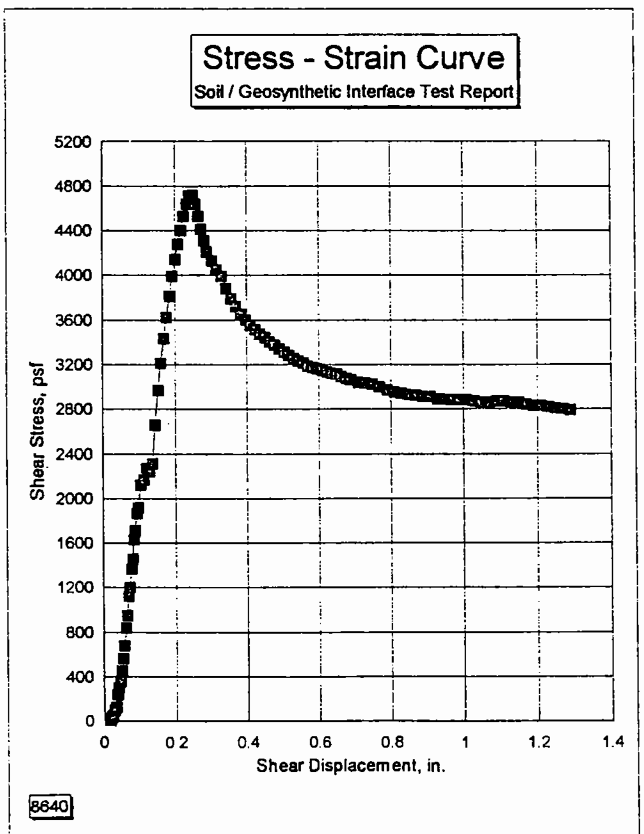
Default Test Descriptions (unless noted otherwise)

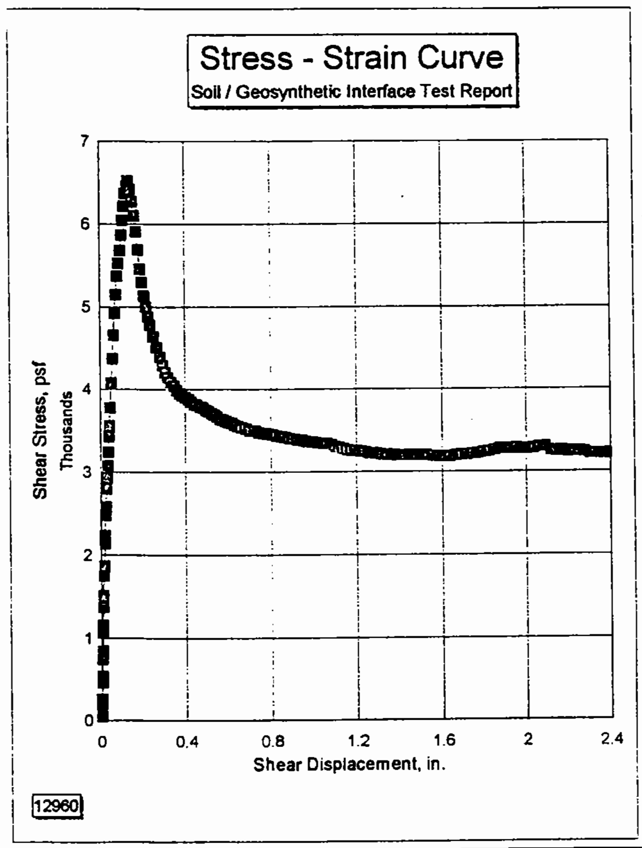
1) The test was performed in a Boart Longyear 300mm Shear Box, Model LG-115
2) The rate of displacement was 0.04 in./min. (procedure A)
3) The lower (travelling box) container was not inundated.
4) The interface zone was NOT submerged at the time of test.
5) The liner was fixed at the lower box half.
6) Load increments were recorded in 10 lbf increments.
7) The Geosynthetic coupons are available for inspection at the lab.

Project	CARMACKS COPPER PROJECT	Project No.	1377A
Lab No.	Date Tested 06/23/96	Tested By	RB/SPB
Test Description	60 mil HF (GSE) smooth vs TR96-1-2	Checked By	SPB







