

PWGSC

Quality in Environmental Services VENUS MINE TAILINGS

SITE REHABILITATION

CONSTRUCTION MANAGEMENT REPORT



December 1995

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VENUS MINE TAILINGS: SITE REHABILITATION

CONSTRUCTION MANAGEMENT REPORT

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EXECUTIVE SUMMARY

The work under this contract is the Site Rehabilitation of the Venus Mine Tailings located 22 km south of Carcross, Yukon. All work was completed as per the PWGSC specifications and drawings. The main components of the design includes the installation of a Waterloo Barrier sheet pile wall system, a cap over the tailings consisting of a geotextile, clay layer and a capillary break, the construction of a plug at the outlet of the asbestos decant pipe and a drainage discharge system.

Public Works and Government Services Canada (PWGSC) was retained by the Department of Indian Affairs (DIAND) to provide construction management and on-site supervision during the execution of the work. The prime contractor was the Carcross/Tagish Development Corporation (CTDC). The subcontractor for the installation of the Waterloo Barrier was C3 Environmental.

The work began on August 11, 1995 and was completed on October 20, 1995. Overall, the project proceeded as planned.

This report should be read in conjunction with the C3 Environmental report entitled "Waterloo Barrier System - Sheet Pile & Sealant Installation Report, October 16th, 1995." The geotechnical information was not included in this report, however, should this information be required, a copy of the report can be obtained from Public Works and Government Services Canada.

The actual total cost of the project is \$1,198,880 excluding the engineering costs. The budget was \$1.2 million including \$100,000 for contingency. The project objectives were met, the total cost was under the allowed budget, and the work was completed on schedule.

TABLE OF CONTENTS

	PAGE
INTRODUCTION	1
<u>PART A</u>	
1.0 WATERLOO BARRIER INSTALLATION	3
2.0 SILTY CLAY CAP	6
3.0 COLLECT AND BURNING OF DEBRIS	7
4.0 EXCAVATING AND LEVELLING TAILING	9
4.1 Excavate and relocated wind blown tailings located outside the Waterloo Barrier	9
4.2 Excavate and Relocate Tailings	11
4.3 Final Shaping and Grading of Tailing Pond	12
5.0 SUPPLY AND INSTALL GEOTEXTILE	12
6.0 CONSTRUCTING DRAINAGE DISCHARGE SYSTEM	12
7.0 CAPILLARY BREAK MATERIAL	13
8.0 SUPPLY AND PLACE PITRUN AGGREGATE AT OUTFALL AREA	14
9.0 COST TO COMPLETE	15
<u>PART B</u>	
1.0 PROJECT COST REVIEW	16
1.1 Additional Cost to the Contract	16
1.2 Overall Summary of Project Costs	19
2.0 POTENTIAL ADDITIONAL WORK	
2.1 Highway Culvert Upgrade	20
2.2 Drainage Discharge System Upgrade	22
2.3 Regrading of Capillary Break Material	22
2.4 Settlement Issue near Waterloo Barrier	22
CONCLUDING REMARKS	24
FOLLOWUP CONTRACTS	25

ANNEXES

Annex A:	Contribution Agreement
Annex B:	PWGSC Specification Document, Drawing and Cost Estimates
Annex C:	Financial Status: Progress Claims and Summary
Annex D:	Carcross/Tagish Development Corporation Report and C3 Environmental Warranty Letter for Waterloo Barrier Installation
Annex E:	Construction Management Report: Initial Phase
Annex F:	Project Schedule: Expected and Actual
Annex G:	Photographs

LIST OF DIAGRAMS

Diagram 1:	Site Drawing
Diagram 2:	Details of Decant Plug at Inlet
Diagram 3:	Details of Decant Plug at Outlet
Diagram 4:	Highway Culvert/Waterloo Barrier Intersection

LIST OF TABLES

Table 1:	Project Cost Summary
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INTRODUCTION

The rehabilitation of the Old Venus Mine tailings pond was initiated by Indian Affairs and Northern Development(DIAND), Action on Waste, in collaboration with the Carcross/Tagish Development Corporation(CTDC) and Public Works and Government Services Canada (PWGSC). The project is funded by DIAND as part of their Action-on-Waste program and the contract is a contribution agreement between DIAND and the CTDC, the prime contractor for this project.

Two drilling programs were undertaken during the summer of 1995 by J.R.Paine and Associates. The first program took place between June 15th and 21st. The drilling program was design to confirm the tailings' volume quantity. Originally, the scope of work included the relocation of the tailings pond to a receiving gravel pit at km 97.5 along the Klondike highway. However, a reevaluation of the options was necessary due to public opposition. The containment of the tailings in-place became the reasonable option. At this point, a second drilling program was undertaken by J.R.Paine on July 19th and 20th. With this information, Public Work and Government Services Canada provided drawings and specifications.

The CTDC reviewed the PWGSC specs and provided an estimated cost of \$1,064,464.00. The cost estimate was approved and the work commenced on August 11th. The Contribution Agreement was signed on August 25, 1995 (see Annex A for details).

There are several components to the design which will reduce the release of contaminants into the environment and are as follows:

1. The Waterloo Barrier Sheet Pile Wall which minimizes the lateral migration of leachate from the tailings pond;
2. The Capping Material which ultimately serves multiple purposes. The cap consists of the following:
 - a Nilex nonwoven geotextile C24 immediately overlying the tailings;
 - 200 mm layer of silty clay cap; and
 - 300 mm layer of capillary break material.

The capping material eliminates the potential for erosion of the tailings surface, maintains the tailings in a saturated state and minimizes upward migration of contaminated water and tailing fines. The saturated state design is to minimize Acid Rock Drainage(ARD) which is a natural, chemical and biological oxidation of reactive sulphide mineral when exposed to air and water. The leaching and "flushing" of these chemical products is the cause of adverse effects to the environment.

3. The Asbestos Cement Decant pipe has been sealed at its upstream and downstream ends to prevent water and sediments from flowing into the lake environment. Originally, surface runoff ran across the tailings pond picking up fine tailing particles. The runoff would flow into the inlet of the decant pipe, discharging into Tagish Lake and depositing the suspended fines. The cap at the outlet prevents further discharge of tailings fines into the lake environment.

4. Drainage Discharge System controls the surface runoff level above the capping material.
5. Underlying dense stiff clay, although it is not man made, provides an excellent barrier below the tailing and minimizes any vertical migration of contaminated water.

J.R.Paine and Associated Ltd. and Underhill Professional Land Surveyors and Engineers provided the necessary engineering services. J.R.Paine provided construction management services during the initial phase of the work and conducted drilling and material testing programs. Underhill provided land surveying services including the layout of the Waterloo Barrier system and in-place volume quantities.

Pathway analysis was performed by Michael Goldstein of Soilcon Laboratories LTD. in Richmond, B.C. The report is entitled "Pathway Analysis and Reclamation Plan at the Old Venus Mine Tailings."

Some issues emerged during the execution of the work: highway culvert repair and settlement near the Waterloo Barrier. The highway culvert was damaged during the installation of the Waterloo Barrier. Additional costs were incurred by the contractor to performed the repairs. Additional concerns arose due to the sealing capabilities of the culvert. Several remedial options have been presented in this report. The settlement of the tailings near the Waterloo Barrier occurred at the completion of the work. Additional capillary break material was hauled to fill the settled area. An evaluation of the site will be required during the summer of 1996 to confirm the cause and effect of the settling tailings.

The work was completed on October 20, 1995.

PART A

1.0 WATERLOO BARRIER INSTALLATION

The Waterloo Barrier System is an low permeability interlocked steel sheet pile wall system. The wall is designed to provide containment of the tailings pond. From a plan view, the wall ties into the bedrock outcropping at the south west corner of the tailings pond, borders the south and east edges of the pond and ties into the bedrock outcrop at the north east corner of the site (see Diagram no.1 for details).

The contract for the installation of the Waterloo Barrier System was awarded to C3 Environmental, a division of Canadian Construction Controls Limited. Pile driving was sub-contracted to a local company: R.C.Crane and Construction Ltd. of Whitehorse, Yukon. Quality control was performed by C3 Environmental engineers during the installation of the system.

The sheet pile joints are sealed with silica fume modified, thiotropic cementitious based grout WBS Type 301. The process of grouting begins by a "flushing stage". Flushing involves lowering a high water pressure hose into the wall joints and flushing accumulated soil. At the same time, the joint is checked for depth which indicates the condition of the sheet pile wall. Quality control of the cementitious grout was also ongoing.

The installation of the Waterloo Barrier System commenced at the south section of the site on September 2nd. According to the geotechnical logs, a boulder stratum exists from 2.5 m to 3.5 m depth underlaid by stiff native clay. An attempt was made by the installation crew to drive the pile into the boulder stratum but was unsuccessful because the sheet pile could not penetrate passed the boulder stratum without damaging the top of the pile. This method was attempted from pile No. 19 to No. 56. From pile No. 57, a trench was excavated to remove the difficult boulder stratum. The sheet piles were placed into the trench, driven into the underlying clay and backfilled. This created an adequate seal between the bottom of the wall and the native clay.

From pile no. 200 to 341, the geotechnical logs from J.R.Paine and Associates Ltd indicated shallower bedrock. The pile were custom cut to follow the bedrock profile. Since trenching, rather that driving, had become the standard procedure, a trench was excavated. This enabled the inspection of the exposed bedrock for fissures and other characteristic hindering the proper seal of the wall/bedrock joint. The bedrock was inspected and appeared acceptable for our purposes. The piles were placed above the exposed bedrock and backfilled on both sides.

The PWGSC drawings indicate the design location of the Waterloo Barrier wall. However, circumstances dictated a slight offsetting from its intended location. The wall varied from the design for two reasons: lack of staging area for the installation equipment and shallow bedrock profile. The first reason for modifying the wall location was that the installation crew required a 5 m wide working area on both side of the wall for their heavy equipment.

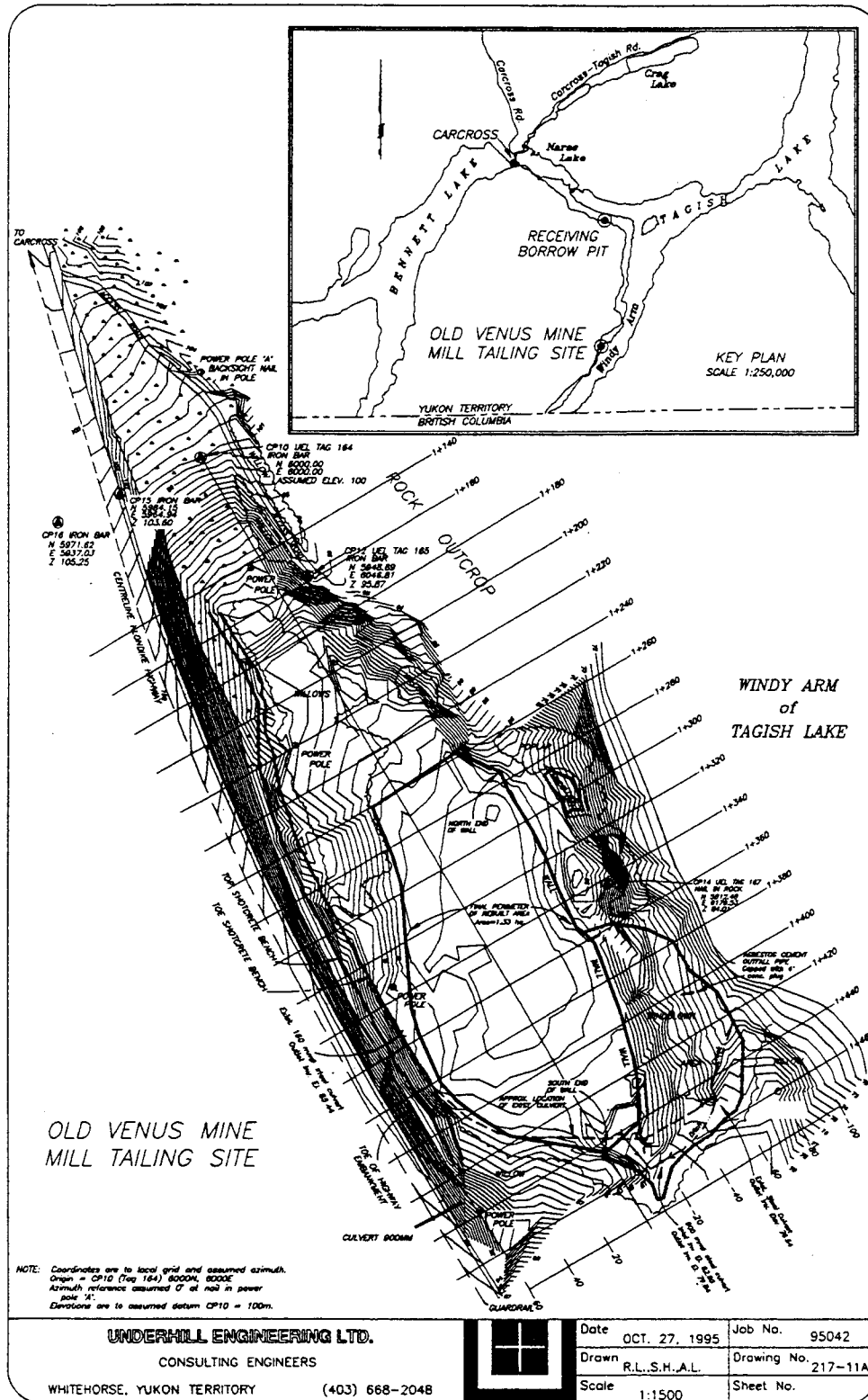


Diagram 1: Site Drawing

The design drawing show the Waterloo Barrier at the edge of the existing berm, leaving no work space on the east side of the wall. The wall location was therefore amended and offset inward by 5 m toward the tailings (see as-built drawings in Annex D). The second reason for altering the wall location was the shallow bedrock encountered near the outcrop at survey benchmark no. 166. Overburden was excavated at the west side of the outcrop during the levelling of the tailings. The ground elevation was lowered by approximately 2 m. A trench was dug at the intended location of the wall. The bedrock was found at a depth of 0.1 m to 0.5 m. Therefore, the wall was relocated farther around the outcrop to enable a deeper section of the wall to be installed, making it more stable (see annex D for details).

Various types of equipment were required during the installation of the Waterloo Barrier system. The heavy equipment was obtained through R.C.Crane and Construction Ltd. The following equipment was used by this contractor:

- Lewis 2500 lb Drop Hammer;
- Grove 20 Ton Telescopic Boom Crane;
- P&H 20 ton Lattice Boom Crawler Crane;
- P&H Track Backhoe; and
- Cat 950 Front End Loader.

C3 Environmental were responsible for grouting and sealing the joints. The following equipment was used:

- Colloidal Mixer;
- Grout Holding/Agitator Tanks;
- Water Measuring Equipment;
- Viscosity Measuring Equipment;
- Portable Air Compressor;
- Moyno 3L4 Progressive Cavity Pump;
- Grout Volume Measuring Equipment; and
- Grout Lines and Pressure Control Valves.

Like the heavy equipment, the man power was divided into two crews: the sheet pile installation and grouting crew. The sheet pile installation crew consisted of 2 heavy equipment operators and one labourer from R.C.Crane. The cutting and welding of the wall's top sections was also performed by this contractor as required. The C3 Environmental crew consisted of a sheet pile installation quality control engineer and a labourer. The grouting crew consisted of a grouting quality control engineer and three labourers: two labourers were hired locally and the other was a C3 Environmental employee.

The construction of the Waterloo Barrier System began on September 2nd and was completed on September 21st. The pile driving took 16 days to complete and was completed on September 17th. The grouting of the joints commenced on September 13. The scheduled timeframe for this work had been 6 weeks commencing on August 28th. The work commenced slightly behind schedule, however, the installation crew worked 14-hour days and

7-day weeks to completed the work two weeks ahead of schedule.

C3 Environmental supplied a Quality Control Documentation entitled Waterloo Barrier System: Sheet Pile & Sealant Installation Report which includes the following information:

1. Pile identification number;
2. Date and time of driving;
3. Model of hammer and energy rating;
4. Elevation of top of pile;
5. Length of sheet pile in the ground when driving is complete;
6. Rate of penetration in feet per minutes;
7. Detailed remarks concerning alignment, obstruction, etc...;
8. Plumbness records of each joint installed; and
9. Joint flushing records for each joint.

The Waterloo Barrier System Quality Control document is not included in this report. However, should it be required, it may be obtained by contacting Public Works and Government Services Canada.

The total labour, equipment and material cost of this item was \$548,000. No cost overruns were incurred for this item of the contract.

2.0 SILTY CLAY CAP

This item of the contract includes supplying, loading, hauling, placing, grading and compacting a clay capping material. It consists of a 200 mm layer of silty clay material placed over the geotextile. The material was hauled from the old residential school site 2 km north of Carcross off highway 37 to Tagish. The purpose of the clay cap is to isolate the tailings pond and reduce potential contamination of surface runoff. An Atterberg Limit was performed and the results are as followed:

Liquid limit	23.1 %
Plastic Limit	19.0%
Plastic Index	4.1%
Unified Soil Classification	CL
Permeability Range using Standard Proctor Compaction	0.0004 to 0.00005 cm/hr

The hauling and placing of the clay material took approximately 11.5 days. A total of 880 loads were hauled with an average of 13 to 14 loads per truck per day. The hauling was performed during two periods: the first 480 loads were hauled and placed on the north third of the tailings and the remaining 400 were later hauled and placed at the south end.

During the construction, the tailing's pond final grade elevation was lowered from 82.5 m to 82.35 m. A mass balance calculation was performed to determine the final grade utilizing

the materials available on the tailings. Since the thickness of the silty clay is 200 mm, the final elevation of the clay was set at 82.55 m. Once the levelling of tailings at the north half was completed, the initial 480 loads of silty clay were hauled and placed. This work took place between September 18 and September 23, inclusively. Six trucks were used to haul the first 480 cu.m. of material.

At the west side of the north half, difficult conditions were encountered. The placement of clay was near impossible due to the tailings' extremely saturated condition. At this point, it was determined that a solid subbase was absolutely required to properly place the clay layer. To construct a solid subbase at the south half, additional dry material was relocated from the wind blown area. This raised the south tailings' final elevation to the original design elevation of 82.5 m. Consequently, the final elevation of the clay returned to 82.7 m across the entire site, hence requiring additional clay material at the north half of the tailings pond. The final clay thickness at the north half was therefore increased to 450 mm. Relocation of the wind blown tailings and final levelling of the south half of the tailings pond was completed on September 27. The following day, the hauling and placing of the remaining clay resumed and was completed on October 4.

The estimated in-place quantity of clay material was 2650 cu.m. This was based on the surface area of tailings of 13,300 sq.m. and the 200 mm layer of in-place clay material. However, the final clay volume exceeded the initial estimate by 1200 cu.m. and totalled 3850 cu.m. This increase in volume was due to consolidation, settlement and a change of tailing grade at the north portion of the tailings pond. The original item cost was estimated at \$50,100 based on a \$18.90/cu.m. unit rate.

	Expected	Actual
Volume	2650	3850
Cost	\$50,100	\$72,765

The equipment used for this task included haul trucks as described above, a Cat 950 front end loader, a Caterpillar D4 LGP and D6D. The D6D was used mainly for placing the clay along the east edge of the site where the tailing subbase was sufficiently stable. On the other hand, the D4 LGP was used where the tailings subbase was too saturated and unstable for the heavier D6D. The Caterpillar D4 LGP, being lighter than the D6, also had 30" wide pads (rather than 24" pads). This piece of equipment was necessary for placing the clay material over unstable tailings.

3.0 COLLECT AND BURNING OF DEBRIS

This item of the contract includes the collection and burning of wooden debris and brush located throughout the site. The burning of debris started on September 11, 1995 and was completed on September 12th. The work included cutting brush and small trees at the berm and wind blown tailings areas. It also included collecting the wooden debris located above the dike. All the combustible materials were collected onto the tailings area and set ablaze.

Also included under this item of the contract, a low permeability plug was constructed at the inlet and outlet of the asbestos cement decant pipe. The inlet was plugged with bentonite clay and capped with concrete as shown in Diagram no. 2. This work was performed on August 29th and 30th.

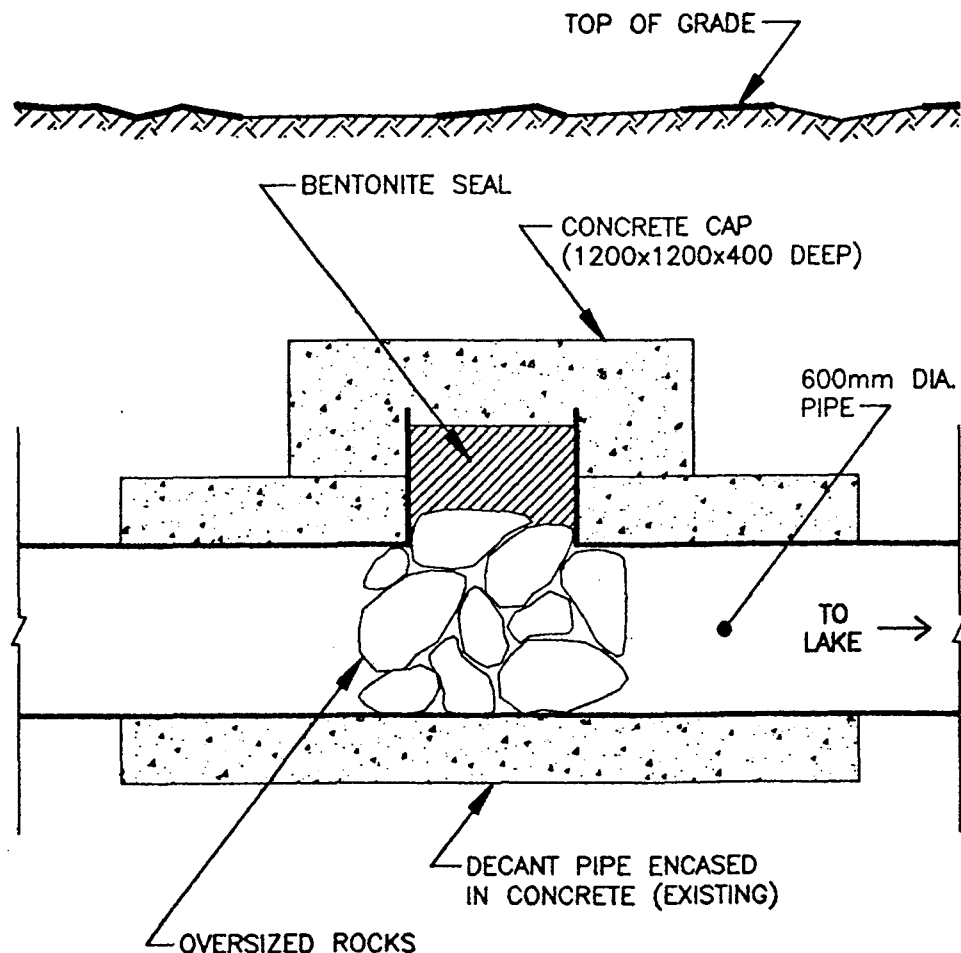


Diagram 2: Details of Decant Pipe Plug at Inlet

A concrete plug was also constructed at the outlet of the asbestos cement pipe at the lake shore. Three 12' asbestos pipe sections were removed at the outlet. A plug was constructed consisting of a 1.2 m concrete plug and a bentonite plug of 375 mm thick (see Diagram no.4 for details).

The work involved building circular wooden forms and placing them into the asbestos pipe. The concrete was poured on Saturday, October 14. Due to cool nights in October, a torch and a tarp were installed to maintain a warm environment for the curing process. On the following Monday, the bentonite plug was poured from the top of the asbestos pipe. J.R.Paine and Associates recommended using a 1:1:1 mix of PUREGOLD bentonite chips, X-tra Gel high yield bentonite and portland cement.

This portion of the project took approximately 5 days to complete. The total cost was \$4,032 as per the Contribution Agreement between DIAND, Arctic Environmental Strategy, and the Carcross/Tagish Development Corporation.

The only heavy equipment required for this activity was an excavator to remove the three sections of asbestos pipe.

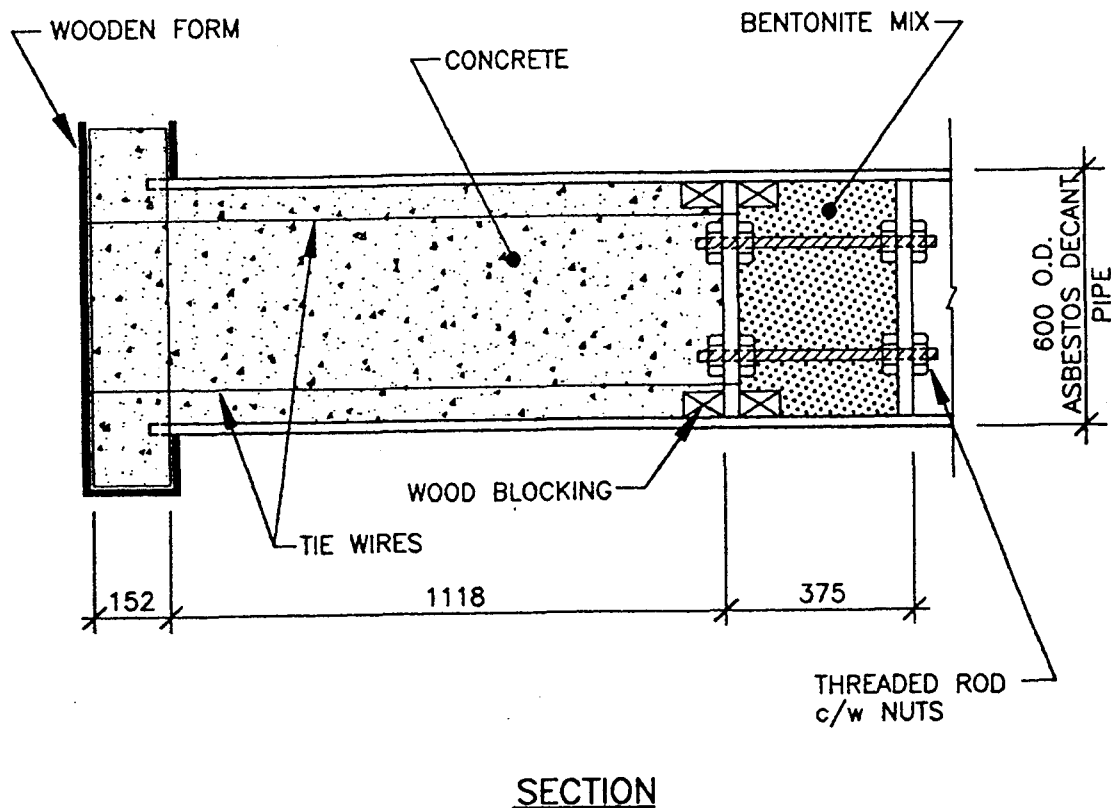


Diagram 3: Detail of Decant Pipe Plug at Outlet

4.0 EXCAVATING AND LEVELLING TAILINGS

4.1 Excavate and relocated wind blown tailings located outside the Waterloo Barrier

This part of the contract included excavating and placing wind blown tailing material originally located outside the original berm and consolidating them within the tailings pond area. In total, 3656 cu.m. were excavated from the wind blown tailings area. This work was accomplished in two sections: an initial 1120 cu.m. of wind blown tailings was excavated and completed on September 7 and an additional 2043 cu.m. of mainly native clayey material was excavated on September 25th and 26th and relocated onto the tailings pond area.

The initial 1120 cu.m. of windblown tailings were excavated as per the PWGSC specifications. However, the laboratory results from the confirmatory samples taken indicated that additional wind blown tailings would need to be excavated and relocated onto the tailings pond.

The dry condition of the wind blown tailings also assisted greatly in the levelling of the tailings: dry material placed above wet tailings made it easier for the levelling process. Once the 1120 cu.m. were relocated, a mass-balance calculation was conducted by Underhill. The results of this calculation indicated that an additional 1400 cu.m. was required to bring the level of the tailings to the design elevation of 82.5 m. This estimated volume did not account for consolidation and would most likely be in the order of 1600 cu.m. after consolidation and settlement. To avoid cost overruns for this item, the final elevation of the tailings was lowered from 82.50 m to 82.35 m (thus requiring no additional material to be hauled).

To achieve 82.35 m across the entire site, excessive handling of the tailings pond material was required. Through capillary forces, the pore water migrated upward. The top 500 mm layer of tailings quickly exceeded its liquid limit and became unstable and unworkable. Several attempts were made to let the tailings dry before resuming the levelling process. However, only a few passes were necessary before the D4 LGP dozer would get stuck. Levelling proceeded very slowly due to these saturated conditions. Consequently, the contractor tried a different approach. He placed the D6 dozer at the perimeter on stable ground and tied the winch cable to the back of the D4 LGP dozer. The D4 would crawl across the saturated tailings pulling the D6's winch cable. Once he was far enough and almost stuck, the D4 LGP would get winched out as it backbladed. The D4 LGP would once again venture into the saturated tailings and get pulled out by the D6 and so on. This "Yo-Yo" method was much more effective for relocating saturated soil.

Finally, the saturated tailings final grade was achieved at 82.35 m. However, the moisture content was so high (exceeding the liquid limit), that the contractor was unable to place the textile and the clay without creating deep ruts with the dozer and damaging the geotextile material in the process. After covering the north half of the tailings pond, it became evident that a solid base would be required in order to properly place the geotextile and the clay. Several attempts were made to allow the tailings to dry and the pore water to settle. However, when the tailings appeared dry and stable, only a few passes with the dozer were required before saturated and unstable conditions would return. This meant that additional dry soil would be required, hence, the tailings final grade was reset to 82.5 m. The least expensive and most readily available dry material was located at the wind blown tailings area.

An additional 2043 cu.m. was excavated from this area. Little quantity was actually wind blown tailings material, but rather, the majority appeared to be native clayey silt. With a dozer, the contractor began near the Waterloo Barrier and pushed the top 300 mm of saturated tailings toward the west side of the pond as he filled in with native dry material. This provided a solid base for working as he continued to push the wet material further and further away from the wall. Within 4 days, the contractor had levelled the majority of the remaining south portion of tailings and had constructed a solid subbase for placing the geotextile and

the clay. The total excavated material from the wind blown tailings was 3656 cu.m. The original contract estimate was 1600 cu.m.. However, due to excessive consolidation, an additional 2043 cu.m. was required.

	Expected	Actual
Volume	1600 m ³	3656 m ³
Cost	\$9760	\$22,301.60

A estimated total of 7 days was required to relocate the wind blown tailings to the tailings pond. Equipment required to complete this work were a Northwest excavator, a Caterpillar D8, D6 and D4 LGP dozer. The Caterpillar D8 dozer was used to stockpile and the Northwest excavator to relocate the stockpile over the Waterloo Barrier.

4.2 Excavate and Relocate Tailings

The excavation and relocating of the tailings inside the Waterloo Barrier includes cutting the material at the perimeter located above the 82.5 m elevation grade, relocating it to low areas such as the center of the pond area. This activity was done concurrently with the excavating and relocating of the wind blown tailings. The work days for this activity was 34 days. The work was primarily done using the Cat D4 LGP dozer. The duration of this work was expected to take 2 weeks. Due to the saturated tailing conditions, this activity took an additional 3 weeks.

The initial phase of the levelling work included the construction of a temporary drainage ditch. Its function was to divert the spring water around the tailings. A filter dike was construction at its outlet to filter suspended tailings. The filter was maintain throughout the duration of the project.

The original estimate for the volume of the tailings to be excavated was 1700 cu.m. However, because the final elevation for the north third of the tailings pond was lowered 150 mm to 82.35, an additional 526 cu.m. was excavated. The circumstances for theses changes are included in the section 4.1 "Excavation and Relocation of wind Blown Tailings" of this report. The following table indicates the expected and actual cost incurred for this item of the contract at a unit cost \$8.82/cu.m.

	Expected	Actual
Volume	1700 m ³	2225 m ³
Cost	\$15,000	\$19,633.32

4.3 Final Shaping and Grading of Tailing Pond

The final shaping and grading was performed concurrently with the excavation and relocating of the tailings. Some backblading was required which took little time. Once the tailings were levelled, the dozer did the minimum amount of activity on the tailings to avoid activating the capillary forces and saturating the surface tailing. An estimated 80% of the tailing pond surface was very stable. The remaining 20% ranged from semi-saturated to extremely saturated. A 3000 sq.m. area of tailings at the west edge was covered with a second layer of geotextile above the clay cap. The textile also provided additional stability when placing the capillary break material.

This work was performed by backblading with either the cat D6D (or the D4 LGP in softer areas). The unit cost for this item of the contract was \$0.36/sq.m. for a 13,300 sq.m. area and a total cost of \$4655.

5.0 SUPPLY AND INSTALL GEOTEXTILE

This section of the contract includes the purchasing of a Nilex non-woven geotextile(C24) and installation as per the manufacturer requirements. The Nilex geotextile has two purposes. From a construction perspective, it provides stability during the placement of clay material. From a design point of view, the textile acts as a filter to prevent tailings fines from migrating upward to the surface.

The materials arrived on site on September 8. On September 18, the hauling and placing of the clay material commenced, hence, the geotextile was placed concurrently. The cloth was overlapped by 24" in areas where the tailings was very soft. A 12" overlap was used in areas of stable tailings. The entire levelled tailings pond was covered with the textile and overlaid by the silty cap. Additional textile was placed to cover a 3000 sq.m. area at the west edge of the tailings. Due to extremely saturated and unstable conditions, the textile may have been damaged when the clay was placed. Approximately 25 rolls of geotextile were placed below the clay and an additional 5 rolls to cover the 3000 sq.m. of wet clay.

Two labourers were required to place the textile and was accomplished by manually unrolling the rolls. A estimated 6 man-days were required to place the textile across the entire site. This item cost was on a unit price basis for a design surface area of 13,300 sq.m.. The contractor's unit rate for this item of the contract was \$3.38/sq.m. (supplied and installed). The total cost for this item was \$44,954.

6.0 CONSTRUCTING DRAINAGE DISCHARGE SYSTEM

The drainage discharge system is composed of a 600 m diameter corrugated galvanized culvert located at the south end of the tailings pond. This system drains excess surface runoff from the top half of the capillary break. The elevation of the outlet is 82.85 m, therefore maintaining a saturated condition for the bottom 150 mm of the capillary break, the clay cap

and the tailings. A dry condition is maintained for the top 150 mm of the capillary break.

A 120 cm x 25 cm notch was cut at the top of the wall. A flared end section was tack-welded to the wall and connected to the culvert. The culvert was installed at a 5% grade (approx) and runs southward perpendicular to the Waterloo Barrier for a distance of 60 ft to an 90° elbow. Then it runs eastward toward the outlet of the Highways Culvert for 80 feet (see as-built drawings for details). The culvert was backfilled at and near the elbow to provide structural stability. The outlet of the drainage system is composed of a second flared end section which discharges the runoff into a small ditch lined with gravel material.

The work commenced on October 17th. A welder cut a 120 cm x 25 cm notch into the top portion of the Waterloo Barrier. He tack-welded a flared end section to the wall. The area was then graded and prepared for the installation of the culvert. The next day, five 20' sections of 600 mm corrugated culvert and the 90° elbow were installed. On October 20th, three additional 20' sections were delivered to the site and installed along with the outlet flared end section.

This item was costed on a lump sum basis. However, since only 25 m of culvert was installed instead of 80 m, the item cost was reduces as follows:

	Expected	Actual
Length	80 m	25 m
Cost	\$15,053	\$4704.06

The installation of 25 m of culvert required 3 manhours of cutting and welding and an estimated 3 mandays for the installation of the discharge system. An excavator was used to handle the culvert sections into place. The D4 LGP dozer graded and prepared the area for the installation of the culvert.

7.0 CAPILLARY BREAK MATERIAL

The loading, hauling, placing, grading and compacting of 75 mm minus screened pitrun material is included in this item of the contract. The purpose of this material is to prevent erosion of the clay cap material and provide a break in the capillary forces. The idea behind the coarse gravel is to maintain the tailings saturated while providing a relatively dry and stable surface.

A grain size analysis was performed on the material and is enclosed in Annex F: J.R.Paine Construction Management report. The original cost estimate for this activity included the screening pitrun to meet the design gradation specification for 75 mm gravel. The cost was estimated at approximately \$13,000. To avoid delay of project, an arrangement was made between the CTDC and the Yukon Territorial Government(YTG) to purchase gravel material, at a cost of \$5.00/cu.m from their Kilometer 90 pit. This cost was estimated at \$25,000

rather than \$13,000 for screening; hence increasing the cost by \$12,000 for this item. The Carcross/Tagish Development Corporation reviewed their estimated costs taking into account the proximity of the pit (2.5 km) and the time frame for loading, hauling and placing of the material. In conclusion, the CTDC estimated that this additional cost would be absorbed into their original cost estimate of \$16.16/cu.m.

The hauling and placing of the pitrun commenced early afternoon of October 11. The work proceeded quickly and was completed on Sunday, October 15. The loading, hauling, placing and compacting of pitrun material at the outlet was also included under this item. Approximately 10 loads of unscreened pitrun material and 10 loads of 75 mm minus screened material was hauled concurrently with the hauling and placing of the capillary break material. Both items (item 7.2.7 and 7.2.8) were combined into this item because both were hauled from the same location, hence justifying having identical hauling costs. The material was placed in 300 mm lifts and compacted with the dozer to minimize potential settlement.

A total of approximately 550 loads of gravel was hauled. The first 400 loads were hauled in approximately 2.5 days using 8 haul trucks. The remaining 150 were hauled 3.5 days using 2 to 3 haul trucks. Approximately 4 loads were hauled per hour per truck. The work proceeded extremely quickly during the first two and a half days, however, the pace was slowed down to enable the dozer to properly place and grade the gravel material.

The unit cost for the capillary break material was \$16.16/cu.m. Included in this cost is the \$5/cu.m. the YTG charged for the supply of the material. The costs are outlined in the following table:

	Expected	Actual
Volume	4100 m ³	4725 m ³
Cost	\$66,250	\$76,356

The equipment used for hauling were band member haul trucks. The placing of the material was performed in combination by the D6 and the D4 LGP.

8.0 SUPPLY AND PLACE PITRUN AGGREGATE AT OUTFALL AREA

This item was deleted from the contract. Rather, pitrun material was hauled, placed, compacted and included in the previous item (Capillary break Material). The material was taken from the same pit and therefore, justifies the consolidation of both items into one and costed at the same unit rate (see previous item).

9.0 COST TO COMPLETE

The cost to complete includes administration, supervision and other miscellaneous costs. This item was a fixed cost for \$344,779.

PART B

1.0 PROJECT COST REVIEW

This section reviews the construction costs for the project. Additional cost were incurred by the CTDC for work above and beyond the original items in the PWGSC specification document. This included additional labour, equipment and material costs incurred due to difficult working conditions during the levelling of the tailings pond and during the highway culvert repairs. Table 1 summaries and compares the itemized contract unit and lump sum costs and the actual cost.

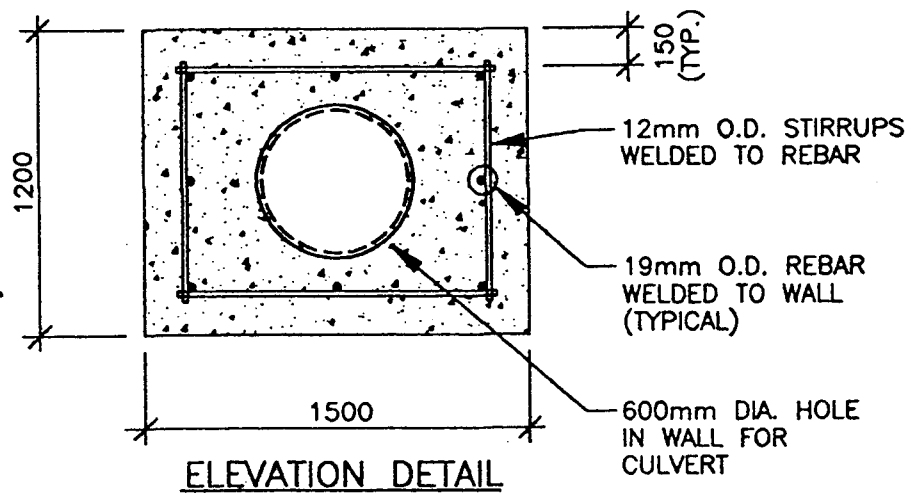
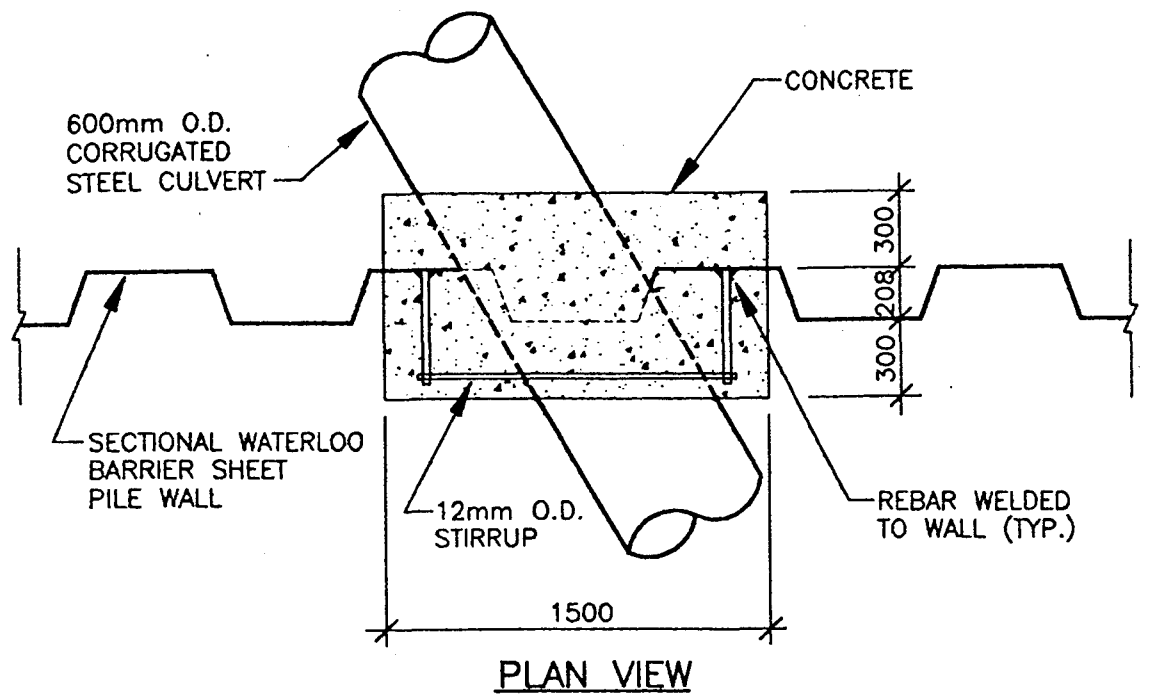
1.1 Additional Cost to the Contract

Due to unforeseen circumstances, the project incurred some additional costs including the repair of the highway culvert, additional equipment time, labour and "cost to complete" costs. The extra costs incurred for the repair of the highway culvert were unexpected. No drawings are available indicating the location of this culvert. The costs include the labour, equipment and material costs are as follows:

Progress Claim No.3	
Highways Culvert Repair	\$12,000
Additional Equipment Time	\$20,000
Additional Labour	\$11,000
Progress Claim no.4	
Additional Cost to Complete	\$8700

Highway Culvert Repair

The work involved replacing a section of highway culvert located along the temporary drainage ditch and at the Waterloo Barrier. The culvert section located below the temporary ditch was damaged during the excavation and a 2 m section needed replacement. The YTG crew from Carcross were on site to perform these repairs. During the installation of the Waterloo Barrier, the sheet piles damaged the Highway culvert. Both sides of the Waterloo Barrier were excavated to a depth of approximately 5 m exposing the culvert. Approximately 5 m of culvert were removed from both side of the wall. A hole was cut into the wall in order to place the new section of culvert. The hole was cut as small as possible and a concrete plug was poured on both side to seal the Waterloo Barrier/wall intersection. The design for this plug was reviewed and approved by the Waterloo Barrier installer, C3 Environmental Ltd. The details are shown in Diagram no.4 on page no. 16. The excavation was then backfilled with tailings and native clay. The labour, equipment and materials costs claimed and approved for this additional work was \$12,000. This extra cost is claimed under Progress Claim no.3



HIGHWAY CULVERT REPAIR

Diagram no.4: Highway Culvert/Waterloo Barrier Intersection

Additional Equipment Time

The CTDC had estimated and budgeted 2 weeks of equipment time for the levelling of the tailings during their initial estimate of 1.1 million dollars. Due to the saturated and unstable conditions of the tailings, the work took 5 weeks to complete (see section 4.1 of this report for details). This doubled the expected rental cost of the equipment. An agreement was made that the CTDC would get compensated for this additional 2 weeks of equipment time, hence **\$20,000**. This extra cost is claimed under Progress Claim no.3 (see Annex C for details).

