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HAT CREEK PROJECT

REPORT ON 1981 SITE INVESTIGATIONS FOR HAT AND FINNEY CREEK DIVERSION AND ACCESS ROAD

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REPORT ON 1981 SITE INVESTIGATIONS FOR HAT AND FINNEY CREEK DIVERSION AND ACCESS ROAD

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SYNOPSIS

Development of the Hat Creek coal resources for a thermal powerplant would require the diversion of Hat and Finney creeks around the area of the proposed open pit mine and the provision of an access road from existing highways to the proposed powerplant site.

The 1981 site investigation program for the above diversion and powerplant access road, consisted of 22 drill holes (650 m overburden drilling), about 170 test pits and geological mapping.

Samples of overburden material were taken and tested in a commercial laboratory. An inclinometer and piezometers were installed in some drill holes.

Information obtained in 1981 in general confirmed the design assumptions used in the 1978 preliminary design of the diversion works and powerplant access road and provided additional geotechnical information for final design.

The 1981 exploration provided additional information on foundation conditions for the canal, headworks dam and pitrim dam.

Three foundation units: lower glaciofluvial sediments, middle impervions till and upper alluvial gravels were defined at headworks dam area. The existence of claystone bedrock with a bentonitic material along the right abutment upstream and downstream of the headworks dam places a weak seam in this slope and downhill creep could affect the proposed canal. A pervious gravel layer at the left abutment of the headworks dam and right abutment of the pitrim dam was also identified, which could affect underdam seepage.

At Ambusten Creek crossing an old channel infilled with about 5 m of alluvial gravels overlain by dense till was identified by drilling data. The abutments at Medicine Creek crossing are dense tills while the valley floor is infilled with about 10 m of alluvial material. The proposed diversion discharge conduit would be founded on sandy gravel material; however, the proposed conduit outlet would be located on a gravel layer underlain by thick clay/silt material.

The proposed Finney Creek diversion canal would follow a gravelly slope. At the proposed junction of Finney Creek and the diversion canal some pervious zones would exist, where canal lining would likely be needed.

The proposed powerplant access road would cross a gravel terrace and then it would pass the southern edge of the proposed limestone quarry. It would then climb a steep rock slope to the upper plateau where the powerplant is to be located. The geological and soils data obtained from 1981 site investigation will provide appropriate information to optimize the road alignment to the powerplant.

SECTION 1.0 - INTRODUCTION

B.C. Hydro is studying a proposed coal-fired thermal generating station at Hat Creek valley near Ashcroft, B.C. Prior to starting open pit coal mine work, Hat Creek would have to be diverted around the rim of the proposed open pit mine (Fig. 1-1).

Geotechnical exploration for the diversion works as well as the powerplant access road were carried out in 1981. The diversion works would consist of a 16 m high headworks dam to divert Hat Creek flow into a 9 km long canal-conduit to bypass the coal mine. A secondary pitrim dam, about 15 m high, would collect surface and seepage water from areas downstream of the headworks and would divert these flows into the canal. On the west side of the Hat Creek valley a small canal would be required to collect the water flowing in Finney Creek and its adjacent slope, which would conduct these flows into the headworks reservoir. Details of the diversion structures and their arrangement are described in B.C. Hydro Report No. 913, "Hat Creek Project, Diversion of Hat and Finney Creeks - Preliminary Design Report", dated March 1978.

The proposed powerplant access road would begin at Highway No. 12 near the north end of Hat Creek valley (Fig. 1-1). The access route would run along Harry Creek, then climb easterly towards the Trachyte Hills where the powerplant would be located. The access road route has been selected on the basis of terrain and access to the proposed coal blending area, mine camp and limestone quarry.

Under Assignment No. 480-140, dated 29 January 1981, the Hydroelectric Generation Projects Division (HGPD) was authorized to provide engineering services for a 1981 Site Investigations Program for the Hat and

Finney creek diversions and the powerplant access road. The assignment was later expanded to include preliminary study of a possible slide at the right bank of the headworks dam area (Appendix C).

The investigation requirements were outlined in Thermal Generation Projects Division (TGPD) "Hat Creek Project - Memorandum - Site Investigations Program 1981 - Powerplant, Off-site Facilities and Mine", dated 24 September 1980. The proposed program included geological mapping, drill hole and permeability testing, test pit sampling and laboratory testing.

This report presents the information obtained from the 1981 Site Investigation Program for the diversion works and the powerplant access road.

SECTION 2.0 - PRE-1981 EXPLORATIONS

2.1 FOUNDATION INVESTIGATIONS

Prior to 1977, about 350 holes were drilled for the exploration of the coal deposit and the design of the proposed open pit mine. Only about 17 holes were near the proposed Hat Creek diversion. Samples from these holes were tested in a commercial laboratory to provide some preliminary soils data.

During 1977 about 21 holes were drilled by Becker hammer rig at the headworks and the pitrim damsite, and along the Hat Creek and Finney Creek canal-conduit routes. Samples were taken at 1.5 to 3 m intervals and in situ permeability tests were carried out. In addition to the drill holes, 16 test pits were dug in the above diversion areas.

At the headworks damsite the 1977 drilling identified an unconformity between siltstone and volcanic rocks in the left abutment area. Also, this early exploration did not define bedrock at the right abutment of the pitrim damsite. Further, the discovery of a bentonitic material along the canal route near the south side of Medicine Creek indicated that further investigation by drilling and test pitting was needed to define the geological conditions in these areas.

In order to obtain more geotechnical information in these areas it was recommended in the Preliminary Design Report (Report No. 913) that the following investigations be carried out:

1. Drill holes and seismic surveys at the proposed Headworks Dam.

2. Drill holes and seismic surveys at the proposed Pitrim Dam.

3. Drill holes and test pits along the proposed Finney Creek canal.

4. Drill holes and seismic surveys at the proposed Ambusten and Medicine Creek crossings. A few test pits and occasional drill holes along the proposed conduit route.

5. Additional test pits and occasional drill holes along the proposed canal route.

2.2 CONSTRUCTION MATERIAL

Based on 1977 investigations, construction materials would be obtained from the following sources:

1. Canal and diversion excavations.

2. Mine pit surficial excavations.

3. Borrow areas.

Surficial exploration in 1977 indicated mine pit excavation would provide large quantities of suitable impervious till and sand and gravels for embankment construction. In the unlikely event that the quality and timing of mine overburden excavations are not suitable or available for diversion construction, three gravel borrow areas and four impervious till borrow areas were examined in 1977.

As an abundance of construction materials would be available from mine pit excavations or local borrow areas, no further construction material investigation was recommended in Report No. 913, and none was carried out during the 1981 geotechnical investigation.

SECTION 3.0 - 1981 GEOTECHNICAL INVESTIGATIONS

3.1 GENERAL

The 1981 exploration work commenced in May and was completed in September 1981. As outlined in Section 2.0, the objectives of this investigation were to obtain more surficial as well as bedrock geological information in the areas under study. It was also a part of this program to compile a summary of all exploration results for future reference.

3.2 DRILLING

The 1981 drilling consisted of 20 air return triconed rotary holes and two diamond rotary drill holes (Fig. 3-1). A Shram drill rig was used for exploration of overburden material. The 20 air rotary holes were located as follows:

1. Five at the proposed Headworks Damsite.

2. Four at the proposed Pitrim Damsite.

3. Two at the proposed Ambusten Creek crossing.

4. Three at the proposed Medicine Creek crossing.

5. Four along the proposed Hat Creek diversion conduit.

6. Two along the proposed Finney Creek diversion canal.

All these drill holes were triconed at least 5 m into bedrock except the four holes along the Hat Creek canal route and one hole near Finney Creek. The two diamond drill holes were located between headworks dam and Ambusten Creek where bentonitic material exists.

At the proposed Headworks and Pitrim damsites, nine holes were drilled to depths between 20 m and 42 m. They identified a pervious stratum of cobbles and boulders that were difficult to drill and they established the claystone bedrock profile along the dam axes. At Ambusten and Medicine Creek crossings five drill holes were drilled to depths between 32 m and 45 m, and penetrated hard till and/or dense gravel to bedrock. The four holes along the proposed Hat Creek conduit were drilled through dense sand and gravel layers and/or alluvial deposits to a depth up to 42 m.

All disturbed samples from the drilling were taken at 2 to 3 m intervals and Shelby tube samples were taken of the silt/clay materials encountered. In the embankment areas split spoon samples were taken and standard penetration tests made at about 5 m intervals.

In most holes permeability tests were made to provide information as to the porosity of the overburden materials. The calculated permeability coefficients are listed in Table 3-1. Upon completion, 14 standpipe and 2 pneumatic piezometers were installed. Their initial readings are shown in Table 3-2.

Graphic logs for the holes are included in Appendix A.

3.3 TEST PITS

A total of 173 test pits were dug by backhoes at the diversion structure sites as well as along the alignment of the proposed powerplant access road. Thirty-one pits were dug in the headworks area to obtain infor-

mation for the foundation design and for the analysis of potential seepage flow and impervious blanket designs. Similarly, 26 pits were dug in the area of the pitrim dam. Seventy-two test pits were completed along the canal route. These pits provided additional information on the bentonitic zones and sand and gravel zones.

The lower and upper thirds of the powerplant access road are located in relatively flat areas. Thirty-three test pits were dug to obtain information on the overburden in these sections of the proposed road. The middle hill area is steep and scattered with bedrock outcrops, therefore, no test pits were dug in this section. The upper section of the proposed powerplant access road would be along the edge of the upper plateau. Test pits were dug along this section to identify road foundation material and/or depth to bedrock.

Disturbed samples were taken from test pits and sent to a commercial laboratory for identification and classification.

Logs for the test pits are included in Appendix B.

3.4 GEOLOGICAL MAPPING

The 1981 geological mapping covered the diversion works as well as the powerplant access road. Prior to field work, available geological mapping in the area concerned was reviewed. Detailed re-examination of reservoir areas and abutments of the headworks and pitrim dam provided geological information for design of the control structures. The uphill side of the canal route between the Headworks Damsite and Ambusten Creek was mapped to obtain information on potential slope movement due to the underlying bentonitic material.

Geological mapping for the powerplant access road was carried out and all outcrops identified. Geological maps (Section 6.0) would provide data for future route selection and design of the access road.

SECTION 4.0 - SITE GEOLOGY

4.1 GENERAL

The upper Hat Creek valley is located within a large intermontane basin infilled with a thick sequence of volcanogenic and clastic sedimentary rocks of Tertiary age which contain the Hat Creek coal formation. The Tertiary rocks are underlain by and laterally in fault contact with eroded rocks of Permian to Pennsylvanian age consisting of volcanic rocks, limestone, chert and argillite of the Cache Creek Group.

During the Pleistocene epoch a complex series of glacial, glaciofluvial and glaciolacustrine sediments were deposited over the pre-existing rocks. The topography has since been altered by the deposition of alluvial fans, alluvial floodplains and by slope failures.

4.2 BEDROCK GEOLOGY

(a) Stratigraphy

The regional stratigraphy of the Hat Creek coal basin, as established by B.C. Hydro in "Hat Creek Coal Exploration Project - Assessment Report on Coal License Numbers 12, 144, 2753-2762, 3003-3004, 3009-3013", is briefly summarized in Table 4-1.

(b) Lithology and Engineering Characteristics

The oldest rock unit mapped in the area of investigation is the Greenstone unit of the Cache Creek Group. It consists of an intensely weathered, relatively weak sequence of chert and chert-pebble conglomerate overlain by an intensely sheared, soft, friable

phyllite-argillite unit. It exists only along the upper portion of the proposed powerplant access road from Kilometre 5.8 to Kilometre 9.7.

The Marble Canyon Formation, the upper member of the Cache Creek Group is represented on site by a tough, sound, massive to thick bedded sequence of limestone that crops out along the proposed powerplant access road near Kilometre 0.2 (Fig. 4-1) and from Kilometre 5.2 to Kilometre 6.5.

The Kamloops Group of volcaniclastics, which overlies the Cache Creek Group, on the east side of the Hat Creek valley, is composed of hard, brittle, commonly thinly flow-banded rocks ranging in composition from andesite to basalt and of a very soft sequence of bentonitic volcaniclastic rocks, usually of rhyolitic composition. The Kamloops volcanics form the east wall of the upper Hat Creek valley from Ambusten Creek north to the main Hat Creek valley. They crop out generally to the east of the proposed Hat Creek diversion canal and from Kilometre 3.5 to Kilometre 4.8 along the proposed powerplant access road. The volcaniclastics are virtually confined to the valley walls to the east of upper Hat Creek and to the south of Medicine Creek.

They form outcrops along the proposed canal route from Kilometre 2.4 to Kilometre 3.0 and in the bottom of the Ambusten Creek valley to the south of the creek.

Stratigraphically above the Kamloops Group lies a unit of soft, weak, bentonitic siltstone, claystone, sandstone and conglomerate which comprise the Coldwater Formation. These rocks do not crop out within the area of investigation but they do comprise the sub-crop under the northern portion of the proposed Finney Creek canal route.

Overlying the Coldwater Formation is a thick sequence of predominantly coal, comprising the Hat Creek coal formation. This unit forms neither outcrop nor sub-crop in the area of concern.

The Medicine Creek formation, composed of a monotonous sequence of very weak, soft, bentonitic siltstone and claystone overlies the Hat Creek coal formation. It contains discrete bands of nearly pure bentonite up to 0.7 m thick. It forms the sub-crop and some outcrop at the proposed location of the headworks dam and is present along the proposed Hat Creek diverion canal route between the headworks dam and Ambusten Creek. These sediments also exist at depth under the surficial materials at the south end of the proposed Finney Creek canal route, at the proposed pit rim dam, and along the proposed Hat Creek diversion canal from Medicine Creek north to the Hat Creek valley.

The Finney Lake Formation, overlying the Medicine Creek Formation, is composed of a highly variable, moderately well indurated to poorly indurated unit of very fine to very coarse grained lahar. The lahar crops out to the east of the proposed Hat Creek diversion canal route just south of Ambusten Creek and appears to be involved in the slide debris just south of the proposed headworks dam.

The youngest rock unit in the area is the Plateau Basalt. It occurs as a fresh, hard, well jointed, vesicular, olivine basalt that caps the older rocks in a sporadic manner. It crops out along the proposed powerplant access road from Kilometre 8.9 to Kilometre 9.6 and may be involved in the slump debris to the south of the proposed headworks dam.

(c) Structural Geology

Numerous high angle gravity faults exist within the area and the beds underlying the valley bottom have been folded into simple

anticlines and synclines. However, the movement along the faults and the deformation of the beds is contemporaneous with the deposition of the coal sequence. No field evidence was found to indicate post-pleistocene fault movement. This tends to confirm previous reports that the faults in the area are relatively stable [Golden Associates, March 1977, Hat Creek Geotechnical Study, Report No. 6, Volume 1, Section 3.1].

4.3 SURFICIAL GEOLOGY

During the Pleistocene epoch the upper Hat Creek valley was eroded to a greater depth and width at the base than the present valley. Due to a subsequent downstream ice dam and later glaciation, the valley floor has been infilled with glaciofluvial and glaciolacustrine sediments. Large portions of the valley have been either infilled and/or blanketed with till.

Except for the valley bottom, most of the area under investigation is blanketed with a layer of basal till. This till is dense to very dense, clayey gravel to gravelly clay, varying locally to clayey sand and silty gravel. It ranges in thickness from less than a metre to several tens of metres. It is widespread over the Hat Creek diversion canal and sporadic along the proposed route of the powerplant access road.

Overlying the till in the northeast corner of the upper Hat Creek valley and at depth in the valley bottom is an extremely thick sequence of glaciofluvial sand and gravel. These beds infilling the old Hat Creek channel are dense to very dense but relatively free draining. They range in thickness up to several tens of metres.

Glaciolacustrine silt and clay are present near surface under a gently sloping bench between the old course and the existing course of Harry Creek. They consist of firm to stiff beds of laminated silt and varved

clay of low to medium plasticity. They also exist as discrete beds within the glaciofluvial sand and gravel. The thickness of this unit ranges up to approximately 10 m.

During a later stage of glaciation these sediments were themselves eroded. A highly variable, loose to compact, ablation till generally consisting of silty gravel to gravelly silt was deposited over them. In some places the ablation till was deposited directly over the basal till. Concurrently, a blanket of ground moraine was deposited over most of the slopes to the west of Hat Creek.

Postglacial sedimentation resulted in the deposition of silt, sand and gravel in the bottom of the Hat Creek valley in a floodplain environment. These sediments are generally highly permeable, loose beds from 5 to approximately 30 m thick. These beds are commonly separated from the glaciofluvial sediments by 1 to 3 m of till.

Alluvial fans resulting from fluvial deposition by Ambusten, Medicine and Harry creeks extend along parts of the right bank of Hat Creek. These deposits consist of moderately loose, relatively free-draining sand and gravel with some interbeds of silt. The thickness of these materials is highly variable.

The last major alterations to the topography are due to subsequent slope failures, generally involving both surficial material and bedrock.

SECTION 5.0 - LABORATORY TESTING

5.1 GENERAL

During the 1981 Site Investigation, overburden samples were taken from the test pits and at 2 to 3 m intervals in the drill holes. The samples were sent to a commercial laboratory for testing [Report to B.C. Hydro, Laboratory Test Results, Vol. I to V, dated 15 March 1982 by Thurber Consultants Ltd., Victoria, B.C.]. The following tests were carried out:

1. Index Tests - The sample material was classified, sieve analyses made and Atterberg limit tests carried out. The numbers and types of index tests are given in Table 5-1. The results of the gradation and Atterberg Limit tests are shown on Figs. 5-1a to 5-1n in groups by areas.

2. Shear Tests - Six triaxial tests and two direct shear tests were carried out. Silt/clay and bentonite claystone samples were tested. The test results are summarized and listed in Table 5-2, and also shown on Figs. 5-2a and 5-2b.

3. Consolidation Test - One sample from an exposed claystone outcrop was tested for compressibility under load. The results are shown on Fig. 5-2b.

4. Swelling Test - One sample of claystone material from RH 81-98 near right abutment of headworks dam was tested for its swelling characteristics upon saturation with water. The results are shown on Fig. 5-2b.

During field drilling, eleven Shelby tube samples were taken. However, in some areas the soil was too dense to obtain reliable samples and in these locations, the Shelby tubes were crimped due to the resistance of the dense material when sampling. Five of the eleven tubes were broken.

5.2 TESTING RESULTS

The materials tested consist of glaciofluvial and moraine material, cohesive material such as silts and clays and claystone material in the potential slide area.

1. Glaciofluvial and Moraine Material - These materials occur generally along the proposed powerplant access road route except middle levels in the rock area, along diversion canal route, at pit rim dam area and at headworks dam area. A total of 475 sieve tests were carried out on disturbed samples.

2. Cohesive Material - Silts and Clays - A total of 248 hydrometer tests and 144 Atterberg limit tests were performed on the silt/clay portion of till or silt/clay samples. The plots shown on Fig. 5-1k and 5-1l indicate that the material is medium to highly plastic.

   One consolidated drained triaxial shear test (CD) was performed on a sample from the Medicine Creek area. The test results indicated the peak friction angle to be about 26° with zero cohesion. Two triaxial tests, one consolidated drained (CD) and one consolidated undrained (CU) were carried out on silt/clay material that was taken from the right abutment of proposed headworks dam. The results of these tests indicated the peak friction angle to range between 17° and 20° with zero cohesion. Laboratory observations found that material containing bentonite also showed signs of slickensides.

3. Claystone Material - Claystone Shelby tube samples were obtained from drill hole RH 81-98 and block samples from an exposed outcrop near Ambusten Creek adjacent to Hat Creek. The block samples were about 30 cm cubes. Because of the weak nature of the material, careful handling during sampling, transportation and preparation was exercised to keep any disturbance to a minimum. Two consolidated undrained (CU) and one consolidated drained (CD) triaxial tests were performed on the block samples. Very slow loading rates up to 265 hours were used. The peak friction angles obtained from the above tests range from 20° to 26° with zero cohesion. It was noticed that the block samples were not a homogeneous material; light brown bentonitic clay was matrixed with pockets of stiff grey claystone.

In addition to the above triaxial tests two direct shear tests (CDS) were carried out to obtain residual strength to define the low limit values which may be reached in part of the slide material due to possible continuous creep. These were performed at a very slow shear rate over a period of about two weeks. The peak friction angle was about 31° with zero cohesion. Five reverse cycles were followed and residual friction values of about 10° with zero cohesion were obtained.

The claystone samples have clay content of about 80 percent. Their liquid limits range from 186 to 307 and plasticity index from 142 to 264.

One consolidation test was carried out on a claystone block sample. The result indicates that the material tested is normally or slightly consolidated with compression index of about Cc=0.28. The e vs. p curve is plotted on Fig. 5-2b.

One swelling test was carried out to check the characteristics of the bentonitic claystone sampled from the right bank downstream of

the headworks damsite. The result from this test is shown on Fig. 5-2b. The swelling pressure was about 49 kPa upon saturation.

SECTION 6.0 - POWERPLANT ACCESS ROAD

6.1 GENERAL

Prior to the 1981 field investigations, a possible powerplant access road alignment was drawn on a 1:10 000 scale map. This alignment would have been bounded by the proposed Mine Maintenance Complex and the proposed overland coal conveyor route on the south and by Indian Reserve IR-1 on the north (see Fig. 6-1). The proposed development of a limestone quarry along the northern slope area required that the access road be rerouted in this area. Ground inspection of the south slope indicated that some of this slope is or has been slumping. A revision to the access road alignment has been made to avoid the south slope (Fig. 6-1).

6.2 GEOLOGICAL MAPPING

The proposed access road alignment (about 9.7 km) was briefly geologically mapped at the beginning of the 1981 investigations. Subsequently, test pit locations were laid out and detailed mapping made. The mapping results are summarized in Table 6-1. The mapping summary indicates the lower third of the access road (km 0.0 to 3.6) is located in alluvial or glaciofluvial sand and gravel, or deep lacustrine silt/clay in some local areas (Figs. 6-2 and 6-3). The rest of the route is along steep rock slopes from km 3.6 to 8.3, or a high rock plateau with thin overburden from km 8.3 to 9.7.

Because of the flow-banding and closely jointed nature of the dacite rock from km 3.6 to 4.4, excavation in these rock areas can probably be accomplished by ripping. However, these same features will affect the stability of the cut slope, hence, it may be necessary to have flatter

rock cut slopes in these areas (Fig. 6-2). The platy nature of the broken dacite would likely not affect the stability of the talus slope, however, proper drainage and/or flatter side slopes may be required.

The sharp switchback at km 6.5 may require a large quantity of cut and fill. It may be possible to relocate this part of the road about 100 m to the north where a more gentle slope exists, as noted by recent ground inspection.

6.3 TEST PITS

Based on the results from geological mapping, test pits were located and dug in the lower and upper third of the proposed powerplant access road. Information obtained from test pits indicates the lower third of the roadbed would be founded on mainly sand and gravel with two following exceptions:

1. From km 0.1 to 0.4 the road would traverse an area of massive limestone.

2. From km 0.4 to 0.6 (Harry Creek area) a deep alluvial fan delta of silt exists.

For the former area it is likely roadbed fill or cut would be shallow and that settlement or heave problems would not occur. However, at a thick sequence of compact sandy silt in the banks of Harry Creek, settlement and/or stability problems could be avoided by using flatter sideslopes, drainage and erosion protection.

SECTION 7.0 - DIVERSION OF HAT AND FINNEY CREEKS

7.1 HEADWORKS DAM AND RESERVOIR

(a) Foundation Condition

At the proposed headworks damsite the bedrock, at about 15 m depth, consists of a soft claystone containing at least two major beds of bentonite (Fig. 7-1). No faulting or shearing was identified. A buried channel, cut into the bedrock by a former creek, has been infilled to its present level with three distinct soil units.

The lower unit is glaciofluvial sediments, about 10 m thick, consisting of compact to very dense, water-bearing sand and gravel of medium to high permeability. The middle unit overlying the glaciofluvial sand and gravel is a layer of impervious till about 5 m thick or more consisting of very dense, silty clay and clayey silt with some sandy horizons. This unit becomes thinner towards right abutment. On top of the till in the bottom of Hat Creek valley only the upper unit is a loose to very loose alluvial floodplain deposit of silt, sand and gravel of medium to low permeability about 5 m thick.

The most significant geotechnical features of the bedrock in the area of the headworks dam are two seams of nearly pure bentonite. The bentonite seams would be about 24 m deep under the base of the dam and are 0.7 and 0.3 m thick. Slumped bedrock material overlies the bentonite seams and consists of intensely fractured, very weak claystone.

(b) Factors Affecting Design

The glaciofluvial sand and gravel (lowest unit) might conduct some seepage around or under the dam. However, it appears that the overlying till forms a continuous, impermeable blanket in the dam area and upstream of the dam. It is believed the till would effectively increase the seepage path in this area to lengths that would be acceptable and not require an expensive cutoff. However, as pervious gravel windows may daylight in the reservoir, an impervious blanket may be needed to seal these possible areas. Adequate and proper instrumentation should be installed to measure foundation piezometric levels and seepage flows.

The till containing silty clay (middle unit) is very dense. The settlement of the foundation should be tolerable for the proposed low dam at this site.

The alluvial floodplain sand and gravel (upper unit) would provide an unacceptable seepage path below the dam and some means of cutoff would be required or pervious material would need to be excavated to found the dam core on the till and construct an impervious blanket.

Because of the steepness of the west bank of the reservoir, just upstream of the dam, some slope trimming would be required to ensure the stability of the slope during reservoir operation. The slope trimming would remove clayey-silty till which could be used as blanket material upstream of the dam.

The claystone beds are more than 15 m deep (extent of drilling) below the glaciofluvial sand and gravel and this relatively weak rock should not result in any special design requirements for the dam. However, as indicated on RH81-90 and 89, the claystone bedrock rises to approximately El. 970 at right abutment area while

the overburden cover reduces to less than 10 m. The design of the canal intake, emergency spillway and dam abutments should allow for the possibility of some creep in the areas of the bentonitic seams in the claystone rock. A slightly wider core in the earthfill dam and special features in the intake and spillway structures could absorb creep movements. For confirmation of design values a few local drill holes may be required as the final design progresses.

Factors affecting design are summarized in Table 7-1.

7.2 PITRIM DAM AND RESERVOIR

(a) Foundation Condition

At the proposed pitrim dam a soft, weak claystone exists that is about 15 m deep below ground surface in the central and left abutment but becomes deeper in the right abutment (Fig. 7-2). To date, no bentonite beds have been detected in the claystone in this area.

The overburden material is more complex at the pitrim damsite than at the headworks. A layer of loose alluvial floodplain material (silt, clean sand and gravel) is underlain by several interlayers of impervious silty material and pervious sand and gravel. The thickness of surficial sand and gravel thickens from about 5 m near the middle of the proposed dam to 10 m or more in the right abutment.

(b) Factors Affecting Design

Because of the depth of pervious sand and gravel zones in the area of the dam abutments, a cutoff wall would be very deep. Therefore, it appears that the economical method to keep seepage to reasonable

volumes, also to avoid any piping, would be to increase the seepage path by placing an impervious blanket upstream of the dam. Some trimming of the bank slopes would be required to accommodate placement of blanket material. The placement of an impervious blanket could be integrated into the design of the bank excavations.

Factors affecting design are summarized in Table 7-1.

7.3 DIVERSION CANAL

The surficial geology and the geotechnical factors affecting design are variable along the canal route but are generally consistent within the following three major sections:

1. Headworks Dam to Ambusten Creek

The surficial materials in this section consist of loose to compact, ablation till containing silty gravel to gravelly silt, with small, erratic, alluvial sand and gravel deposits in old stream channels. The ablation till overlies a very dense, clayey gravel, basal till (Fig. 7-3). Bedrock is soft, weak, bentonitic claystone containing at least two seams of bentonite 0.7 m and 0.3 m thick at about 24 m depth at the proposed headworks dam.

An old slump area exists along the right bank from the headworks dam to Ambusten Creek. (For Field Investigation see Appendix C.) At present the main mass of the slump appears to be stable but, at creek level, the toe of one slump block appears to have been reactivated by creek erosion. At the toe of the slump a 0.6 m bed of bentonite, that probably correlates with the bentonite bed in RH81-98, is exposed. The bentonite is sheared, slickensided and of variable thickness and attitude where exposed. Sheared bentonitic

claystone has very low residual shear strength, about 10° with cohesion of zero as obtained from shear tests. It appears that the slope movement involves a complex slump-translation type of creep with its base along the seams of bentonite.

Due to the moderate to high permeability of the near surface materials, the canal would have to be lined to prevent major leakage. Although the slump area appears to be stable, except for the toe of one block, the canal lining may have to be designed and maintained to allow for slow, differential movement in this area.

(b) Ambusten Creek to Medicine Creek

From Ambusten Creek to Medicine Creek, the canal would be founded on a thin blanket of ablation and basal till overlying very soft, weak, highly bentonitic, undifferentiated volcaniclastics of rhyolitic composition (Fig. 7-3). The rhyolitic tuff, lapilli tuff and tuffaceous sandstone are generally impervious but slake rapidly in water.

Due to the high bentonite content of the volcaniclastics, canal embankments should be designed with a flatter downhill slope. Although the canal is founded on ablation and basal till, in general, some zones of surficial pervious gravels also were revealed in test pits. The canal should be lined in this section to prevent excessive leakage.

(c) Medicine Creek to Conduit Intake

From Medicine Creek to the conduit intake, the surficial materials consist of colluvium, ablation till and glaciofluvial sand and gravel (Fig. 7-4). Claystone exists at depth.

The canal cut would be through these sands and gravels, which have a high permeability. The canal should be lined through the sands and gravels to prevent seepage which could enter the mine pit.

7.4 AMBUSTEN CREEK CROSSING

Bedrock at the Ambusten Creek crossing of the diversion canal consists entirely of rhyolitic, tuffaceous siltstone and sandstone. The tuffaceous siltstone being relatively impermeable has undergone little alteration and remains a soft moderately weak rock. The tuffaceous sandstone is highly altered and consists of isolated quartz grains (up to approximately 60 percent of the rock) totally surrounded by bentonitic clay.

The old channel cut into this rock is infilled with about 5 m of water-bearing alluvial sand and gravel which is overlain by approximately 6 m of dense silty, clayey till and a layer of gravelly till of variable thickness (Fig. 7-5). The present channel of Ambusten Creek, approximately 15 m above the buried channel, is infilled with a thin cover of alluvial sand and gravel.

The tuffaceous siltstone and sandstone at or near the surface in the left abutment of the crossing and silty, clayey till under the current creekbed will have to be carefully assessed during final design of the crossing. Flat embankment slopes may have to be placed to ensure the stability of the crossing (non-impounding) embankment. The deep sand and gravel deposits in the buried channel would tend to keep the foundation drained and to maintain the crossing embankment dry. The dense silty, clayey till likely would not settle significantly under embankment load.

7.5 MEDICINE CREEK CROSSING

At the proposed Medicine Creek crossing, bedrock consists of a hard but intensely fractured basalt overlain by bentonitic tuff, lapilli tuff and tuffaceous sandstone of rhyolitic composition. The tuffaceous sequence is a very soft, weak, intensely altered rock that may have been severely deformed by glacial push (Fig. 7-5).

The data obtained from the right abutment indicates the existence of a very deep channel that has been infilled with a dense to very dense basal till consisting of sandy to silty clay. In the left abutment the tuffaceous rocks appear to be overlain by 0 to 5 m of a compact, ablation till consisting of sandy, silty gravel. The present valley floor is infilled with approximately 10 m of alluvial silt, gravel and sand.

The crossing embankment would be approximately 38 m high and would be founded on tuffaceous rocks and/or dense clayey till. The design of the embankment may require the use of slightly flatter downstream slopes. However, no significant settlement should occur in the foundation, as most of the overburden materials are dense basal till and/or compact ablation tills.

7.6 CONDUIT

Along the proposed route of the buried conduit the bedrock surface is at great depth. The surficial materials are variable along the route with glaciofluvial and alluvial sand and gravel predominant (Fig. 7-6). In one short interval near the proposed conduit outlet firm to stiff, glaciolacustrine silt and clay of low to medium plasticity exist. The conduit outlet would be located on a thick sequence of alluvial sand and gravel underlain by finely interbedded sand, silt and clay.

The conduit should be reinforced with strong bands at joints and protected by filter bedding material or filter cloth to prevent washout of sandy silty foundation material by high velocity flows. The conduit should be founded on firm silt/clay material.

The outlet structure would be founded on about 10 m alluvial sand and gravel; however, the underlying finely interbedded sand silt/clay may settle or displace somewhat under heavy load or high uplift. Potential movement should be studied in the final design stage and local drill holes may be required.

7.7 FINNEY CREEK DIVERSION CANAL

The proposed route of the Finney Creek diversion canal (Fig. 7-7) traverses a slope blanketed by dense to very dense, ground moraine of low permeability ranging in composition from silty sand and gravel to gravelly clay. Underlying the till, at the north end of the canal, is a sequence of soft, weak, bentonitic siltstone and sandstone which is part of the Coldwater Formation. At the headworks dam, bedrock consists of claystone. Neither of these rock types will be encountered in the excavation of the canal.

Because of the dense and impervious nature of the moraine material, the canal will likely require lining only in areas where gravel pockets exist. However, the outlet structure at Hat Creek Headworks Damsite where the Anderson Creek alluvial fan exists should be designed for lighter load on silty sand and gravel deposits.

SECTION 8.0 - DISCUSSION

8.1 DIVERSION WORKS

At the proposed Hat Creek headworks damsite the surficial and bedrock geology has been clarified by the 1981 drilling and surficial mapping. In order to monitor the creeping of the slumped mass of till and claystone in the right abutment, piezometers RH 81-40 and-97 have been established and a slope indicator casing has been installed in RH 81-97. These should be read periodically. More information on the compressibility of the silty and clayey soils in the foundation would be required for estimating possible settlement of the structures.

From the proposed headworks damsite to the Ambusten Creek crossing and from the Medicine Creek crossing to the proposed conduit intake, the Hat Creek diversion canal crosses over numerous zones of relatively loose, free-draining sand and gravel. These reaches of the canal would have to be lined to prevent leakage. From the Ambusten Creek crossing to the Medicine Creek crossing, the presence of bentonitic volcaniclastics dictates the need for a lining to prevent saturation of these materials. Also, the canal embankments will require flatter slopes along this reach of the canal.

At the proposed Ambusten and Medicine Creek crossing of the canal, the embankment slopes may have to have flatter slopes due to the presence of bentonitic volcaniclastics in the foundations.

Along the proposed buried conduit route, two distinct soil types have been mapped: the glaciofluvial sand and gravel and the glaciolacustrine silt and clay. The latter may have to be replaced by compacted granular backfill.

More detailed information on the silts and clays in the foundation of the conduit outlet may be required for final design.

8.2 POWERPLANT ACCESS ROAD ROUTE

From the 1981 investigation, the proposed powerplant access road would be founded mainly on gravelly material and/or excavated into rock. However, at gullies on the upper road route and at Harry Creek crossing, the road would be constructed on silt/clay material. More local information on these materials may be required for final design of the access road.

SECTION 9.0 - CONCLUSIONS AND RECOMMENDATIONS

The 1981 site investigation provided surficial geological mapping information for the design of the proposed powerplant access road, clarified the geology at the headworks and pitrim damsites and provided subsurface information along the proposed routes of Hat Creek diversion canal and conduit and Finney Creek diversion canal.

The foundation information obtained can be used as a base for final design; however, in some areas additional exploration will be required to obtain further information on interbedded silt, sand/gravel and silt/clay with bentonitic material. This additional exploration should be carried out at the proposed structure sites prior to or during final design.

During the next several years the piezometers and slope indicator installed in certain drill holes should be read periodically, and the potential slide area near headworks dam should be inspected periodically to assess if any movement is occurring.

TABLE 3-1

HAT CREEK PROJECT - 1981 SITE INVESTIGATION - CALCULATED PERMEABILITY COEFFICIENT K

RH 81-80		RH 81-81		RH 81-82		RH 81-83		RH 81-84		RH 81-85	
Depth (m)	K x 10^{-4} cm/s	Depth (m)	K x 10^{-4} cm/s	Depth (m)	K x 10^{-4} cm/s	Depth (m)	K x 10^{-4} cm/s	Depth (m)	K x 10^{-4} cm/s	Depth (m)	K x 10^{-4} cm/s
2	0.7	2	200	5	0.01	15	0.07	5	9	10	0.07
4	7	10	60	10	0.5	20	0.2	10	200	20	2
6	3	12	50	15	0.8	24	0.06	15	200	25	0.06
8	40			20	0.06			20	20	30	0.09
10	100			25	0.6					31	0.1
12	20			30	0.08						
16	600			35	0.1						
				40	0.09						

RH 81-86		RH 81-87		RH 81-88		RH 81-89		RH 81-90		RH 81-91	
Depth (m)	K x 10^{-4} cm/s	Depth (m)	K x 10^{-4} cm/s	Depth (m)	K x 10^{-4} cm/s	Depth (m)	K x 10^{-4} cm/s	Depth (m)	K x 10^{-4} cm/s	Depth (m)	K x 10^{-4} cm/s
10	90	10	80	5	0.07	5	100	11	0.09	10	1
20	3			15	30					13	0.3
25	0.1			20	0.1						
				24	10						
				30	0. 005						

RH 81-93		RH 81-94		RH 81-95	
Depth (m)	K x 10^{-4} cm/s	Depth (m)	K x 10^{-4} cm/s	Depth (m)	K x 10^{-4} cm/s
5	0.003	5	10	20	3
		10	0.03	29	0.04
		15	0.02		
		20	0.003		
		30	0.9		
		31	0.09		

TABLE 3-2

HAT CREEK PROJECT

INITIAL PIEZOMETER READINGS

Drill Hole	Type of Piezometer	Depth to Water Surface From Top of Pipe (m)	Date of Reading	Remarks
RH 81-80	s/p	37.06	30 Oct 81	Dry
RH 81-81	s/p	13.52	30 Oct 81	
RH 81-82	s/p	43.88	02 Nov 81	
RH 81-83	s/p	1.25	02 Nov 81	
RH 81-84	s/p	20.94	02 Nov 81	
RH 81-86	s/p	29.25	02 Nov 81	
RH 81-87	s/p	9.37	02 Nov 81	
RH 81-90	Pneumatic	16.3 psi	02 Nov 81	
RH 81-91	s/p	4.67	02 Nov 81	
RH 81-92	s/p	7.46	02 Nov 81	
RH 81-93	s/p	13.36	30 Oct 81	
		(12.46)	(22 Aug 81)	
RH 81-94	s/p	35.93	30 Oct 81	
RH 81-94	Pneumatic	0.9 psi	30 Oct 81	
		(4.2 psi)	(22 Aug 81)	
RH 81-95	s/p	21.23	30 Oct 81	
RH 81-98	s/p	0	24 Oct 81	Overflowing
RH 81-99	s/p	12.47	02 Nov 81	

Legend = s/p = standing pipe piezometers.

TABLE 4-1

REGIONAL STRATIGRAPHY - HAT CREEK BASIN

Period	Epoch	Formation or Group	Soil/Rock Types	Structure Involved*1
Quaternary	Recent		Alluvium, colluvium, fluvial sands and gravels, slide debris, lacustrine sediments.	All diversion structures and powerplant access road where no rock outcrops.
	Pleistocene		Glacial till, glaciolacustrine silt, glaciofluvial sands and gravels, landslides.	
Tertiary	Miocene	Plateau Basalts	Basalt, olivine basalt, vesicular basalt.	Upper powerplant access road.
	Miocene or Middle Eocene?	Finney Lake Formation	Lahar.	Canal south of Ambusten Creek.
	Late Eocene	Medicine Creek Formation	Bentonitic claystone and siltstone.	Headworks and pitrim damsites and canal u/s of Ambusten Creek.
	Late Eocene to Middle Eocene	Hat Creek Coal Formation	Mainly coal with intercalated siltstone, claystone, carbonaceous claystone, sandstone and conglomerate.	
		Coldwater Formation	Siltstone, claystone, sandstone, conglomerate, minor coal.	Under Finney Creek diversion canal.
	Middle Eocene	Kamloops Volcanics	Dacite, andesite, rhyolite, basalt and equivalent pyroclastics.	U/S canal, lower and middle powerplant access road.
Pennsylvanian to Permian or Earlier		Cache Creek Group:		
		Marble Canyon Formation	Marble, limestone, argillite.	Lower and middle powerplant access road.
		Greenstone	Greenstone, chert, argillite, minor limestone and quartzite, chlorite schist, quartz-mica, phyllite.	Upper powerplant access road.

*1 For location of structures see Fig. 1-1.

TABLE 5-1

NUMBERS OF LABORATORY TEST

	Description	Sieve	Hydrometer	Atterberg Limits	Moisture Content	Identification
1.	Test Pits: Totals	244	117	36	46	144
	Pit Rim Dam	47	19	5	6	17
	Medicine Creek	14	10	0	5	8
	Ambusten Creek	12	5	4	4	17
	Conduit Route	23	6	4	3	0
	Finney Creek	12	5	0	5	0
	Canal Route	32	9	3	9	8
	Headworks Dam	40	20	11	11	38
	Powerplant Access Road	64	43	9	3	56
2.	Drill Holes: Totals	231	129	106	36	294
	Pit Rim Dam	58	36	17	3	70
	Medicine Creek	37	34	31	6	33
	Ambusten Creek	28	16	15	11	31
	Conduit Route	12	7	2	3	13
	Finney Creek	5	3	5	1	6
	Miscellaneous	16	15	11	-	39
	Headworks Dam	35	18	25	12	49
	Canal Route	40	-	-	-	53
3.	U/D Block Samples	-	2	2	-	-
	Totals	475	248	144	82	438

TABLE 5-2

HAT CREEK PROJECT

SUMMARY OF RESULTS OF TRIAXIAL AND DIRECT SHEAR TESTS

Description	Drill Hole No. Location	Sample No.	Depth (m)	Test Type	Sample Dia. (cm)	Moisture Content (%)	Dry Density (Mg/m^3)	Atterberg Limits L.L.	P.L.	P.I.	Clay Fraction (%)	Activity P.I./Clay (%)	Strain Rate (%/min)	Effective Consol. Stress kPa	Shear Strength c' kPa	Shear Strength ø' deg
CLAY-hard, some sand, plactic (CH)	RH 81-82	14	26.3	CD	7.2	26.6	1.522	*1124	44	80	52	1.5	.00001	414	0	26.5
CLAY-plastic, slickensides	RH 81-87	5	5.7	CU	3.8	37.1	1.341	80	31	49	59	0.8	.00014	207	0	17.2
with silt seams (CH)	RH 81-87	5	5.7	CD	3.8	37.9	1.320	80	31	49	59	0.8	.00002	414	0	20.2
CLAYSTONE	Block Sample	1	surface	CU	3.8	49.7	1.097	*1186	44	142	81	1.8	.00012	207	0	26.0
plastic, highly	near Ambus-	1	surface	CU	3.8	48.2	1.105	*1186	44	142	81	1.8	.00008	621	0	20.5
fissured (CH)	ten Creek	1	surface	CD	3.8	45.4	1.189	*1186	44	142	81	1.8	.00001	414	0	21.5
CLAYSTONE plastic, bentonitic (CH)	RH 81-98	4	24.0	CDS	4x4	51.0	1.129	*1307	43	264	79	3.3	___	344.8	0	29.6 peak 10.7 res.
CLAYSTONE plastic, highly fissured (CH)	Block Sample	2	surface	CDS	4x4	45.8	1.197	*1201	39	162	79	2.1	___	206.9	0	31.3 peak 11.5 res.

*1 Blenderized for 20 minutes.

NOTES: 1. Block sample No. 1 was used for the consolidation test.

2. RH 81-98 sample No. 4 was used for the swelling tests.

TABLE 6-1

PROPOSED POWERPLANT ACCESS ROAD

SUMMARY OF RESULTS FROM GEOLOGICAL MAPPING

Distance From Highway 12 (km)	Existing*[1] Grade	Foundation Material	Geotechnical Factors Affecting Design
0 - 0.1	Gentle	Alluvial floodplain sand and gravel.	Excellent foundation and good borrow material.
0.1 - 0.4	Gentle	Massive limestone near surface. Overlain by lacustrine silt and clay.	Compressible surficials may cause settlement. Limestone may need drilling and blasting.
0.4 - 0.6	Gentle	Relatively deep lacustrine silt and clay.	As above.
0.6 - 0.9	Moderate	Glaciofluvial sand and gravel.	Excellent foundation and good borrow material.
0.9 - 1.1	Gentle	Alluvial fan delta, silt, sand and gravel.	Good foundation and fair to good borrow material.
1.1 - 1.3 (Harry Creek)	Moderate	Alluvial fan delta. Silt 12 metres thick, compact to dense.	Bridge or culvert crossing requires foundation design.
1.3 - 2.2	Gentle	Alluvial fan delta. Silt, sand and gravel.	Good foundation and fair to good borrow material.
2.2 - 3.6	Gentle	Glaciofluvial sand and gravel.	As above.
3.6 - 4.4	Excessive	Colluvium (talus) with dacite bedrock at or near surface.	Rock easy to excavate by ripper. Have to fill numerous gullies. Cut slope will have to be relatively flat.
4.4 - 5.5	Steep to Moderate	Basal till generally gravelly clay with minor stream gravels.	Good foundation and fill material.

TABLE 6-1 - (Cont'd)

Distance From Highway 12 (km)	Existing*[1] Grade	Foundation Material	Geotechnical Factors Affecting Design
5.5 - 5.6	Excessive	Basal till with massive limestone at/or near surface.	Side hill cut into limestone.
5.6 - 5.9	Gentle	Basal till with mixed outwash deposit. Bedrock contact between limestone and argillite units. Bedrock at depth.	Possible compressible clay in trough may cause settlement. Fill required in gullies.
5.9 - 6.6	Moderate to Steep	Argillite, cherty argillite, and chert-pebble conglomerate under a thin veneer (up to 0.5 m) of ablation till-gravelly silt.	Steep side hill cut and fill required. Rocks easily rippable. Dips into hillside. Slaking and platiness may cause stability problem. Fill required at switchback.
6.6 - 8.3	Moderate to Steep	Silty ablation till, about one metre thick, overlying argillite.	Ripping possible.
8.3 - 8.8	Gentle	Silty ablation till, about two metres thick, overlying possible chert-pebble conglomerate.	Good foundation. Fair borrow material.
8.8 - 8.9	Rolling	Bedrock contact zone between argillite and overlying vesicular basalt. Topographic trough may indicate faulting with possible plastic clay. Overlying till up to 4 m in depth.	Plastic clay may cause settlement.

TABLE 6-1 - (Cont'd)

Distance From Highway 12 (km)	Existing*1 Grade	Foundation Material	Geotechnical Factors Affecting Design
8.9 - 9.6	Moderate to Steep	Vesicular basalt at or within 0.5 m of surface.	Basalt easily rippable and would make good fill material.
9.6 - 9.7	Gentle	Phyllite and argillite at or near surface.	Excellent foundation. Fill required in topographic lows.

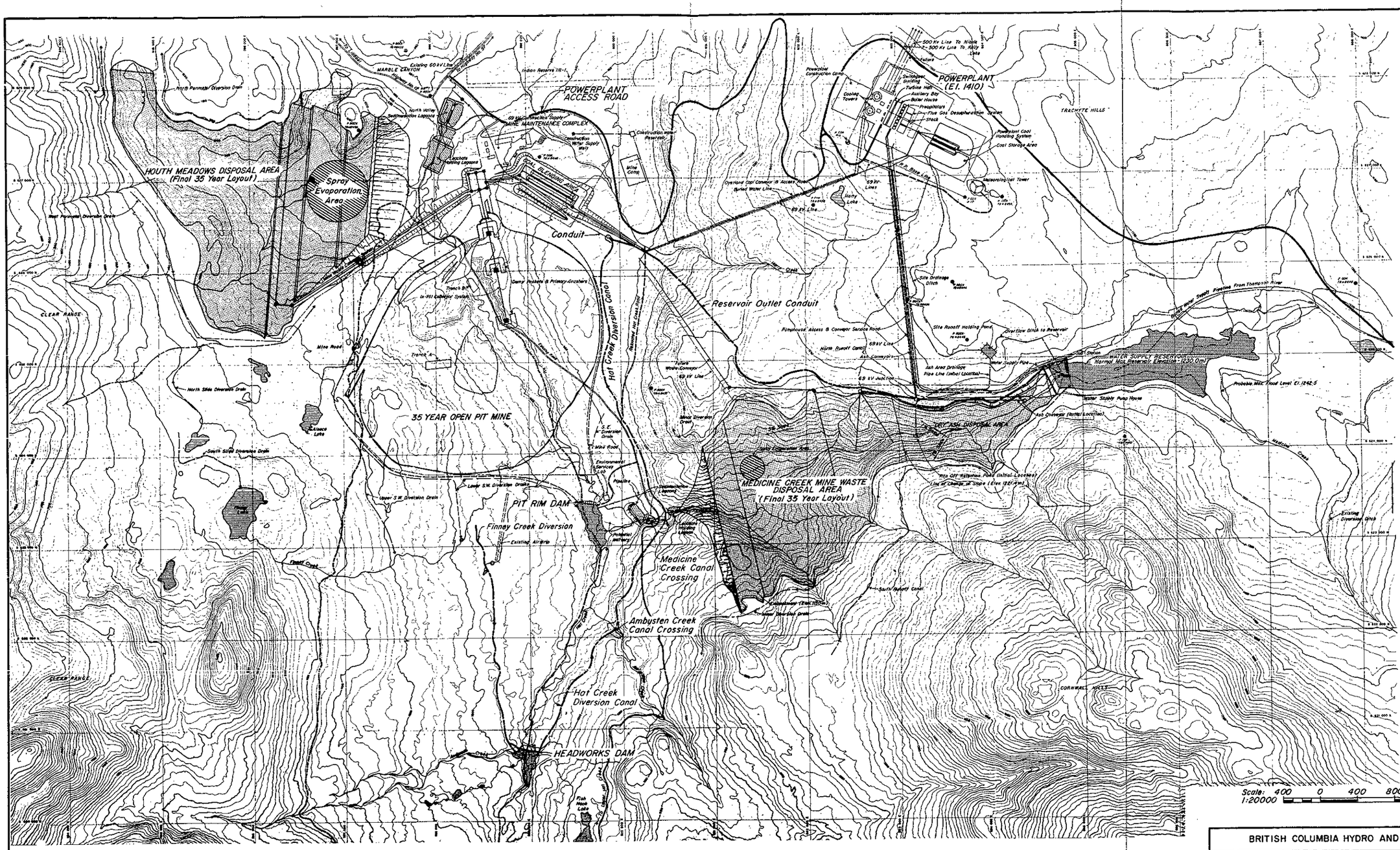
*1 Existing Grade

Gentle	0-3%
Moderate	3-5%
Steep	5-8%
Excessive	8%
Rolling	0-5%, variable

TABLE 7-1

1981 SITE INVESTIGATION - FACTORS AFFECTING DESIGN

Structure	Proposed Arrangement 1978 (Report No. 913)	Factors Affecting Design - Results From 1981 Investigation
Headworks Dam and Reservoir	Earthfill dam (approx. 16 m high) U/S slope 3H = 1V D/S slope 2.5H = 1V Reservoir - impervious blanket	Overburden and claystone profile defined: Lower foundation unit - pervious Middle foundation unit - impervious till Upper foundation unit - Loose, medium to low permeability Complete impervious blanket required. Two weak bentonitic seams exist in claystone, stability and creep design protections required.
Pitrim Dam and Reservoir	Earthfill dam (approx. 13 m high) U/S slope 3H = 1V D/S slope 2.5H = 1V Slurry trench cutoff 10 to 15 m deep	Deeper and more complex overburden formations occur at Pitrim dam abutments. Impervious blanket with bank excavation measures could provide more economical design.
Canal	Length: 6.4 km - Depth: 4.0 m Invert width 1.2 m Side slopes 2.5H = 1V	Canal generally on ablation till with erratic gravel deposits, claystone with weak seams at depth. Lining is likely required, flatter downhill slope may be required if bentonitic material is shallow.
Creek Crossings	Non-impounding embankments D/S slope 3H = 1V	Local silt/clay area may require D/S slope flattened in lower portion of embankment.
Conduit	2400 mm dia corrugated steel pipe, approx. 2 km long. Concrete impact-type energy dissipator	Silt/clay exists below sandy gravel foundation.
Finney Creek Canal	Length: 2.75 km - Depth: 2.2 m Invert width 1.5 m Side slopes 2H = 1V	Lining required only at local gravel or soft material. Lighter design load for outlet work where silty material exists.



BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

1981 SITE INVESTIGATIONS GENERAL ARRANGEMENT

DATE MAR 1982	FIG 1-1
DWN	DWG No. 604H-C14-D137

FINNEY CREEK DIVERSION CANAL

HEADWORKS DAM

PIT RIM DAM

MINE PIT No. 1

HAT CREEK DIVERSION CANAL

35 Year pit outline

U/D BLOCK SAMPLES 1 & 2 TAKEN HERE

Airstrip

Existing Hat Creek Road

To Upper Hat Creek

To Pavilion

To Cache Creek

Highway No. 12

INDIAN RESERVE 1

Ambusten Creek Canal Crossing

Medicine Creek Canal Crossing

Finney Creek

Ambusten Creek

Hat Creek

Harry Creek

Medicine Creek

598,000E

599,000E

600,000E

601,000E

5,621,000 N

5,622,000 N

5,623,000 N

5,624,000 N

5,625,000 N

5,626,000 N

5,627,000 N

5,628,000 N

Scale: 1:10000 200 0 200 400 600 800 Metres

DETAIL A NTS

DETAIL B NTS

DRILL HOLE DATA

HAT CREEK DRILL HOLE NO.	NORTHING	EASTING	ELEVATION	DEPTH DESIGN	DEPTH ACTUAL	HAT CREEK DRILL HOLE NO.	NORTHING	EASTING	ELEVATION	DEPTH DESIGN	DEPTH ACTUAL
RH81-78	5627180	598625	893.1	20	20.2	RH81-89	5620765	598965	966.1	20	14.64
RH81-79	5627535	598200	823.5	30	30.0	RH81-90	5620795	599040	977.5	30	20.64
RH81-80	5626465	599830	973.0	50	41.0	RH81-91	5622160	599850	953	30	20.73
RH81-81	5623475	599655	907.0	30	18.7	RH81-92	5622134	599848	957.4	35	41.67
RH81-82	5623310	600450	966.0	50	48.0	RH81-93	5620795	598850	971.3	30	25.72
RH81-83	5623258	600399	945.7	40	29.0	RH81-94	5620845	598795	989.0	40	41.48
RH81-84	5623495	599515	927.0	30	25.7	RH81-95	5620825	598890	973.8	40	37.8
RH81-85	5623210	600465	965.5	50	38.0	RH81-96	5623320	598420	988.0	30	25.73
RH81-86	5623455	599765	925.2	50	46.1	RH81-97	5627933	598233	817.3	15	14.6
RH81-87	5620815	598940	964.6	15	18.37	RH81-98	5620775	599035	876.8	30	29.6
RH81-88	5623440	599715	908.4	30	35.0	RH81-99	5621800	599650	978	30	24.4

LEGEND:

○ DRILL HOLE

■ TEST PIT

NOTES:

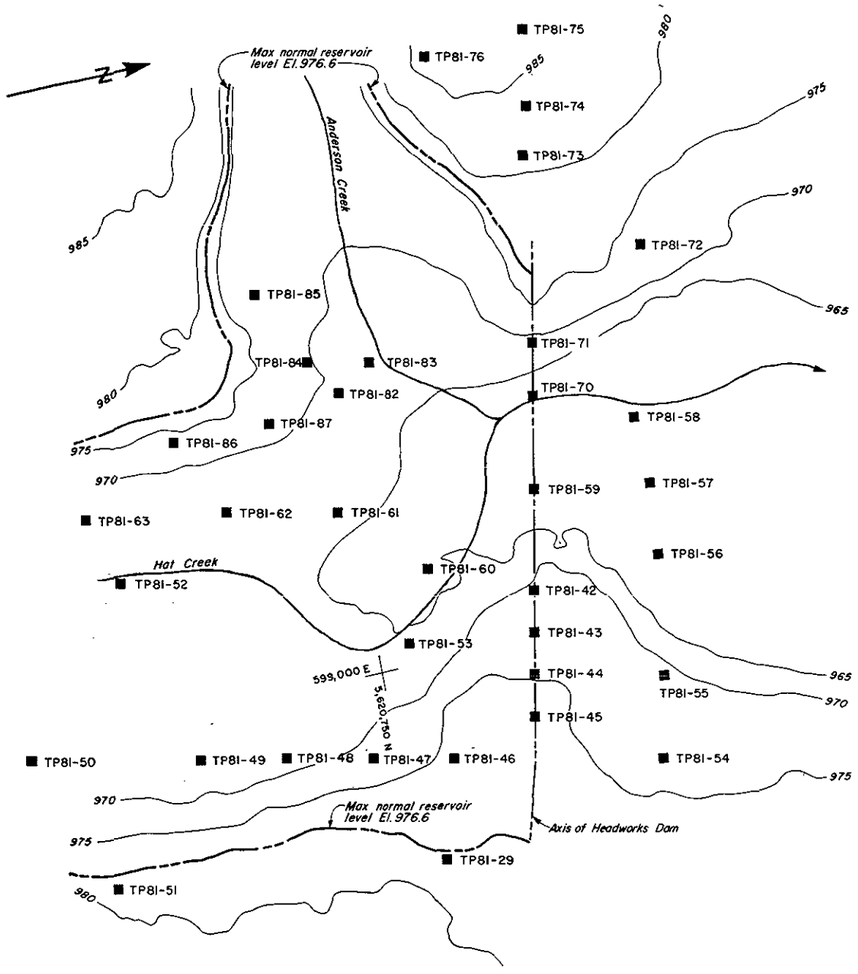
1. LOCATIONS AND ELEVATIONS OF TEST PITS AND DRILL HOLES ARE APPROXIMATE ONLY. FINAL SURVEY TO BE COMPLETED IN 1982.