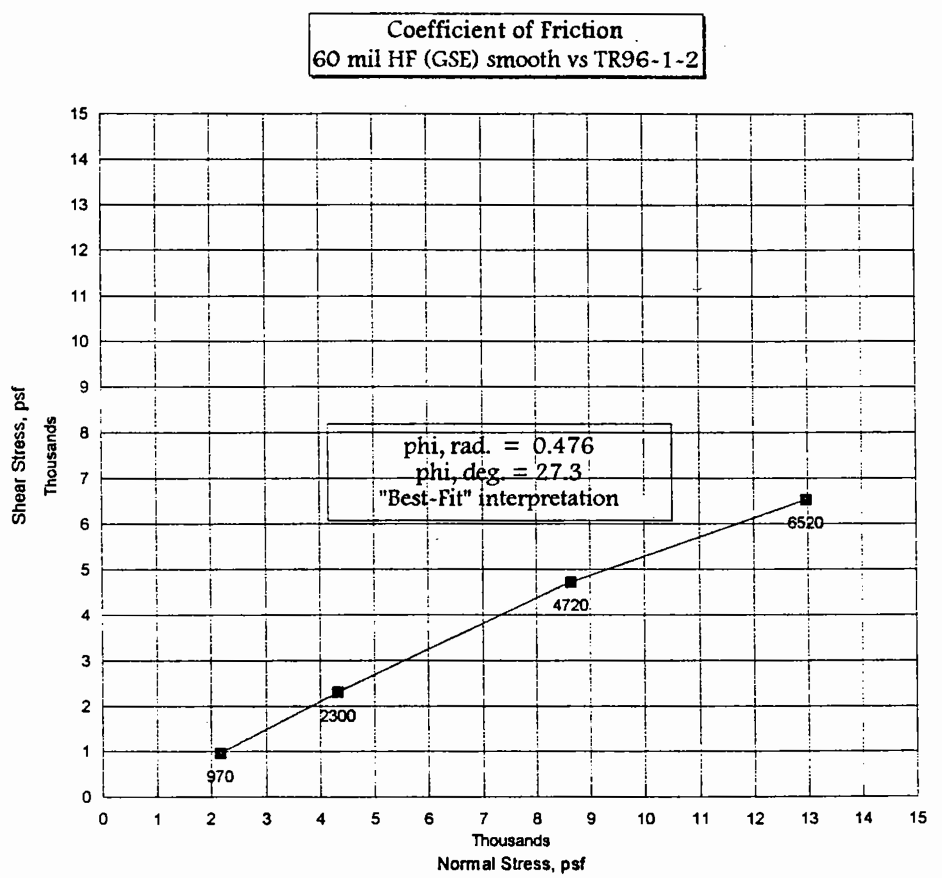


Soil / Geosynthetic Interface Test Report

Project	CARMACKS COPPER PROJECT	Project No.	1377A
Lab No.	Date Tested 06/23/96	Tested By	RB/SFB
Test Description	60 mil HF (GSE) smooth vs TR96-1-2	Checked By	SFB

Test Specimen Parameters

	Initial Data 1	2	3	4	At Test Data 1	2	3	4
Tare ID	g53	g72	g48	g56				
Wet Soil + Tare	688.23	544.14	578.11	412.06				
Dry Soil + Tare	636.84	505.2	536.33	384.6				
Tare	113.56	114.84	115.42	113.72				
Wt. of Water	51.39	38.94	41.78	27.46				
Wt. of Dry Solids	523.28	390.36	420.91	270.88				
Moisture Content, %	9.8	10.0	9.9	10.1				
Wet Soil Wt., lbs.	19.588	19.626	19.624	19.556	consolidated properties not determined			
Sample Height, in.	1.658	1.653	1.656	1.653				
Sample Area, in²	144	144	144	144				
Volume, ft³	0.1382	0.1378	0.1380	0.1378				
Dry Density	129.1	129.6	129.4	128.9				



Peak Strength Parameters

Shear Stress psf	Normal Stress psf
970	2160
2300	4320
4720	8640
6520	12960

FILE NAME: TEST-5A2.TXT
TEST NAME: 1377A5
START DATE: 07/01/96 10:38

CHANNEL 1 TRANSDUCER TYPE: Travel
TRANSDUCER 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCER 0 - 4.000 In

	COUNTS	INTERVAL:
	======	=========
TIME PROFILE	25	000:00:06
	25	000:00:12
	30	000:00:20
	35	000:00:30
	40	000:00:40

RUN TIME	CHANNEL 1	CHANNEL 3	
000:00:00	0	0.001	0
000:00:06	0	0	0
000:00:12	2	0.004	20
000:00:18	5	0.008	50
000:00:24	8	0.012	80
000:00:30	12	0.016	120
000:00:36	20	0.02	200
000:00:42	24	0.024	240
000:00:48	31	0.028	310
000:00:54	32	0.032	320
000:01:00	43	0.036	430
000:01:06	47	0.04	470
000:01:12	56	0.044	560
000:01:18	60	0.048	600
000:01:24	64	0.052	640
000:01:30	63	0.056	630
000:01:36	65	0.06	650
000:01:42	66	0.064	660
000:01:48	68	0.068	680
000:01:54	70	0.072	700
000:02:00	79	0.076	790
000:02:06	83	0.08	830
000:02:12	89	0.084	890
000:02:18	92	0.088	920
000:02:24	95	0.092	950
000:02:36	97	0.096	970
000:02:48	96	0.104	960
000:03:00	95	0.112	950
000:03:12	93	0.12	930
000:03:24	92	0.128	920
000:03:36	90	0.136	900
000:03:48	89	0.144	890
000:04:00	88	0.152	880
000:04:12	86	0.16	860
000:04:24	85	0.168	850
000:04:36	84	0.176	840
000:04:48	83	0.184	830
000:05:00	82	0.192	820
000:05:12	81	0.2	810
000:05:24	81	0.208	810
000:05:36	80	0.216	800
000:05:48	79	0.224	790
000:06:00	78	0.232	780
000:06:12	78	0.24	780
000:06:24	77	0.248	770
000:06:36	77	0.256	770
000:06:48	77	0.264	770
000:07:00	76	0.272	760
000:07:12	76	0.28	760
000:07:24	76	0.288	760
000:07:44	76	0.30133	760
000:08:04	75	0.31466	750
000:08:24	75	0.32799	750
000:08:44	75	0.34132	750
000:09:04	74	0.35465	740
000:09:24	74	0.36798	740
000:09:44	72	0.38131	720
000:10:04	72	0.39464	720
000:10:24	72	0.40797	720
000:10:44	72	0.4213	720
000:11:04	72	0.43463	720
000:11:24	72	0.44796	720
000:11:44	72	0.46129	720
000:12:04	72	0.47462	720
000:12:24	71	0.48795	710
000:12:44	71	0.50128	710
000:13:04	71	0.51461	710
000:13:24	71	0.52794	710
000:13:44	71	0.54127	710
000:14:04	71	0.5546	710
000:14:24	71	0.56793	710
000:14:44	71	0.58126	710
000:15:04	71	0.59459	710
000:15:24	71	0.60792	710
000:15:44	70	0.62125	700
000:16:04	70	0.63458	700
000:16:24	69	0.64791	690
000:16:44	69	0.66124	690
000:17:04	69	0.67457	690
000:17:24	69	0.6879	690
000:17:54	69	0.7079	690
000:18:24	69	0.7279	690