Additional Labour, Supervision and Surveyor Time

These extra costs were claimed for the increase in unit cost items. The claim was approved by the DIAND site representative for the amount of **\$11,000**. This extra cost is claimed under Progress Claim no.3 (see Annex C for details).

Additional "Cost to Complete Project" Cost

Under Item 9: "Costs to complete project", the CTDC included their profit, administration and accounting costs. These costs were based on percentages of the total cost of the project. Since the cost increased from \$1.11 MM to \$1.2 MM, the CTDC claimed for additional costs due to this increase in total project costs. The claim for this additional cost was **\$8700**. It was agreed to and approved by the DIAND site representative.

1.2 Overall Summary of Project Costs

The following table summaries the expected and the actual project costs:

ITEM	DESCRIPTION	Unit Cost	EXPECTED		ACTUAL	
			Quantity	Cost	Quantity	Cost
1	Waterloo Barrier	L.S.	n/a	\$548,000	n/a	\$548,000.00
2	Silty Clay Cap	\$18.90/m ³	2650 m ³	\$50,100	3850 m ³	\$72,765.00
3	Dispose of Wood Debris	L.S.	n/a	\$4,032	n/a	\$4,032.00
4a	Excavate Wind Blown Tailings	\$18.90/m ³	1600 m ³	\$9,750	3656 m ³	\$22,301.60
4b	Excavate Tailings	\$6.10/m ³	1700 m ³	\$15,000	2226 m ³	\$19,633.32
4c	Final Grading	\$0.35/m ³	13,000 m ²	\$4,600	13,300 m ²	\$4,655.00
5	Installation of Geotextile	n/a	13,300 m ²	\$45,000	13,300 m ²	\$44,954.00
6	Drainage Discharge System	L.S.	80 m	\$15,053	25	\$4704.06
7	Capillary Break Material	\$16.16/m ³	4100 m ³	\$66,250	4725 m ³	\$76,356.00
8	Pitrun at Outfall Area		300 m ³	\$6,900	0	0
9	Costs to Complete	L.S.	n/a	\$344,779	n/a	\$344,779.00
SUBTOTAL				\$1,109,464.00		\$1,142,179.98
				Highway Culvert Repair		\$12,000
				Equipment Time		\$20,000
				Labour , Supervision and Surveyor		\$11,000
				Additional "Costs to Complete"		\$8,700
				SUBTOTAL		\$51,700
				TOTAL		\$1,193,879.98

Table no. 1: Project Cost Summary

2.0 ADDITIONAL WORK FOR NEXT SUMMER

2.1 Highway Culvert Upgrade

During the construction of the temporary drainage ditch, a 600 mm diameter corrugated culvert was discovered. The Yukon Highway Transportation department was asked to verify whether the culvert was installed during the construction of the Klondike Highway. However, no documents nor drawings identified the location of the culvert. Its purpose and ownership is therefore unknown. The highway culvert as shown on the as-built drawings in Annex D may have been installed prior to the construction of the Klondike Highway during the Venus Mine operation in the 1970's.

Because the culvert runs underneath the tailings pond from the highway embankment, a concern was raised concerning its structural integrity (life expectancy) and the possibility of infiltrating contaminated tailings water. To address these concerns, various options were proposed by PWGSC and are as follows:

Option

1. Status Quo (Do Nothing)
2. Insertion of a Culvert Sleeve
3. Installation of a Interior Water-proof liner
4. Remove and Replacement with New Culvert
5. Cap and Seal Outlet

Option 1: Status Quo (Do Nothing)

Currently, a "Do Nothing" approach is being followed. A monitoring program of the culvert effluent is underway by Renewable Resources, Indian and Northern Affairs Canada. If water concentrations of arsenic are found to be below federal and territorial guidelines, this option may be acceptable. However, a proactive options, as presented below, may reduce the risk potential future liabilities and provide a more adequate "care-free" long-term solution.

Option 2: Insertion of a Culvert Sleeve

This option consists of sliding a smaller plastic culvert inside the existing corrugated steel culvert and sealing the interstitial space with a bentonite slurry mix. The water presently running through the culvert may have to be diverted during the installation process. Physically, the new culvert can be pushed carefully, section by section, with a backhoe. The disadvantage of this option is that if any intersecting culverts merge with the main culvert along the sleeve, flow will be restricted. Any flow from these intersecting culverts shall not be restricted as it could potentially raise the soil's pore pressure and adversely affect the stability of the highway slope. If intersecting culverts are detected during the camera inspection, two options are available: excavate and expose joint and place a T-section or select a new option. The advantage is the lower cost and it is estimated that the labour, equipment and material costs will range between \$15,000-\$20,000.

Option 3: Installation of a Interior Water-proof liner

This option is a more highly technical solution to sealing the culvert. The technology involves coating the interior of the culvert, hence restricting potential tailing water from seeping into the culvert. The advantage of this technology is that, unlike option 2, holes can be cut into the liner at the intersecting culverts, hence not restricting the flow of water. Presently, there are no local contractors equipped to perform this type of work. A company from Vancouver or Edmonton would be required at an excessive mobilization cost. Bob White, a local contractor who performs TV inspection services, mentioned that next summer, he plans to purchase the necessary equipment to perform such work.

To properly install this liner, running water through the culvert needs to be diverted during the installation. The installer was not willing to provide a cost estimate until a remote camera inspection has been conducted. More information is required before assessing the feasibility of this option.

Option 4: Remove and Replacement with New Culvert

This option implies excavating 50 to 75 linear metres of culvert located below the tailings hence removing the capping material. Due to the saturated nature of the tailings, an extremely wide trench would be required to excavate and remove the existing steel culvert. Our experience during the repair of the culvert dictates that the working condition would be similar. Hence it is anticipated that water will constantly fill the excavation and make the replacement of the culvert very difficult, time consuming and costly.

Option 5: Cap and Seal Outlet

This option involved constructing a seal plug at the outlet of the highways culvert to prevent the flow from running into the aquatic environment of Tagish Lake. It is recommended that this option not be selected because the function of the culvert is unknown. There are no drawings or documents available indicating the origin of the running water. It is assumed that the culvert drains pore water from the highway subbase. Constructing a plug could potentially prohibit the free draining of the soil and potentially jeopardize the stability of the highway slope. After the TV inspection is performed, sufficient information may be gathered to determine the culvert's function and the origin of the flow. However, without being absolutely certain of the function of the highway culvert, this option is not recommended.

Prior to evaluating the options, it is recommended that a visual inspection of the culvert be performed. The culvert interior inspection can be conducted through remote camera investigation. This method of inspection will provide the additional information necessary to adequately evaluate the viability and costs of the options above. The remote camera inspector is to provide the following information:

1. Physical condition and size of culvert;
2. Location and size of intersecting culverts;
3. Location and an angle of elbows and other obstructions; and
4. Any other information necessary to evaluate the remedial options.

The following is a local contractor equipped and experience in this field:

Yukon TV Inspection Services
9 Salter Pl.
Whitehorse, Yukon

Phone no.: 403-633-5051

2.2 Drainage Discharge System Upgrade

The inlet of the discharge system, located at the wall, was constructed at a elevation of 82.85 m. If the tailings settles over the next year, this elevation may need to be lowered to allow free drainage of the top 150 mm of the gravel. These modifications are minor and less costly. However, the upgrades are critical to the control of an acceptable water level and the appearance of a dry condition.

2.3 Regrading of Capillary Break Material

Assuming that the tailing pond is stable, it is recommended that capillary break material be regraded. This work shall be accomplished in July or August, 1996, when the tailings have undergone a full freeze-thaw cycle and potentially settled.

Presently, the standing water covers approximately 50% to 70% of the tailings pond. To eliminate visible standing water, it is recommended that additional pitrun be hauled to the site and placed in the depressions (i.e. at the location of the standing water). The material is to be screened 75 mm minus and 25 mm plus pitrun: all particle sizes below 25 mm shall be screened out. The standing water will sit between the gravel particles and ensure a dry surface condition. If this work proceeds, lowering the outfall elevation may not be required as described in section 2.2 above.

2.4 Settlement Issue near the Waterloo Barrier

On October 20th, settlement of the capping material was noticed at the east side of the tailings pond immediately inside the Waterloo Barrier. The decant pipe may be located immediately below this settlement area. It is also possible that the decant pipe was punctured during the installation of the Waterloo Barrier. If this has occurred, the settlement may be caused by the soil filling the pipe cavity. Settlement did not occur until the outlet was capped and sealed. This indicates that the decant pipe may have filled up with water which allowed the soil to free-flow into the pipe. If the pipe has been filled with the settling tailings, no additional settlement will

be expected. However, further settlement may occur next summer when the tailings thaw out. If this is the case, additional material may need to be hauled to backfill the settled area. The settlement of the tailings should not cause an environmental concern. The settling tailings have no escape pathway because the tailings are confined by the concrete and bentonite cap at the outlet.

Next summer, after the soil has thawed and further settlement has occurred, an evaluation of the site will be required to determine the necessity for further work.

CONCLUDING REMARKS

The project was completed on schedule and under budget. The difficulties pertaining to the execution of the work were solved as the situations arose. The Carcross/Tagish Development Corporation (CTDC) manager and superintendent were very cooperative during this project. When extra costs were anticipated, Larry Whelan and Mel Johnson reevaluated their operating costs and determined whether additional costs could be absorbed into the estimated costs. For example, the CTDC absorbed the additional \$5/cu.m. for the purchase the capillary break material into their \$16.16/cu.m unit cost.

Concerning the planning of the work, a preconstruction meetings was held with the CTDC before the start-up of the work. However, the C3 Environmental crew was not present causing some delays at the start-up of the job and some misunderstandings concerning their work plan. For example, the project manager was under the impression that the installation of the wall would begin at the north end of the tailings. However, the material for the south end section had already been ordered. It is recommended that next time, a pre-construction meeting be held with the prime contractor, the design and construction management engineers and all subcontractors. The purpose of this meeting would be as follows:

- Prepare a step-by-step work plan and schedule;
- Discuss anticipated difficulties with the execution of the work; and
- Clarify ambiguities in the design specification document(if any).

The cost estimate provided by the Carcross/Tagish Development Corporation on August 4th was broken down into items as per the original PWGSC specification document. However, the original document was amended to alter the method of payment and replace the geomembrane specifications with a geotextile. The changes are included in a revised document entitled "Design of Venus Mine: Site Rehabilitation, July 1995 (Revised September, 1995)" in Annex B.

Overall, this project was good learning experience for all parties involved. The execution of the work was completed on schedule and under the allowed budget.

VENUS MINESITE

Followup Contracts

Following completion of the contract for installation of the Waterloo Barrier, and cover on the tailings, two items required follow up. These were as follows:

1. During installation of the Waterloo Barrier, it was discovered that there was an underground pipeline that angled across the site. The origin of the pipe could not be traced, nor could its present ownership. In a followup contract in 1996, Yukon TV Inspection cut into the pipe, lowered a video camera into the opening and provided a continuous video tape of the condition of the pipe. An analysis of the video indicated that the pipe was corroding, joints were failing, and there were breaks in the pipe itself. Clearly there was a need to address the condition of the pipe. The cost of undertaking this inspection was \$4,300.00.

2. The original concept for the cover was based on creating a condition which would result in the tailings being submersed at all times, thus preventing ARD. A further design condition was that the final appearance of the surface would be dry, simply for appearance. It was known that water was entering the site from two sources, a steady flow from beneath the highway, and surface water resultant from rainfall and snow melting. What was not known at the design stage was the amount of water that would enter the site from beneath the highway, nor that this flow would continue unabated throughout the winter. While it was anticipated that there was sufficient water entering the site to ensure that the primary objective of submerging the tailings would be accomplished, it was not anticipated that this objective would be met within days of completing the Waterloo Barrier. Nevertheless the final surfacing of the tailings with a coarse material was expected to provide a medium for allowing water to run off the site via a laminar flow process. In hindsight, material utilized to provide the conduit for laminar flow contained too high a fines content to permit free flow of water and ponding resulted. To address the ponding issue remedial work was required.

As followup work, several contracts were prepared. The first contract which was undertaken was a contract to add additional coarse rock to the surface of the tailings pond in an attempt to reach the objective of a dry pond. Additional material was placed over the area which had ponded during the previous summer. While the depth of water ponding was reduced, the primary affect of adding additional material was that the area ponding was enlarged. As the work was undertaken during winter, over snow, no decision could be made on the effectiveness of the additional material at the time it was placed. This work was undertaken by Arctic Backhoe Services Ltd. for \$31,798.00.

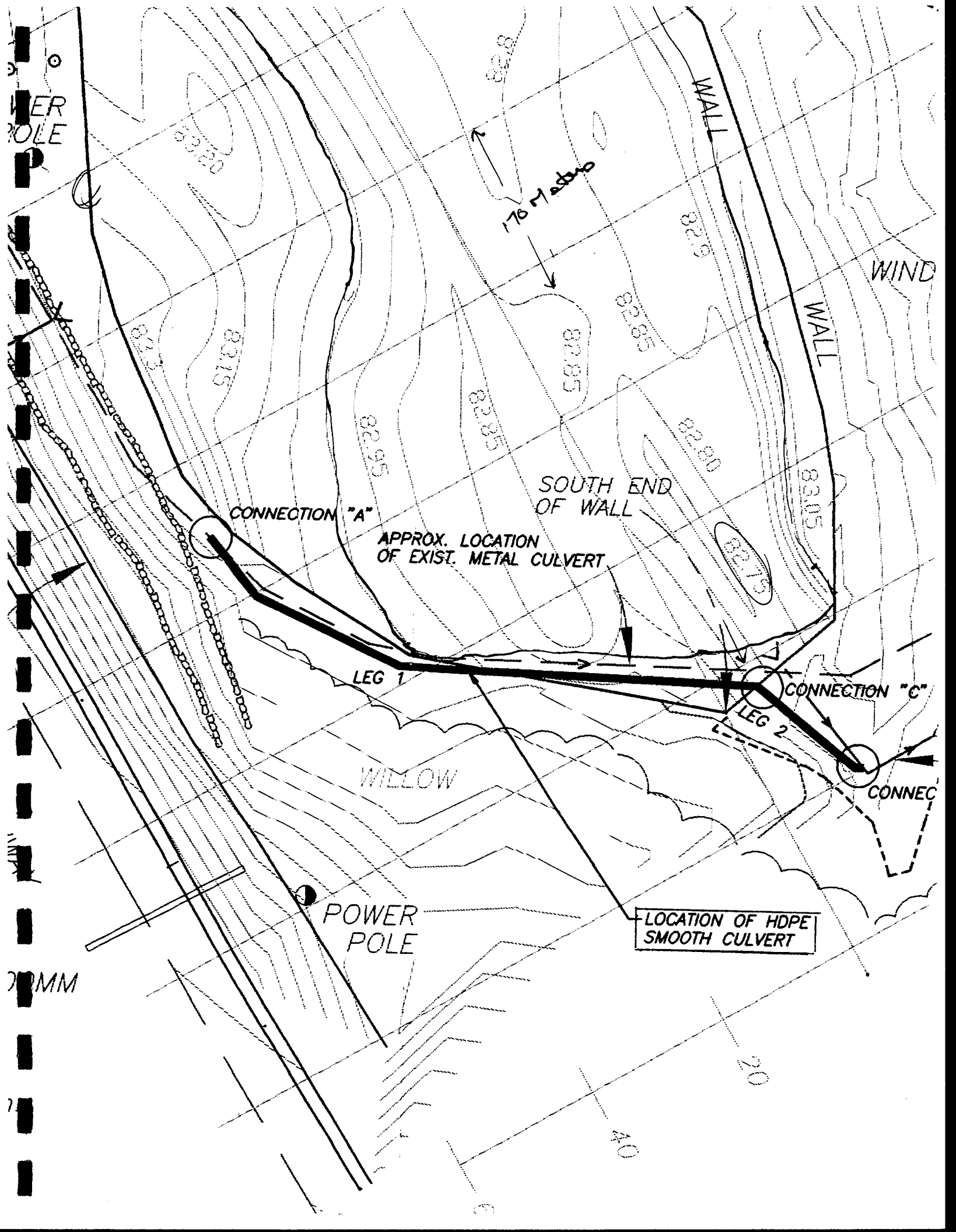
Shortly after the coarse material was placed, a second contract was undertaken by Yukon TV Inspections Ltd. This contract involved the installation of a new HDPE pipe to connect with the pipe which angled across the tailings, at a new location, and sealing the existing pipe at the wall location. This contract was in the amount of \$58,700.00. The new pipe was installed during winter months through the tailings and through the wall. Final cleanup of the backfilling was deferred until spring, as was the plugging of the old culvert. In spring, the contract amount was revised to \$67,931.00 to cover additional work. Yukon TV Inspections returned in spring and excavated along the south wall and exposed the old pipe. A hole was cut into this pipe and concrete pumped into it to form a seal at the wall. While on site, trenches from the previous year's

Venus Minesite Followup Contracts

work were cleaned up, and the new pipe buried at its exit location. The coarse rock which had been placed during the previous winter was regraded. In an attempt to improve the flow of water, the outlet at the south wall was lowered, and the discharge spout reattached.

It was planned to haul in an additional 10 loads of waste crushed gravel to fill in a void at the location outside the wall where excavation had taken place. The initial attempt to haul gravel was a failure as the loaded truck got stuck before it could dump its load. Further attempts at hauling were suspended to prevent damage to the tailings cap. As a result there remains a void at the south end of the wall. Should further attempts be made to fill in this void, they should be undertaken only under winter conditions.

There appears to be some evidence of erosion along the wall approximately midway along the east side. If material is hauled in to correct the depression along the south wall, the eroded areas should be filled in.



**CONTRIBUTION AGREEMENT
ARCTIC ENVIRONMENTAL STRATEGY
ACTION ON WASTE PROGRAM**

FOR THE PERIOD FROM August 1, 1995 to March 31, 1996.

This Agreement made in triplicate the 25th day of AUGUST 1995.

BETWEEN

Her Majesty the Queen in right of Canada, as represented by the
Minister of Indian Affairs and Northern Development
345 - 300 Main Street
WHITEHORSE, Yukon
Y1A 2B5
(hereinafter referred to as "Canada")

OF THE FIRST PART

AND

Carcross Tagish First Nation
Box 130
CARCROSS, Yukon
Y0B 1B0
(hereinafter referred to as the "Recipient")

OF THE SECOND PART

1. INTRODUCTION

- 1.1 Whereas the Minister has been authorized to establish and implement the Arctic Environmental Strategy, hereinafter referred to as the AES, throughout the Yukon Territory;
- 1.2 And whereas the Recipient has requested financial assistance from Canada to participate in the AES;
- 1.3 And whereas Canada has agreed to provide the Recipient with financial assistance to meet the said requirements;

- 1.4 Now therefore this agreement witnesses that the parties hereto, in consideration of the covenants and undertakings herein contained, covenant and agree as follows:

2. PURPOSE

- 2.1 The purpose of this Contribution Agreement is to enable the Recipient to participate in the Arctic Environmental Strategy, Action on Waste program in the Yukon Territory.
- 2.2 To enable the Recipient to clean up the mine tailings of the Old Venus mine in accordance with the plans and specifications outlined in Appendix "A" to this Contribution Agreements.

3. DURATION

- 3.1 This Agreement shall come into effect on the 1st day of August, 1995 and shall continue in effect until the 31st day of March, 1996, by which time the Recipient agrees to have fulfilled all of the terms and conditions of the Agreement. Funding under this Agreement shall terminate on the 31st day of March, 1996.

4. WORKPLAN

- 4.1 The Recipient agrees to undertake the Workplan in the manner and within the time set forth in Appendix "A" to this Contribution Agreement.

5. FUNDING

- 5.1 Subject to the terms and conditions herein described, and subject to funds being appropriated by Parliament for the purposes herein, Canada shall contribute to the Recipient an amount not to exceed One Million One Hundred Thousand Dollars (\$1,100,000.00).
- 5.2 An advance payment in the amount of Four Hundred Thirty Four Thousand Dollars (\$434,000.00) will be made upon signing of this contribution agreement.
- 5.3 Payment will be made upon receipt of progress claims for work satisfactorily completed as agreed between the Carcross Tagish First Nation's Project Manager and DIAND's Project Officer.

- 5.4 Final payment will be made upon receipt of a final report as required in Section 7.1.1.1.

6. DISBURSEMENT OF FUNDS

- 6.1 The disbursement of AES funds by the Recipient shall be in general accordance with plans and activities approved by the Director, Renewable Resources representing the Department of Indian Affairs and Northern Development.
- 6.2 The Recipient agrees that the Contribution or any part thereof shall not be disbursed for any purpose other than those contained in the Agreement. Failure to comply with the provisions of the Agreement entitles Canada to recover from the Recipient an amount equivalent to the sums disbursed for a purpose other than those contained herein, and the Recipient agrees that these amounts shall constitute disallowed expenses, which shall be due and payable by the Recipient to Canada within thirty (30) calendar days of so being requested in writing.
- 6.3 The Recipient agrees to repay any overpayment and unexpended balances, and that these amounts constitute an amount due and payable by the Recipient to Canada within thirty (30) calendar days of so being requested in writing.
- 6.4 The Recipient understands that this funding has been granted only until the 31st day of March, 1996. Acceptance of these funds by the Recipient does not guarantee that the Recipient will receive funding under Arctic Environmental Strategy Program in future years.

7. REPORTS

7.1 Activity Reports

- 7.1.1 The Recipient agrees to provide reports on the Workplan specified in Section 4.1 as follows:

- 7.1.1.1 provide a final report no later than the 31st day of March, 1996, detailing the total expenditures and activities for the duration of the Agreement.

7.2 Financial Reports

- 7.2.1** The Recipient shall maintain a separate account for all receipts and expenditures pursuant to this Agreement, and shall maintain accounting records in a manner consistent with generally accepted accounting principles and practices as issued by the Canadian Institute of Chartered Accountants.
- 7.2.2** The Recipient agrees to provide an unaudited financial statement no later than the 31st day of March, 1996, detailing the recipients expenditures concerning the AES throughout the life of this agreement.
- 7.2.3** The Recipient agrees to forward the reports and financial statements to Director, Renewable Resources, DIAND, 345 - 300 Main Street, Whitehorse, Yukon Y1A 2B5, on behalf of Canada.

8. NON COMPLIANCE

- 8.1** Failure by the Recipient to fulfil any of the terms and conditions of this Agreement may result in no further funding being provided to the Recipient. In such an eventuality, the Recipient shall have thirty (30) calendar days from the date of so being requested in writing by Canada to take remedial action. Failure by the Recipient to do so may result in Canada terminating the Agreement, with the requirement that all funds not disbursed be returned to Canada within thirty (30) calendar days of so being requested in writing.

9. AUDIT

- 9.1** Canada reserves the right to audit the accounts and records of the Recipient to ensure compliance with the provisions of this agreement. Recipient shall make available in a timely manner any records, documents, information and explanation as the audit may reasonably require.
- 9.2** Canada agrees to inform Recipient of the financial results of any audit which it may initiate, providing general comments, information and explanation as the audit may reasonably require.

10. CONFLICT OF INTEREST

- 10.1 No former public office holder who is not in compliance with the post-employment provision of the Conflict of Interest and Post-Employment Code for Public Office Holder shall desire a direct benefit from this Agreement.

11. COMPLIANCE WITH ENVIRONMENTAL LEGISLATION

- 11.1 All activities undertaken pursuant to this Agreement shall conform to applicable environmental legislation and policies at the federal, territorial and local levels.

12. GENERAL

- 12.1 No member of the House of Commons of Canada shall be admitted to any share or part of the Agreement, or to any benefit to arise therefrom.
- 12.2 This Agreement supersedes all communications, negotiations and agreements, either written or oral, between the parties hereto in respect of matters pertaining to this agreement, prior to its execution and delivery.
- 12.3 The Recipient shall indemnify and save harmless Canada, its servants and agents from and against any damages, costs or expenses, or any claim, action, suit or other proceeding which they or any of them may at any time incur or suffer as a result of any injury to persons (including injury resulting in death) or loss of or damage to property which may be or be alleged to be caused by or suffered as a result of actions or omissions of the Recipient, its servants and agents.
- 12.4 The present Agreement shall be deemed to have been entered into at Whitehorse, in the Yukon Territory, and shall be governed by and interpreted in accordance with the laws of the Yukon Territory.
- 12.5 Any and all agreements entered into by the Recipient with third parties to fulfil its obligations under this Contribution Agreement shall include the following clause:

"The parties hereto agree and fully understand that the Carcross Tagish First Nation is not, and does not act as, the agent for Her Majesty the Queen in right of Canada in respect to this Agreement or any part thereof. The parties hereto further agree and acknowledge that each of them acts herein solely as its own Principal and on its own behalf."

12.6 This Agreement may be amended by mutual written consent of both parties hereto or their duly authorized representatives.

12.7 This Agreement may be terminated by either party with reasonable cause upon thirty (30) days written notice indicating the intent and reasons for such termination. All monies unaccounted for at that time shall be subject to an immediate audit as provided for under Article 9 of this Agreement. Any overpayment and unexpended balances shall be repaid and such other appropriate actions shall be taken by Canada or at its direction in these matters.

12.8 Any information released or announced to the public concerning the subject matter of this Agreement shall adequately acknowledge the contribution made by Canada on behalf of the federal government.

GOVERNMENT OF CANADA

SIGNED

24 August 1995.
Date

Bruce Chambers
Director, Renewable Resources
DIAND

Aug. 25, 95
Date

Fabrick
Carcross Tagish First Nation

I certify that this Agreement meets Treasury Board requirements for the Arctic Environmental Strategy in the Yukon.

Aug 24/95
Date

Paul M. Lach
Director
Corporate Services
DIAND

APPENDIX A

WORKPLAN

PROJECT NAME: VENUS MINE TAILINGS SITE REHABILITATION

These Technical Terms and Conditions cover the "in place" environmental clean-up of the mine tailings of the old Venus Mine at Km 86.5 on the South Klondike Highway by the Carcross / Tagish First Nation during the time period from August 1, 1995 to MARCH 31, 1996. The total estimated cost of the project, one million and one hundred thousand dollars (\$ 1,100,000.00), will be provided by AES Action on Waste, Indian and Northern Affairs Canada.

CARCROSS / TAGISH FIRST NATION AGREE:

1. To appoint the First Nation's Capital Project Manager to the project to ensure that the project is implemented in accordance with these Technical Terms and Conditions and this Contribution Agreement.
2. To advise DIAND by copy of a Band Council Resolution of the appointed Project Manager's authorized levels of authority (e.g. negotiating and signing Technical Terms and Conditions, approving changes in scope, signing contracts, etc..)
3. To carry out the following work:
 - a) The environmental clean-up of the mine tailings of the Old Venus in accordance with the Plans and Specifications prepared by Public Works and Government Services' Environmental Services Branch (Edmonton). The Plans and Specifications form a part of these Technical Terms and Conditions.
 - b) To ensure that an environmental screening is carried out prior to starting the project.
 - c) Recording, preparation and distribution of on-site project meeting and weekly meeting minutes.
4. To ensure that the supplier and installer of the Waterloo Barrier provide a one years warranty on the installation of the Waterloo Barrier.

5. That the First Nation's Project Manager will accompany any DIAND's Project Officer or authorized designate on all inspections and will provide necessary site and construction project information.
6. That DIAND has the right to examine the project at any reasonable time and to engage its own or consulting inspection services to ensure conformity with the approved plans and specifications and to these Technical Terms and Conditions.
7. That it has the responsibility to undertake this project using sound project management practices that will ensure successful completion of this project.

DIAND AGREES:

8. To appoint a Project Officer and advise the First Nation in writing of this persons name.
9. To appoint an on-site representative for the project officer and advise the First Nation in writing of this persons name.
10. To transfer funds in a timely and efficient manner for the implementation and completion of the project in compliance with these Technical Terms and Conditions.

<u>Description of Work</u>	<u>Percent</u>	<u>Value</u>
Completion of items in Sections 1,2, 3, 11 and 14 of these Technical Terms and Conditions and by signing these Technical Terms and Conditions.	39.4%	\$434,000.00
Progress payments for work satisfactorily completed as agreed between the First Nation's Project Manager and DIAND's Project Officer.	60.6%	\$666,000.00
Total Funds for the Project	100.0%	\$1,100,000.00

CARCROSS / TAGISH FIRST NATION AND DIAND AGREE:

11. That an environmental screening will be conducted prior to the first release of funds to the First Nation.
12. That a progress review will be held by DIAND in March of 1996 to determine the actual status of this project at which time any necessary decisions on future projects may be made.

13. Allocation of ~~one~~ four year Capital Contributions dependent upon successful completion of current years projects.
14. An initial payment will be made to the First Nation to cover the up-front costs for the project as well as supply and delivery of the Waterloo Barrier. Subsequent progress payments will be based on satisfactorily completed work, as agreed upon between the First Nation's Project Manager and DIAND's Project Officer.
15. A 10% holdback will be retained on all progress payments.



Carcross/Tagish Development Corporation

Head Office : P.O. Box 130

Carcross, Yukon Y0B 1B0

Tel : (403) 821-4109

Fax : (403) 821-4811

August 04, 1995

D.I.A.N.D.
Technical Services
Department of Indian & Inuit Affairs
415 - D 300 Main Street
Whitehorse, Yukon

Attn: Mr. Art Dell P. Eng - Manager, Technical Services.

Dear Sir;

Re: Construction Cost Estimate Venus Mine Site Tailings - Site Rehabilitation.

Attached please find our estimated cost to undertake the work as outlined in P.W.G.S.C Construction Documents of July 1995. We acknowledge receipt of addendums changing earthwork quantities from tonnes to m3 where applicable and agree to survey measured quantities for final payment.

The geomembrane item 6 has not been included due to problems from supplier who is awaiting prices from the U.S. We should know today.

We hope the following to be to your satisfaction and look forward to working with you again.

Regards,

Larry Whelan, Manager

cc. Mel Johnson - Construction Manager
Mark Palmer - Action on Waste Management

CONTRIBUTION AGREEMENT
ARCTIC ENVIRONMENTAL STRATEGY
ACTION ON WASTE PROGRAM

AMENDMENT #1

Contribution Agreement entered into between "Canada" and the "Carcross/Tagish First Nation" for the period August 1, 1995 to March 31, 1996, to clean up the mine tailings of the Old Venus mine is hereby amended:

1. 5. FUNDING, page 2 of the Contribution Agreement

Under Section 5.1 - "Subject to the terms and conditions herein ... an amount not to exceed One Million One Hundred Thousand Dollars (\$1,100,000.00).

Should be amended to read "Subject to the terms and conditions herein ... an amount not to exceed One Million One Hundred Ninety Three Thousand Eight Hundred Eighty Dollars (\$1,193,880.00)."

2. All other terms and conditions of this contribution agreement remain the same.

SIGNED

27 October 1995
Date

Bruce Chambers
Director, Renewable Resources, DIAND

Nov 10, 95
Date

Patrick J. ...
Carcross Tagish First Nation

I certify that this amendment to this Agreement meets Treasury Board requirements for the Arctic Environmental Strategy in the Yukon.

25/10/95
Date

David A. Holt
A/ Director, Corporate Services, DIAND

Yukon

ARCTIC

ENVIRONMENTAL

STRATEGY

**ACTION ON WASTE**

#345, 300 Main Street
Whitehorse, Yukon
Y1A 2B5

Phone: (403) 667-3270
Fax: (403) 667-3206

November 30, 1995

Carcross Tagish First Nation
P.O. Box 130
Carcross, Yukon
Y0B 1B0

ATTENTION: Mr. Larry Whelan

Dear Mr. Whelan:

**RE: Contribution Agreement Amendment #2
Venus Mine Tailings Project**

Please find enclosed three copies of the above amendment for the Venus Mine Tailings Project.

Would you please review and have Chief James sign all copies. Please return two original copies to us for our files.

If you have any questions, please call me at 667-3271.

Sincerely,

L. Dorothy McLeod
Administrative Officer
Arctic Environmental Strategy

encl.



Indian and Northern
Affairs Canada

Affaires Indiennes
et du Nord Canada

Canada

**CONTRIBUTION AGREEMENT
ARCTIC ENVIRONMENTAL STRATEGY
ACTION ON WASTE PROGRAM**

AMENDMENT #2

Contribution Agreement entered into between "Canada" and the "Carcross/Tagish First Nation" for the period August 1, 1995 to March 31, 1996, to clean up the mine tailings of the Old Venus mine is hereby amended:

- 1. 5. FUNDING, page 2 of the Contribution Agreement**

Under Section 5.1 - "Subject to the terms and conditions herein ... an amount not to exceed One Million One Hundred Ninety Three Thousand Eight Hundred Eighty Dollars (\$1,193,880.00).

Should be amended to read "Subject to the terms and conditions herein ... an amount not to exceed One Million One Hundred Ninety Eight Thousand Eight Hundred Eighty Dollars (\$1,198,880.00)."

- 2. All other terms and conditions of this contribution agreement remain the same.**

SIGNED

29 November 1991

Date _____

Pence Chambers

Director, Renewable Resources, DIAND

Date _____

Carcross Tagish First Nation

I certify that this amendment to this Agreement meets Treasury Board requirements for the Arctic Environmental Strategy in the Yukon.

W/ur-24/65

Date _____


Director, Corporate Services, D

Director, Corporate Services, DIAND

**MEMO TO: Federal Department Public Works
Edmonton, Alberta**

DATE: October 27, 1995

ATTN: Mr. G. Strynadska - P. Eng. Mgr.

RE: Restoration Of Settlement Along Retaining Wall At Venus Mine Site.

Dear Sir,

Pursuant to our telephone conversation on Wednesday October 25, 1995 and our subsequent site visit on October 27, 1995.

The settlement is occurring in an area where the sheet piling had to be trenched into place due to large boulders. The backfill in the area immediately adjacent to the sheet piling could not be completed for fear of damage to the pile finish.

Water from the piping and drainage system from the Skagway road is accumulating over the new fill and as the soils become saturated excessive settlement is occurring in the area.

To correct this and redirect the flow of water away from the retaining wall we recommend placing approximately 15 loads of gravel in the area to refill the void and regrade the area adjacent away from the wall.

To do this the trenches and earth berm road has to be reopened and material hauled to the site.

The work required and costs associated are as follows:

Loader 20hrs. @ \$70.00	\$1,400.00
Tandem Truck 10hrs. @ \$65.00	\$650.00
Supervisor 25hrs. @ \$30.00	\$750.00
Pick-up and tamper	\$300.00

Administration 10%	\$3,100.00
	310.00

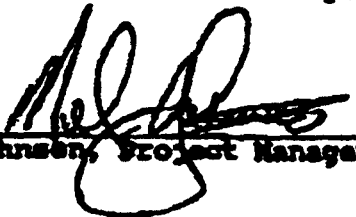
Total	\$3,410.00

We hope the foregoing to be to your satisfaction.

The work should be done before winter and monitored before spring run off as we feel the whole site will be in/undated with water from the highway following spring melt.

Please call if you have questions.

Thanks


Neil Johnson, Project Manager

Add: 15 loads @ 11 met³/load
@ \$5.00 royalty = 825.00
+ Admin. 10% = 82.50

Total 4317
\$4,500.00

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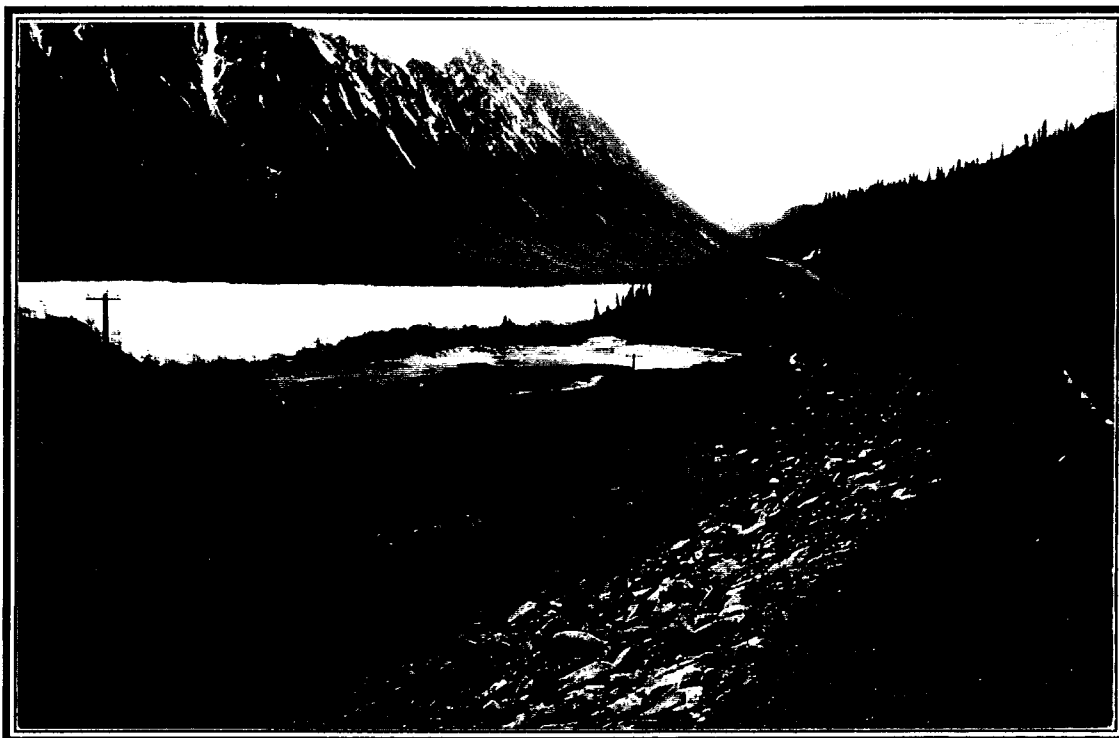
Doc. ID. D007167
 Cert. Pursuant to Sec. 34
 of the FAA Shirley McLeod Nov 24/95
 Pursuant to Sec. 33 of the
 FAA and in accordance
 with Sec. 7 of the
 Document Reg. Regulations

SPECIFICATION

**FINAL DESIGN
OF
VENUS MINE TAILINGS
SITE REHABILITATION**

**July, 1995
(Revised September, 1995)**

**DESIGN OF
VENUS MINE TAILINGS
SITE REHABILITATION**



FINAL DESIGN

**JULY 1995
(Revised September, 1995)**

This Specification is part of the document referred to as
"Plans and Specifications" and marked "A" in the Articles of
Agreement entered into

on the _____ day of _____ 19__.

Between Her Majesty the Queen

and _____

Signed _____
(Authorized Departmental Officer)

(Contractor)

INDEX TO SPECIFICATIONS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGES</u>
DIVISION 01	GENERAL REQUIREMENTS	
01005	General Instructions	8
01014	Project Control	2
01410	Testing Laboratory Services	1
01500	Temporary Facilities	2
01545	Safety Requirements	1
01561	Environmental Protection	1
	Waterloo Barrier	11
	Collection and Disposal of Debris at the Venus Mine Tailings Site	1
	Excavate Wind Blown Tailings, Outfall Area Excavation and Level Existing Mine Site	2

Supply and Placement of a Silty Clay Cap	1
Non Woven Geotextile	10
Capillary Break Material	1
Miscellaneous Aggregates	1
Construct Drainage Outfall	1
Test Hole Logs	36

INDEX TO DRAWINGS

Title: VENUS Mine Tailings
Site Rehabilitation
Tailings Treatment Plan

Project No.: 626483

Date: Revised September 7, 1995

1. **DESCRIPTION OF WORK**

- .1 Work under this Contract covers the "in place" environmental clean up of mine tailings, at the Venus Mine Tailings Site, and related works.
- .2 The Venus Mine Tailings Site is located at approximate km 86.5 on the Skagway-Carcross Highway; granular material is located at Community and Transportation Services, Transportation Engineering Branch pit at Km 90 and capping material is located approximately 2 Km north of Carcross, and is currently being landfarmed.
- .3 Work under this Contract covers the following as indicated on the drawings and specifications:
 - .1 Installation of an impermeable wall (Waterloo Barrier) to contain the tailings pile at its current location.
 - .2 Loading, hauling, and placing a silty clay cap.
 - .3 Collecting and disposing wood debris, sealing pipes, and removing scrub brush.
 - .4 Excavating wind blown tailings and levelling the tailings site.
 - .5 Constructing a drainage discharge system.
 - .6 Supply and installation of a geotextile.
 - .7 Hauling, and placing granular capillary break material.
 - .8 Community consultation.
- .4 Related work associated with this Contract include:
 - .1 Provision of an on site construction office suitable for use by the Owner's site representative and the contractor's superintendent.
- .5 Testing services on this Contract will be provided as follows:
 - .1 The Owner will provide testing personnel to perform compaction testing (if specified), grain size analysis, sieve analysis, and testing for contaminants.