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

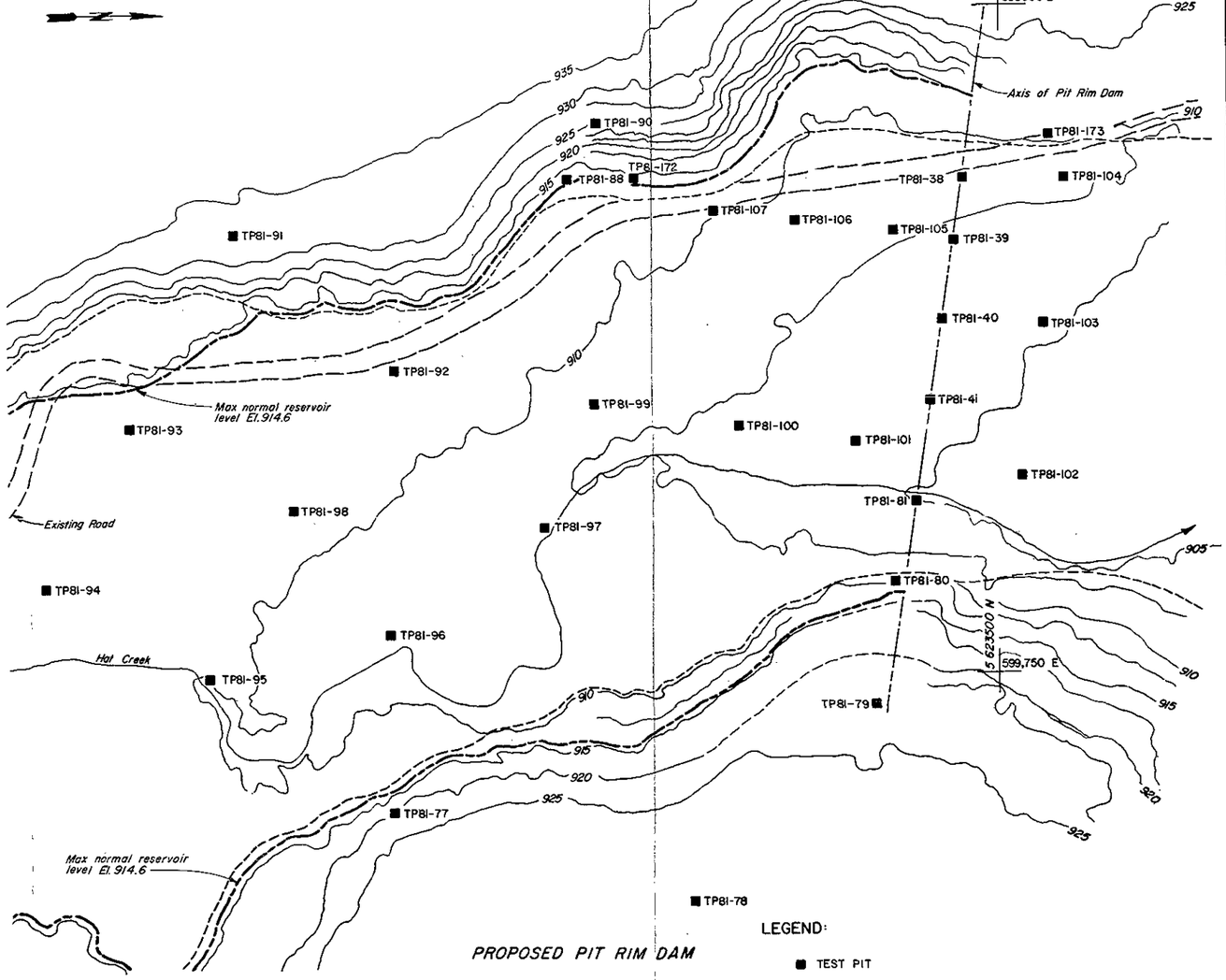
HAT CREEK PROJECT

1981 SITE INVESTIGATIONS PROPOSED DIVERSION DRILL HOLE AND TEST PIT LOCATIONS

DATE MARCH 1982	FIG. 3-1	R
DWN SM/JGP	DWG No. 604H-C14-D138	



PROPOSED HEADWORKS DAM



PROPOSED PIT RIM DAM

LEGEND:

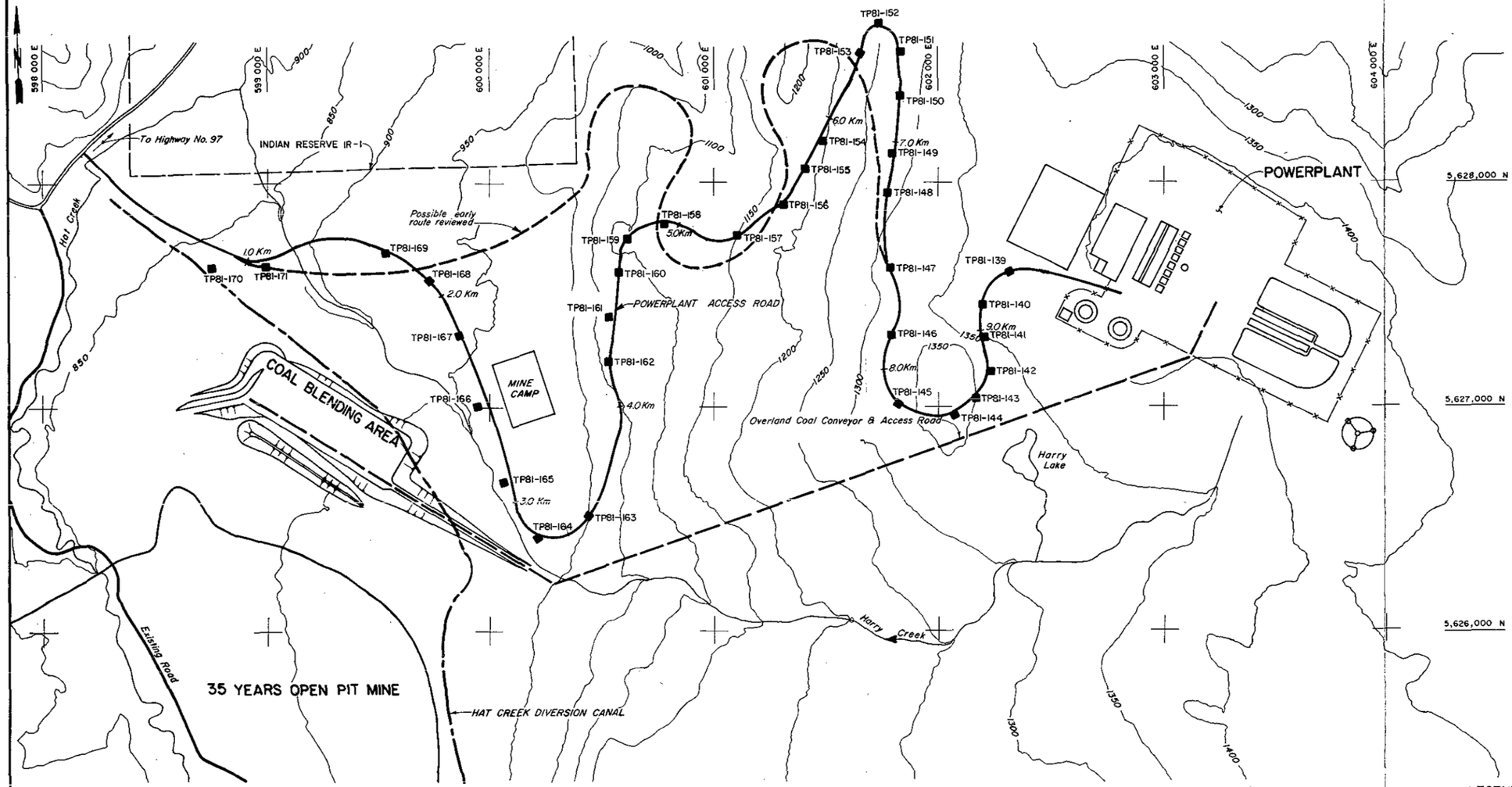
■ TEST PIT

Scale: 1:1000 20 0 20 40 60 80 Metres

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
PROPOSED DIVERSION
HEADWORKS AND PIT RIM DAMSITES
TEST PIT LOCATIONS

DATE MAR 1982	FIG 3-2	R
DWN JGP	DWG No. 604H-C14-D139	



LEGEND:

■ - TEST PIT

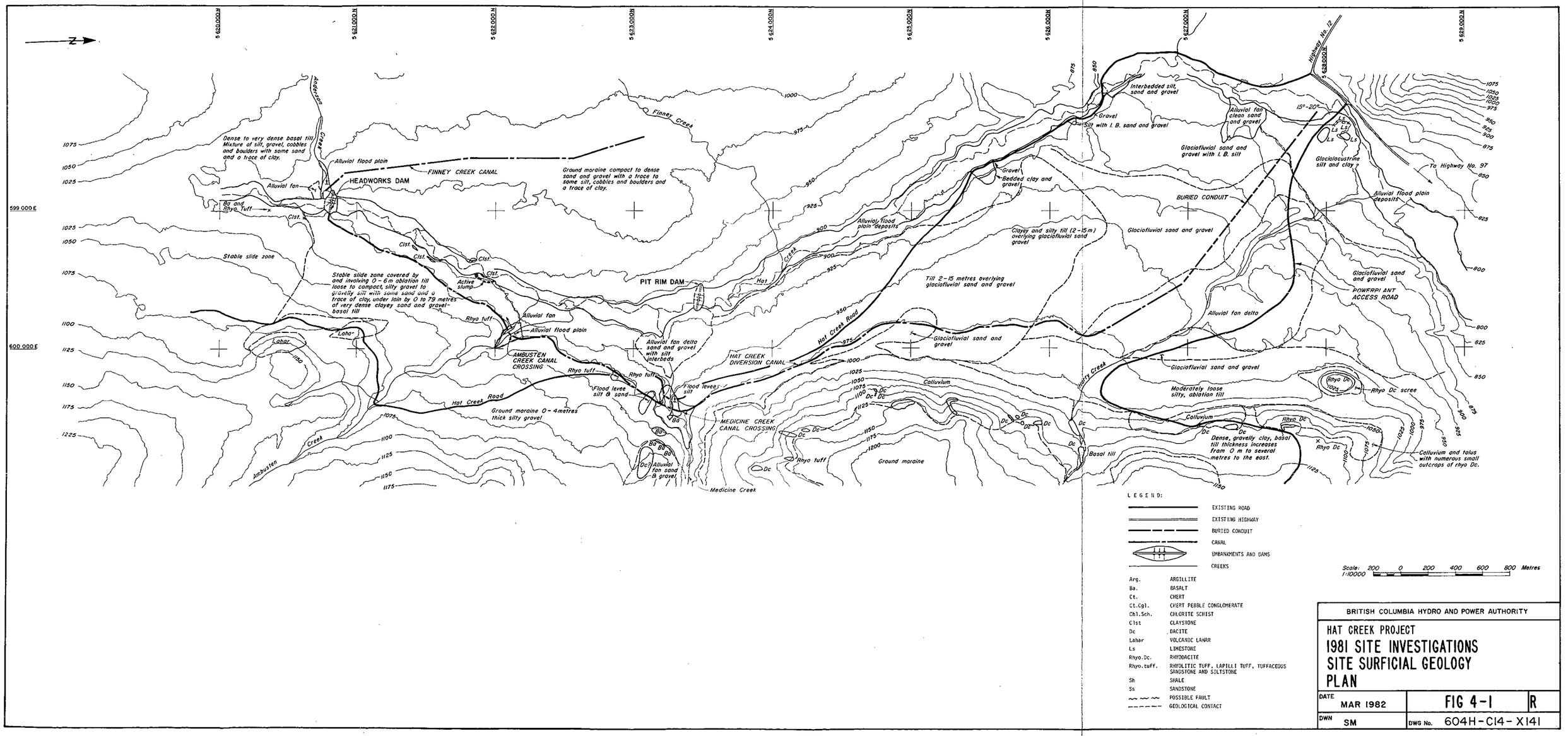
Scale: 1:1000 — 20 0 20 40 60 80 Metres

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

1981 SITE INVESTIGATIONS
PROPOSED POWERPLANT ACCESS ROAD
TEST PIT LOCATIONS

DATE MARCH 1982	FIG 3-3	R
DWN SM/JGP	DWG No. 604H-C14-D140	



LEGEND:

- EXISTING ROAD
- EXISTING HIGHWAY
- BURIED CONDUIT
- CANAL
- EMBANKMENTS AND DAMS
- CREEKS

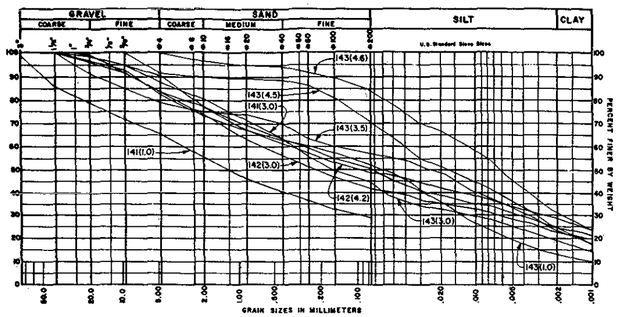
Arg.	ARGILLITE
Ba.	BASALT
Ct.	CHERT
Ct.Cgl.	CHERT PEBBLE CONGLOMERATE
Chl.Sch.	CHLORITE SCHIST
Clst	CLAYSTONE
Dc	DACITE
Lahar	VOLCANIC LAHAR
Ls	LIMESTONE
Rhyo.Dc.	RHYODACITE
Rhyo.tuff.	RHYOLITIC TUFF, LAPILLI TUFF, TUFFACEOUS SANDSTONE AND SILTSTONE
Sh	SHALE
Ss	SANDSTONE
~~	POSSIBLE FAULT
------	GEOLOGICAL CONTACT

Scale: 1:10000 — 200 0 200 400 600 800 Metres

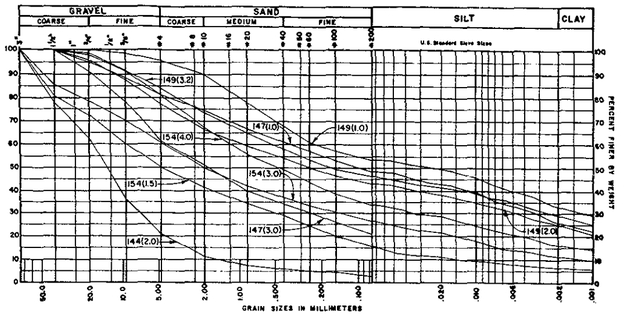
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
SITE SURFICIAL GEOLOGY PLAN

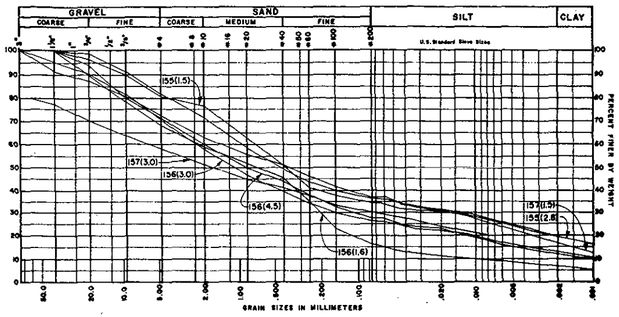
DATE MAR 1982	FIG 4-1	R
DWN SM	DWG No. 604H-C14-X141	



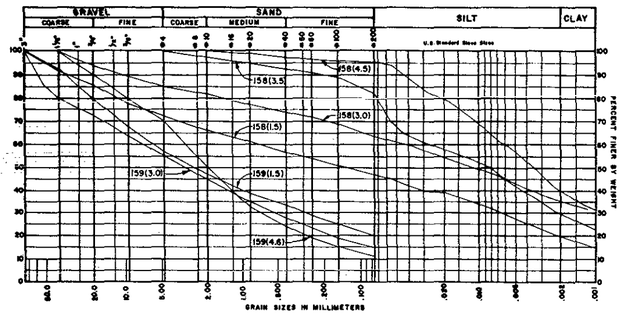
POWERPLANT ACCESS ROAD
Sta 8+600 to Sta 9+400



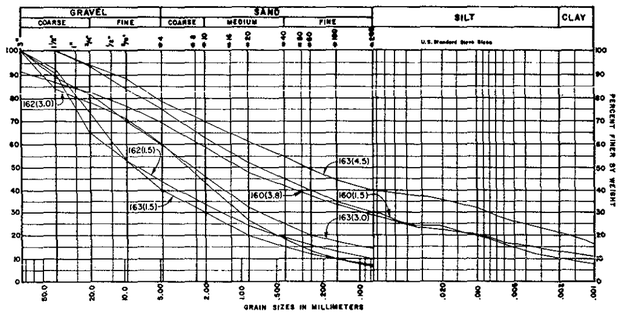
POWERPLANT ACCESS ROAD
Sta 5+800 to Sta 8+600



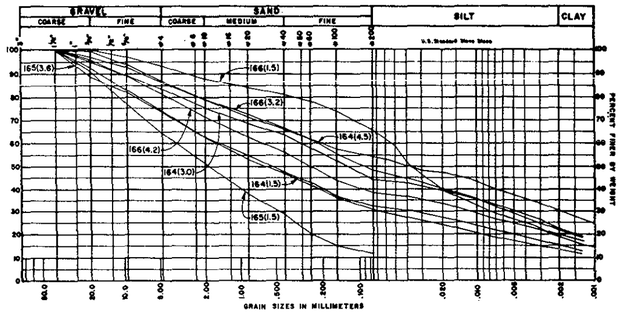
POWERPLANT ACCESS ROAD
Sta 5+000 to Sta 5+800



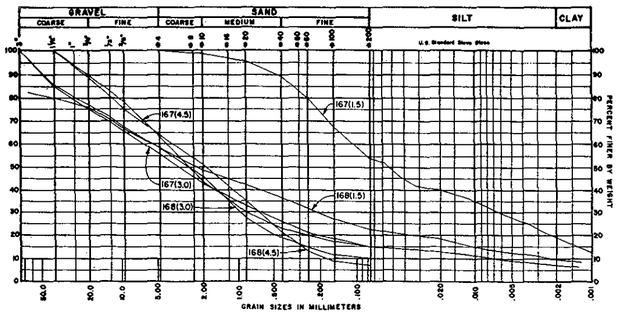
POWERPLANT ACCESS ROAD
Sta 4+600 to Sta 5+000



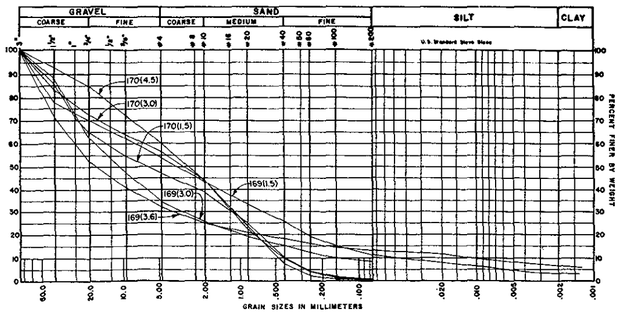
POWERPLANT ACCESS ROAD
Sta 3+400 to Sta 4+600



POWERPLANT ACCESS ROAD
Sta 2+500 to Sta 3+400



POWERPLANT ACCESS ROAD
Sta 1+800 to Sta 2+250



POWERPLANT ACCESS ROAD
Sta 1+400 to Sta 1+800

NOTES:

1. STATION 0 + 000 FOR HAT CREEK DIVERSION CANAL IS TAKEN FROM RH 81-90.
2. STATION 0 + 000 FOR FINNEY CREEK DIVERSION CANAL IS TAKEN FROM RH 81-94.
3. STATION 0 + 000 FOR POWERPLANT ACCESS ROAD IS TAKEN FROM THE INTERSECTION OF HIGHWAY NO. 97 AND THE PROPOSED POWERPLANT ACCESS ROAD.
4. CONDUIT ROUTE (FIG. 5-1d).
5. STATION 0 + 000 FOR CONDUIT IS LOCATED AT RH 81-80.

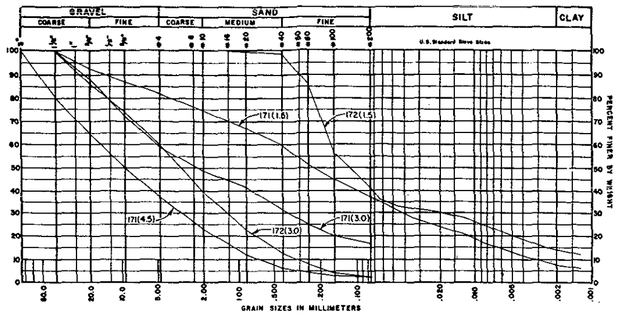
LEGEND:

142 (2.0) — INDICATES TEST PIT NUMBER; INDICATES DEPTH OF SAMPLE IN METRES

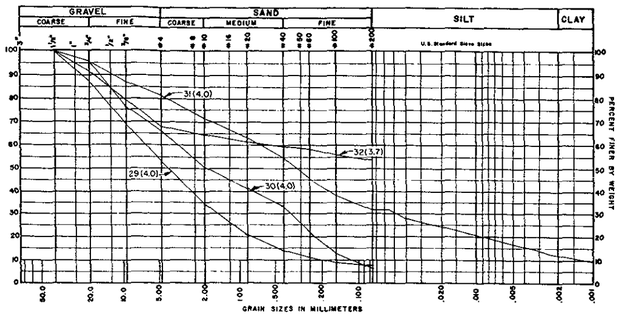
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT
1981 SITE INVESTIGATION
POWERPLANT ACCESS ROAD
GRAIN SIZE CURVES FOR TEST PITS

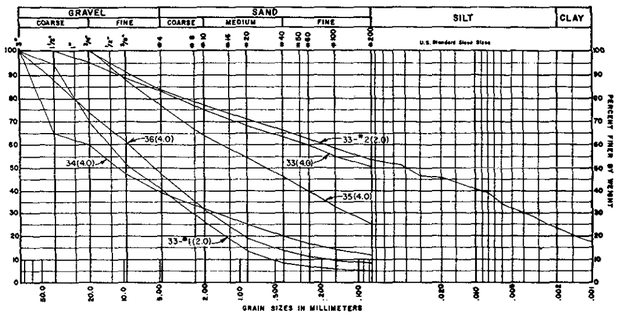
DATE MARCH 1982	FIG 5-1a
DWN S M	DWG No. 604H-C14-U143



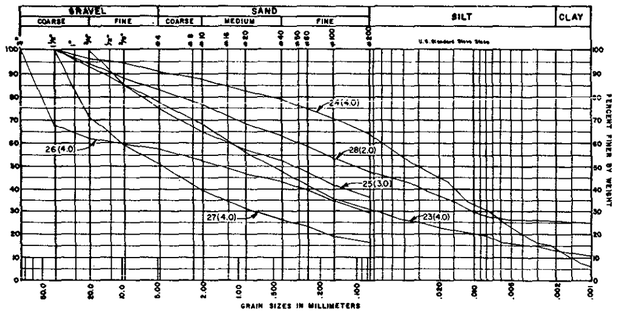
POWERPLANT ACCESS ROAD
From Sta 0+000 to Sta 1+400



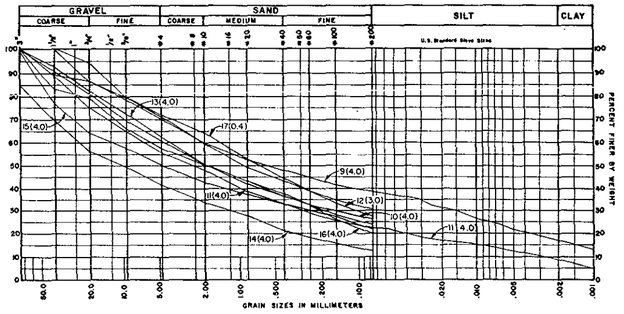
HAT CREEK DIVERSION CANAL
From Sta 0+000 to Sta 1+400



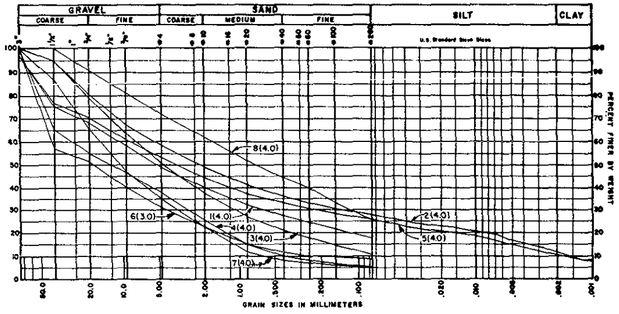
HAT CREEK DIVERSION CANAL
From Sta 1+400 to Sta 1+800



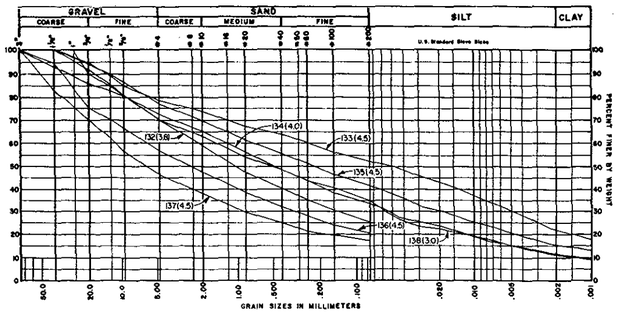
HAT CREEK DIVERSION CANAL
From Sta 1+800 to Sta 2+800



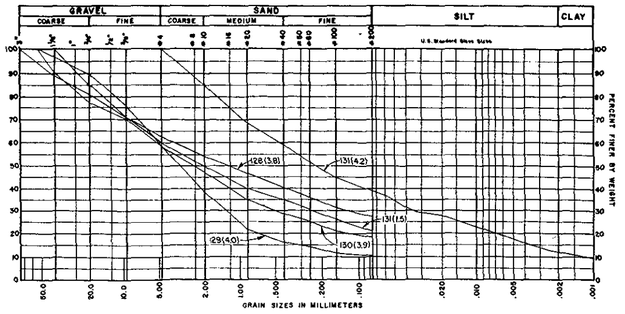
HAT CREEK DIVERSION CANAL
From Sta 2+800 to Sta 4+800



HAT CREEK DIVERSION CANAL
From Sta 4+800 to Sta 6+400



FINNEY CREEK DIVERSION CANAL
From Sta 0+000 to Sta 1+400



FINNEY CREEK DIVERSION CANAL
From Sta 1+400 to Sta 2+400

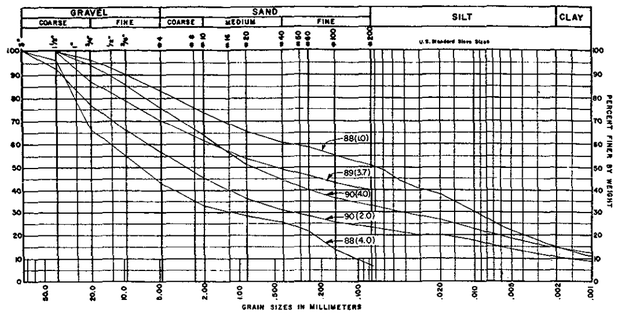
NOTES:
FOR NOTES SEE FIG. 5-1a.

LEGEND:
33-*1(2.0)
- INDICATES TEST PIT NUMBER
- INDICATES DEPTH OF SAMPLE IN METRES
- INDICATES SAMPLE NUMBER

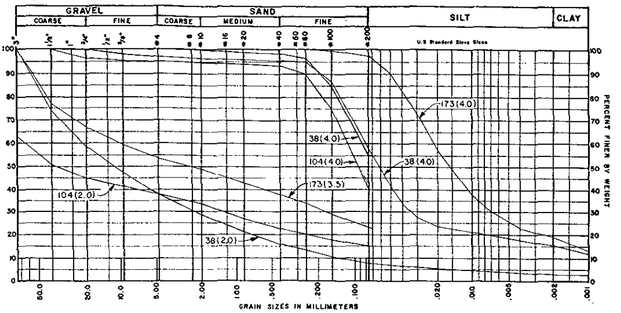
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT
1981 SITE INVESTIGATION
GRAIN SIZE CURVES FOR TEST PITS FROM THE POWERPLANT ACCESS ROAD, AND DIVERSION CANAL

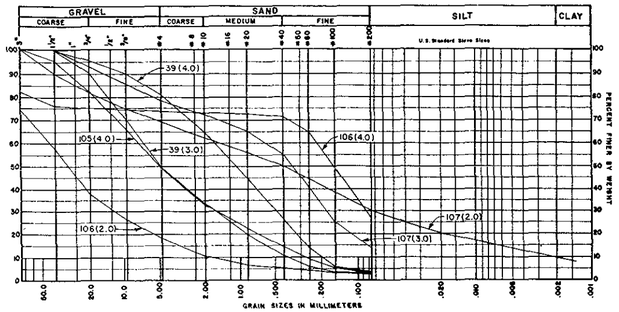
DATE MARCH 1981	FIG. 5-1b
DWN JGP	DWG No. 604H-C14-U144



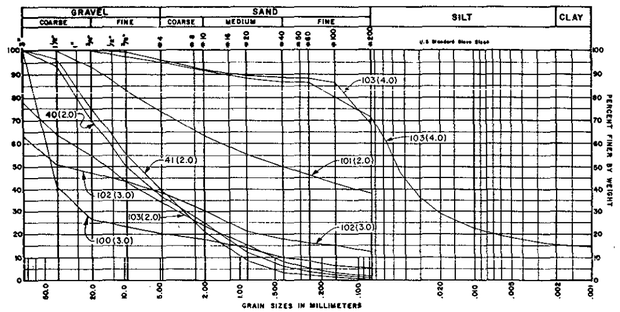
LEFT BANK



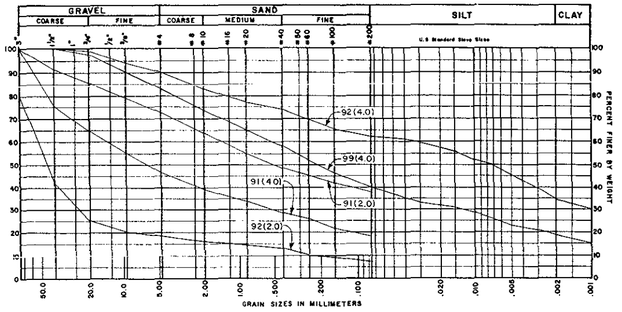
LEFT BANK



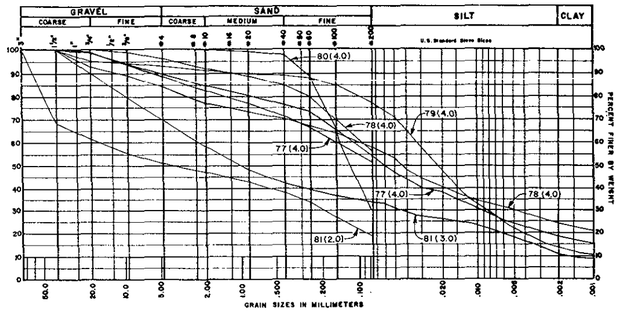
CENTRE



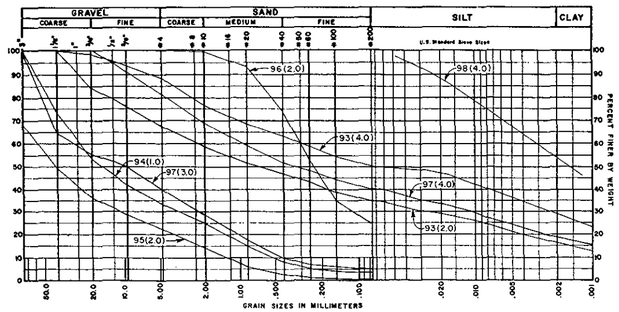
CENTRE



CENTRE



RIGHT BANK



RIGHT BANK

NOTES:

FOR NOTES SEE FIG. 5-1a.

LEGEND:

77(4.0) — INDICATES TEST PIT NUMBER

77(4.0) — INDICATES DEPTH OF SAMPLE IN METRES

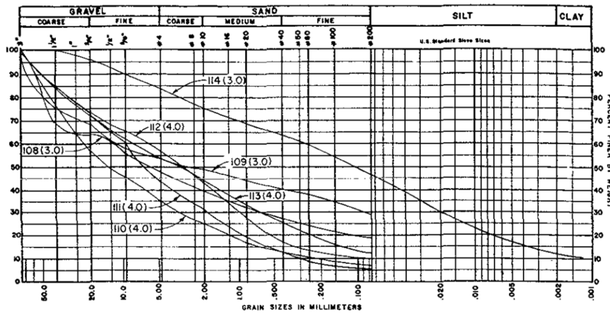
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

1981 SITE INVESTIGATION

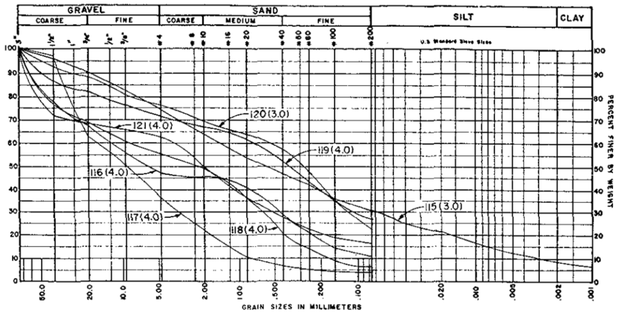
PIT RIM DAM AND RESERVOIR - TEST PIT GRAIN SIZE CURVES

DATE	MARCH 1982	FIG. 5-1c
DWN	JGP	DWG No. 604H-C14-U145



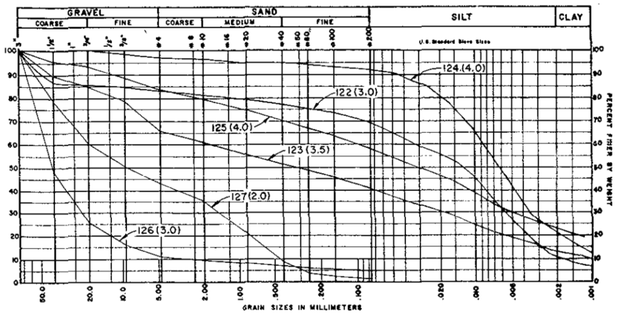
CONDUIT

From Sta 0+000 to Sta 0+900



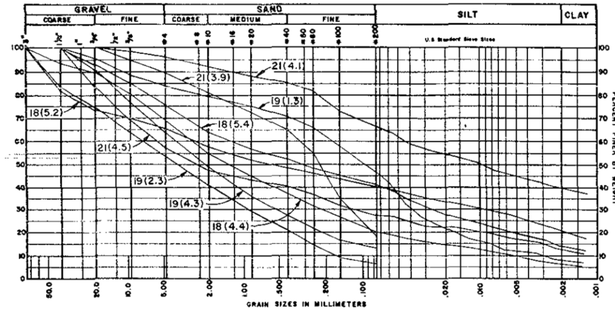
CONDUIT

From Sta 0+900 to Sta 1+700

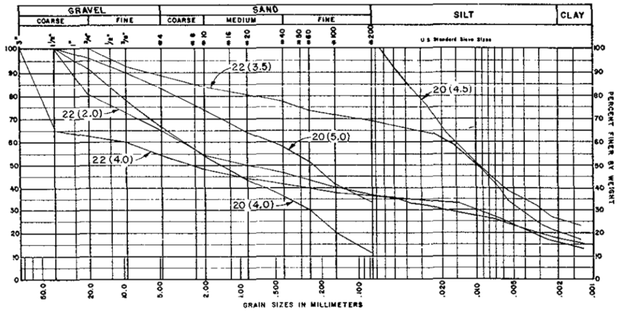


CONDUIT

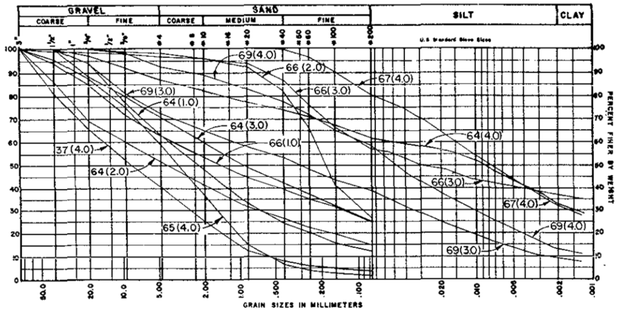
From Sta 1+700 to Sta 2+300



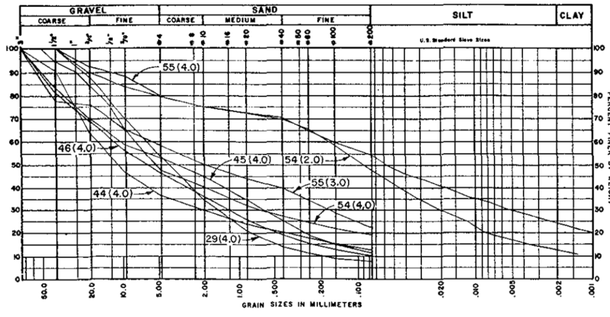
MEDICINE CREEK CANAL CROSSING



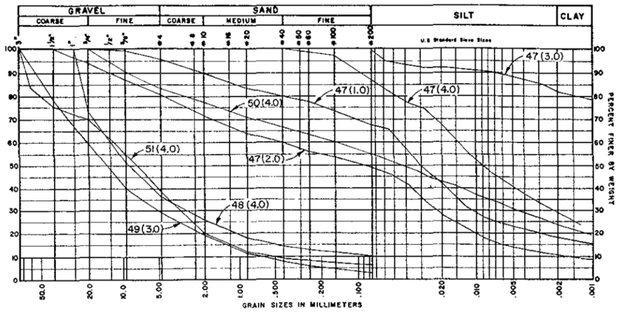
MEDICINE CREEK CANAL CROSSING



AMBUSTEN CREEK CANAL CROSSING



RIGHT BANK OF HEADWORKS DAM & RESERVOIR



RIGHT BANK OF HEADWORKS DAM & RESERVOIR

NOTES:

FOR NOTES SEE FIG. 5-1a.

LEGEND:

65(4.0) — INDICATES TEST PIT NUMBER; INDICATES DEPTH OF SAMPLE IN METRES

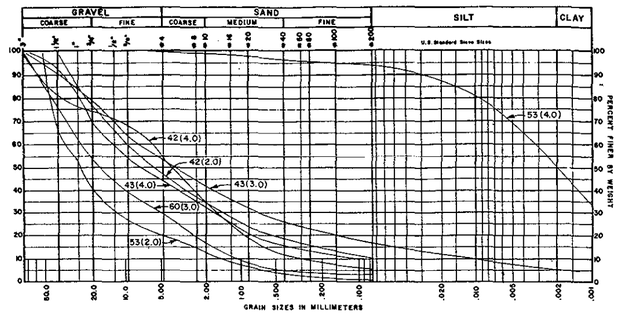
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

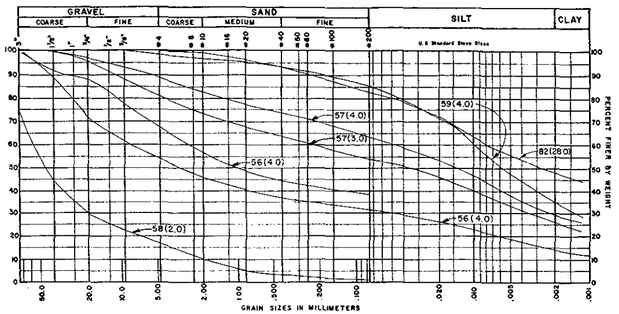
1981 SITE INVESTIGATION

GRAIN SIZE CURVES FOR TEST PITS FROM THE DIVERSION ROUTE AND HEADWORKS DAM AND RESERVOIR

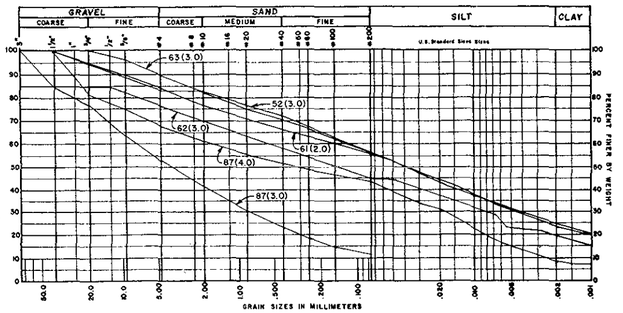
DATE MARCH 1982	FIG. 5-1d
DWN DJ	DWG No. 604H-C14-U146



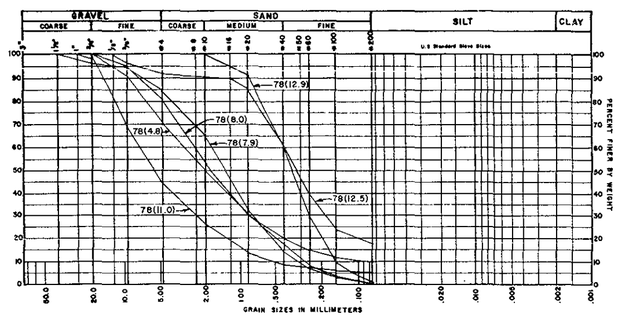
HEADWORKS DAM AND RESERVOIR
CENTRE TEST PITS



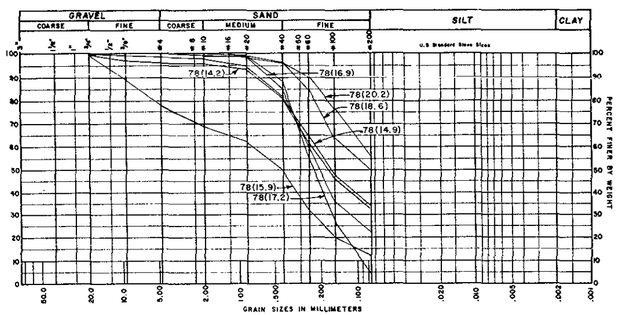
HEADWORKS DAM AND RESERVOIR
CENTRE TEST PITS



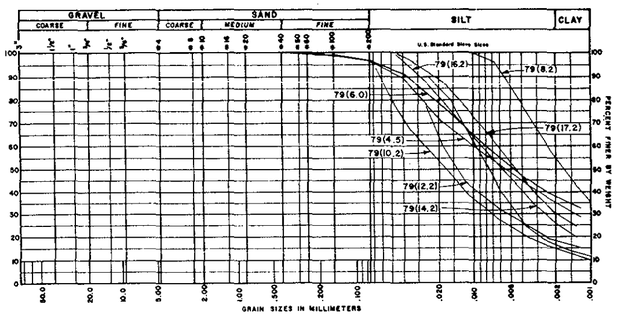
HEADWORKS DAM AND RESERVOIR
CENTRE TEST PITS



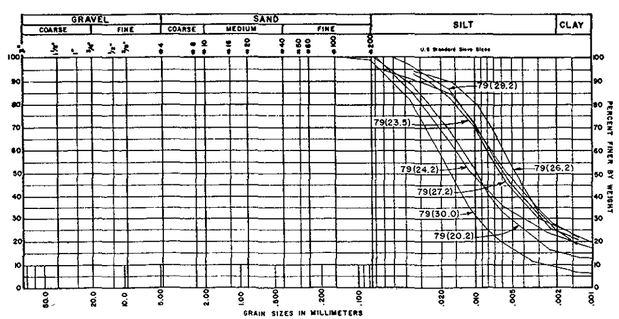
RH 81-78



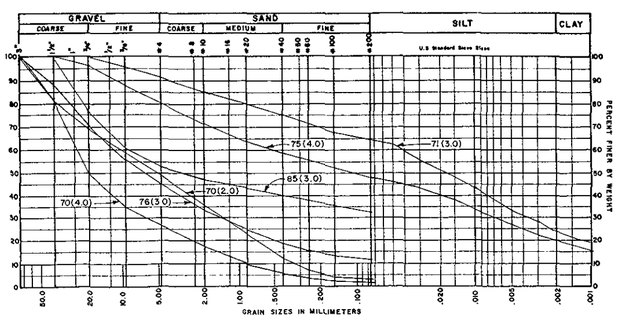
RH 81-78



RH 81-79



RH 81-79



LEFT SIDE OF HEADWORKS DAM

NOTES:

FOR NOTES SEE FIG. 5-1a.

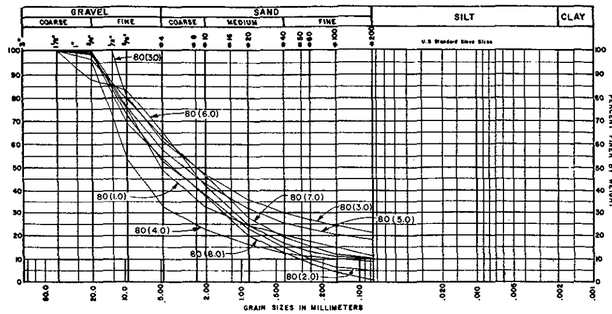
LEGEND:

62(3.0) — INDICATES TEST PIT OR DRILL HOLE NUMBER
INDICATES DEPTH OF SAMPLE IN METRES

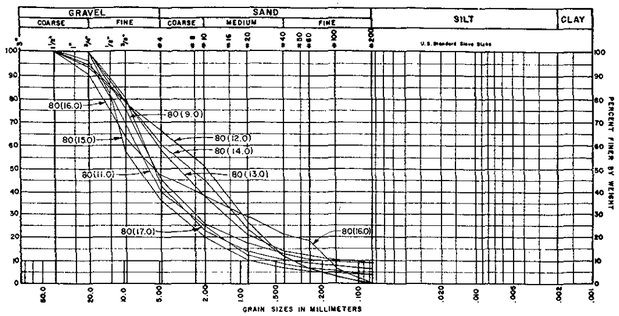
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT
1981 SITE INVESTIGATION
GRAIN SIZE CURVES OF TEST PITS
FROM HEADWORKS DAM/RESERVOIR AND
RH 81-78 AND 81-79

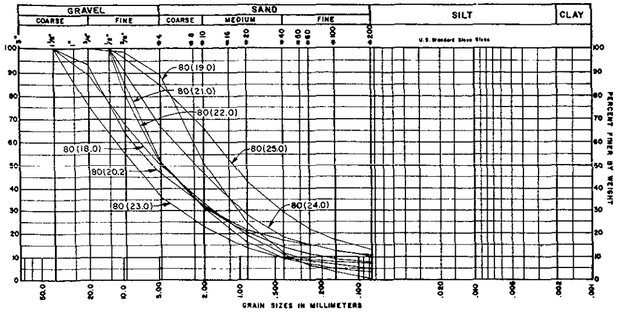
DATE MARCH 1982	FIG. 5-1e
DWN JGP	DWG No. 604H-C14-U147



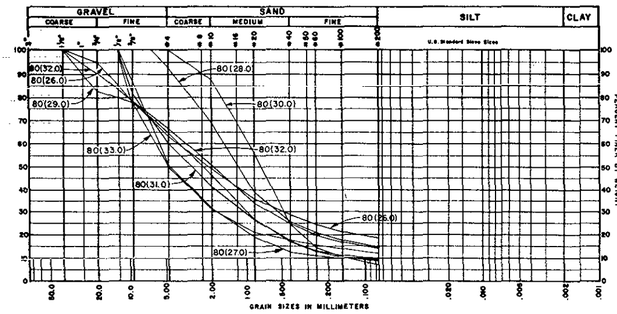
RH 81-80



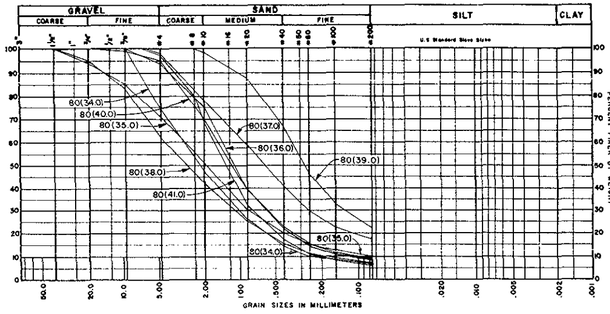
RH 81-80



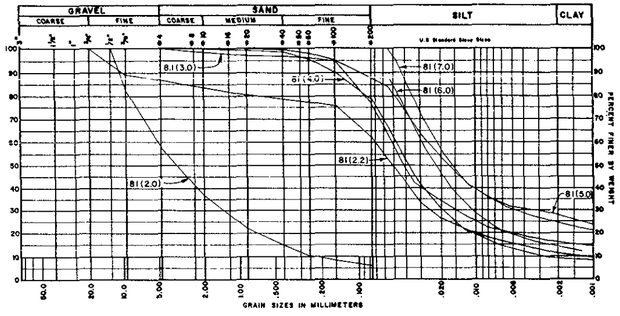
RH 81-80



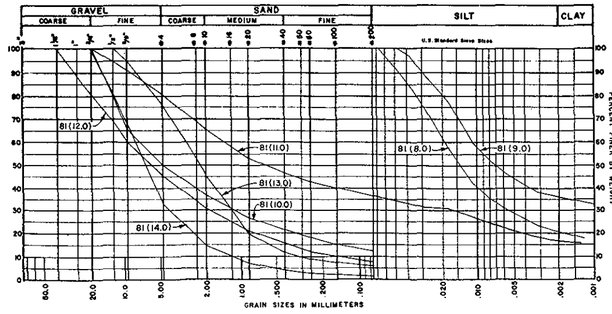
RH 81-80



RH 81-80



RH 81-81



RH 81-81

NOTES:

FOR NOTES SEE FIG. 5-1a.

LEGEND:

81 (2.0) — INDICATES DRILL HOLE NUMBER; INDICATES DEPTH OF SAMPLE IN METRES

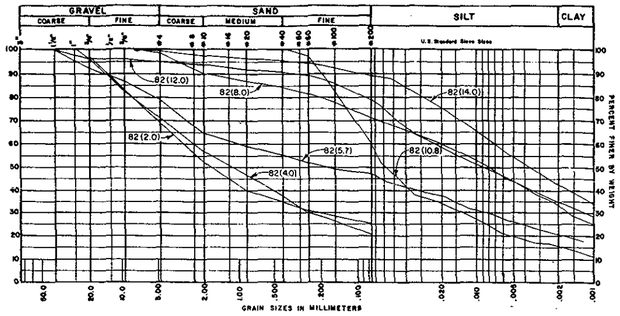
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

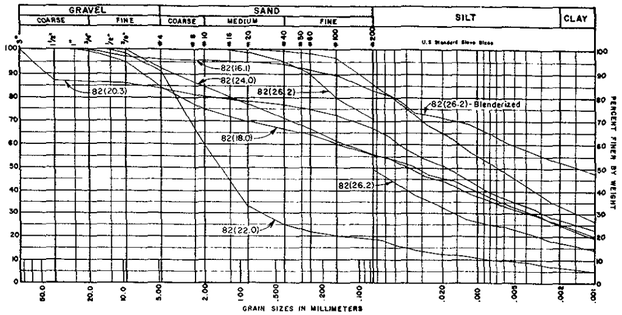
1981 SITE INVESTIGATION

GRAIN SIZE CURVES FOR RH 81-80 AND 81-81

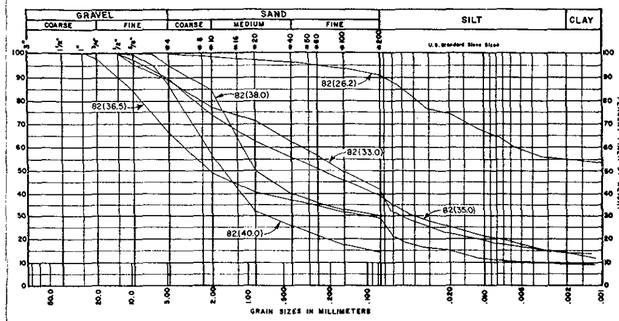
DATE MARCH 1982	FIG 5-1f
DWN K.L.	DWG No. 604H-C14-U148



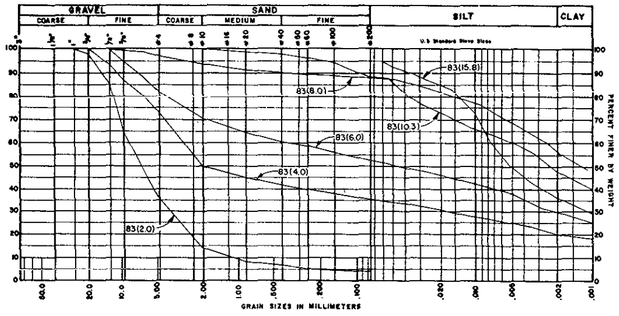
RH 81-82



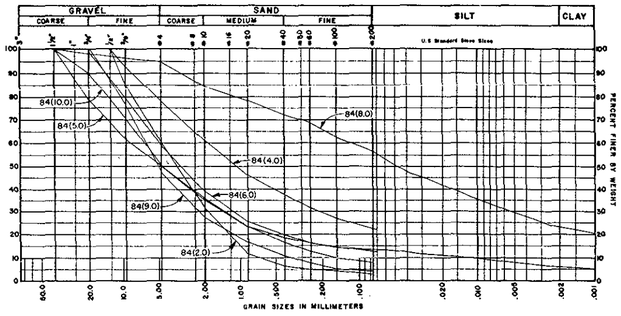
RH 81-82



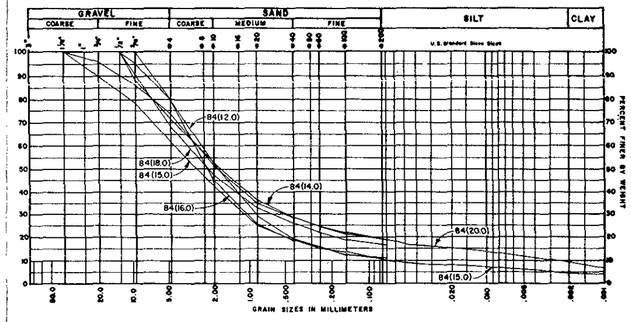
RH 81-82



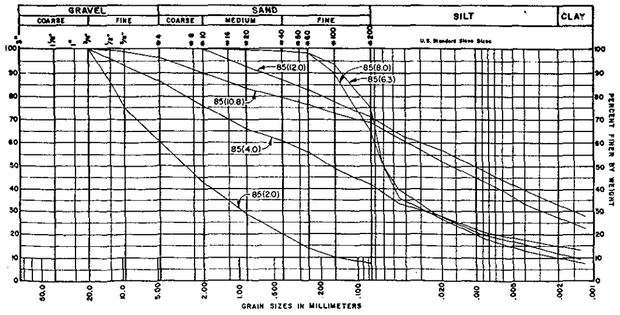
RH 81-83



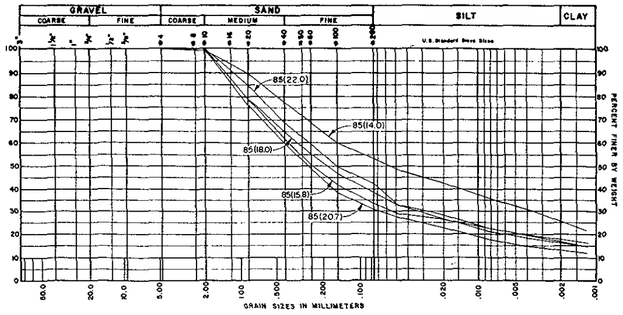
RH 81-84



RH 81-84



RH 81-85



RH 81-85

NOTES:

FOR NOTES SEE FIG. 5-1a.

LEGEND:

82(26.2)-BLENDERIZED

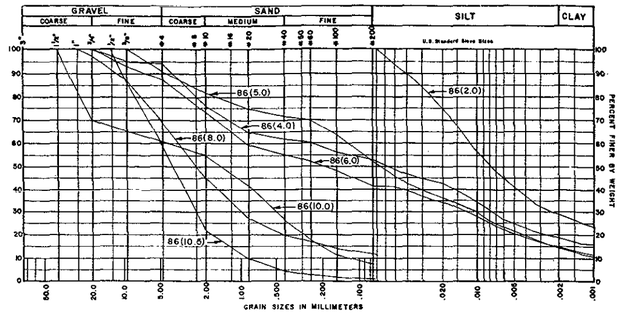
- INDICATES DRILL HOLE NUMBER
- INDICATES DEPTH OF SAMPLE IN METRES
- INDICATES SAMPLE BLENDERIZED FOR 20 MINUTES (WHERE REQUIRED)

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

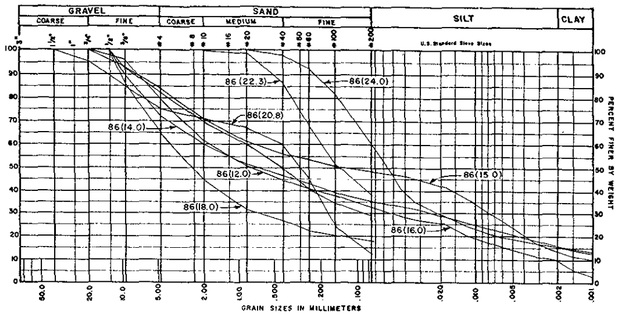
HAT CREEK PROJECT

1981 SITE INVESTIGATION GRAIN SIZE CURVES FOR RH 81-82, 81-83, 81-84 AND 81-85

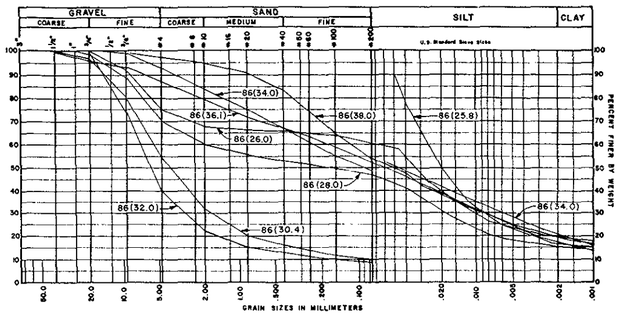
DATE MARCH 1982	FIG. 5-1g
DWN J P	DWG No. 604H-C14-U149



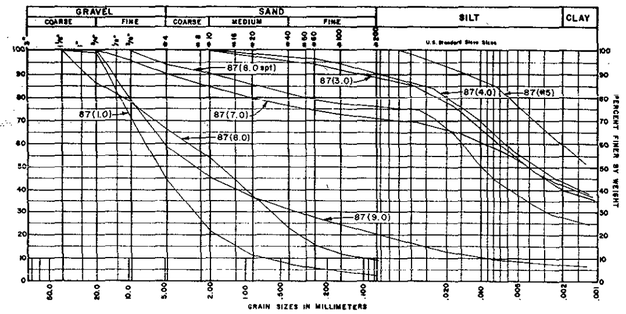
RH 81-86



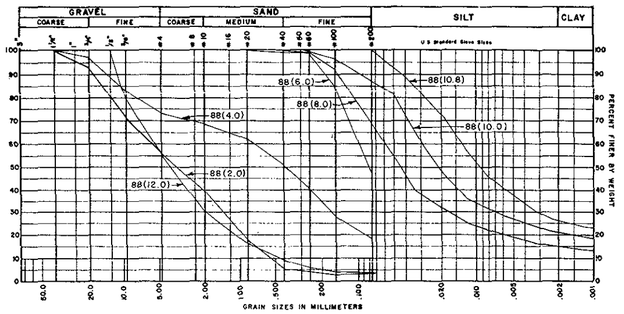
RH 81-86



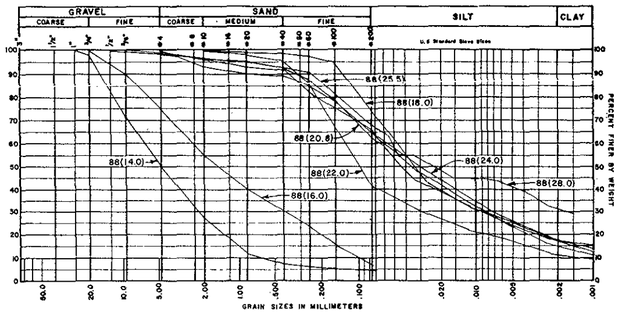
RH 81-86



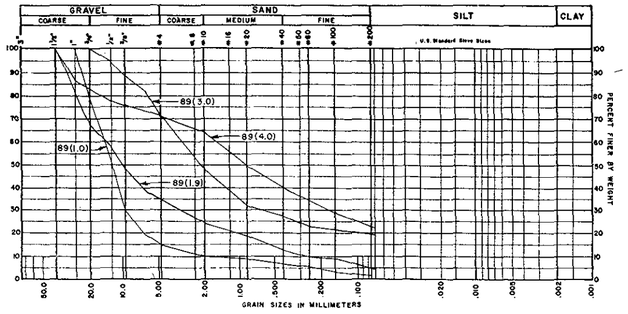
RH 81-87



RH 81-88



RH 81-88



RH 81-89

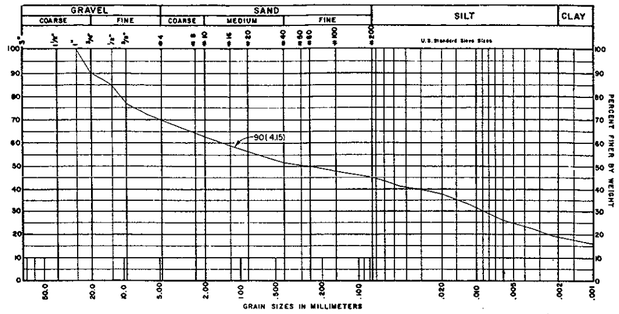
NOTES:
FOR NOTES SEE FIG. 5-1a.