FILE NAME: TEST-5B.TXT
TEST NAME: 1377A2
START DATE 06/27/96 15:15

CHANNEL 1 TRANSDUCER TYPE: Travel
TRANSDUCE 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCE 0 - 4.000 In

	COUNTS	INTERVAL:
	======	=========
TIME PROFIL	25	000:00:06
	25	000:00:12
	25	000:00:20
	25	000:00:30
	25	000:00:40

RUN TIME	CHANNEL 1	CHANNEL 3	
000:00:00	0	0	0
000:00:06	2	0	20
000:00:12	2	0	20
000:00:18	4	0	40
000:00:24	10	0.001	100
000:00:30	15	0.001	150
000:00:36	25	0.002	250
000:00:42	27	0.002	270
000:00:48	34	0.003	340
000:00:54	42	0.005	420
000:01:00	54	0.006	540
000:01:06	60	0.007	600
000:01:12	72	0.01	720
000:01:18	77	0.012	770
000:01:24	87	0.015	870
000:01:30	91	0.017	910
000:01:36	99	0.021	990
000:01:42	100	0.023	1000
000:01:48	113	0.026	1130
000:01:54	119	0.027	1190
000:02:00	131	0.031	1310
000:02:06	138	0.032	1380
000:02:12	150	0.037	1500
000:02:18	155	0.039	1550
000:02:24	164	0.043	1640
000:02:36	177	0.048	1770
000:02:48	190	0.055	1900
000:03:00	201	0.061	2010
000:03:12	210	0.069	2100
000:03:24	220	0.075	2200
000:03:36	227	0.084	2270
000:03:48	230	0.089	2300
000:04:00	229	0.099	2290
000:04:12	226	0.107	2260
000:04:24	221	0.116	2210
000:04:36	216	0.124	2160
000:04:48	212	0.132	2120
000:05:00	209	0.14	2090
000:05:12	206	0.149	2060
000:05:24	203	0.157	2030
000:05:36	200	0.165	2000
000:05:48	198	0.174	1980
000:06:00	196	0.182	1960
000:06:12	194	0.19	1940
000:06:24	192	0.199	1920
000:06:36	190	0.207	1900
000:06:48	189	0.215	1890
000:07:00	187	0.224	1870
000:07:12	185	0.231	1850
000:07:24	184	0.24	1840
000:07:44	182	0.254	1820
000:08:04	180	0.267	1800
000:08:24	178	0.281	1780
000:08:44	176	0.293	1760
000:09:04	174	0.307	1740
000:09:24	172	0.32	1720
000:09:44	171	0.334	1710
000:10:04	170	0.345	1700
000:10:24	168	0.359	1680
000:10:44	167	0.373	1670
000:11:04	165	0.386	1650
000:11:24	164	0.4	1640
000:11:44	163	0.413	1630
000:12:04	162	0.427	1620
000:12:24	161	0.438	1610
000:12:44	160	0.453	1600
000:13:04	159	0.467	1590
000:13:24	159	0.481	1590
000:13:44	157	0.494	1570
000:14:04	157	0.508	1570
000:14:24	156	0.521	1560
000:14:44	155	0.535	1550
000:15:04	154	0.548	1540
000:15:24	154	0.56	1540
000:15:44	153	0.574	1530
000:16:14	151	0.594	1510
000:16:44	150	0.616	1500
000:17:14	150	0.635	1500
000:17:44	148	0.657	1480
000:18:14	147	0.675	1470
000:18:44	147	0.697	1470
000:19:14	146	0.716	1460

FILE NAME: TEST-5C.TXT
TEST NAME: 1377A3
START DATE 06/28/96 12:22

CHANNEL 1 TRANSDUCER TYPE: Travel
TRANSDUCE 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCE 0 - 4.000 In