- .2 The tests performed by the Owner's testing personnel will form the basis for determining the depth and extent of materials to be removed, and will form the basis for acceptance of the work.
- .6 Items peculiar to this contract include:
 - .1 The Contractor is free to use his discretion on the selection and utilization of equipment for this project.
 - .2 To the extent indicated on the contract drawings and specifications, the Owner's intent is to have the bulk of the work completed prior to March 31, 1996.
 - .3 Test borings undertaken by Public Works in 1986 and 1987 and 1995 indicate the presence of high water tables. The selection of suitable equipment will be crucial on this project.

2. **CODES**

- .1 Perform work in accordance with National Building Code of Canada (NBC), and any other code of the Yukon Territory or local application, provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

3. **DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy of each of the following:
 - .1 Contract drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders.
 - .5 Field test reports.
 - .6 Copy of approved work schedule.
 - .7 Permits, licenses and land use regulations.
 - .8 Environmental assessment report.
 - .9 Labour and Materials Payment and Performance Bonds.

4. **SITE CONDITIONS**

- .1 Site information contained in these contract documents was derived from several sources listed below:
 - .1 Tailings Characterization was derived from a report prepared by Rock Group Consulting Engineers dated August 1994, titled "Tailings Characterization".
 - .2 Remedial Options, and anticipated volumes were derived from a report prepared by Kohn-Crippen, "Study of Remedial Options" dated March 1994.
 - .3 Subsurface information was obtained from the Kohn-Crippen report, the Rock Group Report, borings undertaken by PWGSC in 1986 and 1987, and sampling programs undertaken by PWGSC in 1995.
 - .4 Topographic survey undertaken by PWGSC in 1995.
 - .5 Location and depth of tailings were compared with reports prepared by United Keno Hill Mines Ltd. in 1980.
 - .6 Selected geotechnical information is appended to these documents as Appendix 'A'.
 - .7 Photographs dating from 1970 until the present were consulted in deriving the extent of tailings.
- .2 This Contract deals with environmental clean up. Information in the various reports regarding the depth and extent of tailings is contradictory. While every effort has been made to accurately depict the nature and extent of the work to be undertaken, some subsurface conditions may vary from those depicted on the drawings. Accordingly, the Owner will arrange for continuous on site testing to ensure that the intent of the specifications will in fact be met.
- .3 The tailings samples are reasonably typical of a polymetallic deposit with sulphur contents ranging from 3 to 20%, iron from 4 to 9%, with associated arsenic (2.5 to 7.9), zinc (0.05 to 1%) and to a lesser degree cadmium, cobalt, copper, lead and nickel values.

5. **WORK SCHEDULE**

- .1 Provide and maintain a work schedule showing anticipated progress stages

and final completion of work within time period required by contract documents.

- .2 Interim reviews of work progress based on work schedule will be conducted as decided by the Owner's site representative and schedule updated by contractor in conjunction with and to the approval of the Owner's site representative.

6. **COST BREAKDOWN**

- .1 Before submitting first progress claim, submit breakdown of contract price in detail as directed by the Owner's site representative and aggregating contract price. After approval by Owner's site representative, cost breakdown will be used as basis for progress payments.

7. **MEASUREMENT FOR PAYMENT**

- .1 Due to the nature of the work it is proposed to use a combination of lump sum payments and unit price items to enumerate the Contractor on this contract.

- .2 Items which the Contractor will submit prices for are as follows:

- .1 Supply and installation of an impermeable wall (Waterloo barrier) to contain the tailings pile at its current location.

Pricing to be based on proposal submitted.

Lump Sum _____

- .2 Load, haul, place, grade and compact a silty clay cap. Price to include all labour and equipment to construct a silty clay cap.

2,650 cu. m. @ _____ = _____

- .3 Collect and dispose (by burning) wood debris on site, and dispose of brush, and seal decant pipe. Price to include all labour and equipment necessary to clean up work areas at the Venus Mine Tailings site.

Lump Sum _____

- .4 Excavating wind blown tailings and levelling tailings site. Price to include all labour and equipment necessary to excavate wind blown tailings; excavate high areas on the tailings pile and move to low

areas; final levelling and compaction of tailings site.

- .1 Excavate and place wind blown tailings, including material in the drainage discharge area.

1,600 cu. metres @ _____

- .2 Excavate and relocate tailings on site.

1,700 cu. metres @ _____

- .3 Final shaping, grading, and compaction of tailings site.

13,300 square metres @ _____

- .5 Supply and installation of geotextile. Price to include all labour and equipment necessary to supply a geotextile, and place the geotextile in accordance with manufacturer's recommendations, over the mine tailings.

13,300 square metres @ _____

- .6 Constructing a drainage discharge system. Price to include the supply and installation of piping material; supply and installation of end sections and all connections.

Lump Sum _____

- .7 Loading, hauling, and placing capillary break material. Price to include the loading, hauling, placing, and compaction of a capillary break material to the lines and grades specified.

4,100 cu. m. @ _____ = _____

- .8 Supply and place pitrun aggregate in the outfall area.

300 cu. m. @ _____ = _____

- .9 Costs to complete project. Price to include supervision, profit, administration, community consultation, supply of temporary facilities, flagpersons, scale persons, dewatering, and any costs for items not covered above.

Lump Sum _____

8. **CONTRACTOR'S USE OF SITE**

- .1 Contractor has use of site with the following restrictions:
 - .1 Use of site shall comply with environmental protection requirements.
 - .2 Tracking of mud onto the Skagway-Carcross Highway is not permitted.
 - .3 Contractor shall undertake any snow clearing at the Venus Mine Tailings Site.
 - .4 The Skagway-Carcross Highway may be subject to snow slides during the winter months. The Owner assumes no responsibility for lost time in the event that access to the site is curtailed for any length of time due to snow slides or other natural phenomenon.

9. **PERMITS**

- .1 The Contractor shall be responsible for paying all costs associated with obtaining licenses, permits and royalties. Costs for these items will be covered under the cash allowance provided in the cost tables.
- .2 The Contractor shall register, obtain and pay for all licenses and permits for individual tradespersons employed for work of their section.

10. **PROJECT MEETINGS**

- .1 The Contractor and the Owner's site representative will develop an appropriate schedule for holding project meetings.
- .2 For contract activities which are ongoing, project meetings shall be held monthly.
- .3 For contract activities which are unique, e.g. Waterloo Barrier, installation of geomembrane and start of winter operations, meetings shall be scheduled at the start of each activity.
- .4 Times and locations of meetings to be approved by Owner's site representative.
- .5 Notify participants of meetings.
- .6 Record minutes of meetings, and distribute to participants within 3 days of meeting.

11. **SITE SUPERVISION**

- .1 Contractor will designate a competent and qualified supervisor to be on site at all times during construction, to have full authority to make decisions for the Contractor, to be knowledgeable of the requirements of the contract, and to act on the Owner's site representative's instructions.

12. **COMMUNITY RELATIONS**

- .1 The Contractor will be responsible for undertaking any community consultations required for this project.
- .2 The Contractor shall be responsible for providing and paying for any required translation services, and for recording and distributing minutes of meetings on approval of the Owner's representative.
- .3 The Owner, and Owner's site representative will attend any community meetings related to this project at the request of the Contractor.

13. **SETTING OUT OF WORK**

- .1 The Owner's representative will arrange and pay for a survey crew to provide initial layout of the work, periodic grade stakes, measurements for final payment, and line and grade for the drain pipe.
- .2 The Contractor shall employ methods to place the drain pipe at the correct elevation from lines and grades provided.
- .3 The Contractor shall take precautions to protect survey stakes. Costs to replace the indiscriminate removal of grade stakes will be back-charged to the Contractor.

14. **EXISTING SERVICES**

- .1 Power poles and lines exist at the Venus Mine Tailings Site. These lines are outside the work area and will be left in place.

15. **ADDITIONAL DRAWINGS**

- .1 Owner's site representative may furnish additional drawings for clarification. These additional drawings have same meaning and intent as if they were included with plans referred to in Contract documents.

16. **WORK METHODOLOGY PLAN**

- .1 The Contractor shall provide, prior to start of work, a Work Methodology Plan that demonstrates how the various activities will be carried out.
- .2 The plan, shall be submitted in three copies, and indicate the equipment to be used, sources of materials, and anticipated durations.

17. **EXAMINATION OF SITE**

- .1 Prior to finalizing pricing negotiations, the Contractor, a representative from DIAND, and a representative from the design team shall visit the site to ensure that all aspects of the work are clearly understood.
- .2 The Contractor shall notify the Owner's site representative, in writing, of any matters which could prejudice proper execution of the work.

18. **DEFINITIONS**

- .1 The **Owner**, as described in these documents is the Manager, Contaminants/Waste Programs, Renewable Resources, Indian and Northern Affairs, Whitehorse.
- .2 The **Owner's Site Representative** is the Divisional Manager, Environmental Services, Public Works and Government Services Canada, Edmonton, Alberta.
- .3 The **Contractor** is the Tagish/Carcross Band.
- .4 It is understood that the contract will be undertaken through a contribution agreement with the Tagish/Carcross Band.

19. **LOCAL CONTENT**

- .1 Two fundamental principles apply to the manner in which this contract is to be executed. These are as follows:
 - .1 Human resources to execute the work to be recruited from local communities to the maximum extent possible. Any legislation effective in the Yukon Territory relating to use of local human resources must be complied with without exception.
 - .2 Training as required is to be provided to local recruits in undertaking all aspects of the work.

1. **PROJECT CONTROL SYSTEM REQUIREMENTS AND APPLICATION**

- .1 The Owner's site representative will operate a system of overall project control of which this contract forms a part. The Contractor is required to provide the Owner's site representative with information and assistance necessary to manage the project control system.

2. **CONTRACTOR PROJECT CONTROL**

- .1 The Contractor will be required to input into two aspects of the project control system, as follows:

- .1 **Schedule Control**

- .1 The Contractor shall provide a schedule (bar chart) to indicate when various activities in the contract will be carried out.
 - .2 Schedules shall be updated monthly to indicate actual performance vs planned performance.
 - .3 Deviations from the schedule shall be addressed by the Contractor in such a manner that assurance is provided that the contract will be completed by the specified date.

- .2 **Cost and Quantity Control**

- .1 Maintain accurate up-to-date record of quantities of work carried out.
 - .2 Quantities of materials to be paid for by the cubic metre will be measured by the Owner's site representative prior to start of work and after completion of the work.
 - .3 Lump sum items shall be submitted by the Contractor as applicable work is carried out.
 - .4 On a monthly basis, report status on all items, report statistics on lost time accidents, and cost data for cash allowance items.

3. **PURPOSE**

- .1 The purpose of Project Control Information includes the following:

- .1 Provide the Contracting Authority with the basis for allocating resources to the project.
 - .2 Identify cash flow requirements.
 - .3 Documents how specific project objectives are being achieved.
 - .4 Provide the Contracting Authority with the basis for making contract payments.
- .2 The Contractor is advised that revisions to the plan to maximize project efficiencies will be permitted.

4. **UPDATING, MAINTAINING AND REPORTING PROGRESS**

- .1 As part of each site meeting, the Contractor and the Owner's site representative shall inspect all of the work in progress, and note any variances from the approved contract requirements, or schedules.

5. **EFFECT OF ACCEPTANCE**

- .1 Acceptance by the Owner's site representative of the Contractor's schedules does not relieve the Contractor from any duties or responsibilities required by the contract.

1. **GENERAL**

- .1 This section covers requirements for inspection and testing services for this contract.

2. **APPOINTMENT AND PAYMENT**

- .1 The Contractor will appoint and pay for services of testing laboratory for the following:
- .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .3 Testing, adjustment and balance of weigh scales.
- .2 The Owner's site representative will appoint and pay for services of testing laboratory for the following:
- .1 Inspection and testing required by the condition of land use permits issued for the work.
 - .2 Testing to confirm the presence or absence of contaminated materials.
 - .3 Testing required under monitoring programs.
 - .4 Compaction testing.
- .3 The Supplier will appoint and pay for testing laboratory for the following:
- .1 All quality assurance and certificates for compliance related to installation of the Waterloo Barrier.
 - .2 All quality assurance and certificates for compliance related to installation of the geomembrane.

1. **GENERAL**

- .1 Temporary facilities consist of essential temporary buildings, structures, utilities and services required at the site during clean up of the site.
- .2 Temporary facilities shall meet the requirements of Federal, Territorial and local authorities having jurisdiction.

2. **SANITARY FACILITIES**

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .3 Sanitary facilities to be provided at the mine tailings site.

3. **SITE OFFICE**

- .1 Provide a site office, at the Venus Mine Tailings Site, for use by the Contractor and the Owner's site representative.
- .2 Inside dimensions for area to be used by Owner's site representative shall be minimum 3.6 m long x 3 m wide, by 2.4 m high, complete with 4-50% opening windows and one lockable door.
- .3 Equip office with 1 x 2 m table, 4 chairs, 6 m of shelving 300 mm wide, one 3-drawer filing cabinet, one plain rack and one coat rack and shelf.
- .4 Site office shall be insulated, and a heating system installed to maintain 22°C inside at -30°C outside temperature.
- .5 Install electrical lighting system to provide min. 750 lx using surface mounted, shielded commercial fixtures with 10% upward light component.
- .6 Arrange and pay for a communication system. Long distance calls placed on this phone by the Owner's site representative will be paid for by the Owner.
- .7 Maintain in clean condition.

4. PAYMENT

- .1 Payment for temporary facilities will be paid for by the Contractor under "costs to complete project".

1. **GENERAL**

- .1 Personnel safety, and reliable communications are of concern due to the remoteness of the site.

2. **CONSTRUCTION SAFETY MEASURES**

- .1 Observe and enforce construction safety measures required by the latest revisions of Canada Labour Code, Workers' Compensation Board, and applicable Occupational Health and Safety Regulations, Territorial and local statutes and authorities.

3. **SIGNAGE AND TRAFFIC CONTROL**

- .1 Erect construction signs as indicated on the contract drawings.
- .2 Maintain signs on a daily basis, including covering messages during periods of inactivity.
- .3 Post flag persons at the mine tailings site when hauling is being carried out.
- .4 Two flag persons shall be posted during periods of high tourist traffic. During winter months, with low vehicular traffic, flag persons will not be required.
- .5 Observe any regulations for flag persons required by the Yukon Highway Department.

4. **COMMUNICATIONS**

- .1 Establish a communications network for communications on site, with the nearest community and through long distance networks.
- .2 Flag persons shall be provided with portable radios suitable for communicating with each other, and with a base station located at the construction office.
- .3 Communication facilities in the field office shall be suitable for making long distance calls to Carcross, to Whitehorse and points south.

5. **MEASUREMENT FOR PAYMENT**

- .1 Work under this section will be paid for under "Costs to Complete Project".

1. **GENERAL**

- .1 The Contractor shall ensure that all applicable legislation, regulations, guidelines and codes of practice are followed.

2. **REFERENCES**

- .1 Although not necessarily limited to, some key environmental references are:
- .1 Canadian Environmental Protection Act (1988) CEPA.
 - .2 Occupational Health Regulations.
 - .3 "Guidelines for the Abandonment and Restoration Planning of Mines in the Northwest Territories", Northern Territories Water Board and Northern Territories Region Northern Affairs Program, Department of Indian Affairs and Northern Development, September 1990.
 - .4 "Guidelines for Tailings Impoundment in the Northwest Territories", February 1987.
 - .5 "Acid Rock Drainage Potential in the Northwest Territories: An Evaluation of Active and Abandoned Mines", Minister of Indian Affairs and Northern Development, Ottawa, 1994.
 - .6 MacLaren Plansearch, "Environmental Guidelines: Pits and Quarries", Minister of Indian Affairs and Northern Development, Ottawa, 1989.

3. **SUBMITTALS**

- .1 PWGSC will make necessary submittals for land use permit requirements directly to the responsible agency.

4. **ENVIRONMENTAL ASSESSMENT**

- .1 The environmental assessment for this project, prepared by DIAND, forms part of this contract.

5. **FIRES**

- .1 Fires and burning of rubbish on site permitted only on approval of the Owner's site representative.
- .2 Provide supervision, attendance and fire protection measures as directed.

1. **GENERAL**

1.1 **WORK INCLUDED**

- .1 This section specifies requirements for furnishing all materials and equipment and for performing all operations to install the steel sheet pile barrier walls including joint sealing procedures as shown on the Drawings. Sheet piling shall also be installed where required by the Contractor's method of construction and the existing conditions. This steel sheet pile barrier wall technology is described in a British Patent issued April 7th, 1993 (No. 2228760).
- .2 The Owner has undertaken a geotechnical survey of the site. Information contained in the test logs are generally indicative of the types of materials which will be encountered. Soils information is not available on the final selected alignment of the Waterloo Barrier. The supplier, as part of his overall cost, must undertake sufficient additional borings to determine the exact length of sheet piles required.
- .3 The Owner will specify the top elevation and configuration of the sheet piles, and will specify the criteria for acceptance of the bottom elevation of the piles.

1.2 **RELATED WORK**

- .1 Related work, specified in the "Scope of Work" section of the specifications includes:
 - .1 Excavation of wind blown tailings and levelling of the tailings pile.
 - .2 Screening, hauling, and placing capillary break material.
 - .3 Supply and installation of a geomembrane.
 - .4 Construction of a drainage outfall structure.

1.3 **REFERENCE STANDARDS**

- .1 American Society for Testing and Materials (ASTM):
 - .1 A 36 - Standard Specification for Structural Steel.
 - .2 A 328 - Standard Specification for Steel Sheet Piling.

- .3 A 572 - High Strength Low Alloy Columbium-Vanadium Steels of Structural Quality.
- .4 A 668 - Standard Specification for Steel Forging, Carbon and Alloy, for General Industrial Use.
- .2 American Welding Society (AWS). D1.1 - Structural Welding Code.
- .3 Canadian Standards Association:
 - .1 G40.20 General Requirements for Rolled or Welded Structural Quality Steel.
 - .2 G40.21 Structural Quality Steels.
- .4 Figures showing sections of the Waterloo Barrier™ are provided at the end of this section.

1.4 **SUBMITTAL**

- .1 Submit the following items for review by the Engineer:
 - .1 Certification: Provide documentation of agreement with Waterloo Barrier Inc. licensed installer (C3 Environmental, 519-648-3611, Breslau, Ontario) for provision of quality control services for the sheet pile installation and to complete joint sealing.
 - .2 Pile Installation Plan which outlines detailed pile placement, equipment used, splicing requirements and details, the method to achieve verticality within 1 percent, quality control measures, joint preparation prior to sealing and grout materials, mixing and placement.
 - .3 Mill test documentation for piling to be used on project.
 - .4 Manufacturer's data that indicates the structural properties of piling section(s) to be used, including I, S, Moment Capacity, thickness and width/depth dimensions.
 - .5 Proposed welding procedures and certification of welders.
 - .6 Proposed method of sealing ends between Waterloo Barrier and rock surface.

1.5 **COORDINATION**

- .1 Notify the Engineer at least 5 working days prior to beginning pile driving operations at any location. This will not relieve the Contractor of his responsibilities for performing the work in accordance with these specifications and contract drawings.

1.6 **QUALITY CONTROL**

- .1 The Quality Assurance Quality Control (QA/QC) program and joint sealing to be completed by Waterloo Barrier Inc. licensed installer (C3 Environmental, 519-648-3611, Breslau, Ontario).
- .2 Horizontal Alignment and Plumbness Tolerances: The maximum permissible horizontal tolerance in pile driving will be a deviation of not more than 150 mm (6 inches) from the plan location indicated on the Drawings.

2. **PART 2 - PRODUCTS**

2.1 **RELATED WORK**

- .1 Provide piling as manufactured by Canadian Metal Rolling Mills in Cambridge, Ontario, or other approved manufacturer under licence from Waterloo Barrier Inc.
- .2 A foot plate will be welded to the base of each female joint of the sealable sheet piling to prevent soil from entering the joint as the pile is driven into the ground. The fabrication and attachment of the foot plate will be the responsibility of the Site Contractor. Exact dimensions of the foot plate will be based on the final rolled sheet piles. The Contractor will make the necessary fabrication arrangement to assure manufacture of the foot plates does not delay the sheet pile installation.
- .3 If the Contractor chooses to drive sheet piles in doubles, a cone will be employed to prevent soil from entering the mated (centre) joint. The Contractor will be responsible for the fabrication and installation of the cone for each paired sheet pile set. Foot plates will be welded to the base of the female joint of the paired set as described in the preceding paragraph.
- .4 Minimum Section Properties of Piling:
 - .1 Thickness: 0.295 inches 7.5 mm

.2	Nominal Width:	22.25 inches	565 mm
.3	Section Area:	10.47 square inches	$6.7 \times 10^{-10} \text{ m}^2$
.4	Weight:	19.2 lbs./square foot	93.8 kg/m ²
.5	Radius of Gyration:	3.39 inches	86.1 mm

- .5 The sealant to be used to seal the Waterloo Barrier™ sheet pile wall will be a silica fume modified, thixotropic cementitious based grout, WBS Type 301 or approved equal.

3. EXECUTION

3.1 SHEET PILE INSTALLATION

- .1 Handling Sheet Piles:
- .1 Lift in a manner which will not cause excessive bending stresses.
 - .2 Do not damage sheet piles in either handling or installing operations.
 - .3 The joint of each sheet pile will be visually inspected by the Contractor prior to installation. Any foreign material will be removed and damaged joints and/or sheet piles will be rejected.
 - .4 Replace or repair sheet piles which are damaged during installation.
- .2 Location and Tolerances:
- .1 Drive piles vertically and in correct alignment so that the top of the wall lies on a straight line and ensure a proper interlocking throughout the entire length of the piles.
 - .2 Sheet pile locations on the Drawings are approximate and will be field located when appropriate and when approved by the Engineer.
 - .3 Deviation in horizontal alignment will not exceed 10 degrees at each joint.
 - .4 The maximum permissible vertical tolerance (plumbness) in the pile installation will not be greater than a deviation of 1/16 inch per 1 foot vertical. The integrity of the interlock between

adjacent pile will be verified by flushing the joint. Joint inspection and flushing will be performed by the Quality Control Engineer.

- .3 The Contractor will use suitable templates to ensure alignment and plumbness during driving.
- .4 Pile Installation:
 - .1 Install piles with equipment suitable for the conditions encountered. The method and equipment selected will install the piling to the design depths as shown on the Drawings and minimize damage to each end of piling and adjacent interlocks. Suitable procedures must be employed to prevent damage to the pile tops and joints.
 - .2 Prevent and correct any tendency of the sheet piles to bend, twist or rotate, and to pull out of interlock. The integrity of each pile and interlocked joint must be maintained during and after driving.
 - .3 Top of pile at elevation of cut-off will be within 2 inches (50 mm) of the specified alignment. Manipulation of piles to force them into position will not be permitted. Piles will be checked for heave. Piles found to have heaved will be redriven to the required point elevation.
 - .4 Piles damaged or driven outside the above tolerances will be replaced. Any sheet pile ruptured in the interlock or otherwise damaged during installation will be immediately pulled and replaced.
 - .5 Piles will be driven not deeper than 1 foot (300 mm) of the specified depths for each location. The Contractor will take the necessary precautions to assure adjacent piles do not penetrate deeper during pile installation.
 - .6 Pull any sheet piling that are known to have pulled out of the interlock or are suspected of having tip or interlock damage, as determined by the Quality Control Engineer, and pull for visual inspection before proceeding further.
 - .7 Splicing is permitted if shown on the Drawings or as approved by the Engineer.

- .8 Make splices using a full penetration weld or as otherwise directed by the Engineer for structural purposes.
- .9 Space between the end section of Waterloo Barrier, and rock face are to be sealed.

3.2 JOINT SEALING

- .1 All sheet pile joints are to be sealed. Joint sealing is to be completed by Waterloo Barrier Inc. licensed installer (C3 Environmental, 519-648-3611, Breslau, Ontario).
- .2 Joint sealing will not be performed adjacent to sheet pile installation within a radius of the length of a sheet plus 10 feet (3 mm) from the sheet piling installation point.
- .3 After sheet piling has been installed in the ground all sealable cavities will be checked by probing and flushing of the joints with pressurized water to remove any remaining loose material.
- .4 During the flushing, a hose or pipe will be inserted into the sealable cavity and advanced downward. The hose will allow soil particles to travel up and out of the cavity.
- .5 The flushing operation will be considered complete when the hose has been passed to the base of the sealable cavity and the water escaping from the top of the joint is reasonably clean. The flushing hose may then be removed from the cavity.
- .6 A tremie hose or tube for pressure injection of the sealant will be inserted into the sealable cavity. When the tube has reached the bottom of the hole, sealant injection will begin. The hose will be withdrawn progressively up the hole as the sealant fills the space below. Keep tremie nozzle at least 6 inches (150 mm) below rising surface of sealant.
- .7 The speed at which the injection tube is withdrawn must be carefully regulated to prevent trapping water bubbles within the sealant and to ensure there is adequate sealant to fill the cavity.

3.3 RECORDS

- .1 Provide accurate records of each sheet pile driven. Submitted records will include the following information:

- .1 Pile identification number.
 - .2 Date and time of driving.
 - .3 Model of hammer and energy rating.
 - .4 Elevation of top of pile.
 - .5 Length of sheet pile in the ground when driving is complete.
 - .6 Rate of penetration in feet/minute.
 - .7 Detailed remarks concerning alignment, obstructions, etc.
 - .8 Plumbness records of each sheet pile installed.
 - .9 Joint flushing records for each joint installed.
- .2 Mark waterproof identification number clearly visible on each sheet pile, within 2 feet (600 mm) from the top of pile.
 - .3 Spray paint all sheet piles rejected from the work for any reason, at the time of rejection, with the letter "X" within 3 feet (1 m) of both ends.
 - .4 Provide accurate sealant installation records. Submitted records will include the following information:
 - .1 Joint identification number.
 - .2 Date and time of sealing operation.
 - .3 A complete list of the equipment used during the installation.
 - .4 Volume of sealant required to seal each joint.

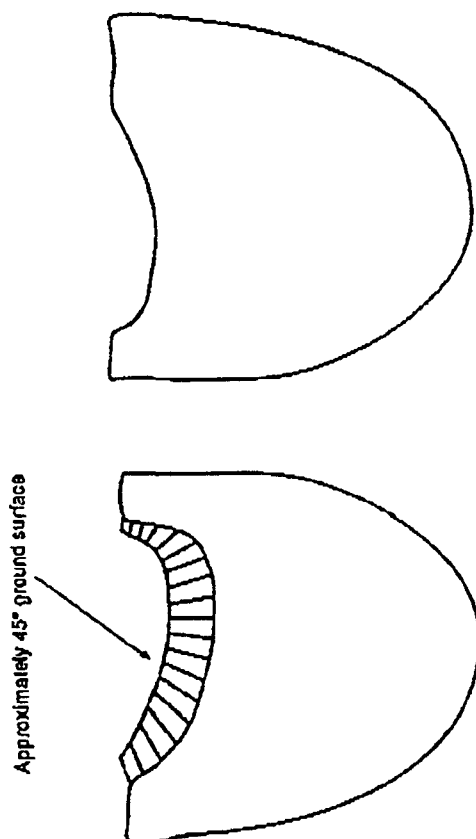
4. **REJECTION**

- 4.1 If rejected from the work because of deviation from location, plumbness requirements, excessive bending, twisting, or pulling out of interlock, or other reasons, take suitable corrective action at no additional cost to the Owner. Suitable action includes extracting, and furnishing and driving of replacement sheet piles, so that all sheet piles installed meet the requirements of this Specification.

5. **MEASUREMENT FOR PAYMENT**

- 5.1 Payment for supply and installation of the Waterloo Barrier shall be made on the basis of a proposal to be submitted by the supplier, which shall include as a minimum the following breakdowns:
 - .1 Mobilization and fixed costs.
 - .2 Accommodation, travel and communications expenses.
 - .3 Quality assurance/quality control inspection services.

- .4 Waterloo Barrier, Sheet Piling supply and preparation. This cost to be quoted on a square foot basis.
- .5 Waterloo Barrier, Sheet Pile Installation - this cost to be quoted on a per linear foot basis, to include any preparation work, and final clean up. Price to also include any support material outside of the containment area to provide stability.
- .6 Waterloo Barrier Sheet Pile Joint Sealing - price to include sealing both ends to adjacent rock faces.

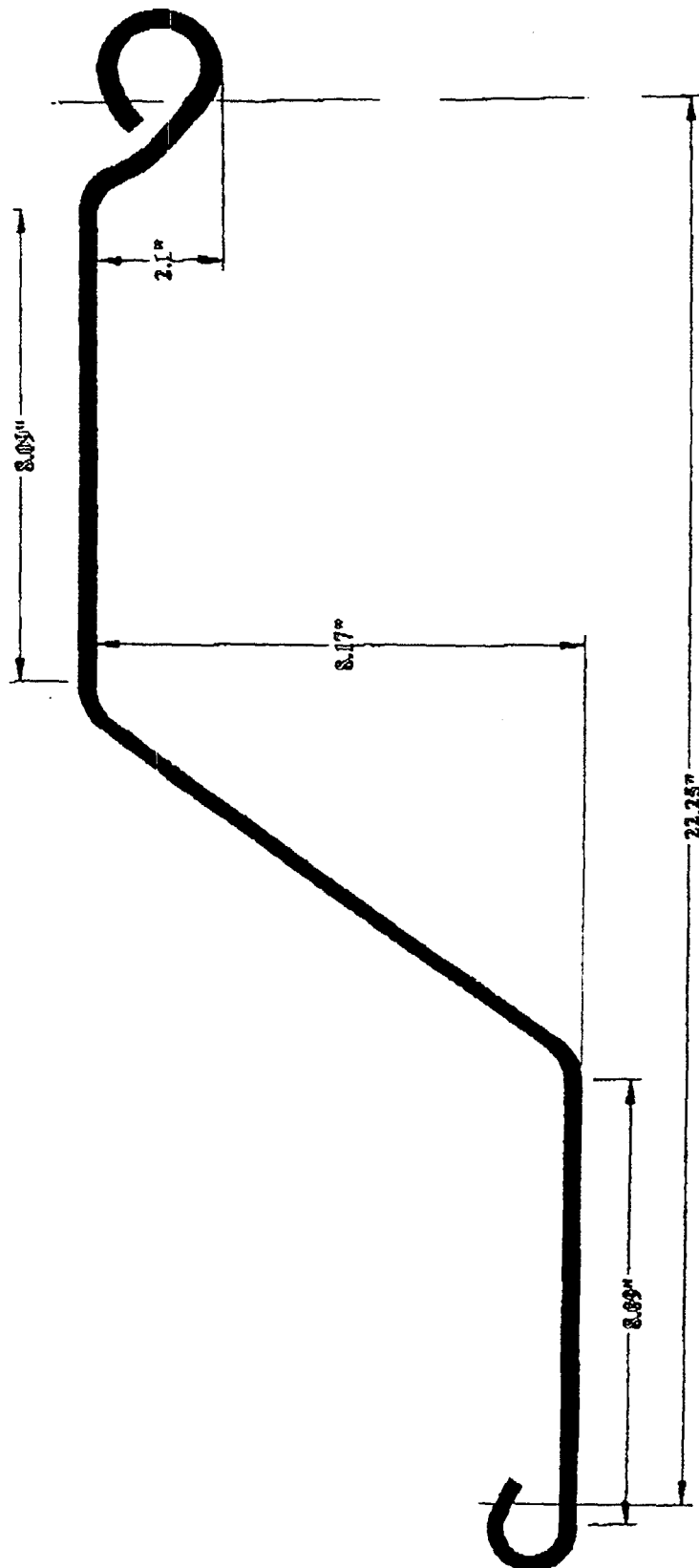


ACTUAL SIZE

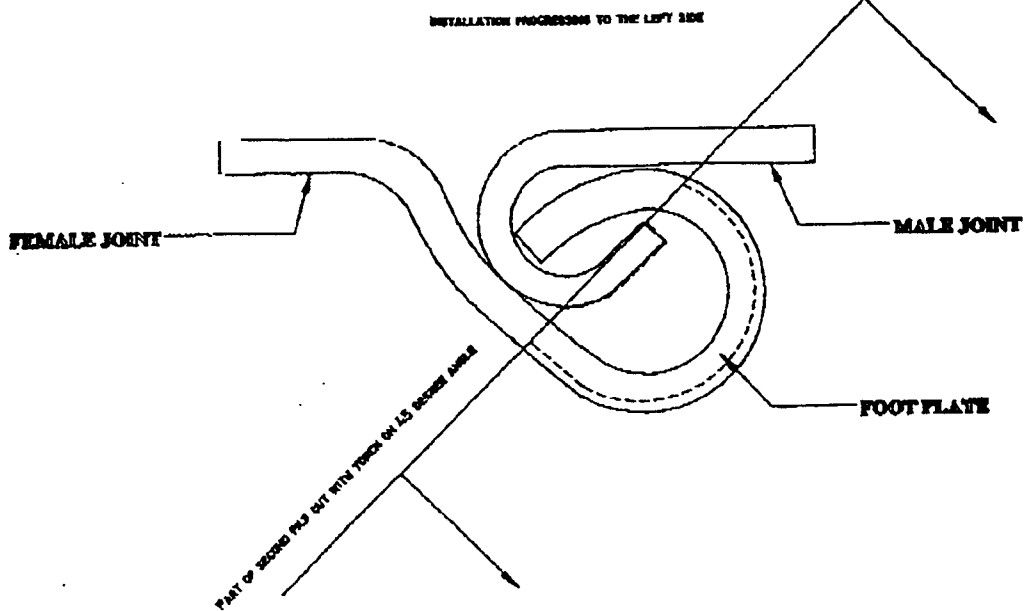
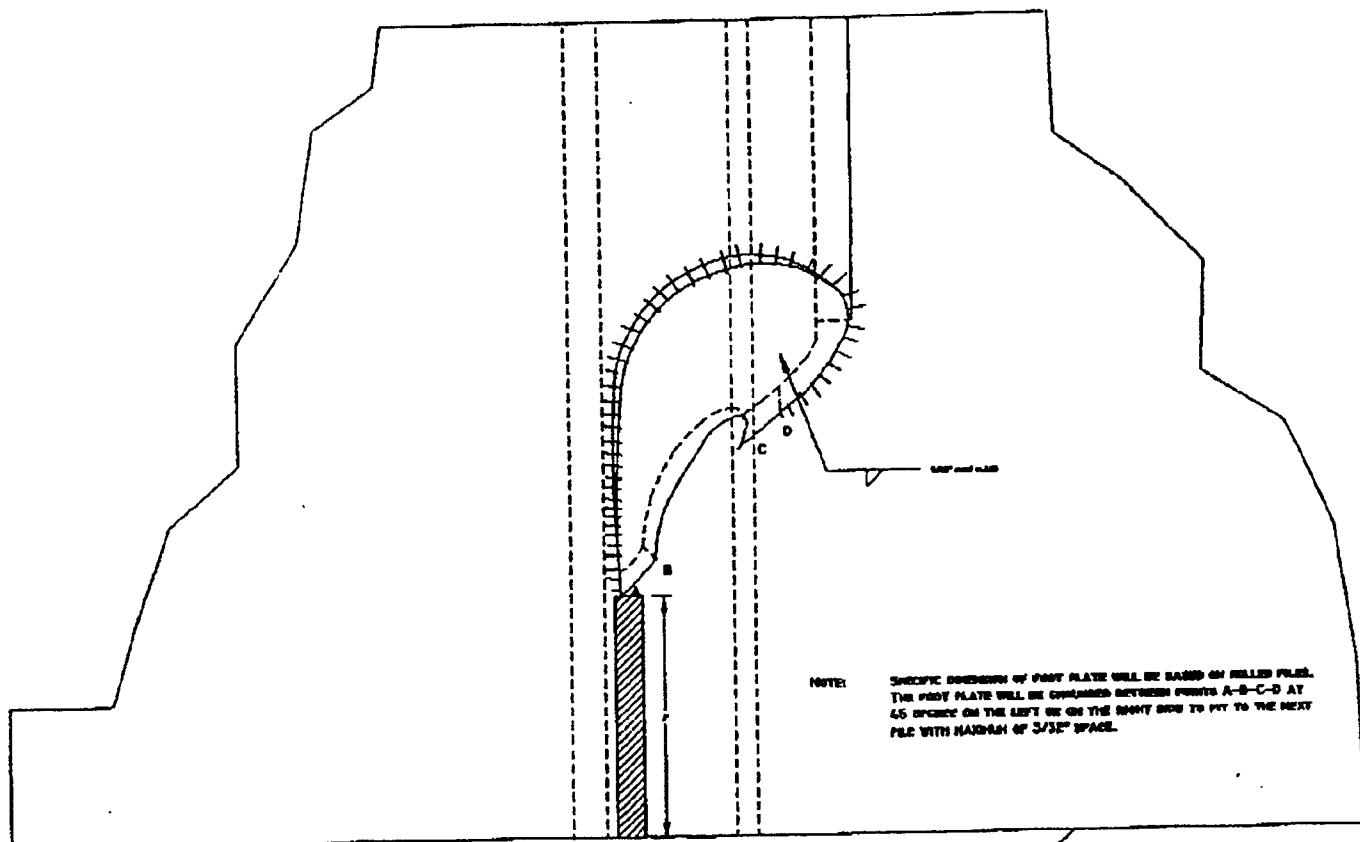
C3 ENVIRONMENTAL LIMITED • BRESLAU, ONTARIO

FOOT PLATE CONFIGURATION

DATE: 10/12/94 SCALE: N.T.S. DRAWN BY: MLE



C3 ENVIRONMENTAL LIMITED - BRISLAU, ONTARIO
STANDARD WATERLOO BARRIER SHEET PILE SECTION
DATE: 14/12/94 SCALE: N.T.S. DRAWN BY: MLE



CS ENVIRONMENTAL LIMITED - BURLINGTON, ONTARIO		
FOOT PLATE WELD DETAIL		
DATE: 1/12/94	SCALE: NTS	DRAWN BY: MLE

1. **SCOPE OF WORK**

- 1.1 The scope of work under "Collection and Disposal of Debris at the Venus Mine Tailings Site" includes the supply of labour and equipment necessary to collect and dispose of (by burning) wood debris at the Venus Mine Tailings Site, sealing the decant pipe, and cutting and disposing of brush within the work area.

2. **METHODOLOGY**

- 2.1 All loose wood debris located on the mine tailings shall be collected, piled on the mine tailings site and burned.
- 2.2 All scrub brush located in work areas shall be cut to ground level, collected and burned at the mine tailings site.
- 2.3 Ashes from burning are to be collected and spread over the tailings.
- 2.4 The Contractor shall be responsible for obtaining any necessary burning permits, and for compliance with any local or territorial by laws or codes with request to burning.
- 2.5 The decant pipe located in the work area shall be sealed at its inlet, and at the location where the decant pipe crosses the Waterloo Barrier. Sealing may be accomplished by use of lean mixed concrete or any other means proposed by the Contractor and accepted by the Engineer.

3. **MEASUREMENT FOR PAYMENT**

- 3.1 Work under this section will be paid for at the lump sum price bid for "Collection and Disposal of Debris, Disposal of Brush, and Sealing Decant Pipe".

1. **SCOPE OF WORK**

- 1.1 The scope of work under "Excavate Wind Blown Tailings, and Level Existing Mine Site" includes excavating wind blown tailings outside the containment area, excavating tailings at the outfall (breech), and levelling the site to the design grade.

2. **METHODOLOGY**

- 2.1 Scrub brush, debris, and the existing pipe is to be removed and disposed of.
- 2.2 Wind blown tailings in the area designated shall be picked up, transported to the tailings area, dumped, and spread out.
- 2.3 Excavation in areas designated as wind blown tailings to be removed to a depth of 0.3 metres.
- 2.4 Tailings in the outfall area to be removed to a depth of one meter, loaded, hauled to low areas in the tailings pile, and spread.
- 2.5 The entire mine tailings area is to be levelled to elevation 82.5.
- 2.6 Compaction in low areas shall be achieved by the judicious routing of contractors equipment, aided with a wobbly wheel packer.
- 2.7 Final compaction shall be achieved by the judicious routing of contractors equipment, plus a minimum of 3 passes with an 8 to 10 tonne wobbly wheel packer. Compaction shall be deemed acceptable only after a minimum of 3 passes, and when the surface is free from ruts caused by the compaction equipment.
- 2.8 Concurrent to levelling and compaction, the entire surface is to be graded to a smooth flat surface, within 25 mm of the established grade, but not uniformly high or low.

3. **MEASUREMENTS FOR PAYMENT**

- 3.1 Payment for cleaning up wind blown tailings, excavation of tailings in the outfall area, and for levelling and compacting the entire mine site area will be made at the unit price bid to supply and labour and equipment under three (3) categories as follows:
- .1 Clean up wind blown tailings and excavate tailings in the outfall area, will include all costs related to excavating material outside the

Waterloo Barrier.

- .2 Levelling the tailings area will include all costs related to excavation and movement of material inside the Waterloo Barrier.
- .3 Levelling and compaction will include all costs related to achieving specified grade and compaction requirements.

1. **SCOPE OF WORK**

- 1.1 The scope of work under "Supply and Placement of a Silty Clay Cap" includes loading, hauling, weighing, and placing silty clay materials from a "landfarm" located approximately 2 Km north of Carcross.

2. **METHODOLOGY**

- 2.1 Material to be used to construct a cap over the tailings consists of silty clay material which is currently being landfarmed at a site located approximately 2 Km north of Carcross.
- 2.2 Following excavation of wind blown tailings, site levelling, and placement of geotextile, clay materials to be used as a cap are to be loaded, hauled, weighed, and placed over the geotextile membrane.
- 2.3 Placement of cap material is to be undertaken by spreading silty clay to a depth of 200 mm, levelling and compacting the final surface.
- 2.4 Compaction shall be achieved by the judicious routing of construction equipment, plus a minimum of 3 passes with an 8 to 10 tonne wobbly wheel packer. Compaction shall be deemed acceptable only after a minimum of 3 passes and when the surface is free of ruts caused by the compaction equipment.
- 2.5 The final grade shall be within 25 mm of the design grade, but not uniformly high or low.
- 2.6 Following completion of hauling cap materials, the original "landfarm" site is to be smoothed, to a degree that no ponding occurs on the surface.

3. **MEASUREMENT FOR PAYMENT**

- 3.1 Silty clay material to be used as a cap, shall be loaded, hauled, placed, compacted, and graded. Price to include all labour and equipment necessary to construct a silty clay cap, and to smooth the source site, and shall be based on the unit price tendered, per cubic metre, measured "in place", for capping material.