LEGEND:
86(14.0) — INDICATES DRILL HOLE NUMBER
86(14.0) — INDICATES DEPTH OF SAMPLE IN METRES

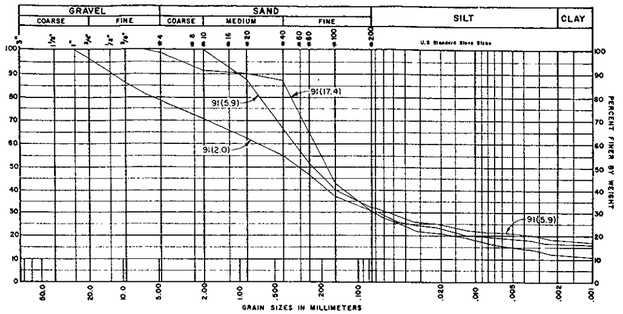
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT
1981 SITE INVESTIGATION
GRAIN SIZE CURVES FOR
RH 81-86, 81-87, 81-88 AND 81-89

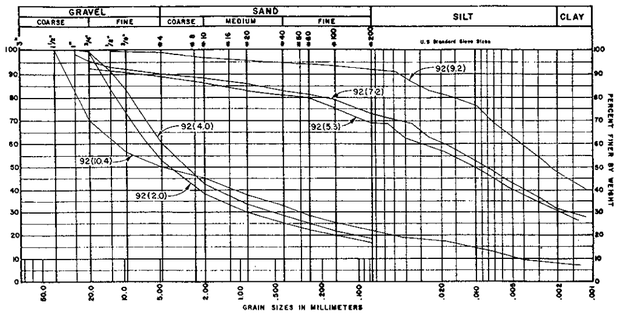
DATE MARCH 1982	FIG. 5-1h
DWN JP	DWG No. 604H-C14-U150



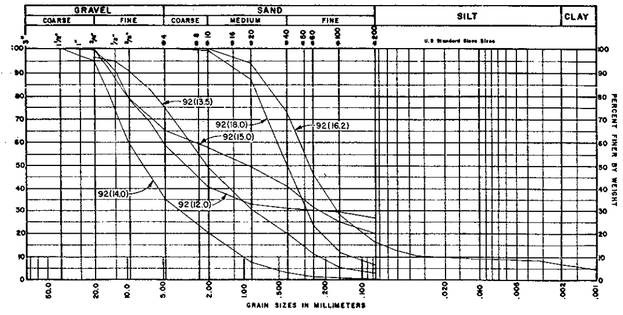
RH 81-90



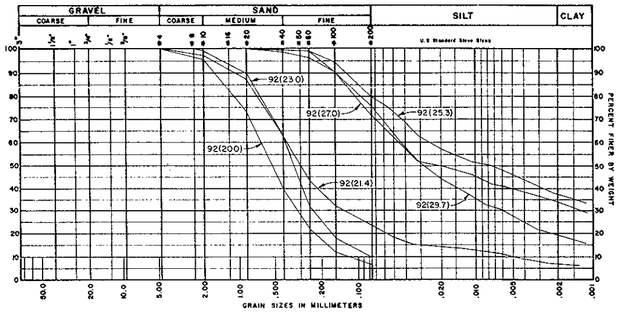
RH 81-91



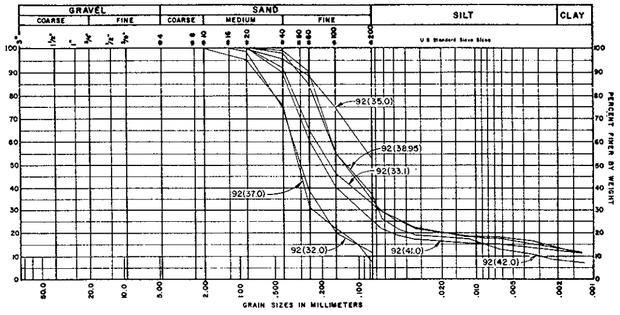
RH 81-92



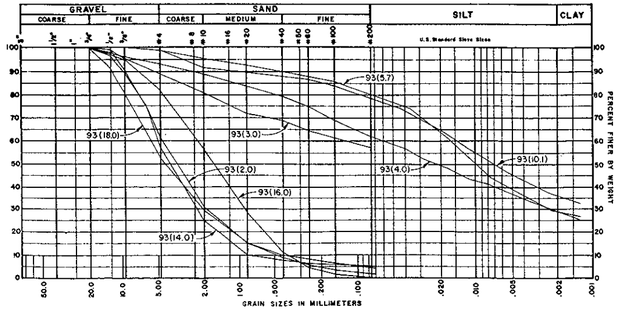
RH 81-92



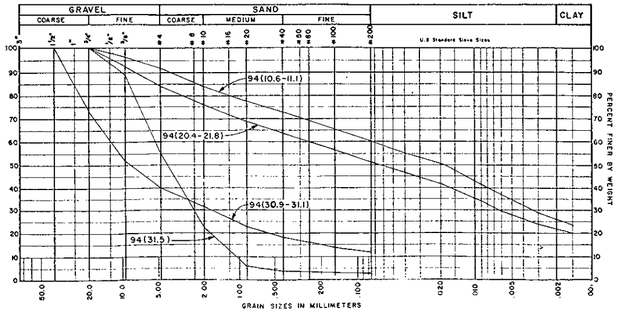
RH 81-92



RH 81-92



RH 81-93



RH 81-94

NOTE:

FOR NOTES SEE FIG. 5-1a.

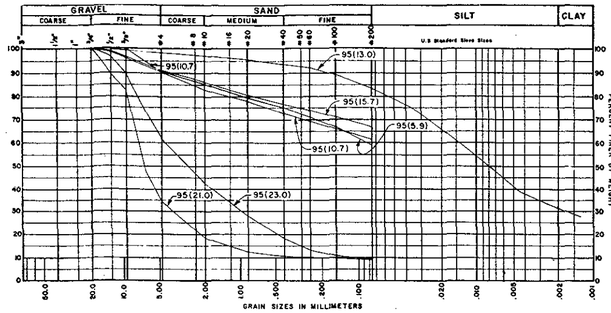
LEGEND:

92(37.0) — INDICATES DRILL HOLE NUMBER
INDICATES DEPTH OF SAMPLE IN METRES

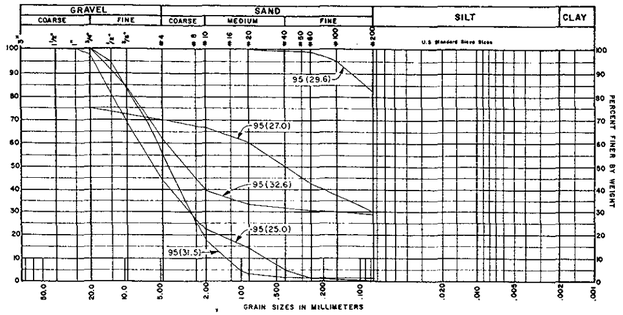
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT
1981 SITE INVESTIGATION
GRAIN SIZE CURVES FOR
RH 81-90, 81-91, 81-92, 81-93 AND 81-94

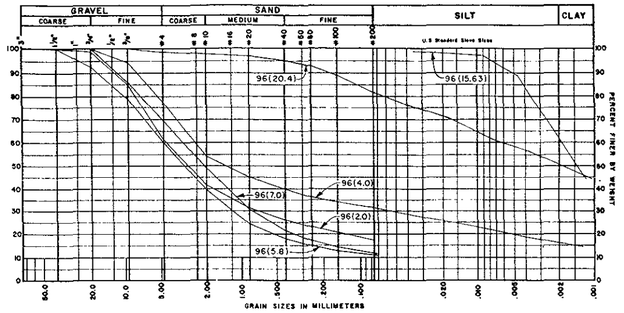
DATE MARCH 1982	FIG. 5-1j
DWN JP	DWG No. 604H-C14-U151



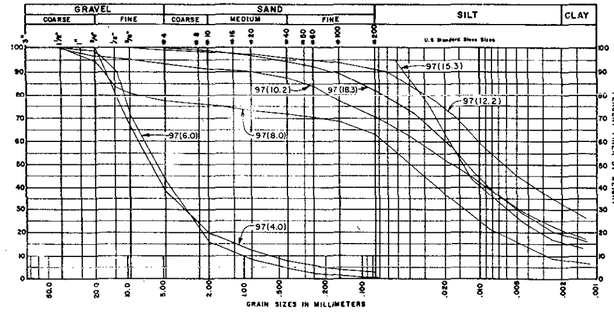
RH 81-95



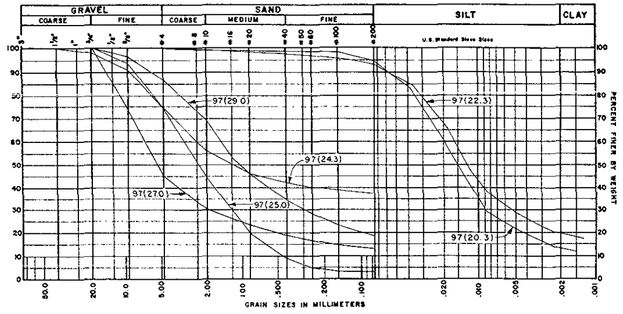
RH 81-95



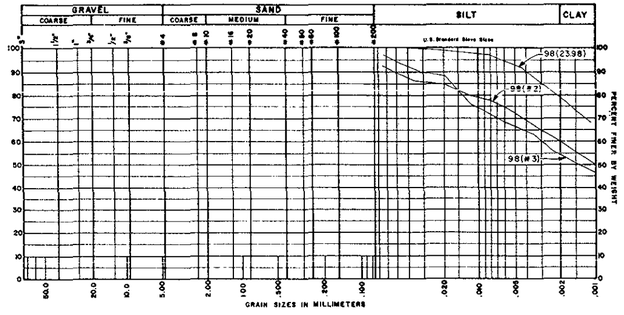
RH 81-96



RH 81-97



RH 81-97



RH 81-98

NOTE:

FOR NOTES SEE FIG. 5-1a.

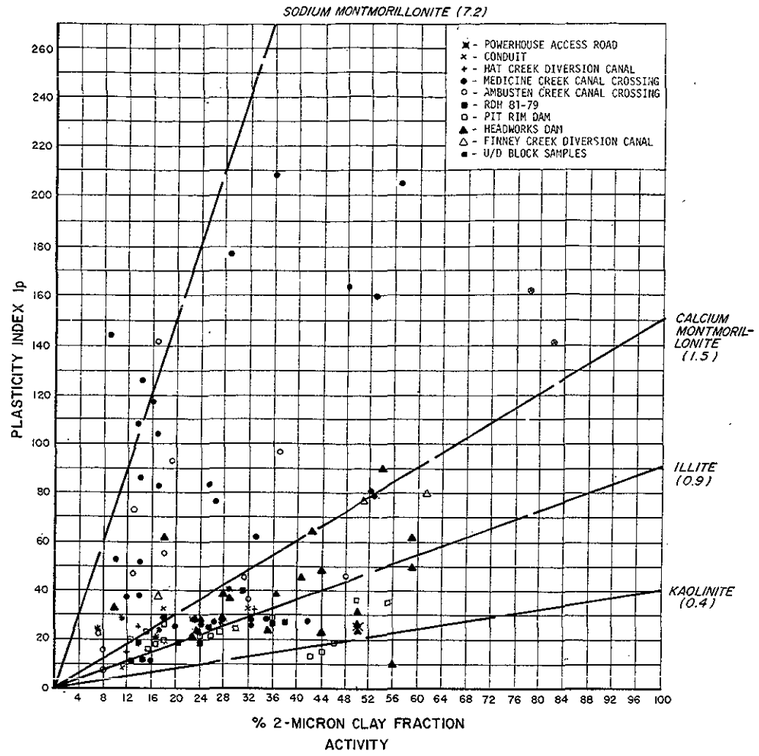
LEGEND:

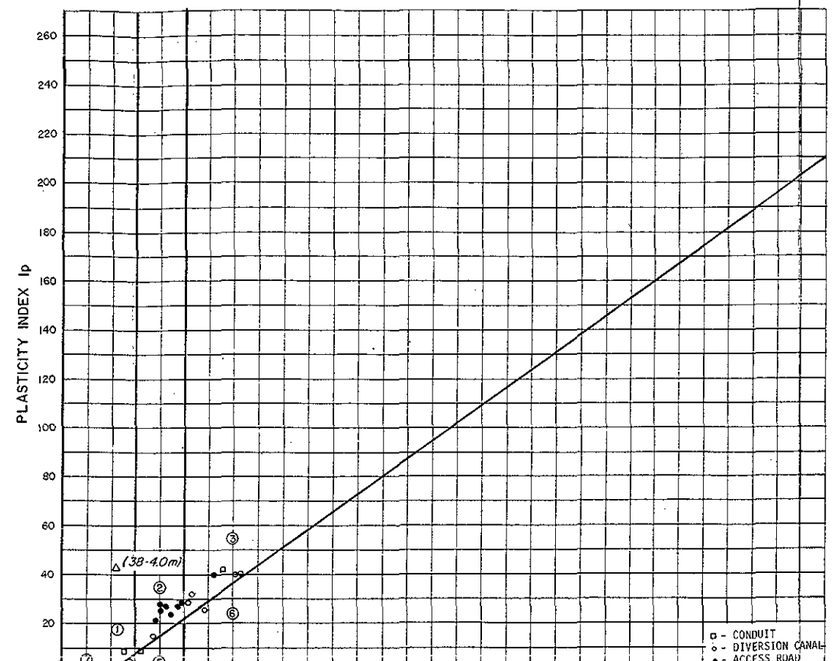
95(29.6) — INDICATES DRILL HOLE NUMBER
95(29.6) — INDICATES DEPTH OF SAMPLE IN METRES

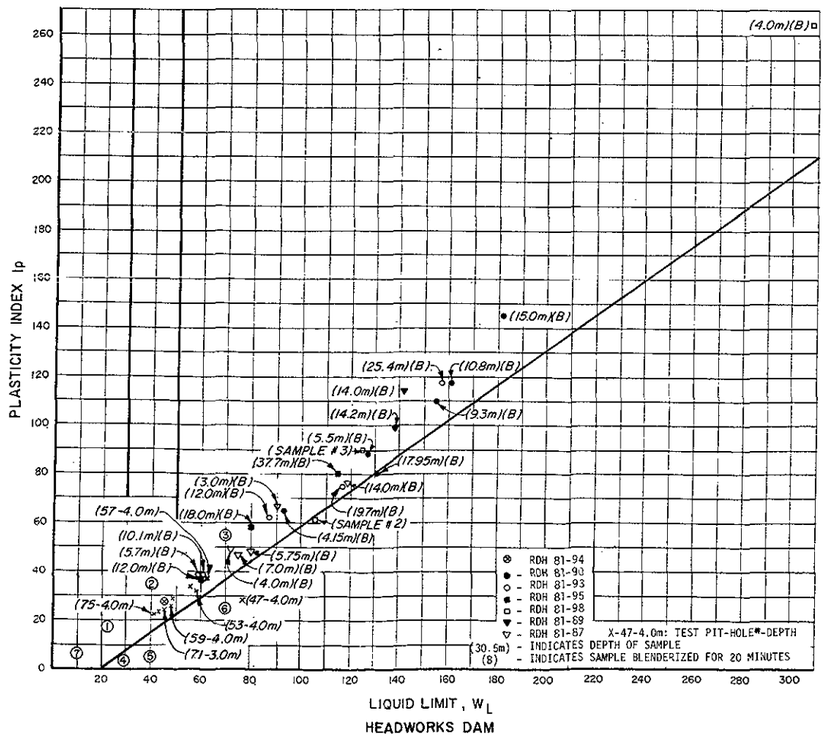
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

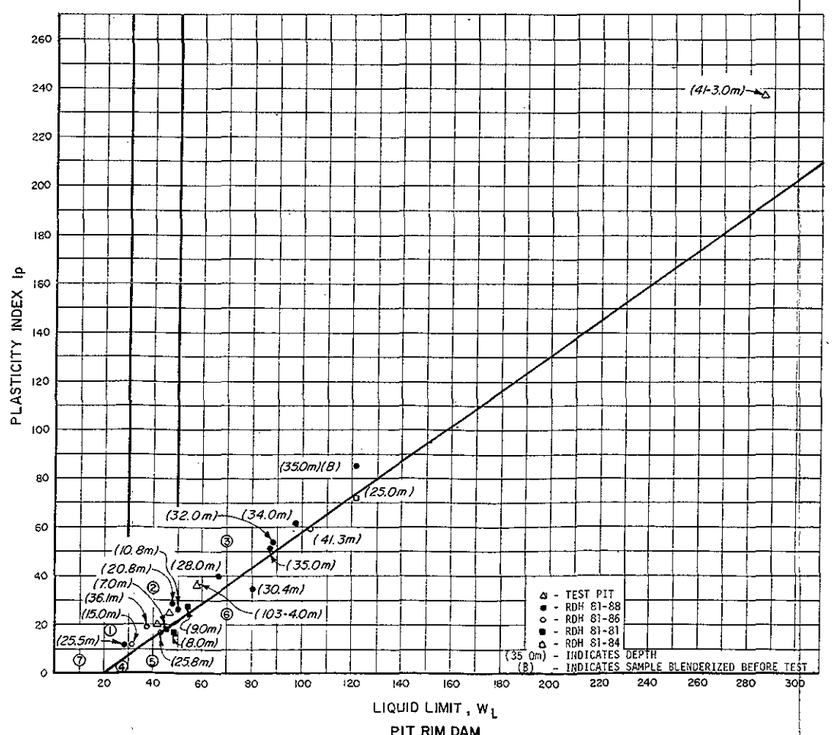
HAT CREEK PROJECT
1981 SITE INVESTIGATION
GRAIN SIZE CURVES FOR
RH 81-95, 81-96, 81-97 AND 81-98

DATE MARCH 1982	FIG. 5-1k
DWN K.L.	DWG No. 604H-C14-U152









LEGEND:

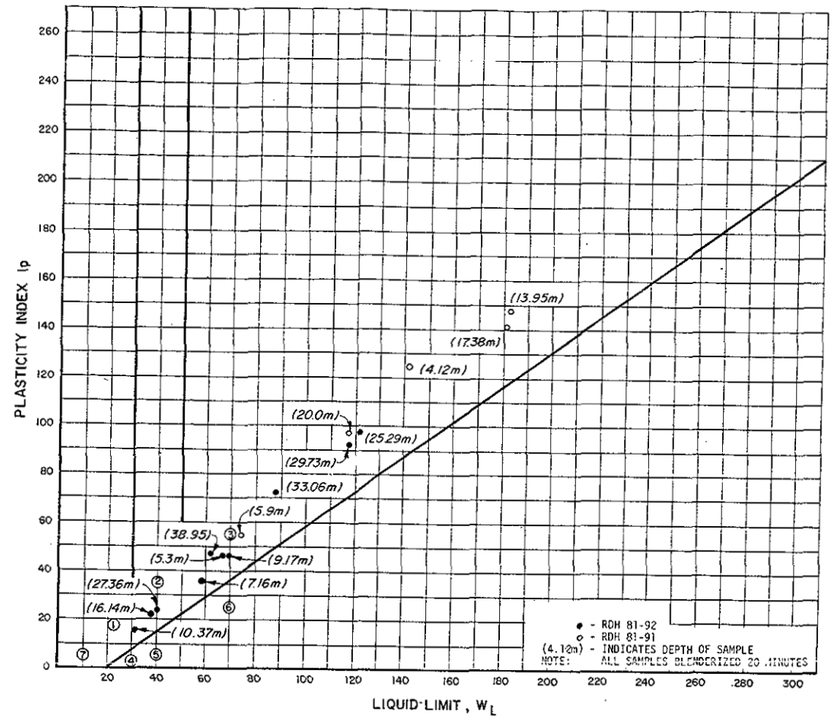
① Inorganic clays of low plasticity.
② Inorganic clays of medium plasticity.
③ Inorganic clays of high plasticity.
④ Inorganic silts of low compressibility.
⑤ Inorganic silts of medium compressibility and organic silts.
⑥ Inorganic silts of high compressibility and organic clays.
⑦ Cohesionless soils.

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

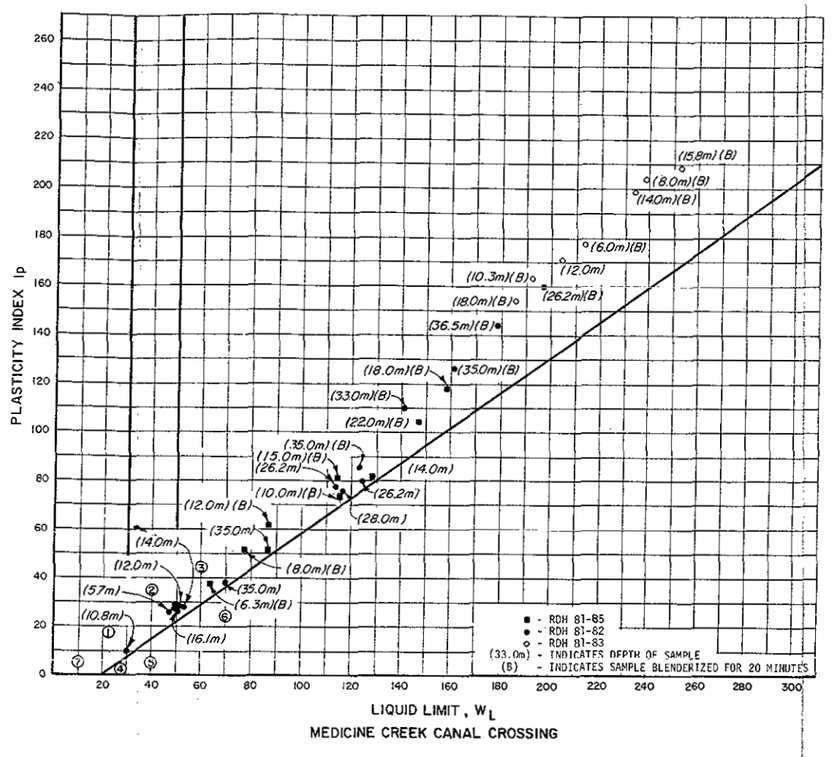
HAT CREEK PROJECT

1981 SITE INVESTIGATIONS ATTERBERG LIMITS

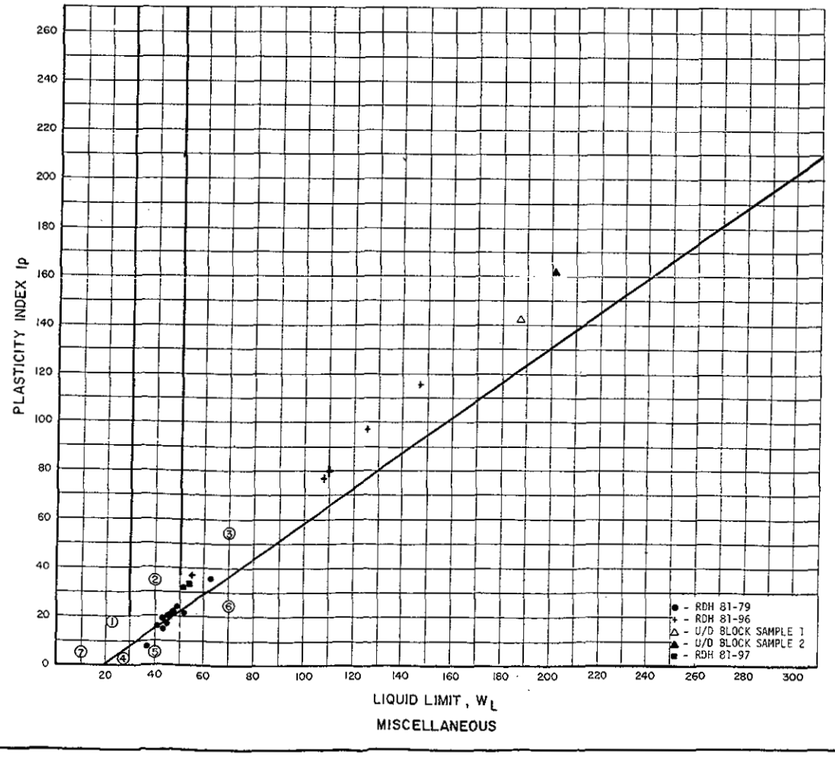
DATE MARCH 1982	FIG. 5-1m
DWN RKW	DWG No. 604H-C14-D163



AMBUSTEN CREEK CANAL CROSSING



MEDICINE CREEK CANAL CROSSING



MISCELLANEOUS

LEGEND:

① Inorganic clays of low plasticity.

② Inorganic clays of medium plasticity.

③ Inorganic clays of high plasticity.

④ Inorganic silts of low compressibility.

⑤ Inorganic silts of medium compressibility and organic silts.

⑥ Inorganic silts of high compressibility and organic clays.

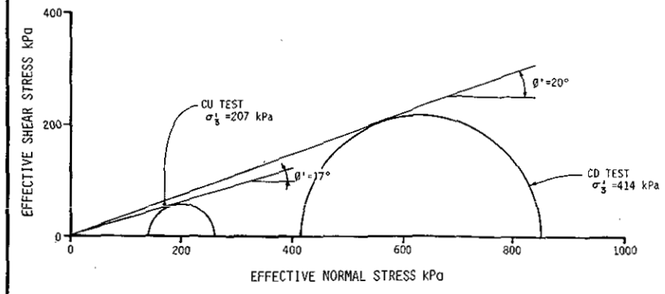
⑦ Cohesionless soils.

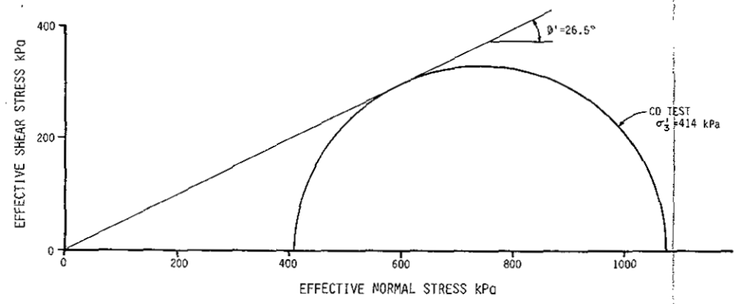
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

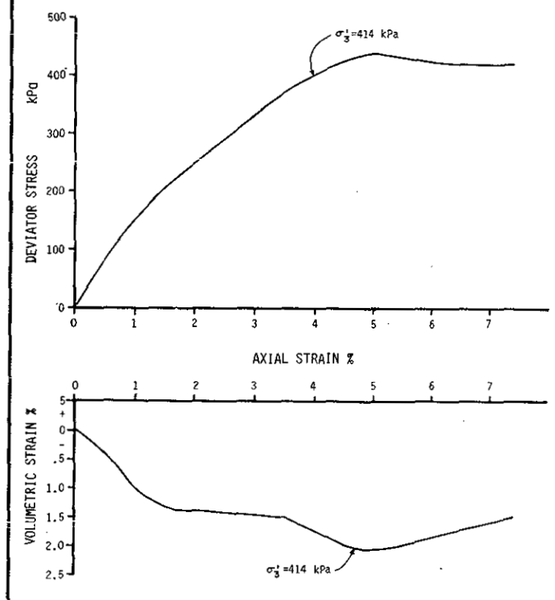
HAT CREEK PROJECT

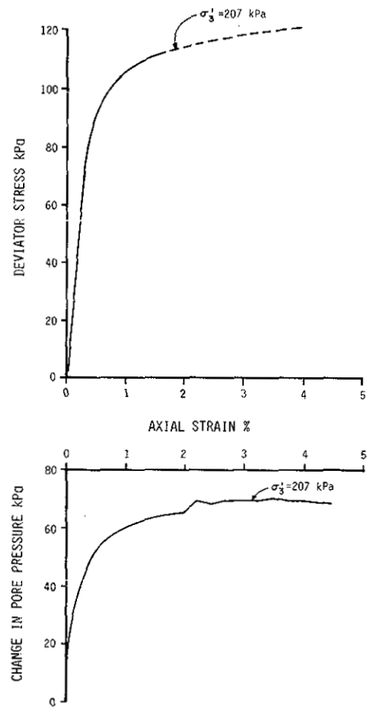
1981 SITE INVESTIGATIONS
ATTERBERG LIMITS

DATE	FIG. 5-1 n
MARCH 1982	
DWN RKW	DWG No 604H-C14-D164

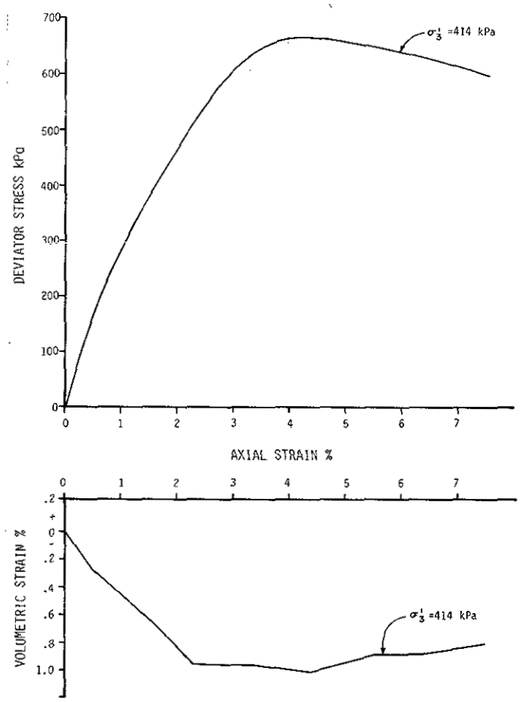








TRIAXIAL TESTS
RH 81-87 SAMPLE NO. 5



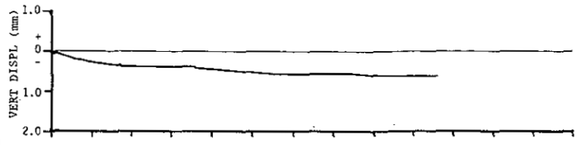
TRIAXIAL TESTS
RH 81-82 SAMPLE NO. 14

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

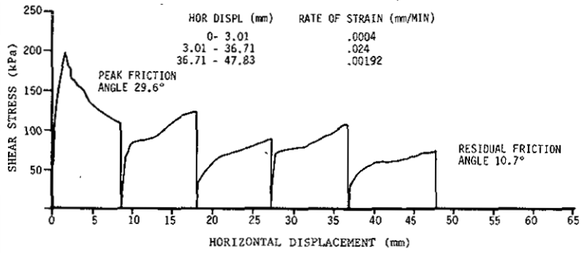
HAT CREEK PROJECT

1981 SITE INVESTIGATIONS
LABORATORY SHEAR TESTS

DATE MARCH 1982	FIG 5-2a	R
DWN A.F.	DWG No. 604H-C14-D163	

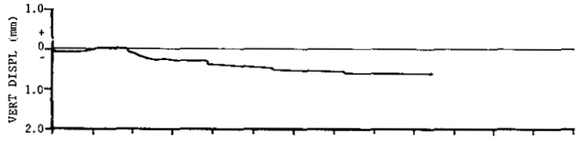


EFFECTIVE NORMAL STRESS = 345 kPa

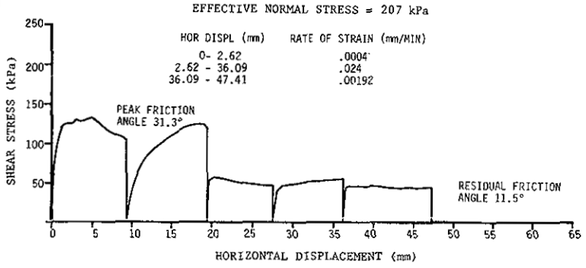


RH 81-98 SAMPLE NO. 4

DIRECT SHEAR TEST

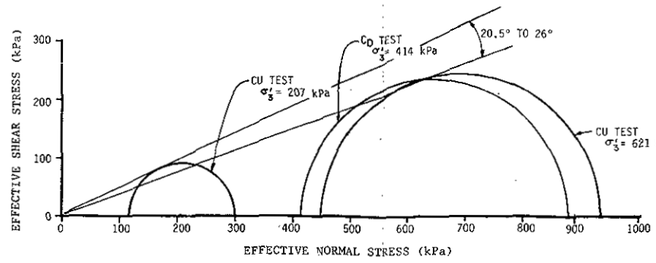


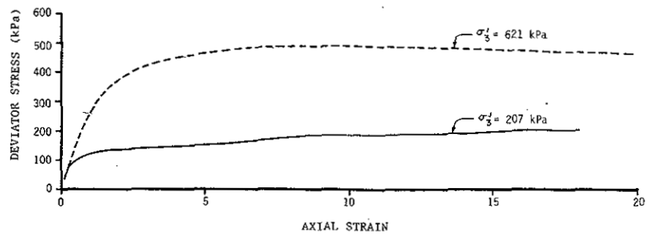
EFFECTIVE NORMAL STRESS = 207 kPa

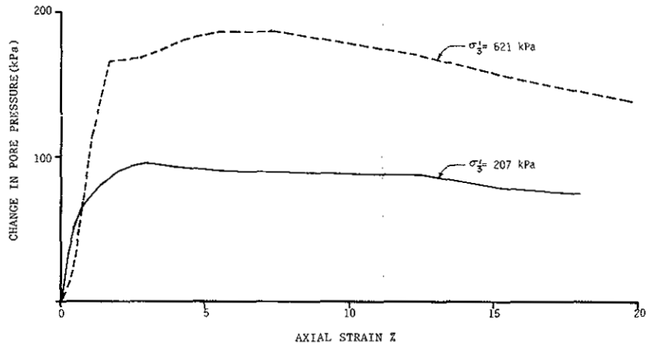


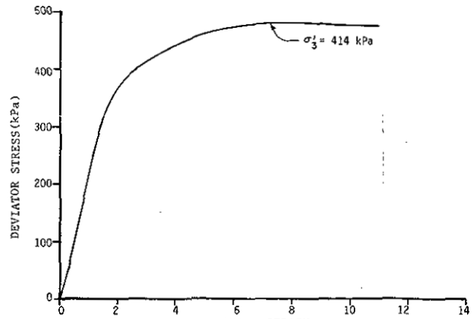
BLOCK SAMPLE NO. 2

DIRECT SHEAR TEST



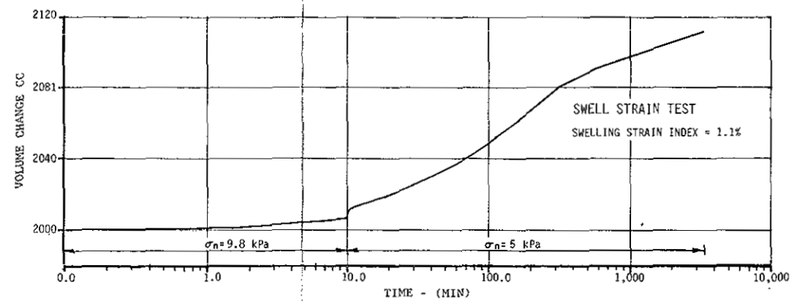


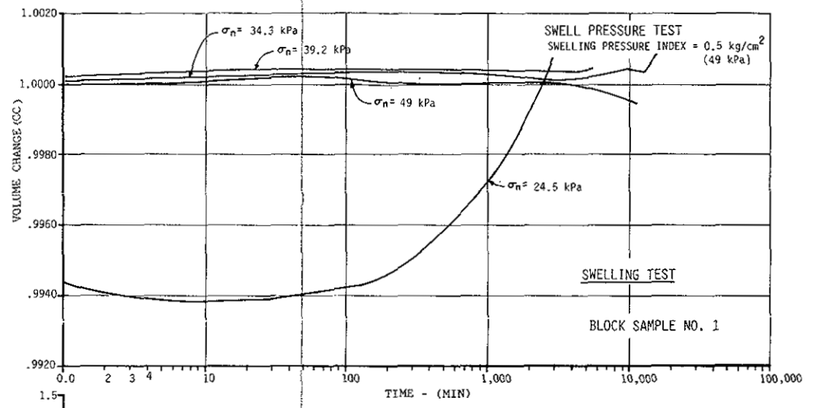


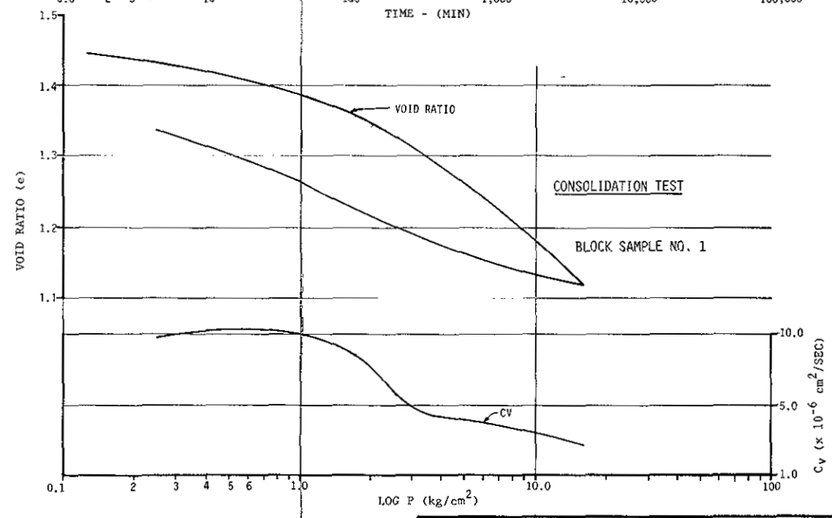


TRIAXIAL TESTS

BLOCK SAMPLE NO. 1





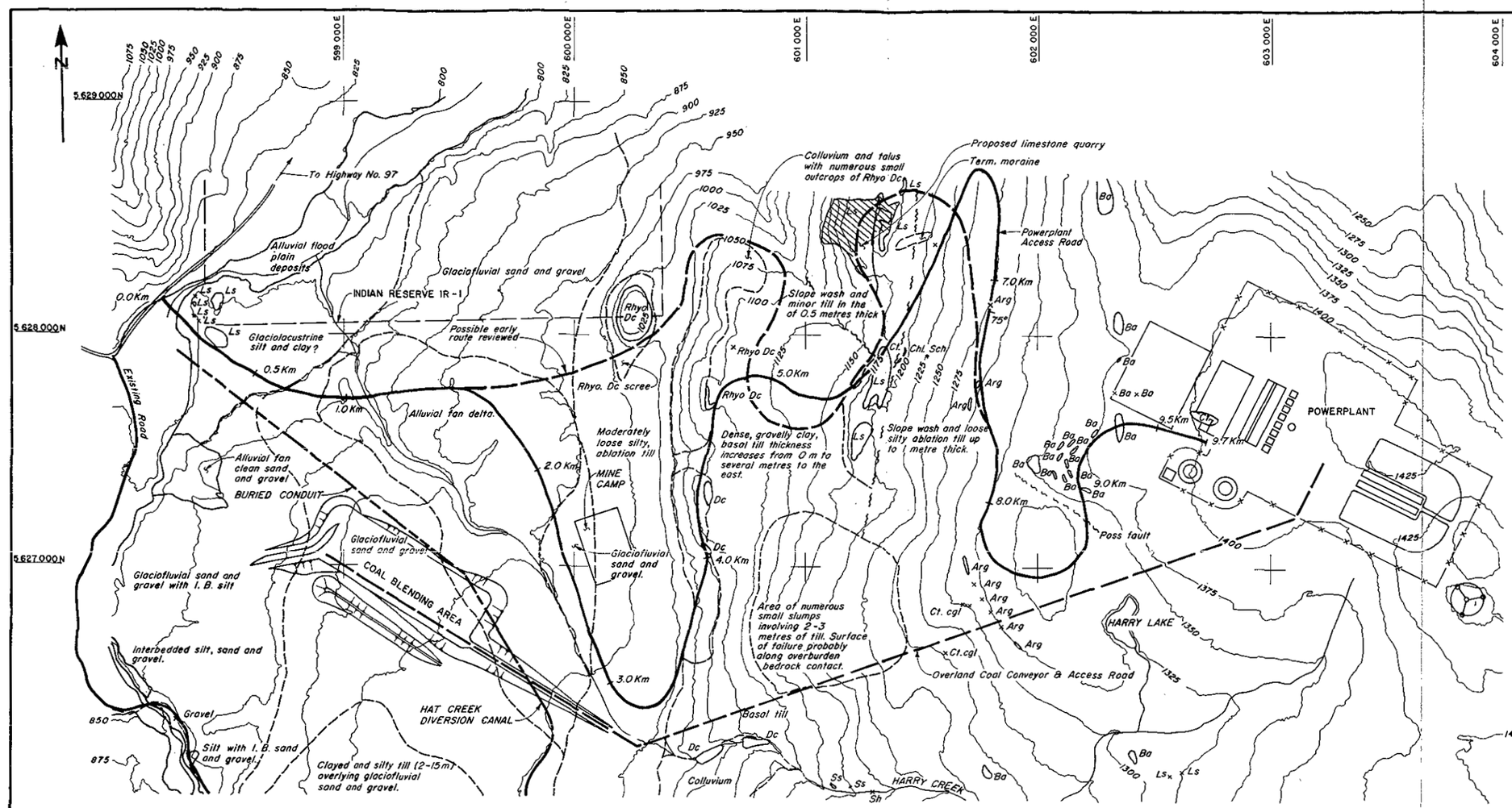


BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

1981 SITE INVESTIGATIONS
LABORATORY SHEAR, CONSOLIDATION AND SWELLING TESTS

DATE MARCH 1982	FIG 5-2b	R
DWN AA	DWG No. 604H-C14-D164	



NOTES:

1. FOR LEGEND SEE FIG. 4-1.

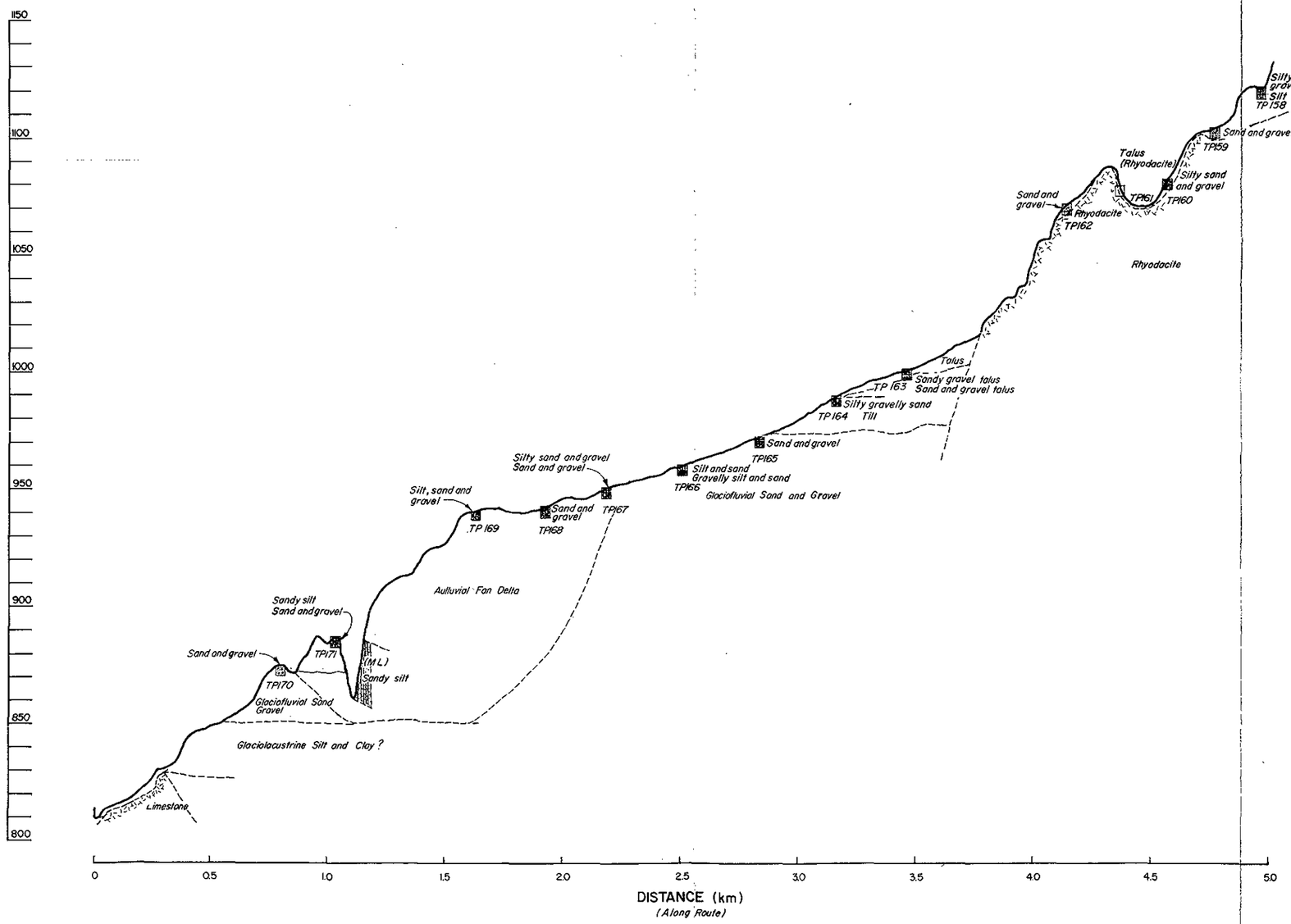
Scale: 1:10000 — 200 0 200 400 600 800 Metres

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

1981 SITE INVESTIGATIONS
PROPOSED POWERPLANT ACCESS ROAD
SURFICIAL GEOLOGY
PLAN

DATE MARCH 1982	FIG. 6-1	R
DWN SM	DWG No. 604H-C13-D153	



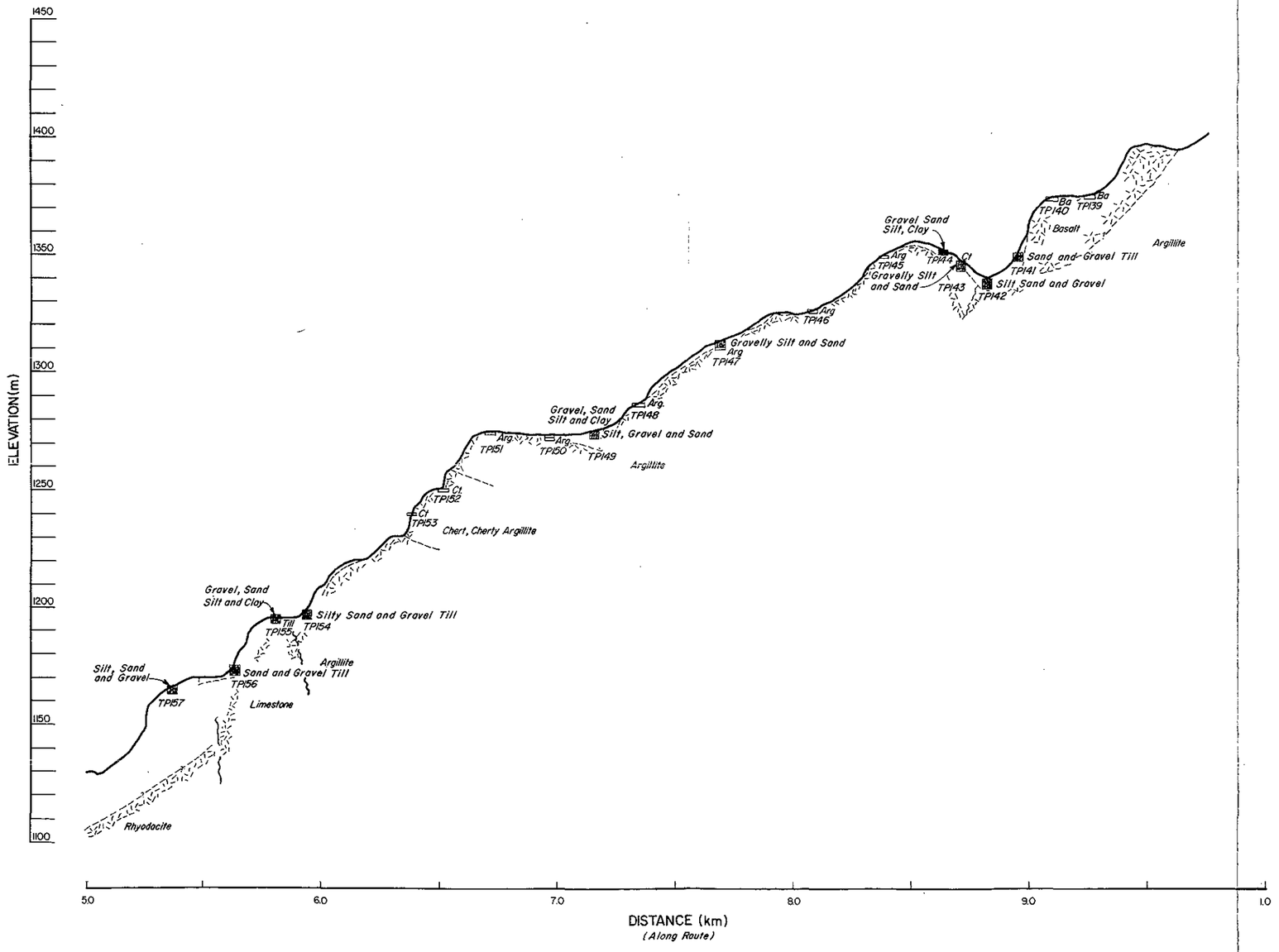
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

1981 SITE INVESTIGATIONS
PROPOSED POWERPLANT ACCESS ROAD
SURFICIAL GEOLOGY
SECTION

SHEET 1

DATE MARCH 1982	FIG. 6-2	R
DWN JGP	DWG No. 604H-C14-D154	



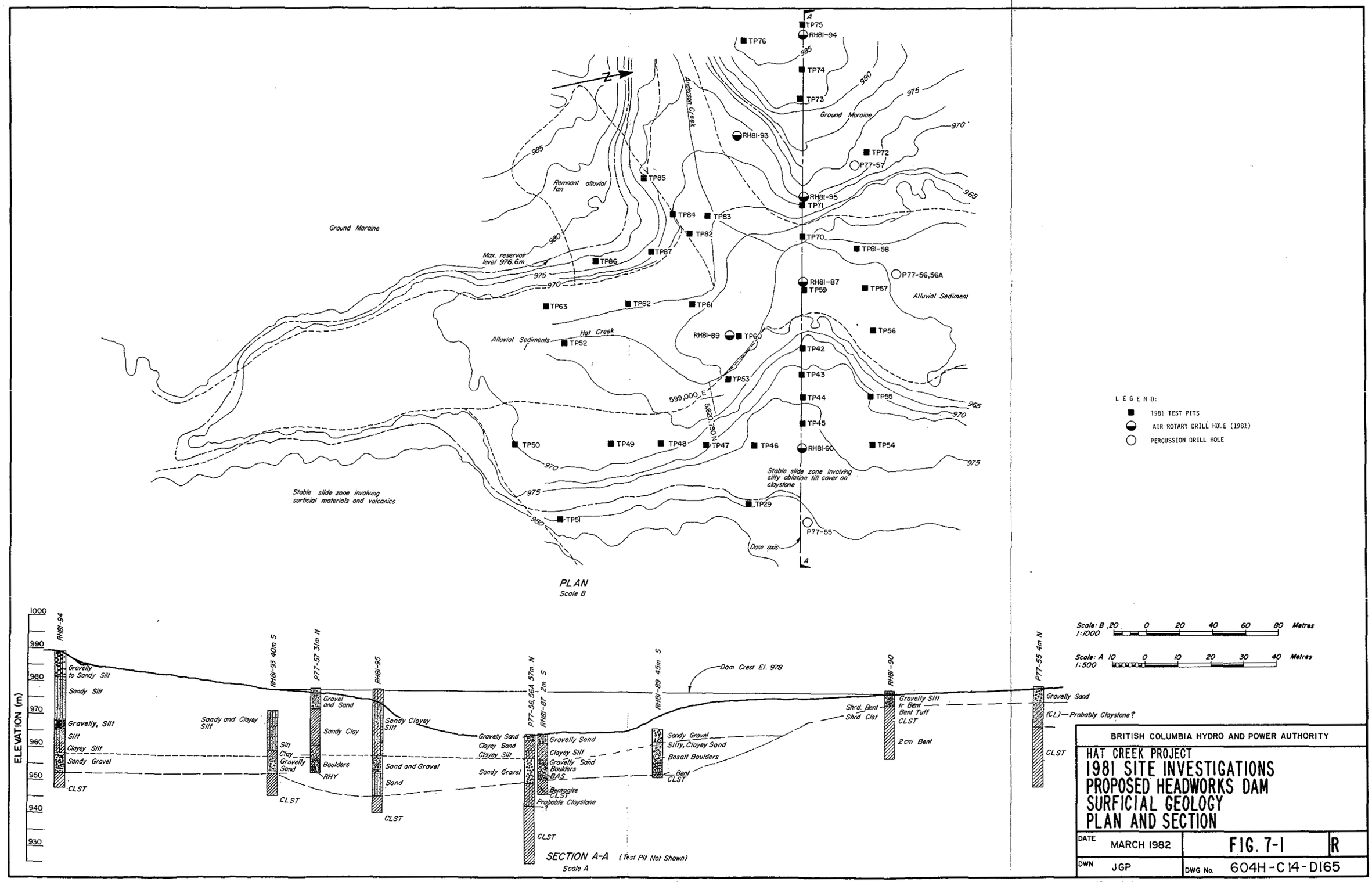
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

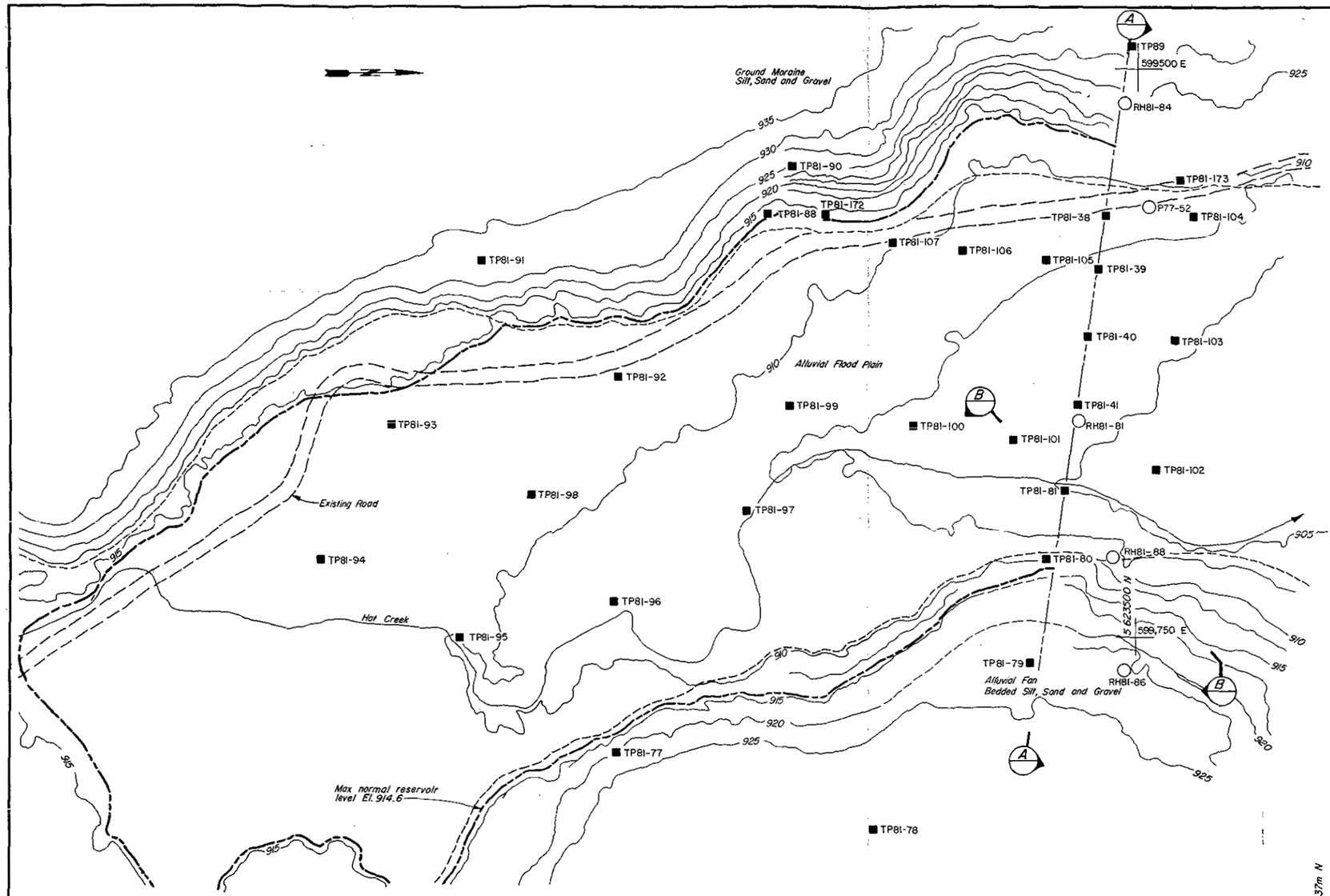
HAT CREEK PROJECT

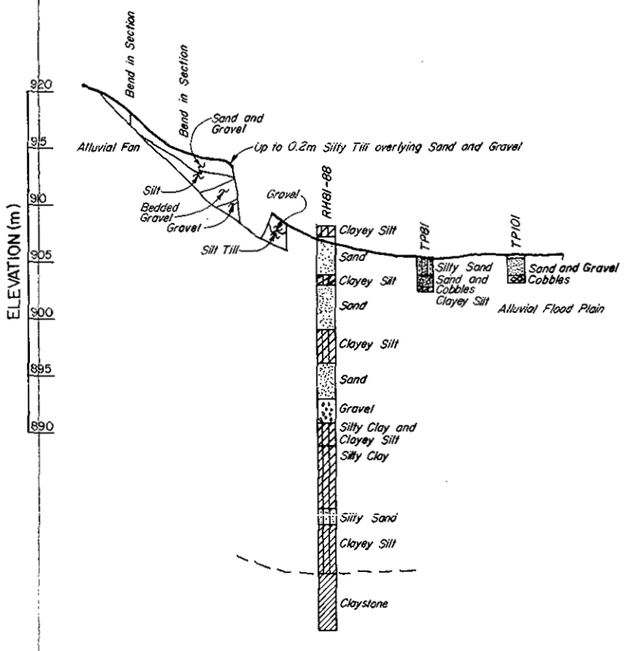
1981 SITE INVESTIGATIONS
PROPOSED POWERPLANT ACCESS ROAD
SURFICIAL GEOLOGY
SECTION