	COUNTS	INTERVAL:
	======	=========
TIME PROFIL	25	000:00:06
	25	000:00:12
	25	000:00:20
	30	000:00:30
	35	000:00:40

RUN TIME	CHANNEL 1	CHANNEL 3	
000:00:00	0	0	0
000:00:06	1	0.001	10
000:00:12	1	0	10
000:00:18	3	0.001	30
000:00:24	5	0.001	50
000:00:30	10	0	100
000:00:36	13	0	130
000:00:42	24	0.001	240
000:00:48	30	0.001	300
000:00:54	36	0.001	360
000:01:00	45	0.001	450
000:01:06	56	0.003	560
000:01:12	68	0.003	680
000:01:18	84	0.005	840
000:01:24	95	0.005	950
000:01:30	112	0.008	1120
000:01:36	120	0.008	1200
000:01:42	137	0.011	1370
000:01:48	146	0.013	1460
000:01:54	163	0.015	1630
000:02:00	171	0.017	1710
000:02:06	187	0.02	1870
000:02:12	192	0.021	1920
000:02:18	212	0.025	2120
000:02:24	217	0.026	2170
000:02:36	227	0.033	2270
000:02:48	224	0.043	2240
000:03:00	231	0.049	2310
000:03:12	266	0.054	2660
000:03:24	297	0.06	2970
000:03:36	321	0.066	3210
000:03:48	343	0.071	3430
000:04:00	362	0.078	3620
000:04:12	381	0.084	3810
000:04:24	399	0.092	3990
000:04:36	414	0.099	4140
000:04:48	428	0.106	4280
000:05:00	440	0.112	4400
000:05:12	453	0.118	4530
000:05:24	464	0.126	4640
000:05:36	471	0.134	4710
000:05:48	472	0.141	4720
000:06:00	464	0.15	4640
000:06:12	453	0.16	4530
000:06:24	441	0.169	4410
000:06:36	431	0.176	4310
000:06:48	421	0.186	4210
000:07:00	413	0.194	4130
000:07:12	405	0.203	4050
000:07:24	399	0.211	3990
000:07:44	388	0.225	3880
000:08:04	379	0.24	3790
000:08:24	372	0.253	3720
000:08:44	365	0.266	3650
000:09:04	360	0.279	3600
000:09:24	355	0.294	3550
000:09:44	351	0.307	3510
000:10:04	347	0.32	3470
000:10:24	344	0.334	3440
000:10:44	340	0.347	3400
000:11:04	337	0.361	3370
000:11:24	334	0.374	3340
000:11:44	331	0.387	3310
000:12:04	328	0.399	3280
000:12:24	325	0.414	3250
000:12:44	323	0.428	3230
000:13:04	321	0.441	3210
000:13:24	318	0.455	3180
000:13:44	317	0.469	3170
000:14:04	316	0.482	3160
000:14:24	315	0.494	3150
000:14:44	313	0.508	3130
000:15:04	312	0.521	3120
000:15:24	311	0.536	3110
000:15:44	309	0.549	3090
000:16:14	307	0.571	3070
000:16:44	306	0.59	3060
000:17:14	304	0.612	3040
000:17:44	303	0.631	3030
000:18:14	302	0.652	3020
000:18:44	300	0.67	3000
000:19:14	297	0.693	2970

FILE NAME: TEST-5D.TXT
TEST NAME: 1377A4
START DATE 06/28/96 15:20

CHANNEL 1 TRANSDUCER TYPE: Travel
TRANSDUCE 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel
TRANSDUCE 0 - 4.000 In

	COUNTS	INTERVAL:
	======	=========
TIME PROFIL	25	000:00:06
	25	000:00:12
	30	000:00:20
	35	000:00:30
	40	000:00:40

RUN TIME	CHANNEL 1	CHANNEL 3	
000:00:00	-1	0	-10
000:00:06	5	0	50
000:00:12	19	0.001	190
000:00:18	26	0.001	260
000:00:24	46	0.002	460
000:00:30	54	0.003	540
000:00:36	74	0.004	740
000:00:42	84	0.005	840
000:00:48	106	0.007	1060
000:00:54	115	0.007	1150
000:01:00	137	0.01	1370
000:01:06	151	0.01	1510
000:01:12	175	0.013	1750
000:01:18	187	0.015	1870
000:01:24	214	0.018	2140
000:01:30	223	0.019	2230
000:01:36	248	0.022	2480
000:01:42	258	0.024	2580
000:01:48	280	0.028	2800
000:01:54	293	0.03	2930
000:02:00	308	0.033	3080
000:02:06	324	0.035	3240
000:02:12	343	0.038	3430
000:02:18	356	0.041	3560
000:02:24	378	0.045	3780
000:02:36	408	0.051	4080
000:02:48	437	0.057	4370
000:03:00	466	0.063	4660
000:03:12	492	0.069	4920
000:03:24	515	0.076	5150
000:03:36	537	0.082	5370
000:03:48	553	0.089	5530
000:04:00	568	0.096	5680
000:04:12	587	0.102	5870
000:04:24	605	0.109	6050
000:04:36	622	0.115	6220
000:04:48	637	0.121	6370
000:05:00	646	0.13	6460
000:05:12	652	0.137	6520
000:05:24	642	0.145	6420
000:05:36	627	0.155	6270
000:05:48	610	0.162	6100
000:06:00	591	0.173	5910
000:06:12	569	0.182	5690
000:06:24	546	0.191	5460
000:06:36	529	0.201	5290
000:06:48	513	0.21	5130
000:07:00	500	0.219	5000
000:07:12	488	0.228	4880
000:07:24	478	0.237	4780
000:07:44	464	0.252	4640
000:08:04	451	0.266	4510
000:08:24	439	0.28	4390
000:08:44	429	0.293	4290
000:09:04	421	0.306	4210
000:09:24	414	0.319	4140
000:09:44	409	0.333	4090
000:10:04	404	0.347	4040
000:10:24	399	0.36	3990
000:10:44	395	0.372	3950
000:11:04	393	0.386	3930
000:11:24	390	0.4	3900
000:11:44	388	0.414	3880
000:12:04	385	0.427	3850
000:12:24	382	0.442	3820
000:12:44	381	0.455	3810
000:13:04	379	0.469	3790
000:13:24	378	0.481	3780
000:13:44	375	0.495	3750
000:14:04	373	0.509	3730
000:14:24	371	0.522	3710
000:14:44	369	0.535	3690
000:15:04	367	0.549	3670
000:15:24	364	0.563	3640
000:15:44	363	0.576	3630
000:16:04	362	0.589	3620
000:16:24	360	0.603	3600
000:16:44	359	0.617	3590
000:17:04	357	0.63	3570
000:17:24	355	0.644	3550
000:17:54	354	0.664	3540
000:18:24	352	0.685	3520

FILE NAME: TEST-5A2.TXT
TEST NAME: 1377A5
START DATE: 07/01/96 10:38

CHANNEL 1 TRANSDUCER TYPE: Travel TRANSDUCER 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel TRANSDUCER 0 - 4.000 In