1. **SCOPE OF WORK**

- 1.1 The scope of work under this section covers the supply and installation of a non woven geotextile.

2. **MATERIALS**

- 2.1 Geotextile to be utilized shall be Nilex Geotextile, designation 4551 (C24) or approved equivalent.

3. **METHODOLOGY**

- 3.1 Installation shall be in accordance with manufacturer's guidelines.
- 3.2 Geotextile shall be placed directly over the tailings.

4. **MEASUREMENT FOR PAYMENT**

- 4.1 Non woven geotextile shall be paid for at the unit price tendered per square metre for non woven geotextile, and shall include all costs related to supply, freight, and installation of the material in accordance with plans and specifications.

NILEX GEOTEXTILES

Nilex Offices:
 Vancouver: (604) 20-6443
 Edmonton: (403) 604-463-9535
 Calgary: (403) 604-236-8385

NILEX

TYPICAL VALUES - METRIC

Property	Test Method	Units	Nonwoven Geotextiles							Woven Geotextiles							
			4535 C10	4545 C14	4551 C24	4553 C34	4557 C54	4561	4599 AmoPave	2000 P100	2002 P500	2006 P600	2016	2044	1188	1199	1380 Silt Stop
Grab Tensile Strength	ASTM-D-4632	N	374	490	779	1068	1455	1687	485	●712	●1024	●1513	●1590	●3000 ▲960	●1429 ▲1268	●1691 ▲1268	●1046
Grab Tensile Elongation	ASTM-D-4632	%	70	70	70	70	70	70	66	●24	●22	●22	●22	●22	●32	●36	●26
Mullen Burst	ASTM-D-3786	kPa	1419	1826	2633	3618	4962	6850	1716	2519	2963	4376	5920	10000	3205	3653	2929
Puncture	ASTM-D-4833	N	215	356	520	700	912	1522	330	356	445	623	623	745	623	668	490
Trapezoid Tear	ASTM-D-4533	N	128	227	338	467	600	1055	205	356	490	668	670	1560	400	400	400
UV Resistance	ASTM-D-4355	%	85	85	85	85	85	70	70	70	70	70	80	80	90	90	80
Apparent Opening Size	ASTM-D-4751	um	115	100	100	75	75	50	n/a	212	212	212	212	150	212	150	300
Permittivity	ASTM-D-4491	sec ⁻¹	2.7	2.5	1.9	1.5	1.1	0.7	n/a	0.04	0.04	0.02	0.55	0.15	0.5	0.04	0.4
Flow Rate	ASTM-D-4491	L/s/m ²	200	169	121	92	65	34	n/a	3.4	3.4	1.7	40	12	34	4	36
Unit Weight		g/m ²	125	175	230	285	400	455	125	125	180	230	256	425	177	177	234
Thickness		mm	1.2	1.7	3.0	3.2	4.3	5.4	1.5	0.45	0.5	0.6	0.7	0.9	0.6	0.6	0.7

● Warp ▲ Fill Amoco Product Number Nilex Product Number

The above geotextiles are manufactured for Nilex by Amoco Fabrics and Fibers Company.

DEFINITION: *Typical Value*

Since various companies perform their "typical value" tests differently, it is difficult to define the method used to obtain a Typical Value. Generally, the *Typical Value* is the average (arithmetic mean) value of an indeterminate number of sample tests (I.E. Could be the average of 2 samples or of 2000 samples). *Typical Values* should therefore be used only if *Minimum Average Roll Values* are not available.

Disclaimer: The information presented herein, while not guaranteed, is to the best of our knowledge true and accurate, and the recipient assumes all responsibility for its use. No warranty, expressed or implied, is made regarding the performance of any product, as the manner of use and handling are beyond our control. Nothing contained herein is to be construed as permission or as a recommendation to infringe any patent.

GEOTEXTILES IN SEPARATION APPLICATIONS GUIDE SPECIFICATION

DESCRIPTION

This work shall consist of furnishing and placing a geotextile for use as a permeable separator to prevent inter-mixing of dissimilar materials such as: subgrades and surfaced or unsurfaced pavement materials; and foundations and select fill materials. The geotextile shall be designed to allow passage of water while retaining in-situ soil. This specification does not address geotextiles used for reinforcement.

MATERIAL REQUIREMENTS

Geotextile: The geotextile shall be composed of synthetic fibers formed into a woven or nonwoven fabric. Fibers used in the manufacture of the geotextile shall be composed of at least 85 percent by weight polyolefins, polyesters, or polyamides. The geotextile shall be free of defects or flaws which significantly affect its physical properties. The geotextile shall meet the requirements of Table 5-1. The choice of a geotextile for this application is determined by the ability of the geotextile to survive installation stresses as shown in Table 5-2.

CONSTRUCTION AND INSTALLATION REQUIREMENTS

Geotextile Shipment/Storage: The geotextile rolls shall be furnished with suitable wrapping for protection against moisture and extended ultraviolet exposure prior to placement. Rolls shall be stored in a manner which protects them from the elements. If stored outdoors, they shall be elevated and protected with a waterproof cover. At no time shall the geotextile be exposed to ultraviolet light for a period exceeding fourteen days. The geotextile rolls shall be labeled as per ASTM D 4873, "Guide for Identification, Storage, and Handling of Geotextiles".

Site Preparation: The installation area shall be prepared by clearing all debris or obstructions which may damage the geotextile. Trees and large bushes should be cut at ground level. In most cases, all native vegetation, roots and topsoil must be removed from the roadway subgrade prior to geotextile placement. Where required by the contract documents, soft and otherwise unsuitable subgrade areas shall be identified, excavated and backfilled with select material in accordance with the contract documents. Stabilization of these areas may be enhanced by use of a geotextile at the bottom of the excavation before backfilling. However, when designed for soft or wet subgrade conditions, native vegetation, roots and topsoil may be left in place so as to limit disturbance and resulting shear strength loss of the subgrade soil.

Geotextile Placement: The geotextile shall be unrolled as smoothly as possible on the prepared subgrade in the direction of construction traffic. Geotextile rolls shall be overlapped in the direction of subbase placement. The geotextile shall be overlapped or seamed in accordance with the minimum requirements provided in Table 5-3. Sewing is recommended where subgrade soils exhibit a CBR less than 0.5 and is preferred where subgrade soils exhibit a CBR greater than 0.5 but less than or equal to one.

If required, the geotextile may be held in place prior to subbase placement with pins, sand bags, or piles of fill or rock. On curves, the geotextile may be folded or cut to conform to the curve as illustrated in Figure 5-1. If site conditions require geotextile seaming, the geotextile shall be cut and seamed on the curve. The fold or overlap shall be in the direction of construction and shall be held in place as prescribed above. The geotextile shall not be dragged across the subgrade.

Damaged geotextiles, as identified by the engineer, shall be repaired immediately. The damaged area plus an additional three feet around the damaged area shall be cleared of all fill material. A geotextile patch extending three feet beyond the perimeter of the damage shall be constructed as directed by the engineer. Sewing of a geotextile patch may be required over soft subgrades as directed by the engineer. Damaged geotextile shall be repaired at no cost to the owner.

Aggregate Placement: The aggregate base or subbase (aggregate) shall be placed by end dumping adjacent to the geotextile or over previously placed aggregate. End dumping or tail gate dumping of aggregate on the geotextile will not be permitted. The aggregate shall be spread from the backdumped pile using a bulldozer or motor grader. A sufficient thickness of aggregate should be in place prior to dumping to minimize the potential of subgrade pumping and localized subgrade failure.

The aggregate shall be placed on the geotextile in lifts not less than 6-in. thick. For low volume roads, the minimum lift may be reduced to a 4-in. thickness at the discretion of the engineer. Traffic shall not be permitted directly on the geotextile. Sudden stops or turns by equipment operating on aggregate placed over the geotextile shall be avoided. A smooth drum roller shall be used to achieve specified aggregate density. Any ruts occurring during construction shall be filled with additional aggregate and compacted to the specified density. Vibratory compaction shall not be used on the initial lift over the geotextile.

METHOD OF MEASUREMENT

Geotextile: The geotextile shall be measured by the number of square yards from the payment lines shown on the plans or from the payment lines established in writing by the engineer. This excludes seams and overlaps. Excavation, backfill, bedding, and cover material are separate pay items.

BASIS OF PAYMENT

Geotextile: The accepted quantities of geotextile shall be paid for at the contract unit price per square yard in place.

TABLE 5-1
 PHYSICAL REQUIREMENTS^{1, 2, 3}
 GEOTEXTILES IN SEPARATION APPLICATIONS

Property	Units	Required Values		Test Method
		Medium Survivability ⁴	High Survivability ⁴	
Tensile Strength	lbs	180	270	ASTM D 4632
Elongation	%	50	50	ASTM D 4632
Seam Strength	lbs	160	240	ASTM D 4632
Puncture Strength	lbs	70	100	ASTM D 4833
Trapezoid Tear Strength	lbs	70	100	ASTM D 4533
Permitivity	1/sec	.02 ⁽⁵⁾	.02 ⁽⁵⁾	ASTM D 4491
Apparent Opening Size	U.S. Standard Sieve	(6)	(6)	ASTM D 4751
Ultraviolet Stability ⁷	%	70	70	ASTM D 4355

Notes:

1. Conformance of geotextiles to specification property requirements shall be determined according to ASTM D 4873, "Guide for Identification, Storage, and Handling of Geotextiles".
2. Contracting agency may require a letter from the manufacturer certifying that its geotextile meets specification requirements.
3. All numerical values, except those of elongation, represent minimum average roll values (i.e., average test results from any sampled roll in a lot shall exceed the minimum average roll values) in weaker principal direction. Values of elongation represent maximum average roll values. Lot sampled according to ASTM D 4354, "Practice for Sampling Geosynthetics for Testing".

(Table 5-1 continued)

4. Recommended survivability ratings are provided in Table 5-2.
5. Permittivity shall be greater than the specified minimum value and result in a geotextile permeability which is greater than the permeability of the subgrade soil.
6. Minimum #30 U.S. Standard Sieve (maximum 0.6mm) for subgrade soils with 50 percent or greater particles by weight passing the #200 U.S. Standard Sieve. Minimum #50 U.S. Standard Sieve (maximum 0.297mm) for subgrade soils with more than 50 percent particles by weight passing the #200 U.S. Standard Sieve. Design apparent opening size to be selected by the design engineer based on site soil and groundwater conditions.
7. Percent of tensile strength retained as evaluated using ASTM D 4632, "Test Method for Breaking Load and Elongation of Geotextiles (Grab Method)" after conditioning for 500 hours.

TABLE 5-2
CONSTRUCTION SURVIVABILITY RATINGS^{1, 2, 3, 4}

Subgrade CBR At Installation	<1		1-2		>2	
Equipment Contact Pressure (psi)	>50	<50	>50	<50	>50	<50
Compacted Aggregate Thickness (in) ⁽⁵⁾						
4 ⁽⁶⁾	NR	NR	H	M	M	M
6	NR	NR	H	H	M	M
12	NR	H	M	M	M	M
18	H	M	M	M	M	M

Notes:

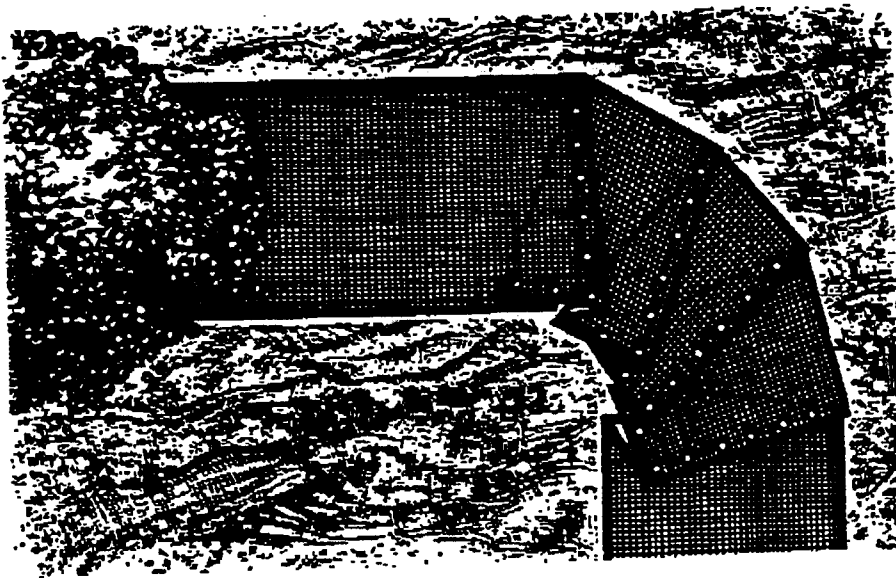
1. From "Geotextile Design and Construction Guidelines", Federal Highway Administration, Publication No. FHWA-HI-90-001, October 1989.
2. H - HIGH
3. M - MEDIUM
4. NR - NOT RECOMMENDED
5. Maximum aggregate size not to exceed one half the compacted thickness.
6. The four inch minimum cover is intended for existing road bases and not intended for use in new construction.

TABLE 5-3
SEAM RECOMMENDATIONS^{1,2}

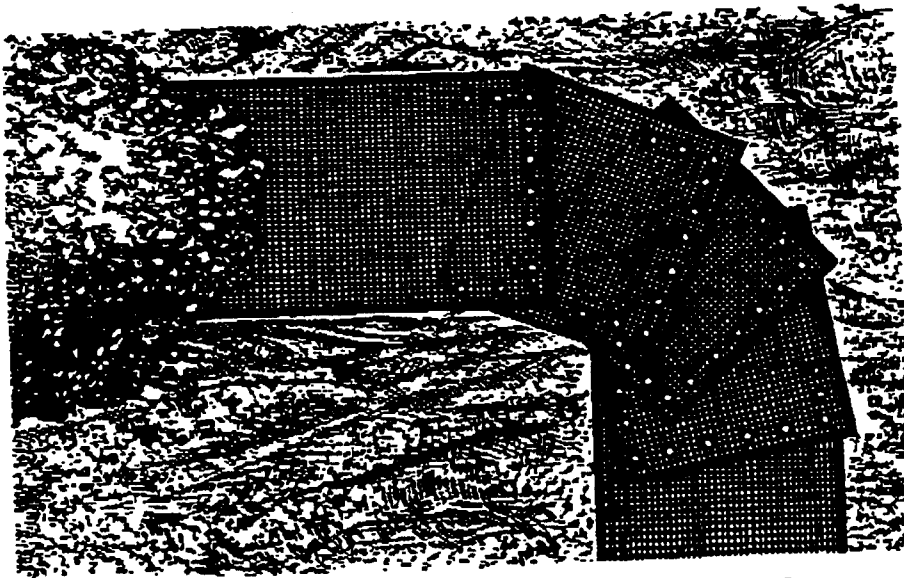
Overlap Location	Soil Strength (CBR)	Minimum Overlap (ft)
Overlap of adjacent geotextile rolls	<0.5	3 ⁽³⁾
	$\leq 1 > 0.5$	3 ⁽⁴⁾
	≤ 2	2.5 ⁽⁵⁾
	> 2	1.5 ⁽⁵⁾
Overlap of geotextile roll ends	≤ 0.5	3 ⁽³⁾
	> 0.5	3 ⁽⁵⁾

Notes:

1. Adapted from Task Force 25 and "Geotextile Design and Construction Guidelines," Federal Highway Administration Publication No. FHWA-HI-90-001, October 1989.
2. Overlap requirements are not applicable to sewn seams.
3. Overlaps are not recommended for soil CBR less than 0.5.
4. Sewn seams of adjacent geotextile rolls are preferred for soil CBR greater than 0.5 but less than or equal to one.
5. Sewn seams are acceptable for all soil CBRs.



A. FORMING A CURVE USING FOLDS



B. FORMING A CURVE USING CUT PIECES

Figure 5-1 PLACEMENT OF SEPARATION GEOTEXTILE
ON CURVES [FHWA, 1989]

(Note: o - indicates locations of pins, sandbags, piles of fill or rock, or other means of temporarily anchoring geotextile. Anchors shall be placed on 2 feet centers minimum.)

1. **SCOPE OF WORK**

- 1.1 The scope of work under "Capillary Break Material" includes the loading, hauling, weighing, placing, grading, and compacting of granular materials.

2. **METHODOLOGY**

- 2.1 Material for use as a capillary break material shall be screened pit run stone or gravel, meeting the following gradation:

Sieve Designation	% Passing
75 mm	100%
25 mm	60 to 100%
12.5 mm	38 to 70%
0.075 mm	2 to 10%

Material to be tested to ASTM C136 and ASTM C117; sieve sizes up to CAN/CGSB-8.1.

- 2.2 Screened pit run material is to be loaded, hauled, weighed at the mine site, and spread over the clay cap.
- 2.3 Material shall be placed in one 300 mm (compacted) lift.
- 2.4 Compaction shall be achieved by the judicious routing of construction equipment, plus a minimum of 3 passes with an 8 to 10 tonne steel roller.
- 2.5 The final surface shall be graded and compacted to a flat, firm surface, within 25 mm of the established grade, but not uniformly high or low.
- 2.6 Material is to be placed on clean, unfrozen surfaces, free from ice or snow.
- 2.7 Material shall not be frozen when placed.

3. **MEASUREMENT FOR PAYMENT**

- 3.1 Capillary break material shall be paid for at the unit price tendered per cubic metre, measured in place. Price to include all labour and equipment to load, haul, grade, compact, and place the material to the level indicated on the contract drawings.

1. **SCOPE OF WORK**

- 1.1 The scope of work under this section includes the supply and placement of pitrun aggregate for use as a fill at the outfall, outside of the Waterloo Barrier.

2. **METHODOLOGY**

- 2.1 Material to be used for fill outside the Waterloo Barrier, shall consist of pitrun aggregate, with 100% passing a 200 mm screen.
- 2.2 Screened material shall be loaded, hauled, and placed at the outfall.
- 2.3 Material shall be placed in layers not exceeding 500 mm and compacted with spreading equipment (dozer).
- 2.4 The final surface shall be at the design grade at the Waterloo Barrier, and sloped to blend with existing terrain.

3. **MEASUREMENT FOR PAYMENT**

- 3.1 Material used for fill at the outfall shall be paid for at the unit price tendered, per cubic metre, measured in place. Price to include all labour and equipment necessary, to screen, load, haul, weigh, and place material at the outfall.

1. **SCOPE OF WORK**

- 1.1 The scope of work under this section includes supply and installation of piping and end sections at the drainage outfall.

2. **METHODOLOGY**

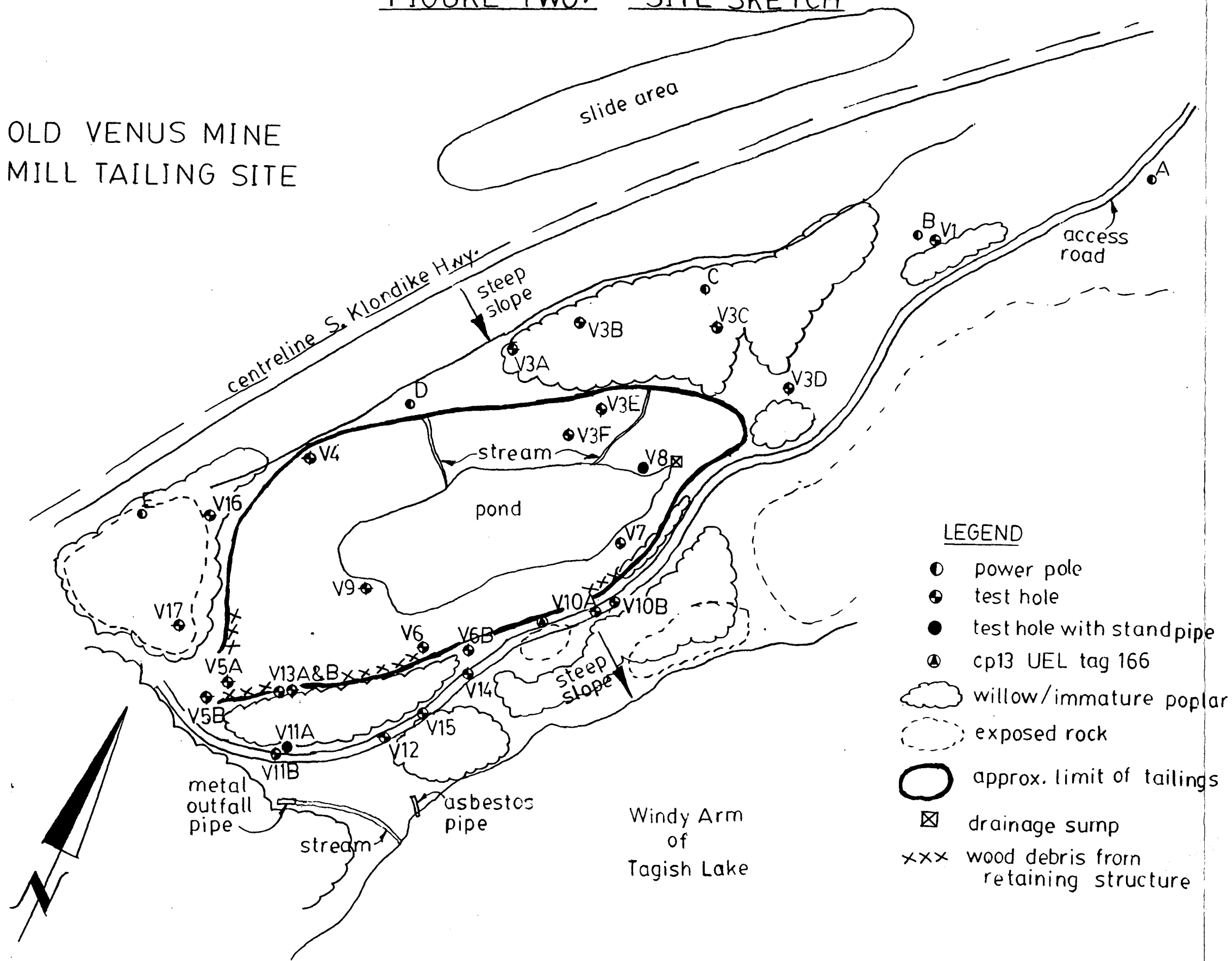
- 2.1 Water discharging from the tailings shall be collected by means of a galvanized steel end section for round pipe.
- 2.2 Pipe shall be supplied to the configuration shown on the drawings and shall be 600 mm corrugated metal pipe.
- 2.3 Galvanized steel end sections for round pipe shall be installed at both ends.
- 2.4 Pipe and end section leaving the outlet shall be supported by pitrun gravel, maximum size 200 mm.
- 2.5 Pipe at the discharge section shall be covered with a minimum of 300 mm native material and compacted to the density of adjacent undisturbed material.

3. **MEASUREMENT FOR PAYMENT**

- 3.1 Payment for constructing the outfall structure will be at the lump sum price tendered for constructing the drainage outfall structure. Price to include all labour, equipment and materials, except for 200 mm pitrun aggregate which will be paid for as a separate item.

FIGURE TWO: SITE SKETCH

OLD VENUS MINE
MILL TAILING SITE



LEGEND

- power pole
- test hole
- test hole with stand pipe
- ⊙ cp13 UEL tag 166
- ☁ willow/immature poplar
- - - exposed rock
- approx. limit of tailings
- ⊠ drainage sump
- xxx wood debris from retaining structure

 J. R. Paine & Associates Ltd. CONSULTING AND TESTING ENGINEERS	
VENUS MINE TAILINGS TESTING AND DRILLING PROGRAM KM 86.5 AND KM 97.5 SOUTH KLONDIKE HIGHWAY	
Dwn. By MEB	Date 1995/07/05
Scale 1:1500	Plate No. 1 of 1

Public Works Canada Environmental A&ES		Venus Mine Tailings Site		BOREHOLE NO: V1	
Drilled using CME 75 track mounted rig		V1 located adjacent to power pole "B"		PROJECT NO: 8054-12	
with solid stem augers		(see site sketch)		ELEVATION:	
SAMPLE TYPE ☒ TUBE ☐ LOST ☒ AUGER ☐ BULK ☐ SPT ☐ CORE					
BACKFILL TYPE ☒ BENTONITE ☐ PEA GRAVEL ☐ SLOUGH ☐ GROUT ☐ DRILL CUTTINGS ☐ SAND					

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	PLASTICITY INDEX			SOILS DESCRIPTION				USC	SOIL SYMBOL	ELEVATION(m)
				10 20 30 40			20	40	60	80			
				10 20 30 40									
				PLASTIC	M.C.	LIQUID							
0.0	☒ T48						GRASS COVER				PT		0.0
0.05							GRAVELLY SANDY SILT -auger action indicates cobbles and possibly boulders present, chipped rock in sample, dry, light brown, loose,				ML		-1.0
1.7							SILTY CLAY -some sand, trace gravel, stiff, traces of oxidation around gravel and sand, moist, brown, -becomes wet and soft at 3.0 m				CL-ML		-3.0
3.0	☒ T49						END OF HOLE @ 3.0M						-4.0
3.0							NOTES: -waste rock to 1.7 m						-5.0
4.0													-6.0
5.0													-7.0
6.0													-8.0
7.0													-9.0
8.0													-10.0
9.0													-11.0
10.0													-12.0
11.0													-13.0
12.0													-14.0

J.R. Paine & Associates Ltd. Whitehorse, Yukon		LOGGED BY: MEB	COMPLETION DEPTH: 3.0 m
		REVIEWED BY: WCK	COMPLETE: 95/06/15
		Fig. No: 1	Page 1 of 1



J. R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

SCREEN ANALYSIS

Sample: T48 Depth: 0.3m-0.5m
Location: Tailings Area, Test Hole V1

Client: PWGSC, A & ES
Project: Venus Mines Reclamation
Made by: P.R. Job No.: 8054-12
Ck'd by: M.B. Date: 95/06/23

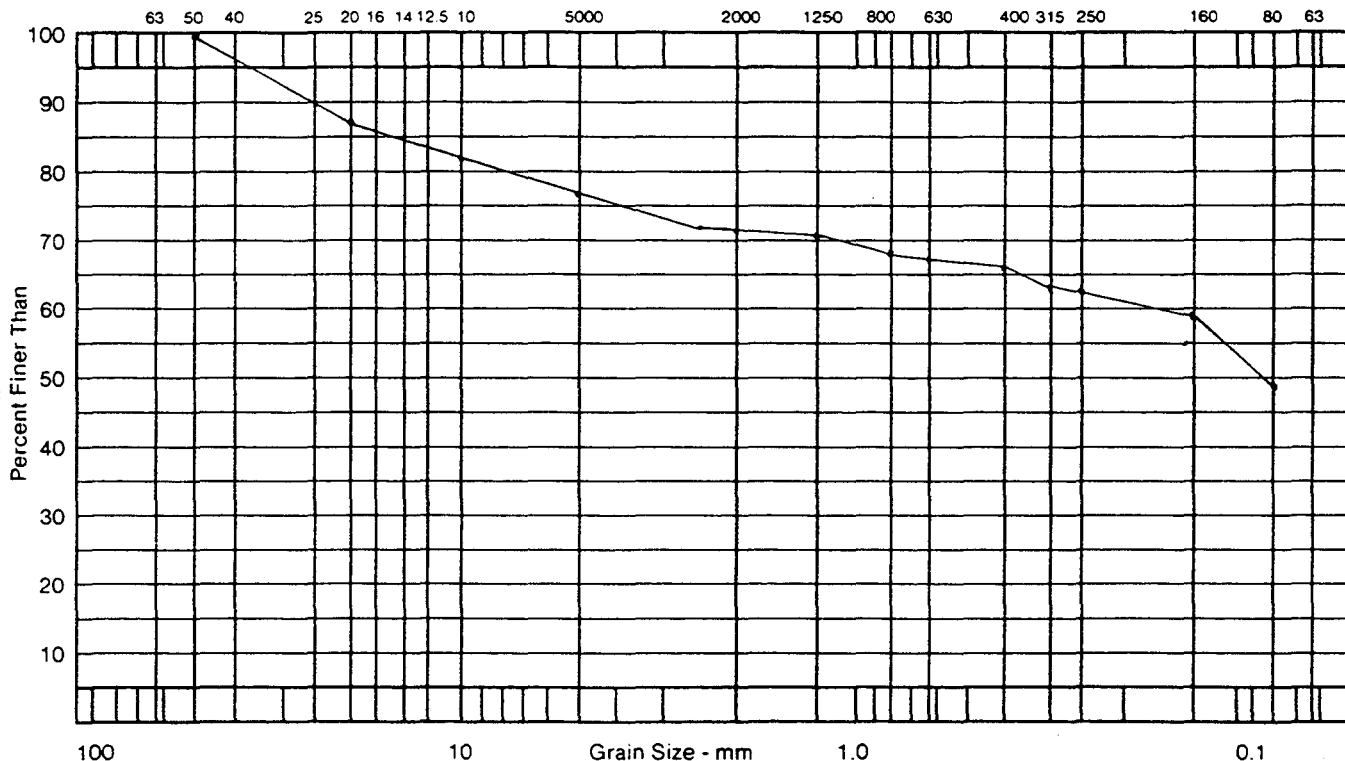
Sieve No.	Size of Opening MM	Weight Retained gms	Total Wt. Finer Than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
80,000	80,000				
50,000	50,000				100.0
20,000	20,000				87.1
10,000	10,000				82.2
5,000	5,000				76.7
2,500	2,500				72.5
2,000	2,000				71.8
1,250	1,250				70.1
800	800				68.5
630	630				67.5
400	400				65.5
315	315				63.8
250	250				62.5
160	160				58.1
80	80				48.6

Description of Sample _____
gravelly sandy silt, ML

Method of Preparation _____ Dry _____ Washed X

Remarks _____
gravel = 23.3
sand = 28.1
finer = 48.6

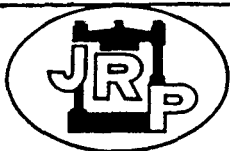
Time of Sieving _____ Min.



Public Works Canada Environmental A&ES		Venus Mine Tailings Site		BOREHOLE NO: V3A	
Drilled using CME 75 track mounted rig		V3A located near toe of highway		PROJECT NO: 8054-12	
with solid stem augers		(see site sketch)		ELEVATION:	
SAMPLE TYPE ☒ TUBE ☐ LOST ☒ AUGER ☐ BULK ☐ SPT ☐ CORE					
BACKFILL TYPE ☒ BENTONITE ☐ PEA GRAVEL ☐ SLOUGH ☐ GROUT ☐ DRILL CUTTINGS ☐ SAND					

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	PLASTICITY INDEX			SOILS DESCRIPTION				USC				SOIL SYMBOL	ELEVATION(m)
				10 20 30 40			VEGETATION (bushes), TOPSOIL	0.05m	CLAY	SILT	SAND	GRAVEL				
				10 20 30 40												
				PLASTIC	M.C.	LIQUID										
0.0															0.0	
1.0															-1.0	
2.0	X	T39													-2.0	
3.0	X	T40													-3.0	
4.0	X	T41													-4.0	
5.0															-5.0	
6.0															-6.0	
7.0															-7.0	
8.0															-8.0	
9.0															-9.0	
10.0															-10.0	
11.0															-11.0	
12.0															-12.0	
13.0															-13.0	
14.0															-14.0	

J.R. Paine & Associates Ltd. Whitehorse, Yukon		LOGGED BY: MEB	COMPLETION DEPTH: 4.5 m
		REVIEWED BY: WCK	COMPLETE: 95/06/14
		Fig. No: 1	Page 1 of 1



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CONSULTING AND TESTING ENGINEERS

EDMONTON - GRANDE PRAIRIE - WHITEHORSE - PEACE RIVER

PROJECT VENUS MINES RECLAMATION		CLIENT Public Works Canada Environment A & ES		DATE RECORDED 6-26-95	
STA.	SAMPLE TYPE AUGER	DEPTH 2.8m	HOLE NO. V3A	FIELD NO.	LAB NO. T40

GRAIN SIZE ANALYSIS

SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT	DIA. MM	% FINER BY WEIGHT	DIA. MM	% FINER BY WEIGHT
				.075	99.99	.0075	71.28
				.150	99.00	.0015	55.44
				.300	98.01		
				.600	97.02		
				.850	95.04		
				1.18	91.08		
				1.65	86.13		
				2.00	78.20		

PETROGRAPHIC ANALYSIS

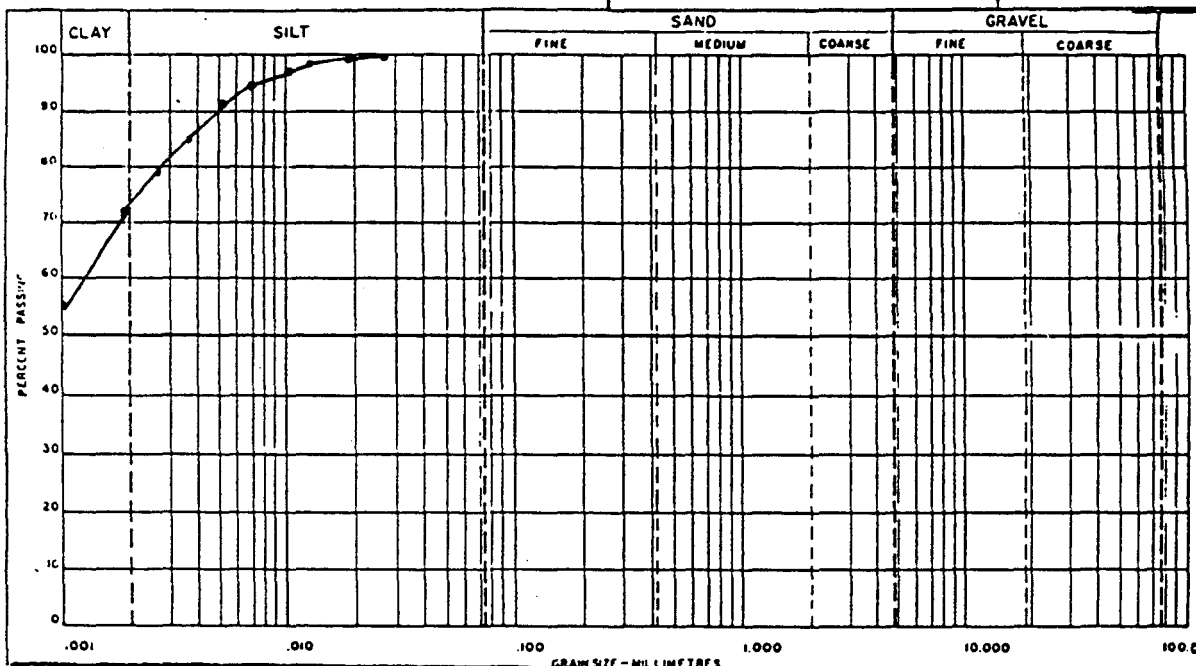
MATERIAL TYPE	% OF TOTAL SAMPLE
SAND	0.0
SILT	29.0
CLAY	71.0

SAMPLE NO.	UNIFIED CLASSIFICATION	LL	PL	PI	NATURAL MOISTURE	SS
T40	SILTY CLAY				12	

PARTICLE SHAPE ANALYSIS

ROUND	
SUB-ROUND	
ANGULAR	
SUB-ANGULAR	
FLATS	
NEEDLES	

CRUSH COUNT _____ %



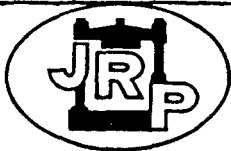
LABORATORY'S REMARKS SIEVE ANALYSIS WAS NOT
CONDUCTED ON FINE GRAINED SAND

DATE SAMPLED _____
DATE RECEIVED _____
TECHNICIAN(S) M.S. / T.D.
CHECKED BY _____

Public Works Canada Environmental A&ES			Venus Mine Tailings Site			BOREHOLE NO: V3B		
Drilled using CME 75 track mounted rig			V3B located near toe of highway			PROJECT NO: 8054-12		
with solid stem augers			(see site sketch)			ELEVATION:		
SAMPLE TYPE ☒ TUBE ☐ LOST ☒ AUGER ☐ BULK ☐ SPT ☐ CORE								
BACKFILL TYPE ☒ BENTONITE ☐ PEA GRAVEL ☐ SLOUGH ☐ GROUT ☐ DRILL CUTTINGS ☐ SAND								

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	SOILS DESCRIPTION										USC	SOIL SYMBOL	ELEVATION(m)
				10 ☒ LIQUID ☒ 30 40 10 ☒ PLASTIC ☒ 30 40												
				PLASTIC M.C. LIQUID 10 20 30 40												
							20 ☒ CLAY ☒ 60 80 20 ☒ SILT ☒ 60 80 20 ☒ SAND ☒ 60 80 20 ☒ GRAVEL ☒ 60 80									
0.0	☒ T42			VEGETATION (bushes), TOPSOIL										PT		0.0
0.05m																
1.0	☒ T43			CLAYEY SILT -light brown, firm, moist, medium to high plasticity, -LL=54, PL=25.4, PI=28.6, LI=1.2										ML		-1.0
1.8m																
2.0				CLAYEY SILT -wet, soft, grey, medium plasticity												-2.0
5.2m																
6.0	☒ T44			CLAYEY SILT -moist, firm, medium plasticity, grey,										CL		-6.0
6.0m																
7.0				END OF HOLE @ 6.0M												-7.0
				NOTES: -soft, wet material extends to approximately 5.2 M												-8.0
																-9.0
																-10.0
																-11.0
																-12.0
																-13.0
																-14.0

J.R. Paine & Associates Ltd. Whitehorse, Yukon		LOGGED BY: MEB	COMPLETION DEPTH: 6.0 m
		REVIEWED BY: WCK	COMPLETE: 95/06/14
		Fig. No: 1	Page 1 of 1



J. R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

EDMONTON - GRANDE PRAIRIE - WHITEHORSE - PEACE RIVER

PROJECT VENUS MINES RECLAMATION		CLIENT Public Works Canada Environment A & ES		DATE RECORDED 6-26-95	
STA.	SAMPLE TYPE AUGER	DEPTH 6.0 m	HOLE NO. V3B	FIELD NO.	LAB NO. T44

GRAIN SIZE ANALYSIS

SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT	DIA. mm	% FINER BY WEIGHT	DIA. mm	% FINER BY WEIGHT
.063	93.8			.0564	92.07	.0044	41.58
				.0404	89.10	.0032	31.65
				.0290	85.14	.0023	25.74
				.0209	82.17	.0014	18.81
				.0151	77.22		
				.0114	69.30		
				.0083	62.37		
				.0060	54.45		

SAMPLE NO.	UNIFIED CLASSIFICATION	LL	PL	PI	NATURAL % H ₂ O	SS.
T44	CLAYEY SILT				26	

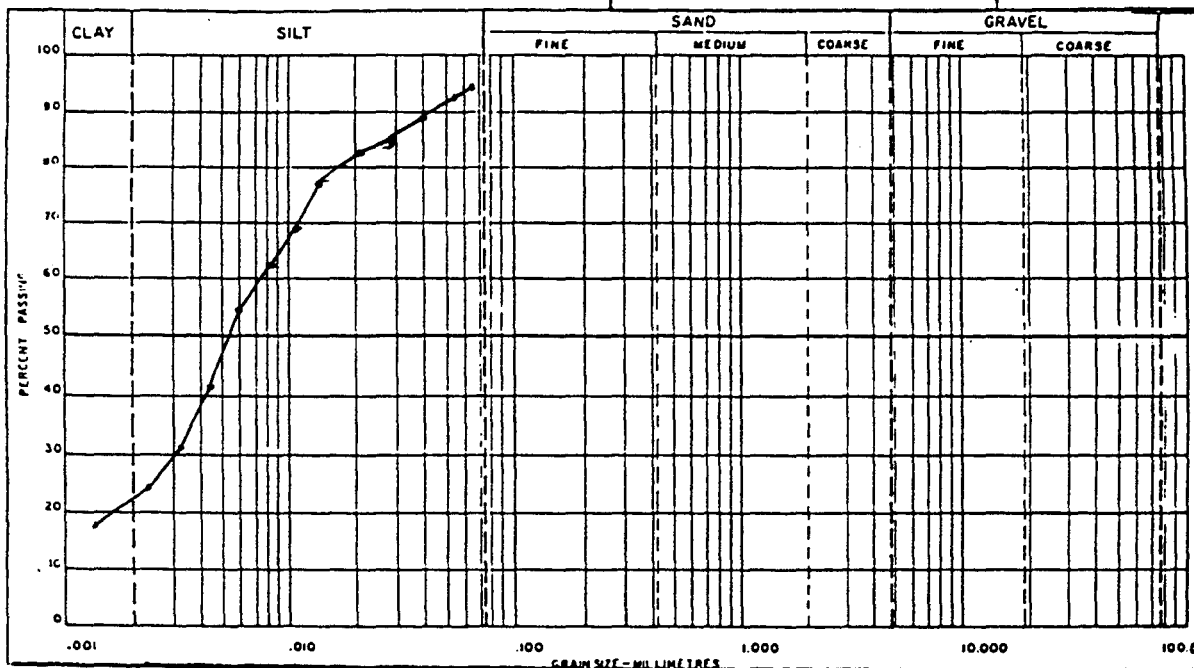
PETROGRAPHIC ANALYSIS

MATERIAL TYPE	% OF TOTAL SAMPLE
SAND	6.0
SILT	71.0
CLAY	23.0

PARTICLE SHAPE ANALYSIS

ROUND	
SUB-ROUND	
ANGULAR	
SUB-ANGULAR	
FLATS	
NEEDLES	

CRUSH COUNT _____ %



LABORATORY'S REMARKS SIEVE ANALYSIS WAS NOT
CONDUCTED ON FINE GRAINED SAND.