SHEET 2

DATE MARCH 1982	FIG. 6-3	R
DWN JP	DWG No. 604H-C14-D155	


A
TP75
RH81-94
TP76
985
TP74
980
TP73
975
Ground Moraine
970
RH81-93
TP72
P77-57
Anderson Creek
TP85
Remnant alluvial fan
965
RH81-95
TP71
TP84
TP83
Ground Moraine
TP82
980
TP70
TP81-58
Max. reservoir level 976.6m
TP87
TP86
975
970
P77-56,56A
RH81-87
TP59
TP57
Alluvial Sediment
TP63
TP62
TP61
TP56
Alluvial Sediments
Hat Creek
TP52
RH81-89
TP60
TP42
TP43
TP53
599,000 E
5620,750 N
TP44
TP55
965
970
TP45
TP50
TP49
TP48
TP47
TP46
RH81-90
TP54
970
975
Stable slide zone involving silty oblation till cover on claystone
Stable slide zone involving surficial materials and volcanics
975
TP29
980
TP51
P77-55
Dam axis
A
PLAN
Scale B
1000
990
980
970
960
950
940
930
ELEVATION (m)
RH81-94
Gravelly to Sandy Silt
Sandy Silt
Gravelly, Silt
Silt
Clayey Silt
Sandy Gravel
CLST
RH81-93 40m S
Sandy and Clayey Silt
Silt
Clay
Gravelly Sand
CLST
P77-57 31m N
Gravel and Sand
Sandy Clay
Boulders
RHY
RH81-95
Sandy Clayey Silt
Sand and Gravel
Sand
CLST
P77-56,56A 57m N
RH81-87 2m S
Gravelly Sand
Clayey Sand
Clayey Silt
Sandy Gravel
Gravelly Sand
Clayey Silt
Gravelly Sand
Boulders
BAS
Bentonite
CLST
Probable Claystone
?
CLST
RH81-89 45m S
Dam Crest El. 978
Sandy Gravel
Silty, Clayey Sand
Basalt Boulders
Bent
CLST
RH81-90
Shrd Bent
Shrd Clst
Gravelly Silt
Ir Bent
Bent Tuff
CLST
2cm Bent
P77-55 4m N
Gravelly Sand
(CL) — Probably Claystone?
CLST
SECTION A-A (Test Pit Not Shown)
Scale A
LEGEND:
1981 TEST PITS
AIR ROTARY DRILL HOLE (1981)
PERCUSSION DRILL HOLE
Scale: B 1:1000 20 0 20 40 60 80 Metres
Scale: A 1:500 10 0 10 20 30 40 Metres
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
PROPOSED HEADWORKS DAM
SURFICIAL GEOLOGY
PLAN AND SECTION
DATE MARCH 1982
FIG. 7-1
R
DWN JGP
DWG No. 604H-C14-D165





LEGEND:

■ - TEST PIT

○ - DRILL HOLE

Scale: B 20 0 20 40 60 80 Metres

Scale: A 10 0 10 20 30 40 Metres

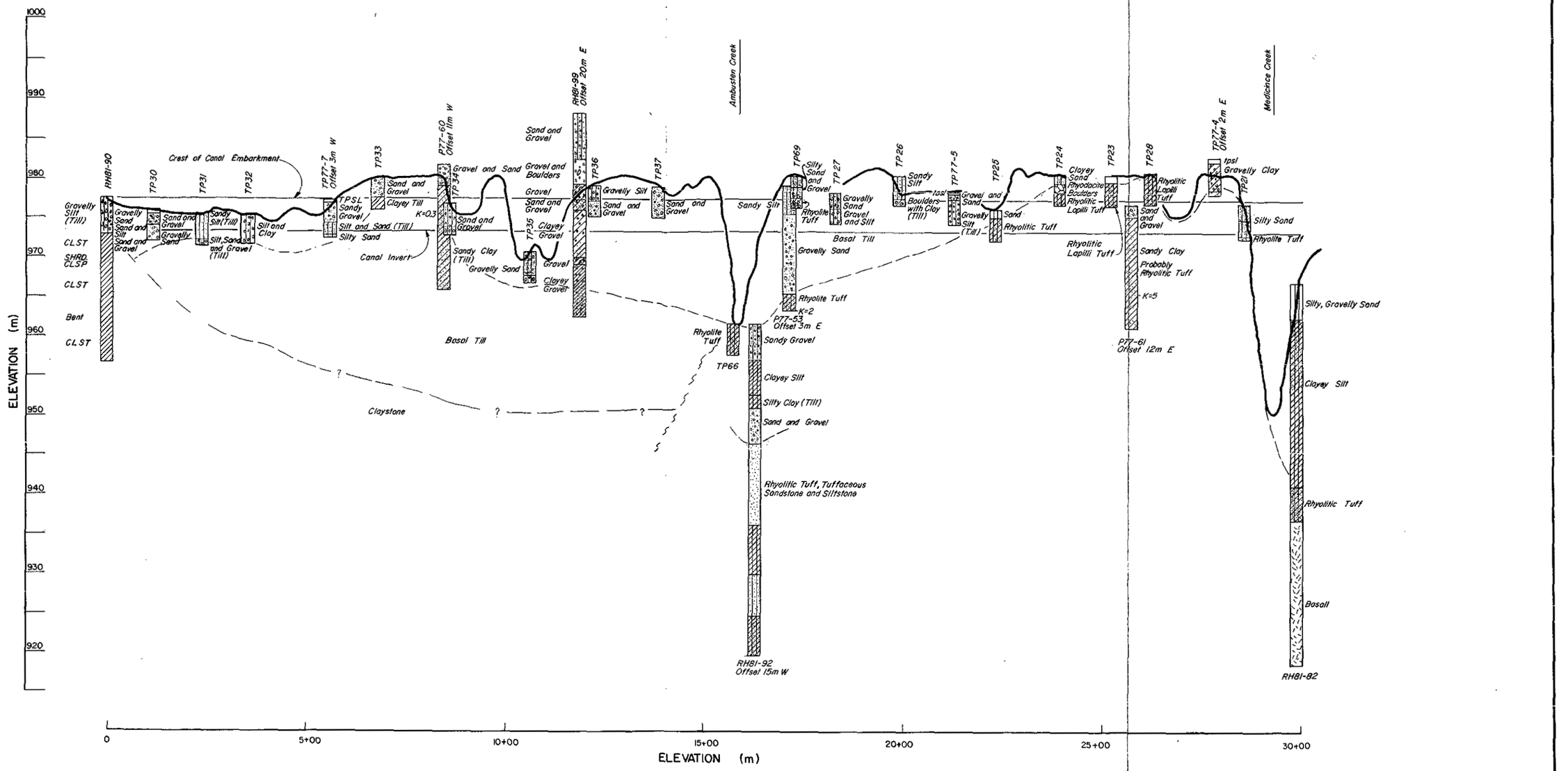
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

1981 SITE INVESTIGATIONS
PROPOSED PIT RIM DAM
SURFICIAL GEOLOGY
PLAN AND SECTIONS

DATE MARCH 1982	FIG. 7-2	R
DWN JGP	DWG No. 604H-C14-D157	

REPORT No. H1478

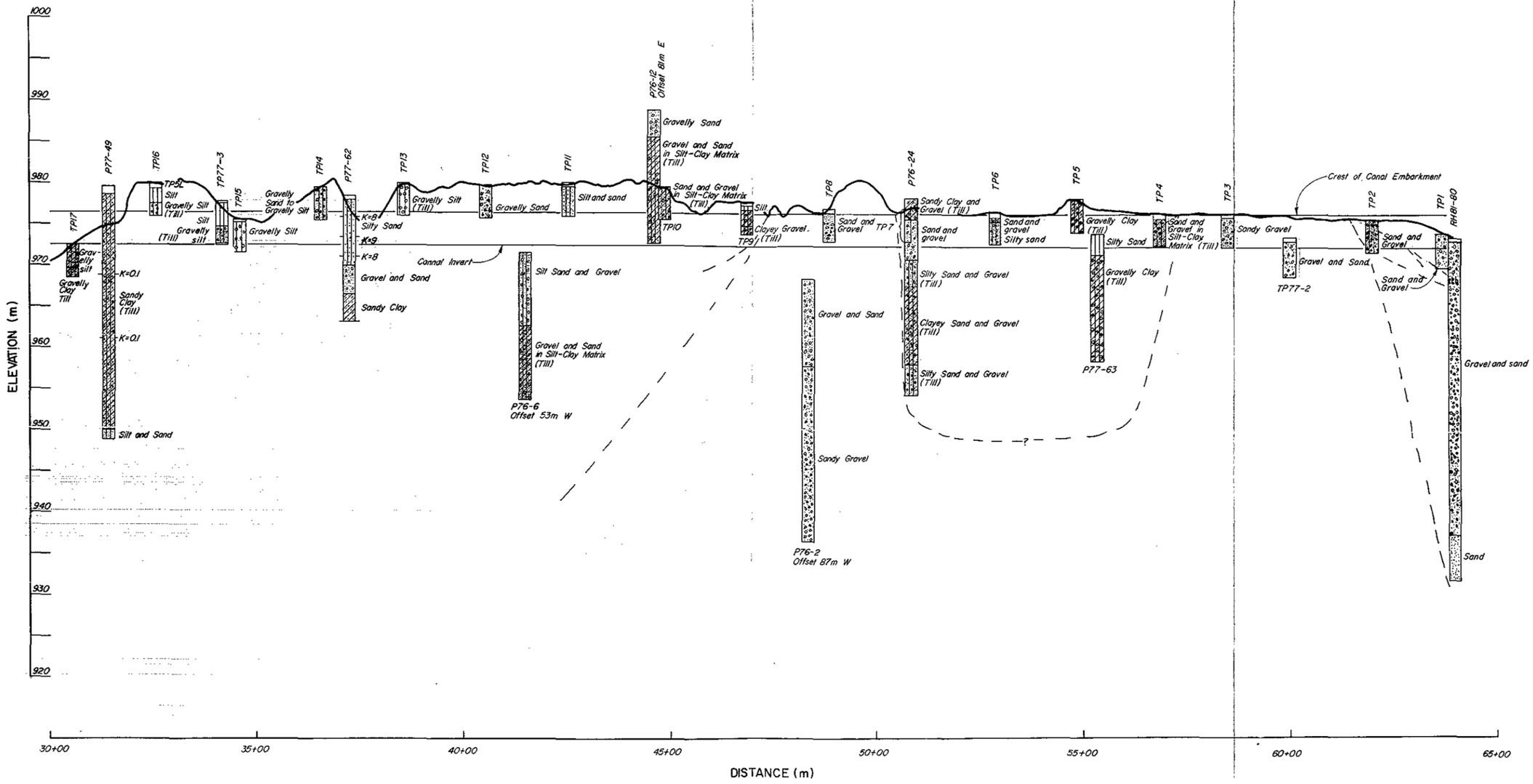


BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

1981 SITE INVESTIGATIONS
PROPOSED CANAL
HEADWORKS DAM TO MEDICINE CREEK

DATE MARCH 1982	FIG. 7-3	R
DWN JGP	DWG No. 604H-C14-D158	



BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

1981 SITE INVESTIGATIONS
PROPOSED CANAL
MEDICINE CREEK TO CONDUIT

DATE MARCH 1982	FIG. 7-4	R
DWN JGP	DWG No. 604H-C14-D159	

N

599,750 E

Ambusten Creek

Alluvial Fan

A

Centerline of the canal

P77-54

TP68

Alluvial Sediment

RH81-91

TP67

Rhyo tuff

Sta. 15.90

TP66

TP65

RH81-92

TP64

TP69

P77-53

970 960 980 975 955 965

5,622,000 N

600,000 E

PLAN

AMBUSTEN CREEK

Crest of Canal embankment

TP 69

P77-53

Silt, sand and gravel rhyo. tuff

Sandy Silt (Till)

Gravelly Sand

Rhyolite Tuff

Till

RH81-91 Offset 20m

Ambusten Creek

RH81-92 Offset 16m

Sand, gravel (Till)

Gravelly Silty sand

Clayey silt (Till)

Silty Clay

Sand and Gravel

Rhyolitic Tuff, Tuffaceous Sandstone and Siltstone

Rhyolitic Tuff, Tuffaceous Sandstone and Siltstone

980 975 970 965 960 955

ELEVATION (m)

SECTION A

N

P77-50

Medicine Creek

940 945 950 960 955 965 970 975 980 990

TP17

B

5,623,500 N

P77-49

Flood and Levee Silt with Sand and Gravel

Rhyo Tuff

RH81-83

Sta. 29+30

RH81-82

Basal Till

Centerline of the canal

TP22

Flood Levee Silt with Sand and Gravel

TP77-4

TP21

B

TP20

RH81-85

TP18

TP19

500,500 E

5,623,250 N

Alluvial Sediments

Ablation Till

PLAN

MEDICINE CREEK

Crest of Canal embankment

970 965 960 955 950 945 940 935 930 925 920 915

ELEVATION (m)

Gravelly Sand (Till) Tuff

TP20

Gravelly Sand (Till)

Silt

Rhyolitic Tuff, Tuffaceous sandstone and siltstone Lapilli Tuff

Medicine Creek

Basalt

RH81-85 Offset 18m

Silty, gravelly sand

Clayey Silt

Rhyolitic tuff

Basalt

RH81-82 Offset 12 m

SECTION B

985 980 975 970 965 960 955 950 945

Sandy Clay (Till)

Silt and Sand

P77-49

Scale: 1:1000

20 0 20 40 60 80 Metres

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

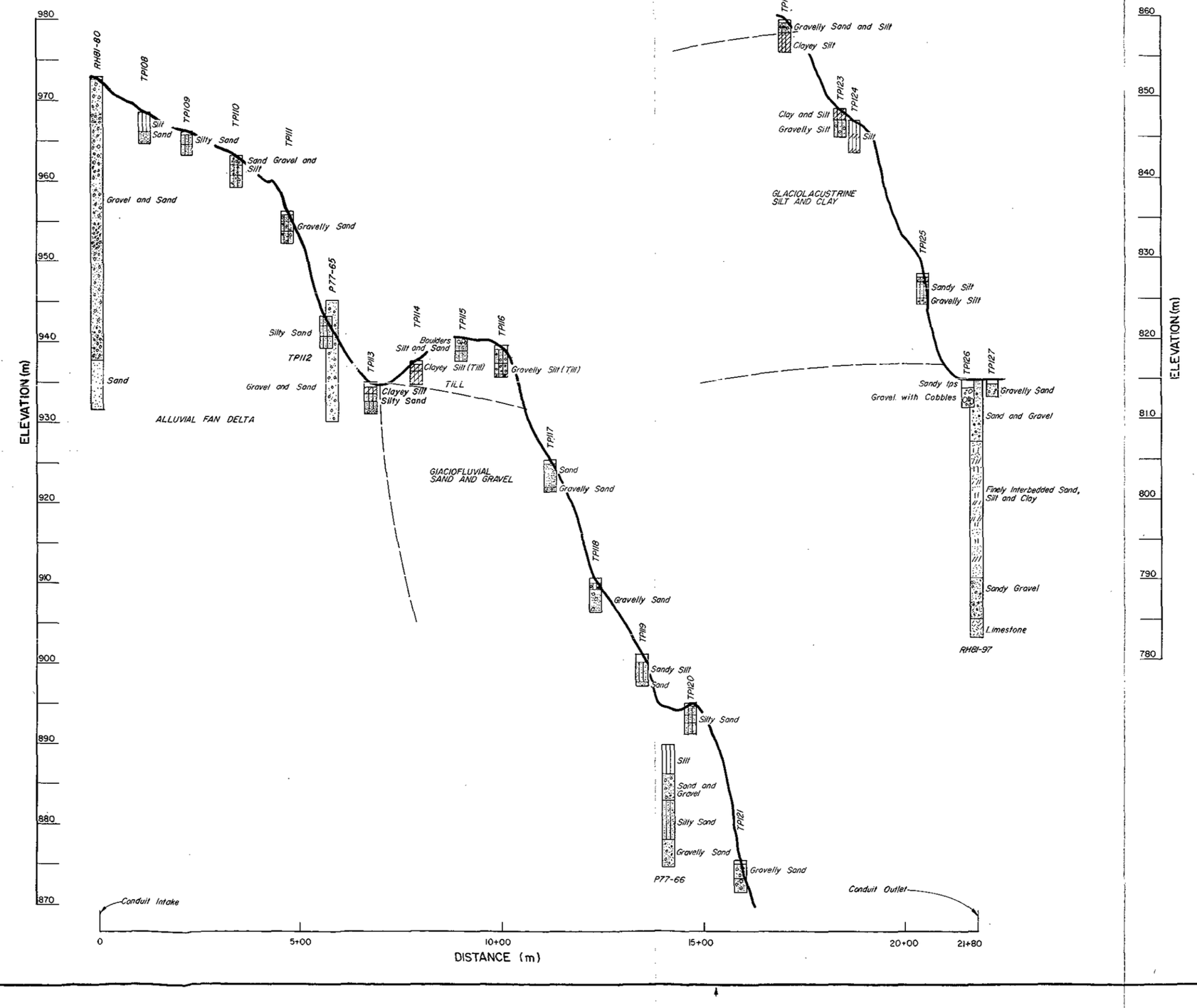
1981 SITE INVESTIGATIONS

PROPOSED CANAL

MEDICINE CREEK AND AMBUSTEN CREEK CROSSINGS

DATE MARCH 1982	FIG 7-5	R
DWN J.G.P.	DWG No. 604H-C14-D160	

REPORT No. H1478



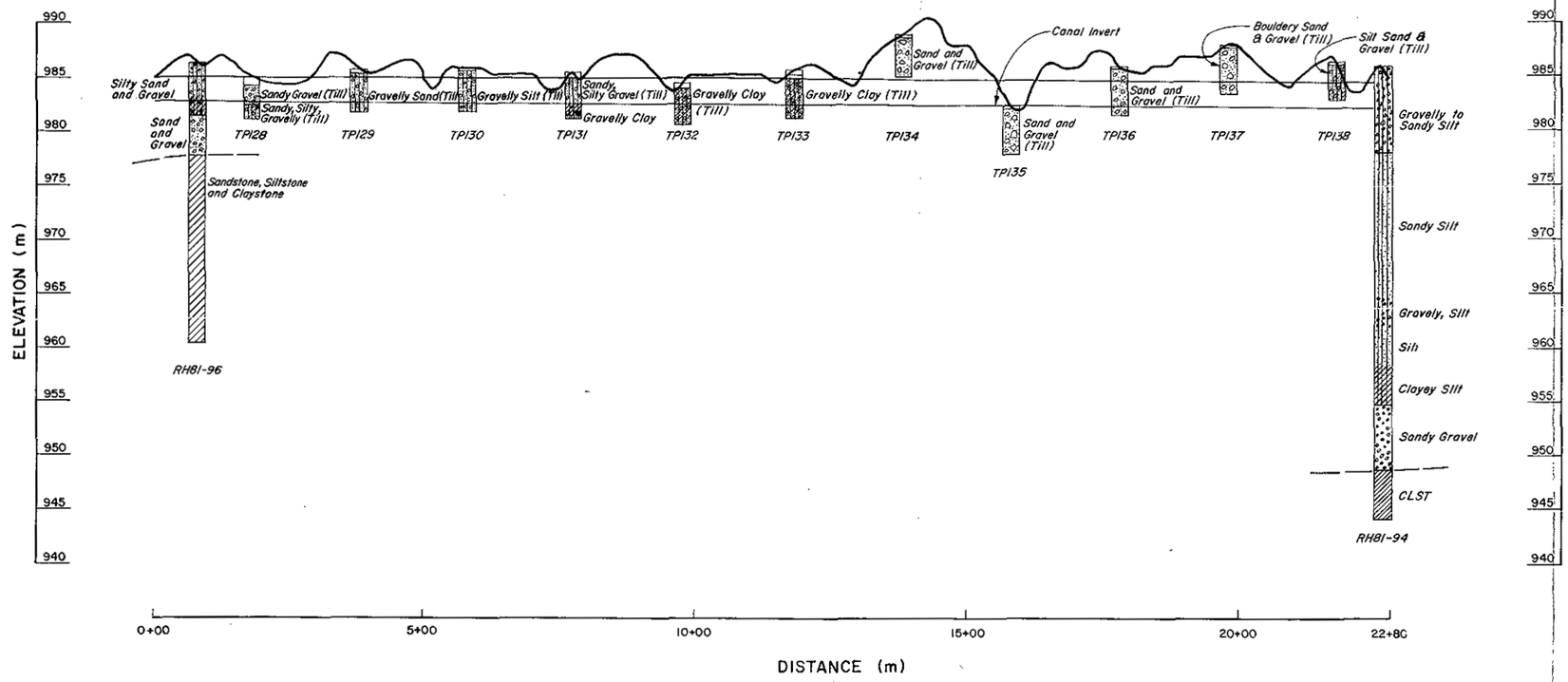
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

1981 SITE INVESTIGATIONS
PROPOSED CONDUIT

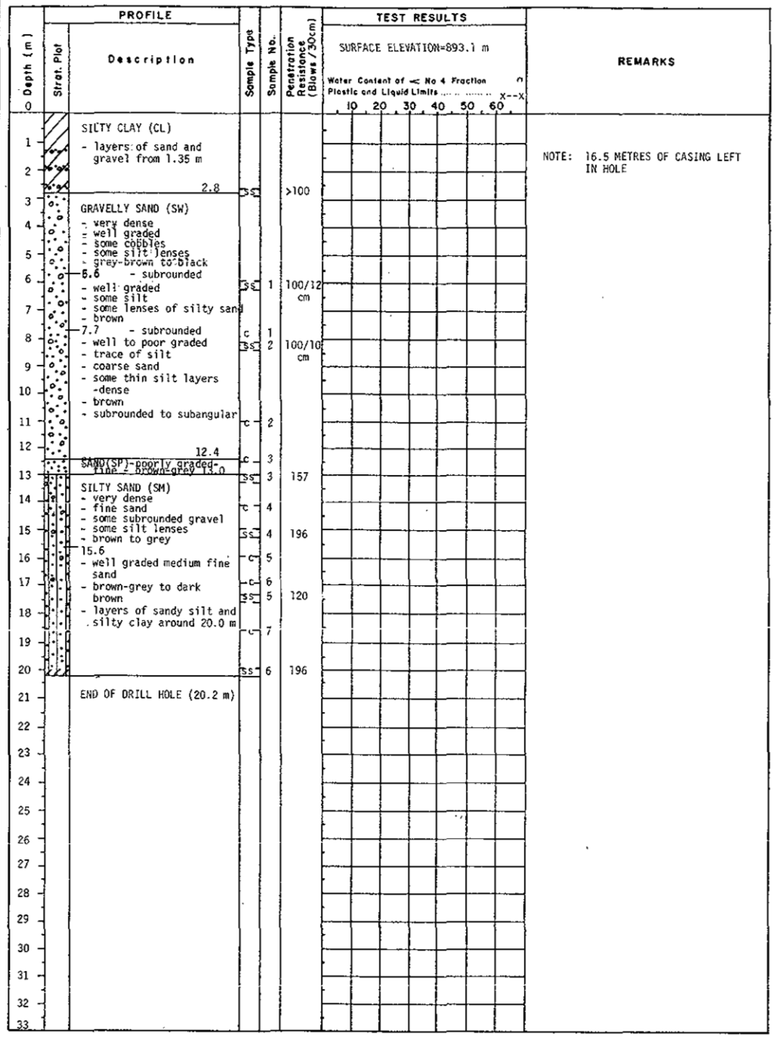
DATE MARCH 1982	FIG 7-6	R
DWN JGP	DWG No. 604H-C14-D161	

REPORT No. H1478

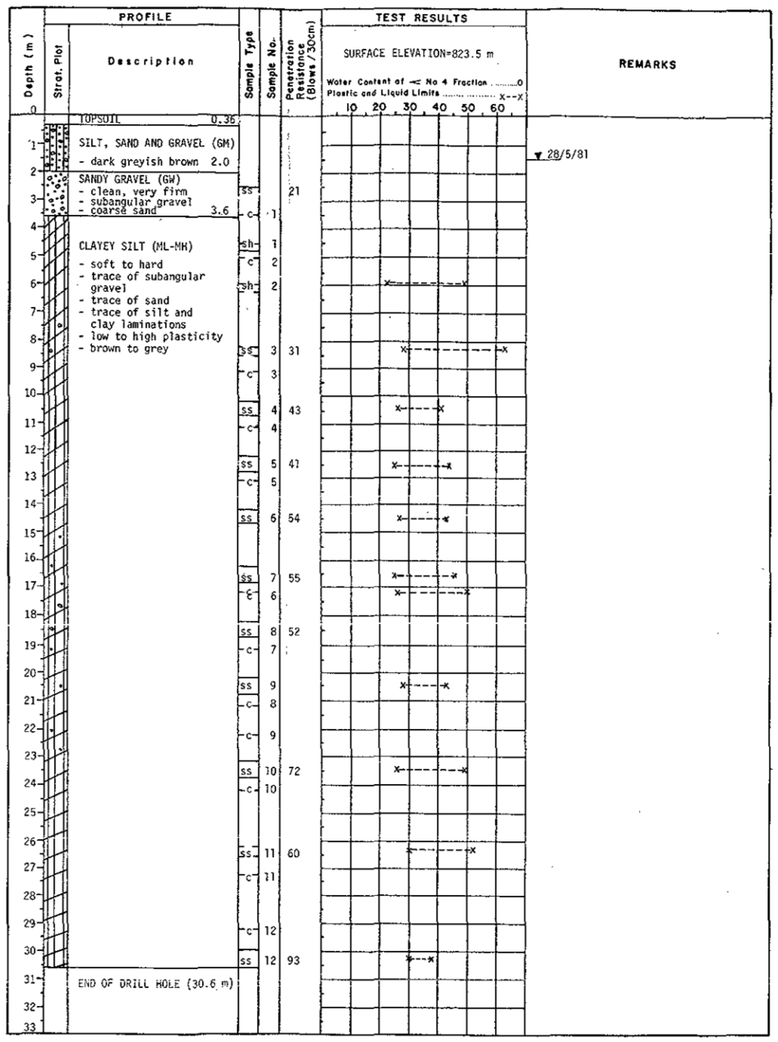


BRITISH COLUMBIA HYDRO AND POWER AUTHORITY		
HAT CREEK PROJECT		
1981 SITE INVESTIGATIONS PROPOSED FINNEY CREEK DIVERSION		
DATE MAR 1982	FIG 7-7	R
DWN JGP	DWG No. 604H-C14-D162	

APPENDIX A



DRILL HOLE No. RDH 81-78
PROJECT HAT CREEK
LOCATION CONDUIT ROUTE



DRILL HOLE No. RDH 81-79
PROJECT HAT CREEK
LOCATION CONDUIT ROUTE

LEGEND AND ABBREVIATIONS
ON DRILL HOLE AND TEST PIT LOGS

SYMBOL	DESCRIPTION	UNIT
SS	SPLIT SPOON SAMPLE	
SH	SHELBY TUBE SAMPLE	
C	CUTTINGS SAMPLE	
G	GRAB SAMPLE	
157	STANDARD PENETRATION RESISTANCE (N VALUE) - 63.5 kg HAMMER, 76 cm DROP	BLOWS/30 cm
○	MOISTURE CONTENT	%
×—×—×	PLASTIC AND LIQUID LIMITS	%
▼ 28/5/81	WATER LEVEL AND DATE OF OBSERVATION	
✳	LOCATION OF FALLING OR CONSTANT HEAD PERMEABILITY TEST	
	SAND OR SANDSTONE	
	GRAVEL	
	BOULDERS	
	CLAY OR CLAYSTONE	
	SILT OR SILTSTONE	
	BEDROCK	
	CASING	
	STANDPIPE OR PNEUMATIC PIEZOMETER LINE	
	SAND - CEMENT GROUT	
	BENTONITE CLAY SEAL	
	PEA GRAVEL	
	#16 SILICA SAND	
	SLOTTED PVC PIPE OR PNEUMATIC PIEZOMETER TIP	

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

1981 SITE INVESTIGATIONS
GRAPHIC DRILL LOGS

SHEET 1

DATE MAR 1982

DWN

DWG No. 604H-C14-D166

DRILL HOLE No. RDH 81-80
PROJECT HAT CREEK
LOCATION CONDUIT ROUTE

Depth (m)	Strat. Plot	Description	Sample Type	Sample No.	Penetration Resistance (Blows/30cm)	TEST RESULTS — SURFACE ELEVATION = 973.0 m; Water Content of < No 4 Fraction ....O; Plastic and Liquid Limits .... (10 20 30 40 50 60)	REMARKS
0		TOPSOIL 0.4					
1		GRAVEL AND SAND (SM TO GW)	C	1			
2		- angular, subangular and subrounded gravel	C	2			
3		- zones of gravel or sand	C	3			
4		- trace to some silt	C	4			
5		- some boulders and cobbles	C	5			
6		- low to medium permeability	C	6			
7		very dense	SS	-	NO PENE-TRATION		
8		5.6 clean coarse gravel (GW) 5.9	C	7			
9			C	8			
10			SS	1	54/8cm		
11			C	9			
12			C	10			
13			C	11			
14			C	12			
15			SS	2	229		
16			C	13			
17			C	14			
18			SS	3	138		
19			C	15			
20			C	16			
21			SS	4	50/5cm		
22			C	17			
23			C	18			
24			SS	5	157		
25		24.8 boulder 24.7 Sand (SP) - some silt - trace of gravel	C	19			
26			C	20			
27		27.3	SS	6	175/5cm		
28			C	21			
29		28.2 28.9	C	22			
30		Sand (SP) - trace of silt	C	23			
31		30.7	SS	7	110/12cm		
32			C	24			
33			C	25			
			C	26			
			SS	8	58/5cm		
			C	27			
			C	28			
			C	29			
			SS	9	133		
			C	30			
			C	31			
			C	32			
			SS	10	147		
			C	33			

DRILL HOLE No. RDH 81-80
PROJECT HAT CREEK
LOCATION CONDUIT ROUTE

Depth (m)	Strat. Plot	Description	Sample Type	Sample No.	Penetration Resistance (Blows/30cm)	TEST RESULTS — SURFACE ELEVATION=973.0 m; Water Content of < No 4 Fraction .... O; Plastic and Liquid Limits .... x--x (10 20 30 40 50 60)	REMARKS
33							
34		GRAVEL AND SAND (GW-SW)	C	34			
35		- subrounded gravel	C	35			
36		- trace of silt	SS	11	196		
37		- very dense 35.5	C	36			
38		SAND (SW)	C	37			
39		- trace to some silt	C	38			
40		- dense	SS	12	32		
41		37.9- brown	C	39			
42		- trace of gravel	C	40			
43		gravelly-subrounded -boulder	C	41			
44		38.8					
45		END OF DRILL HOLE (41.0 m)					
46							
47							
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							
60							
61							
62							
63							
64							
65							
66							

DRILL HOLE No. RDH 81-80
PROJECT HAT CREEK
LOCATION CONDUIT ROUTE

Depth (m)	Strat. Plot	Description	Sample Type	Sample No.	Penetration Resistance (Blows/30cm)	TEST RESULTS — SURFACE ELEVATION=907.0 m; Water Content of < No 4 Fraction .... O; Plastic and Liquid Limits .... x--x (10 20 30 40 50 60)	REMARKS
0		TOPSOIL 0.15					+5/6/81
1		SANDY GRAVEL (GP)-brown 0.85					
2		GRAVELLY SAND (SW-SM)	C	1			*
3		- some silt - subrounded gravel - brown 2.1	SS	1	51		
4		SANDY SILT (ML) - hard, brown - some sub-rounded gravel 3.0	C	2			
5		CLAYEY SILT (ML-CL)	SS	2	68		
6		- hard	C	3			
7		- low to medium plastic	SS	3	36		
8		- zone of very fine sand (SP) between 7.5 & 7.8 m	C	4			
9		- trace of sand	SS	4	45		
10		- trace of gravel	C	5			
11		brown 7.5 7.8	SS	5	100		*
12		SANDY SILT (ML) - trace of gravel 9.75	C	6			
13		GRAVELLY SAND (SP) - some silt - grey - low permeability subangular gravel 11.15	SS	6	100		*
14		SANDY GRAVEL (GW) - medium to coarse, brown - some silt - low permeability 12.65	C	7			
15		GRAVELLY SAND (SW) - medium to coarse - trace of silt - brown 15.0	C	8			
16		CLAYEY SILT (ML) - some sand-trace of gravel 15.55					
17		CLAYSTONE - grey					BEGAN DIAMOND CORING
18							NOTE: PIEZOMETER INSTALLED
19		END OF DRILL HOLE (18.77 m)					
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							

DRILL HOLE No. RDH 81-81
PROJECT HAT CREEK
LOCATION PIT RIM DAM

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

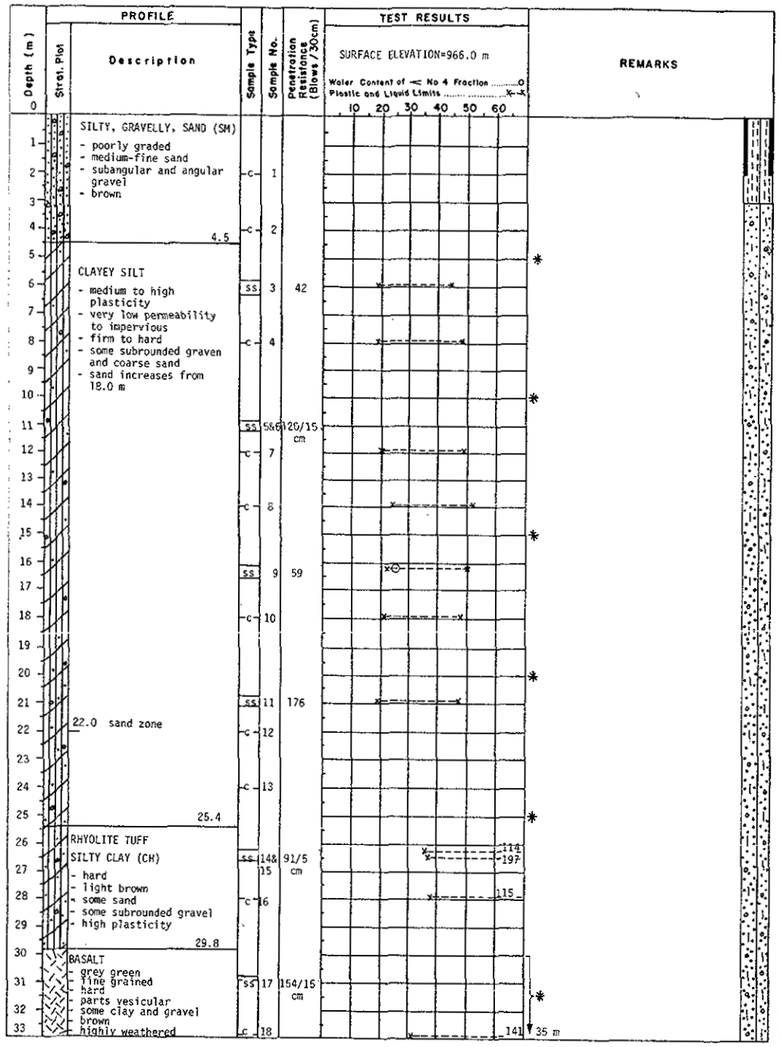
1981 SITE INVESTIGATIONS
GRAPHIC DRILL LOGS

SHEET 2

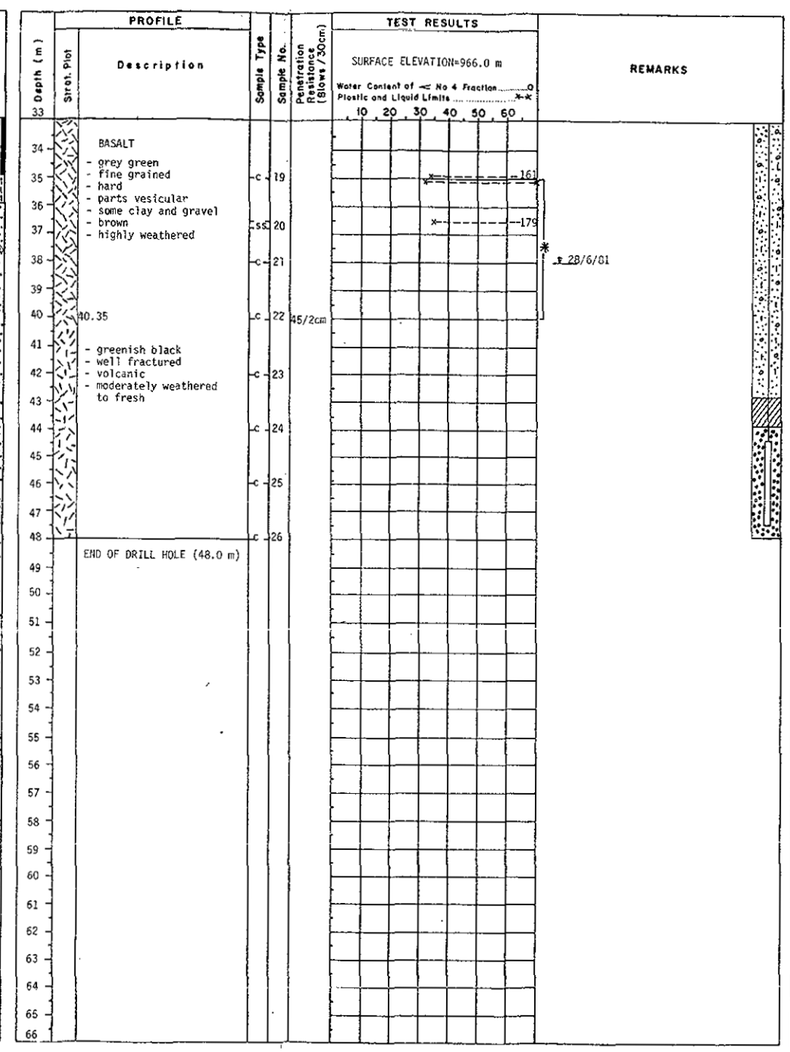
DATE MAR 1982

DWN

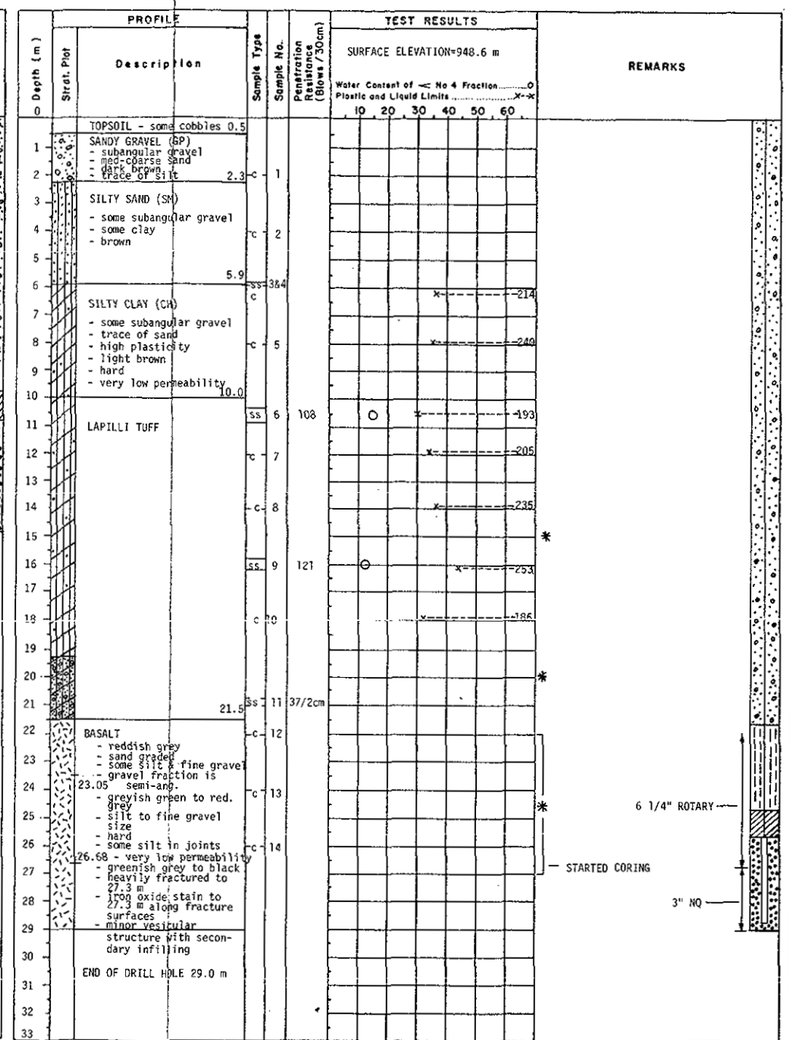
DWG No. 604H-C14-D167



DRILL HOLE No. RDH 81-82
PROJECT HAT CREEK
LOCATION MEDICINE CREEK CANAL CROSSING



DRILL HOLE No. RDH 81-82
PROJECT HAT CREEK
LOCATION MEDICINE CREEK CANAL CROSSING



DRILL HOLE No. RDH 81-83
PROJECT HAT CREEK
LOCATION MEDICINE CREEK CANAL CROSSING

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

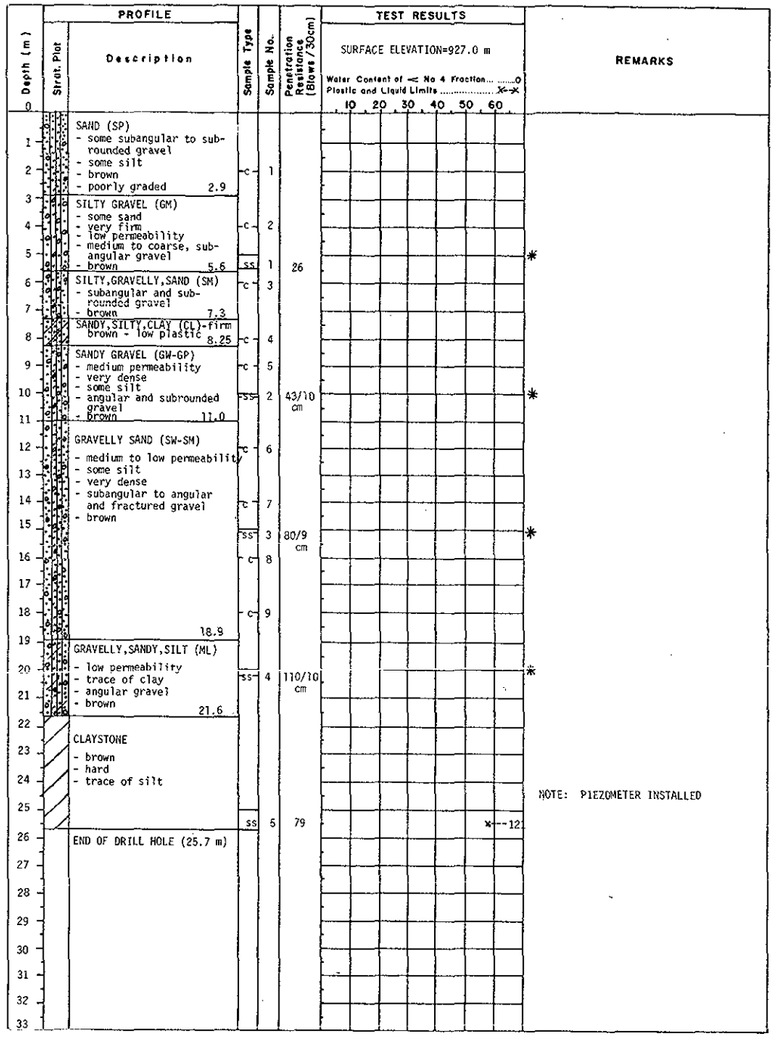
1981 SITE INVESTIGATIONS GRAPHIC DRILL LOGS

SHEET 3

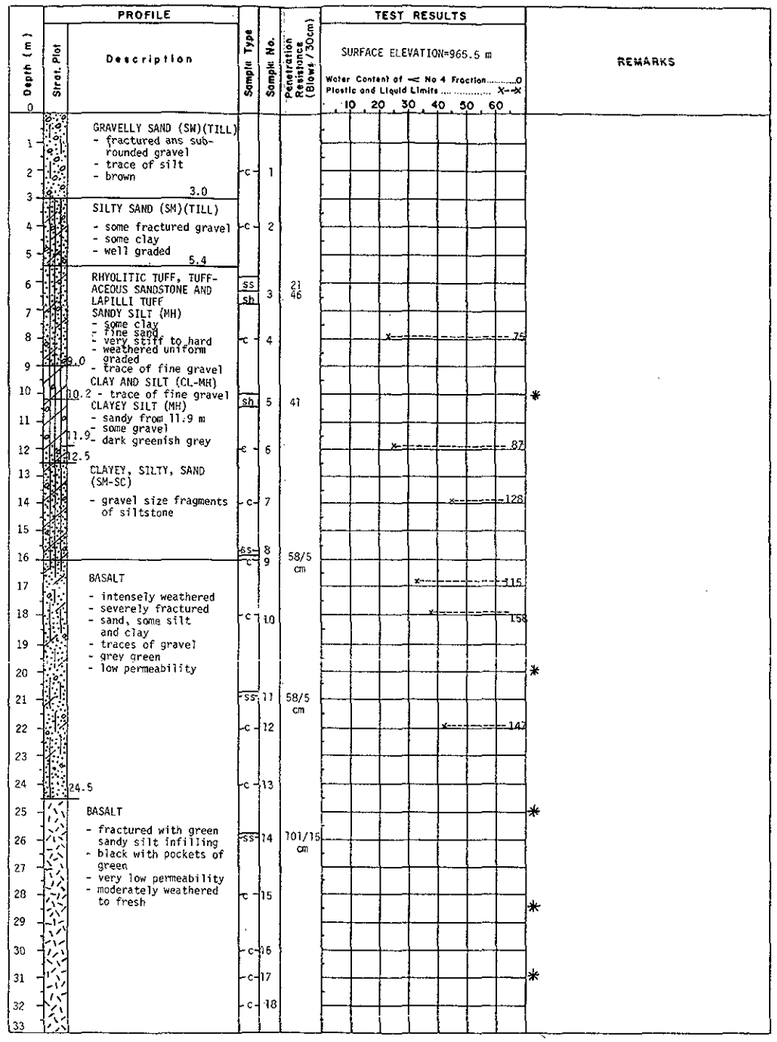
DATE MAR 1982

DWN

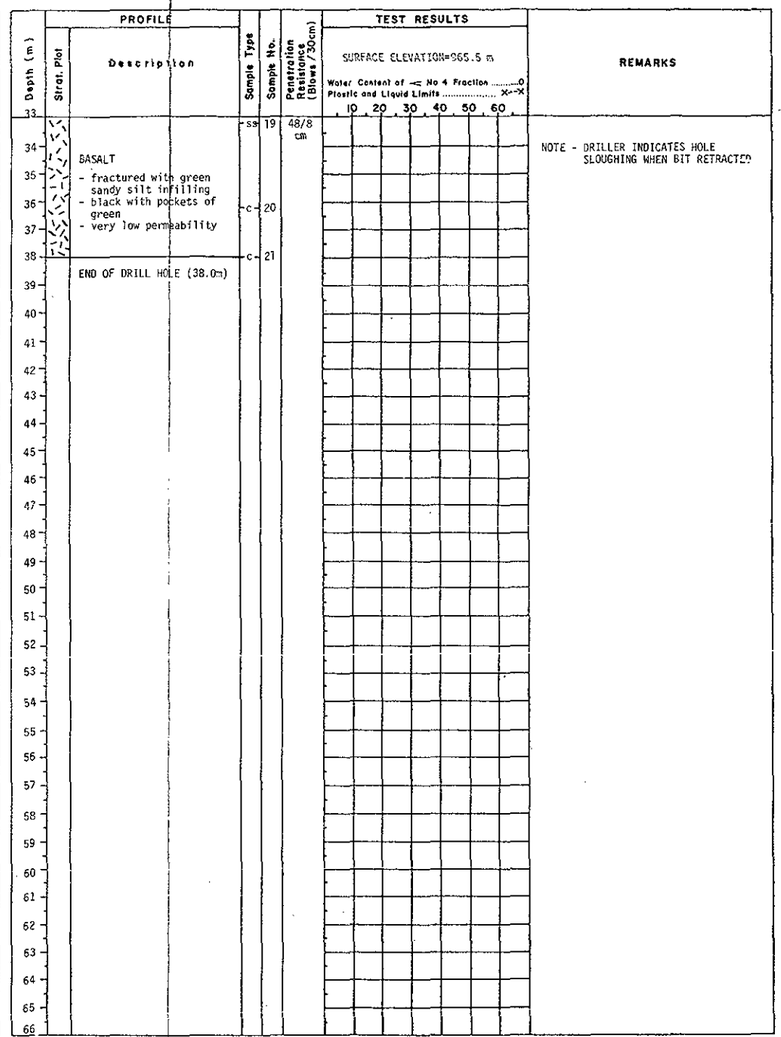
DWG No. 604H-C14-D168



DRILL HOLE No. RDH 81-84
PROJECT HAT CREEK
LOCATION PIT RIM DAM



DRILL HOLE No. RDH 81-85
PROJECT HAT CREEK
LOCATION MEDICINE CREEK CANAL CROSSING



DRILL HOLE No. RDH 81-85
PROJECT HAT CREEK
LOCATION MEDICINE CREEK CANAL CROSSING

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

1981 SITE INVESTIGATIONS GRAPHIC DRILL LOGS

SHEET 4

DATE MAR 1982

DWN

DWG No. 604H-C14-D169

DRILL HOLE No. RDH 81-86
PROJECT HAT CREEK
LOCATION PIT RIM DAM

Depth (m)	Description	Sample Type	Sample No.	Penetration Resistance (Blows / 30cm)
0	GRAVELLY SILT (ML)			
	- coarse gravel 1.5			
	SILT (ML)	C	1	
	- some clay			
	- trace of sand			
	- some subrounded gravel 3.65			
	SILTY SAND (SM)	C	2	
	- some clay	SS	1	39
	- some fine subrounded gravel	C	3	
	- brown			
	- dense			
	- well to gap graded 7.4			
	GRAVELLY SAND (SM)	C	4	
	- some silt to 19.75 m			
	- some clay between 13.5 m and 19.75 m	SS	2	34
	- coarse-fine subrounded to angular gravel	C	5	
	- low to very low permeability	C	6	
	- brown			
	- well to gap graded	C	7	
		SS	3	113/20 cm
		C	8	
		C	9	
		SS	4	111
	21.75			
	SILTY SAND (SM)	C	10	
	- fine sand 22.75			
	SANDY SILT (ML)	C	11	
	- some clay			
	- fine sand			
	- brown			
	- stiff 24.75			
	GRAVELLY SILT(ML) - some clay	SS	5	
	- subrounded gravel	C	12	63
	- brown 26.0			
	SILT AND CLAY(CL-ML) - grey	C	13	
	- trace of gravel 27.0			
	GRAVELLY SILT (ML-GM)	SS	6	56/25 cm
	- some clay and sand			
	- subrounded gravel			
	- grey-brown			
	31.4			
	SANDY GRAVEL (GP)	C	14	
	- trace of silt			
	- subangular gravel			
	- brown			

SURFACE ELEVATION=925.2 m

Water Content of < No 4 Fraction ..... O
Plastic and Liquid Limits ..... x—x

10 20 30 40 50 60

REMARKS

▼ 11/6/81

CASING LEFT IN HOLE TO 32.75 m

DRILL HOLE No. RDH 81-86
PROJECT HAT CREEK
LOCATION PIT RIM DAM

Depth (m)	Description	Sample Type	Sample No.	Penetration Resistance (Blows / 30cm)
33	SILTY SAND (SM)	C	15	
	- some clay and gravel			
	- brown			
	- well graded 35.1			
	SILT (ML)- some medium-coarse sand 36.0			
	- some clay	SS	7	203
	SILTY SAND (SM)	C	16	
	- some clay			
	- trace of fine gravel			
	- well graded			
	- brown			
	41.1			
	CLAYSTONE	SS	8	197/23 cm
	- grey			
	- heavily fractured			
	END OF DRILL HOLE (46.07m)			

SURFACE ELEVATION=925.2 m

Water Content of < No 4 Fraction ..... O
Plastic and Liquid Limits ..... x—x

10 20 30 40 50 60

REMARKS

HOLE OPEN

103 BEGAN DIAMOND DRILLING

DRILL HOLE No. RDH 81-87
PROJECT HAT CREEK
LOCATION HEADWORKS DAM

Depth (m)	Description	Sample Type	Sample No.	Penetration Resistance (Blows / 30cm)
0	GRAVELLY SAND (SM)	C	1	
	- well graded			
	- fractured and angular gravel			
	- some roots	SS	2	29
	- brown 2.8			
	CLAYEY SILT (MH)	C	3	
	- trace of subrounded gravel	SS	4	39
	- grace of sand			
	- brown	SS	5	
	- medium to high plasticity	C	6	
	8.0			
	CLAYEY GRAVELLY SAND (SC)	SS	7	41
	- brown			
	- subangular-subrounded 9.0	C	8	
	VOLCANIC SEDIMENT-fragments of vesicular basalt			
	- some sand-clay-silt 10.0			
	VESICULAR BASALT BOULDERS	C	9	
	- olivine crystals and clay in vesicules			
	14.0			
	CLAYSTONE	SS	10	107
	- brown			
	- very hard			
	- zones of vesicular basalt			
	- seams of bentonitic clay			
		SS	11	116
	END OF DRILL HOLE (18.37 m)			