	COUNTS	INTERVAL:
	======	=========
TIME PROFILE	25	000:00:06
	25	000:00:12
	30	000:00:20
	35	000:00:30
	40	000:00:40

RUN TIME	CHANNEL 1	CHANNEL 3	
000:18:54	69	0.7479	690
000:19:24	69	0.7679	690
000:19:54	69	0.7879	690
000:20:24	68	0.8079	680
000:20:54	68	0.8279	680
000:21:24	68	0.8479	680
000:21:54	67	0.8679	670
000:22:24	67	0.8879	670
000:22:54	66	0.9079	660
000:23:24	66	0.9279	660
000:23:54	66	0.9479	660
000:24:24	66	0.9679	660
000:24:54	66	0.9879	660
000:25:24	66	1.0079	660
000:25:54	66	1.0279	660
000:26:24	66	1.0479	660
000:26:54	66	1.0679	660
000:27:24	66	1.0879	660
000:27:54	65	1.1079	650
000:28:24	65	1.1279	650
000:28:54	65	1.1479	650
000:29:24	65	1.1679	650
000:29:54	64	1.1879	640
000:30:24	64	1.2079	640
000:30:54	64	1.2279	640
000:31:24	64	1.2479	640
000:31:54	64	1.2679	640
000:32:24	63	1.2879	630
000:32:54	63	1.3079	630
000:33:24	64	1.3279	640
000:33:54	64	1.3479	640
000:34:24	64	1.3679	640
000:34:54	64	1.3879	640

FILE NAME: TEST-5B.TXT
TEST NAME: 1377A2
START DATE 06/27/96 15:15

CHANNEL 1 TRANSDUCER TYPE: Travel TRANSDUCE 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel TRANSDUCE 0 - 4.000 In

	COUNTS	INTERVAL:
	======	=========
TIME PROFIL	25	000:00:06
	25	000:00:12
	25	000:00:20
	25	000:00:30
	25	000:00:40

RUN TIME	CHANNEL 1	CHANNEL 3	
000:19:44	145	0.737	1450
000:20:14	144	0.756	1440
000:20:44	143	0.778	1430
000:21:14	143	0.795	1430
000:21:44	142	0.818	1420
000:22:14	142	0.837	1420
000:22:44	141	0.858	1410
000:23:14	141	0.878	1410
000:23:44	140	0.899	1400
000:24:14	139	0.917	1390
000:24:44	139	0.938	1390
000:25:14	138	0.957	1380
000:25:44	137	0.978	1370
000:26:14	137	0.997	1370
000:26:44	136	1.018	1360
000:27:14	136	1.036	1360
000:27:44	136	1.057	1360
000:28:14	136	1.075	1360
000:28:54	134	1.102	1340
000:29:34	134	1.128	1340
000:30:14	133	1.155	1330
000:30:54	134	1.181	1340
000:31:34	133	1.209	1330
000:32:14	133	1.236	1330
000:32:54	132	1.263	1320
000:33:34	132	1.29	1320
000:34:14	132	1.318	1320
000:34:54	132	1.344	1320
000:35:34	131	1.372	1310
000:36:14	130	1.399	1300
000:36:54	130	1.427	1300
000:37:34	129	1.454	1290
000:38:14	129	1.481	1290
000:38:54	129	1.506	1290
000:39:34	128	1.535	1280
000:40:14	128	1.561	1280
000:40:54	128	1.587	1280
000:41:34	127	1.615	1270
000:42:14	127	1.641	1270
000:42:54	127	1.667	1270
000:43:34	127	1.694	1270
000:44:14	126	1.718	1260
000:44:54	126	1.745	1260

FILE NAME: TEST-5C.TXT
TEST NAME: 1377A3
START DATE 06/28/96 12:22

CHANNEL 1 TRANSDUCER TYPE: Travel TRANSDUCE 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel TRANSDUCE 0 - 4.000 In

	COUNTS	INTERVAL:
	======	=========
TIME PROFIL	25	000:00:06
	25	000:00:12
	25	000:00:20
	30	000:00:30
	35	000:00:40

RUN TIME	CHANNEL 1	CHANNEL 3	
000:19:44	295	0.711	2950
000:20:14	294	0.733	2940
000:20:44	293	0.751	2930
000:21:14	292	0.772	2920
000:21:44	291	0.79	2910
000:22:14	291	0.812	2910
000:22:44	289	0.832	2890
000:23:14	289	0.852	2890
000:23:44	288	0.871	2880
000:24:14	288	0.892	2880
000:24:44	288	0.908	2880
000:25:14	287	0.93	2870
000:25:44	286	0.949	2860
000:26:14	286	0.969	2860
000:26:44	287	0.987	2870
000:27:14	287	1.007	2870
000:27:44	286	1.026	2860
000:28:14	286	1.047	2860
000:28:44	284	1.065	2840
000:29:14	283	1.086	2830
000:29:44	283	1.103	2830
000:30:14	282	1.124	2820
000:30:44	281	1.142	2810
000:31:24	280	1.167	2800
000:32:04	279	1.195	2790
000:32:44	279	1.223	2790
000:33:24	278	1.25	2780
000:34:04	277	1.277	2770
000:34:44	277	1.303	2770
000:35:24	276	1.331	2760
000:36:04	277	1.358	2770
000:36:44	277	1.385	2770
000:37:24	277	1.412	2770
000:38:04	276	1.439	2760
000:38:44	277	1.467	2770
000:39:24	277	1.493	2770
000:40:04	278	1.52	2780
000:40:44	279	1.547	2790
000:41:24	279	1.574	2790
000:42:04	279	1.601	2790
000:42:44	276	1.628	2760
000:43:24	274	1.655	2740
000:44:04	272	1.682	2720
000:44:44	270	1.706	2700
000:45:24	268	1.735	2680
000:46:04	268	1.762	2680
000:46:44	266	1.788	2660
000:47:24	267	1.815	2670
000:48:04	265	1.842	2650
000:48:44	265	1.868	2650
000:49:24	263	1.894	2630
000:50:04	263	1.921	2630
000:50:44	262	1.947	2620
000:51:24	262	1.977	2620
000:52:04	262	2.004	2620
000:52:44	262	2.032	2620
000:53:24	262	2.06	2620
000:54:04	262	2.088	2620