DATE SAMPLED _____
DATE RECEIVED _____
TECHNICIAN(S) M.S. / T.D.
CHECKED BY _____

Public Works Canada Environmental A&ES		Venus Mine Tailings Site		BOREHOLE NO: V3C	
Drilled using CME 75 track mounted rig		V3C located near power pole "C"		PROJECT NO: 8054-12	
with solid stem augers		(see site sketch)		ELEVATION:	
SAMPLE TYPE		☒ TUBE	☐ LOST	☒ AUGER	☐ BULK
BACKFILL TYPE		☐ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT
		☐ DRILL CUTTINGS	☐ CORE		

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	LIQUID		PLASTIC		SOILS DESCRIPTION	USC				SOIL SYMBOL	ELEVATION(m)
				10	20	30	40		20	40	60	80		
				▲ PLASTIC ▲		● CLAY ●			▲ SILT ▲		■ SAND ■			
				10	20	30	40		20	40	60	80		
0.0								GRASS COVER, BUSHES -organic and topsoil layer					PT	0.0
1.0								SANDY SILT -auger action indicates cobbles and possibly boulders present, chipped rock in sample, damp, brown, loose,					ML	-1.0
2.0													CL-ML	-2.0
3.0	X	T45						SILTY CLAY -some sand, trace gravel, stiff, traces of oxidation around gravel and sand, moist, brown and grey, low plasticity						-3.0
4.0								END OF HOLE @ 3.0M						-4.0
5.0														-5.0
6.0														-6.0
7.0														-7.0
8.0														-8.0
9.0														-9.0
10.0														-10.0
11.0														-11.0
12.0														-12.0
13.0														-13.0
14.0														-14.0

J.R. Paine & Associates Ltd.		LOGGED BY: MEB	COMPLETION DEPTH: 3.0 m
Whitehorse, Yukon		REVIEWED BY: WCK	COMPLETE: 95/06/15
		Flg. No: 1	Page 1 of 1

Public Works Canada Environmental A&ES		Venus Mine Tailings Site		BOREHOLE NO: V3D	
Drilled using CME 75 track mounted rig		V3D located east of power pole "C"		PROJECT NO: 8054-12	
with solid stem augers		(see site sketch)		ELEVATION:	
SAMPLE TYPE ☒ TUBE ☐ LOST ☒ AUGER ☐ BULK ☐ SPT ☐ CORE					
BACKFILL TYPE ☒ BENTONITE ☐ PEA GRAVEL ☐ SLOUGH ☐ GROUT ☐ DRILL CUTTINGS ☐ SAND					

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	LIQUID			SOILS DESCRIPTION	USC				SOIL SYMBOL	ELEVATION(m)
				10	20	40		20	40	60	80		
				PLASTIC									
				10	20	30		40	20	40	60		
0.0	☒	T46					SILT -some clay, grey, low plasticity, trace organics, firm, damp 1.2m					ML	0.0
1.0	☒	T47											-1.0
2.0							SILTY CLAY -trace gravel, beige/light grey, moist, soft, medium plasticity 1.5m					CL-ML	-2.0
3.0							END OF HOLE @ 1.5m						-3.0
4.0							NOTES: -V3D located in small channel leading toward tailings area; washed appearance on surface; some bushes in channel						-4.0
5.0													-5.0
6.0													-6.0
7.0													-7.0
8.0													-8.0
9.0													-9.0
10.0													-10.0
11.0													-11.0
12.0													-12.0
13.0													-13.0
14.0												-14.0	

J.R. Paine & Associates Ltd. Whitehorse, Yukon		LOGGED BY: MEB	COMPLETION DEPTH: 1.5 m
		REVIEWED BY: WCK	COMPLETE: 95/06/15
		Fig. No: 1	Page 1 of 1

Public Works Canada Environmental A&ES		Venus Mine Tailings Site		BOREHOLE NO: V3E	
Drilled using CME 75 track mounted rig		V3E located near northwest perimeter of		PROJECT NO: 8054-12	
with solid stem augers		tailings area (see site sketch)		ELEVATION:	
SAMPLE TYPE ☒ TUBE ☐ LOST ☒ AUGER ☐ BULK ☐ SPT ☐ CORE					
BACKFILL TYPE ☒ BENTONITE ☐ PEA GRAVEL ☐ SLOUGH ☐ GROUT ☐ DRILL CUTTINGS ☐ SAND					

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	■ LIQUID ■ 10 20 30 40 ▲ PLASTIC ▲ 10 20 30 40 PLASTIC M.C. LIQUID 10 20 30 40 SOILS DESCRIPTION ● CLAY ● 20 40 60 80 ▲ SILT ▲ 20 40 60 80 ■ SAND ■ 20 40 60 80 ◆ GRAVEL ◆ 20 40 60 80		USC	SOIL SYMBOL	ELEVATION(m)
0.0	☒	T50		ORGANICS and TAILINGS			PT-FI	0.0
1.0	☒	T51		SILTY CLAY -firm, medium plasticity, grey, moist,			CL	-1.0
2.0				END OF HOLE @ 1.5m				-2.0
3.0				NOTES: -small amount of tailings mixed in with organics to 0.2m; appears to be area of previous high water level				-3.0
4.0							-4.0	
5.0							-5.0	
6.0							-6.0	
7.0							-7.0	
8.0							-8.0	
9.0							-9.0	
10.0							-10.0	
11.0							-11.0	
12.0							-12.0	
13.0							-13.0	
14.0							-14.0	

J.R. Paine & Associates Ltd. Whitehorse, Yukon		LOGGED BY: MEB	COMPLETION DEPTH: 1.5 m
		REVIEWED BY: WCK	COMPLETE: 95/06/15
		Fig. No: 1	Page 1 of 1

Public Works Canada Environmental A&ES			Venus Mine Tailings Site			BOREHOLE NO: V3F		
Drilled using CME 75 track mounted rig			V3F located near northwest perimeter of			PROJECT NO: 8054-12		
with solid stem augers			tailings area (see site sketch)			ELEVATION:		
SAMPLE TYPE			☒ TUBE	☐ LOST	☒ AUGER	☐ BULK	☐ SPT	☐ CORE
BACKFILL TYPE			☒ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT	☐ DRILL CUTTINGS	☐ SAND

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	SOILS DESCRIPTION										USC	SOIL SYMBOL	ELEVATION(m)												
				LIQUID			PLASTIC			M.C.			CLAY				SILT			SAND			GRAVEL					
				10	20	40	10	20	40	10	20	40	20				40	60	80	20	40	60	80	20	40	60	80	
				PLASTIC	M.C.	LIQUID																						
0.0	☒	T52																								FI		0.0
1.0																										PT		-1.0
2.0																										CL		-2.0
3.0																												-3.0
4.0																												-4.0
5.0																												-5.0
6.0																												-6.0
7.0																												-7.0
8.0																												-8.0
9.0																												-9.0
10.0																												-10.0
11.0																												-11.0
12.0																												-12.0
13.0																												-13.0
14.0																												-14.0

TAILINGS
-silty sand, fine grained sand, wet, loose

0.8m

DECAYED ORGANICS

0.9m

SILTY CLAY
-firm, medium plasticity, grey, moist, native material

1.5m

END OF HOLE @ 1.5m

NOTES:
-approximately 0.8 metres of tailings
-well defined organic layer marks end of tailings material

LOGGED BY: WEB

REVIEWED BY: WCK

Fig. No: 1

COMPLETION DEPTH: 1.5 m

COMPLETE: 95/06/15

Page 1 of 1

J.R. Paine & Associates Ltd.
Whitehorse, Yukon

95/07/11 07:43AM

Public Works Canada Environmental A&ES		Venus Mine Tailings Site		BOREHOLE NO: V4	
Drilled using CME 75 track mounted rig		V4 located near southwest perimeter of		PROJECT NO: 8054-12	
with solid stem augers		tailings area (see site sketch)		ELEVATION:	
SAMPLE TYPE ☒ TUBE ☐ LOST ☒ AUGER ☐ BULK ☐ SPT ☐ CORE					
BACKFILL TYPE ☒ BENTONITE ☐ PEA GRAVEL ☐ SLOUGH ☐ GROUT ☐ DRILL CUTTINGS ☐ SAND					

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	LIQUID			SOILS DESCRIPTION	CLAY				USC	SOIL SYMBOL	ELEVATION(m)			
				10	20	30		40	20	40	60				80		
				PLASTIC				M.C.	SILT						SAND		
				10	20	30		40	20	40	60				80		
0.0	☒	T36					SANDY SILT -fine grained sand, tailings material, loose, wet, oxidation, grey, soft non-plastic					ML		0.0			
1.0	☒	T37													-1.0		
2.0															-2.0		
3.0	☒	T38					SILTY CLAY -trace gravel, firm, moist, beige/grey medium plasticity, native					CL		-3.0			
4.0														-4.0			
5.0							END OF HOLE @ 3.0m							-5.0			
6.0							NOTES: -tailings material extends to 1.8 m							-6.0			
7.0													-7.0				
8.0													-8.0				
9.0													-9.0				
10.0													-10.0				
11.0													-11.0				
12.0													-12.0				
13.0													-13.0				
14.0													-14.0				

J.R. Paine & Associates Ltd. Whitehorse, Yukon		LOGGED BY: MEB	COMPLETION DEPTH: 3.0 m
		REVIEWED BY: WCK	COMPLETE: 95/06/14
		Fig. No: 1	Page 1 of 1



J. R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

SCREEN ANALYSIS

Sample: T36 Depth: 0.2-0.4m
Location: Tailings Area, Test Hole V4

Client: PWGSC, A & ES
Project: Venus Mines Reclamation
Made by: P.R. Job No.: 8054-12
Ck'd by: M.B. Date: 95/06/23

Sieve No.	Size of Opening MM	Weight Retained gms	Total Wt. Finer Than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
80,000	80.000				
50,000	50.000				
20,000	20.000				
10,000	10.000				
5,000	5.000				
2,500	2.500				
2,000	2.000				
1,250	1.250				
800	.800				
630	.630				
400	.400				100.0
315	.315				98.6
250	.250				98.2
160	.160				92.2
80	.080				59.3

Description of Sample _____
sandy silt, ML

Method of Preparation _____ Dry _____ Washed X

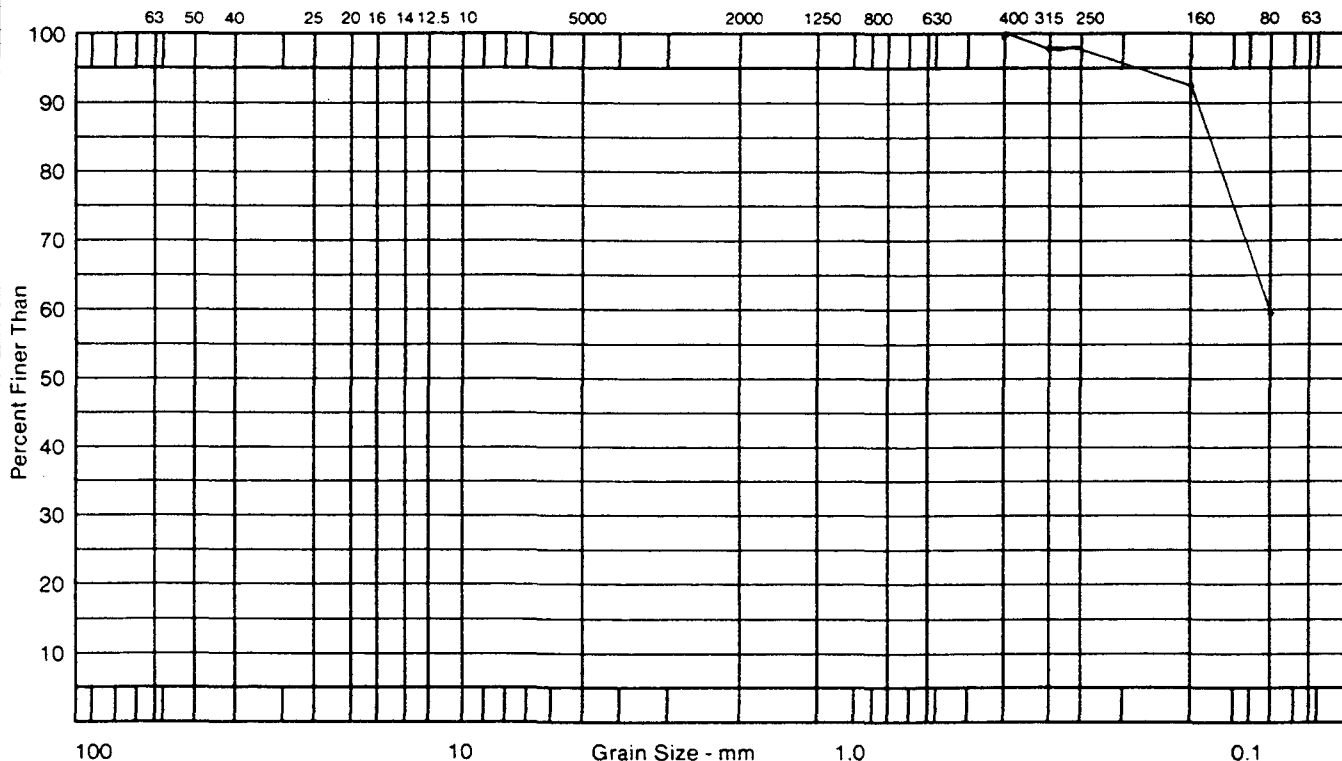
Remarks _____

gravel = 0 %

sand = 40.7 %

fines = 59.3 %

Time of Sieving _____ Min.



Public Works Canada Environmental A&ES		Venus Mine Tailings Site		BOREHOLE NO: V5A	
Drilled using CME 75 track mounted rig		V5A located within breach area- south		PROJECT NO: 8054-12	
with solid stem augers		west corner of tailings area		ELEVATION:	
SAMPLE TYPE ☒ TUBE ☐ LOST ☒ AUGER ☐ BULK ☐ SPT ☐ CORE					
BACKFILL TYPE ☒ BENTONITE ☐ PEA GRAVEL ☐ SLOUGH ☐ GROUT ☐ DRILL CUTTINGS ☐ SAND					

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	10 20 30 40 ▲ PLASTIC ▲ 10 20 30 40 PLASTIC M.C. LIQUID SOILS DESCRIPTION		20 40 60 80 ● CLAY ● 20 40 60 80 ▲ SILT ▲ 20 40 60 80 ■ SAND ■ 20 40 60 80 ◆ GRAVEL ◆ USC SOIL SYMBOL ELEVATION(m)											
						0.0	☒	T34		SILTY SAND -brown and rust in colour, damp, loose, well graded, (tailings) 0.8m							
						1.0	☒	T35									
						2.0				GRAVELLY SILTY CLAY -brown, medium plasticity, moist, soft, oxidation around rock 2.4m							
3.0				AUGER REFUSAL @ 2.4m													
4.0				NOTES: -moved drill rig 5m south of V5A to drill V5B - similar soil profile with refusal at 2.1 m													
5.0																	
6.0																	
7.0																	
8.0																	
9.0																	
10.0																	
11.0																	
12.0																	
13.0																	
14.0																	

J.R. Paine & Associates Ltd. Whitehorse, Yukon		LOGGED BY: MEB	COMPLETION DEPTH: 2.4 m
		REVIEWED BY: WCK	COMPLETE: 95/06/14
		Fig. No: 1	Page 1 of 1

Public Works Canada Environmental A&ES			Venus Mine Tailings Site			BOREHOLE NO: V6		
Drilled using CME 75 track mounted rig			V6 located west of berm at east edge of			PROJECT NO: 8054-12		
with solid stem augers			tailings area (see site sketch)			ELEVATION:		
SAMPLE TYPE	TUBE	LOST	AUGER	BULK	SPT	CORE		
BACKFILL TYPE	BENTONITE	PEA GRAVEL	SLOUGH	GROUT	DRILL CUTTINGS	SAND		

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA			SOILS DESCRIPTION				USC	SOIL SYMBOL	ELEVATION(m)
			LIQUID	PLASTIC	M.C.	CLAY	SILT	SAND	GRAVEL			
0.0	X	T15										0.0
1.0	X	T16										-1.0
2.0												-2.0
3.0	X	T17										-3.0
3.5	X	T18										-3.5
4.0	X	T19										-4.0
4.5	X	T20										-4.5
5.0												-5.0
6.0												-6.0
7.0												-7.0
8.0	X	T21										-8.0
8.5	X	T22										-8.5
9.0	X	T23										-9.0
9.5	X	T24										-9.5
10.0	X	T25										-10.0
11.0												-11.0
12.0												-12.0
13.0												-13.0
14.0												-14.0

J.R. Paine & Associates Ltd.
Whitehorse, Yukon

LOGGED BY: MEB
REVIEWED BY: WCK
Fig. No: 1

COMPLETION DEPTH: 10.7 m
COMPLETE: 95/06/14
Page 1 of 1



J. R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

SCREEN ANALYSIS

Client: PWGSC, A & ES
Sample: T22 Depth: 8.2-8.4m Project: Venus Mines Reclamation
Location: Tailings Area, Test Hole V6 Made by: P.R. Job No.: 8054-12
Ck'd by: M.B. Date: 95/06/23

Sieve No.	Size of Opening MM	Weight Retained gms	Total Wt. Finer Than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
80,000	80.000				100.0
50,000	50.000				56.1
20,000	20.000				
10,000	10.000				
5,000	5.000				46.2
2,500	2.500				43.8
2,000	2.000				43.4
1,250	1.250				42.5
800	.800				42.1
630	.630				41.6
400	.400				41.1
315	.315				40.6
250	.250				39.8
160	.160				38.6
80	.080				35.0

Description of Sample _____
silty gravel, some sand, GM

Method of Preparation _____ Dry _____ Washed X

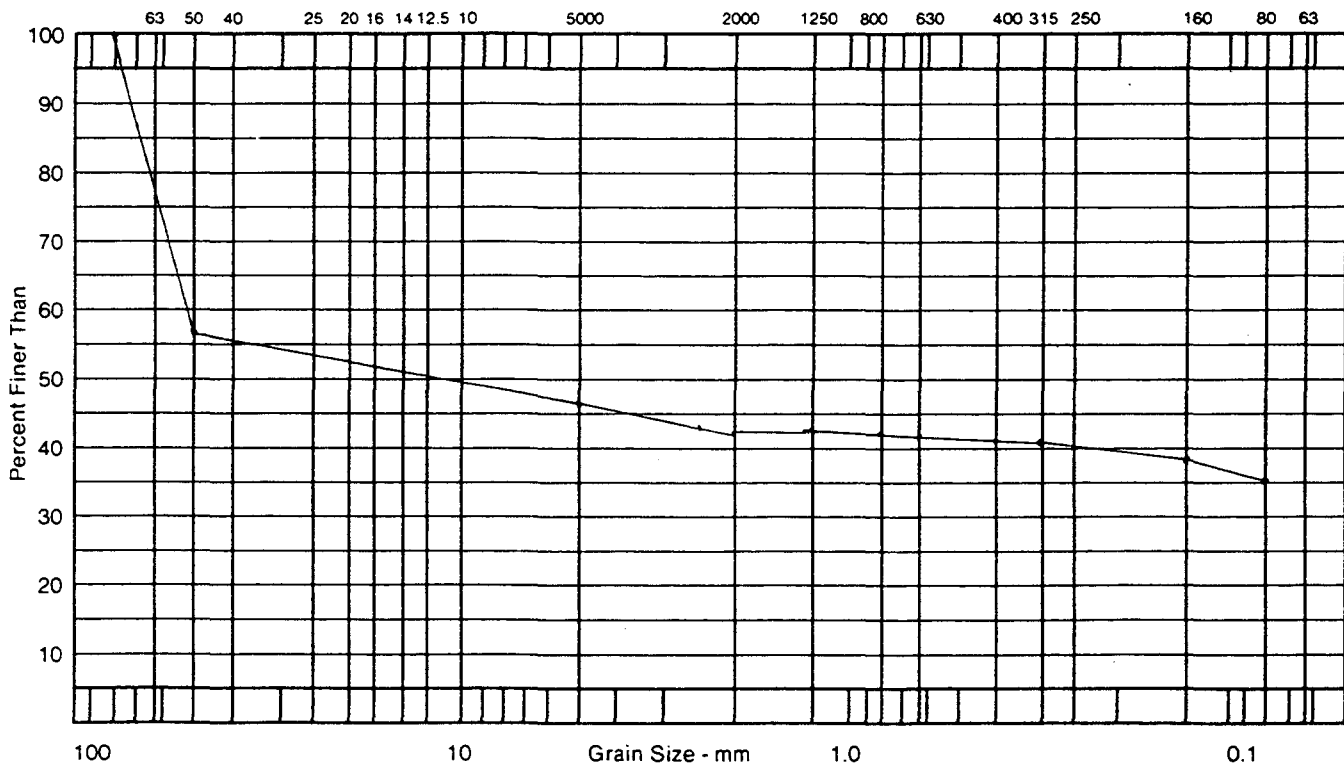
Remarks gravel = 53.8

sand = 11.2

fines = 35.0

Time of Sieving _____ Min.

NOTE: COBBLE IN SAMPLE



Public Works Canada Environmental A&ES		Venus Mine Tailings Site		BOREHOLE NO: V6B	
Drilled using CME 75 track mounted rig		V10B located on berm at east edge of		PROJECT NO: 8054-12	
with solid stem augers		tailings area (see site sketch)		ELEVATION:	
SAMPLE TYPE ☒ TUBE ☐ LOST ☒ AUGER ☐ BULK ☐ SPT ☐ CORE					
BACKFILL TYPE ☒ BENTONITE ☐ PEA GRAVEL ☐ SLOUGH ☐ GROUT ☐ DRILL CUTTINGS ☐ SAND					

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	PLASTICITY INDEX			SOILS DESCRIPTION				USC	SOIL SYMBOL	ELEVATION(m)
				10 20 30 40			20	40	60	80			
				▲ PLASTIC ▲									
				PLASTIC	M.C.	LIQUID							
0.0													0.0
1.0	X	T55							SILTY SAND (tailings) -fine grained sand sizes, loose, light brown, dry,				-1.0
2.0									CLAYEY SILT -trace gravel, brown, low plasticity, traces of organics, stiff, traces of oxidation around rocks, auger action indicates oversize (cobbles) materials				-2.0
3.0	X	T56							COBBLE and BOULDER STRATUM -very difficult drilling (destroyed lead auger)				-3.0
4.0	X	T57							SILTY CLAY -stiff, damp, grey/light brown, traces of organics throughout,				-4.0
5.0	X	T58							SILTY CLAY -some gravel, wet, soft, possibly water bearing stratum,				-5.0
6.0	X	T59							AUGER REFUSAL @ 5.8m				-6.0
7.0									NOTES: -boulder stratum occurs between 2.4m and 2.8m -auger refusal due to bedrock or boulder stratum -groundwater encountered at approximately 5.2 m (believed confined)				-7.0
8.0													-8.0
9.0													-9.0
10.0													-10.0
11.0													-11.0
12.0													-12.0
13.0													-13.0
14.0													-14.0

J.R. Paine & Associates Ltd.		LOGGED BY: MEB	COMPLETION DEPTH: 5.8 m
Whitehorse, Yukon		REVIEWED BY: WCK	COMPLETE: 95/06/15
		Fig. No: 1	Page 1 of 1

Public Works Canada Environmental A&ES		Venus Mine Tailings Site		BOREHOLE NO: V7	
Drilled using CME 75 track mounted rig		V7 located north east perimeter of		PROJECT NO: 8054-12	
with solid stem augers		tailings area (see site sketch)		ELEVATION:	
SAMPLE TYPE		☒ TUBE ☐ LOST ☒ AUGER ☐ BULK ☐ SPT ☐ CORE			
BACKFILL TYPE		☐ BENTONITE ☐ PEA GRAVEL ☐ SLOUGH ☐ GROUT ☐ DRILL CUTTINGS ☐ SAND			

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	PLASTICITY		SOILS DESCRIPTION	USC				SOIL SYMBOL	ELEVATION(m)	
				PLASTIC									
				M.C.									
				LIQUID									
0.0				10	20	30	40	20	40	60	80		0.0
1.0				10	20	30	40	20	40	60	80		-1.0
2.0				10	20	30	40	20	40	60	80		-2.0
3.0				10	20	30	40	20	40	60	80		-3.0
4.0				10	20	30	40	20	40	60	80		-4.0
5.0				10	20	30	40	20	40	60	80		-5.0
6.0				10	20	30	40	20	40	60	80		-6.0
7.0				10	20	30	40	20	40	60	80		-7.0
8.0				10	20	30	40	20	40	60	80		-8.0
9.0				10	20	30	40	20	40	60	80		-9.0
10.0				10	20	30	40	20	40	60	80		-10.0
11.0				10	20	30	40	20	40	60	80		-11.0
12.0				10	20	30	40	20	40	60	80		-12.0
13.0				10	20	30	40	20	40	60	80		-13.0
14.0				10	20	30	40	20	40	60	80		-14.0

SANDY SILT
 -fine grained sand, moist, brown, firm, sand seams with oxidation, loose
 -sandy silt, more sand in sample than above, wet, rust and brown (more oxidation), tailings

SILTY CLAY
 -light brown/grey, firm, moist, medium plasticity

CLAYEY GRAVEL
 -difficult drilling, wet, grey, free water, rock chips in sample

AUGER REFUSAL @ 5.5m

NOTES:
 -tailings to 1.3 m depth
 -possibly free water at 5.0 m

1.3m

5.0m

5.5m

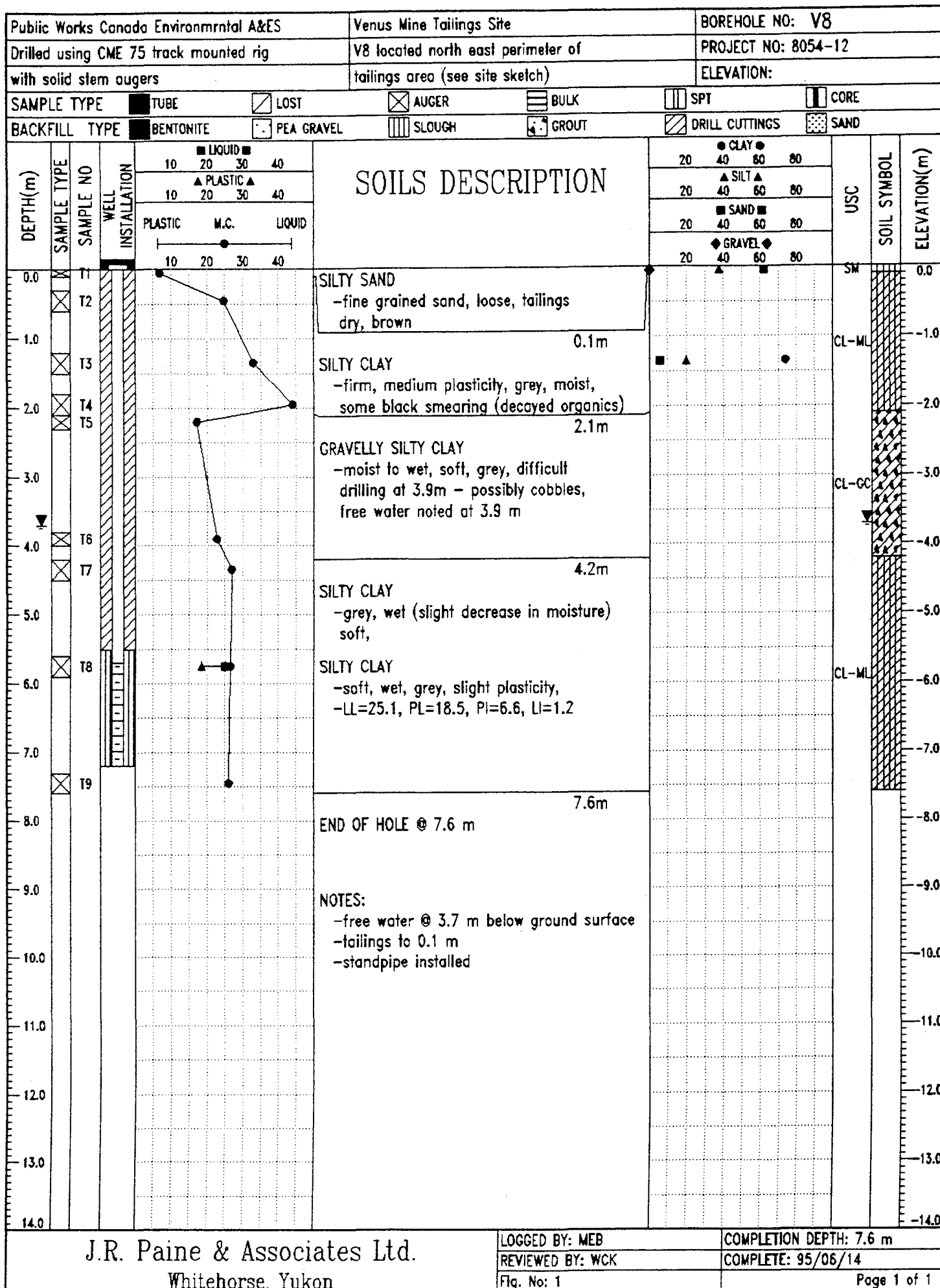
ML-SM

CL-ML

GC

J.R. Paine & Associates Ltd.
 Whitehorse, Yukon

LOGGED BY: MEB	COMPLETION DEPTH: 5.5 m
REVIEWED BY: WCK	COMPLETE: 95/06/14
Fig. No: 1	Page 1 of 1





J. R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

SCREEN ANALYSIS

Client: PWGSC, A & ES
Sample: T1 Depth: 0-0.2m Project: Venus Mines Reclamation
Location: Tailings Area, Test Hole V8 Made by: P.R. Job No.: 8054-12
Ck'd by: M.B. Date: 95/06/23

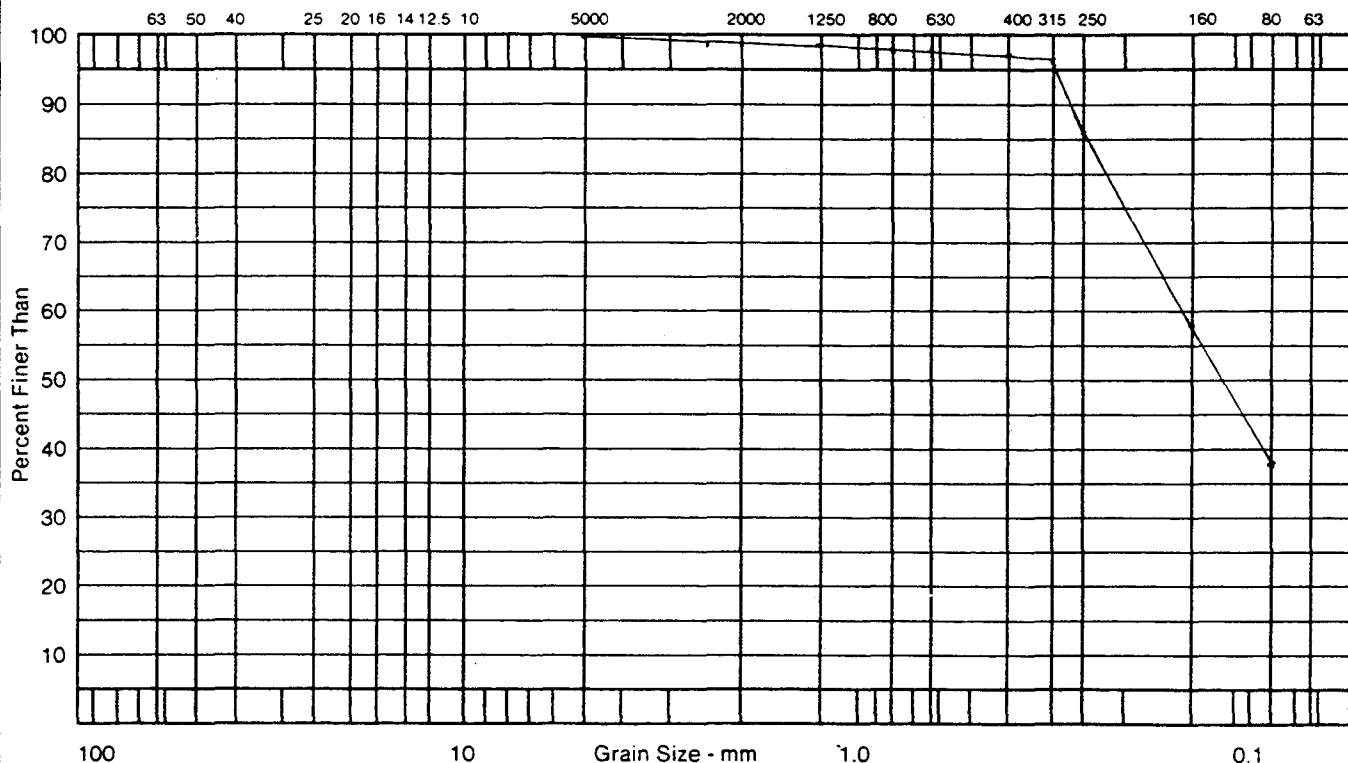
Sieve No.	Size of Opening MM	Weight Retained gms	Total Wt. Finer Than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
80,000	80.000				
50,000	50.000				
20,000	20.000				
10,000	10.000				
5,000	5.000				100.0
2,500	2.500				99.6
2,000	2.000				99.4
1,250	1.250				99.1
800	.800				98.5
630	.630				97.9
400	.400				96.3
315	.315				95.5
250	.250				85.2
160	.160				57.7
80	.080				37.6

Description of Sample
silty sand, SM

Method of Preparation _____ Dry _____ Washed X

Remarks
gravel = 0 %
sand = 62.4%
finer = 37.6%

Time of Sieving _____ Min.



J. R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

EDMONTON - GRANDE PRAIRIE - WHITEHORSE - PEACE RIVER

PROJECT VENUS MINES RECLAMATION			CLIENT Public Works Canada Environment A & ES		DATE RECORDED 6-26-95
STA.	SAMPLE TYPE AUGER	DEPTH 1.3 m	HOLE NO. V8	FIELD NO.	LAB NO. T3

GRAIN SIZE ANALYSIS

SIEVE SIZE	% FINE BY WEIGHT	SIEVE SIZE	% FINE BY WEIGHT	DIA. mm	% FINE BY WEIGHT	DIA. mm	% FINE BY WEIGHT
.063	93.6			.0103	93.06		
				.0074	80.09		
				.0052	88.50		
				.0037	85.14		
				.0027	80.18		
				.0020	74.25		
				.0012	64.35		

PETROGRAPHIC ANALYSIS

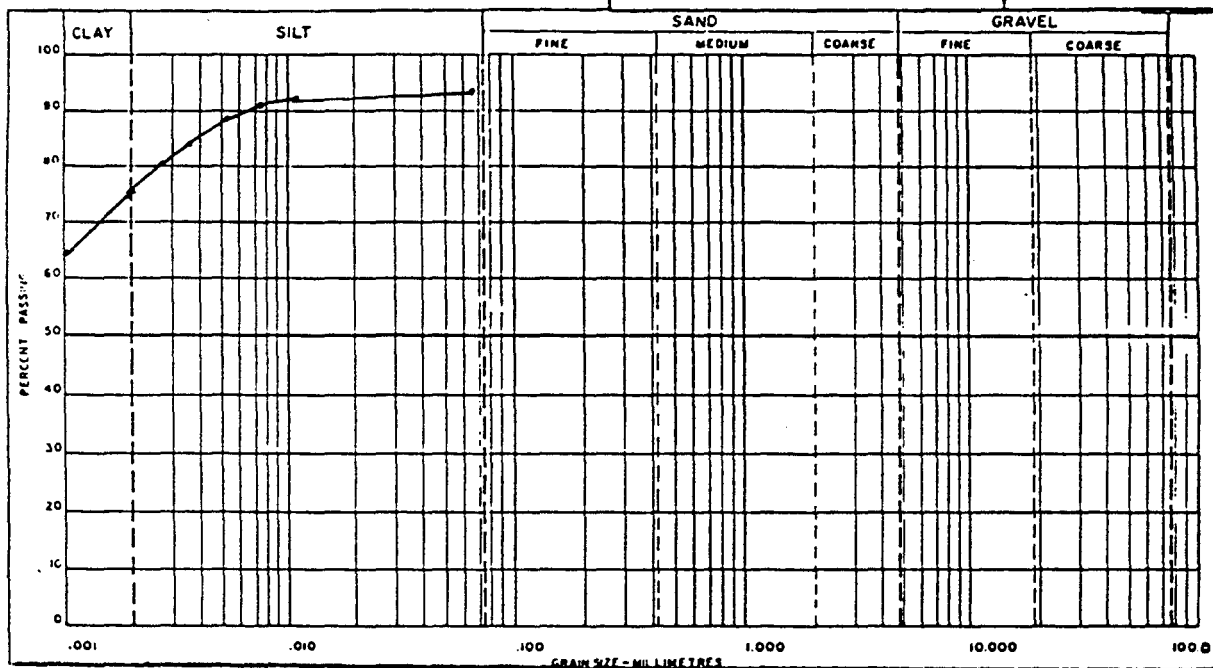
MATERIAL TYPE	% OF TOTAL SAMPLE
SAND	6.0
SILT	20.0
CLAY	74.0

SAMPLE NO.	UNIFIED CLASSIFICATION	LL	PL	P.I.	NATURAL $\frac{w}{p}$	S.G.
T3	SILTY CLAY				33	

PARTICLE SHAPE ANALYSIS

ROUND	
SUB-ROUND	
ANGULAR	
SUB-ANGULAR	
FLATS	
NEEDLES	

CRUSH COUNT _____ %



LABORATORY'S REMARKS SIEVE ANALYSIS WAS NOT
CONDUCTED ON FINE GRAINED SAND

DATE SAMPLED _____
DATE RECEIVED _____
TECHNICIAN(S) M.S. / T.D.
CHECKED BY _____

Public Works Canada Environmental A&ES			Venus Mine Tailings Site			BOREHOLE NO: V9		
Drilled using CME 75 track mounted rig			V9 located just south of tailings pond			PROJECT NO: 8054-12		
with solid stem augers			within tailings area (see site sketch)			ELEVATION:		
SAMPLE TYPE		☒ TUBE	☐ LOST	☒ AUGER	☐ BULK	☐ SPT	☐ CORE	
BACKFILL TYPE		☒ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT	☒ DRILL CUTTINGS	☐ SAND	

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	SOILS DESCRIPTION				USC	SOIL SYMBOL	ELEVATION(m)
0.0	X	T26		SANDY SILT						0.0
1.0	X	T27		-wet, fine grained sand, brown and rust (oxidation) in colour, free water at 0.1 m, non-plastic						-1.0
2.0				SANDY SILT						-2.0
3.0	X	T28		-higher sand content at 1.2 m						-3.0
4.0										-4.0
5.0	X	T31								-5.0
5.0	X	T29		DECAYED ORGANICS						-5.0
6.0				-black, moist, previous ground surface						-6.0
7.0	X	T32		SILTY CLAY						-7.0
7.0	X	T33		-stiff to hard, moist, medium plasticity, traces of oxidation, grey						-7.0
8.0				SILTY CLAY						-8.0
9.0				-some gravel, moist, grey, gravel to 50 mm diameter, traces of oxidation, stiff						-9.0
10.0				-LL=23.1, PL=19.0, PI=4.1, LI=-0.32						-10.0
11.0				END OF HOLE @ 7.6m						-11.0
12.0				NOTES:						-12.0
13.0				-tailings to 4.5 m						-13.0
14.0										-14.0

J.R. Paine & Associates Ltd. Whitehorse, Yukon		LOGGED BY: MEB	COMPLETION DEPTH: 7.6 m
		REVIEWED BY: WCK	COMPLETE: 95/06/14
		Fig. No: 1	Page 1 of 1



J. R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

SCREEN ANALYSIS

Sample: T27 Depth: 0.8-1.0m
Location: Tailings Area, Test Hole V9

Client: PWGSC, A & ES

Project: Venus Mines Reclamation

Made by: P.R. Job No.: 8054-12

Ck'd by: M.B. Date: 95/06/23

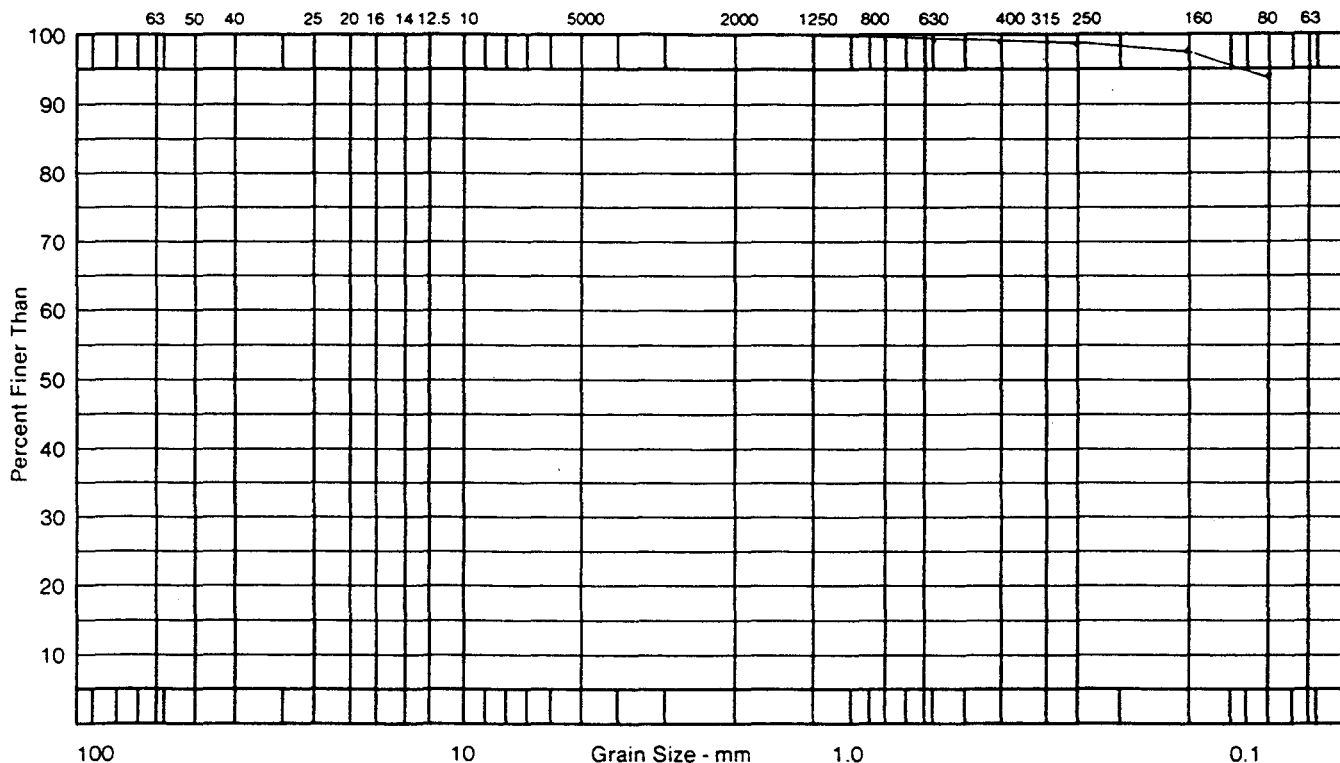
Sieve No.	Size of Opening MM	Weight Retained gms	Total Wt. Finer Than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
80,000	80,000				
50,000	50,000				
20,000	20,000				
10,000	10,000				
5,000	5,000				
2,500	2,500				
2,000	2,000				
1,250	1,250				100.0
800	.800				99.8
630	.630				99.7
400	.400				99.6
315	.315				99.4
250	.250				99.0
160	.160				98.1
80	.080				94.1

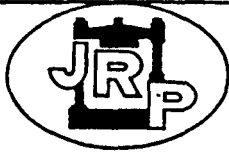
Description of Sample _____
silt _____, trace sand, ML

Method of Preparation _____ Dry _____ Washed X

Remarks _____
gravel = 0 %
sand = 5.9%
finer = 94.1%

Time of Sieving _____ Min.