SURFACE ELEVATION=964.6 m

Water Content of < No 4 Fraction ..... O
Plastic and Liquid Limits ..... x—x

10 20 30 40 50 60

REMARKS

▼ 14/7/81

NOTE: PIEZOMETER INSTALLED

BEGAN CORING

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

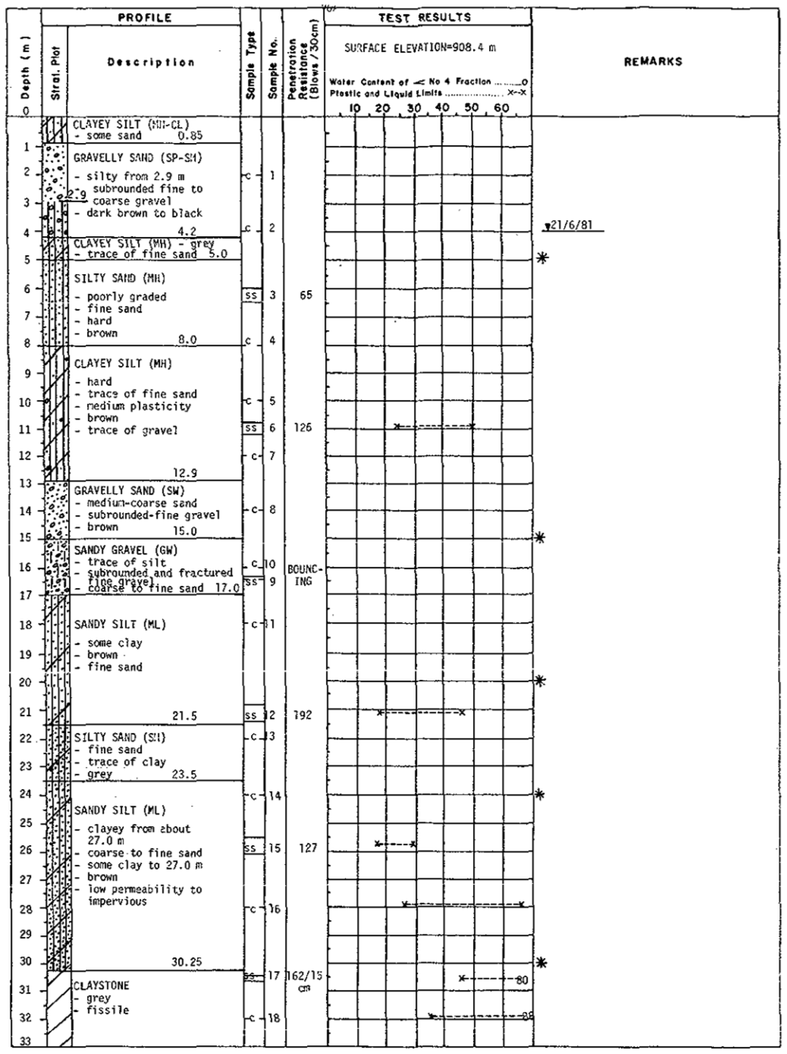
1981 SITE INVESTIGATIONS
GRAPHIC DRILL LOGS

SHEET 5

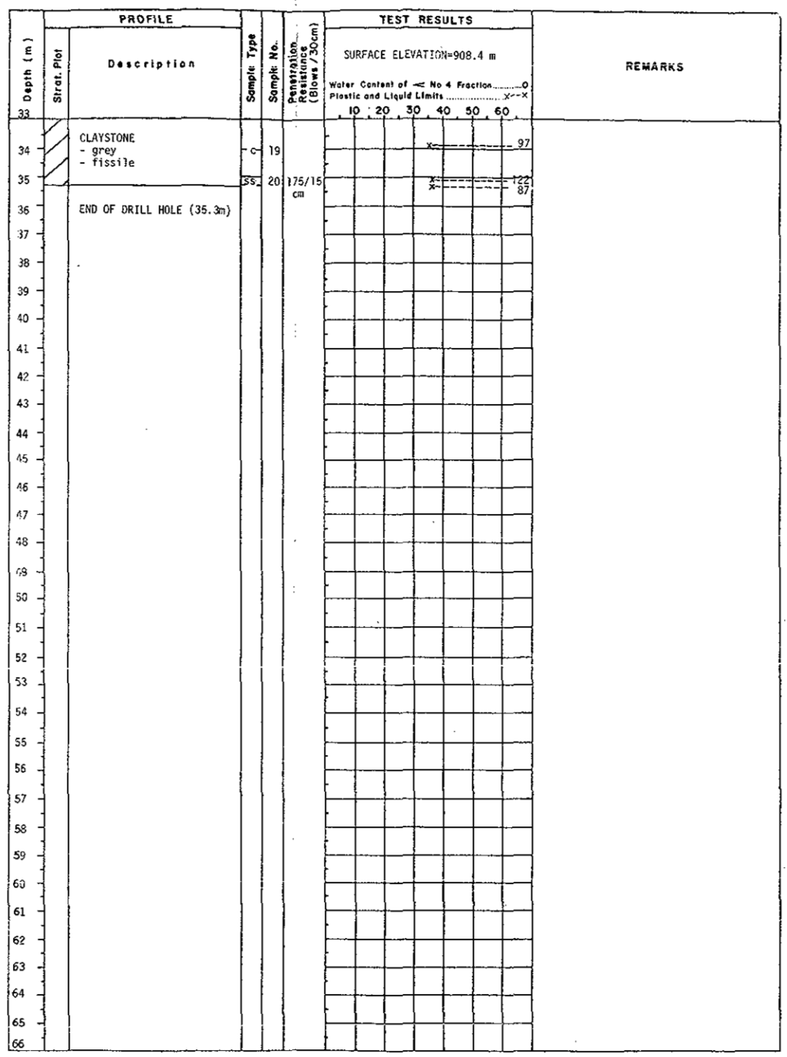
DATE MAR 1982

DWN

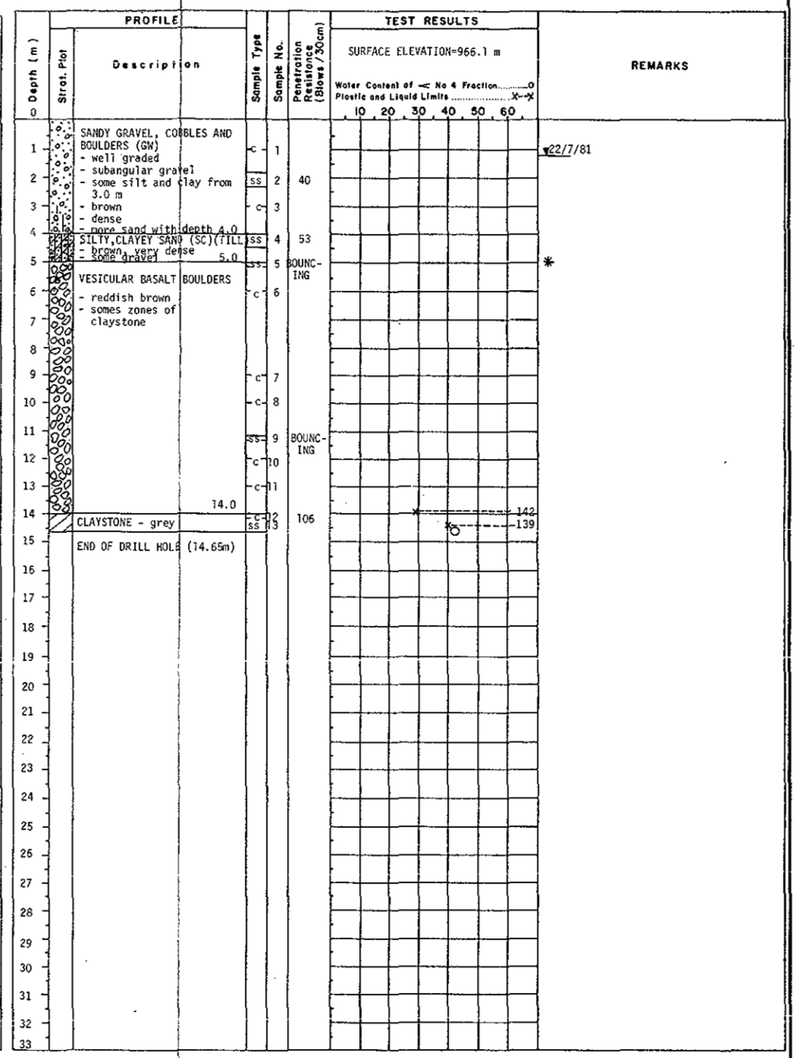
DWG No. 604H-C14-D170



DRILL HOLE No. RDH 81-88
PROJECT HAT CREEK
LOCATION PIT RIM DAM



DRILL HOLE No. RDH 81-88
PROJECT HAT CREEK
LOCATION PIT RIM DAM



DRILL HOLE No. RDH 81-89
PROJECT HAT CREEK
LOCATION HEADWORKS DAM

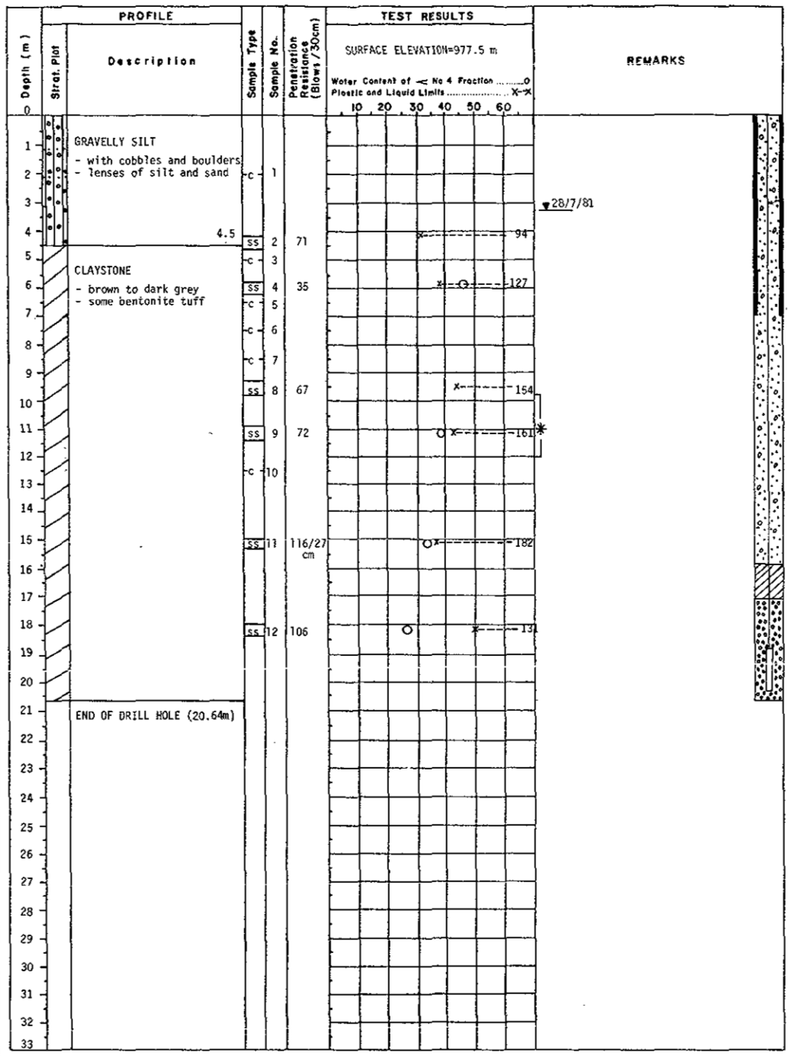
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

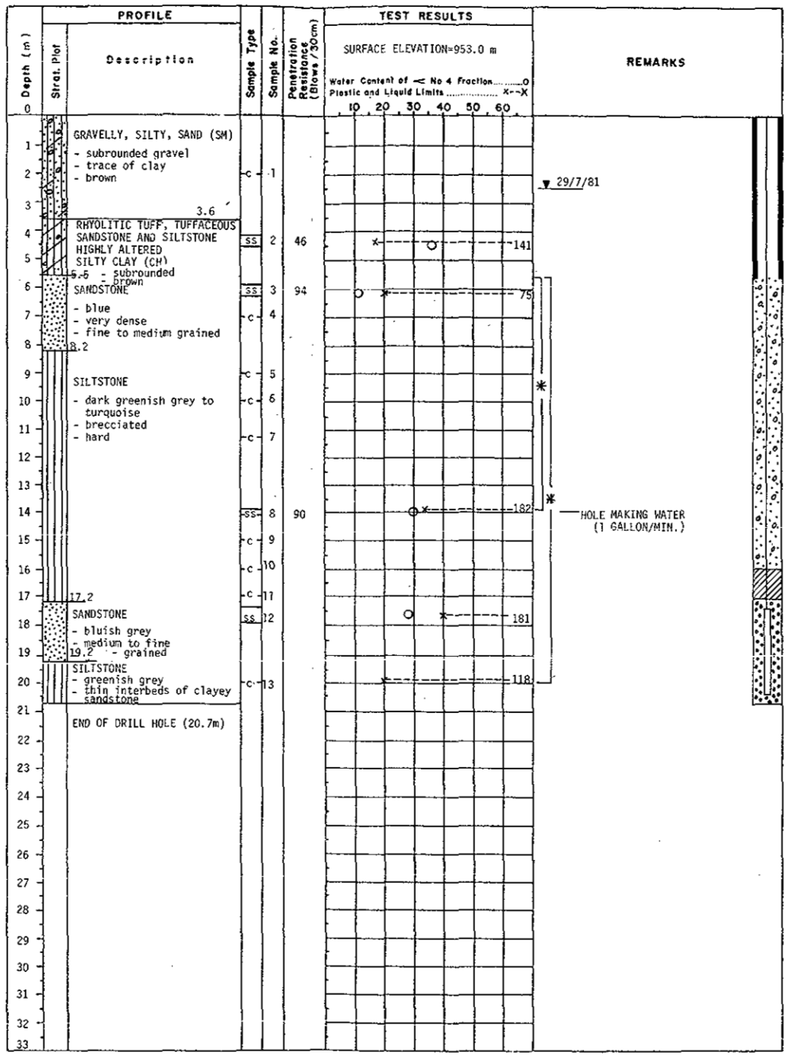
1981 SITE INVESTIGATIONS
GRAPHIC DRILL LOGS

SHEET 6

DATE MAR 1982	
DWN	DWG No. 604H-C14-D171



DRILL HOLE No. RDH 81-90
PROJECT HAT CREEK
LOCATION HEADWORKS DAM



DRILL HOLE No. RDH 81-91
PROJECT HAT CREEK
LOCATION AMBUSTEN CREEK CANAL CROSSING

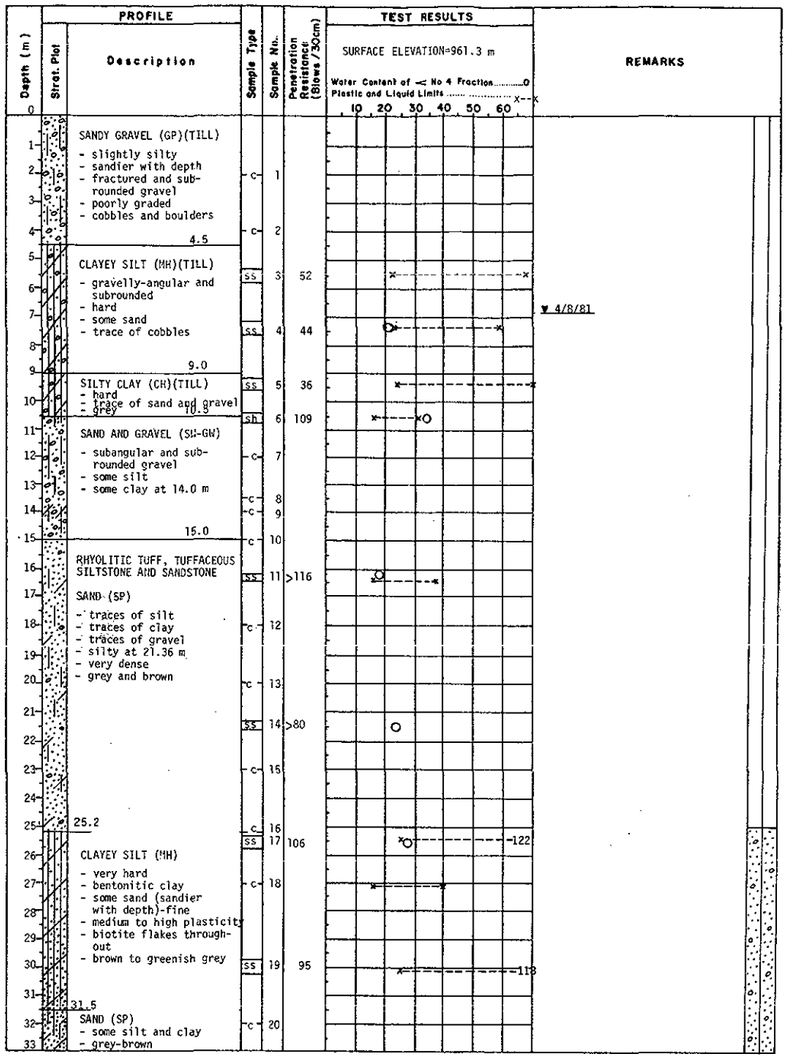
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

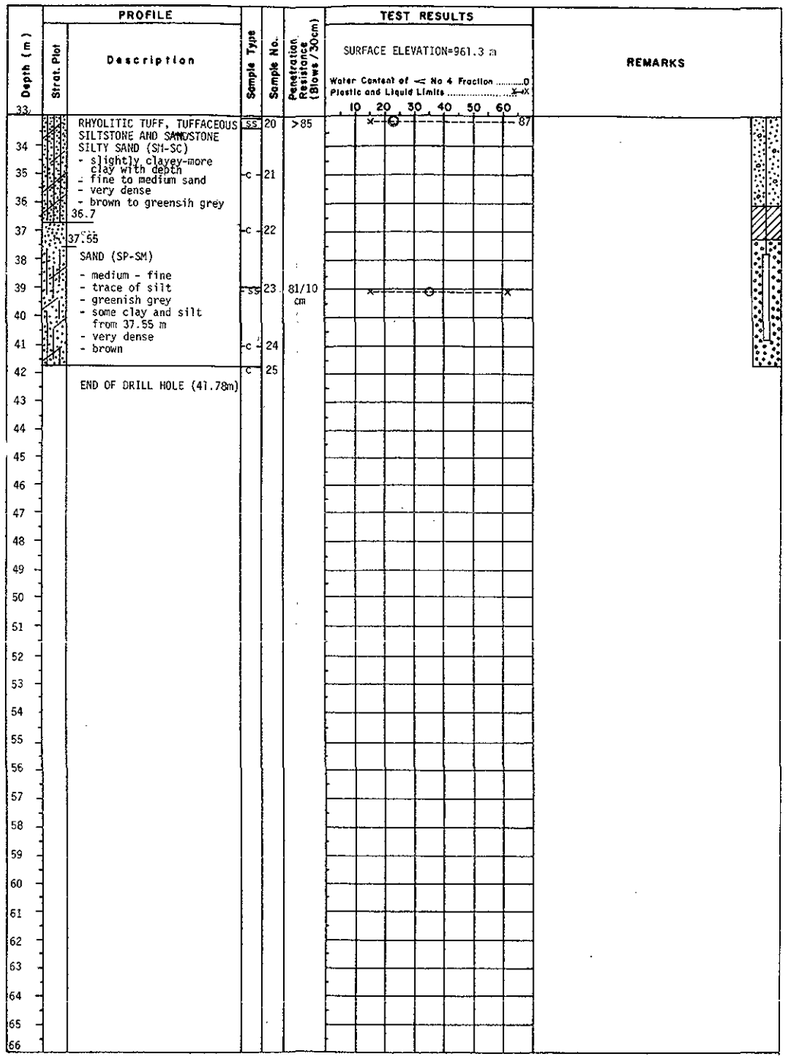
1981 SITE INVESTIGATIONS
GRAPHIC DRILL LOGS

SHEET 7

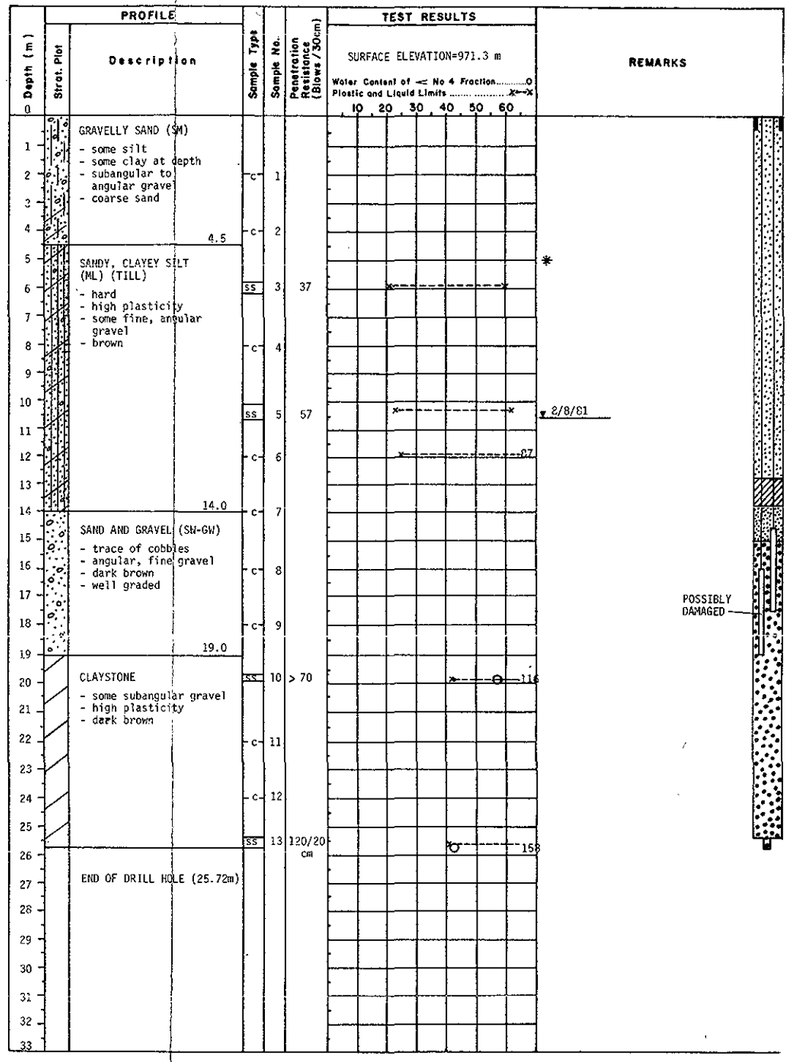
DATE MAR 1982	
DWN	DWG No. 604H-C14-D172



DRILL HOLE No. RDH 81-92
PROJECT HAT CREEK
LOCATION AMBUSTEN CREEK CANAL CROSSING



DRILL HOLE No. RDH 81-92
PROJECT HAT CREEK
LOCATION AMBUSTEN CREEK CANAL CROSSING



DRILL HOLE No. RDH 81-93
PROJECT HAT CREEK
LOCATION HEADWORKS DAM

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

1981 SITE INVESTIGATIONS
GRAPHIC DRILL LOGS

SHEET 8

DATE MAR 1982	
DWN	DWG No. 604H-C14-D173

Depth (m)	Strat. Plot	Description	Sample Type	Sample No.	Penetration Resistance (Blows/30cm)
0		SILT (ML) (TILL) - with sand, gravel and cobbles - some boulders - traces of clay - angular to rounded particles - hard			
6			SS	1	105
8			C	2	
11			SS	3	58
13			C	4	
16			SS	5	55
18			C	6	
21			SS	7	78
26			SS	8	78
28			C	9	
31			SS	10	80
31.0			C	11	
32		SAND, GRAVEL, COBBLES - dense - some silt and clay - rounded to angular particles			
33					

TEST RESULTS

SURFACE ELEVATION=989.0 m

Water Content of < No 4 Fraction .....O
Plastic and Liquid Limits .....X--X
10 20 30 40 50 60

REMARKS

NATIVE MATERIAL BACKFILLED TO SURFACE

NATIVE MATERIAL

DRILL HOLE No. RDH 81-94
PROJECT HAT CREEK
LOCATION HEADWORKS DAM

Depth (m)	Strat. Plot	Description	Sample Type	Sample No.	Penetration Resistance (Blows/30cm)
33		GRAVEL, COBBLES - dense - some silt and clay - rounded to angular particles			
35			C	12	
37			C	13	
38		CLAYSTONE - very hard - dark brown			
39			C	14	
41			SS	15	116/26 cm
42		END OF DRILL HOLE (41.48 m)			

TEST RESULTS

SURFACE ELEVATION=989.0 m

Water Content of < No 4 Fraction .....O
Plastic and Liquid Limits .....X--X
10 20 30 40 50 60

REMARKS

STANDPIPE PIEZOMETER
PNEUMATIC PIEZOMETER
SLOUGH

DRILL HOLE No. RDH 81-94
PROJECT HAT CREEK
LOCATION HEADWORKS DAM

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

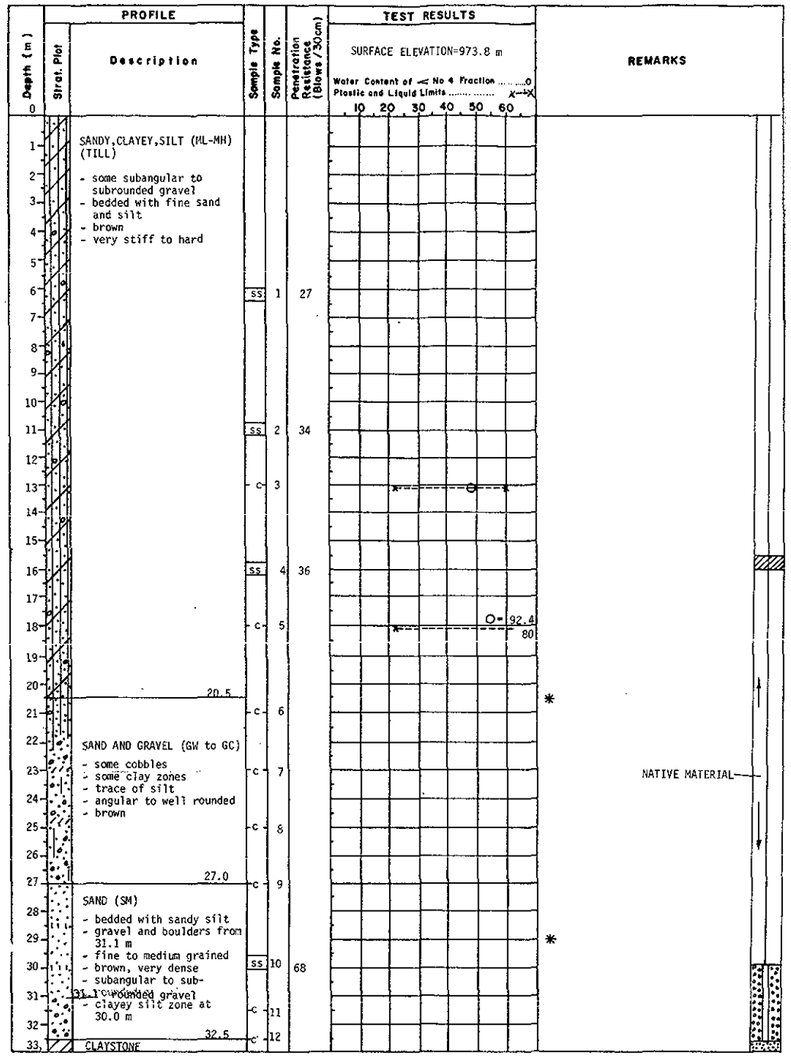
1981 SITE INVESTIGATIONS
GRAPHIC DRILL LOGS

SHEET 9

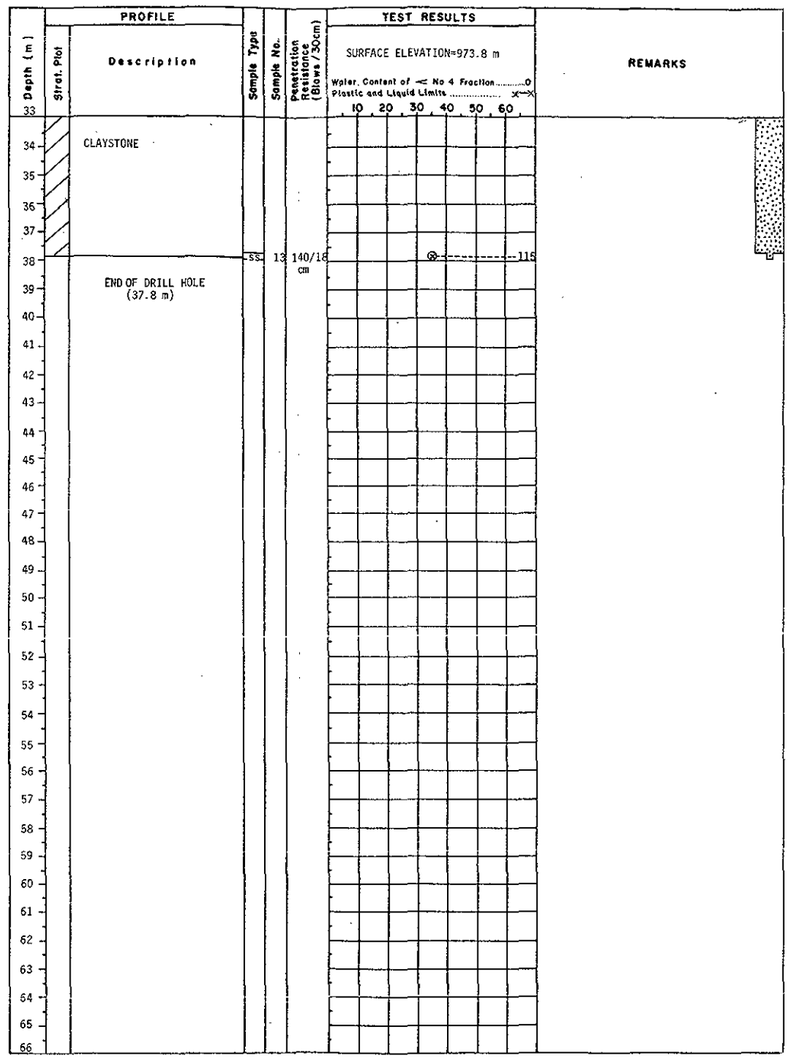
DATE MAR 1982

DWN

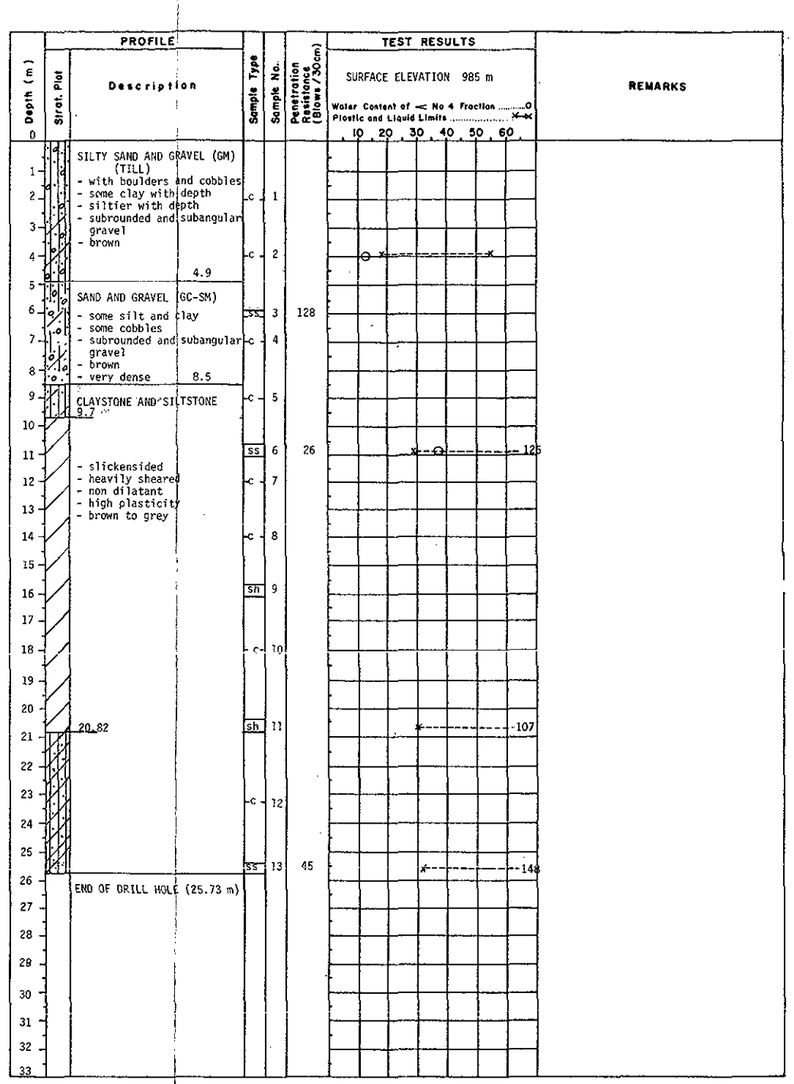
DWG No. 604H-C14-D174



DRILL HOLE No. RDH 81-95
PROJECT HAT CREEK
LOCATION HEADWORKS DAM



DRILL HOLE No. RDH 81-95
PROJECT HAT CREEK
LOCATION HEADWORKS DAM



DRILL HOLE No. RDH 81-96
PROJECT HAT CREEK
LOCATION FINNEY CREEK DIVERSION CANAL

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

1981 SITE INVESTIGATIONS
GRAPHIC DRILL LOGS

SHEET 10

DATE MAR 1982

DWN

DWG No. 604H-C14-D175

Depth (m)	Strat. Plot	Description	Sample Type	Sample No.	Penetration Resistance (Blows/30cm)
0		SAND AND GRAVEL (GW-SP) - well graded - subangular and sub-rounded gravel - traces of silt and clay - brown			
7.5		SAND (SM-SC) - bedded with sandy silt and clay - some angular and sub-rounded gravel - brown - very dense	C	1	
			C	2	
			C	3	
			SS	4	56
			C	5	
			SS	6	58
			C	7	
			SS	8	79
			C	9	
24.3		- some well rounded to angular gravel - trace of silt (SP) - poorly graded - grey	C	10	
			C	11	
27.0		SANDY GRAVEL (GP-GC) - some cobbles - alternating beds of silt and clay - brown - angular	C	12	
29.4			C	13	
		BEDROCK - LIMESTONE	C	14	
31.67		END OF DRILL HOLE (31.67 m)			

TEST RESULTS — SURFACE ELEVATION 820 m

Water Content of < No 4 Fraction ..... O
Plastic and Liquid Limits ..... X—X
10 20 30 40 50 60

REMARKS

DRILL HOLE No. RDH 81-97
PROJECT HAT CREEK
LOCATION CONDUIT ROUTE

Depth (m)	Strat. Plot	Description	Sample Type	Sample No.	Penetration Resistance (Blows/30cm)
0		SANDY SILT (ML) (TILL)			
2.9		BOULDERS			
3.8		SILTY SAND AND GRAVEL (SW-GW) (TILL) - some silt - more gravel with depth			
8.5		CLAY (CL)(TILL)			
9.1		CLAYSTONE - bentonitic			
		END OF DRILL HOLE (29.6 m)			

TEST RESULTS — SURFACE ELEVATION=976.8 m

Water Content of < No 4 Fraction ..... O
Plastic and Liquid Limits ..... X—X
10 20 30 40 50 60

REMARKS

DRILL HOLE No. RDH 81-98
PROJECT HAT CREEK
LOCATION HEADWORKS DAM

Depth (m)	Strat. Plot	Description	Sample Type	Sample No.	Penetration Resistance (Blows/30cm)
0		SAND AND GRAVEL (SW-GW) (TILL) - some cobbles and boulders - some silt - subrounded to angular gravel			
6.0		GRAVEL AND BOULDERS (GW)			
9.0		GRAVEL (GW) - with sand, silt, clay, cobbles and boulders			
11.0		SAND AND GRAVEL (SW-GW)			
12.18		CLAYEY GRAVEL (GC) (TILL) - dense - with sand and cobbles - grey - subrounded to sub-angular			
18.3		GRAVEL (GW)			
19.0		CLAYEY GRAVEL (GC) (TILL) - dense - with sand and cobbles			
		END OF DRILL HOLE (24.4m)			

TEST RESULTS — SURFACE ELEVATION 980 m

Water Content of < No 4 Fraction ..... O
Plastic and Liquid Limits ..... X—X
10 20 30 40 50 60

REMARKS

DRILL HOLE No. RDH 81-99
PROJECT HAT CREEK
LOCATION HAT CREEK DIVERSION CANAL

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

1981 SITE INVESTIGATIONS
GRAPHIC DRILL LOGS

SHEET 11

DATE MAR 1982

DWN

DWG No. 604H-C14-D176

APPENDIX B

LEGEND AND ABBREVIATIONS
ON DRILL HOLE AND TEST PIT LOGS

SYMBOL	DESCRIPTION	UNIT
SS	SPLIT SPOON SAMPLE	
SH	SHELBY TUBE SAMPLE	
C	CUTTINGS SAMPLE	
G	GRAB SAMPLE	
157	STANDARD PENETRATION RESISTANCE (N VALUE) - 63.5 kg HAMMER, 76 cm DROP	BLOWS/30 cm
○	MOISTURE CONTENT	%
×———×	PLASTIC AND LIQUID LIMITS	%
▼ 28/5/81	WATER LEVEL AND DATE OF OBSERVATION	
*	LOCATION OF FALLING OR CONSTANT HEAD PERMEABILITY TEST	
	SAND OR SANDSTONE	
	GRAVEL	
	BOULDERS	
	CLAY OR CLAYSTONE	
	SILT OR SILTSTONE	
	BEDROCK	
	CASING	
	STANDPIPE OR PNEUMATIC PIEZOMETER LINE	
	SAND - CEMENT GROUT	
	BENTONITE CLAY SEAL	
	PEA GRAVEL	
	#16 SILICA SAND	
	SLOTTED PVC PIPE OR PNEUMATIC PIEZOMETER TIP	

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
ORGANIC TOPSOIL		G 1.0	
SAND AND GRAVEL (GW) - some cobbles; trace silt; homogeneous and dense.	2	G 2.0	
	4	G 3.0 G 3.8	
PIT BOTTOM	6		
	8		

TP81-1

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
SAND AND GRAVEL (GM) - some silt; trace clay and cobbles; medium dense.	2	G 1.1	
	4	G 2.0 G 3.0 G	7.3
PIT BOTTOM	6	4.0	
	8		

TP81-2

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 1

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
ORGANIC TOPSOIL			
SANDY GRAVEL (GC) - some clay; and cobbles; trace boulders; homogeneous.	2	G 1.0	
	4	G 2.0 G 3.0 G 4.0	
PIT BOTTOM	6		
	8		

TP81-3

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
ORGANIC TOPSOIL			
SAND AND GRAVEL (GC) - some silt; trace clay and cobbles; fairly homogeneous	2	G 1.0	
	4	G 2.0 G 3.0 G 4.0	
PIT BOTTOM	6		
	8		

TP81-4

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 2

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
GRAVELLY CLAY (GC) – trace cobbles.	2	G 1.0	
GRAVELLY SAND (GP) - some silt; trace clay.		G 2.0	
GRAVELLY CLAY (GC) - some silt; trace cobbles; gravel, rounded; fairly homogeneous, dense.	4	G 3.0	6.2
		G 4.0	
PIT BOTTOM	6		
	8		

TP81-5

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND AND GRAVEL (GP) - trace silt & cobbles.	2	G 1.0	
SILTY SAND (GM) - some gravel and cobbles.		G 2.0	
	4	G 3.0	
		G 4.0	
PIT BOTTOM	6		
	8		

TP81-6

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 3

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
DARK ORGANIC TOPSOIL			
SAND AND GRAVEL (GW) - trace silt and clay; some boulders; coarse gravel; rounded coarse to medium sand, medium dense.	2	G 1.1	
	4	G 2.0 G 3.0	
PIT BOTTOM	6	G 4.0	
	8		

TP81-7

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND AND GRAVEL (GM) - some silt; trace cobbles, medium dense.	2	G 1.0	
	4	G 2.0 G 3.0	
PIT BOTTOM.	6	G 4.0	
	8		

TP81-8

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 4

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SILT (ML) - some clay; trace sand and gravel	2	G 1.0 G	
CLAYEY GRAVEL (GC) - some sand; trace silt, dense.	4	2.0 G 3.0	6.1
PIT BOTTOM	6	G 4.0	
	8		

TP81-9

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND AND GRAVEL (GW) - trace silt and cobbles.	2	G 1.0 G	
SILTY GRAVEL (GM) - some sand; trace cobbles and clay, medium dense.	4	2.0 G 3.0	
PIT BOTTOM	6	G 4.0	
	8		

TP81-10

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 5

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
BROWN TOPSOIL			
SILT AND SAND (GM) - some gravel; trace cobbles, loose to medium dense; homogeneous.	2	G 1.0	
	4	G 2.0 G 3.0 G 4.0	
PIT BOTTOM	6		
	8		

TP81-11

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
GRAVELLY SAND (GM) - some silt; trace clay and cobbles; homogeneous, loose.	2	G 1.0	
	4	G 2.0 G 3.0 G 4.0	
PIT BOTTOM	6		
	8		

TP81-12

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 6

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
GRAVELLY SILT (GM) - some sand; trace cobbles and clay; silt dense with depth	2	G 2.0	
	4	G 4.0	
PIT BOTTOM	6		
	8		

TP81-13

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
GRAVELLY SAND (GW) - trace cobbles and silt/clay; silt content increases with depth; loose to medium dense	2	G 2.0	
	4	G 4.0	
PIT BOTTOM	6		
	8		

TP81-14

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 7

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
GREY TOPSOIL			
GRAVELLY SILT (GM) (TILL) - some sand; trace clay and cobbles, very dense	2	G 2.0	
	4	G 4.0	7.1
PIT BOTTOM	6		
	8		

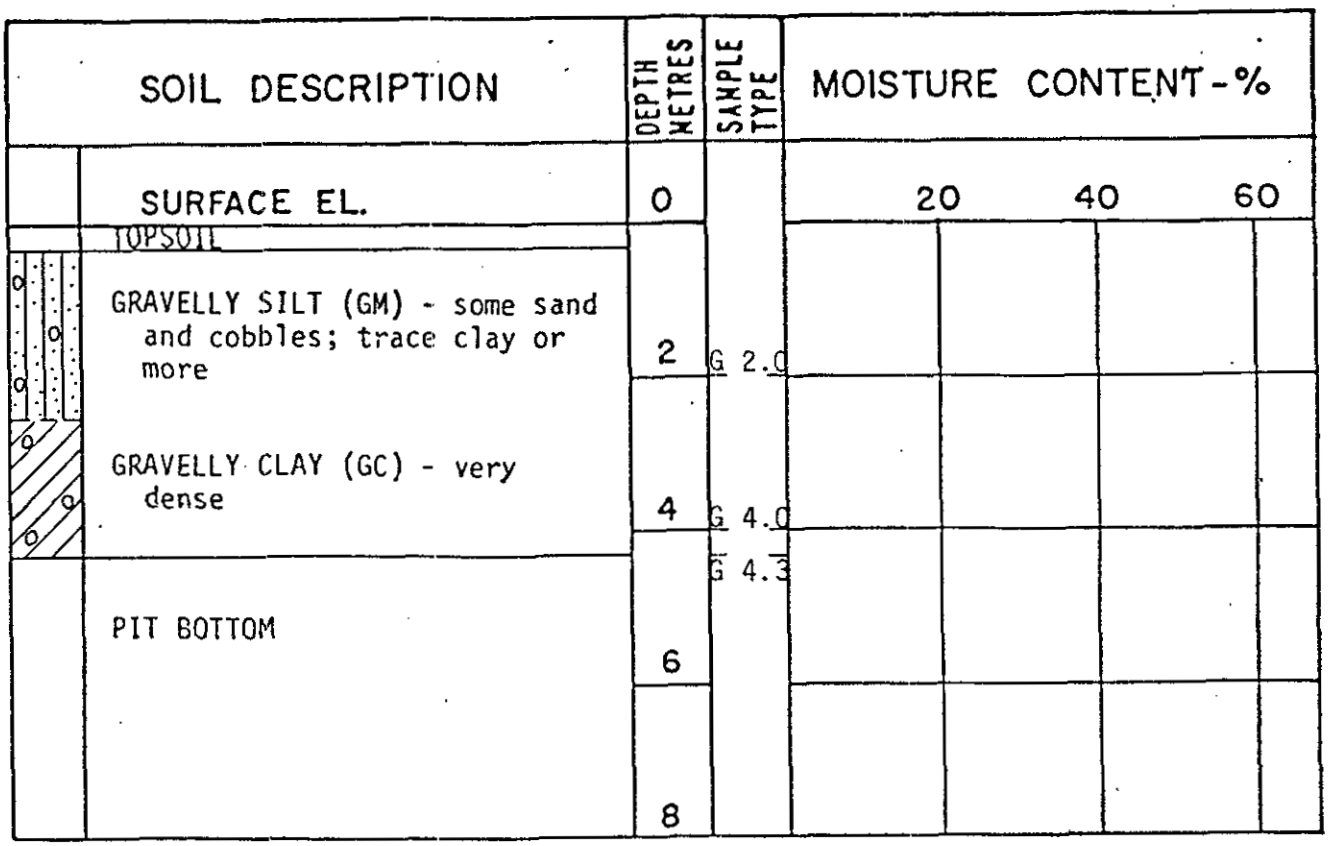
TP81-15

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
DARK TOPSOIL			
SILT (GM) - some gravel and sand; trace cobbles	2	G 2.0	
GRAVELLY SILT (GM) - some sand; trace cobbles and clay; boulder at 3.0 m, dense.	4	G 4.0	
PIT BOTTOM	6		
	8		

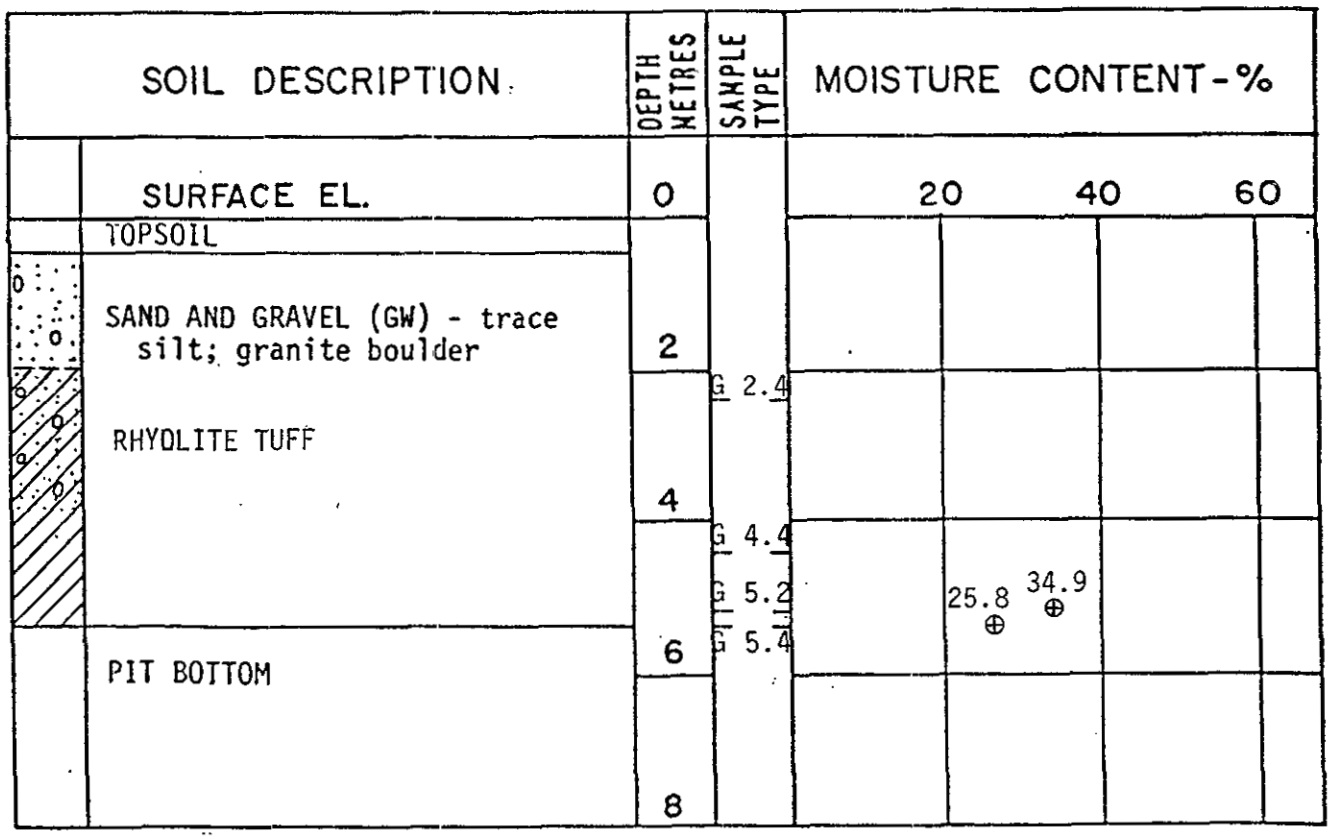
TP81-16

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 8



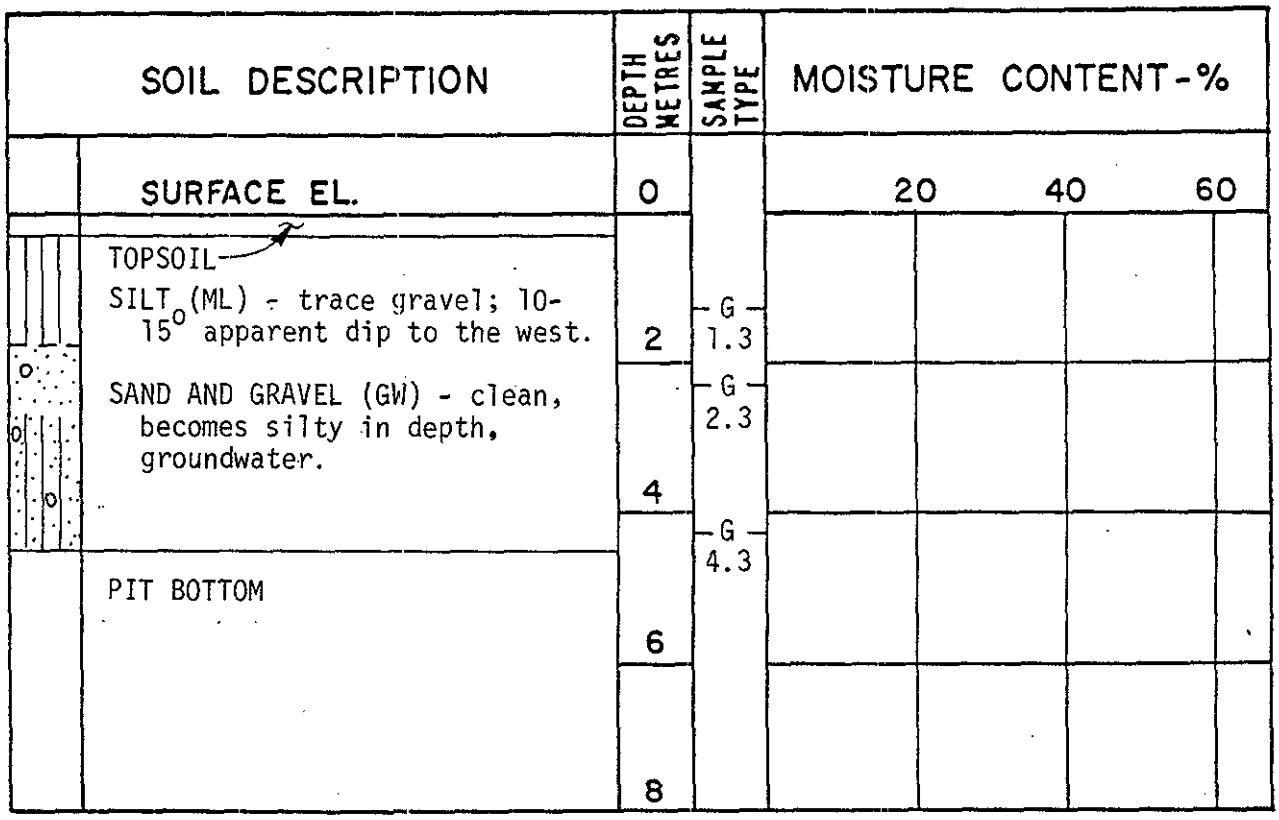
TP81-17



TP81-18

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 9



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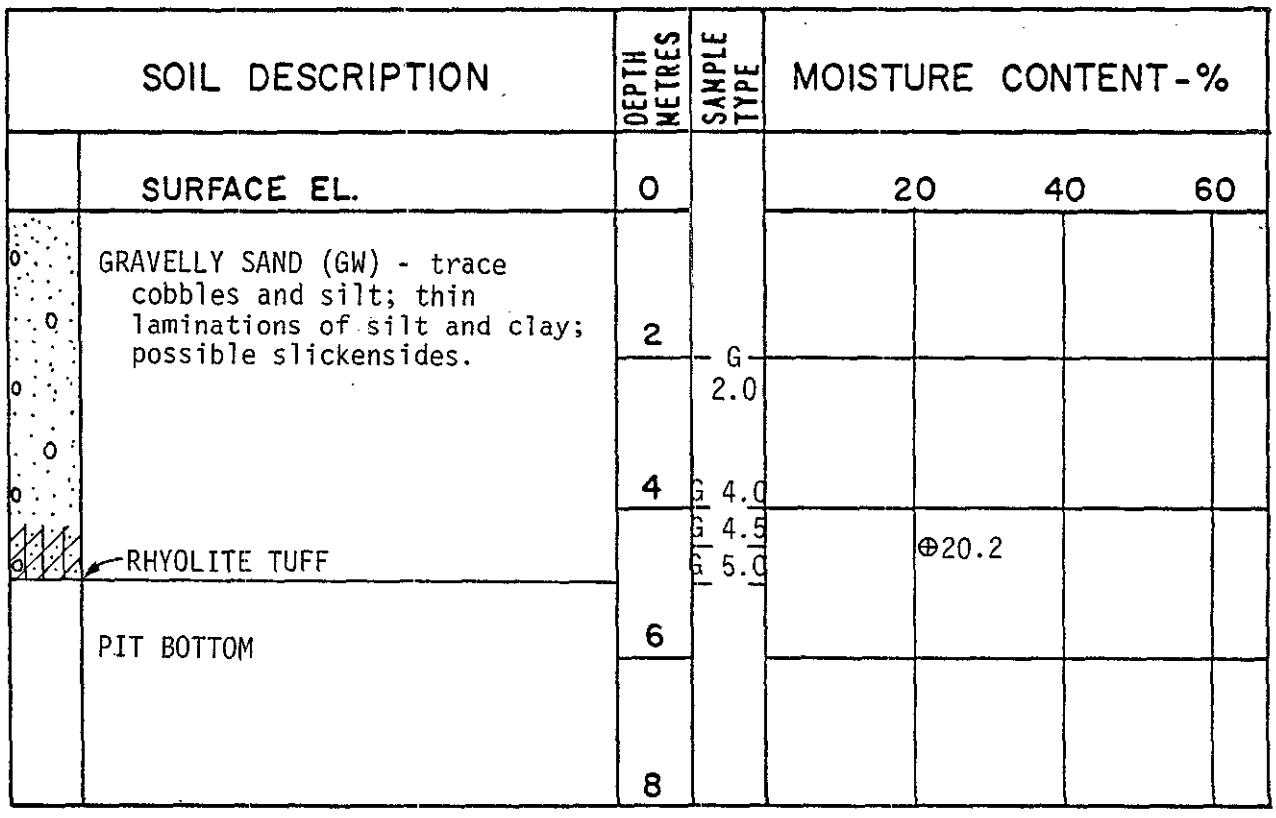
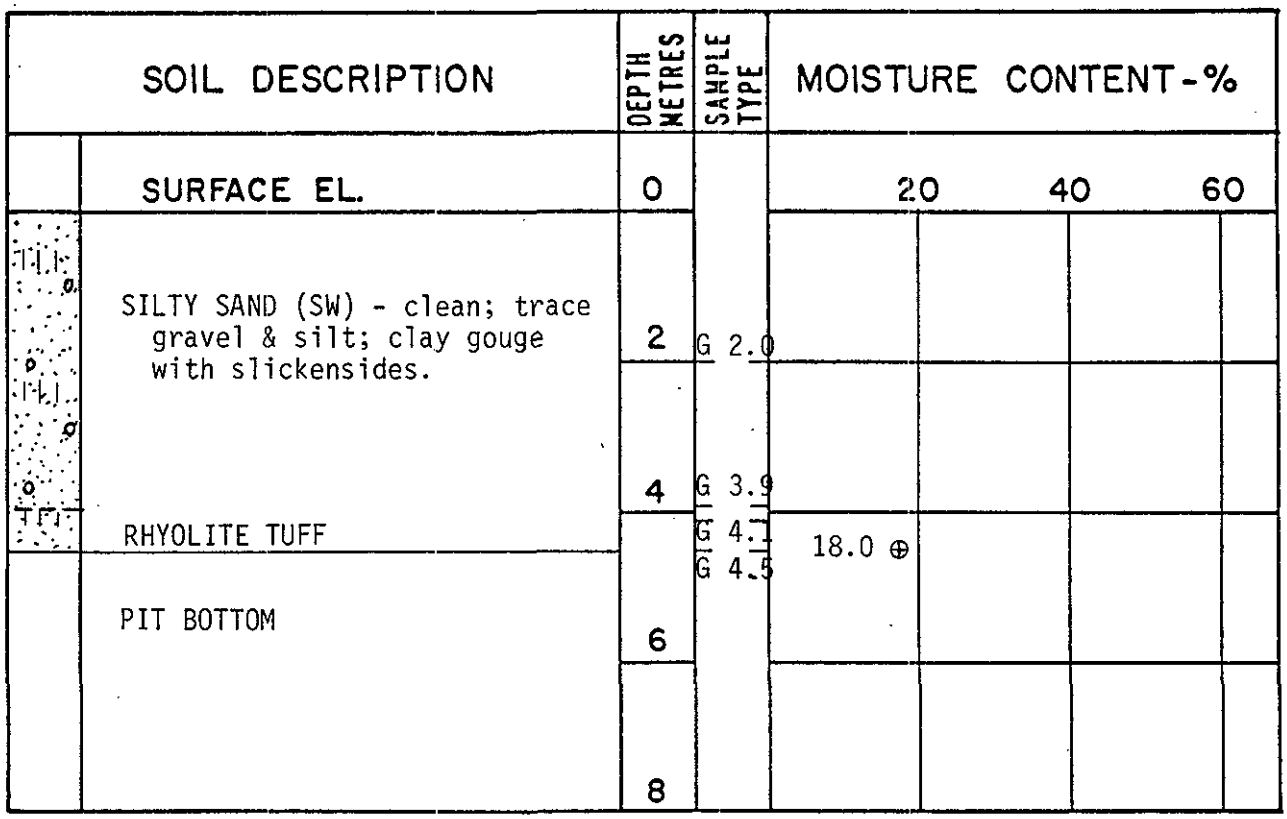