FILE NAME: TEST-5D.TXT
TEST NAME: 1377A4
START DATE 06/28/96 15:20

CHANNEL 1 TRANSDUCER TYPE: Travel TRANSDUCE 0 - 4.000 In

CHANNEL 3 TRANSDUCER TYPE: Travel TRANSDUCE 0 - 4.000 In

	COUNTS	INTERVAL:
	======	=========
TIME PROFIL	25	000:00:06
	25	000:00:12
	30	000:00:20
	35	000:00:30
	40	000:00:40

RUN TIME	CHANNEL 1	CHANNEL 3	
000:18:54	350	0.703	3500
000:19:24	350	0.725	3500
000:19:54	348	0.743	3480
000:20:24	347	0.764	3470
000:20:54	346	0.783	3460
000:21:24	345	0.804	3450
000:21:54	344	0.823	3440
000:22:24	343	0.845	3430
000:22:54	342	0.862	3420
000:23:24	341	0.884	3410
000:23:54	340	0.902	3400
000:24:24	339	0.923	3390
000:24:54	338	0.941	3380
000:25:24	337	0.961	3370
000:25:54	337	0.979	3370
000:26:24	336	1.001	3360
000:26:54	335	1.019	3350
000:27:24	334	1.04	3340
000:27:54	334	1.059	3340
000:28:24	333	1.08	3330
000:28:54	331	1.097	3310
000:29:24	330	1.117	3300
000:29:54	328	1.136	3280
000:30:24	327	1.157	3270
000:30:54	326	1.175	3260
000:31:24	326	1.196	3260
000:31:54	325	1.216	3250
000:32:24	324	1.238	3240
000:32:54	323	1.257	3230
000:33:24	323	1.278	3230
000:33:54	322	1.298	3220
000:34:24	321	1.319	3210
000:34:54	321	1.339	3210
000:35:34	320	1.365	3200
000:36:14	320	1.393	3200
000:36:54	320	1.421	3200
000:37:34	320	1.449	3200
000:38:14	320	1.475	3200
000:38:54	320	1.502	3200
000:39:34	320	1.529	3200
000:40:14	319	1.556	3190
000:40:54	319	1.583	3190
000:41:34	319	1.61	3190
000:42:14	319	1.637	3190
000:42:54	320	1.664	3200
000:43:34	321	1.69	3210
000:44:14	321	1.716	3210
000:44:54	322	1.742	3220
000:45:34	323	1.768	3230
000:46:14	324	1.794	3240
000:46:54	325	1.822	3250
000:47:34	327	1.848	3270
000:48:14	328	1.874	3280
000:48:54	328	1.897	3280
000:49:34	328	1.925	3280
000:50:14	329	1.951	3290
000:50:54	328	1.979	3280
000:51:34	328	2.005	3280
000:52:14	329	2.033	3290
000:52:54	331	2.06	3310
000:53:34	331	2.087	3310
000:54:14	326	2.114	3260
000:54:54	325	2.139	3250
000:55:34	326	2.166	3260
000:56:14	324	2.194	3240
000:56:54	325	2.221	3250
000:57:34	325	2.247	3250
000:58:14	324	2.273	3240
000:58:54	322	2.3	3220
000:59:34	322	2.325	3220
001:00:14	322	2.351	3220
001:00:54	322	2.378	3220
001:01:34	321	2.404	3210

Knight Piésold Ltd.
CONSULTING ENGINEERS

APPENDIX B3

AGRA CONCRETE AGGREGATE REPORT

AGRA
Earth & Environmental

AGRA Earth &
Environmental Limited
2227 Douglas Road
Burnaby, B.C.
Canada V5C 5A9
Tel. (604) 294-3811
Fax (604) 294-4664

April 23, 1996

Our Reference: VA03715
Your Reference: 1784.03

Knight Piésold Limited
Suite 1400 - 750 West Pender Street
VANCOUVER, B.C.
V6C 2T8

ATTENTION: Mr. Les Galbraith

Dear Sir:

RE: Concrete Aggregate Assessment
Carmacks Copper Project
William's Creek, Yukon

1.0 INTRODUCTION

AGRA Earth & Environmental Limited (AEE) has conducted an assessment of a sample of proposed concrete aggregate, sampled and supplied by you, and understood to have originated from the William's Creek area of the Yukon.

This letter reports of the results of the evaluation conducted to date.

2.0 PROGRAM OF EVALUATION

The samples received were contained in two 5-gallon plastic pails, and were combined to form one composite sample. The sample consisted of a pit run sand and gravel.

The evaluations consisted of the following:

1. Sieve Analysis (CSA A23.2-2A)
2. Organic Impurities (CSA A23.2-7A)
3. Petrographic Examination (ASTM C-295)
4. Relative Density & Absorption (CSA A23.2-6A, 12A)

Detailed Technical Reports providing all test results are appended to this letter. In the sections which follow, the test results are briefly noted and their significance discussed.

2.1 SIEVE ANALYSIS

The appended Sieve Analysis Report indicates a moderately well-graded sand and gravel material consisting of roughly equivalent amounts of sand and gravel (e.g., 52.3% sand: 47.7% gravel). The maximum gravel size noted passed the 100 mm (4") screen. The sand fraction, however, contained an excessive amount of coarse sand with comparatively little medium to fine sand (e.g., minus 1 mm, plus 75 μm), resulting in a Fineness Modulus (F.M.) value of 3.58. The recommended range for F.M. for concrete sands in CSA A23.1-M94 is 2.2 - 3.1. The silt content for the sand fraction was 1.5% by mass, which is acceptable.