J. R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

EDMONTON - GRANDE PRAIRIE - WHITEHORSE - PEACE RIVER

PROJECT VENUS MINES RECLAMATION		CLIENT Public Works Canada Environment A & ES		DATE RECORDED 6-26-95	
STA.	SAMPLE TYPE AUGER	DEPTH 5.9 m	HOLE NO. V9	FIELD NO.	LAB NO. T 32

GRAIN SIZE ANALYSIS

SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT	DIA. mm	% FINER BY WEIGHT	DIA. mm	% FINER BY WEIGHT
				.0192	99.99	1.0072	52.47
				.0137	99.00		
				.0101	98.01		
				.0072	95.04		
				.0052	91.08		
				.0037	84.15		
				.0028	75.24		
				.0020	65.34		

SAMPLE NO.	UNIFIED CLASSIFICATION	LL	PL	PI	NATURAL % H ₂ O	SS.
T32	SILTY CLAY				32	

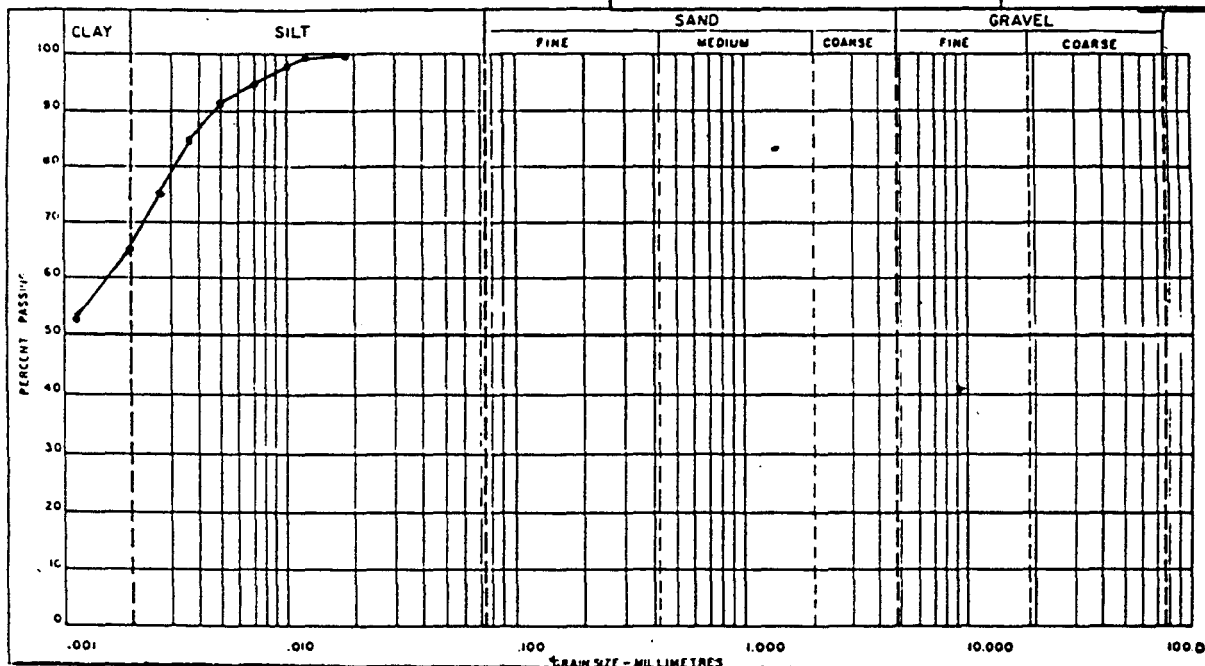
PETROGRAPHIC ANALYSIS

MATERIAL TYPE	% OF TOTAL SAMPLE
SAND	0.0
SILT	35.0
CLAY	65.0

PARTICLE SHAPE ANALYSIS

ROUND	
SUB-ROUND	
ANGULAR	
SUB-ANGULAR	
FLATS	
NEEDLES	

CRUSH COUNT _____ %



LABORATORY'S REMARKS SIEVE ANALYSIS WAS NOT
CONDUCTED ON FINE GRAINED SAND

DATE SAMPLED _____
DATE RECEIVED _____
TECHNICIAN(S) M.S./T.D.
CHECKED BY _____

Public Works Canada Environmental A&ES		Venus Mine Tailings Site		BOREHOLE NO: V10A	
Drilled using CME 75 track mounted rig		V10A located on access road east of		PROJECT NO: 8054-12	
with solid stem augers		tailings area		ELEVATION:	
SAMPLE TYPE		☒ TUBE	☐ LOST	☒ AUGER	☐ BULK
BACKFILL TYPE		☐ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT
		☐ DRILL CUTTINGS	☐ SAND		

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	PLASTICITY INDEX			SOILS DESCRIPTION				USC	SOIL SYMBOL	ELEVATION(m)	
				PLASTIC										
				M.C.										
				LIQUID										
0.0	☒	T53		10	20	30	40	GRAVELLY SILTY SAND						0.0
1.0								-dense, dry, brown, difficult drilling - auger action indicates cobbles and possibly boulders throughout, possibly road fill material						-1.0
2.0	☒	T54						-rock chips found within auger cuttings (from bedrock or boulders)						-2.0
3.0								AUGER REFUSAL @ 1.8 m						-3.0
4.0								NOTES:						-4.0
5.0								-no groundwater encountered						-5.0
6.0								-test hole V10A located near rock outcrop and thus refusal suspected to be due to bedrock						-6.0
7.0								-move drill rig 5 m north and drill V10B to determine refusal depth						-7.0
8.0														-8.0
9.0														-9.0
10.0														-10.0
11.0														-11.0
12.0														-12.0
13.0														-13.0
14.0														-14.0

J.R. Paine & Associates Ltd.		LOGGED BY: MEB	COMPLETION DEPTH: 1.8 m
Whitehorse, Yukon		REVIEWED BY: WCK	COMPLETE: 95/06/15
		Fig. No: 1	Page 1 of 1

Public Works Canada Environmental A&ES			Venus Mine Tailings Site			BOREHOLE NO: V10B		
Drilled using CME 75 track mounted rig			V10B located on access road east of			PROJECT NO: 8054-12		
with solid stem augers			tailings area			ELEVATION:		
SAMPLE TYPE			☒ TUBE	☐ LOST	☒ AUGER	☐ BULK	☐ SPT	☐ CORE
BACKFILL TYPE			☒ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT	☐ DRILL CUTTINGS	☐ SAND

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	☒ LIQUID ☐ PLASTIC ☐ M.C. ☐ LIQUID			SOILS DESCRIPTION				☐ CLAY ☐ SILT ☐ SAND ☐ GRAVEL		USC	SOIL SYMBOL	ELEVATION(m)
				10	20	30	40	20	40	60	80				
				10	20	30	40	20	40	60	80				
				10	20	30	40	20	40	60	80				
0.0													0.0		
1.0													-1.0		
2.0													-2.0		
3.0													-3.0		
4.0													-4.0		
5.0													-5.0		
6.0													-6.0		
7.0													-7.0		
8.0													-8.0		
9.0													-9.0		
10.0													-10.0		
11.0													-11.0		
12.0													-12.0		
13.0													-13.0		
14.0													-14.0		

SILTY SAND

-some gravel, dense, dry, brown, auger action indicates cobbles and possibly boulders throughout, possibly road fill material

2.8m

AUGER REFUSAL @ 2.8 m

NOTES:

-no groundwater encountered

-auger refusal at similar elevation as in V10A, assumed bedrock presence

J.R. Paine & Associates Ltd.
Whitehorse, Yukon

LOGGED BY: MEB

REVIEWED BY: WCK

Flg. No: 1

COMPLETION DEPTH: 2.8 m

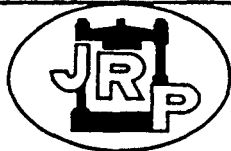
COMPLETE: 95/06/15

Page 1 of 1

Public Works Canada Environmental A&ES		Venus Mine Tailings Site		BOREHOLE NO: V11A	
Drilled using CME 75 track mounted rig		V11A located southeast of tailings-		PROJECT NO: 8054-12	
with solid stem augers		adjacent to road (site sketch)		ELEVATION:	
SAMPLE TYPE ☒ TUBE ☐ LOST ☒ AUGER ☐ BULK ☐ SPT ☐ CORE					
BACKFILL TYPE ☒ BENTONITE ☐ PEA GRAVEL ☐ SLOUGH ☐ GROUT ☐ DRILL CUTTINGS ☐ SAND					

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	PLASTICITY INDEX (PI)			SOILS DESCRIPTION		USC		SOIL SYMBOL	ELEVATION(m)
				10	20	30	40	20	40	60		
0.0								GRASS COVER, ORGANIC RICH SOIL				0.0
0.05								CLAYEY SILT				
1.0								-trace gravel, non-plastic, biege with light grey pockets, traces of oxidation around gravel, damp, firm				
1.2								CLAYEY SILT				
2.0								-trace gravel, grey, layering, moist, firm, black decayed organic seems, medium plasticity, clay pockets within silt, LL=36.7, PL=26.1, PI=10.6, U=0.1				
2.7								BOULDER LAYER				
3.9								CLAYEY SILT				
4.0								-trace gravel, layering, oxidation around gravel, wet, soft, medium plasticity, clay pockets within silt -becomes very wet and soft at 4.9m				
4.9												
6.0												
8.2								GRAVELLY SILT				
8.8								-some sand, moist to wet, brown/grey, auger action indicates oversize material starts at 8.8m				
9.1								END OF HOLE @ 9.1m				
9.1								NOTES:				
10.0								-standpipe installed to 7.0 m below ground surface				
11.0								-boulder stratum occurs between 2.7m and 3.9m				
12.0								-water stratum may occur at depths below 4.0 m				
13.0												
14.0												

J.R. Paine & Associates Ltd.		LOGGED BY: MEB	COMPLETION DEPTH: 9.0 m
Whitehorse, Yukon		REVIEWED BY: WCK	COMPLETE: 95/06/21
		Fig. No: 1	Page 1 of 1



J. R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

EDMONTON - GRANDE PRAIRIE - WHITEHORSE - PEACE RIVER

PROJECT VENUS MINES RECLAMATION		CLIENT Public Works Canada Environment A & ES		DATE RECORDED 6-26-95	
STA.	SAMPLE TYPE AUGER	DEPTH 4.2 m	HOLE NO. VIIA	FIELD NO.	LAB NO. T64

GRAIN SIZE ANALYSIS

SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT	DIA. mm	% FINER BY WEIGHT	DIA. mm	% FINER BY WEIGHT
.063	89.0			.0575	87.13	.0044	42.57
				.0417	82.17	.0032	34.65
				.0301	77.22	.0023	28.71
				.0219	70.28	.0014	20.78
				.0158	66.33		
				.0117	60.37		
				.0085	54.45		
				.0061	49.50		

PETROGRAPHIC ANALYSIS

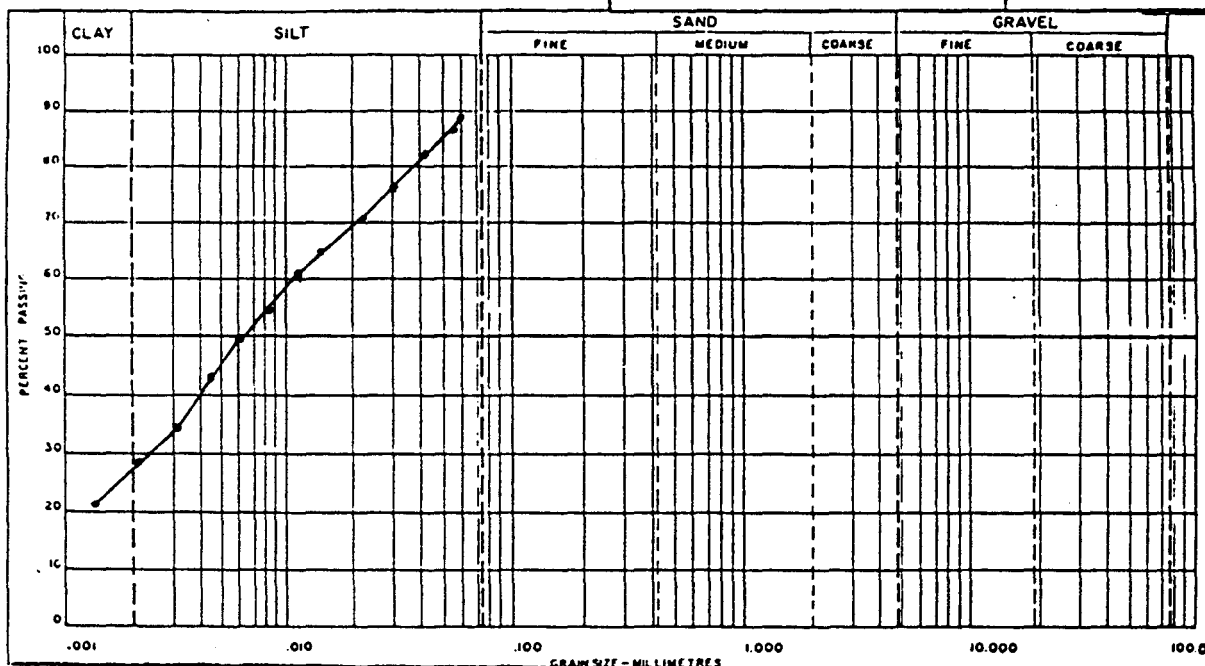
MATERIAL TYPE	% OF TOTAL SAMPLE
SAND	11.0
SILT	62.0
CLAY	27.0

SAMPLE NO.	UNIFIED CLASSIFICATION	LL	PL	P.I.	NATURAL % H ₂ O	SG.
T64	CLAYEY SILT				25	

PARTICLE SHAPE ANALYSIS

ROUND	
SUB-ROUND	
ANGULAR	
SUB-ANGULAR	
FLATS	
NEEDLES	

CRUSH COUNT _____ %



LABORATORY'S REMARKS SIEVE ANALYSIS WAS NOT
CONDUCTED ON FINE GRAINED SAND

DATE SAMPLED _____
DATE RECEIVED _____
TECHNICIAN(S) M.S. / T.D.
CHECKED BY _____

Public Works Canada Environmental A&ES		Venus Mine Tailings Site		BOREHOLE NO: V11B	
Drilled using CME 75 track mounted rig		V11B located southeast of tailings-		PROJECT NO: 8054-12	
with solid stem augers		adjacent to road (site sketch)		ELEVATION:	
SAMPLE TYPE ☒ TUBE ☐ LOST ☒ AUGER ☐ BULK ☐ SPT ☐ CORE					
BACKFILL TYPE ☒ BENTONITE ☐ PEA GRAVEL ☐ SLOUGH ☐ GROUT ☐ DRILL CUTTINGS ☐ SAND					

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	SOILS DESCRIPTION		USC				SOIL SYMBOL	ELEVATION(m)
0.0				GRASS COVER, ORGANIC RICH SOIL	0.05m					PT	0.0
1.0				CLAYEY SILT						ML-CL	-1.0
2.0				-trace gravel, non-plastic, biege with light grey pockets, traces of oxidation around gravel, damp, firm							
3.0				CLAYEY SILT	1.2m					CL	-2.0
4.0				-trace gravel, grey, layering, moist, firm, black decayed organic seams low plasticity							
5.0				BOULDER LAYER	3.0m					GP	-3.0
6.0				-very difficult drilling							
7.0				CLAYEY SILT	3.7m					CL	-4.0
8.0				-trace gravel, layering, oxidation around gravel, wet, soft, medium plasticity							
9.0				-becomes very wet and soft at 4.9m							
10.0				GRAVELLY SILT	8.2m					GC	-8.0
11.0				-some sand, moist to wet, brown/grey, auger action indicates oversize material starts at 8.8m							
12.0				AUGER REFUSAL @ 9.1m	9.1m						-9.0
13.0				NOTES:							-10.0
14.0				-boulder stratum occurs between 3.0m and 3.7m							-11.0
				-water stratum may occur at depths below 4.0 m							-12.0
				-test hole V11B located 4m south, 0.5m east of THV11A							-13.0
				-two test holes were drilled 4m E, 5m S of V11, however auger refusal occurred at boulder layer (3.7m)							-14.0

J.R. Paine & Associates Ltd.		LOGGED BY: MEB	COMPLETION DEPTH: 9.8 m
Whitehorse, Yukon		REVIEWED BY: WCK	COMPLETE: 95/06/21
		Fig. No: 1	Page 1 of 1

Public Works Canada Environmental A&ES		Venus Mine Tailings Site		BOREHOLE NO: V12	
Drilled using CME 75 track mounted rig		V12 located east of tailings-		PROJECT NO: 8054-12	
with solid stem augers		adjacent to road (site sketch)		ELEVATION:	
SAMPLE TYPE		☒ TUBE ☐ LOST ☒ AUGER ☐ BULK ☐ SPT ☐ CORE			
BACKFILL TYPE		☒ BENTONITE ☐ PEA GRAVEL ☐ SLOUGH ☐ GROUT ☐ DRILL CUTTINGS ☐ SAND			

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	PLASTICITY			SOILS DESCRIPTION				USC	SOIL SYMBOL	ELEVATION(m)
				LIQUID: 10 20 30 40 PLASTIC: 10 20 30 40 M.C. 10 20 30 40									
0.0	X	T67					SILT -some gravel, road surface, firm, damp, traces of oxidation around rock, brown 0.3m				ML		0.0
1.0													-1.0
2.0							SILTY CLAY -trace gravel, medium plasticity, moist, firm, oxidation around rocks				CL-ML		-2.0
3.0	X	T68											-3.0
4.0	X	T69					-becomes wet, soft at 4.1m -sample T69, LL=22.7, PL=15.4, PI=7.3 LI=0.4						-4.0
5.0	X	T70					-becomes very soft at 5.2m				CL		-5.0
6.0													-6.0
7.0	X	T71					CLAYEY GRAVEL -auger action indicates gravel and possibly oversize material 6.7m				GC		-7.0
8.0	X	T72					GRAVELLY CLAY -grey, soft, wet (free water), medium plasticity 7.0m				CL		-8.0
9.0	X	T73					CLAYEY GRAVEL -difficult drilling indicates oversize material, wet, soft clay, 7.3m				GC		-9.0
10.0							AUGER REFUSAL @ 8.2m 8.2m						-10.0
11.0							NOTES: -free water may occur at depths of 4.5 metres and greater -at completion, water level raised to 3.6 m in hole (appears to be confined aquifer)						-11.0
12.0													-12.0
13.0													-13.0
14.0													-14.0

J.R. Paine & Associates Ltd.
Whitehorse, Yukon

LOGGED BY: MEB
REVIEWED BY: WCK
Fig. No: 1

COMPLETION DEPTH: 8.2 m
COMPLETE: 95/06/15

Public Works Canada Environmental A&ES		Venus Mine Tailings Site		BOREHOLE NO: V13A	
Drilled using CME 75 track mounted rig		V13A located on southeast area of berm		PROJECT NO: 8054-12	
with solid stem augers		(see site sketch)		ELEVATION:	
SAMPLE TYPE		☒ TUBE ☐ LOST ☒ AUGER ☐ BULK ☐ SPT ☐ CORE			
BACKFILL TYPE		☒ BENTONITE ☐ PEA GRAVEL ☐ SLOUGH ☐ GROUT ☐ DRILL CUTTINGS ☐ SAND			
DEPTH(m) SAMPLE TYPE SAMPLE NO INSTRUMENTATION DATA		SOILS DESCRIPTION 10 20 30 40 PLASTIC M.C. LIQUID 10 20 30 40		20 40 60 80 CLAY 20 40 60 80 SILT 20 40 60 80 SAND 20 40 60 80 GRAVEL	
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0		SAND -fine grained, loose, dry, light brown, tailings 0.1m CLAYEY SILT -trace gravel, damp, firm, traces of oxidation around gravel -auger action indicates boulders or bedrock - difficult drilling 1.6m AUGER REFUSAL @ 1.6m NOTES: -attempted to drill another test hole (V13B) 5 m north of V13A -similar soil profile in V13B as V13A with refusal at 1.6 m		SM ML 0.0 -1.0 -2.0 -3.0 -4.0 -5.0 -6.0 -7.0 -8.0 -9.0 -10.0 -11.0 -12.0 -13.0 -14.0	
J.R. Paine & Associates Ltd.		LOGGED BY: MEB		COMPLETION DEPTH: 1.6 m	
Whitehorse, Yukon		REVIEWED BY: WCK		COMPLETE: 95/06/15	
		Fig. No: 1		Page 1 of 1	

Public Works Canada Environmental A&ES			Venus Mine Tailings Site			BOREHOLE NO: V14		
Drilled using CME 75 track mounted rig			V14 located on access road east of			PROJECT NO: 8054-12		
with solid stem augers			tailings area			ELEVATION:		
SAMPLE TYPE ☒ TUBE ☐ LOST ☒ AUGER ☐ BULK ☐ SPT ☐ CORE								
BACKFILL TYPE ☒ BENTONITE ☐ PEA GRAVEL ☐ SLOUGH ☐ GROUT ☐ DRILL CUTTINGS ☐ SAND								

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	SOILS DESCRIPTION				USC	SOIL SYMBOL	ELEVATION(m)
0.0				GRAVELLY CLAYEY SILT -trace sand, brown, damp, non-plastic, possibly cobbles, fine grained sand sizes, firm				ML		0.0
1.0				0.9m				ML-CL		-1.0
2.0				CLAYEY SILT -trace sand, easier drilling, grey/light brown, firm, damp				GP		-2.0
3.0				1.5m						-3.0
4.0				COBBLES and BOULDERS -difficult drilling						-4.0
5.0				2.1m						-5.0
6.0				AUGER REFUSAL @ 2.1 m						-6.0
7.0				NOTES: -exposed bedrock approximately 25 m north of Test Hole V14						-7.0
8.0										-8.0
9.0										-9.0
10.0										-10.0
11.0										-11.0
12.0										-12.0
13.0										-13.0
14.0										-14.0

J.R. Paine & Associates Ltd. Whitehorse, Yukon		LOGGED BY: MEB	COMPLETION DEPTH: 2.1 m
		REVIEWED BY: WCK	COMPLETE: 95/06/21
		Fig. No: 1	Page 1 of 1

Public Works Canada Environmental A&ES			Venus Mine Tailings Site			BOREHOLE NO: V15		
Drilled using CME 75 track mounted rig			V15 located on access road east of			PROJECT NO: 8054-12		
with solid stem augers			tailings area			ELEVATION:		
SAMPLE TYPE			☒ TUBE ☐ LOST ☒ AUGER ☐ BULK ☐ SPT ☐ CORE					
BACKFILL TYPE			☒ BENTONITE ☐ PEA GRAVEL ☐ SLOUGH ☐ GROUT ☒ DRILL CUTTINGS ☐ SAND					

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	■ LIQUID ■ ▲ PLASTIC ▲ 10 20 30 40 10 20 30 40			SOILS DESCRIPTION	● CLAY ● ▲ SILT ▲ ■ SAND ■ ◆ GRAVEL ◆ 20 40 60 80 20 40 60 80 20 40 60 80 20 40 60 80				USC	SOIL SYMBOL	ELEVATION(m)
				PLASTIC M.C. LIQUID 10 20 30 40										
0.0						CLAYEY SILT -some sand, fine grained sand sizes, brown, firm, low plasticity,						0.0		
1.0												-1.0		
2.0												-2.0		
3.0												-3.0		
4.0												-4.0		
4.5						GRAVELLY SILT and CLAY -moist, firm, auger action indicates presence of oversize material						-4.5		
5.0												-5.0		
5.5												-5.5		
6.0						SILTY CLAY -traces of gravel, wet, soft, oxidation around gravel,						-6.0		
6.5												-6.5		
7.0												-7.0		
8.0												-8.0		
9.0												-9.0		
10.0												-10.0		
11.0												-11.0		
11.4						CLAYEY GRAVEL -difficult drilling indicates possible oversize material						-11.4		
12.0												-12.0		
12.0						AUGER REFUSAL @ 12.0m						-12.0		
13.0												-13.0		
14.0												-14.0		

J.R. Paine & Associates Ltd. Whitehorse, Yukon		LOGGED BY: MEB	COMPLETION DEPTH: 12.0 m
		REVIEWED BY: WCK	COMPLETE: 95/06/21
		Fig. No: 1	Page 1 of 1

Public Works Canada Environmental A&ES			Venus Mine Tailings Site			BOREHOLE NO: V16		
Drilled using CME 75 track mounted rig			V16 located southwest of tailings (see site sketch)			PROJECT NO: 8054-12		
with solid stem augers						ELEVATION:		
SAMPLE TYPE			☒ TUBE	☐ LOST	☒ AUGER	☐ BULK	☐ SPT	☐ CORE
BACKFILL TYPE			☒ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT	☒ DRILL CUTTINGS	☐ SAND

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	PLASTICITY INDEX			SOILS DESCRIPTION				USC	SOIL SYMBOL	ELEVATION(m)
				PLASTIC			GRAVEL	SAND	SILT	CLAY			
				M.C.									
				10	20	30							
0.0													0.0
1.0	☒	75											-1.0
2.0													-2.0
3.0													-3.0
4.0													-4.0
5.0													-5.0
6.0													-6.0
7.0													-7.0
8.0													-8.0
9.0													-9.0
10.0													-10.0
11.0													-11.0
12.0													-12.0
13.0													-13.0
14.0													-14.0

GRAVELLY SANDY SILT
 -oversize material -cobbles and possibly boulders present, loose, dry, brown,

1.2m

AUGER REFUSAL @ 1.2m

NOTES:
 -exposed boulders (or bedrock) along embankment in area of test hole V16
 -moved drill rig 3 m north of V16; auger refusal occurred at 1.0 m

J.R. Paine & Associates Ltd. Whitehorse, Yukon		LOGGED BY: MEB	COMPLETION DEPTH: 1.2 m
		REVIEWED BY: WCK	COMPLETE: 95/06/21
		Fig. No: 1	Page 1 of 1



J. R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

SCREEN ANALYSIS

Client: PWGSC, A & ES
Sample: T75 Depth: 0.9m-1.2m Project: Venus Mines Reclamation
Location: Tailings Area, Test Hole V16 Made by: P.R. Job No.: 8054-12
Ck'd by: M.B. Date: 95/06/23

Sieve No.	Size of Opening MM	Weight Retained gms	Total Wt. Finer Than gms	Percent Finer Than	% Finer Than Basis Orig. Sample
80,000	80.000				
50,000	50.000				100.0
20,000	20.000				96.4
10,000	10.000				84.1
5,000	5.000				73.8
2,500	2.500				66.0
2,000	2.000				64.2
1,250	1.250				60.7
800	.800				57.7
630	.630				56.3
400	.400				54.0
315	.315				52.9
250	.250				52.0
160	.160				50.4
80	.080				47.3

Description of Sample _____
gravelly sandy silt, ML

Method of Preparation _____ Dry _____ Washed X

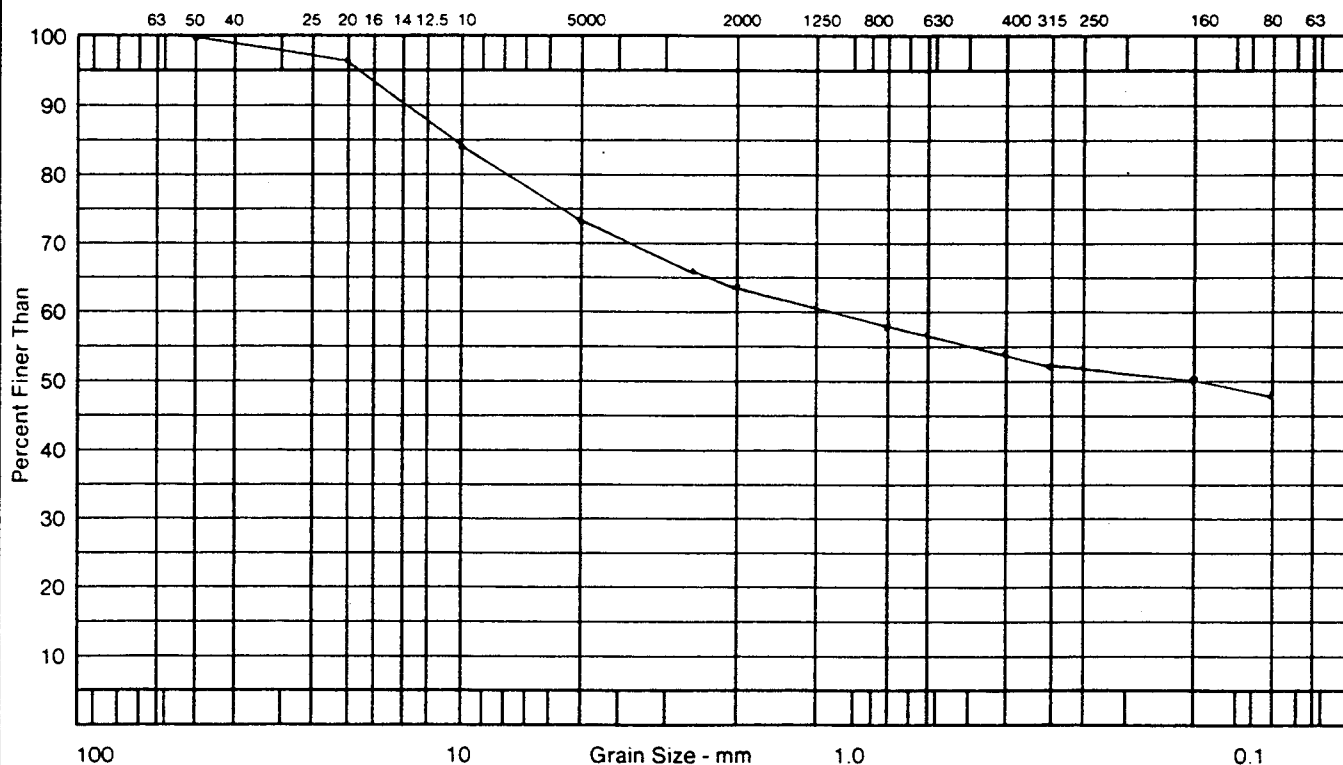
Remarks _____

gravel = 26.2

sand = 26.5

finer = 47.3

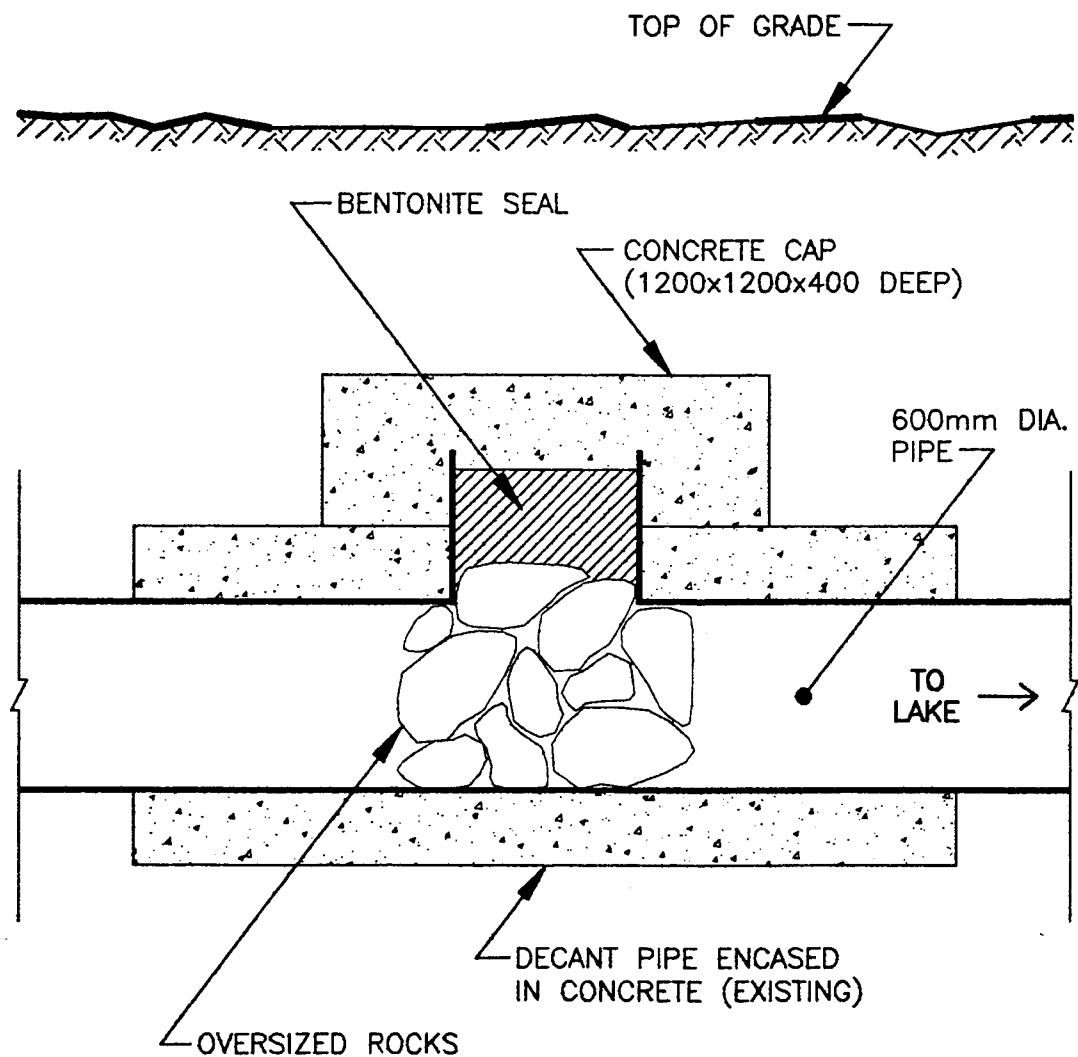
Time of Sieving _____ Min.



Public Works Canada Environmental A&ES		Venus Mine Tailings Site		BOREHOLE NO: V17	
Drilled using CME 75 track mounted rig		V17 located southwest of tailings (see		PROJECT NO: 8054-12	
with solid stem augers		site sketch)		ELEVATION:	
SAMPLE TYPE		☒ TUBE	☐ LOST	☒ AUGER	☐ BULK
BACKFILL TYPE		☒ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT
		☐ DRILL CUTTINGS	☐ SAND		

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	INSTRUMENTATION DATA	SOILS DESCRIPTION		USC				SOIL SYMBOL	ELEVATION(m)
0.0											0.0
1.0					SILTY SAND					SM	-1.0
					-some gravel, cobbles and possibly boulders present, loose, dry, brown						
					AUGER REFUSAL @ 0.9m						
2.0											-2.0
3.0											-3.0
4.0											-4.0
5.0					NOTES:						-5.0
					-exposed boulders (or bedrock) along slope where test hole V17 is located						
					-moved drill rig 8 m west to drill another hole; auger refusal @ 1.4m						
6.0											-6.0
7.0											-7.0
8.0											-8.0
9.0											-9.0
10.0											-10.0
11.0											-11.0
12.0											-12.0
13.0											-13.0
14.0											-14.0

J.R. Paine & Associates Ltd.		LOGGED BY: MEB	COMPLETION DEPTH: 0.9 m
Whitehorse, Yukon		REVIEWED BY: WCK	COMPLETE: 95/06/21
		Fig. No: 1	Page 1 of 1



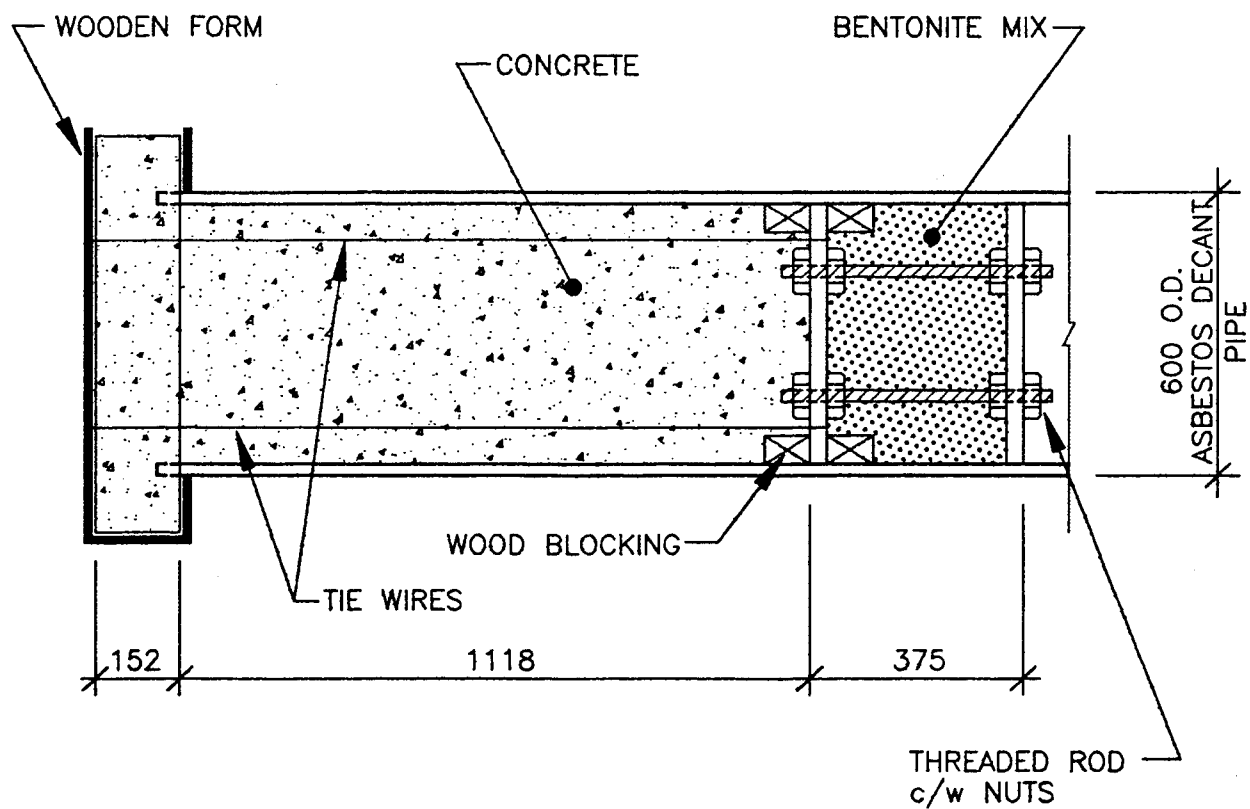
SECTION

DECANT PIPE PLUG AT INLET

N.T.S.

PLOT 1-1
CAD FILE: VENUS\V-01

 Public Works And Government Services Canada Travaux publics et Services gouvernementaux Canada Architectural & Engineering Services Environmental Services - Alta./N.W.T. Division	designed by: _____ date: _____	
	concu par: _____	
	drawn by: _____	
	dessiné par: _____	
	approved by: _____	
approuvé par: _____		
revisions: _____		
VENUS MINES, N.W.T. DECANT PIPE PLUG AT INLET		project no. no. du projet: 626483
		page no. numéro de page: 1 of 3



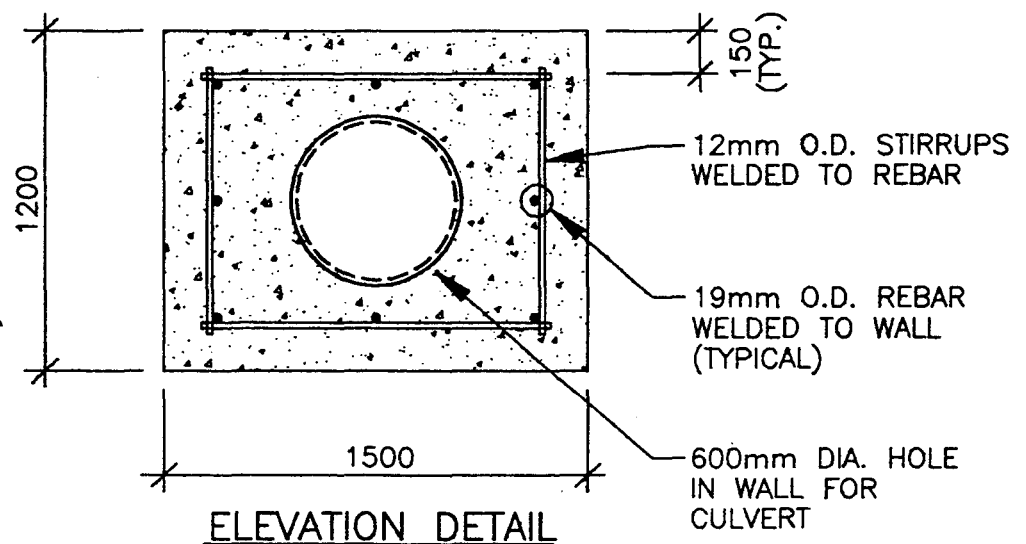
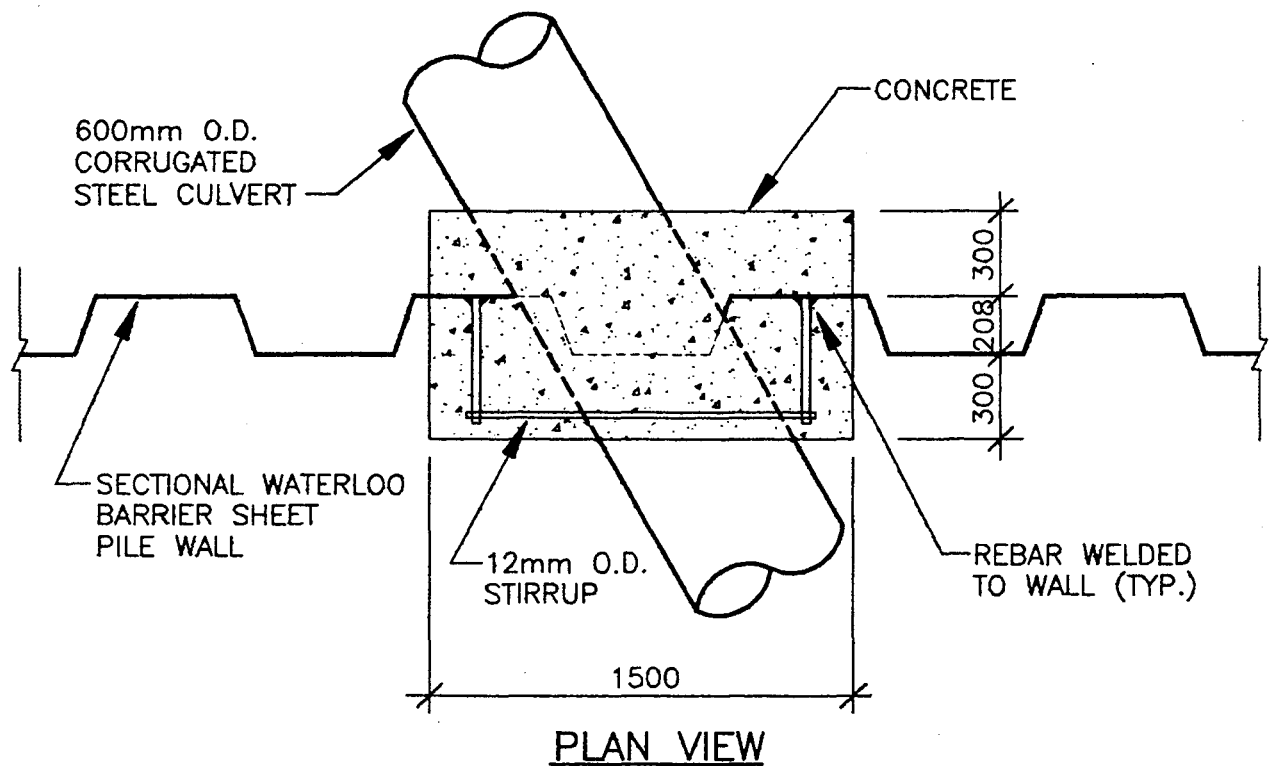
SECTION

DECANT PIPE PLUG AT OUTLET

N.T.S.