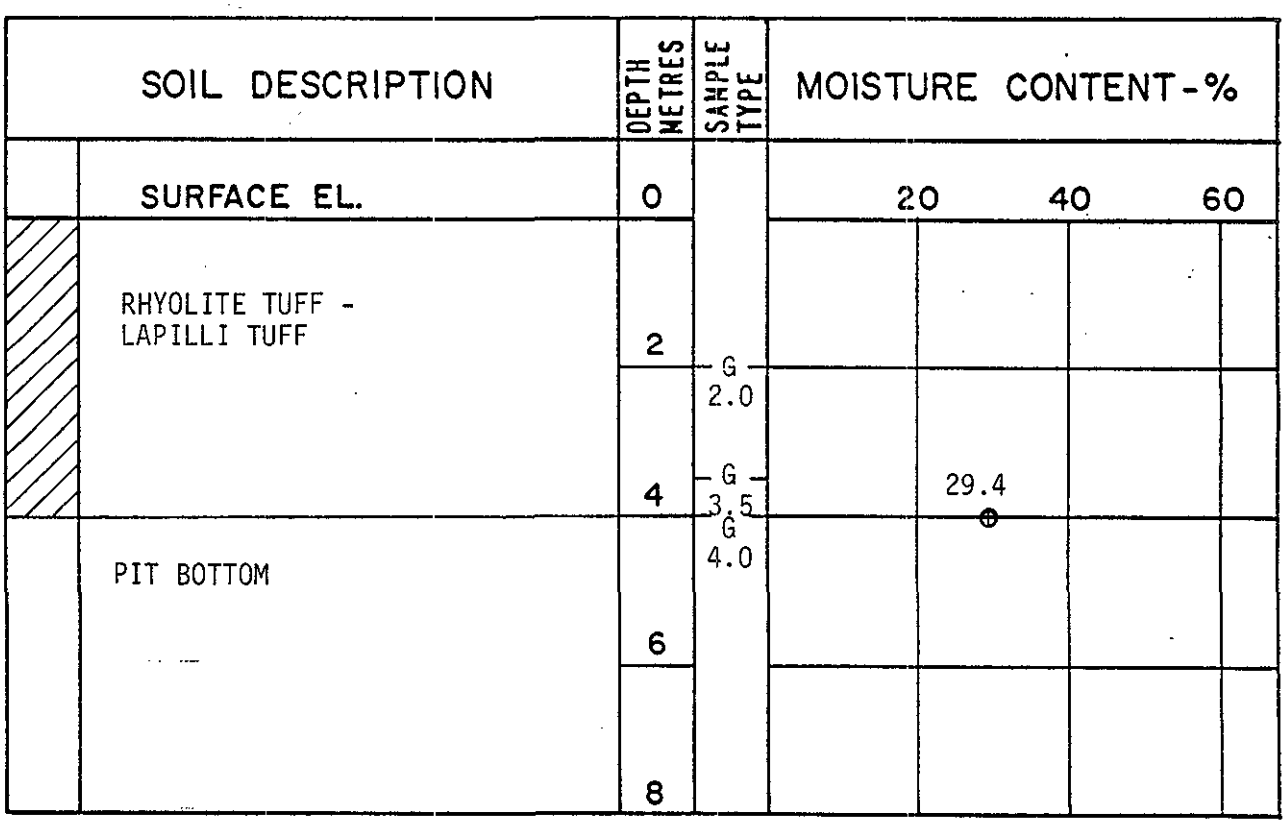
TP81-20

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 10



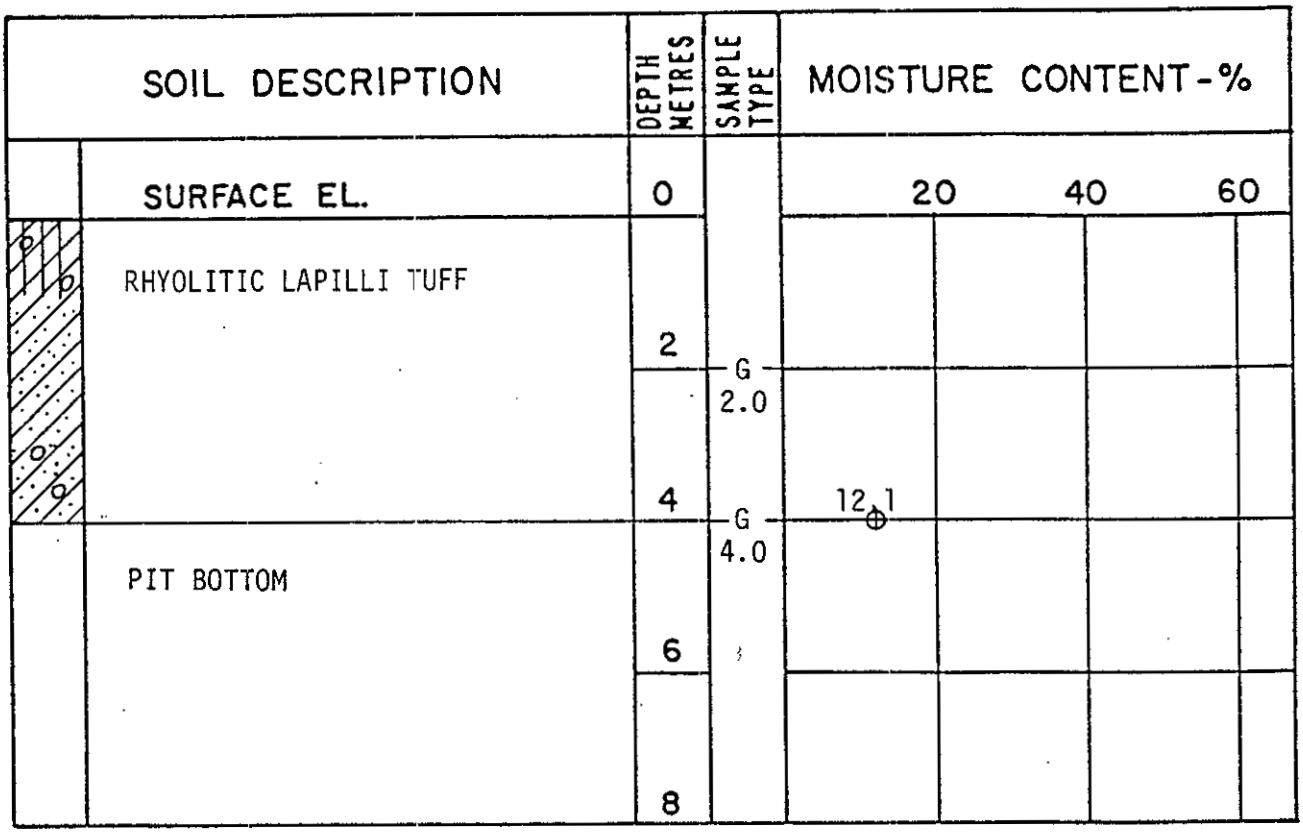
TP81-21



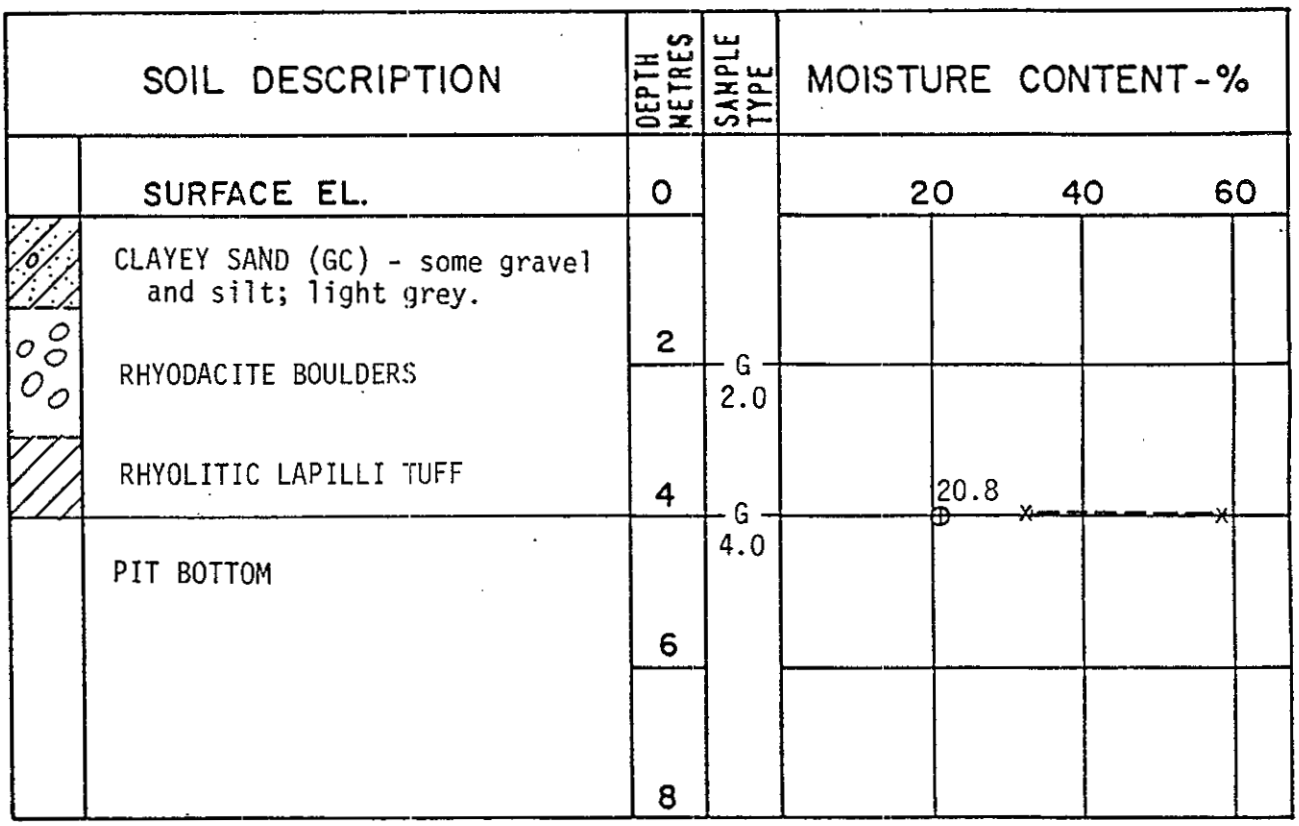
TP81-22

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 11



TP81-23



TP81-24

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 12

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SAND (GM) - some silt and gravel; trace cobbles and clay; 1-2 cm thick.	2	G	
RHYOLITIC TUFF	4	G 2.0 G 3.0	
PIT BOTTOM	6		
	8		

TP81-25

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
MEDIUM BROWN SILTY TOPSOIL			
SANDY SILT (GM) - some gravel; trace cobbles, clay and boulder.	2	G	
TILL - very dense cobbles of basalt.	4	G 2.0 G 4.0	
PIT BOTTOM	6	G 4.3	
	8		

TP81-26

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 13

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
DARK TOPSOIL			
GRAVELLY SAND (GM) - some silt; trace cobbles.	2	G 2.0	
GRAVEL AND SILT (GM) - some sand; gravel particles are volcanic & conglomerate.	4	G 4.0	
PIT BOTTOM	6		
	8		

TP81-27

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
ORGANIC TOPSOIL			
RHYOLITIC LAPILLI TUFF			
SILT (SC) - some sand; trace gravel and clay; light orange/brown.	2	G 2.0	19.0
SILT (SC) - some sand and clay; trace gravel, rust colour.	4	G 4.0	
PIT BOTTOM	6		
	8		

TP81-28

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 14

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
RICH BLACK TOPSOIL			
SAND AND GRAVEL (GW) - trace cobbles, boulders and clay.	2	G 2.0	
	4	G 4.0	
PIT BOTTOM	6		
	8		

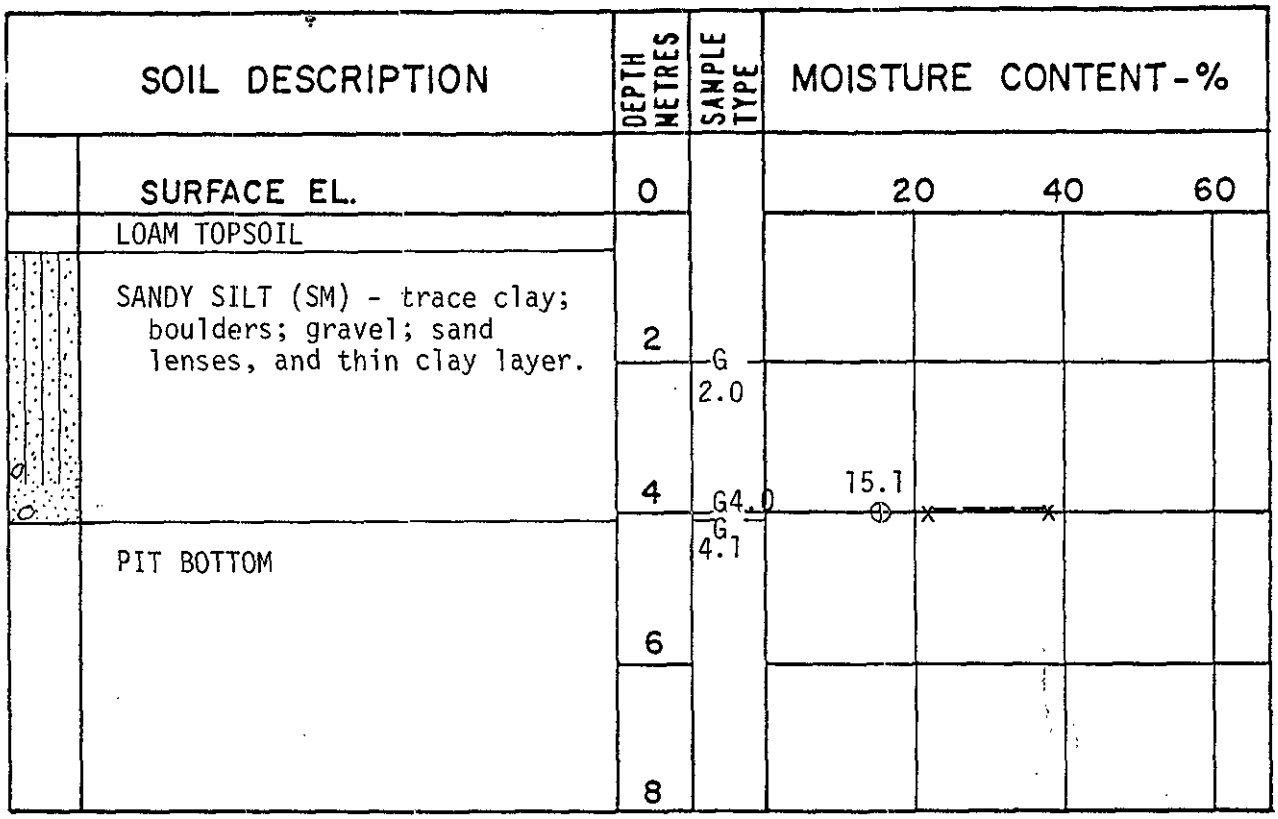
TP81-29

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SILTY TOPSOIL			
SAND AND GRAVEL (GW) - inter-bedded with clay (5cm).	2	G 2.0	
GRAVELLY SAND (GW) - trace silt clay, medium dense.	4	G 4.0	
PIT BOTTOM	6		
	8		

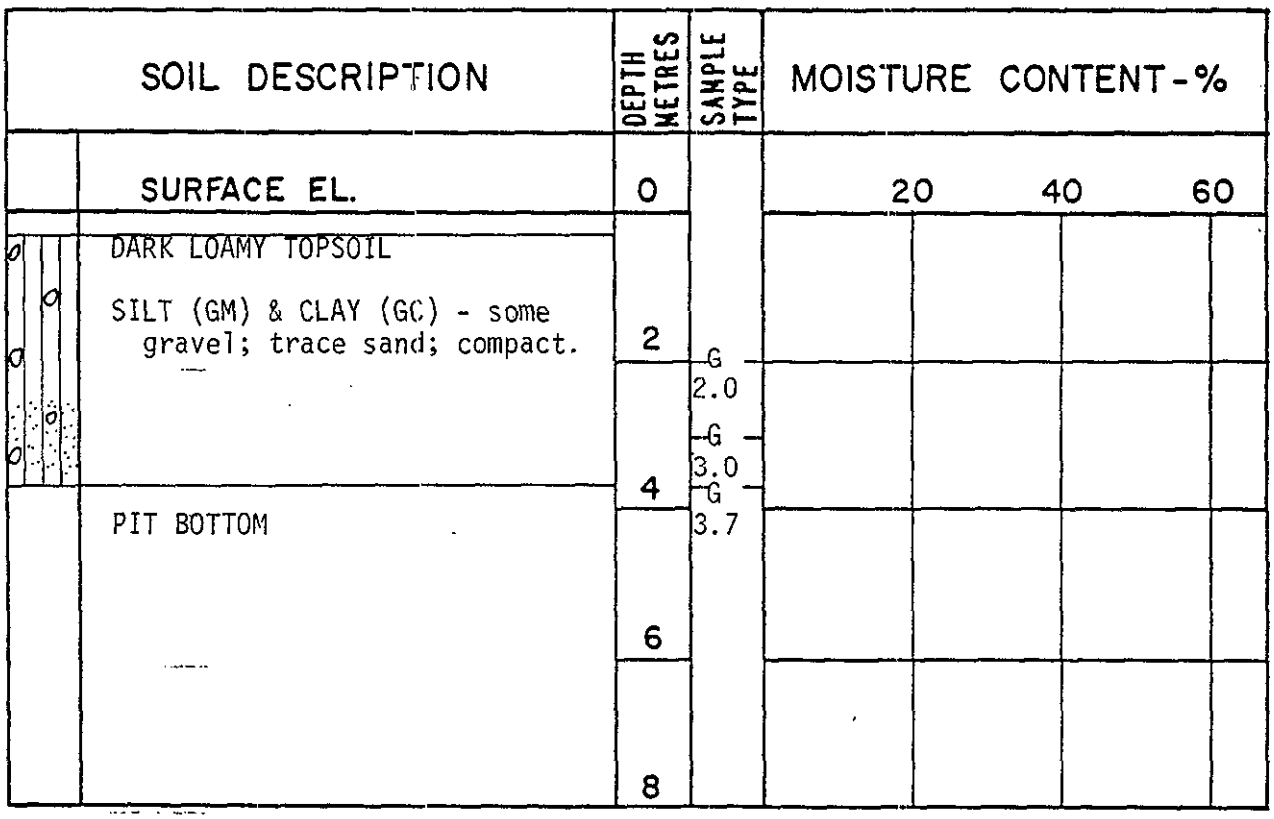
TP81-30

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 15



TP81-31



TP81-32

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 16

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
GRAVELLY TOPSOIL SAND AND GRAVEL (GW) - clean; well bedded below 1.0 m.	2	G 2.0	× —— ×
CLAY (GC) (TILL) - some sand and gravel.	4	G 4.0	15.9 ⊕
PIT BOTTOM	6		
	8		

TP81 – 33

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SAND AND GRAVEL (GW) - some cobbles and boulders; trace silt; homogeneous, loose.	2	G 2.0	
	4	G 4.0	
PIT BOTTOM	6		
	8		

TP81 – 34

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 17

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL GRAVELLY SAND (GM) - some silt; trace cobbles and clay; gravel content decreases with depth, dense.	2	G 2.0	
	4	G 4.0	
PIT BOTTOM	6		
	8		

TP81-35

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL GRAVELLY SILT (GM) - some sand; trace boulders.	2	G 2.0	
SAND AND GRAVEL (GW) - trace boulders, loose to medium dense	4	G 4.0	
PIT BOTTOM	6		
	8		

TP81-36

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 18

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SAND AND GRAVEL (GW) - trace cobbles; clean; homogeneous	2	G 2.0	
	4	G 4.0	
PIT BOTTOM	6		
	8		

TP81-37

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND AND GRAVEL (SW-GW) 1.8 - trace of silt - some cobbles & boulders - brown cobbles 2.0 - trace of organics ▼ 13/6/81	2	G 1.0 G 2.0	
SAND AND SILT (ML-SP) - some clay - very firm - brown	4	G 3.0 G 4.0	× ⊕ ×
PIT BOTTOM	6		
	8		

TP81-38

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 19

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND (SW) - gravel from 1.8 m which decreased with depth layer of cobbles and boulders - water inflow at 1.8 m (~5 litre/min) - well rounded gravel	2	G 1.0 G 2.0	
	4	G 3.0 G 4.0	
PIT BOTTOM	6		
	8		

TP81-39

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SAND AND GRAVEL (SW-GW) - trace of cobbles - well to subrounded	2	G 1.0 G 2.0	
PIT BOTTOM	4		
	6		
	8		

TP81-40

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 20

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SAND AND GRAVEL (GW-SW)	2	G 1.0	
PIT BOTTOM	4	G 2.0	
	6		
	8		

TP81-41

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SAND AND GRAVEL (SW-GW) - some silt - some cobbles and boulders from 1.0 to 3.0 metres	2	G 1.0	
	4	G 2.0 G 3.0	
PIT BOTTOM	6	G 4.0	
	8		

TP81-42

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 21

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SAND AND GRAVEL (SW-SM)(TILL) - some silt - some cobbles	2	G 1.0 G 2.0 G 3.0	
	4		
PIT BOTTOM	6		
	8		

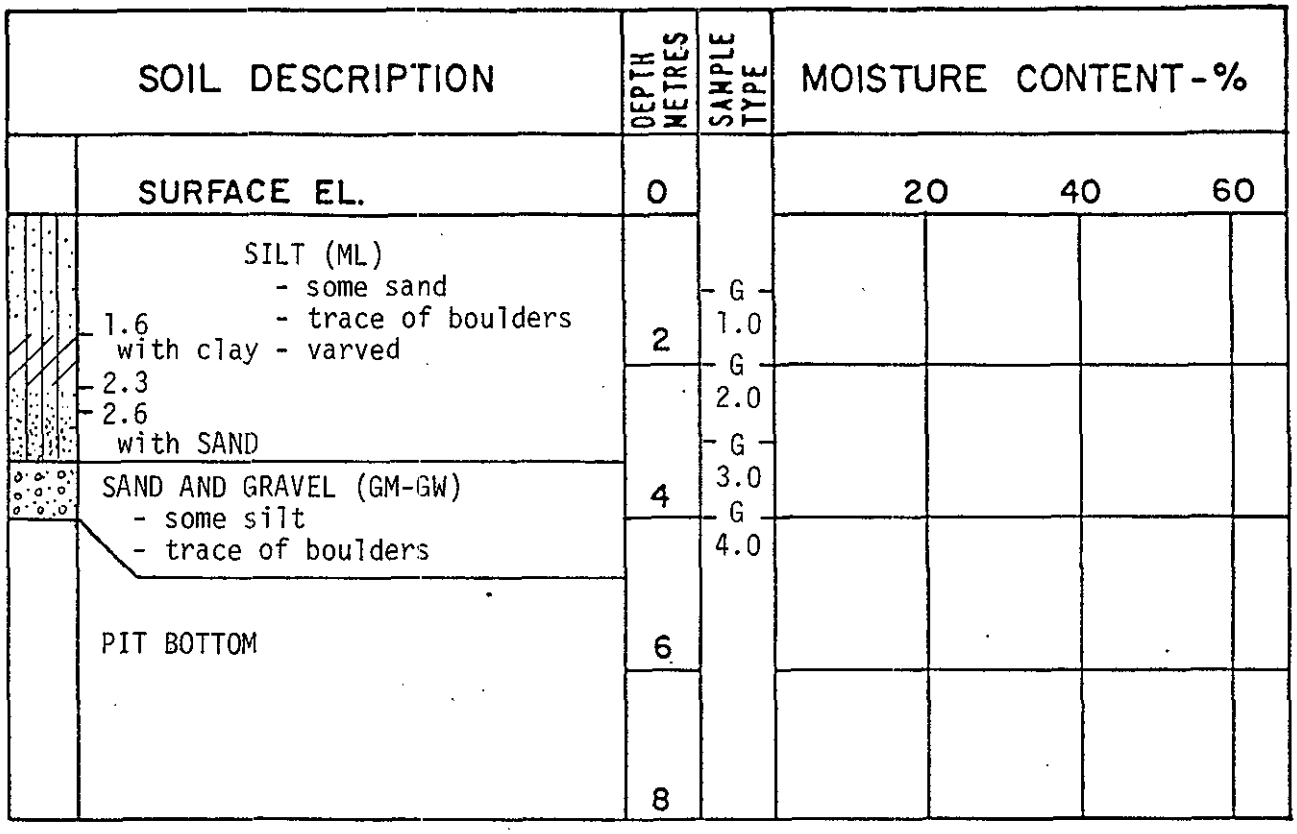
TP81-43

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SILT (ML) - grey - sandy from 1.6 m - trace of clay from 1.6 m - boulders from 2.0 to 3.0 m	2	G 1.0 G 2.0	
SAND AND GRAVEL (SM-GM) - some silt and cobbles - gravel is well rounded	4	G 3.0 G 4.0	
PIT BOTTOM	6		
	8		

TP81-44

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 22



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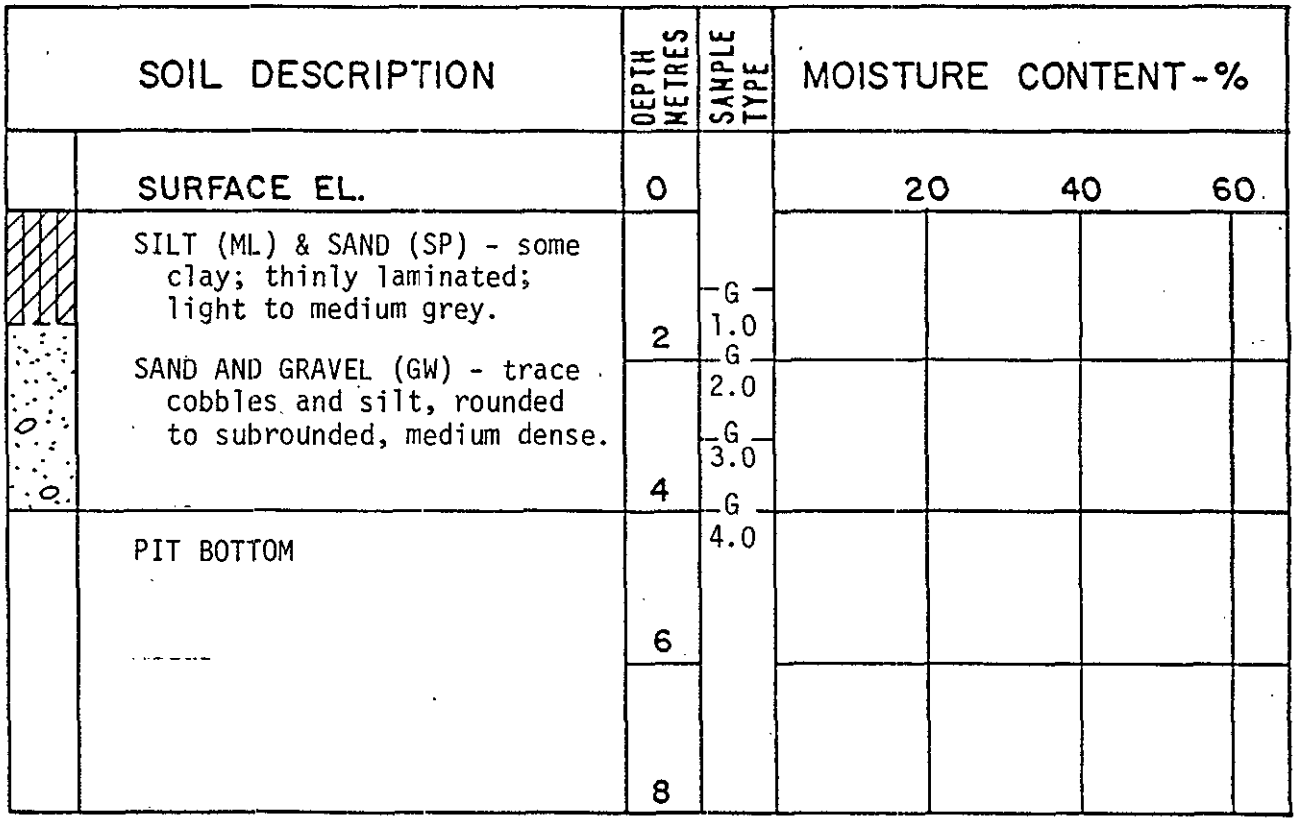

TP81-46

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

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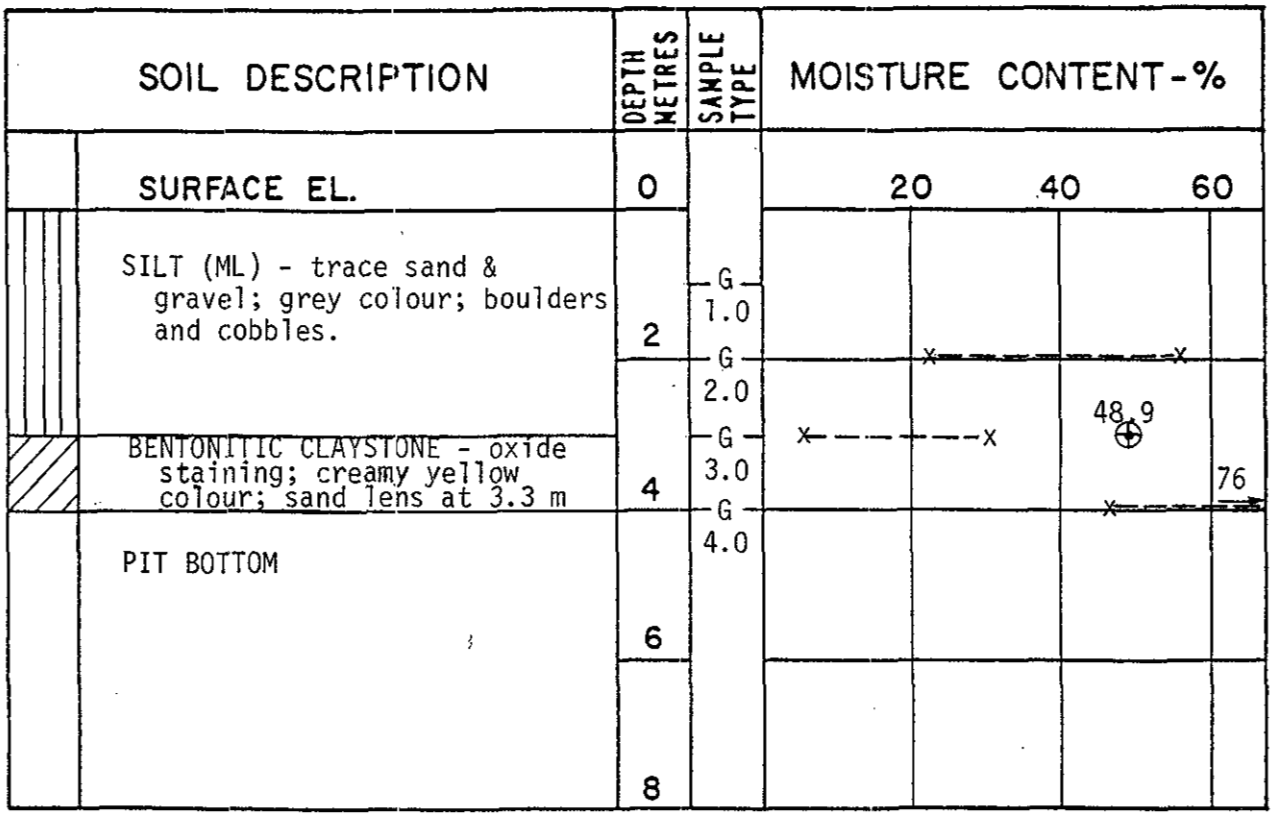

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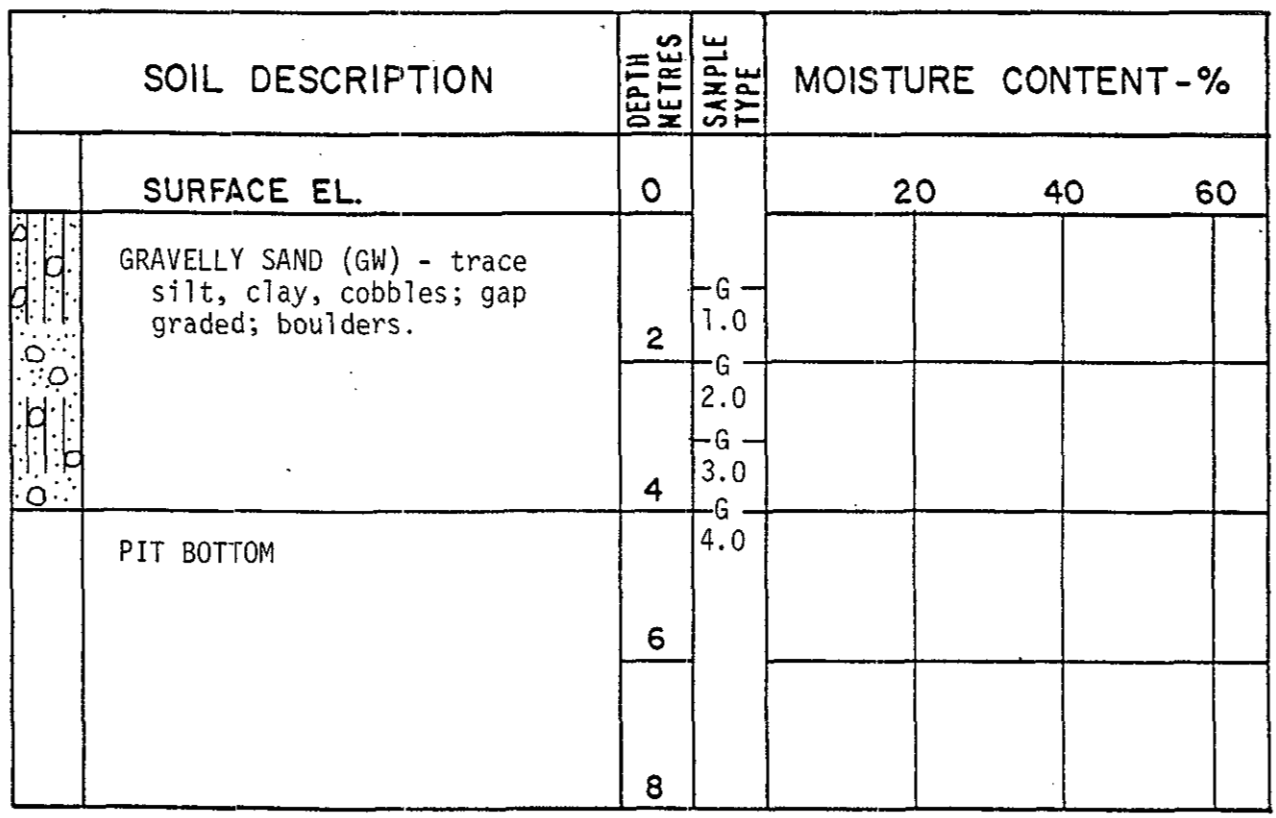


TP81-48

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 24

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SAND AND SILT TOPSOIL			
SANDY GRAVEL (GW) - some cobbles; trace silt; generally coarser grained dense.	2	G 1.0	
	4	G 2.0 G 3.0	
PIT BOTTOM	6		
	8		

TP81-49

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
ORGANIC TOPSOIL			
SAND AND GRAVEL (GW) - bedded; clean	2	G 1.0	
CLAY AND GRAVEL (GP) - some sand and silt; rounded gravel, dense.	4	G 2.0 G 3.0 G 4.0	13.9
PIT BOTTOM	6		
	8		

TP81-50

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 25

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
BLACK LOAMY TOPSOIL			
CLAYEY SILT (ML) - light grey colour; trace sand.	2	G 1.0	
CLAYEY SILT (ML) - with trace sand, boulders, cobbles, dark grey colour.	4	G 2.0 G 3.0	
PIT BOTTOM	6	G 4.0	
	8		

TP81-51

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
BROWN SILTY TOPSOIL			
GRAVELLY SILT (GM) - trace cobbles, clay and boulders.	2	G 1.0	
CLAY AND GRAVEL (GC) - well rounded to rounded gravel; firm, plastic clay.	4	2.0 G 3.0	12.9
PIT BOTTOM	6	G 4.0	
	8		

TP81-52

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 26

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
DARK SILTY TOPSOIL		G 1.0	
SAND AND GRAVEL (GW) - clean; well graded; angular to well rounded gravel; trace cobbles; trace boulders.	2	G 2.0	
CLAYEY SILT (ML) (TILL) - stiff; plastic; dark grey.	4	G 3.0	
PIT BOTTOM		G 4.0	23.0
	6		
	8		

TP81-53

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SILT AND SAND (SC) - some clay; soft, plastic grey clay; gravel cobbles.		G 1.0	
	2	G 2.0	
GRAVELLY SILT (GM) - some sand and clay; hard, plastic clay; well rounded gravel.	4	G 3.0	
PIT BOTTOM		G 4.0	
	6		
	8		

TP81-54

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 27

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
DARK ORGANIC TOPSOIL			
SAND (SP) - trace silt and cobbles; light brown; gap graded; boulders.	2	G 1.0	
SILTY SAND (GM) - some gravel; trace clay; cobbles; rounded gravel.	4	G 2.0 G 3.0	
PIT BOTTOM	6	G 4.0	
	8		

TP81-55

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
ORGANIC TOPSOIL			
SAND AND GRAVEL (GM) - some silt; trace clay & boulders.	2	G 1.0	
GRAVELLY CLAY (GC) - some coarse sand; dark grey, dense very hard clay.	4	G 2.0 G 3.0	
PIT BOTTOM	6	G 4.0	
	8		

TP81-56

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 28

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
ORGANIC TOPSOIL			
SAND AND GRAVEL (GW) - some cobbles; boulders; well graded.	2	G 1.0	
		G 2.0	
GRAVELLY CLAY (GC) - some sand and gravel; rounded, stiff, plastic, dark grey clay.	4	G 3.0	17.7 ⊕ x---x
		G 4.0	20.5 x⊕
PIT BOTTOM	6		
	8		

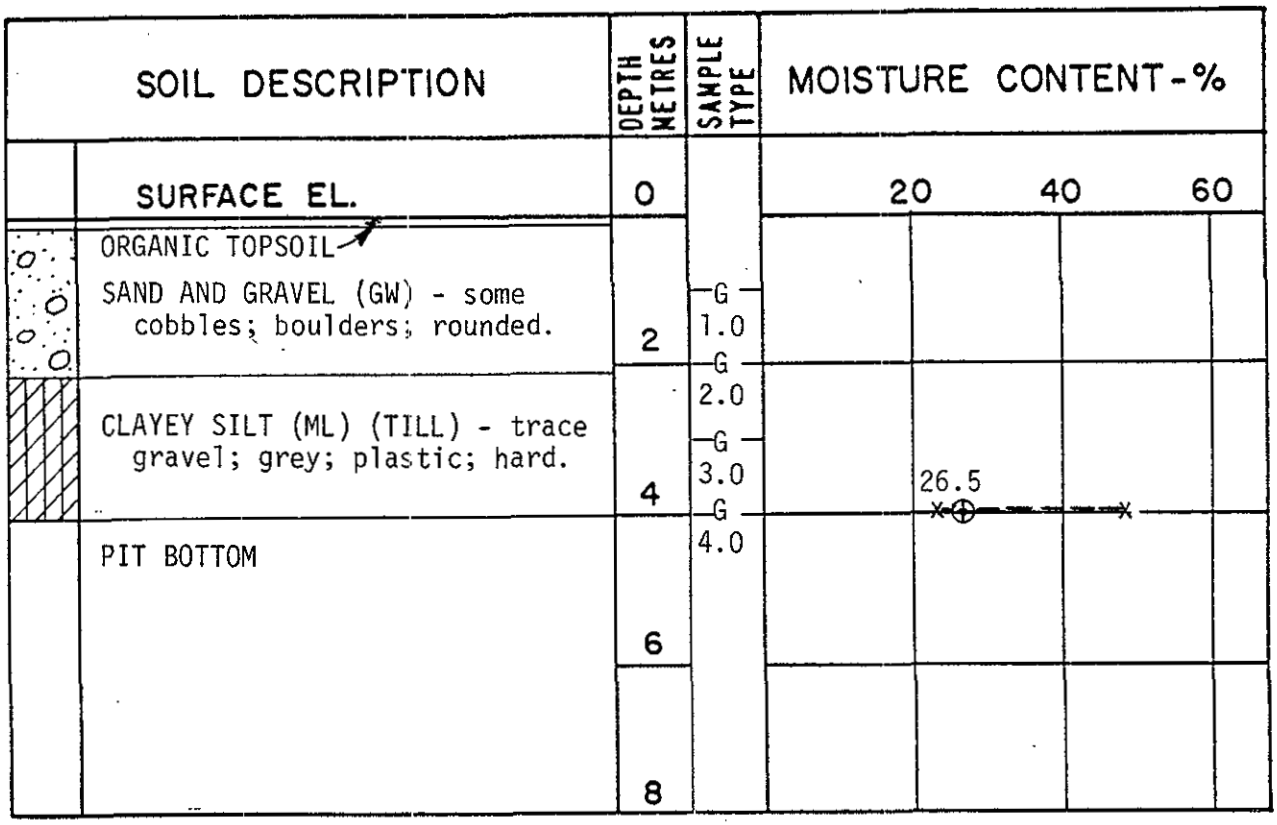
TP81-57

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
GRAVELLY SAND (GP) - clean; silt interbeds, trace cobbles.	2	G 1.0	
Groundwater		G 2.0	
PIT BOTTOM	4		
	6		
	8		

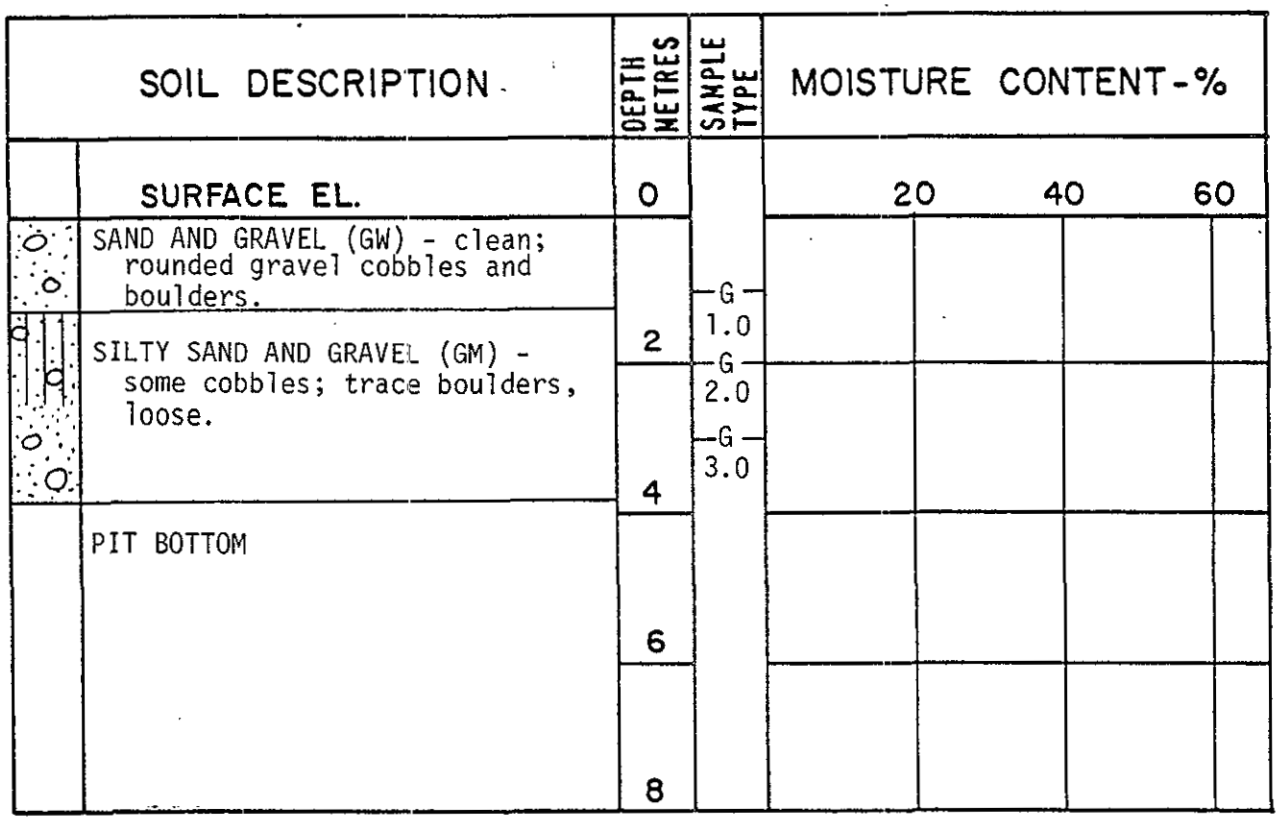
TP81-58

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 29



TP81-59



TP81-60

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 30

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SAND AND GRAVEL (GW) - trace cobbles and boulders.	2	G 1.0	
GRAVELLY CLAY (GC) (TILL) - some sand; dense, plastic clay.		G 2.0	
PIT BOTTOM	4		
	6		
	8		

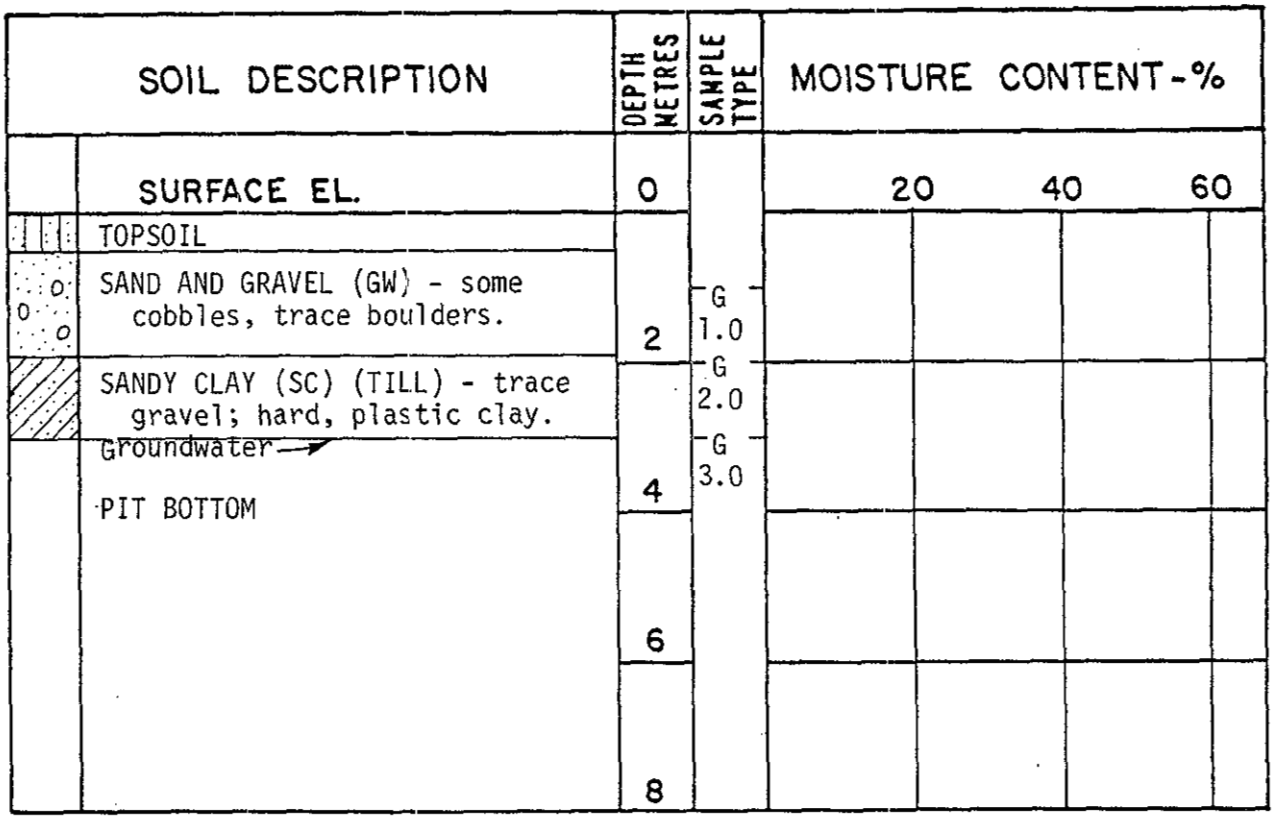
TP81-61

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SILTY SAND (SM) - coarse to fine sand.		G 1.0	
SAND AND GRAVEL (GW) - some cobbles; trace boulders	2	G 2.0	
CLAY (GC) - some sand and gravel; firm, plastic, grey clay.		G 3.0	17.2 ⊕
PIT BOTTOM	4		
	6		
	8		

TP81-62

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 31



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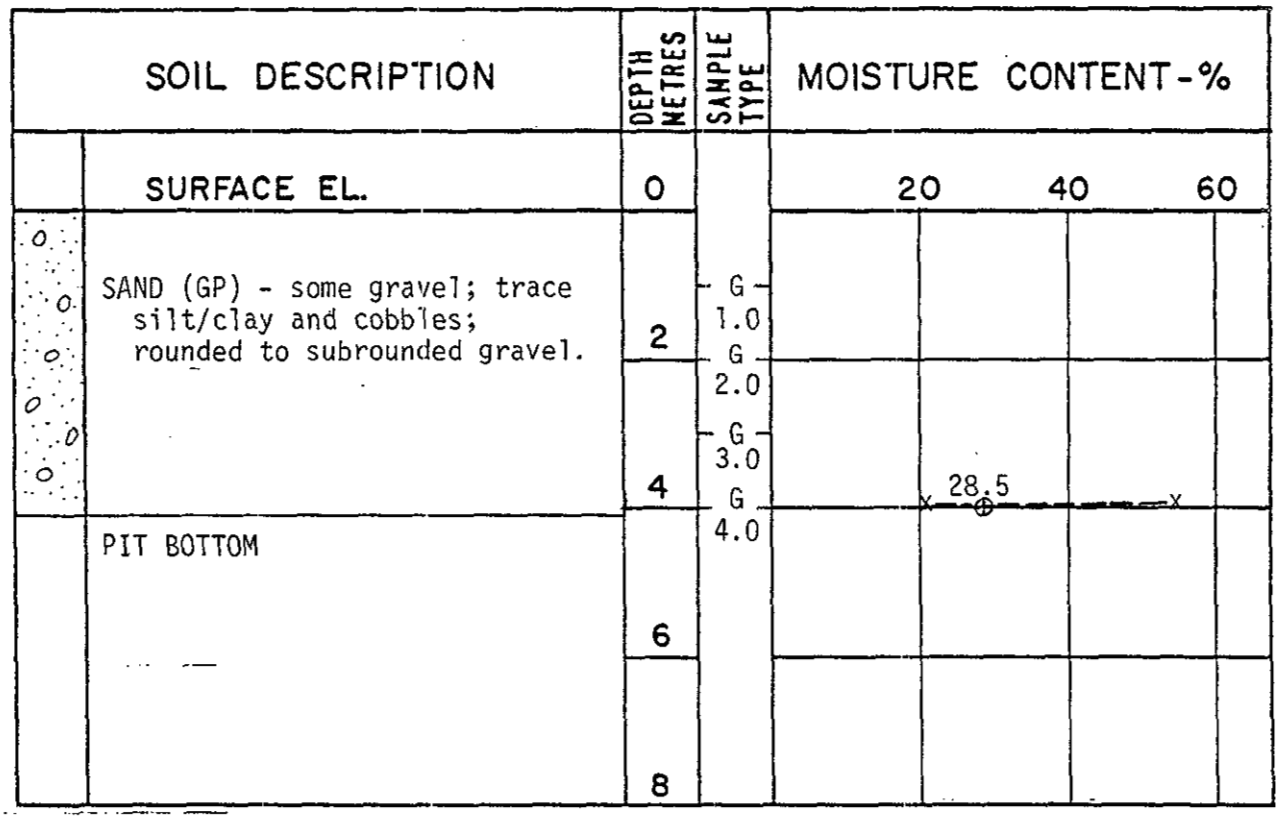


TP81-64

HAT CREEK PROJECT

1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 32

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SILTY SAND (GM) - some cobbles; trace gravel and boulders.	2	G 1.0	
		G 2.0	
SAND AND GRAVEL (GW) - clean below 3.8 m; trace cobbles.	4	G 3.0	
		G 4.0	
PIT BOTTOM	6		
	8		

TP81-65

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SANDY SILT (SM) - trace angular to subrounded gravel, cobbles.	2	G 1.0	23.5 72
SAND (SW) - trace clay; compact.		G 2.0	35.7 72
TUFFACEOUS SANDSTONE	4	G 3.0	
PIT BOTTOM	6		
	8		

TP81-66

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 33

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
DARK ORGANIC TOPSOIL		G 1.0	
SILTY SAND (SM) - trace clay; brown.	2	G 2.0	
GRAVEL AND COBBLES (GW) - some sand.		G 3.0	24.5 ⊕ × 74 →
TUFFACEOUS SANDSTONE	4	G 4.0	
PIT BOTTOM	6		
	8		

TP81-67

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
ROAD FILL		None	
SAND AND GRAVEL Groundwater →	2		
PIT BOTTOM	4		
	6		
	8		

TP81-68

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 34

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
DARK ORGANIC TOPSOIL			
SILTY SAND AND GRAVEL (GM) - trace cobbles and clay; tan.	2	G 1.0	
	4	G 2.0 G 3.0	
PIT BOTTOM	6	G 4.0	
	8		

TP81-69

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
DARK ORGANIC TOPSOIL			
GRAVELLY SAND (GW) - trace cobbles; brown; rounded to subrounded .	2	G 1.0	
	4	G 2.0 G 3.0	
PIT BOTTOM	6	G 4.0	
	8		

TP81-70

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 35

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SANDY CLAY (SC) (TILL) - trace gravel; firm, grey clay.	2	G 1.0	
		G 2.0	14.4 ⊕ x---x
PIT BOTTOM	4	G 3.0	
	6		
	8		

TP81-71

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
ORGANIC TOPSOIL SILT (ML) - loose; brown.	2	G 1.0	
SANDY SILT (SM) - trace gravel and clay; light brown; plastic clay in small clasts, firm.		G 2.0	
	4	G 3.0	
PIT BOTTOM		G 4.0	
	6		
	8		

TP81-72

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 36

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
ORGANIC TOPSOIL			
SILT, SAND AND GRAVEL (GM) - trace cobbles; coarser grained rusty orange; subrounded particles.	2	G 1.0	
		G 2.0	
	4	G 3.0	
		G 4.0	
PIT BOTTOM	6		
	8		

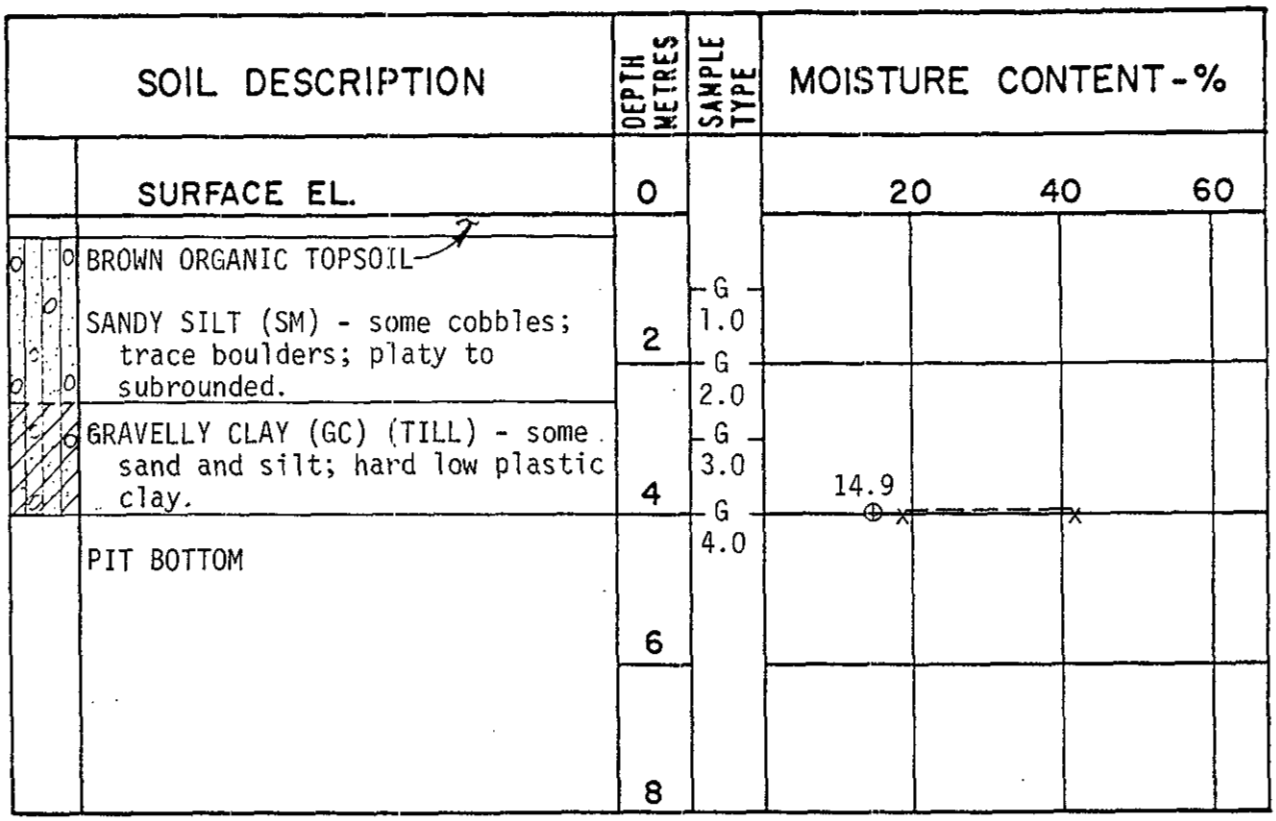
TP81 - 73

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
LOAMY TOPSOIL			
SANDY SILT (SM) - some gravel and clay; trace cobbles; angular to subrounded particles; soft, plastic clay.	2	G 1.0	
		G 2.0	
	4	G 3.0	
		G 4.0	
PIT BOTTOM	6		
	8		