2.2 ORGANIC IMPURITIES

The Organic Impurities value measured for a representative sample of the fine aggregate was '0', which is acceptable.

2.3 PETROGRAPHIC EXAMINATION

The coarse aggregate fractions of the sample were split on the 20 mm screen for separate Petrographic Examination in accordance with ASTM C-295. In addition, Petrographic Numbers were derived for each fraction (i.e., +20 mm sizes, and 20 mm x 5 mm sizes).

2.3.1 General

The coarse aggregate samples were coated with a significant amount of brown silt and fine sand. Most of this material was removed with wash water, except for minor amounts of well-adhering silt/clay on some aggregate particles. There were fairly heavy coatings of calcite on some aggregate particles. The calcite was well adhering, and could typically only be dislodged from the particle's surface by plucking or impact.

The particle geometry was generally isometric to slightly flattened shapes, with only a few flat particles. ("Flat" particles are usually defined by a width-to-thickness ratio greater than 3:1.)

2.3.2 Geologic Composition

The sample was composed of an array of rock types, including volcanic and granitic rocks, quartzite, sandstone, siltstone, undifferentiated metamorphic rocks, fine-grained metasedimentary rocks, chert and limestone. There was some variation within these generic rock types, in terms of texture, mineralogy, alteration, metamorphism and weathering. Thin-section analyses would be required in order to provide detailed descriptions for ceratin of the rock types present in the sample.

Several of the rock types in the sample would be classified as "potentially alkali-reactive" when used in concrete. A review of the conditions to which concrete made from this aggregate would be subjected, as well as other pertinent project data, would be necessary in order to assess whether Alkali-Aggregate Reaction (AAR) would be a concern for the purposes of the Carmacks project.

2.3.3 Physical Quality

In addition to the classification of the aggregate on the basis of geologic composition, the aggregate sample was also subdivided on the basis of physical qualities, such as strength, porosity, absorption and weathering. The sample was thus sorted into "Good", "Fair" and "Poor" categories. Each of these physical quality classes was assigned a multiplier (e.g., '1', '3' and '6' respectively), as a basis for calculation of a Petrographic Number (PN). The PNs derived for these coarse aggregate samples were as follows:

SAMPLE FRACTION	PN	QUALITY RATING
+20 mm	146	Good/Fair
20 x 5 mm	195	Poor

The PN of 146 for the +20 mm fraction indicates that this size fraction possesses better quality than the finer, 20 x 5 mm fraction of the sample. It is typical for coarser aggregate fractions to have lower PNs than the corresponding finer aggregate sizes. Overall, however, the PN of 195 is considered to be a more accurate indication of the Petrographic character of the coarse aggregate sample.

Review of the PNs indicates that the subject aggregates would be of marginal quality for concrete production purposes.

2.3.4 Relative Density and Absorption

The relative density values for the fine and coarse aggregates were 2.553 and 2.504 respectively. The absorption values for the samples were 2.06% and 2.62% respectively. The relative density values are lower than typical values for good quality concrete aggregate of this geological makeup. The absorption values are somewhat high, and also reflect the inferior physical quality of the aggregate.

3.0 DISCUSSION AND RECOMMENDATIONS

Taken together, the excessively coarse gradation of the fine aggregate, the high absorption values and the high PNs all point towards an inferior quality aggregate for concrete production. AEE recommend rejection of this aggregate source on the basis of the Petrographic data alone, and recommend that other possibilities for concrete aggregate be explored prior to any further evaluation of this aggregate source.

However, we also note the following:

1. The samples examined were "as-is", pit run aggregate. In processing the aggregate using standard production procedures such as screening, washing and crushing, it may be possible to beneficiate the material sufficiently so that the resulting aggregate is of acceptable quality for use in concrete. One way to check this potential would be to run a few truckloads' pit run through an aggregate processing plant, and then evaluate the processed aggregate using the same evaluation methodology as reported in this letter.

2. If the Carmacks project has a limited service life, and if no other aggregate sources are available within economic proximity to the project, then the use of a "sub-standard" aggregate, such as this, might be acceptable to the owners. The use of these aggregates would, however, likely require an allowance for higher-than-normal concrete maintenance costs for the duration of the project.

If further evaluation of the aggregate is considered, then it is recommended that the following be done, in addition to assessment of a sample of processed material as noted above:

- Sulphate Soundness (CSA A23.2-9A)
- Los Angeles Abrasion (CSA A23.2-16A, 17A)

Conducting these physical-durability tests should provide useful additional information to supplement that which has been presented in this report.

Finally, it is recommended that the project requirements be reviewed in the light of AAR durability concerns, if this aggregate supply is to be used for concrete production at the Carmacks project.

4.0 CLOSURE

We trust that the information contained in this report suits your present requirements. Should you have any questions, or if we can be of further service, please call.

Yours truly,

AGRA EARTH & ENVIRONMENTAL LIMITED

April 23, 1996

PROFESSIONAL
PROVINCE OF
F. H. SHRIMER
BRITISH COLUMBIA
GEOSCIENTIST

Per: Reviewed By:

Fred H. Shrimer, P. Geo.
Project Geologist

D. R. Morgan, Ph. D, P. Eng.
Chief Materials Engineer

AGRA
Earth & Environmental

AGRA Earth &
Environmental Limited
2227 Douglas Road
Burnaby, B.C.
Canada V5C 5A9
Tel. (604) 294-3811
Fax (604) 294-4664

TECHNICAL REPORT

Knight Piésold Ltd.
Suite 1400 - 750 West Pender Street
VANCOUVER, B.C.
V6C 2T8

PROJECT: VA03715
DATE: March 20 1996
YOUR REFERENCE: 6/0854

ATTENTION: Dr. Bruce Brown, P. Eng.