PLOT 1-1
CAD FILE: VENUS\V-02

 Public Works And Government Services Canada Architectural & Engineering Services Environmental Services - Alta./N.W.T. Division	Travaux publics et Services gouvernementaux Canada		designed by:	date:
			conçu par:	
			drawn by:	
			dessiné par:	
			approved by:	
			approuvé par:	
			revisions:	
VENUS MINES, N.W.T.			project no. no. du projet:	page no. numéro de page
DECANT PIPE PLUG AT OUTLET			626483	2 of 3



HIGHWAY CULVERT REPAIR

N.T.S.

PLOT @ 1=1
CAD FILE: VENUS/V-03

 Public Works And Government Services Canada Architectural & Engineering Services Environmental Services - Alta./N.W.T. Division	Travaux publics et Services gouvernementaux Canada Architectural & Engineering Services Environmental Services - Alta./N.W.T. Division	designed by: _____ date: _____	
		concur par: _____	
VENUS MINES, N.W.T. HIGHWAY CULVERT REPAIR		drawn by: _____	
		designe par: _____	
		approved by: _____	
		approuve par: _____	
		revisions: _____	
		project no. no. du projet:	page no. numéro de page
		626483	3 of 3



BTY (Alberta) Ltd.

Chartered Quantity Surveyors and Cost Consultants

July 4th, 1995

Public Works and Government Services Canada
Architectural and Engineering Services
9th Floor Canada Place
9700 Jasper Avenue
Edmonton, Alberta
T5J 4E2

Attention: Mr. Lawrence Borowski, P. Eng.

Dear Sir:

Re: Venus Mine Tailings
Skagway Carcross Highway
Yukon Territory

We have finalized our cost estimate for the removal of the contaminated material from the Venus Mine Tailings Site based on the proposed scope of work.

The cost estimate totals \$ 1 556 000 and includes a 10% contingency. The estimated amounts exclude the Goods and Services Tax. A more detailed breakdown has been summarized on the attached sheets.

Should you require any further information, please do not hesitate to contact us.

Yours very truly,

BTY (Alberta) Ltd.

G. Graeme Alston

GGA:mm
Enclosure

Suite 308
Strathcona Centre
10328 - 81 Avenue
Edmonton, Alberta
T6E 1X2

Fax: (403) 431-2458
Tel: (403) 431-0556

John R. Yates
FRICS, PQS
G. Graeme Alston
FRICS, PQS

**Venus Mine Tailings
Skagway Carcross Highway
Yukon Territory**

June 1995
Page 1

COST BREAKDOWN

Item	Quantity	Unit Rate	Estimated Cost
Improve access to the receiving pit by installing a culvert in the highway ditch, and surfacing the access route with pit run gravel. Price to include supply of culvert, installation of culvert, hauling and placing granular material and any other costs related to providing access.	Allow	Sum	13 000
Set up scales at the receiving borrow pit. Price to include all costs related to supply of scales, rentals, site preparation, erection and dismantling scales at the conclusion of the project.	Allow	Sum	25 000
Receiving Burrow Pit - Excavate, load, haul, weigh and stockpile borrow pit material under summer conditions. Price to include all labour, materials and equipment required to move borrow pit material using trucks, loaders and heavy earth moving equipment.	10 000 t	6.00	60 000
Receiving Borrow Pit - Excavate, load, haul, weigh, place and compact borrow pit material under summer conditions. Price to include all labour, materials and equipment required to move borrow pit material using trucks, loaders and heavy earth moving equipment.	7 500 t	8.00	60 000
Venus Mines Tailings Site - Excavate, load, haul, weigh and stockpile mine tailings material under summer conditions. Price to include all labour, materials and equipment required to move mine tailings material using trucks, loaders and heavy earth moving equipment.	2 500 t	6.00	15 000
Venus Mine Tailings Site - Excavate, load, haul, weigh, place and compact mine tailings material under summer conditions. Price to include all labour, materials and equipment necessary to move mine tailings material using trucks, loaders, and heavy earth moving equipment	10 000 t	8.00	80 000

**Venus Mine Tailings
Skagway Carcross Highway
Yukon Territory**

June 1995
Page 2

COST BREAKDOWN (continued)

Item	Quantity	Unit Rate	Estimated Cost
Final placement of stockpiled borrow pit and tailings material. Load, haul, place and compact and/or doze, spread and compact stockpiled borrow pit and tailings material. Price to include all costs necessary for final placement of stockpiled borrow pit and tailings material, including clean up of stockpile areas:			
. mine tailings	2 500 t	3.00	7 500
. borrow pit material	10 000 t	3.00	30 000
Venus Mine Tailings Site - Excavate, load, haul, weigh, place and compact mine tailings material under winter conditions. Price to include all labour, materials and equipment necessary to rip, load, haul, weight and place mine tailings material during winter months.			
	30 000 t	11.00	330 000
Vibratory drum compactor. Use of vibratory drum compactor for additional compaction effort at the toe of the highway embankment:			
. base lease rate	Allow	Sum	12 000
. operating time c/w operator	75 hrs	100.00	7 500
Liner material, Load, haul, weigh, place and compact silty clay liner materials in the receiving borrow pit. Price to include all labour and equipment necessary to load and haul the material, place in the receiving borrow pit, shape to required dimensions and compact.			
	6 500 t	7.00	45 500
Capping material. Load, haul, weigh and stockpile materials to be used for capping the final mine tailings pile. Price to include all labour and equipment necessary to prepare the stockpile area, load and haul the material and stockpile.			
	3 500 t	7.00	24 500

**Venus Mine Tailings
Skagway Carcross Highway
Yukon Territory**

June 1995
Page 3

COST BREAKDOWN (continued)

Item	Quantity	Unit Rate	Estimated Cost
Level capping material at the site near Carcross. Price to include labour and equipment necessary to restore the current "landfarm" to a smooth, drained surface.	Allow	Sum	5 000
Remove, (or relocate) power lines. Price to include actual costs incurred by a local power company to complete the work.	Allow	Sum	5 000
Collect and dispose (by burning) wood debris on site, and dispose of brush and decant pipe material. Price to include all labour and equipment necessary to clean up work areas at the Venus Mine Tailings site.	Allow	Sum	5 000
Final clean up of mine tailings area, including levelling and shaping the mine tailings site. Price to include all labour and equipment necessary to shape the Venus mine site to the final grades indicated on the contract drawings.	Allow	Sum	10 000 (1-96)
Licences, permits and royalties. Cash allowance to cover payments made by the contractor for licenses, permits, bonds and royalties.	Allow	Sum	20 000
Cost to complete project. Price to include supervision, profit, administration, community consultation, supply of temporary facilities, flagpersons, scale persons and any costs for items not covered above.	Allow	Sum	200 000
Supply 3/4" granular fill. Price to include loading, hauling, placing and compacting the material in two (2) lifts, each 300 mm in thickness and constructing berm in accordance with design details. Assume 15 km haul.			
. berm (can be constructed in 1995)	6 500 t	14.00	91 000
. granular fill	9 000 t	12.00	108 000

75% - 1995
25% - 1996

Crush/stockpile 1995
Haul/place 1996

Venus Mine Tailings
Skagway Carcross Highway
Yukon Territory

June 1995
Page 4

COST BREAKDOWN (continued)

Item	Quantity	Unit Rate	Estimated Cost
Geocomposite clay liner. Supply and install Bentofix GCL or equivalent clay liner	9 000 m2	20.00	180 000 (1996)
Vegetation cover. Hydro seed borrow pit area. Price to include supply of seed mixture, hydro- seeding and placement of a degradable erosion blanket	9 000 m2	3.00	27 000 (1996)
De-watering of existing pond	Allow	Sum	40 000
Place capping material/grade/compact	3 500 t	4.00	14 000 (1996)
Contingency allowance (10%)	Allow	Sum	141 500
TOTAL			\$ 1 556 500

Breakdown - 1995 909000
1996 506000
Contingency 141,500



BTY (Alberta) Ltd.

Chartered Quantity Surveyors and Cost Consultants

July 17th, 1995

Public Works and Government Services Canada
Transportation
Architectural and Engineering Services
9th Floor Canada Place
9700 Jasper Avenue
Edmonton, Alberta
T5J 4E2

Attention: Mr. Henry Westerman

Dear Sir:

Re: Venus Mine Tailings
Skagway Carcross Highway
Yukon Territory

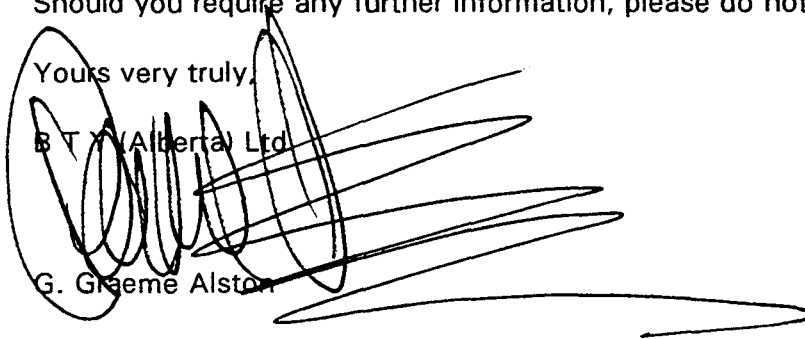
Following our meeting with Mr. Lawrence Borowski, we have finalized our cost estimate for the containment of the contaminated material at the Venus Mine Tailings Site based on the proposed scope of work.

The cost estimate totals \$ 1 221 000 and includes a 10% contingency. The estimated amounts exclude the Goods and Services Tax. A more detailed breakdown has been summarized on the attached sheets.

Should you require any further information, please do not hesitate to contact us.

Yours very truly,

BTY (Alberta) Ltd.



G. Graeme Alston

GGA:mm
Enclosure

Suite 308
Strathcona Centre
10328 - 81 Avenue
Edmonton, Alberta
T6E 1X2

Fax: (403) 433-2458
Tel: (403) 439-0056

John R. Yates
FRICS, PQS

G. Graeme Alston
FRICS, PQS

**Venus Mine Tailings
Skagway Carcross Highway
Yukon Territory**

July 1995

Page 1

COST BREAKDOWN

<u>Item</u>	<u>Quantity</u>	<u>Unit Rate</u>	<u>Estimated Cost</u>
Set up scales at the Venus Mine Tailings Site. Price to include all costs related to supply of scales, rentals, site preparation, erection and dismantling scales at the conclusion of the project	Allow	Sum	12 000
Supply and installation of an impermeable wall (Waterloo Barrier) to contain the tailings pile at its current location:			
. Mobilization and fixed costs	Allow	Sum	35 000
. Accommodation, travel and communication expenses	Allow	Sum	40 000
. Quality Assurance/Quality Control inspection services	Allow	Sum	30 000
. Waterloo Barrier sheet piling supply and installation	Allow	Sum	210 000
. Waterloo Barrier sheet pile installation	Allow	Sum	145 000
. Waterloo Barrier sheet pile joint sealing	Allow	Sum	90 000
Load, haul, weigh, place, grade and compact a silty clay cap. Price to include all labour and equipment to construct a silty clay cap.	4 500 t	8.00	36 000
Collect and dispose (by burning) wood debris on site and dispose of brush and seal decant pipe. Price to include all labour and equipment necessary to clean up work areas at the Venus Tailings site.	Allow	Sum	5 000

**Venus Mine Tailings
Skagway Carcross Highway
Yukon Territory**

July 1995

Page 2

COST BREAKDOWN (continued)

Item	Quantity	Unit Rate	Estimated Cost
Excavating wind blown tailings and levelling tailings site. Price to include all labour and equipment necessary to excavate wind blown tailings; excavate high areas on the tailings pile and move to low areas; final leveling and compaction of tailings site:			
. Excavate and place wind blown tailings, including material in the drainage discharge area	1 600 m3	3.00	4 800
. Excavate and relocate tailings on site	1 700 m3	3.00	5 100
. Final shaping, grading and compaction of tailings site	13 300 m2	2.00	26 600
Supply and installation of geomembrane. Price to include all labour and equipment necessary to supply a geomembrane and place (including field welding, if specified) a geomembrane over the silty clay cap.	13 300 m2	18.00	239 400
Constructing a drainage discharge system. Price to include the supply and installation of piping material; supply and installation of end sections and all connections	Allow	Sum	7 000
Screening, hauling and placing capillary break material. Price to include the screening, hauling, placing and compaction of a capillary break material to the lines and grades specified.	7 300 t	13.00	94 900
Supply and place pitrun aggregate in the outfall area	500 t	12.00	6 000
Licenses, permits and royalties. Cash allowance to cover payments made by the contractor for licenses, permits, bonds and royalties.	Allow	Sum	10 000

Venus Mine Tailings
Skagway Carcross Highway
Yukon Territory

July 1995
Page 3

COST BREAKDOWN (continued)

Item	Quantity	Unit Rate	Estimated Cost
Costs to complete project. Price to include supervision, profit, administration, community consulting, supply of temporary facilities, flagpersons, scale persons, dewatering and any costs for items not covered above			
	Allow	Sum	113 200
Contingency allowance (10%)	Allow	Sum	111 000
TOTAL			\$ 1 221 000

VENUS MINE TAILINGS REMEDIATION: CONSTRUCTION COST SUMMARY

ITEM NO.	DESCRIPTION	CONSTRUCTION COST ESTIMATE				START UP FUND PC #1	PROGRESS CLAIM #2			PROGRESS CLAIM #3			PROGRESS CLAIM #4		
		Unit of measure	Expected Quantity	Unit price	Total Item Cost(\$)		Percent complete	Quantity	Claimed	Percent complete	Quantity	Claimed	Percent complete	Quantity	Claimed
1	Setup weigh scales														
2	Waterloo Barrier	L.S.			548,000.00	-	95%		520,600.00	100%		548,000.00	100%		548,000.00
3	Haul & place clay cap	cu.m.	2650	18.90	50,085.00	-		2650	50,085.00		3850	72,765.00		3850	72,765.00
4	Collect & dispose of debris	L.S.			4,032.00	-	100%		4,032.00	100%		4,032.00	100%		4,032.00
5a	Excavate wind blown tailings	cu.m.	1600	6.10	9,760.00	-		1600	9,760.00		3656	22,301.60		3656	22,301.60
5b	Excavate tailings pond	cu.m.	1700	8.82	14,994.00	-		1700	15,000.00		2226	19,633.32		2226	19,633.32
5c	Level tailings pond	sq.m.	13300	0.35	4,655.00	-		13300	4,655.00		13300	4,655.00		13300	4,655.00
6	Supply & install geotextile	sq.m.	13300	3.38	44,954.00	-		6650	22,477.00		12426	41,999.88		13300	44,954.00
7	Construct drainage system	L.S.	80	188.16	15,052.81	-	0%		0.00	0%		0.00	0%	25	4,704.06
8	Screening & hauling gravel	cu.m.	4100	16.16	66,256.00	-	0%		0.00		0	0.00		4725	76,356.00
9	Haul and place pitrun(outfall)														
10	Cash allowance														
11	Cost to complete	L.S.			344,779.00	-	50%		172,389.50	90%		310,779.00	100%		344,779.00
										Extra		43,000.00			51,700.00
	TOTAL				1,102,567.81	434,000.00			798,998.50			1,067,165.80			1,193,879.98
	(less) 10% Holdback								79,899.85			106,716.58			67,588.02
	Net Amount					434,000.00			719,098.65			960,449.22			1,126,291.96
	(less) Previous Payment					0.00			434,000.00			719,098.65			1,012,249.20
	NET AMOUNT PAYABLE					434,000.00			285,098.65			241,350.57			114,042.76



Public Works
Canada

Travaux publics
Canada

REQUEST FOR PROGRESS PAYMENT

REQUEST NO.

5 /

DEPT.

28

REGION/DISTRICT

PAYMENT PERIOD

Aug 1 - 15 - INITIAL Contribution

FROM:

TO:

CONTRACTOR (NAME AND ADDRESS)

CPRCROSS / TAYLOR

P.O. Box 130, Carleton Place, ON

R.O. FILE NO.

D.O. FILE NO.

DESCRIPTION AND LOCATION OF WORK

Veritas mine TAILINGS REHABILITATION

CONTRACT NO.

PROJECT NO.

PART 1 - PROGRESS CLAIM

THIS PERIOD

TOTAL TO DATE

A) Portion of work completed

\$ 434,000

\$ 434,000.00

B) Material delivered to site
but not incorporated in work

\$ 0

\$ 0

AMOUNT CLAIMED

\$ 434,000.00

\$ 434,000.00

This claim is submitted in accordance with TP 4.2 of the Terms of Payment of the above contract for work completed and material delivered to site but not incorporated in the work, the whole as described in the attached COST BREAKDOWN.

CONTRACTOR:

AUTHORIZED SIGNING OFFICER

Manager

TITLE

Oct 10/95

DATE

PART 2 - PROGRESS REPORT

TOTAL AMOUNT

(LESS) HOLDBACK

NET AMOUNT

A) Work completed to date

\$ 0

\$ 0

\$ 434,000 -

B) Material delivered to site but
not incorporated in the work

\$

\$

\$ 0

TOTALS TO DATE

\$

\$

\$ 434,000 -

(Less) Previous Payment(s)

\$ 0

NET AMOUNT PAYABLE

\$ 434,000.00

The value of the portion of the work completed and material delivered to site, described in the above Progress Claim is as shown in this Progress Report.

DPW:

Patricia Vallen

AUTHORIZED SIGNING OFFICER

Project Manager

TITLE

Oct 95/95

DATE

PRE-AUDIT BY:

CERTIFIED PURSUANT TO SECTION 27 OF
THE FINANCIAL ADMINISTRATION ACT

REQUISITIONED FOR PAYMENT PURSUANT
TO SECTION 26 OF THE FINANCIAL ADMINIS-
TRATION ACT AND CERTIFIED IN ACCORD-
ANCE WITH SUBSECTION 7(1) OF THE AC-
COUNT VERIFICATION AND PAYMENT REQUI-
SITION REGULATIONS.

SIGNATURE

SIGNATURE

ORIGINAL CONTRACT AMOUNT

APPROVED ADDITIONS

APPROVED DEDUCTIONS

AUTHORIZED CONTRACT
AMOUNT TO DATE

\$

\$

\$

\$

REF. NO.

ACCOUNT CODING

AMOUNT

CR.

CHEQUE NO. & DATE

SERVICE OFFICER

TOTAL ▶



Carcross/Tagish Development Corporation

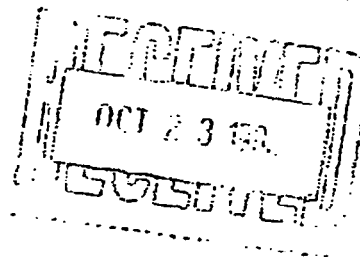
Head Office : P.O. Box 130

Carcross, Yukon Y0B 1B0

Tel : (403) 821-4109

Fax : (403) 821-4811

D.I.A.N.D.
Action on Waste Management
300 Main Street
Whitehorse, Yukon



October 20, 1995

Attn: Mrs. Dorothy McLeod, Administrator.

Dear Mrs. McLeod;

Re: Expenditures Paid Under the Venue Mine Site Rehabilitation.

Further to our meeting of Thursday, October 19, 1995 regarding expenditures from the first advance of \$434,000.00 the following is a list of these for your records.

Coine & Sons Equipment Rental	\$ 28,000.00
L & J Construction	22,000.00
Riverside Contracting	16,400.00
H.R. Vance	15,000.00
United Keno Hill	10,000.00
Camp Rental & Food	26,000.00
L.W. Dickson Contracting	56,000.00
Labour	143,000.00
Insurance	2,500.00
Job Site Offices	6,000.00
Hilker	27,000.00
Legal Fees	3,000.00
Y.T.G. Highways	22,000.00
Bray-Shay Enterprises	8,000.00
Nilex	17,000.00
Caddock Trucking	3,000.00
Hawkshaw Transport	1,500.00
Helm Trucking	5,000.00
Butch Beattie Trucking	4,000.00
Beaver Lumber	2,740.00
Kilrich Industries	5,786.00
Total:	423,926.00

The above numbers have been rounded to the nearest \$10.00. As of this date the project is completed and attached please find our final progress claim for work done.

We hope the foregoing to be to your satisfaction and look forward to payment.

Regards,

Larry Whelan

Larry Whelan, Manager

LW/mp

Public Works
CanadaTravaux publics
Canada

REQUEST FOR PROGRESS PAYMENT

REQUEST NO.

2

DEPT.

28

REGION/DISTRICT

PAYMENT PERIOD

FROM: Aug 5

TO: SEPT 15, 1995

CONTRACTOR (NAME AND ADDRESS)

CARCROSS TAGISH DEVELOPMENT CORPORATION
FOR CARCROSS/TAGISH FIRST NATION

R.O. FILE NO.

D.O. FILE NO.

DESCRIPTION AND LOCATION OF WORK

VENUS MINE TAILINGS REHABILITATION Project

CONTRACT NO.

PROJECT NO.

PART 1 - PROGRESS CLAIM

THIS PERIOD

TOTAL TO DATE

A) Portion of work completed

\$ 798,998.50

\$ 798,998.50

B) Material delivered to site
but not incorporated in work

\$ 0

\$ 0

AMOUNT CLAIMED

\$ 798,998.00

\$ 798,998.50

This claim is submitted in accordance with TP 4.2 of the Terms of Payment of the above contract for work completed and material delivered to site but not incorporated in the work, the whole as described in the attached COST BREAKDOWN.

CONTRACTOR:

Laurence Whelan

Manager

Sept 30/95

AUTHORIZED SIGNING OFFICER

TITLE

DATE

PART 2 - PROGRESS REPORT

TOTAL AMOUNT

(LESS) HOLDBACK

NET AMOUNT

A) Work completed to date

\$ 798,998.50

\$ 79,899.85

\$ 719,098.65

B) Material delivered to site but
not incorporated in the work

\$ 0

\$ 0

\$ 0

TOTALS TO DATE

\$ 798,998.50

\$ 79,899.85

\$ 719,098.65

(Less) Previous Payment(s)

\$ 434,000.00

NET AMOUNT PAYABLE

\$ 285,098.65

The value of the portion of the work completed and material delivered to site, described in the above Progress Claim is as shown in this Progress Report.

DPW:

AUTHORIZED SIGNING OFFICER

TITLE

DATE

PRE-AUDIT BY:

CERTIFIED PURSUANT TO SECTION 27 OF
THE FINANCIAL ADMINISTRATION ACTREQUISITIONED FOR PAYMENT PURSUANT
TO SECTION 26 OF THE FINANCIAL ADMINIS-
TRATION ACT AND CERTIFIED IN ACCORD-
ANCE WITH SUBSECTION 7(1) OF THE AC-
COUNT VERIFICATION AND PAYMENT REQUI-
SITION REGULATIONS.

SIGNATURE

SIGNATURE

ORIGINAL CONTRACT AMOUNT

APPROVED ADDITIONS

APPROVED DEDUCTIONS

AUTHORIZED CONTRACT
AMOUNT TO DATE

\$

\$

\$

\$

REF. NO.

ACCOUNT CODING

AMOUNT

CR.

CHEQUE NO. & DATE

SERVICE OFFICER

TOTAL ►



Public Works
Canada

Travaux publics
Canada

REQUEST FOR PROGRESS PAYMENT

REQUEST NO.

DEPT.

3

28

REGION/DISTRICT

PAYMENT PERIOD

FROM: Sept 15

TO: Oct 10 1995

CONTRACTOR (NAME AND ADDRESS)

CARCROGS/TAGISH DEVELOPMENT

R.O. FILE NO.

P.O. Box 130 CARCROGS YACON

D.O. FILE NO.

DESCRIPTION AND LOCATION OF WORK

VENUS MINE TAILINGS REHABILITATION PROJECT

CONTRACT NO.

PROJECT NO.

PART 1 - PROGRESS CLAIM

THIS PERIOD

TOTAL TO DATE

A) Portion of work completed

\$ 268,167.50

\$ 1,067,165.80

B) Material delivered to site
but not incorporated in work

\$ 0

\$ 0

AMOUNT CLAIMED

\$ 268,167.50

\$ 1,067,165.80

This claim is submitted in accordance with TP 4.2 of the Terms of Payment of the above contract for work completed and material delivered to site but not incorporated in the work, the whole as described in the attached COST BREAKDOWN.

CONTRACTOR:

X. Whelan

Manager

Oct 10/95

AUTHORIZED SIGNING OFFICER

TITLE

DATE

PART 2 - PROGRESS REPORT

TOTAL AMOUNT

(LESS) HOLDBACK

NET AMOUNT

A) Work completed to date

\$ 1,067,165.80

\$ 106,716.58

\$ 960,449.22

B) Material delivered to site but
not incorporated in the work

\$ 0

\$ 0

\$ 0

TOTALS TO DATE

\$ 1,067,165.80

\$ 106,716.58

\$ 960,449.22

(Less) Previous Payment(s)

\$ 719,098.65

NET AMOUNT PAYABLE

\$ 241,350.57

The value of the portion of the work completed and material delivered to site, described in the above Progress Claim is as shown in this Progress Report.

DPW:

Dan Valen

Project Manager

Oct 10/95

AUTHORIZED SIGNING OFFICER

TITLE

DATE

PRE-AUDIT BY:

CERTIFIED PURSUANT TO SECTION 27 OF
THE FINANCIAL ADMINISTRATION ACT

REQUISITIONED FOR PAYMENT PURSUANT
TO SECTION 26 OF THE FINANCIAL ADMINISTRATION ACT AND CERTIFIED IN ACCORDANCE WITH SUBSECTION 7(1) OF THE ACCOUNT VERIFICATION AND PAYMENT REQUISITION REGULATIONS.

SIGNATURE

SIGNATURE

ORIGINAL CONTRACT AMOUNT

APPROVED ADDITIONS

APPROVED DEDUCTIONS

AUTHORIZED CONTRACT
AMOUNT TO DATE

\$

\$

\$

\$

REF. NO.

ACCOUNT CODING

AMOUNT

CR.

CHEQUE NO. & DATE

SERVICE OFFICER

TOTAL ►



**COST BREAKDOWN
FOR UNIT PRICE CONTRACT**

REQUEST NO.

3

PAGE

OF

DESCRIPTION AND LOCATION OF WORK

CONTRACT NO.

PROJECT NO.

ITEM NO.	CLASS OF LABOUR PLANT OR MATERIAL	UNIT OF MEASURE	QUANTITIES			UNIT PRICE	VALUE TO DATE
			AUTHORIZED	THIS PERIOD	TO DATE		
01	Set-up WEIGHT SERIES	N/A	N/A	N/A			N/A
02	WATERLOO BARRIER	L.S	548,000		548,000	548,000	548,000.00
03	Load/Place & Compact SILTY CLAY	M ³	2650	1200	3850	18 ⁹⁰	72,765.00
04	Collect & Dispose DEBRIS	L.S		0	100%	4032	4032.00
05 A	EXCAVATE TAILINGS	M ³	1600	2056	3656	6 ¹⁰	22,301.60
B		M ³	1700	526	2226	8 ⁸⁰	19,633.32
C		Sq M	1330	0	13,300	0 ³⁵	4655.00
06	Supply Geomembrane	Sq M	1330	5776	12,426	3 ⁵⁸	41,999.88
07	Construct Drainage 54,570 m	L.M	80	0	0	158 ¹⁶	0
08	SCREENING, hauling 1+ RUN GRAVEL	M ³	4100	0	0	16 ¹⁶	0
09	Supply place & compact 1+ RUN	M ³	300	0	0	33.00	0
10	OPEN ALLOWANCE	N/A	0	0	0		N/A
11	COST TO COMPLETE	L.S	311,779	138,389	310,779	311,779	310,779
	C.O No 1		43,000	43,000	43,000		43,000
							1,067,165 ⁸⁰

CERTIFICATION (Sign Last Page Only)

I hereby certify that the work done and material delivered to site up to the date of this request for payment are as listed above. Work and material are according to plans, specifications and contract, that the prices are according to contract or, if not specified by contract, are reasonable.

CONSULTANT

DATE

AUTHORIZED DPW OFFICER

DATE

FINAL CERTIFICATE OF MEASUREMENT

The quantities shown are those obtained in the final measurement of this contract. I hereby issue this Final Certificate of Measurement in accordance with GC 44.7 and 44.8 of the General Conditions.

CONSULTANT

DATE

ENGINEER

DATE

PROJECT : Venus Mine Tailings Rehabilitation Project.

CLIENT : D.I.A.N.D. Action On Waste/Federal D.P.W.

DATE : October 10, 1995

APPROVED BY : Project Engineer,

Patrick Vallance, Oct 10/95.

Project Manager,

[Signature]

ITEM #01- Excavate/Repair Highways
Culvert (not known previously)
Agreed Price \$12,000.00

ITEM #02- Additional Eqpt. Time
Required When Tailings
Could Not Be Relocated And
Compacted Due To Unstable
Soil Conditions. \$20,000.00

ITEM #03- Additional Labour,
Supervision And Surveying Time
To Cover Increases In Unit
Pay Items. \$11,000.00

\$43,000.00

AMOUNT DUE \$43,000.00



REGION/DISTRICT		PAYMENT PERIOD	
		FROM: Oct 10 TO: Oct 20 / 95	
CONTRACTOR (NAME AND ADDRESS)		R.O. FILE NO.	
CARRINGTON TRADING CO. LTD. P.O. Box 130, City Centre, Yukon			
DESCRIPTION AND LOCATION OF WORK		D.O. FILE NO.	
Genes Mine Site Tailings Rehabilitation Carrington, Yukon			
CONTRACT NO.		PROJECT NO.	
PART 1 - PROGRESS CLAIM		THIS PERIOD	TOTAL TO DATE
A) Portion of work completed	\$ 126,714.18	\$ 1,193,879.98	
B) Material delivered to site but not incorporated in work	\$ 0	\$ 0	
AMOUNT CLAIMED		\$ 126,714.18	\$ 1,193,879.98

This claim is submitted in accordance with TP 4.2 of the Terms of Payment of the above contract for work completed and material delivered to site but not incorporated in the work, the whole as described in the attached COST BREAKDOWN.

CONTRACTOR: D. Whelan Manager Oct 20 / 95
AUTHORIZED SIGNING OFFICER TITLE DATE

PART 2 - PROGRESS REPORT	TOTAL AMOUNT	(LESS) HOLDBACK	NET AMOUNT
A) Work completed to date	\$ 1,193,879.98	\$ 67,588.02	\$ 1,126,291.96
B) Material delivered to site but not incorporated in the work	\$ 0	\$ 0	\$ 0
TOTALS TO DATE	\$ 1,193,879.98	\$ 67,588.02	\$ 1,126,291.96
(Less) Previous Payment(s)			\$ 1,012,249.20
NET AMOUNT PAYABLE			\$ 114,042.76

The value of the portion of the work completed and material delivered to site, described in the above Progress Claim is as shown in this Progress Report.

DPW: Daniel Vallan Project Manager Oct 20 / 95
AUTHORIZED SIGNING OFFICER TITLE DATE

PRE AUDIT BY:	CERTIFIED PURSUANT TO SECTION 27 OF THE FINANCIAL ADMINISTRATION ACT		REQUISITIONED FOR PAYMENT PURSUANT TO SECTION 26 OF THE FINANCIAL ADMINISTRATION ACT AND CERTIFIED IN ACCORDANCE WITH SUBSECTION 7(1) OF THE ACCOUNT VERIFICATION AND PAYMENT REQUISITION REGULATIONS.	
	SIGNATURE		SIGNATURE	
ORIGINAL CONTRACT AMOUNT	APPROVED ADDITIONS	APPROVED DEDUCTIONS	AUTHORIZED CONTRACT AMOUNT TO DATE	
\$	\$	\$	\$	
REF. NO.	ACCOUNT CODING		AMOUNT	CR.
CHEQUE NO. & DATE				
SERVICE OFFICER				
		TOTAL ▶		



Public Works
Canada

Travaux publics
Canada

COST BREAKDOWN FOR UNIT PRICE CONTRACT

REQUEST NO.

14

PAGE 1 OF 2

DESCRIPTION AND LOCATION OF WORK

CONTRACT NO.

PROJECT NO.

ITEM NO.	CLASS OF LABOUR PLANT OR MATERIAL	UNIT OF MEASURE	QUANTITIES			UNIT PRICE	VALUE TO DATE
			AUTHORIZED	THIS PERIOD	TO DATE		
01	SET-UP WEIGHTS		N/A	N/A	N/A		N/A
02	WATER/EO BARRIER	L.S	548 000	0	548 000	L.S	548 000.00
03	ROAD PLACE compact SILTY CLAY	M ³	2650	0	2650	15 ⁹⁰	72,765.00
04	COLLECT DEBRIS	L.S	0		100%	4032 ⁰⁰	4032.00
05	EXCAVATE TAILINGS	M ³					
	A	M ³	1600	0	3656	6 ¹⁰	22 301 ⁶⁰
	B	M ³	1700	0	2226	8 ⁵²	19 633.72
	C	M.SJ	13300	0	13300	0 ³⁵	4665.00
06	Apply Geomembrane	S.GM	13300	0	13300	3 ³⁸	44 954.00
07	CONSTRUCT Drainage	L.M	80	25	25	158 ¹⁶	11 704.00
08	Screening/hauling P.T. RUN	M ³	4100	4725	4725	16 ¹⁶	76 356.00
09	Supply place pit Rev	M ³	300	0	0	23 ⁰⁰	0
10	WASH ALLOWANCE	N/A					N/A
11	COST to complete		344 779				344 779 ⁰⁰
00	# 1						113 000.00
00	# 2						8 700.00
							1688 100.00
							1193 879 98

CERTIFICATION (Sign Last Page Only)

I hereby certify that the work done and material delivered to site up to the date of this request for payment are as listed above. Work and material are according to plans, specifications and contract, that the prices are according to contract or, if not specified by contract, are reasonable.

CONSULTANT

Valeri Valente

DATE

Oct 20/95

AUTHORIZED DPW OFFICER

DATE

FINAL CERTIFICATE OF MEASUREMENT

The quantities shown are those obtained in the final measurement of this contract. I hereby issue this Final Certificate of Measurement in accordance with GC 44.7 and 44.8 of the General Conditions.

CONSULTANT

DATE

ENGINEER

DATE



Carcross/Tagish Development Corporation

Head Office : P.O. Box 130

Carcross, Yukon Y0B 1B0

Tel : (403) 821-4109

Fax : (403) 821-4811

Change Order No. 2

Venus Mill site Tailings Rehabilitation

Client - DIAND-Action on Waste Management

Approved: Government of Canada Engineer

Carcross/Tagish DEV. Corp. Manager

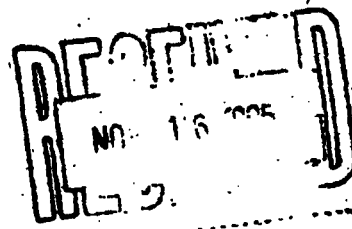
Date: October 20, 1995

To increase the contract amount to compensate for cost to complete due to increases in unit quantities:

Amount of this change order \$8700.00

**ENVIRONMENTAL**

Environmental Contractors & Engineers



November 14, 1995

Indian and Northern Affairs Canada
Arctic Environmental Strategy
Action on Waste/Contaminants
#345, 300 Main Street
Whitehorse, Yukon
Y1A 2B5

Attention: Mr. Mark Palmer/Mr. Brett Hartshorne

Dear Sirs:

**Re: Waterloo Barrier™ Installation -
Old Venus Mine Site, Yukon Territory**

Please find attached, the following documentation regarding this project:

- i) Statutory Declaration, re: payment of accounts;
- ii) Workers' Compensation Board Clearance Certificate;
- iii) Warranty Letter.

Should you have any questions or require additional information, please do not hesitate to contact the undersigned at your convenience.

Yours truly,

C3 Environmental

Murray G. Gamble, P.Eng.
President

Enclosure

MCG:kp

Containment • Control • Corrective Action

P.O. Box 188, Breslau, Ont. N0B 1M0 Phone (519) 648-3611 Fax (519) 648-3505

DEC 5 '95 14:40

403 667 3199 PAGE.002

CCDC Document 9A

Statutory Declaration

TO BE MADE BY THE CONTRACTOR WHEN APPLYING FOR RELEASE
OF HOLDBACK, SECURITY DEPOSIT OR BOTH UPON
SUBSTANTIAL/TOTAL PERFORMANCE

IN THE MATTER OF THE CONTRACT
between Indian and Northern Affairs Canada
....., Owner
and C³ Environmental, a division of Canadian
Construction Controls Limited Contractor
for Waterloo Barrier™ Installation - Old
Venus Mine Site, Yukon Territory
(insert title of the Work and the Project)

I, Murray Gamble of the town of Breslau
in the Province of Ontario DO SOLEMNLY DECLARE:

THAT I am President (See Note 1) of C³ Environmental
....., the Contractor named in the Contract abovementioned,
and as such have personal knowledge of the facts hereunder declared, and that all accounts for labour, subcontracts, pro-
ducts, construction machinery and equipment and other indebtedness which may have been incurred by the Contractor in the
Performance of the Work (See Note 2) and for which the Owner might in any way be held responsible have been paid in full
except holdback monies properly retained.

AND I MAKE THIS SOLEMN DECLARATION conscientiously believing it to be true and knowing it is of the same force
and effect as if made under oath.

DECLARED before me at the
town of Breslau
in the province
of Ontario this 14th
day of November 19 95.

A Commissioner for Oaths, Notary Public, Justice of the Peace.

Peter Ato Stool, a Commissioner, etc.,
County of Wellington, for Canadian
Construction Controls Limited

NOTE 1: The Declaration must be made by the President, a Vice President, the Secretary, the Treasurer, or a Director of an incorporated company. If an individual may make the Declaration provided that two copies of the by-law issued under the Corporation seal authorizing such individual to execute documents accompanies the first Declaration on each Contract. For a partnership the Declaration must be made by one of the partners and for a sole proprietorship the sole proprietor himself must make the Declaration. The position of the declarant and the name of the Contractor must be clearly noted.

NOTE 2: Other indebtedness shall mean only such debts incurred by the Contractor to persons in privity of contract with him, debts arising out of statutory requirements, and in the case of the Contractor's workers any debt arising out of collective bargaining agreements, legislation applying to worker's compensation, unemployment insurance, and minimum wage standards where applicable.

403 667 3199
CCDC 9A - 1982 Fm 00825

DEC 5 '95 14:41

403 667 3199 PAGE.003



Workers'
Compensation
Board

Commission
des accidents
du travail

151 FREDERICK STREET
KITCHENER, ONTARIO
N2H 2M2 (519) 576-4130

Clearance Certificate Certificat de décharge

The Workers' Compensation Board (WCB) hereby waives its rights under Section 11 (3) (R.S.O. 1990) of the Workers' Compensation Act to hold the Principal that is in a contractual agreement with the Contractor named, liable for any Section 11(3) (R.S.O. 1990) liability of the Contractor for assessments and levies of the WCB owing now or within 60 days from the date of this Certificate.

CONTRACTOR
L'ENTREPRENEUR

CANADIAN CONSTRUCTION
CONTROLS LIMITED
BOX 188
BRESLAU
N0B 1M0

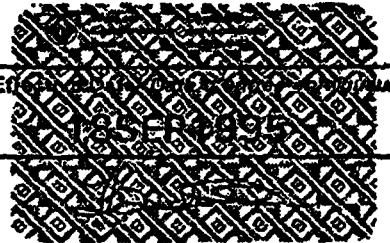
ON

Par la présente, la Commission des accidents du travail (CAT) renonce aux droits qui lui sont conférés en vertu du paragraphe 11 (3) de la Loi sur les accidents du travail (L.R.O. 1990) et qui l'autorisent à tenir l'entrepreneur principal, qui a signé une entente contractuelle avec l'entrepreneur dont le nom figure sur le présent certificat, responsable du paiement de toute cotisation ou de toute somme que l'entrepreneur est tenu de verser à la CAT immédiatement ou dans les 60 jours suivant la date indiquée sur ce certificat.

THIS CERTIFICATE IS VALID FOR ALL CONTRACTS OF
THE NAMED CONTRACTOR DURING THE EFFECTIVE PERIOD

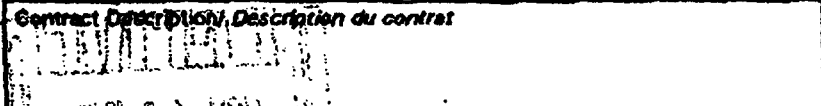
LE PRESENT CERTIFICAT EST VALIDE POUR TOUS LES CONTRATS PASSES PAR
LEDIT ENTREPRENEUR PENDANT LA PERIODE D'APPLICATION DU CERTIFICAT

Valid only when signed by an authorized Officer of the WCB.
Non valide sans la signature d'un agent autorisé de la CAT.

Account No./ N° de compte	Firm No./ N° d'entreprise	Entrepreneur principal
4011759	240643FD	

Rate/Taux	Description	Rate/Taux	Description
723	GENERAL CONTRACTOR	745	CONCRETE/FORMING

Contract Description/ Description du contrat



Certificate No./ N° de certificat

200583900

F5196483505

Contact the WCB if you question the validity of this document.
Veuillez communiquer avec la CAT si vous doutez de la validité du présent document.