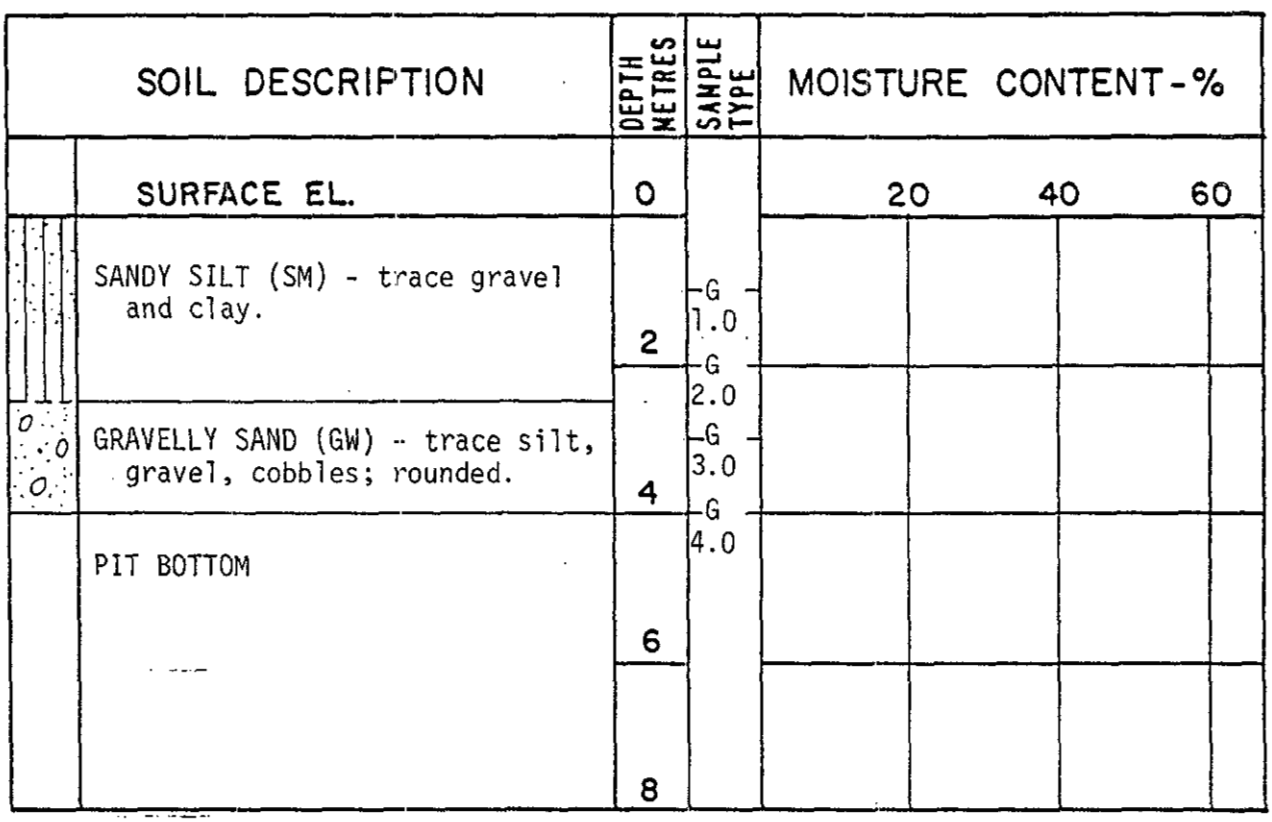
TP81 - 74

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 37



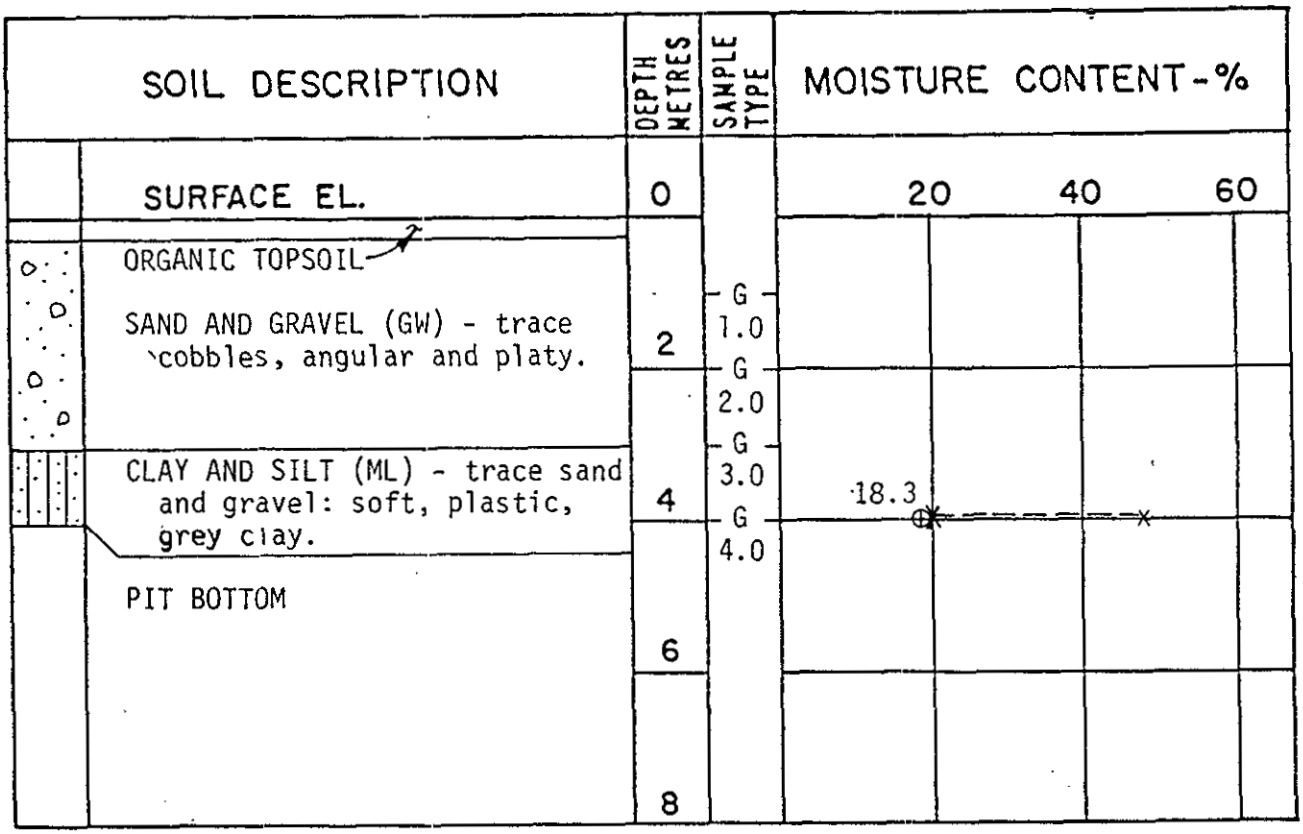
TP81-75



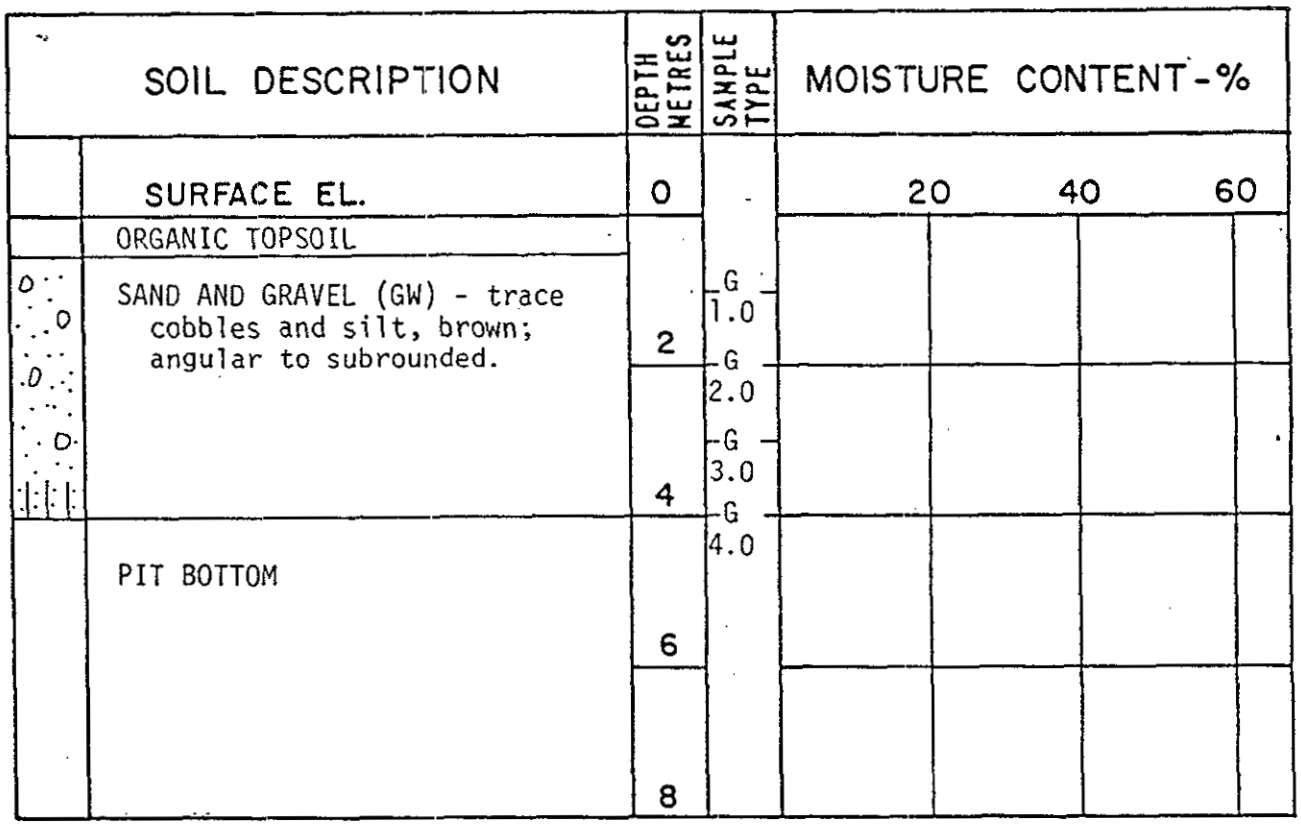
TP81-76

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 38



TP81-77



TP81-78

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 39

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND AND GRAVEL (GW) - clean ; well graded; brown, angular to subrounded.	2	G 1.0	
CLAYEY SILT (ML) - trace gravel, sand, cobbles; plastic, grey clay.	4	G 2.0 G 3.0 G 4.0	30.0
PIT BOTTOM	6		
	8		

TP81-79

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
COBBLY GRAVEL (GW) - some sand and silt; trace clay;	2	G 1.0	
SAND (SP) - clean; medium to fine grained; dark grey, medium dense.	4	G 2.0 G 3.0 G 4.0	
PIT BOTTOM	6		
	8		

TP81-80

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 40

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SILTY SAND TOPSOIL (SM) - dark brown; alternating orange/ grey.	2	G 1.0	
SAND AND GRAVEL (GM) - some silt /clay and gravel; subrounded cobbles.		G 2.0	
Groundwater →		G 3.0	
PIT BOTTOM	4		
	6		
	8		

TP81-81

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL →			
BOULDERS, COBBLES, GRAVEL AND SAND - angular to subrounded.	2	G 1.0	
SANDY SILT (SM) (TILL) - trace gravel and clay; very hard; dense.		G 2.0	
		G 3.0	
PIT BOTTOM	4		
	6		
	8		

TP81-82

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 41

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
ORGANIC TOPSOIL GRAVEL (GW) - some cobbles and sand; trace boulders; angular to subrounded.	2	G 1.0 G 2.0	
CLAYEY SILT (GC) - some sand and gravel; firm, plastic grey clay.	4	G 3.0 G 4.0	
PIT BOTTOM	6		
	8		

TP81-83

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
TOPSOIL SILT (ML) - trace clay; boulder.	2	G 1.0 G 2.0	
COBBLY SILT (GM) - trace of gravel and sand.	4	G 3.0 G 4.0	
SANDY CLAY (SC) (TILL) - some silt; trace gravel; hard. PIT BOTTOM	6		
	8		

TP81-84

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 42

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND AND GRAVEL (GW) - clean; bedded; angular to well rounded.	2	G 1.0	
		G 2.0	
SANDY SILT (SM) - trace gravel; subrounded, brown medium dense.	4	G 3.0	
PIT BOTTOM	6		
	8		

TP81-85

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SANDY SILT (SM) - trace clay.	2	G 1.0	
GRAVELLY SAND (GW) - some cobbles; trace silt/clay.		G 2.0	
CLAYEY SILT (ML) - dense; gravelly; low plastic.	4	G 3.0	
		G 4.0	
PIT BOTTOM	6		
	8		

TP81-86

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 43

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SILTY ORGANIC TOPSOIL			
SANDY SILT (GM) - some cobbles and gravel; brown.	2	G 1.0 G 2.0	
SAND AND GRAVEL (GW) - trace cobbles &silt.	4	G 3.0 G 4.0	
PIT BOTTOM	6		
	8		

TP81-87

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
CLAYEY SILT (ML) - trace sand; tan, plastic.	2	G 1.0 G 2.0	
SAND AND GRAVEL (GW) - trace cobbles; subrounded to rounded, compact.	4	G 3.0 G 4.0	
PIT BOTTOM	6		
	8		

TP81-88

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 44

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL - trace gravel.		G 1.0	
SANDY SILT (GM) - some gravel trace cobbles, dense.	2	G 2.0 G 3.0 G 3.7	
PIT BOTTOM	4		
	6		
	8		

TP81-89

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL CLAYEY SILT (ML) - trace sand and gravel; angular to sub-rounded; brown. SANDY SILT (SM) - some cobbles; trace gravel and clay; subrounded to rounded. TILL	2	G 1.0 G 2.0 G 3.0 G 4.0	
PIT BOTTOM	4		
	6		
	8		

TP81-90

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 45

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SILT (GM) - some sand and cobbles; trace gravel and clay; platy and angular to subrounded; medium plastic clay in clasts.	2	G 1.0 G 2.0 G	
SAND (GW) - some cobbles and gravel; trace silt and clay; angular to well rounded.	4	3.0 G	
PIT BOTTOM	6	4.0 G	
	8		

TP81-91

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SAND AND SILT (SM) TOPSOIL - fine sand.			
COBBLES AND SAND (GM) - some gravel and silt; platy to well rounded.	2	G 1.0 G 2.0 G	
GRAVELLY CLAY (GC) (TILL) - some sand; trace silt; hard, moderately plastic, dull grey, angular to subrounded.	4	3.0 G	23.8
PIT BOTTOM	6	4.0 G	
	8		

TP81-92

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 46

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SAND AND SILT (SM) - brown, firm, some cobbles.	2	G 1.0	
GRAVELLY CLAY (TILL) (GC) - some sand and silt, clay in clasts, firm to stiff, plastic, grey, moist.	4	G 2.0 G 3.0	
PIT BOTTOM	6	G 4.0	
	8		

TP81-93

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND AND GRAVEL (GW) - some cobbles; well rounded.	2	G 1.0	
Groundwater →			
PIT BOTTOM	4		
	6		
	8		

TP81-94

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 47

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND AND COBBLES (GM) - some gravel and boulders, well graded; subrounded to rounded. Groundwater	2	G 1.0	
		G 2.0	
PIT BOTTOM	4		
	6		
	8		

TP81-95

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND (SP) - clean; medium grained; reddish brown; two silt bands.	2	G 1.0	
SANDY GRAVEL (GW) - some cobbles.		G 2.0	
		G 3.0	
PIT BOTTOM	4		
	6		
	8		

TP81-96

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 48

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-% 20 40 60
SURFACE EL.	0		
TOPSOIL SANDY SILT (ML) - trace clay; gravel; cobbles; dark bands.	2	G 1.0	
		G 2.0	
GRAVELLY CLAY (TILL) (GC) - some sand and silt dense; angular to subrounded.	4	G 3.0	31.7 ⊕
		G 4.0	
PIT BOTTOM	6		
	8		

TP81-97

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-% 20 40 60
SURFACE EL.	0		
TOPSOIL SANDY SILT (ML)	2	G 1.0	
SANDY COBBLES AND GRAVEL (GW) - trace boulders; very dense; trace clay.		G 2.0	
	4	G 3.0	
		G 4.0	
PIT BOTTOM	6		
	8		

TP81-98

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 49

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND AND SILT (SM) - trace gravel & cobbles; clean sand below 1.0 m.	2	G 1.0 G 2.0 G 3.0	
SILTY CLAY (GC) (TILL) - some sand and gravel; very dense, medium plastic.	4	G 4.0	
PIT BOTTOM	6		
	8		

TP81-99

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND AND GRAVEL (GW) - some cobbles.	2	G 1.0 G 2.0 G 3.0	
Groundwater	4		
PIT BOTTOM	6		
	8		

TP81-100

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 50

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND, GRAVEL, COBBLES - trace boulders; well graded.	2	G 1.0	
Groundwater →		G 2.0	
PIT BOTTOM	4		
	6		
	8		

TP81-101

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SILTY SAND (SM) - organic (~15%); roots; brown/red; wet.	2	G 1.0	
SANDY BOULDERS (GW) - some cobbles and gravel, loose.	4	G 2.0 G 3.0	
PIT BOTTOM	6		
	8		

TP81-102

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 51

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SAND AND GRAVEL (GW) - trace boulders and cobbles; cobbly layers; rounded to subrounded.	2	G 1.0	
		G 2.0	
SAND (SP) - fine grained; trace silt.	4	G 3.0	26.0
PIT BOTTOM	6	G 4.0	
	8		

TP81-103

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND (SP) - trace silt; brown/ grey; fine grained, beddings.	2	G 1.0	
COBBLES AND GRAVEL (GW) - some boulders, sand layers, very loose.		G 2.0	
	4	G 3.0	
PIT BOTTOM		G 4.0	
	6		
	8		

TP81-104

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 52

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND AND GRAVEL (GW) - clean; well rounded, some cobbles.	2	G 1.0	
	4	G 2.0 G 3.0 G	
PIT BOTTOM	6	4.0	
	8		

TP81-105

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SANDY GRAVEL (GW) - some cobbles; trace boulders; coarser grained.	2	G 1.0	
SAND (SP) - very fine grained; possibly silty.	4	G 2.0 G 3.0 G	
PIT BOTTOM	6	4.0	
	8		

TP81-106

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 53

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
GRAVELLY CLAY (GM) - some sand and silt; some cobbles below 3.0 m.	2	G 1.0	
Groundwater	4	G 2.0 G 3.0	
PIT BOTTOM	6		
	8		

TP81-107

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SILT (ML) - trace clay, sand and cobbles; brown colour.	2	G 1.0	
SAND (GM) - some cobbles, gravel and silt; gap graded.	4	G 2.0 G 3.0	
PIT BOTTOM	6	G 4.0	
	8		

TP81-108

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 54

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SILTY SAND (SW) - some gravel; trace cobbles; gap graded; grey/brown; subrounded.	2	G 1.0	
		G 2.0	
	4	G 3.0	
PIT BOTTOM			
	6		
	8		

TP81-109

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND, GRAVEL AND SILT (GM) - trace cobbles below 2.0 m; rounded to subrounded, homogeneous.	2	G 1.0	
		G 2.0	
	4	G 3.0	
		G 4.0	
PIT BOTTOM	6		
	8		

TP81-110

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 55

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
GRAVELLY SAND (GM) - some silt and cobbles; bedding rounded to subrounded, dense.	2	G 1.0	
	4	G 2.0 G 3.0 G 4.0	
PIT BOTTOM	6		
	8		

TP81-111

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SILTY SAND (SM) - trace gravel and cobbles; grey; angular to rounded; gap graded; dense.	2		
	4		
PIT BOTTOM	6		
	8		

TP81-112

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 56

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
CLAYEY SILT (ML) - some sand.	2	G 1.0 G	
SILTY SAND (SM) - trace gravel, cobbles, boulders; dense.	4	2.0 G 3.0 G 4.0	
PIT BOTTOM	6		
	8		

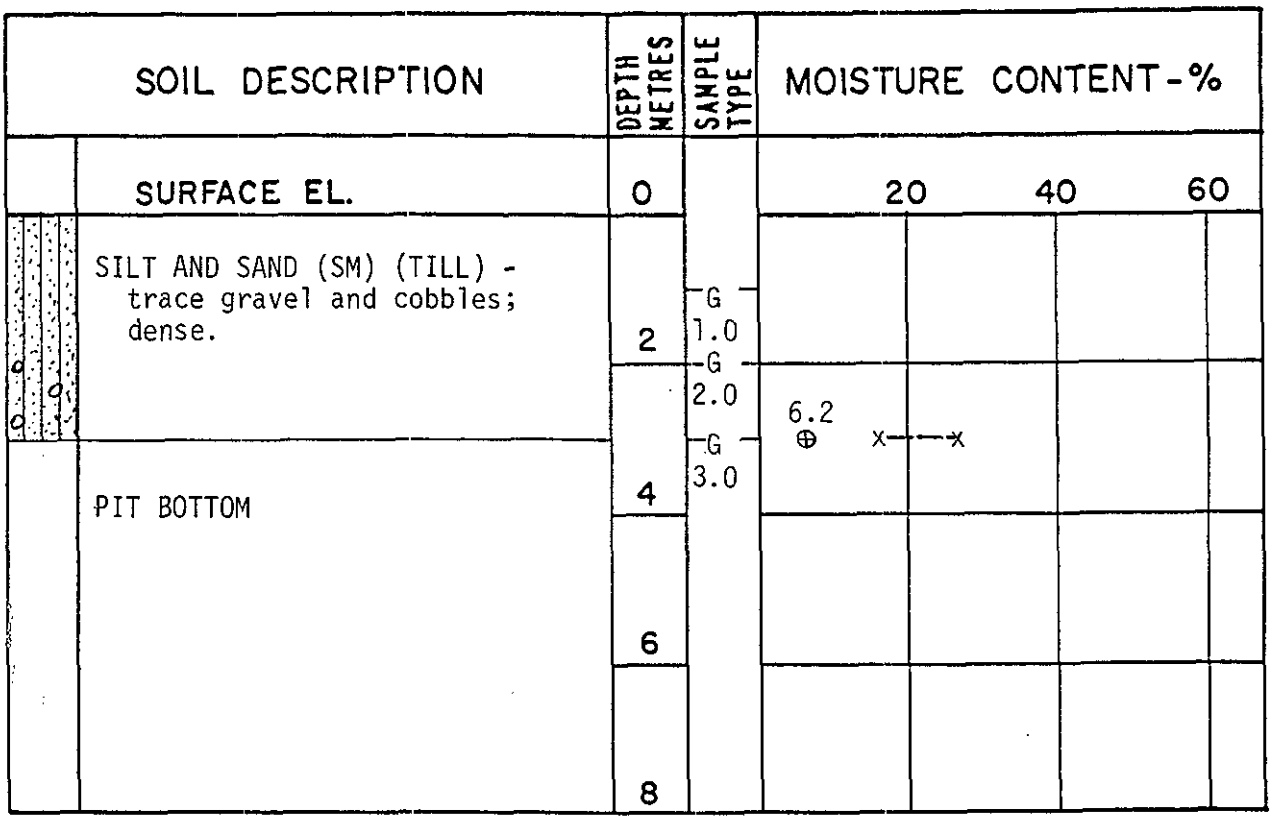
TP81-113

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
CLAYEY SILT (SC) (TILL) - some sand; trace gravel & cobbles.	2	G 1.0 G	
	4	2.0 G 3.0	
PIT BOTTOM	6		
	8		

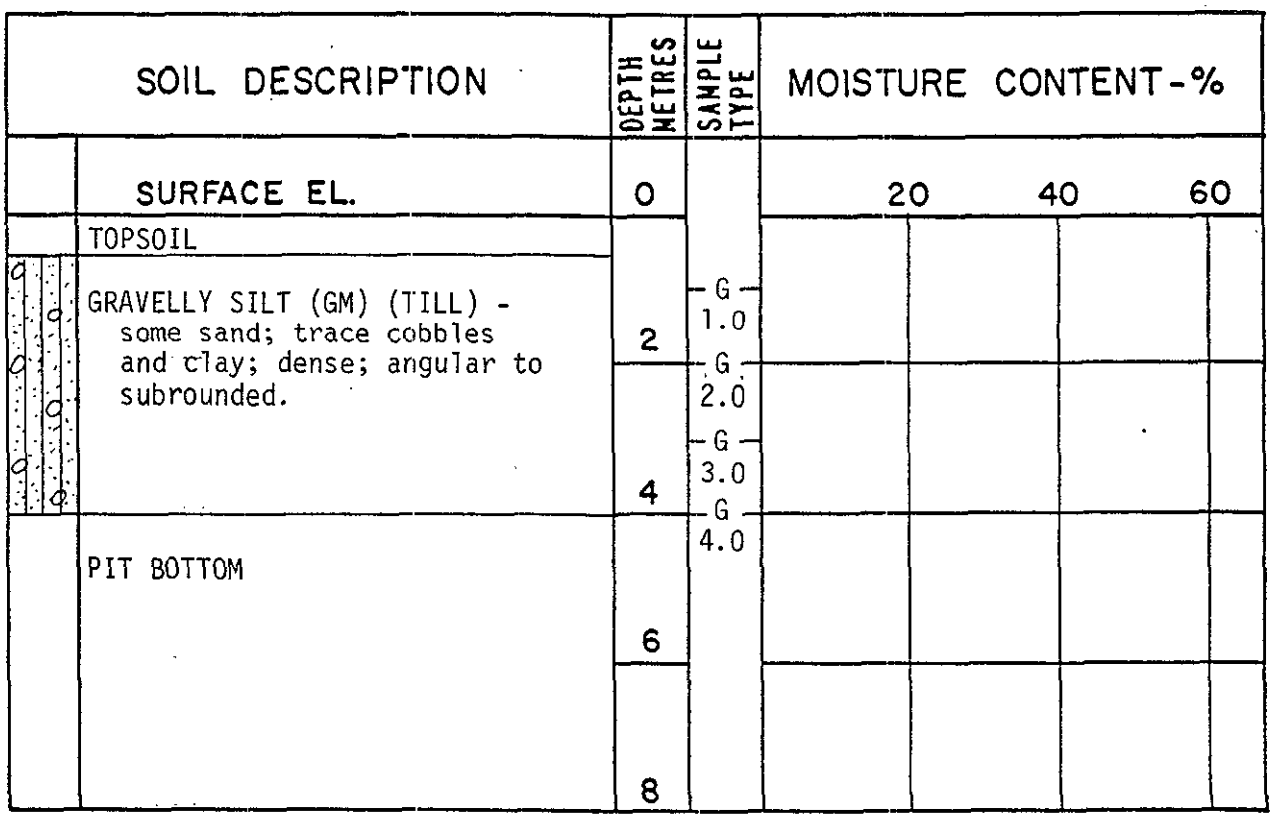
TP81-114

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 57



TP81-115



TP81-116

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 58

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND (GW) - some silt and gravel; trace clay; gravel & cobbles.	2	G 1.0	
	4	G 2.0 G 3.0	
PIT BOTTOM	6	G 4.0	
	8		

TP81-117

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
GRAVELLY SAND - some cobbles; trace silt, dense.	2	G 1.0	
	4	G 2.0 G 3.0	
PIT BOTTOM	6	G 4.0	
	8		

TP81-118

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 59

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SANDY SILT (SM) - trace gravel and cobbles; angular to subrounded, dense.	2	G 1.0 G 2.0 G 3.0	
	4	G 4.0	
PIT BOTTOM	6		
	8		

TP81 - 119

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SILTY SAND (SM) - trace subrounded to rounded gravel; medium dense.	2	G 1.0 G 2.0 G 3.0	
	4	G 4.0	
PIT BOTTOM	6		
	8		

TP81 - 120

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 60

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
GRAVELLY SAND (GW) - trace cobbles and boulders; trace silt; medium dense.	2	G 1.0	
	4	G 2.0 G 3.0 G	
		4.0	
PIT BOTTOM	6		
	8		

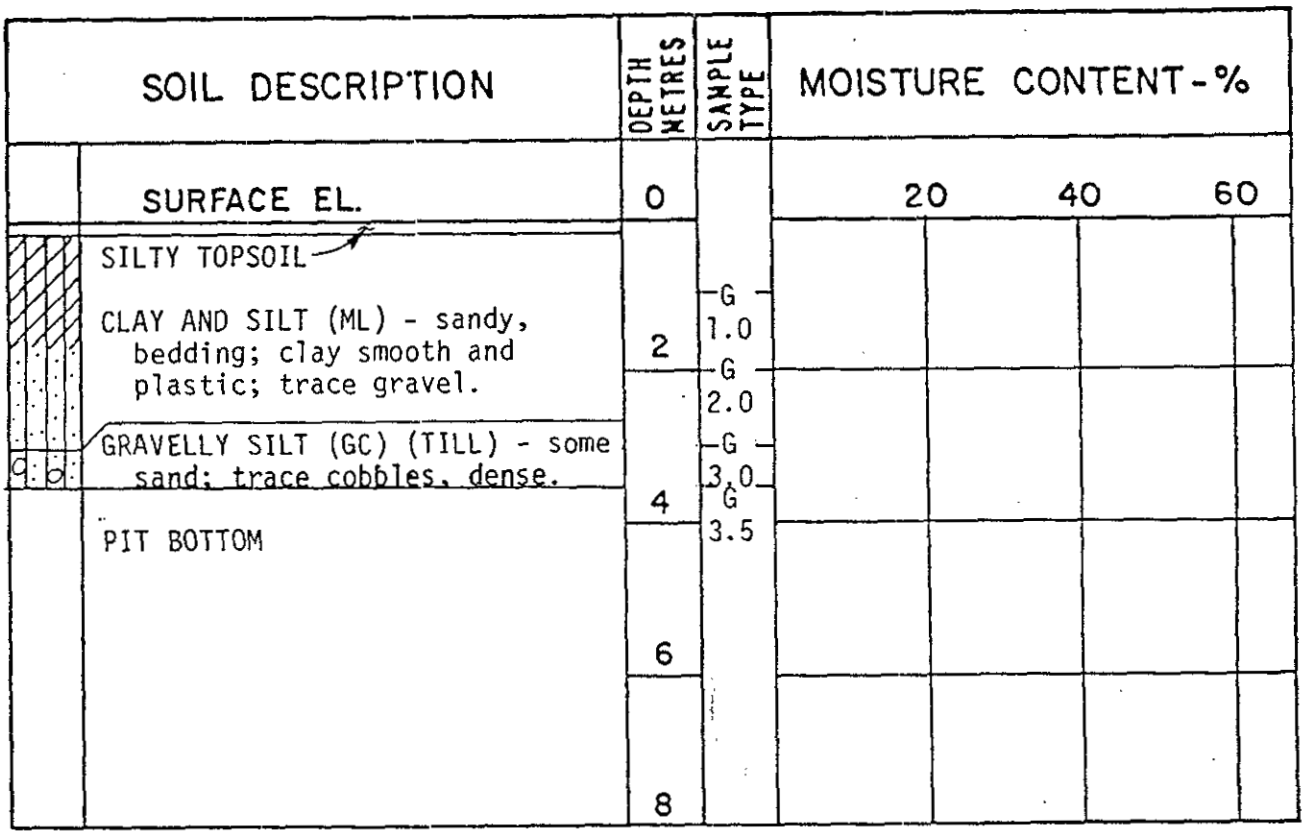
TP81 - 121

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
GRAVELLY SAND & SILT (GP) - interbedded.	2	G 1.0	
CLAYEY SILT (ML) - trace gravel; finely bedded; clay slightly plastic, firm; trace sand near bottom.	4	G 2.0 G 3.0 G	14.7 ⊕ x---x
		4.0	
PIT BOTTOM	6		
	8		

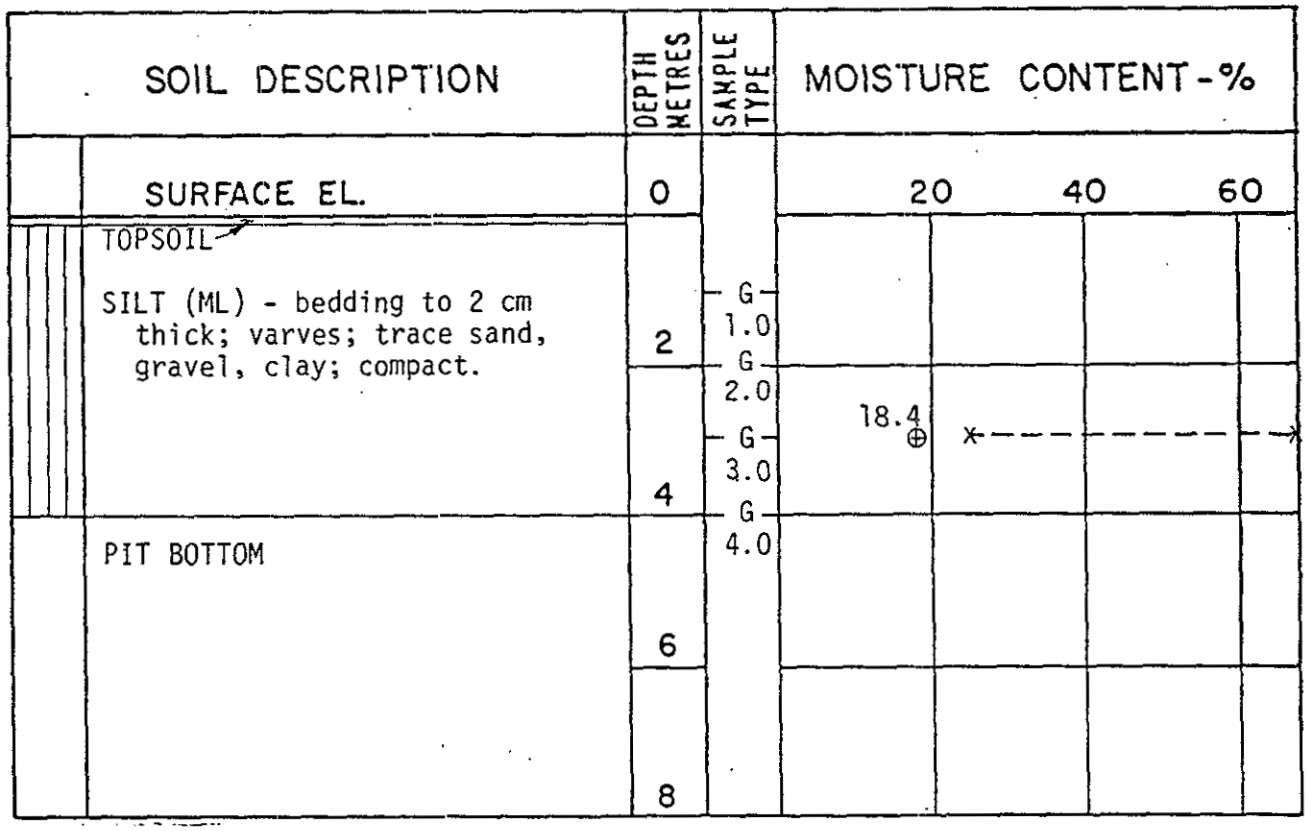
TP81 - 122

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 61



TP81-123



TP81-124

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 62

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SANDY SILT (SM) - trace gravel, cobbles, clay; well rounded cobbles; subrounded gravel.	2	G 1.0 G 2.0	
GRAVELLY SILT (GM) (TILL) - some sand; trace clay; dense.	4	G 3.0 G	
PIT BOTTOM	6	4.0	
	8		

TP81-125

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL - trace gravel and cobbles.			
COBBLY GRAVEL (GW) - some sand and boulders; particles platy to well rounded; well rounded; well graded; loose.	2	G 1.0 G 2.0	
Groundwater →	4	G 3.0	
PIT BOTTOM	6		
	8		

TP81-126

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 63

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - % (20 / 40 / 60)
SURFACE EL.	0		
TOPSOIL			
GRAVELLY SAND (GW) - coarse to medium grained sand; clean; loose; well rounded to subrounded.	2	G 1.0	
Groundwater		G 2.0	
PIT BOTTOM	4		
	6		
	8		

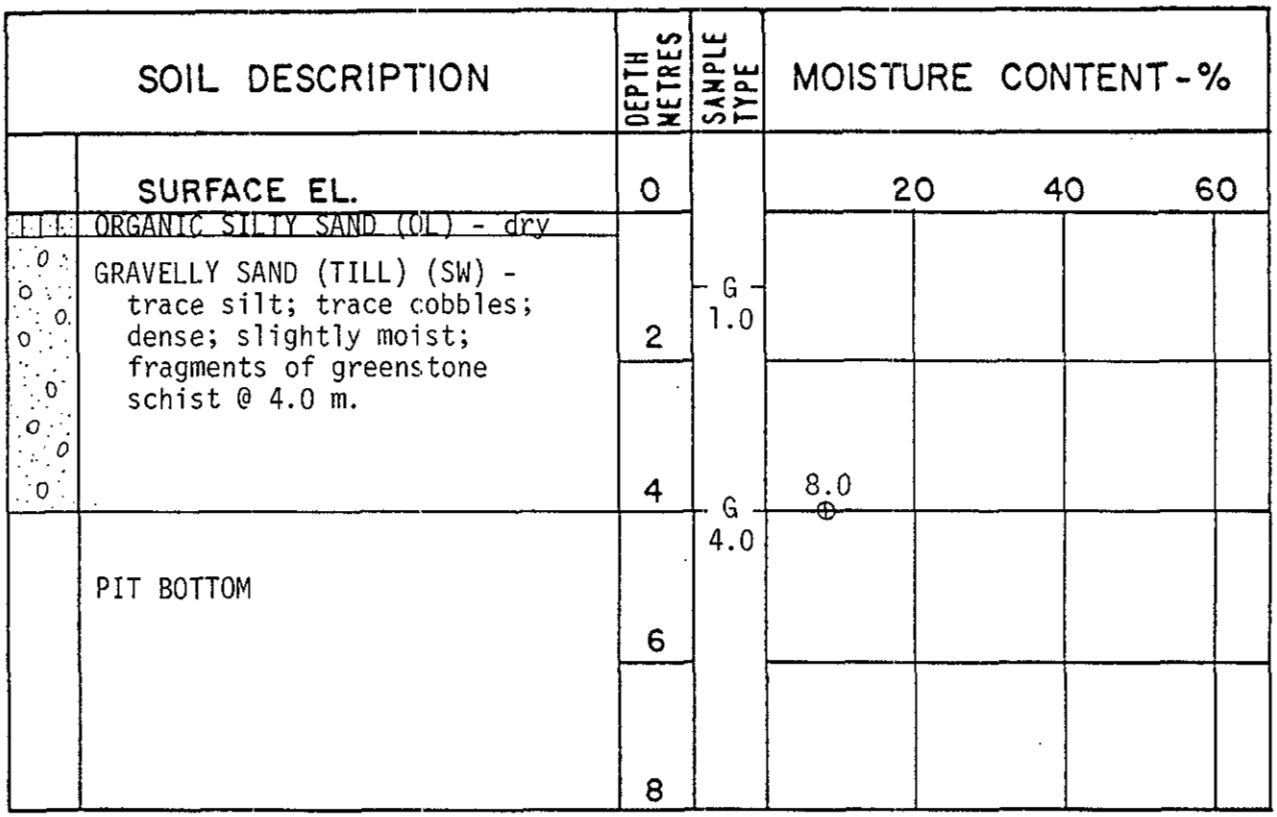
TP81-127

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - % (20 / 40 / 60)
SURFACE EL.	0		
ORGANIC TOPSOIL			
SANDY GRAVEL (GW) - trace silt; some cobbles; dense; till like; occasional boulder.	2	G 1.0	
GRAVELLY SILT (TILL) (SM) - some sand, very dense; trace cobbles; boulders.	4	G 3.8	12.8 ⊕
PIT BOTTOM	6		
	8		

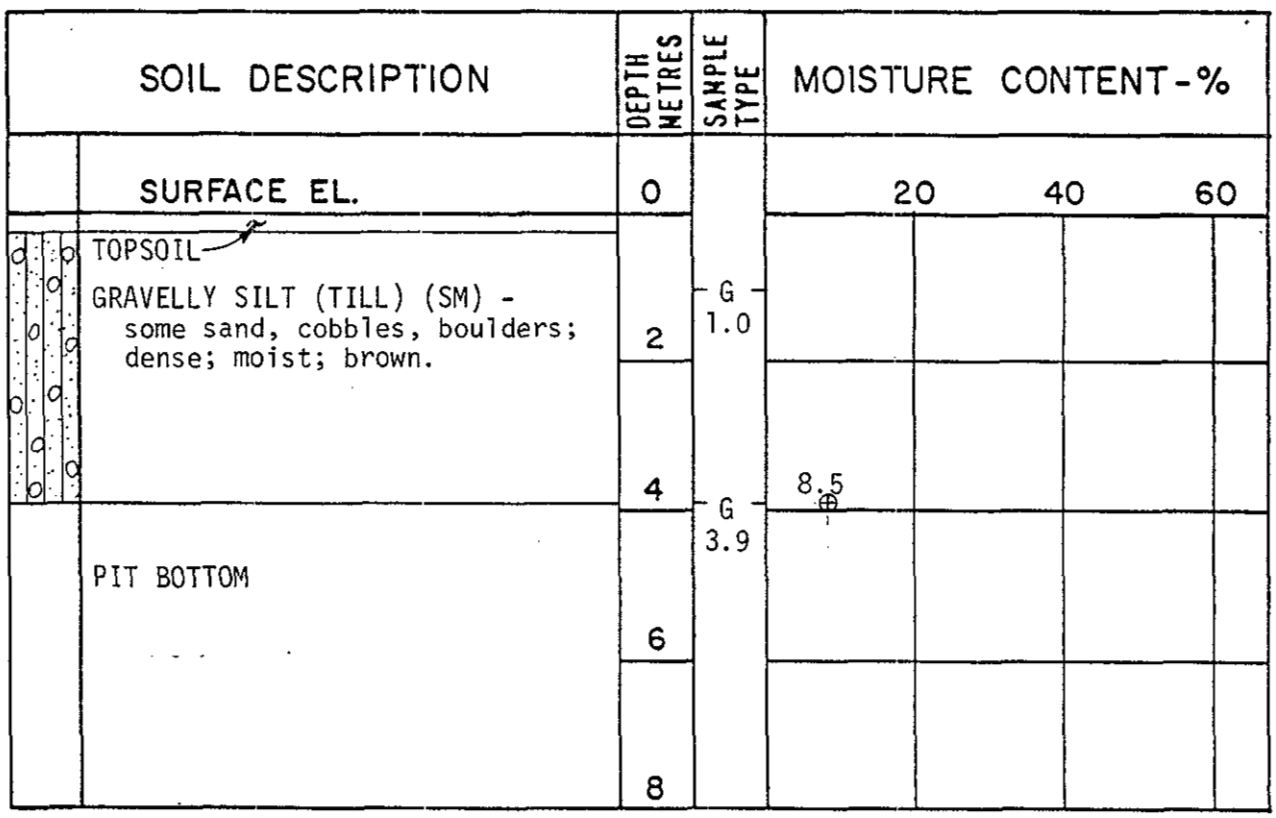
TP81-128

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 64



TP81-129



TP81-130

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 65

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SILTY, GRAVELLY SAND (TILL) (GM) trace cobbles and boulders; dense; brown; medium moist.	2	G 1.5	⊕ 7.9
GRAVELLY CLAY (TILL) (GC) - some sand & silt; very dense; moist; wet.	4		
Wet, grey, silt.	6	G 4.2	
PIT BOTTOM	8		

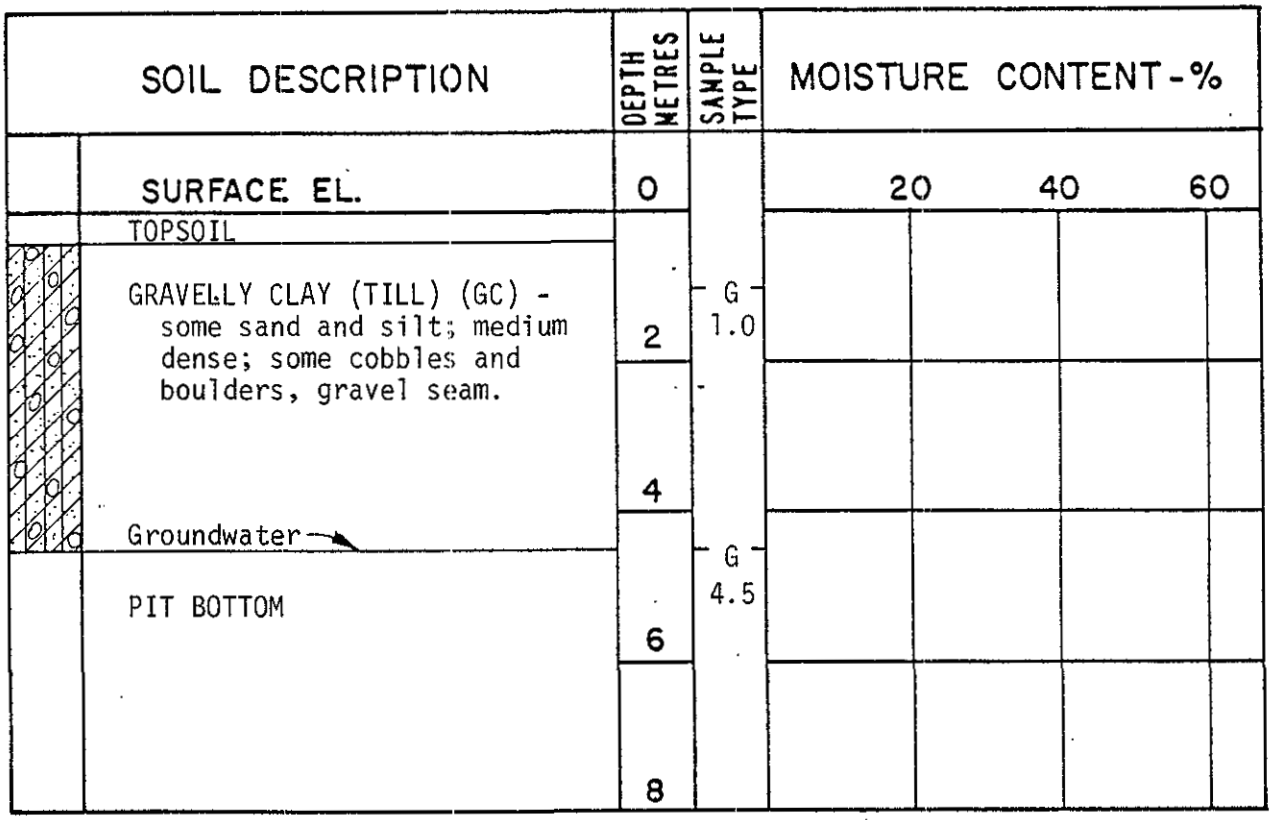
TP81-131

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
GRAVELLY CLAY (TILL) (GC) - some silt and sand; medium dense; some cobbles; trace boulders; increasing sand with depth.	2	G 1.0	
	4	G	⊕ 8.9
PIT BOTTOM	6	3.8	
	8		

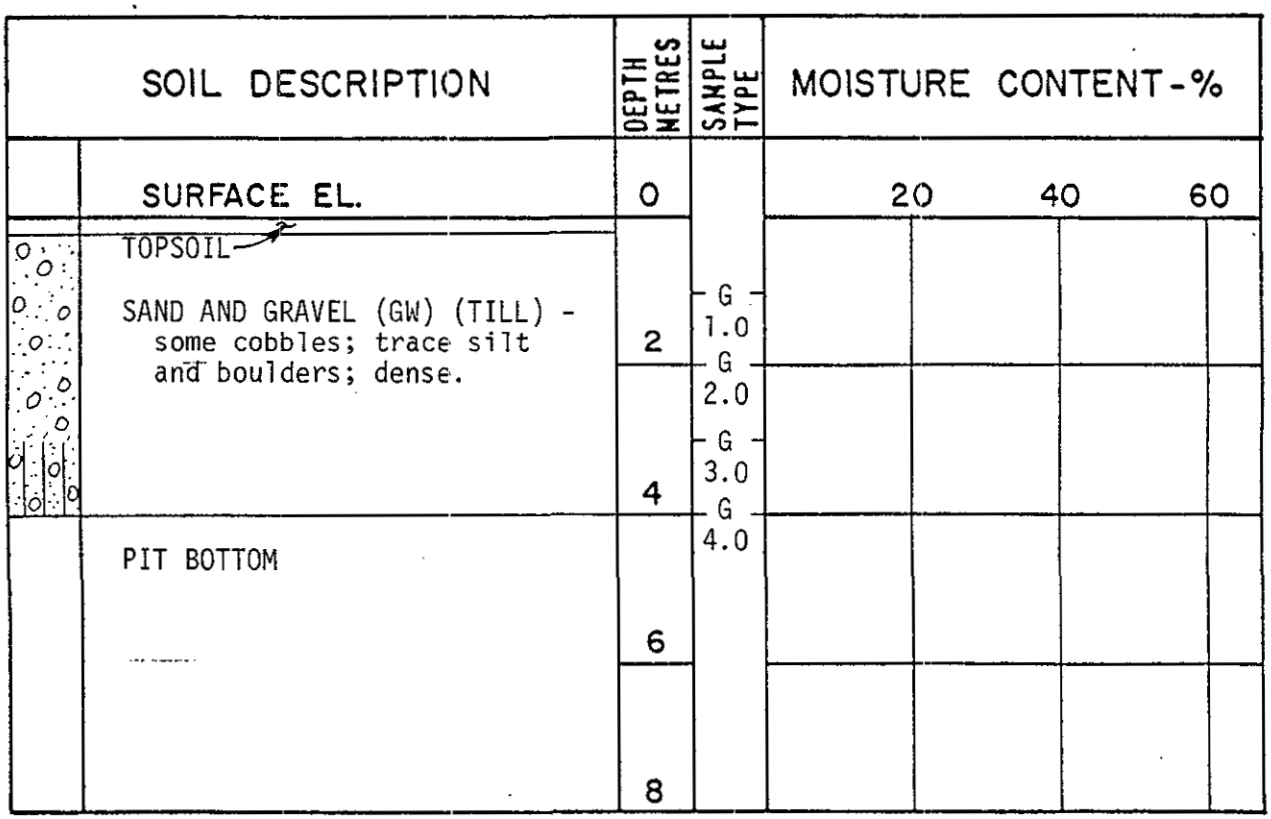
TP81-132

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 66



TP81-133



TP81-134

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 67

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND AND GRAVEL (GM) (TILL) - some silt and cobbles; very dense; brown.	2	G 1.5	
	4	G 3.0	
	6	G 4.5	
PIT BOTTOM	8		

TP81-135

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND AND GRAVEL (GW) (TILL) - some cobbles; trace silt and boulders; dense; rounded to subangular; moist.	2	G 1.5	
	4	G 3.0	
	6	G 4.5	
PIT BOTTOM	8		

TP81-136

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 68

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL SAND AND GRAVEL (GM) (TILL) - bouldery and cobbly; some silt; brown; some thin stratified deposits of sandy silt; moist, dense.	2	G 1.5	
	4	G 2.8	
PIT BOTTOM	6	G 4.5	
	8		

TP81-137

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL GRAVEL, SAND AND SILT (GM)(TILL) trace to some cobbles and boulders; increasing cobbles and boulders with depth; very dense.	2	G 1.5	
	4	G 2.6	
PIT BOTTOM	6		
	8		

TP81-138

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 69

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
BOULDERS - interlocking			
BEDROCK - fine grained; vesicular; basalt.		G 1.0	
PIT BOTTOM	2		
	4		
	6		
	8		

TP81 - 139

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
PIT BOTTOM		G 0.1	
BEDROCK - fine to medium grained; black to dark green colour; massive basalt.	2		
	4		
	6		
	8		

TP81 - 140

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 70

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
SAND AND GRAVEL (GM) (TILL) - some silt; dense.	2	G 1.0	
	4	G 3.0	
PIT BOTTOM	6		
	8		

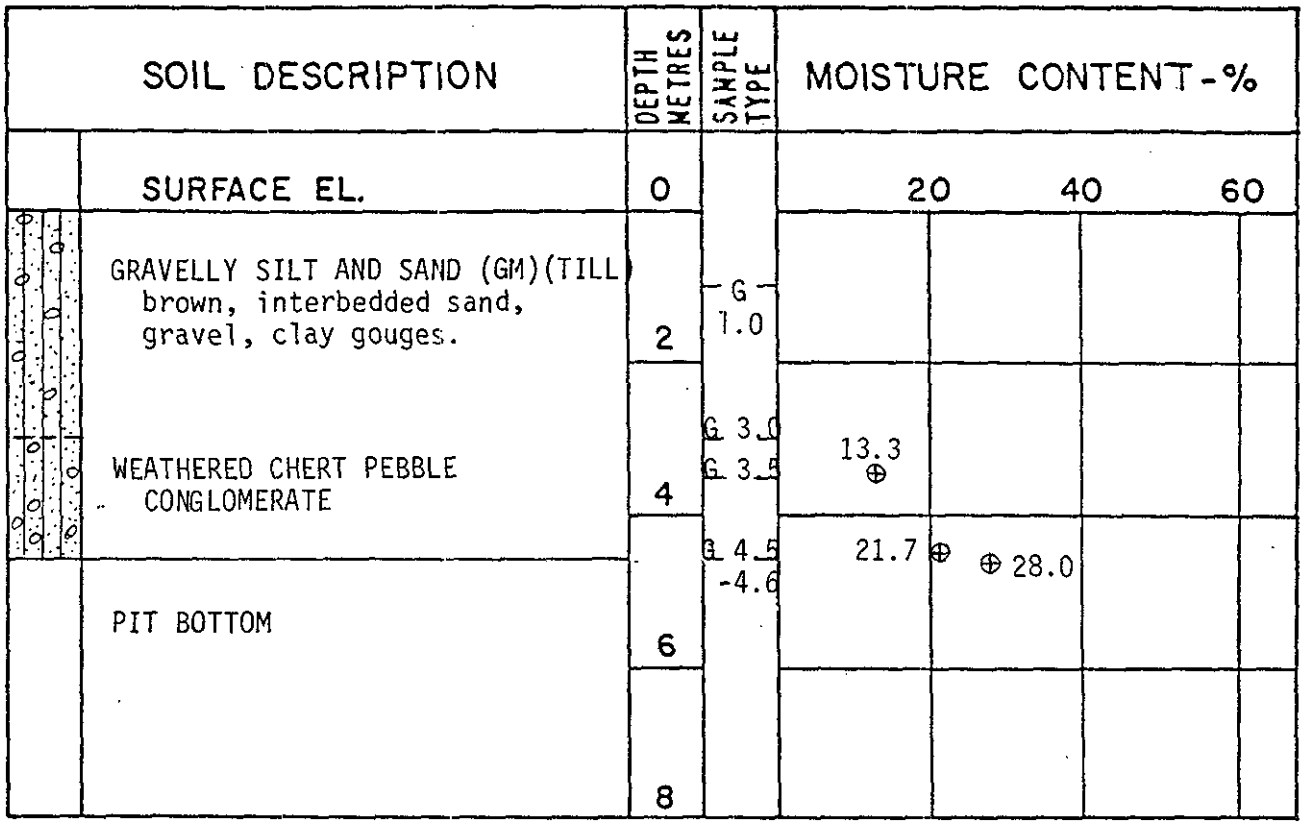
TP81-141

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
COBBLES AND SILT (GM) - loose; brown; rounded to subangular.	2	G 1.0	
SILT, SAND AND GRAVEL (GM)(TILL) grayish brown to gray colour; dense; moist; trace clay.	4	G 3.0	
	6	G 4.25	
PIT BOTTOM	8		

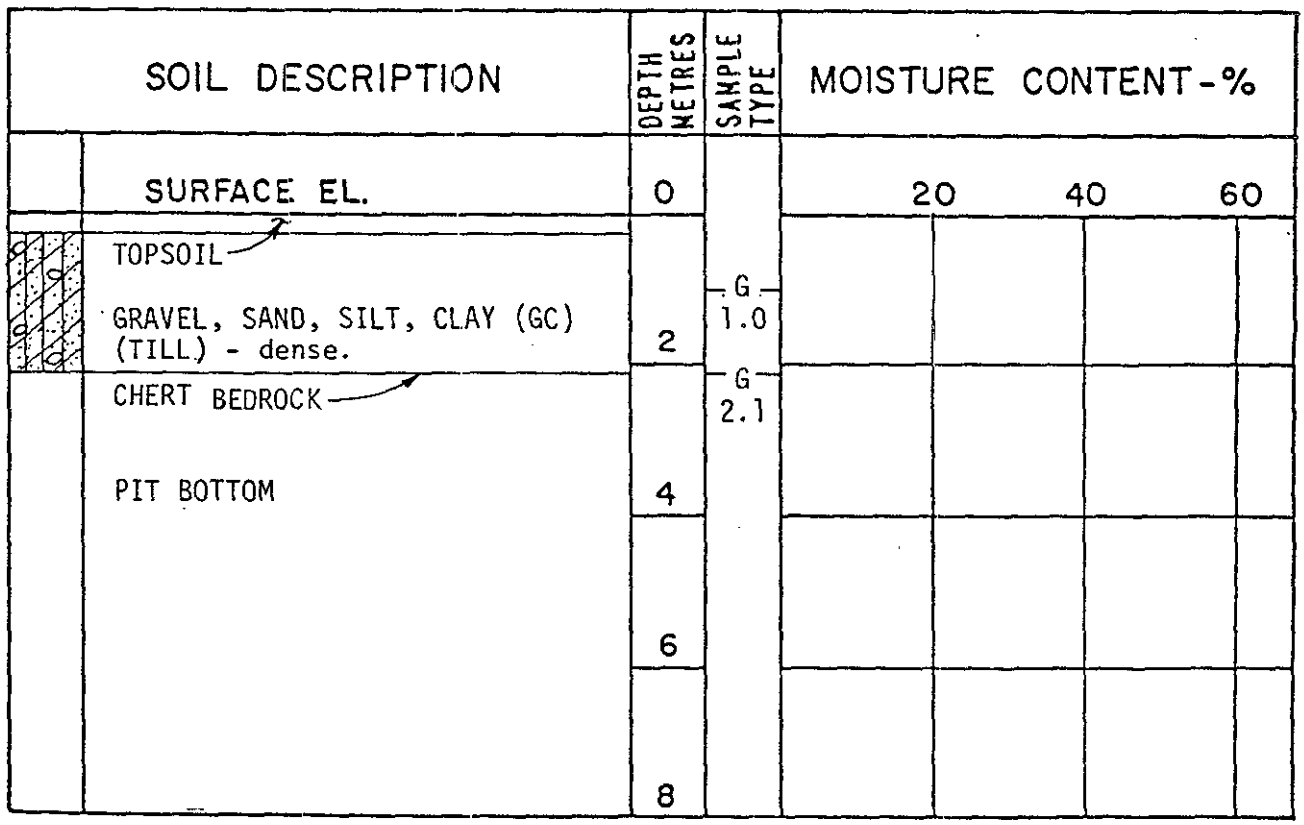
TP81-142

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 71



TP81-143



TP81-144

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 72

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
TOPSOIL CHERTY ARGILLITE BEDROCK - dark gray to black; Greenstone of the Cache Creek Group.	2	G 1.0	
PIT BOTTOM	4		
	6		
	8		

TP81 - 145

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
TOPSOIL CHERTY ARGILLITE BEDROCK - greenish grey to black; fine grained; some weathering and schistosity.	2	G 1.25	
PIT BOTTOM	4		
	6		
	8		

TP81 - 146

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 73

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
GRAVELLY SILT AND SAND (GM) (TILL) - dense; some cobbles; gray; subrounded to sub-angular.	2	G 1.0	
	4	G 3.0 G 3.1	
CHERTY ARGILLITE BEDROCK - graphitic coating; digs like dense till; wet.			
PIT BOTTOM	6		
	8		

TP81-147

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
CONTACT BETWEEN TWO ROCK TYPES			
PIT BOTTOM greenish gray black, fine grained; siliceous or phyllitic argillite; highly weathered and altered; some schistosity.	2	G 0.8	
	4		
	6		
	8		

TP81-148

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 74

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SILT, GRAVEL AND SAND(GM)(TILL) dense; some clay.	2	G 1.0 G 2.0	x---x x---x
PIT BOTTOM	4	G 3.2	x---x
	6		
	8		

TP81-149

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL GRAVEL,SAND,SILT,CLAY (GC)(TILL)			
ARGILLITE BEDROCK - highly to extremely weathered; orange brown; white and gray alteration.	2	G 1.5	
PIT BOTTOM	4	G 2.6	
	6		
	8		

TP81-150

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 75

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
ARGILLITE BEDROCK - gray; slightly weathered.		G 1.0	
PIT BOTTOM	2		
	4		
	6		
	8		

TP81 - 151

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
BEDDED CHERT BEDROCK - weathered white.		G 1.1	
PIT BOTTOM	2		
	4		
	6		
	8		

TP81 - 152

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 76

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
BEDDED CHERT BEDROCK		G 0.7	
highly weathered to gray; vertical bedding strikes NW.	2		
PIT BOTTOM	4		
	6		
	8		

TP81-153

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SILTY SAND AND GRAVEL (GM)(TILL) compact to dense; tan; subrounded; trace cobbles and boulders.	2	G 1.5	x——x
	4	G 3.0	x——x
PIT BOTTOM	6		
	8		

TP81-154

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 77

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - % (20 / 40 / 60)
SURFACE EL.	0		
TOPSOIL			
GRAVEL, SAND, SILT AND CLAY (GC) (TILL) - grayish brown to tan; white streaks; dense.	2	G 1.5	x - - - - x
PIT BOTTOM	4	G 2.0	x - - - - x
	6		
	8		

TP81 - 155

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - % (20 / 40 / 60)
SURFACE EL.	0		
TOPSOIL			
SAND AND GRAVEL (GW) (TILL) - trace silt; uniform medium to fine grained sand; tan; trace to some cobbles.	2	G 1.6	
	4	G 3.0	
PIT BOTTOM	6	G 4.5	
	8		

TP81 - 156

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 78

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL SILT, SAND AND GRAVEL (GM)(TILL) trace cobbles, boulders.	2	G 1.5	
	4	G 3.0	
PIT BOTTOM	6		
	8		

TP81-157

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SILTY SAND AND GRAVEL (GM)(TILL) trace cobbles; dense; brown.	2	G 1.5	
SILT (ML) - very stiff; mottled gray and reddish brown; some bedding; coal seam 5cm thick.	4	G 3.0	x---x
PIT BOTTOM	6	G 4.5	
	8		

TP81-158

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 79

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
SAND AND GRAVEL (GM) - some cobbles and silt; trace boulders; white or brown; dense.	2	G 1.5	
	4	G 3.0	
WEATHERED CHERT PEBBLE CONGLOMERATE	6	G 4.6	
PIT BOTTOM	8		

TP81 - 159

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
SILTY SAND AND GRAVEL (GM) (TILL) dense; light brown.	2	G 1.5	
	4	G 3.8	
PIT BOTTOM	6		
	8		

TP81 - 160

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 80

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
BROKEN RHYODACITE - sandy; some silt/clay; red; angular.	2	G 1.5	
	4	G 3.2	
	6	G 4.5	
PIT BOTTOM	8		

TP81 - 161

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND AND GRAVEL (GM) - some silt; compact; light tan colour.	2	G 1.5	
RHYODACITE BEDROCK	4	G 3.0 G 3.5	
PIT BOTTOM	6		
	8		

TP81 - 162

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 81

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL			
SANDY GRAVEL (GM) (TALUS) - some silt; trace cobbles.	2	G 1.5	
SAND AND GRAVEL (GW) - some cobbles; trace silt and boulders gap graded; light brown; compact; subangular particles.	4	G 3.0	
PIT BOTTOM	6	G 4.5	
	8		

TP81-163

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL - brown.			
SILTY, GRAVELLY SAND (GM) (TILL) trace cobbles; dense.	2	G 1.5	
	4	G 3.0	
PIT BOTTOM	6	G 4.5	
	8		