PROJECT: **Carmacks Copper Project, Concrete Aggregate Assessment**
SUBJECT: **Petrographic Examination (ASTM C-295)**

Sample: Pit Run, +20 mm fraction **Source:** William's Creek, Yukon

ROCK TYPES/ QUALITY	PERCENT BY MASS	CONTRIBUTION TO PETROGRAPHIC NUMBER
Good *(PN Multiplier: 1)*		
Volcanic Rocks	34.5	34.5
Granite	16.3	16.3
Quartzite	13.2	13.2
Metamorphic Rocks (Undifferentiated)	0.9	0.9
Sandstone/Metasandstone	10.4	10.4
Fine-grained Metasediments (Argilllite)	1.4	1.4
Chert	0.3	0.3
Limestone	3.9	3.9
subtotal	*80.9*	*80.9*
Fair *(PN Multiplier: 3)*		
Volcanic Rocks	3.8	11.4
Granite	6.4	19.2
Quartzite	4.1	12.3
Sandstone	0.3	0.9
Chert	0.4	1.2
Siltstone	1.4	4.2
subtotal	*16.4*	*49.2*
Poor *(PN Multiplier: 6)*		
Volcanic Rocks	0.7	4.2
Granite	2.0	12.0
subtotal	*2.7*	*16.2*
TOTALS	**100.0%**	**PN = 146**

NOTES: 1. The PN is not related to the potential for Alkali-Aggregate Reactivity (AAR) of this aggregate. Potential for AAR must be separately evaluated.

CERTIFIED BY:
F. Shrimer, P. Geo.

PROFESSIONAL PROVINCE OF F. H. SHRIMER BRITISH COLUMBIA GEOSCIENTIST

CEBC MEMBER

Engineering & Environmental Services

AGRA
Earth & Environmental

AGRA Earth &
Environmental Limited
2227 Douglas Road
Burnaby, B.C.
Canada V5C 5A9
Tel. (604) 294-3811
Fax (604) 294-4664

TECHNICAL REPORT

Knight Piésold Ltd.
Suite 1400 - 750 West Pender Street
VANCOUVER, B.C.
V6C 2T8

PROJECT: VA03715
DATE: March 20 1996
YOUR REFERENCE: 6/0854

ATTENTION: Dr. Bruce Brown, P. Eng.

PROJECT: **Carmacks Copper Project, Concrete Aggregate Assessment**
SUBJECT: **Petrographic Examination (ASTM C-295)**

Sample: Pit Run, 20 x 5 mm fraction **Source:** William's Creek, Yukon

ROCK TYPES/ QUALITY	PERCENT BY MASS	CONTRIBUTION TO PETROGRAPHIC NUMBER
Good *(PN Multiplier: 1)*		
Volcanic Rocks	27.2	27.2
Granite	14.0	14.0
Quartzite	11.8	11.8
Metamorphic Rocks (Undifferentiated)	0.8	0.8
Sandstone/Metasandstone	3.7	3.7
Fine-grained Metasediments (Argilllite)	3.1	3.1
Chert	4.1	4.1
Limestone	2.0	2.0
subtotal	*66.7*	*66.7*
Fair *(PN Multiplier: 3)*		
Volcanic Rocks	6.1	18.3
Granite	6.4	19.2
Quartzite	4.3	12.9
Metamorphic Rocks (Undifferentiated)	0.2	0.6
Sandstone	2.4	7.2
Fine-grained Metasediments	2.7	8.1
Chert	0.3	0.9
Limestone	1.5	4.5
subtotal	*23.9*	*71.7*
Poor *(PN Multiplier: 6)*		
Volcanic Rocks	1.8	10.8
Granite	5.1	30.6
Sandstone	1.0	6.0
Metasediments	1.5	9.0
subtotal	*9.4*	*56.4*
TOTALS	**100.0%**	**PN = 195**

NOTES: 1. The PN is not related to the potential for Alkali-Aggregate Reactivity (AAR) of this aggregate. Potential for AAR must be separately evaluated.

CERTIFIED BY: F. Shrimer, P. Geo.

PROFESSIONAL PROVINCE OF F. H. SHRIMER BRITISH COLUMBIA GEOSCIENTIST

Engineering & Environmental Services

CEBC MEMBER

AGRA
Earth & Environmental

AGRA Earth &
Environmental Limited
2227 Douglas Road
Burnaby. B.C.
Canada V5C 5A9
Tel. (604) 294-3811
Fax (604) 294-4664

TECHNICAL REPORT

Knight Piésold Ltd.
Suite 1400 - 750 West Pender Street
VANCOUVER, B.C.
V6C 2T8

PROJECT: VA03715
DATE: March 21 1996
YOUR REFERENCE: 6/0854

ATTENTION: Dr. Bruce Brown, P. Eng.

PROJECT: **Carmacks Copper Project, Concrete Aggregate Assessment**
SUBJECT: **Relative Density & Absorption of Aggregate (CSA A23.2-6A, 12A)**

Sample: Pit run aggregate **Source:** William's Creek, Yukon

AGGREGATE	BULK RELATIVE DENSITY	BULK RELATIVE DENSITY (SSD BASIS)	ABSORPTION (%)
Coarse	2.709	2.504	2.62
Fine	2.605	2.553	2.06

NOTES: 1. Average result of two runs for each sample reported here.

CERTIFIED BY:
F. Shrimer, P. Geo.

PROFESSIONAL
PROVINCE OF
F. H. SHRIMER
BRITISH COLUMBIA
GEOSCIENTIST

Disk FS-44:\3715sgab.rpt