DEC 5 '95 14:42

**ENVIRONMENTAL**

Environmental Contractors & Engineers

RECEIVED
NOV 16 1995
05

November 14, 1995

Indian and Northern Affairs Canada
Arctic Environmental Strategy
Action on Waste/Contaminants
#345, 300 Main Street
Whitehorse, Yukon
Y1A 2B5

Attention: Mr. Mark Palmer/Mr. Brett Hartshorne

Dear Sirs:

**Re: Waterloo Barrier™ Installation -
Old Venus Mine Site, Yukon Territory**

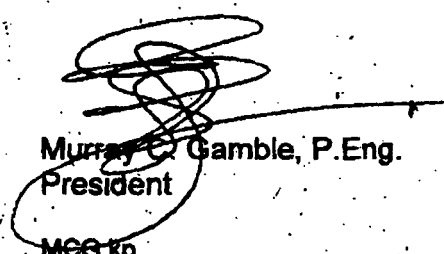
This letter is to confirm that as per our contract with the Carcross/Tagish Development Corporation, C³ Environmental warrants against defects in workmanship and materials related to the supply and installation of the Waterloo Barrier™ system for a period of one year (effective as of final completion September 25, 1995).

This warranty is limited only to the provision of materials and services necessary to repair/reinstate the barrier in order to achieve the specified performance criteria and does not cover contingent liabilities.

C³ Environmental does not assume liability with respect to the performance of the overall site remediation program and cannot be responsible for subsequent damage to the barrier caused by other parties or activities beyond our control.

Should you have any questions or require additional information, please do not hesitate to contact the undersigned at your convenience.

Yours truly,

C³ Environmental

Murray C. Gamble, P.Eng.
President

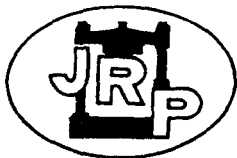
MCG:kp

Containment • Control • Corrective Action.

P.O. Box 188, Breslau, Ont. N0B 1M0 Phone (519) 648-3611 Fax (519) 648-3505

DEC 5 '95 14:43

403 667 3199 PAGE.005



J. R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

EDMONTON - GRANDE PRAIRIE - WHITEHORSE - PEACE RIVER

ADDRESS ALL CORRESPONDENCE TO

14 Burns Road
Whitehorse, Yukon
Y1A 4Y9

File No: 8054-12

September 07, 1995

PUBLIC WORKS CANADA
Architectural and Engineering Services
1000 Canada Place
9700 Jasper Avenue
Edmonton, Alberta
T5J 4E2

Attention: Mr. George Strynadka, Senior Project Engineer

Dear Sir:

**Re: Venus Mine Tailings Project
Construction Management Services**

The following letter summarizes the results of the construction management services which our firm has performed for the subject project.

J.R. Paine & Associates Ltd. role during construction was to provide interim construction management services between the dates of August 14, 1995 and September 06, 1995. This essentially consisted of facilitating the construction activities by providing recommendations to the contractor as required. Michael Billowits, P. Eng. was the J.R. Paine & Associates Ltd. site representative.

This letter will summarize the activities which occurred during our management period and provide details of testing services which we performed to facilitate the site rehabilitation program.

ACTIVITY REVIEW

The construction activities progressed in accordance with the tentative schedule drawn up by yourself at the meeting with the Carcross First Nations Corporation on August 11, 1995. The following includes a summary of the activities, expected and actual completion dates.

Item	Activity	Expected Completion Date	Actual Completion Dates
1	Mobilization - prepare work area, field office, site access	95/08/21	95/08/18
2	Clean-up debris, brush and dispose	95/08/21	95/08/11
3	Provide temporary drainage and filter	95/08/21	95/08/25
4	Cut off and plug existing decant line	95/08/21	95/08/30
5	Excavate and place peripheral tailings	95/08/28	95/08/23
6	Level tailings area, grade and compact	95/09/05	Anticipated 95/09/08
7	Install sheet barrier wall	95/10/02	In progress on schedule

The remainder of the activities have yet to be initialised. Exception to this includes Item 10 which involves the provision to screen and process granular/rock fill (capillary break material). The contractor has secured an 80 millimetre minus subbase aggregate from the Government of Yukon, Transportation Maintenance Branch. As such, the screening activity no longer will be required.

As mentioned, our role on site was to facilitate the construction activities. Specific details of the events on site are provided below. Also, several photographs which were taken during our management period are depicted in Appendix B.

Although each activity required some input from our site representative, extensive direction was necessary specifically for the design and placement of the temporary drainage trench. Also required was the communication with applicable government authorities to finalize and gain authorization for said design provisions.

Verbal direction was received from George Strynadka to drain the pond and re-route (through the life of the construction) the existing creek near power pole 'D' shown on Figure One in Appendix A. Provision was to be made to avoid excessive sediments entering the lake via suspended solids in the drain water.

In order to satisfy the above objectives, the following steps were taken.

- determine location of and elevation of lowest point in pond.
- stake out primary trench location as shown in Figure One in Appendix "A".
- Move tailings south and west of trench location inside the tailings area (to avoid crossing the trench after it had been excavated).
- Excavate trench to design grade as shown in Figure Two in Appendix "A".
- Place rock material along -4.5% grade section for erosion protection.
- Establish secondary trench using backhoe and then with hand digging.

The trench excavation was delayed when the backhoe unexpectedly hit and damaged the corrugated steel pipe which derives from a highway drainage system (culvert location shown on Figure One). In the specifications, this culvert was assumed to not enter the tailings area. The culvert was damaged at approximately Sta 5+195 on August 17, 1995. A repair crew from Government of Yukon, Transportation Maintenance Branch mobilized to site immediately and had the damaged section repaired by the morning of August 18, 1995. Refer to Photos 10 and 11 for photo documentation. The remaining section of culvert leading toward the highway embankment was identified with a metal detector and the primary trench was re-routed to avoid damaging it again.

The trench was completed on August 25, 1995 and the pond was drained on August 28, 1995. Once the surface water was drained, the contractor was directed to close the secondary trench. This decision was based on the concern that water deriving from the tailings (below the ground surface) may have excessive levels of impurities in solution and of suspended solids which, if drained directly into the lake, would compromise the Land Use Permit and the direction of DIAND, Water Resources (Refer to Appendix C).

The peripheral tailings were excavated and placed within the tailings area and the levelling process was initiated on August 26, 1995.

The levelling of the tailings proved to be difficult due to the presence of saturated fine grained silty sand material. With excessive disturbance induced by machines, the water greatly undermined the structure of the soil and caused water to migrate to the surface through capillary action. This was evident in the letter provided to your organization September 05, 1995 regarding the release of surface water from the tailings area.

The decant pipe was capped on August 30, 1995 with the as-built detail provided as Figure Three in Appendix A.

TESTING DURING CONSTRUCTION

Testing services were performed as required to facilitate the construction activity.

As mentioned, an 80 millimetre minus screened source identified at a government borrow pit was proposed by the contractor to be used as the capillary break material. A grain size analysis was performed with the results displayed in Appendix D. Note that the 80 millimetre source essentially meets the specification provided for the capillary break material. It appears that the sand sizes are coarser than those specified, however, it is recommended that this would be favourable for the intended use of the material.

The proposed material for the clay cap was inspected and sampled for analyses. An Atterberg limit was performed with the following results:

Liquid Limit = 23.1
Plastic Limit = 13.6
Plasticity Index = 9.5
Unified Soil Classification = CL
(Using Casagrandes's Plasticity Chart)

That the material had a strong hydrocarbon odour, a sample was tested for Total Extractable Hydrocarbons and BETX with the results presented in Appendix D. It is understood that your department has retained another consultant for the

environmental design considerations at this site. As such, it was our intention to provide recent information for your purposes regarding the level of impurities in the proposed material.

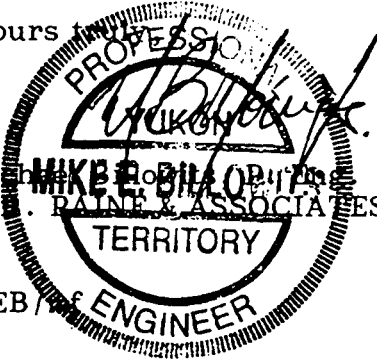
CONCLUSIONS

It is envisioned that the information presented herein adequately summarized the construction management services which our firm performed for the Venus Tailings Site Rehabilitation Project.

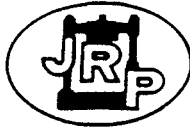
To supplement this report and to aid in the transfer of management responsibilities, extensive site meeting was held on September 06, 1995. This meeting was successful in ensuring that the contractor and PWC site representative were in understanding of the duties performed to date and of the activities to follow.

Thank you for the opportunity to be of service to your organization. If you should have any questions or comments regarding this summary report, please do not hesitate to contact our office.

Yours truly,

A circular professional seal for the Yukon Territory. The outer ring contains the text "PROFESSIONAL ENGINEER" at the top and "YUKON TERRITORY" at the bottom. In the center, there is a signature and the name "MIKE BILLORE".
Mike Billore
J. R. PAINE & ASSOCIATES LTD.
MEB/ENGINEER

B:1/Pr.10/8054-12/Venusmm.rep



J. R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

EDMONTON - GRANDE PRAIRIE - WHITEHORSE - PEACE RIVER

GRAIN SIZE ANALYSIS

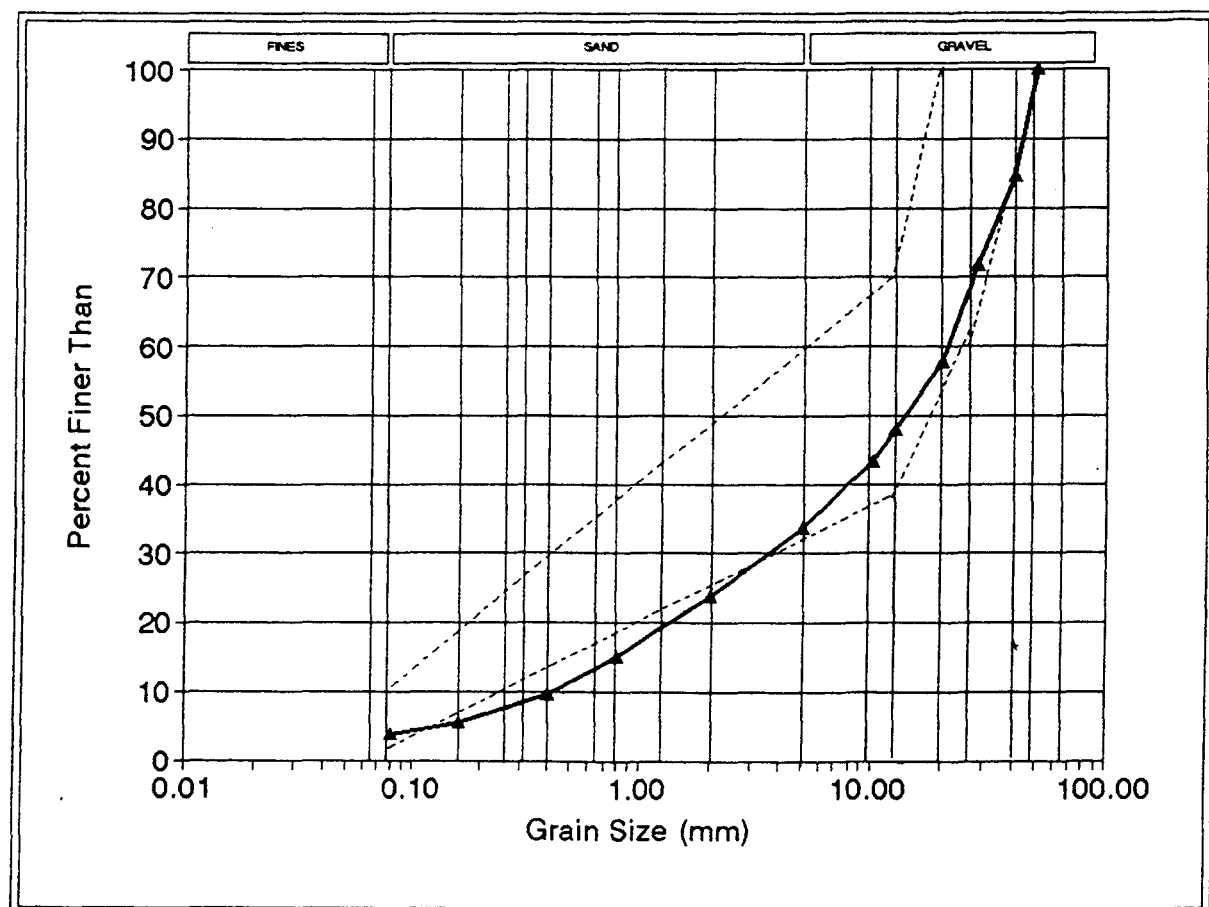
SAMPLE: PIT-1	CLIENT: PWGSC, A&ES
DEPTH: n/a	
LOCATION: 80mm stockpile	PROJECT: VENUS MINE TAILINGS
DATE: 95/8/23	STUDY
MADE BY: MEB	CHECKED:

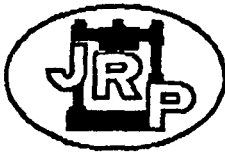
CHARACTERISTICS OF SAMPLE:

MOIST. CONT.: 1.6	CRUSH COUNT:
% GRAVEL: 66.5	% FRAC. FACES:
% SAND: 29.8	LIQUID LIMIT:
% FINES: 3.7	PLASTIC LIMIT:

DESCRIPTION OF SAMPLE:	REMARKS:
SANDY GRAVEL, GW	sample originated from the 80mm minus sub-
	aggregate stockpile from YTG borrow pit located
	approximately 2 km north of subject site
	this material proposed for capillary break

Sieve No.	Size of Opening (mm)	% Finer Than Basis Orig. Sample
50000	50.0	100.0
40000	40.0	84.4
28000	28.0	71.7
20000	20.0	57.7
14000	14.0	
12500	12.5	47.8
10000	10.0	43.2
5000	5.0	33.5
2000	2.0	23.7
1250	1.250	
800	0.800	14.8
630	0.630	
315	0.315	
250	0.250	
160	0.160	5.3
80	0.080	3.7





J. R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

EDMONTON - GRANDE PRAIRIE - WHITEHORSE - PEACE RIVER

ADDRESS ALL CORRESPONDENCE TO:

14 Burns Road
Whitehorse, Yukon
Y1A 4Y9

File No: 8054-12

October 23, 1995

PUBLIC WORKS CANADA
Architectural and Engineering Services
1000 Canada Place
9700 Jasper Avenue
Edmonton, Alberta
T5J 4E2

Attention: Mr. George Strynadka, Senior Project Engineer

Dear Sir:

**Re: Venus Mine Tailings Project
Construction Management Services**

From a grains size analysis (GSA) completed on the proposed capillary break material sample we have estimated the following range of coefficient of permeability.

For a clean well graded sand and gravel mixture, GW, (See attached GSA) a coefficient of permeability would be expected to be between 1.0 to 10^{-2} centimetres/second.

This variation in the coefficient may be expected due to variations in fines contents, compactness, hydraulic head, etc..

EDMONTON
482-1288

GRANDE PRAIRIE
532-1515

WHITEHORSE
668-4648

PEACE RIVER
624-4968

J. R. Paine & Associates Ltd.

.../2

We trust the above is suitable for your purpose. If you should have any questions or comments, please feel free to contact the undersigned.

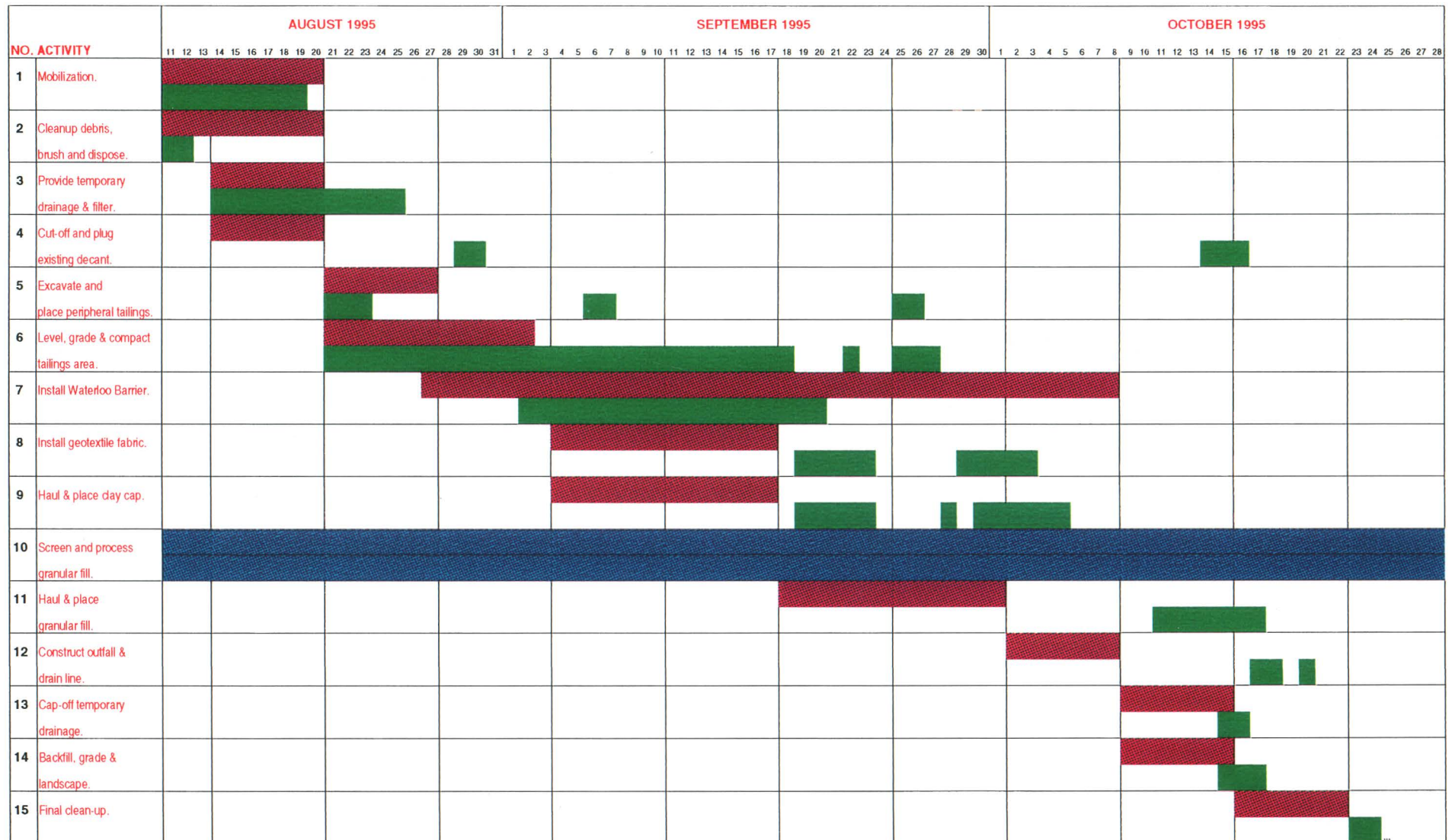
Yours truly,



Wilbur C. Kolbe, P. Eng.
Office Manager
J.R. PAINE & ASSOCIATES LTD.

WCK/mf

VENUS MINE TAILINGS REMEDIATION: PROJECT WORK SCHEDULE



 Expected Construction Schedule

 Actual Construction Schedule

 Activity Omitted from contract



Photo 3: Welder Cutting Top of Wall to Design Elevation
8 September 1995



Photo 1: Waterloo Barrier Installation
5 September 1995

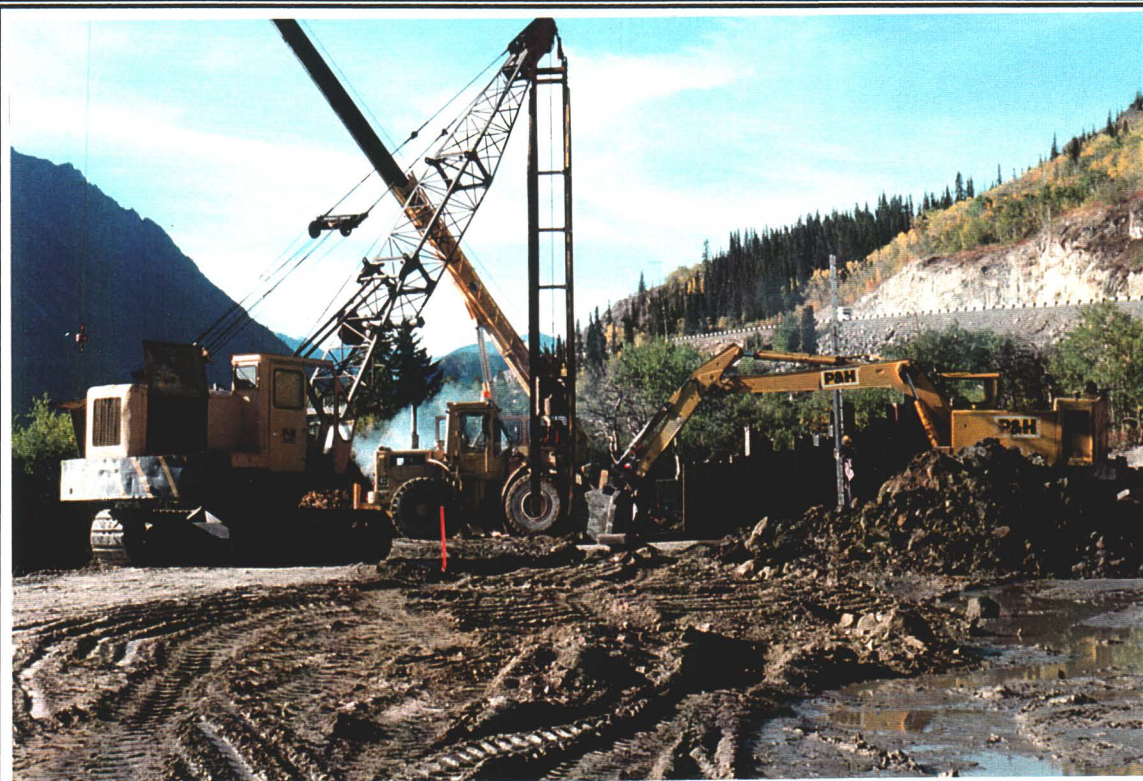


Photo 2: Waterloo Barrier Installation
5 September 1995

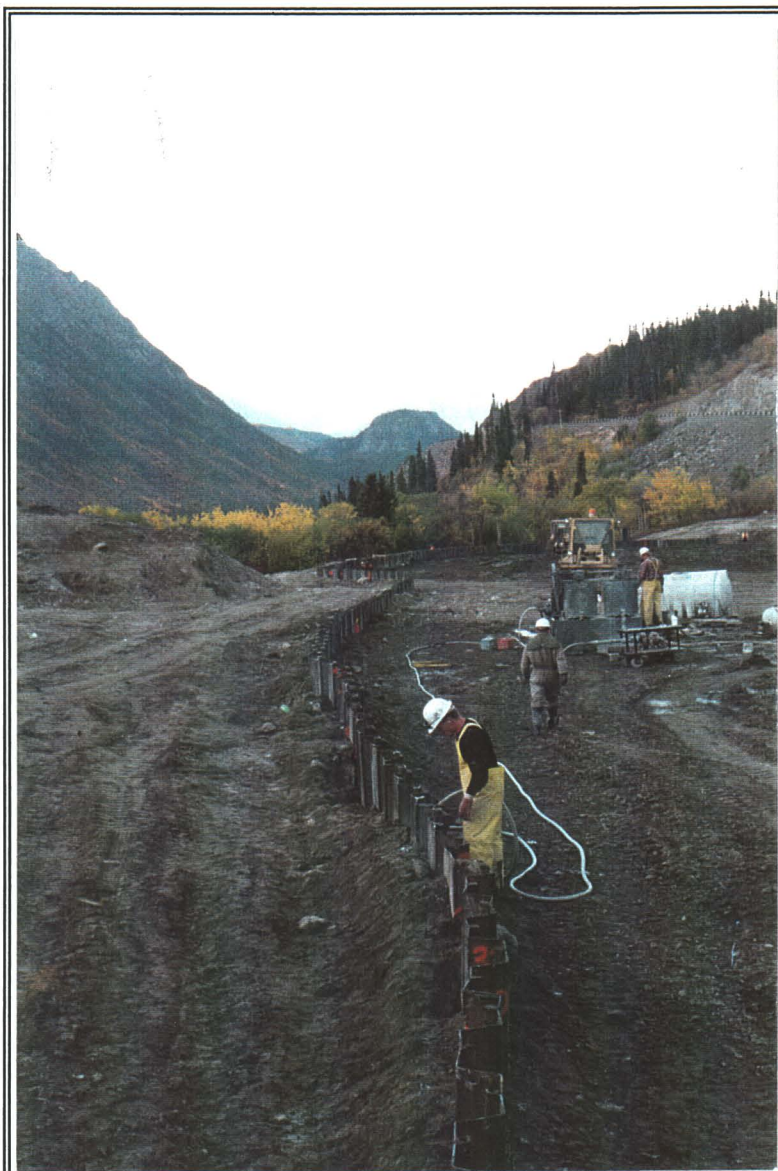


Photo 4: Sealing Wall Joints
18 September, 1995



Photo 5: Hauling and Placing of Clay Cap Material
19 September 1995



Photo 6: Placing Clay Layer above Geotextile
2 October 1995



Photo 7: Placing Wind Blown Tailings onto Tailings Area.
7 September 1995



Photo 8: Difficulties during the Levelling of the Tailings
9 September 1995



Photo 9: Labourer Placing Geotextile
2 October 1995



Photo 10: Hauling and Placing of Capillary Break Material
11 October 1995

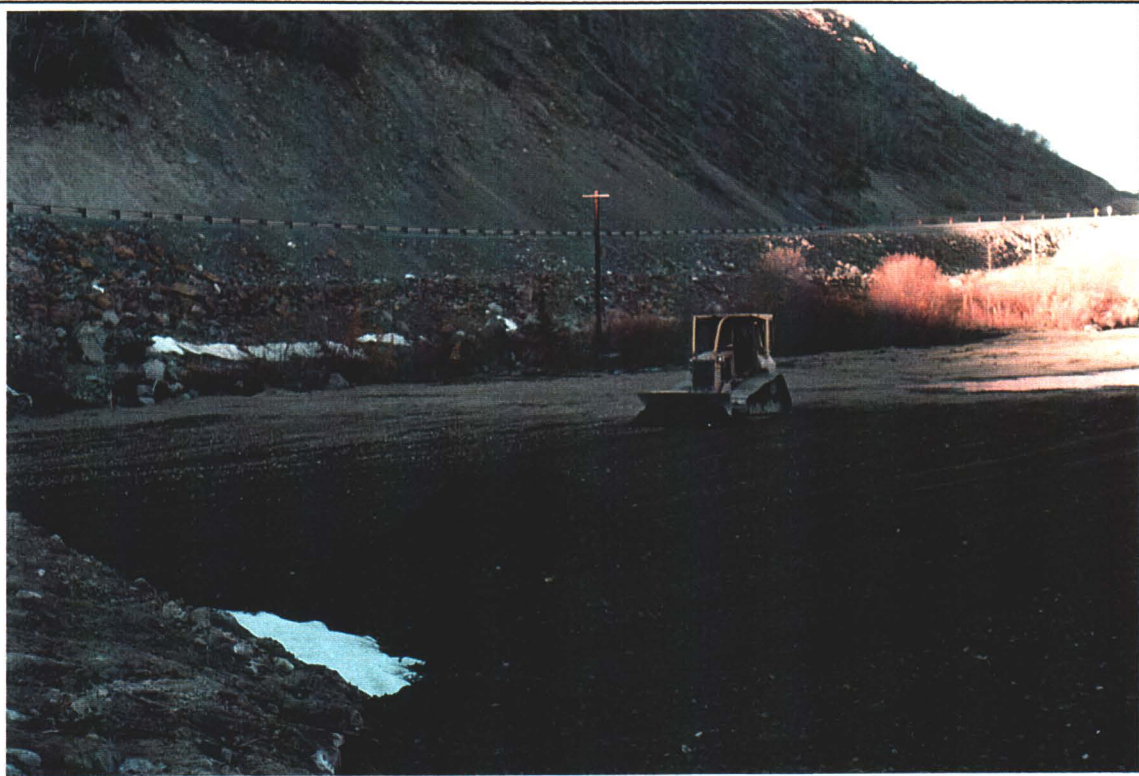


Photo 11: Final Levelling of the Capillary Break Material
17 October 1995



Photo 12: Concrete Plug at Inlet of Decant Pipe
8 September 1995



Photo 13: Filter Dike in Temporary Drainage Ditch
5 September 1995



Photo 14: Highway Culvert Repair
17 September 1995



Photo 15: Excavation for HDPE Pipe

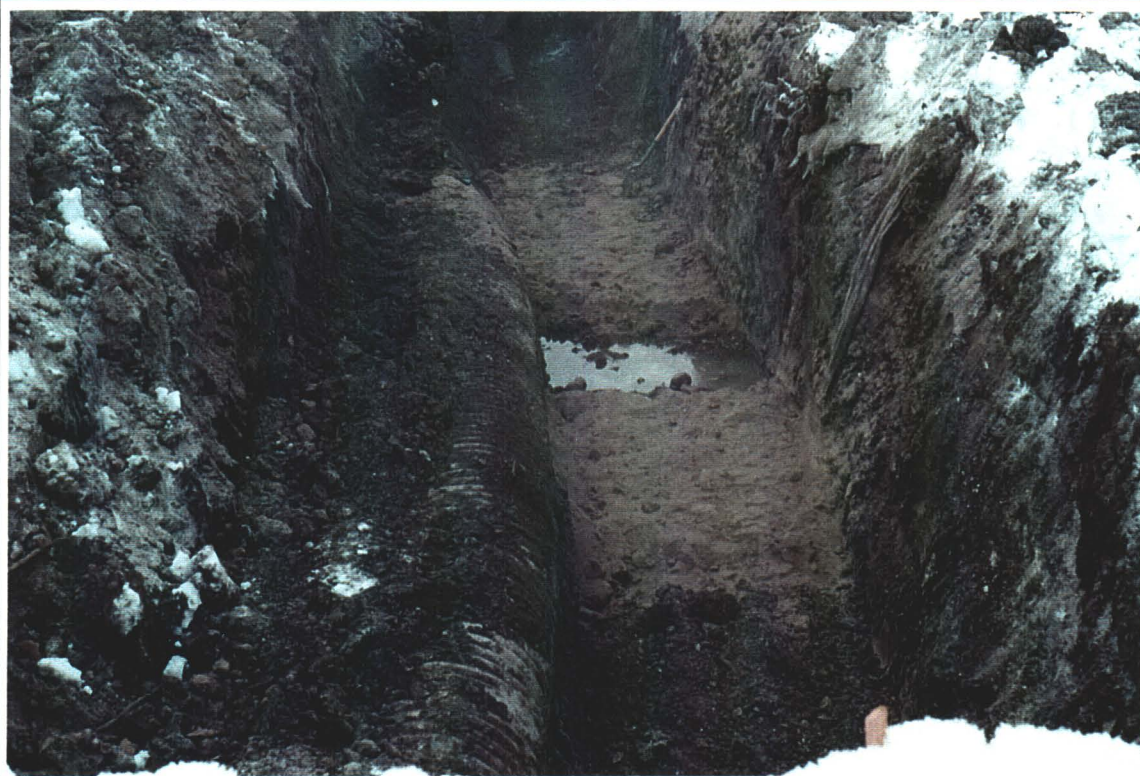


Photo 16: New Pipe Bedding; Old Pipe Alongside



Photo 17: Removal of Section of Old Pipe at Connection Location

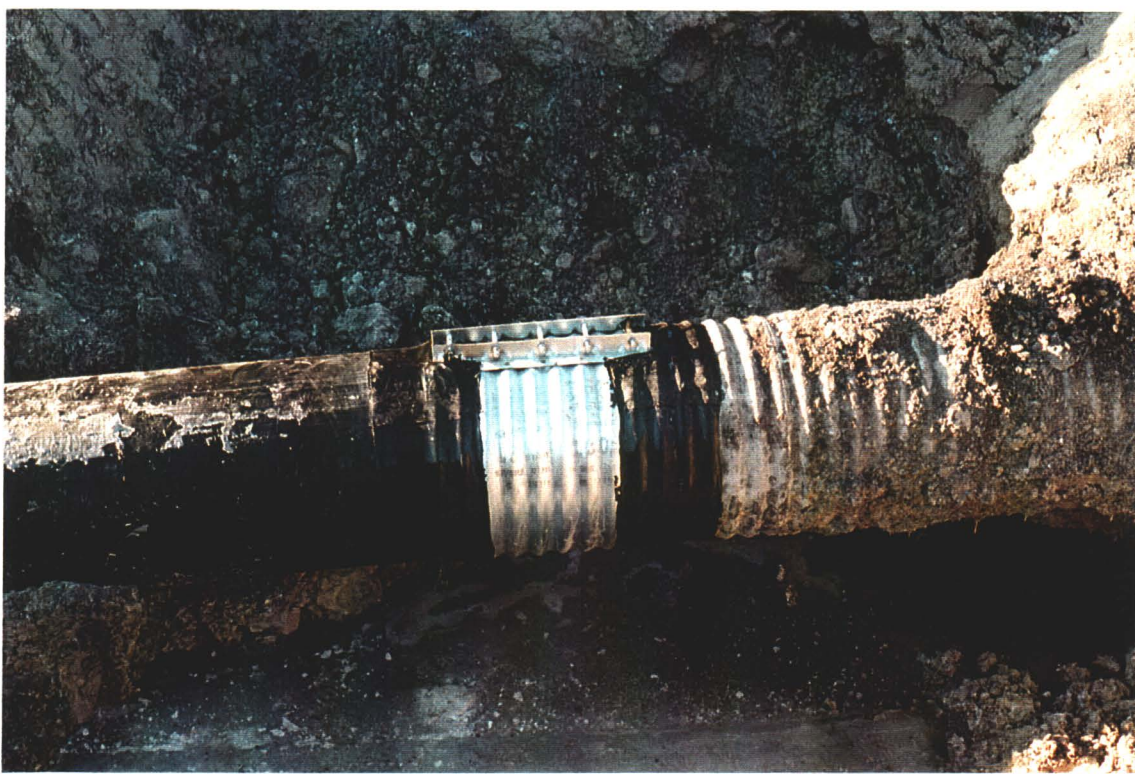


Photo 18: Pipe Connections

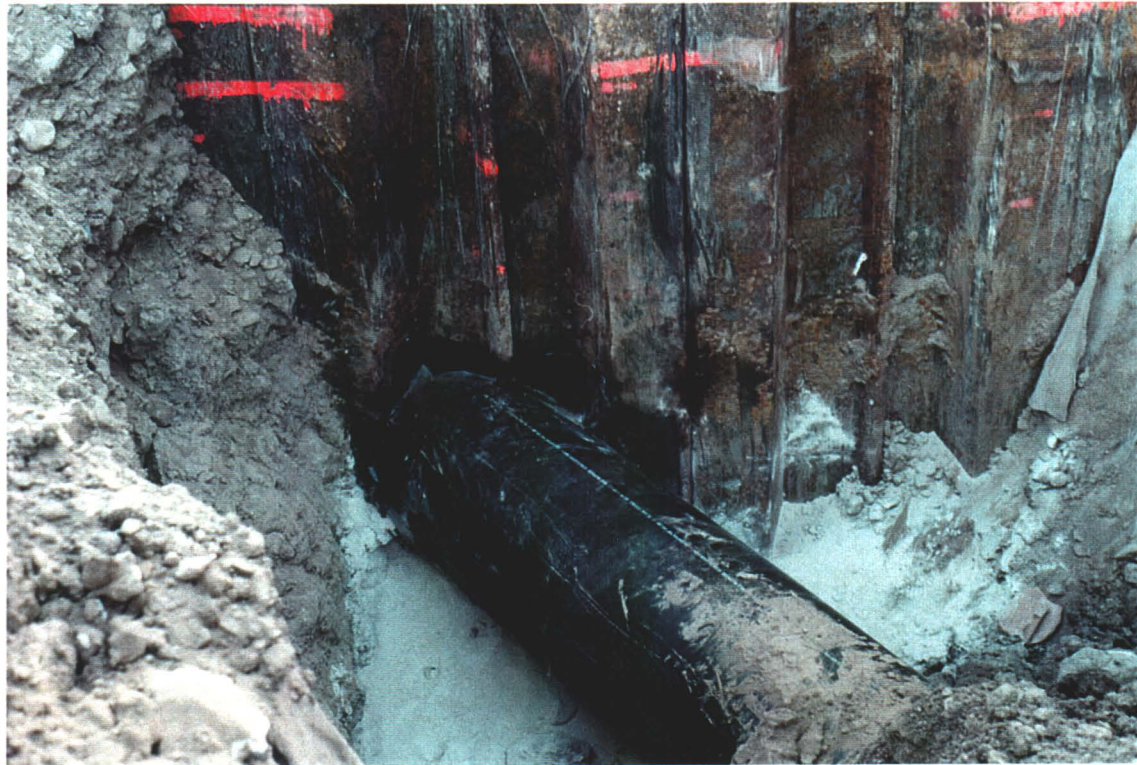


Photo 19: New Pipe at Outlet through South Wall

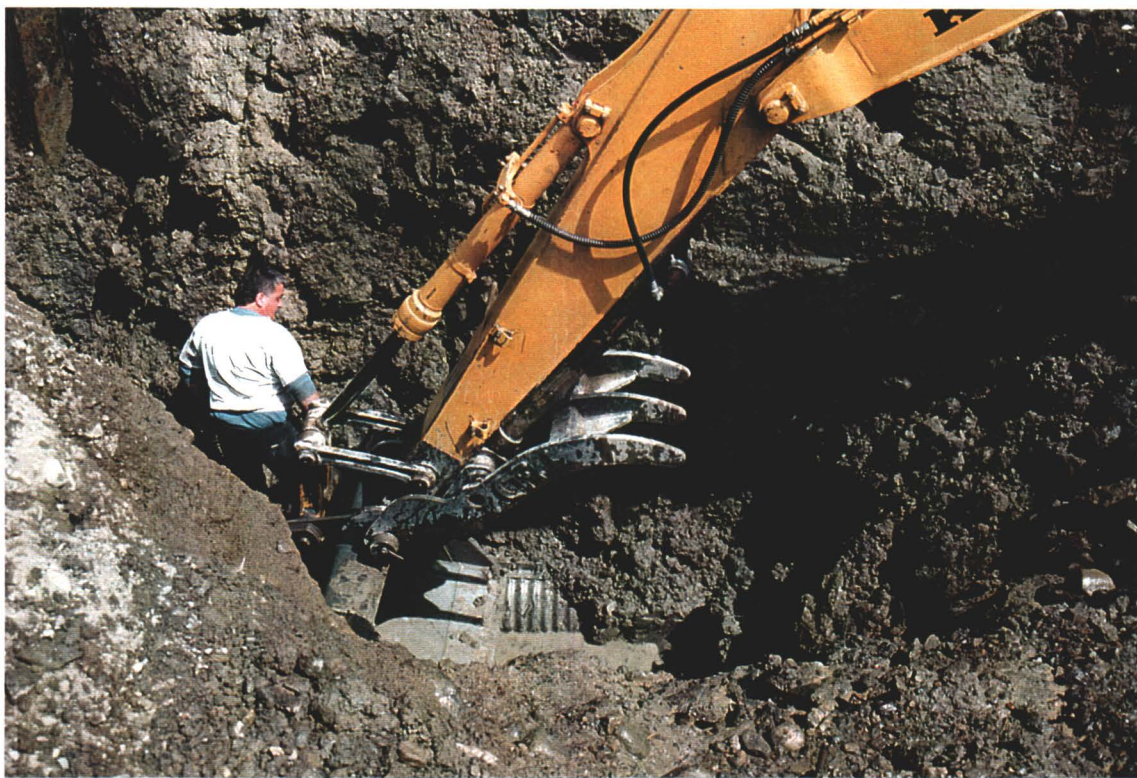


Photo 20: Excavation to Locate Old Pipe, Outside Wall



Photo 21: Depressions at South Wall requiring Additional Material



Photo 22: Site in May, 1997



Photo 23: Coarse Material placed in December, 1996

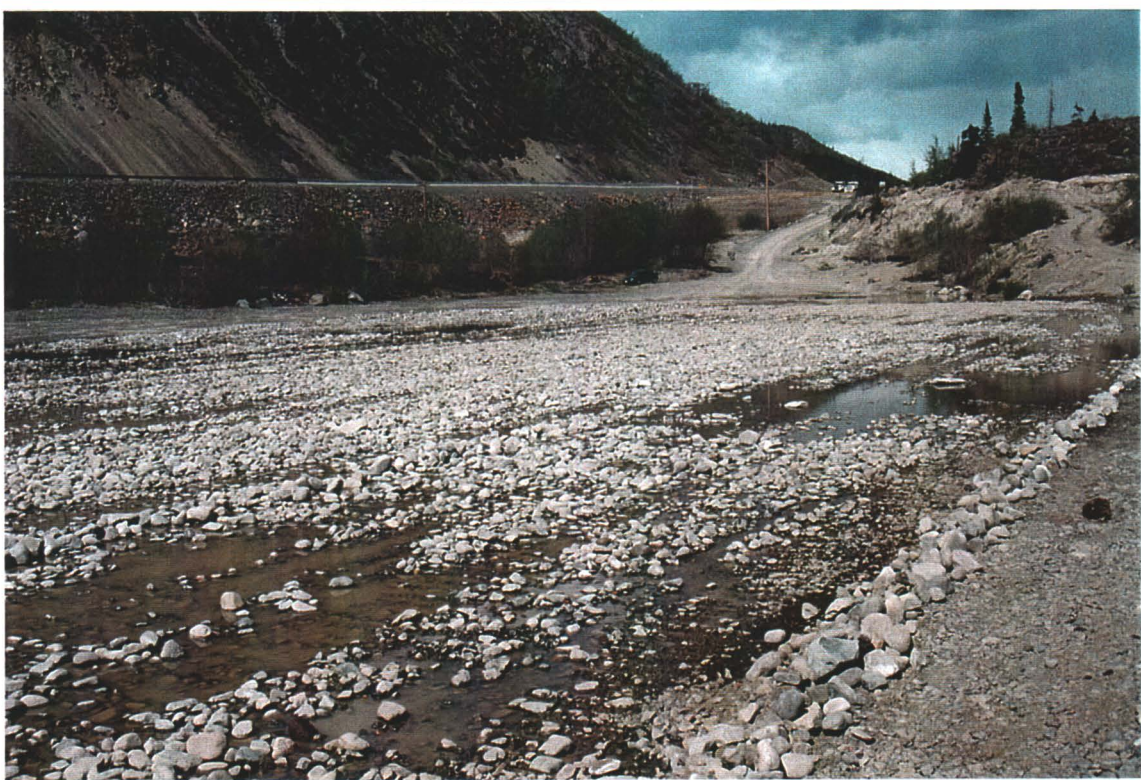


Photo 24: Coarse Material regraded. Final Appearance May, 1997