TP81-164

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 82

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
TOPSOIL			
SAND AND GRAVEL (GM) - some silt; compact; gray; bedded with gravelly sand; clean.	2	G 1.5	
	4	G 3.6	
	6	G 4.5	
PIT BOTTOM	8		

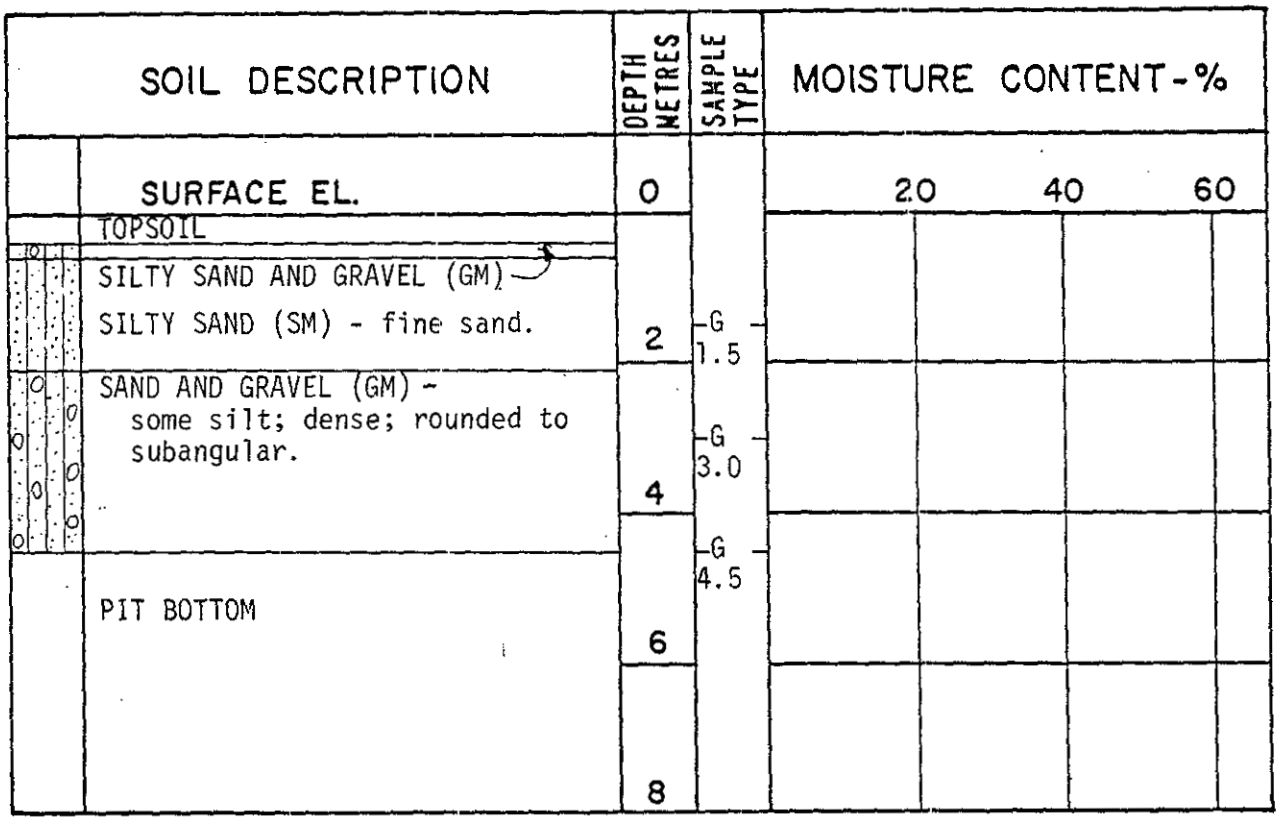
TP81-165

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
TOPSOIL			
SILT AND SAND (SM) - fine sand; uniform.	2	G 1.5	
GRAVELLY SILT AND SAND (GM) dense, brown; trace cobbles.	4	G 3.2	
	6	G 4.2	
PIT BOTTOM	8		

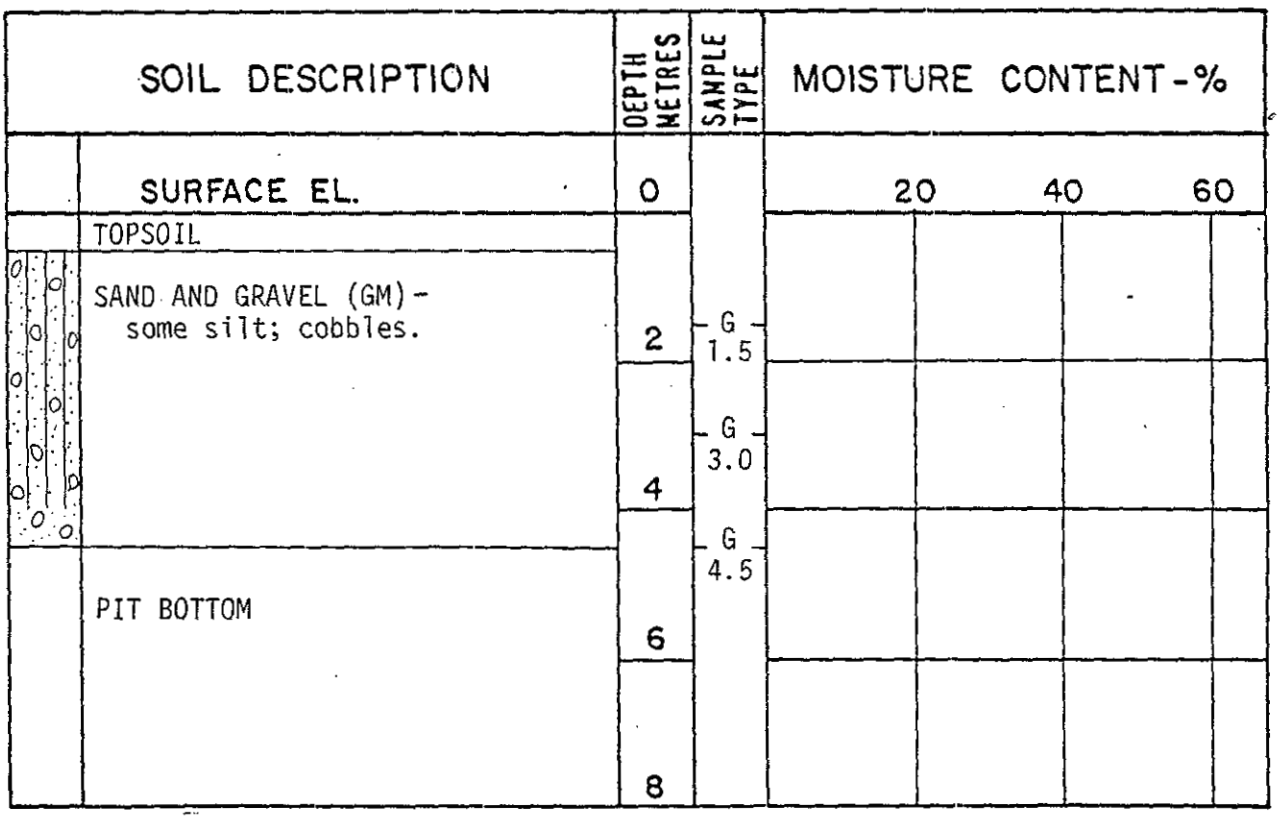
TP81-166

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 83



TP81 - 167



TP81 - 168

HAT CREEK PROJECT

1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 84

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
TOPSOIL SILT, SAND AND GRAVEL (GM)(TILL)	2	G 1.5	
	4	G 3.0 G 3.6	
PIT BOTTOM	6		
	8		

TP81 - 169

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT - %
SURFACE EL.	0		20 40 60
TOPSOIL SAND AND GRAVEL (GW) - clean; medium dense; rounded to subangular.	2	G 1.5	
	4	G 3.0	
PIT BOTTOM	6	G 4.5	
	8		

TP81 - 170

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 85

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL SANDY SILT (BM) - some gravel; brown; compact.	2	G 1.5	
	4	G 3.0	
SAND AND GRAVEL (GW) - some cobbles; trace to some silt; compact	6	G 4.5	
PIT BOTTOM	8		

TP81-171

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
TOPSOIL CLAYEY SILT (ML) - trace sand and gravel; brown.	2	G 1.5	
SAND (SW) - mottled grey and brown; fine grained.			
GRAVELLY SAND (GW) - clean; some cobbles, boulders; compact.	4	G 3.0	
	6		
PIT BOTTOM	8		

TP81-172

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 86

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
SILTY SAND AND GRAVEL (GM)(TILL) - subangular to rounded gravel - slightly clayey - trace of organics - brown	2	G 1.0	
CLAYEY SILT (ML) - brown - trace of sand & gravel - cemented	4	G 3.5	
PIT BOTTOM	6		
	8		

TP81-173

SOIL DESCRIPTION	DEPTH METRES	SAMPLE TYPE	MOISTURE CONTENT-%
SURFACE EL.	0		20 40 60
	2		
	4		
	6		
	8		

TP81-

HAT CREEK PROJECT
1981 SITE INVESTIGATIONS
TEST PIT LOGS

DWG No. 604H-C14-A156 SHEET 87

APPENDIX C

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

DIARY OF Y. Chow, W. Seyers and J. Rotzien **DATE** 23 July 1981

SUBJECT Potential Slide at East Bank of Headworks **PROJECT** Hat Creek Project

FILE NO. 2-2-19

On June 25 and 26, 1981, W. Seyers, J. Rotzien and Y. Chow visited Hat Creek Project to investigate the potential slide area at the right abutment area of the proposed Headworks Dam and the Hat Creek Diversion Canal from the Headworks Dam to Ambusten Creek. W. Seyers and J. Rotzien left the site on June 26 and Y. Chow left the site on June 27.

During the site visit the weather was sunny with cloudy periods and light showers.

Potential Slide Area

Most of the afternoon and evening of June 25 were spent inspecting the area of concern and reviewing the records of back-hoe test pits along the canal route. Road cuts along a recently improved tote road running parallel to and downhill from the canal were also inspected.

The most prominent overburden material in the area is till. Two types were seen:

i) Gravelly Till: This material is a well compacted, dense, poorly sorted, probably gap graded, sandy gravel. Few fines are present. It ravels easily and is probably relatively pervious (say 10^{-2} to 10^{-3} cm/sec).

ii) Silty Till: This material is somewhat finer than the gravelly till with some silt.

Both tills are very stoney containing a wide variety of non-local metamorphic and igneous rock types. The stones range from pebble to boulder size and can be moderately well rounded to subangular. A clayey till is apparently found below the other tills in the area of the dam but was not seen on this trip.

Pockets and lenses of well sorted, water deposited sand and gravel and silty sands were also seen in or overlying the till. As seen along the tote road these lenses were generally not continuous for more than a few metres.

Bedrock, which is exposed in a few places along the tote road, is a claystone of the Miocene Kamloops Group (Medicine Creek Formation). The rock appeared fractured and weathered in the outcrops. It is very light and is probably much weaker than the overlying till.

The topography of the lower valley is hummocky with most green vegetation and surface water being found in the low areas. The hills are generally sparsely vegetated and are often covered with cobble to boulder size erratics. This type of topography (associated with glacial till) is generally referred to as "knob and kettle" and is described in geological dictionaries as:

> "An undulating morainal landscape in which a disordered assemblage of knolls, mounds, or ridges of glacial drift is interspersed with irregular depressions, pits or kettles that are commonly undrained and may contain swamps or ponds."

Geologically it is referred to as a hummocky moraine which may have been formed either along a live-ice front or around masses of stagnant ice.

During the examination of the canal route, no obvious signs of surface sloughing or sliding were noted; also no ground cracks, leaning trees and winding fences were seen.

Since the diversion canals will be small and lined, it is not expected that the canal excavation will initiate any ground movement. The size of the canal, the overall perviousness of the subsoil and water tightness of the till is beneficial in not activating soil movement. Any leakage from the canal would be effectively drained downslope.

An old mud flow slide area located some 2000 m upstream from the dam site and approximately 1500 m uphill from Hat Creek was also investigated. A small mound with fresh, cold, carbonated water was seen in the middle of the mud flow bowl. The mound is approximately 60 cm wide and 90 cm high. The present water level is approximately 30 - 40 cm below the top of the mound. Bubbling water was also seen in parts of a muddy cattle trough located about 20 - 30 m from the marl mound. Marl type deposits are in evidence throughout the surface of the mud flow debris. A surface erosion gully about 3 m deep indicates that the surficial material is silty/clay with a trace of sand and gravel.

Finney Creek Canal Route

Y. Chow and J. Rotzien inspected the main irrigation ditch and the control gates along Finney Creek. However, at the time of inspection only a trickle of water was flowing in Finney Creek because the steel control gate valve at the outlet of Finney Lake was closed. Also, the wood gate control structure at the head of the irrigation ditch was rotted and out of order. The water level in Finney Lake was at least 3 m higher than the top of the steel control gate valve.

This small water flow downstream of the valve disappears underground in the pervious material in the creek bed. The creek bed was dry in the area of the intersection of Finney Creek and the proposed Finney Creek diversion canal.

Additional Notes from the Diary of J. Rotzien

During a subsequent examination of the Hat Creek Diversion Canal route between the Headworks Dam and Ambusten Creek by J. Rotzien several items were observed:

1) In a bank cut by Hat Creek, downhill from test pit 81-34, three seams of yellowish-green bentonite were exposed within the claystone sequence.

2) Small, discontinous "lenses" of bentonite were discovered within the claystone exposed along the tote road.

3) A more detailed examination of the test pit logs and samples revealed a bentonitic clay seam of 0.3 m in test pit 81-47, just upstream from the Headworks dam.

4) A layer of dark green bentonitic sandstone, found in test pits 81-66 and 67, can be traced from the bottom of Ambusten Creek up to a possible slump scar on the slopes above.

5) Active displacements, possibly rotational, were observed just downhill from test pits 81-34 and 35.

6) Further discussions with local, old-time residents of the valley indicated slope movement of up to two feet during one particularly wet spring approximately 7-8 years ago. Also, a

few springs were noted both above and below the proposed canal route.

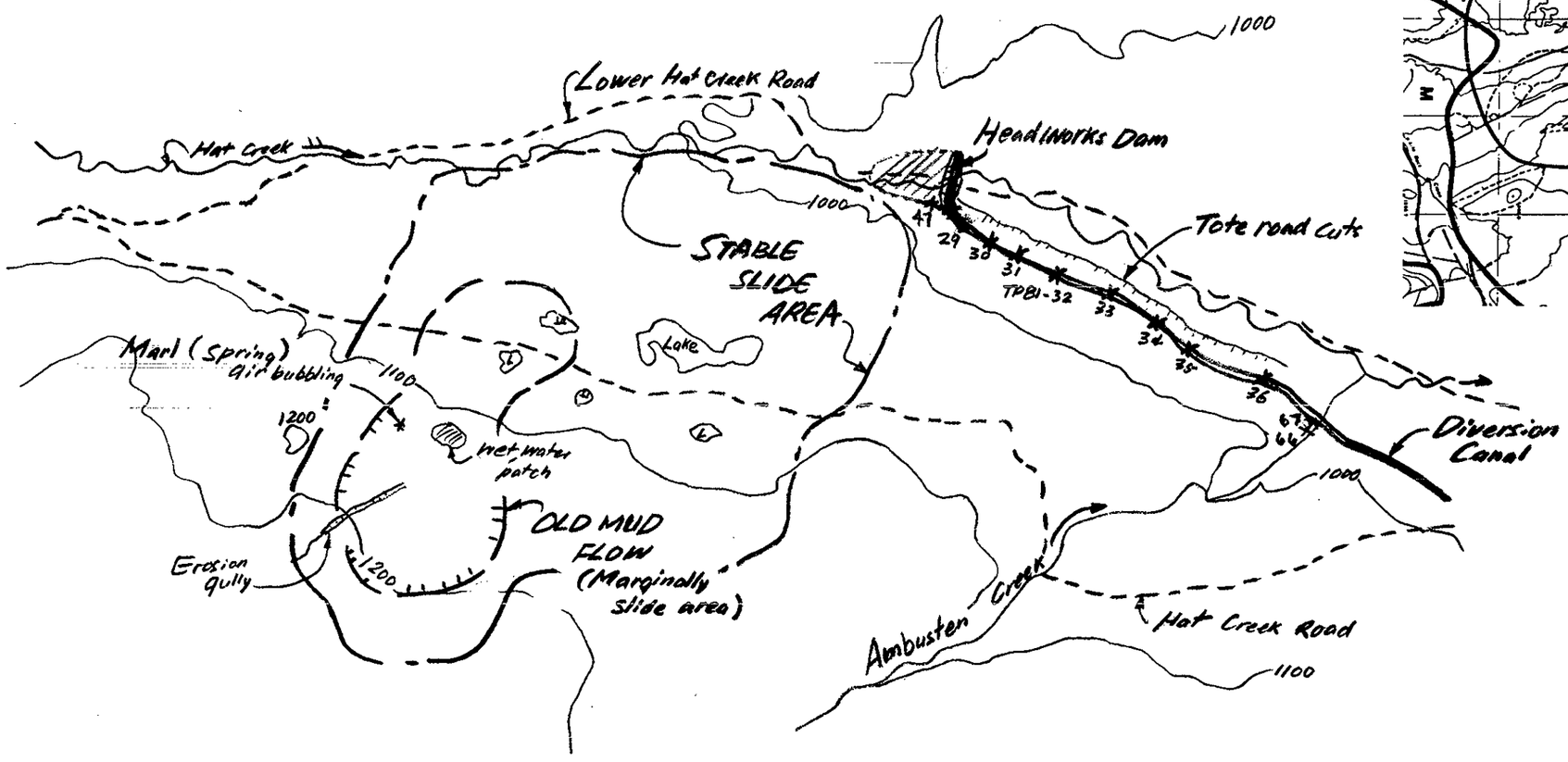
V. Chow

W. Seyers

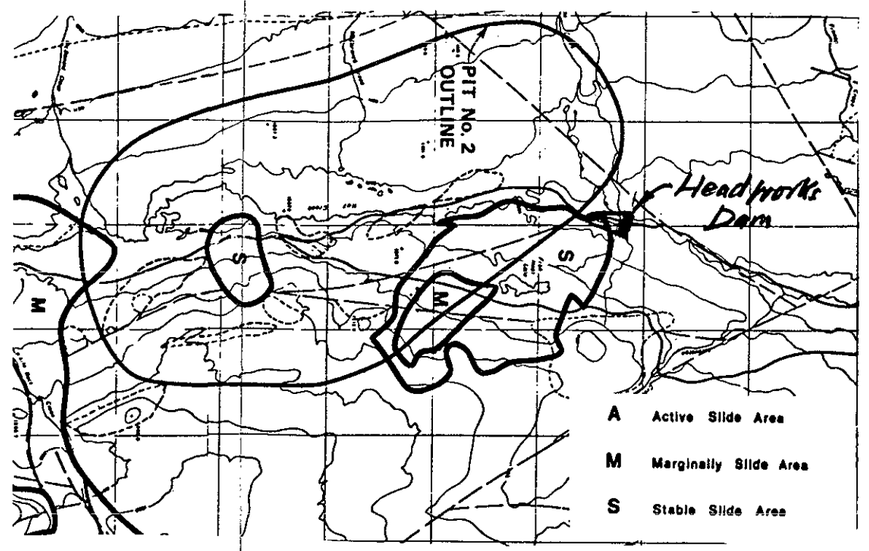
J. Rotzien

YC/mg

cc: H. Taylor
N. G. Stephenson



PLAN 1:20,000



KEY PLAN - Taken from:
Hat Creek - Coal Liquefaction Project
pre-feasibility study, TGPD Mar. 1981

Fig. 1

HAT CREEK PROJECT -
CREEK DIVERSION

Investigation - 1981
Potential Slide Area

VC July 2, 1981

B. C. HYDRO

STATION PROJECTS DIVISION

MINING DEPARTMENT

BOX 12121

555 WEST HASTINGS STREET

VANCOUVER, B.C. V6B 4T6

Assessment Report for the

HAT CREEK

COAL EXPLORATION PROJECT

1982

On Coal License Numbers

12, 144, 2753-2762, 2991-2999, 3000-3013,

3655, 7440-7457

KAMLOOPS M.D.

NTS AREA 92 I/12 and 13

Between

Latitude 50° 36'20" - 50° 48'55"

Longitude 121° 39'30" - 121° 28'25"

APRIL 1983

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FIGURES

TABLES

INTRODUCTION

This report summarizes the exploration and development work carried out by B. C. Hydro on coal licences in Upper Hat Creek Valley from May 1982 to April 1983. Golder associates were consultants for the two major studies, the Geotechnical and Hydrogeological Exploration Program, and the Hat Creek Diversion Program 1982.

Extensive trenching and sampling carried out by the Mining Department are not reported here because they were on Crown Grant Land, CG83912E.

The project has been administered by W. C. Fothergill, P. Eng., Site Manager, B. C. Hydro. W. E. Meeks, P. Eng., was responsible for the technical coordination and supervision.

Detailed exploration costs have been presented in the Application to Extend Terms of Licences. A summary is presented in Schedule B, as required under the Coal Act.

As the two programs comprise the work credit claimed for this Assessment Report, the results of the investigations, as presented by the consultants are submitted herewith.

As all the work including the geology are fully described in these reports it is not considered necessary to make an abstract of the findings in this report. However, a bedrock geology map (Figure 2) is included herein as required by the Coal Act.

The lab analyses of the overburden samples and other data have been presented and discussed in these reports as well and therefore not presented separately.

LOCATION

Upper Hat Creek Valley, in which the coal licences are situated, is located 192 km northeast of Vancouver, B. C. midway between the towns of Lillooet and Ashcroft (Figure 1). Railheads can be reached at Pavilion, on the B. C. Railroad, 24 km to the northeast, and at Ashcroft, on the C. P. and C. N. railroads, 48 km to the east. Easiest access to the property is from the Trans-Canada Highway at Cache Creek, 37 km to the east, via the secondary highway (No. 12) between Cache Creek and Pavilion. The closest regularly serviced airport is at Kamloops, 109 km to the east.

The coal licences are situated in the broad, north-trending, grassland valley, about 24 km in length, through which flows the upstream portion of Hat Creek. From the north end of this valley Hat Creek flows northeastward through a narrow valley into the Bonaparte River, which flows south to join the Thompson River at Ashcroft.

Upper Hat Creek Valley lies within the Interior Dry Belt of British Columbia at a mean elevation of about 1067 m. The valley is flanked by somewhat subdued mountains that rise to elevations of 1830-2130 m 6.5 km to the west of Hat Creek and to elevations 1525-1830 m 9.7 km to the east. The uplands are covered by thin forests and the valleys are sparsely-treed open ranges of grass and sage.

COAL LICENCES

The coal licences held by B. C. Hydro have been regrouped into four groups as shown in Figure 3.

Table 1 shows the licence numbers and areas in hectares and acres, and their locations.

Hat Creek Diversion Exploration Program

Studies by Monenco (1977) of the various alternative arrangements for diverting Hat Creek and Finney Creek around the proposed open pit during operation of the Hat Creek Mine considered the need for a tunnel as part of the scheme. Such a tunnel appeared likely to be routed through the escarpment east of the pit. It could be driven either prior to excavation of the pit, or at a later date when the pit had expanded to a point at which the stability of a canal located between the advancing pit edge and the escarpment could be endangered. The scheme recommended by Monenco consisted of a canal diversion around the rim of the east side of the pit up until Year 14, when a tunnel would be driven to provide a permanent diversion for the creeks.

In 1982 a study was conducted by Golder Associates (in association with Sigma Engineering Ltd.) to reconsider the various methods of diverting the creeks around the pit in light of revised pit plans and new geotechnical data, with particular emphasis on the extent to which a deep level tunnel could achieve drainage of the east pit slopes, and hence improve slope stability.

The results of the field work done in 1982 is reported in the "Report to B. C. Hydro on the Hat Creek Project Diversion Study" by Golder Associates which accompanies this report.

Geotechnical and Hydrogeological Exploration Program

In 1981 Golder Associates carried out groundwater exploration for potential aquifers and the design, construction and testing of water supply wells for construction purposes. A supply of water for the concrete batching plant and potable water for camp requirements up to a maximum of 1700 m3/d (19.7 L/s, 311 U.S. gpm) was specified.

Subsequent well drilling for the Construction Camp Water Supply identified a sandy gravel aquifer (Hat Creek Aquifer) to the north of the proposed pit. It was suggested that further investigations be carried out on the ground water regime in this area to ascertain whether there could be any adverse ground water impact on the open pit as a result of the presence of that aquifer.

The 1982 investigation program was thus designed to provide a more definitive understanding of hydrogeological conditions to the north and northeast of the proposed pit. The results of this field work is detailed in the "Report to B. C. Hydro on the Hat Creek Project Geotechnical and Hydrogeological Update, Fall 1982" by Golder Associates which accompanies this report.

GROUP 1 (GREEN)

SCHEDULE B

Category of Work	Dimensions (where applicable)	Unit Cost (where applicable)	Cost
Geological Mapping			
Reconnaissance			
Detail—			
Surface			
Underground			
Other (specify)*			
Geophysical/Geochemical Surveys			
Method	TRANSIENT E.M. GROUND SURVEY		2,406
Grid			
Topographic			
Other (specify)*			
Road Construction			
On licences Nos.			
Access to			
Surface Work			
Trenching			
Seam tracing			
Crosscutting			
Other (specify)*			
Underground Work			
Test adits			
Other workings*			
Drilling			
Core—			
Diamond			
Wireline			
Rotary—			
Conventional			
Reverse circulation			
Other (specify)*			
Contractor			
Where core stored			
Logging			
Sampling			
Testing			
Other work: (specify details)*	SITE MAINTENANCE & TRANSPORT		94,819
Reclamation work (Permit No.)	(103)		

ON-PROPERTY COSTS $ 97,225

OFF-PROPERTY COSTS $210,749

TOTAL EXPENDITURES $307,974

APRIL 19, 1983
(Date)

W.E. MEEKS, ACTING MINING DEPT. MANAGER.
(Signature and position)

*A full explanation of "Other" work is to be included.

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GROUP 2 (YELLOW)

SCHEDULE B

Category of Work	Dimensions (where applicable)	Unit Cost (where applicable)	Cost
Geological Mapping			
Reconnaissance			
Detail—			
Surface			
Underground			
Other (specify)*			
Geophysical/Geochemical Surveys			
Method	TRANSIENT E.M. GROUND SURVEY		16,358
Grid			
Topographic			
Other (specify)*			
Road Construction			
On licences Nos.			
Access to			
Surface Work			
Trenching			
Seam tracing			
Crosscutting			
Other (specify)*			
Underground Work			
Test adits			
Other workings*			
Drilling			
Core—			
Diamond	HQ 917.1m		143,258
Wireline			
Rotary—			
Conventional			
Reverse circulation			
Other (specify)*	SUPERVISION		70,000
Contractor D.W. COATES			
Where core stored HAT CREEK			
Logging	ROKE ENTERPRISES		3,369
Sampling			
Testing			
Other work: (specify details)*	SITE MAINTENANCE & TRANSPORT		94,819
Reclamation work (Permit No.) #103			

ON-PROPERTY COSTS . . . . . $ 327,804

OFF-PROPERTY COSTS . . . . . $ 210,749

TOTAL EXPENDITURES . . . $ 538,553

APRIL 19th, 1983 (Date)

W E MEEKS, P.ENG. ACTING MINING DEPT. MGR. (Signature and position)

*A full explanation of "Other" work is to be included.

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GROUP 3 (RED)

SCHEDULE B

Category of Work	Dimensions (where applicable)	Unit Cost (where applicable)	Cost
Geological Mapping			
Reconnaissance			
Detail—			
Surface			
Underground			
Other (specify)*			
Geophysical/Geochemical Surveys			
Method	TRANSIENT E.M. GROUND SURVEY		6,254
Grid			
Topographic			
Other (specify)*			
Road Construction			
On licences Nos.			
Access to			
Surface Work			
Trenching			
Seam tracing			
Crosscutting			
Other (specify)*			
Underground Work			
Test adits			
Other workings*			
Drilling			
Core—			
Diamond			
Wireline			
Rotary—			
Conventional			
Reverse circulation			
Other (specify)*			
Contractor			
Where core stored			
Logging			
Sampling			
Testing			
Other work: (specify details)*	SITE MAINTENANCE & TRANSPORT		94,819
Reclamation work (Permit No.)	(103)		

ON-PROPERTY COSTS $ 101,073

OFF-PROPERTY COSTS $ 210,749

TOTAL EXPENDITURES $ 311,822

APRIL 19, 1983
(Date)

W.E. MEEKS, P.ENG., ACTING MINING DEPT. MGR.
(Signature and position)

*A full explanation of "Other" work is to be included.

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GROUP 4 (ORANGE)

SCHEDULE B

Category of Work	Dimensions (where applicable)	Unit Cost (where applicable)	Cost
Geological Mapping			
Reconnaissance			
Detail—			
Surface			
Underground			
Other (specify)*			
Geophysical/Geochemical Surveys			
Method	TRANSIENT E.M. GROUND SURVEY		23,094
Grid			
Topographic			
Other (specify)*			
Road Construction			
On licences Nos.			
Access to			
Surface Work			
Trenching			
Seam tracing			
Crosscutting			
Other (specify)*			
Underground Work			
Test adits			
Other workings*			
Drilling			
Core—			
Diamond			
Wireline			
Rotary—			
Conventional	390.2m		61,282
Reverse circulation			
Other (specify)*	SUPERVISION		30,000
Contractor	DRILWELL LTD.		
Where core stored	HAT CREEK		
Logging			
Sampling			
Testing			
Other work: (specify details)*	)SITE MAINTENANCE		94,819
Reclamation work (Permit No.)	(103) & TRANSPORT		

ON-PROPERTY COSTS $ 209,195

OFF-PROPERTY COSTS $ 210,749

TOTAL EXPENDITURES $ 419,944

APRIL 19, 1983
(Date)

W.E. MEEKS P.ENG., ACTING MINING DEPT. MGR.
(Signature and position)

*A full explanation of "Other" work is to be included.

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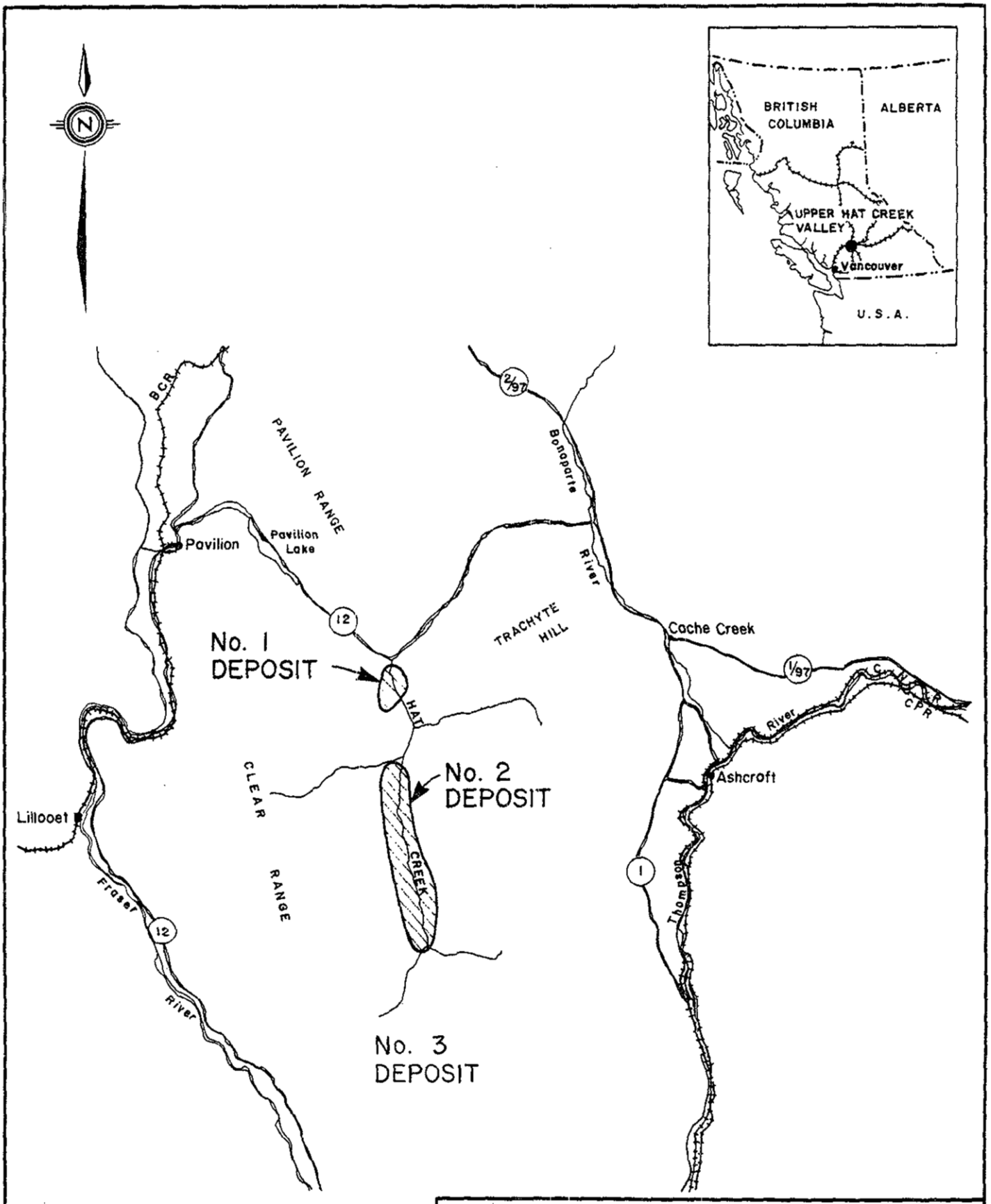
TABLE 1

	LICENCE No.	ACRES	HECTARES	LOCATION*
	12	640	259.0	E½ of E½ of W½ of 1/21/27 + W½ of W½ of 6/21/26
	144	320	129.5	E½ of W½ of 6/21/26 + E½ of W½ of 7/21/26
	2758	630	254.95	11/21/27
	2759	588	237.95	2/21/27
GREEN	2760	319	129.09	W½ of W½ of 12/21/27 + W½ of W½ of 1/21/27
GROUP				
NO. 1	2761	640	259.0	35/21/27
	3005	320	129.5	N½ of 25/19/27
	3006	640	259.0	36/19/27
	3007	640	259.0	1/20/27
	3008	640	259.0	12/20/27
	3009	640	259.0	13/20/27
	3010	320	129.5	E½ of 23/20/27
	3013	640	259.0	26/20/27
	13 Licences	6,977	2823.49	
	2992	316	127.88	N½ of 18/19/26
	2993	640	259.0	19/19/26
	2996	635	256.97	30/19/26
	2997	642	259.81	31/19/26
	3000	642	259.81	6/20/26
YELLOW	3001	642	259.81	7/20/26
	3002	640	259.0	18/20/26
GROUP	3011	640	259.0	24/20/27
NO. 2	3012	640	259.0	25/20/27
	2753	640	259.0	31/20/26
	2754	638	258.19	E½ of 6/21/26 + E½ of 7/21/26
	2762	640	259.0	36/20/27
	7445	637.50	258.0	8/21/26W6
	7446	640	259.0	9/21/26W6
	14 Licences	8,632.50	3493.47	

TABLE 1 (Cont'd)

	LICENCE No.	ACRES	HECTARES	LOCATION*
	2991	320	129.5	W½ of 17/19/26
	2994	321	129.9	W½ of 20/19/26
	2995	320	129.5	W½ of 29/19/26
	2998	320	129.5	W½ of 32/19/26
	2999	320	129.5	W½ of 5/20/26
RED	3003	640	259.0	19/20/26
	3004	640	259.0	30/20/26
GROUP	3655	641	259.4	W½ of 8 +17/20/26
NO. 3	7440	640	259.0	32/20/26 W6
	7441	640	259.0	33/20/26 W6
	7442	640	259.0	3/21/26 W6
	7443	640	259.0	4/21/26 W6
	7444	640	259.0	5/21/26 W6
	13 Licences	6,722	2720.3	
	2755	636	257.4	18/21/26
	2756	639	258.6	13/21/27
	2757	636	257.4	14/21/27
	7447	640	259.0	10/21/26 W6
ORANGE	7448	640	259.0	11/21/26 W6
	7449	644.94	261.0	12/21/26 W6
GROUP	7450	640	259.0	15/21/26 W6
	7451	640	259.0	16/21/26 W6
NO. 4	7452	640	259.0	17/21/26 W6
	7453	143	58.0	Fraction of S½ of 19/21/26 W6
	7454	548.57	222.0	20/21/26 W6
	7455	627.64	254.0	21/21/26 W6
	7456	640	259.0	22/21/26 W6
	7457	613	248.0	24/21/27 W6
	14 Licences	8,328.15	3370.4	
Totals	54 Licences	30,659.65	12,407.66	

* Section/Township/Range (West of the 6th Meridian, Kamloops Land District)

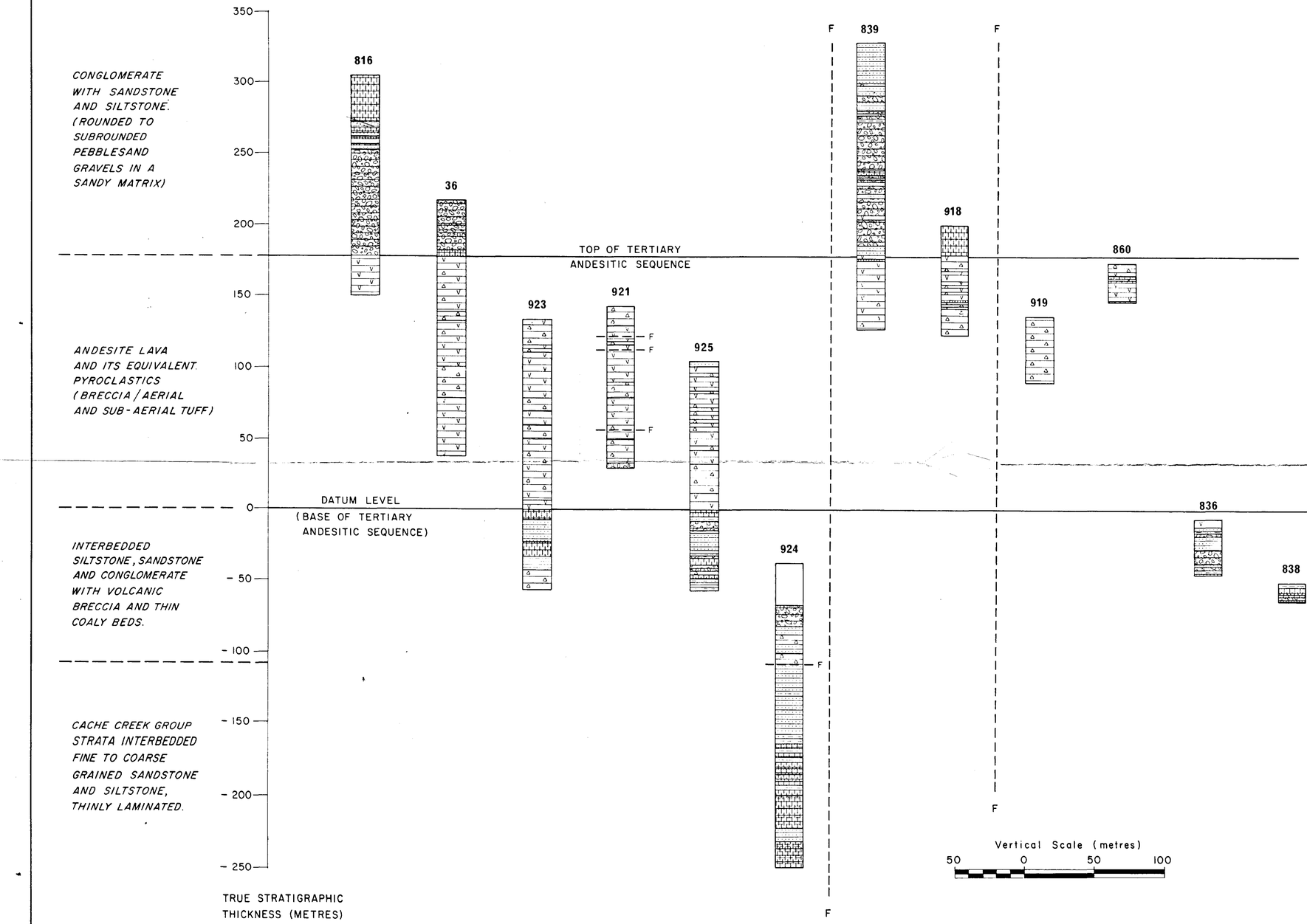


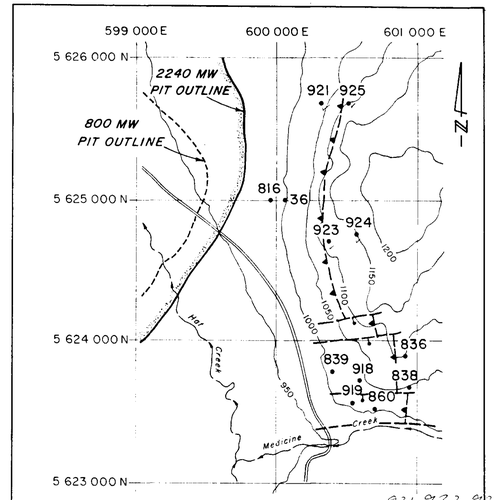
BRITISH COLUMBIA HYDRO & POWER AUTHORITY

THERMAL DIVISION · MINING DEPARTMENT
HAT CREEK PROJECT

LOCATION PLAN

SEPTEMBER 1979 | FIGURE 1





921, 922, 923, 924, 925
LIC 7445

LEGEND:

- Claystone
- Siltstone
- Sandstone
- Conglomerate
- Fragmentary Volcanics (mainly Andesite Flow Breccia)
- Vesicular and Amygdaloidal Andesite Lava including thinly laminated Andesite Tuff, Flowbanded Andesite and Basaltic Andesite.
- Coal
- F Fault

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Golder Associates/Sigma Engineering Ltd.

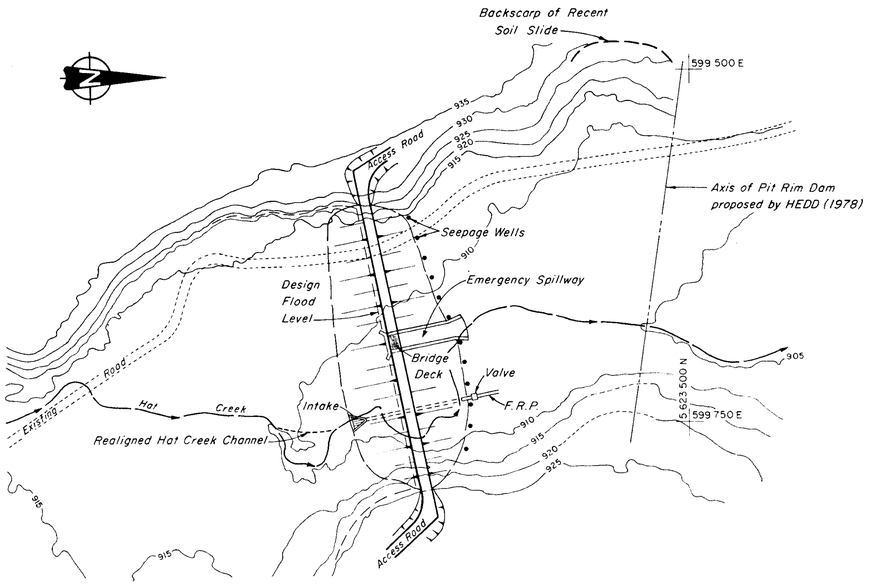
B.C. Hydro & Power Authority

HAT CREEK DIVERSION STUDY

COMPARATIVE STRATIGRAPHIC COLUMN TERTIARY VOLCANICS AND VOLCANICLASTICS.

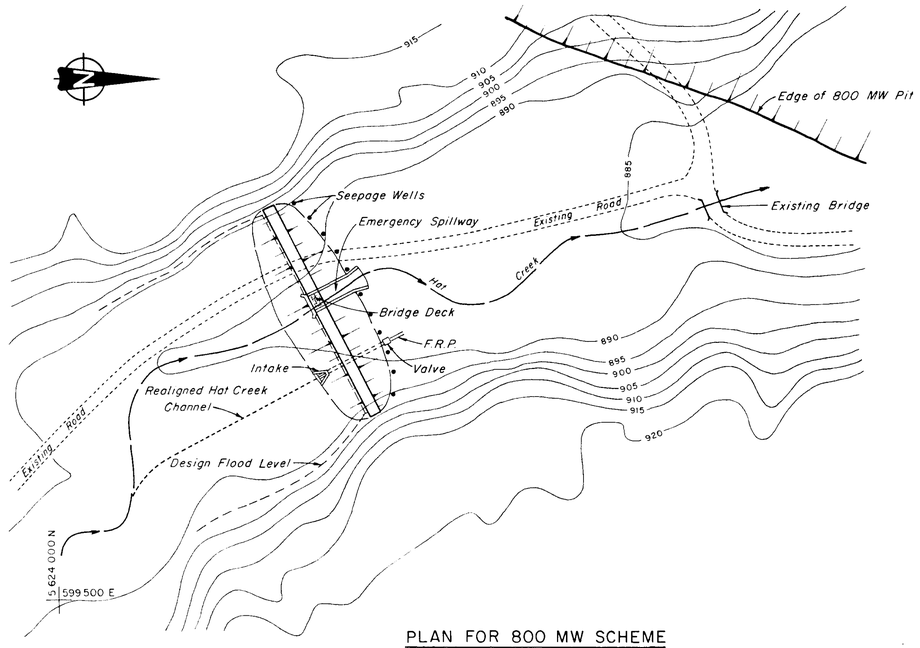
00145 7/7 (1)

Drawn	Checked	Reviewed
Date JAN. 1983	Scale AS SHOWN	Figure 5



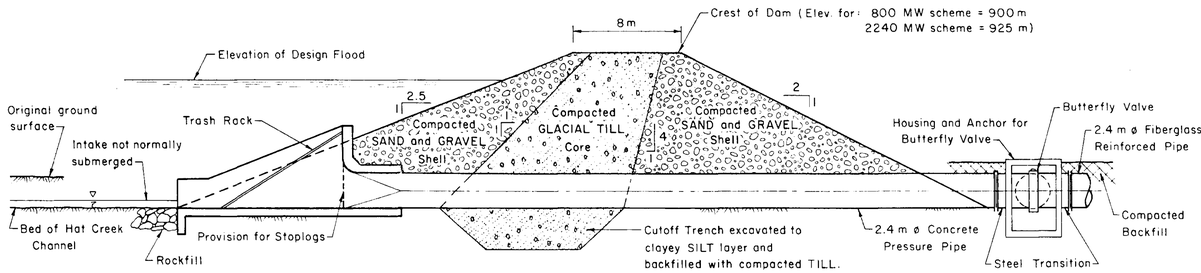
PLAN FOR 2240 MW SCHEME

20 0 20 40 60 80 m



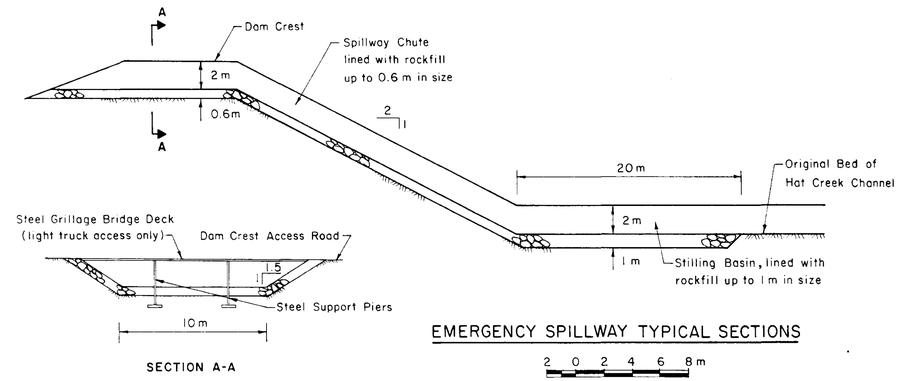
PLAN FOR 800 MW SCHEME

20 0 20 40 60 80 m



TYPICAL SECTION THROUGH DIVERSION DAM AND INTAKE (similar for both schemes)

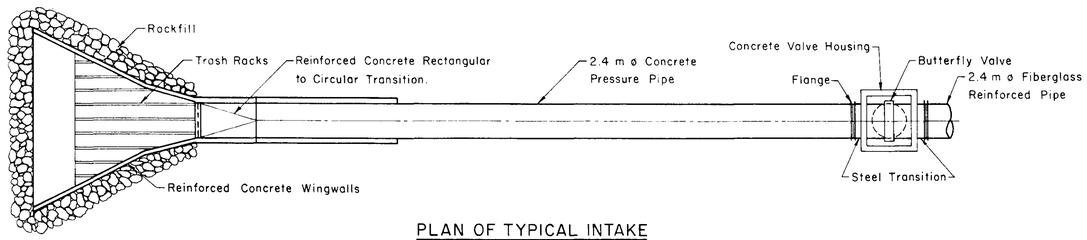
2 0 2 4 6 8 m



SECTION A-A

EMERGENCY SPILLWAY TYPICAL SECTIONS

2 0 2 4 6 8 m



PLAN OF TYPICAL INTAKE

2 0 2 4 6 8 m

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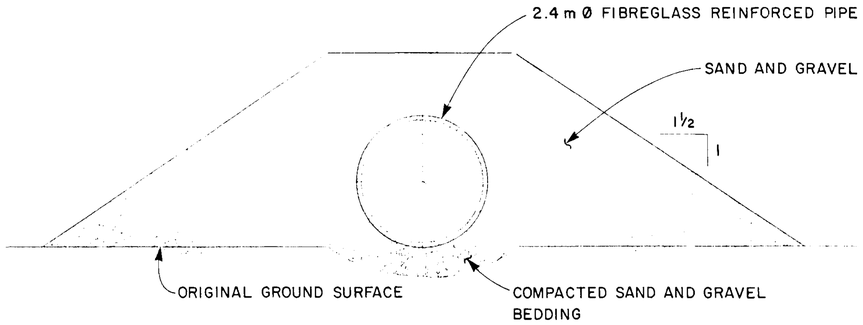
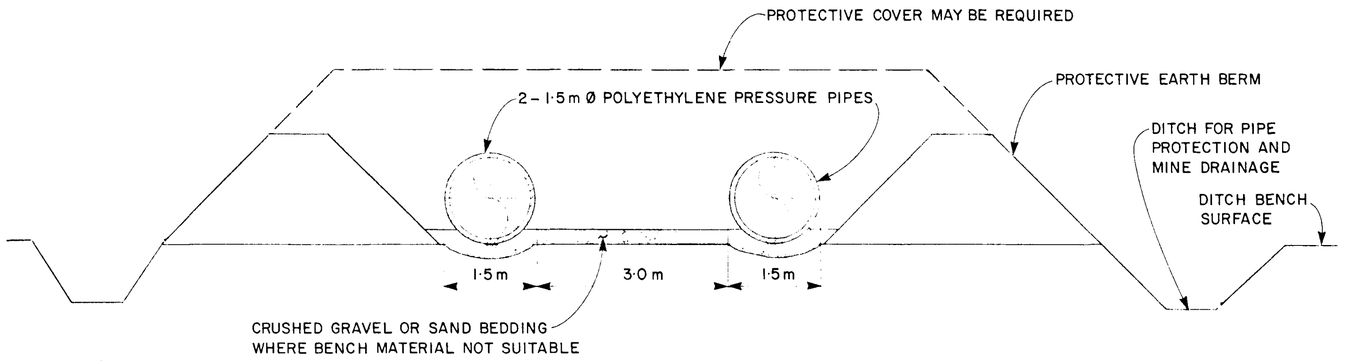
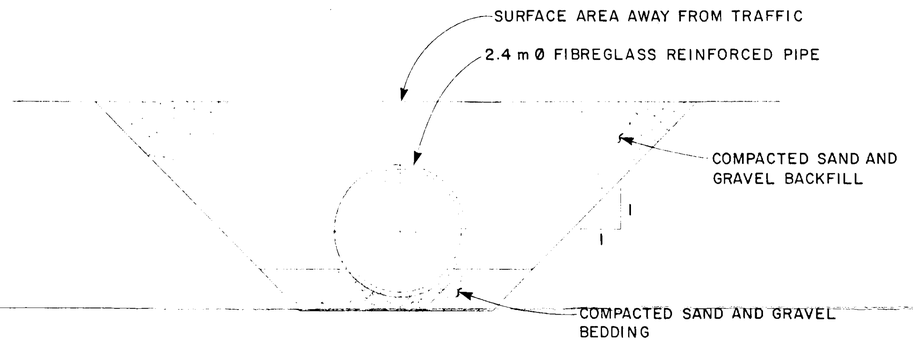
Golder Associates/Sigma Engineering Ltd.	
B.C. Hydro & Power Authority	
HAT CREEK DIVERSION STUDY	
00145 7/7 (2)	
800 MW AND 2240 MW SCHEME PIPELINE ARRANGEMENT FOR DIVERSION DAM AND INTAKE STRUCTURE	
Drawn	Checked GK / Reviewed GP
Date JAN. 1983	Scale AS SHOWN / Drawing 13



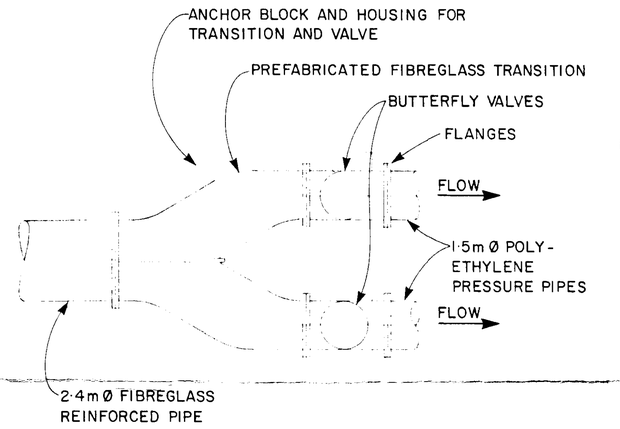
TYPICAL ABOVE GROUND INSTALLATION FOR FIBREGLASS REINFORCED PIPE BETWEEN DIVERSION DAM AND PIT, OR BETWEEN PIT EXIT REGION AND LEACHATE LAGOON.



DETAIL OF POLYETHYLENE PIPE PLACEMENT ON PIT BENCH

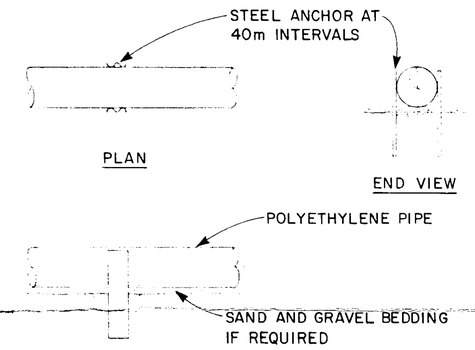


TYPICAL SHALLOW BURIAL INSTALLATION FOR FIBREGLASS REINFORCED PIPE BETWEEN DIVERSION DAM AND PIT, OR BETWEEN PIT EXIT REGION AND LEACHATE LAGOON.

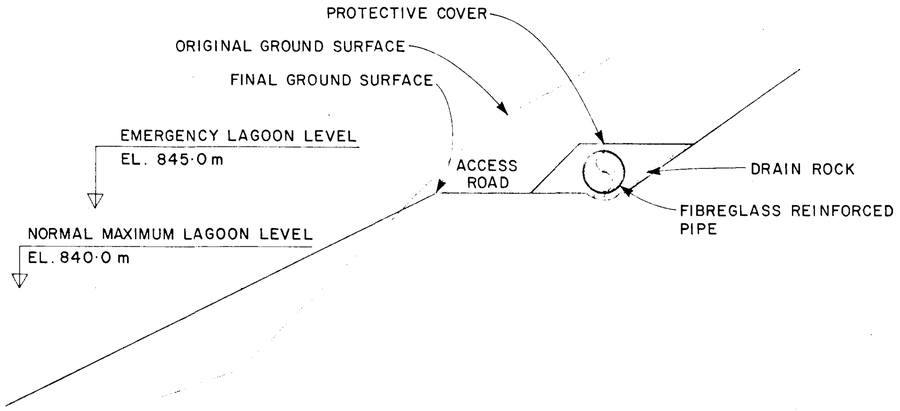


TRANSITION STRUCTURE AND VALVES

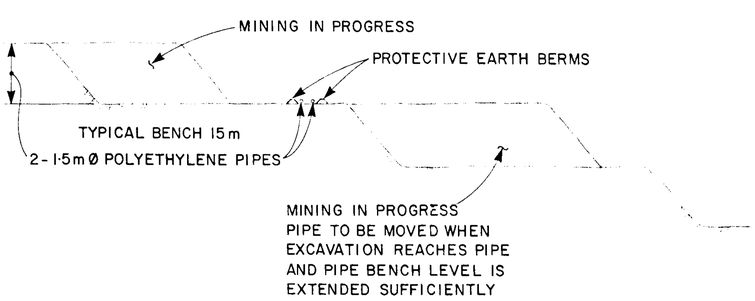
FIBREGLASS REINFORCED PIPE TO POLYETHYLENE PRESSURE PIPES.



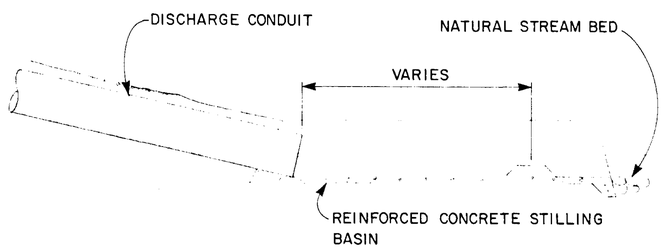
RESTRAINT SYSTEM FOR UNCOVERED POLYETHYLENE PIPE



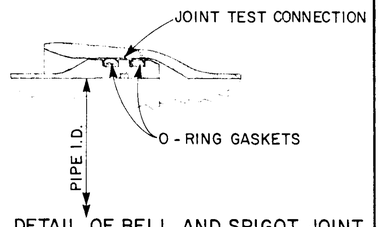
SECTION THROUGH DIVERSION PIPE AT LEACHATE LAGOON



PIT EXCAVATION IN RELATION TO PIPE MOVES



ENERGY DISSIPATOR STRUCTURE (TYPICAL)



DETAIL OF BELL AND SPIGOT JOINT FOR FIBREGLASS REINFORCED PIPE

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Golder Associates/Sigma Engineering Ltd

B.C.Hydro & Power Authority

HAT CREEK DIVERSION STUDY

800 MW AND 2240 MW SCHEMES
PIPELINE ARRANGEMENT

PIPE DETAILS

00145 7/7 (3)

Drawn	J.NG	Checked		Reviewed	
Date	SEP 1982	Scale	N.T.S.	Drawing	14