Project No. R.034893.001 **Date: 03 April 2012**

Rehabilitate Runway 11-29, Taxi 'B', Aprons, Maintenance Road,
Airport Access Road, and Parking Lot
Port Hardy Airport, Port Hardy, British Columbia.

Addendum #2

Addendum #2.

This Addendum is in addition to, and forms a part of the Contract. The cost, if any, of this revision(s) shall be included in the Contract price. All bidders shall acknowledge receipt and acceptance of this addendum by indicating Addendum number, date, and description, on the Tender Form provided. The revision(s) is as follows:

Revise The Specifications as follows:

1. Specification Section 32 12 16, Asphalt Paving: Clause 2.2.1, change Asphalt Cement grade from "150-200A, high viscosity penetration grade" to "80-100A, high viscosity penetration grade".
2. Specification Section 32 12 16, Asphalt Paving : Clause 4.12, Longitudinal Joint Compaction Acceptance, for Table 8 Page 47 Longitudinal Joint Acceptance, Reverse the Lot and Sub-Lot Column Headings.

Revise OPS Plan Issued March 28, 2012 as follows:

1. Construction Staging and Schedule: 1 GENERAL: Add item 1.9- For all stages of work, isolate, disconnect, and lockout power to all lighting system within the closed portions of the Runways to keep closed portion runway lights off (see Drawing E01).
2. Construction Staging and Schedule: 5 STAGE 3B - REHABILITATION OF RUNWAY 11-29 FROM STATION 4+977 TO STATION 5+910 AND TAXI B FROM STATION 5+000 TO STATION 5+037- Change Declared Distances, Stage 3B Table: change LDA for Runway 34 Column to 1765.

INQUIRIES AND RESPONSES

Question #1: Construction Staging and Schedules:

The staging and schedule section of the "Plan of Construction Operations" indicates that there will be a complete shutdown of runway 11-29 after September 4, 2012. Is this in fact the case?

Answer: No. The runways, taxiways, and apron construction is first priority and has to be finished first before any other Asphalt paving. Therefore runway work will be finished before 04 September 2012, and therefore will not require any closing.

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Question #2: Section 32.12.16.2.2 – Asphalt Cement:

The specification for asphalt cement calls for 150-200A Penetration Grade. This grade of asphalt cement is not used in this region. The Penetration Grade Asphalt Cement should be 80-100 Group A. Please clarify.

Answer: Yes that is correct. It should be 80-100 Group A Penetration Grade.

Question #3: Section 32 12 16.2.5.1 Requirements for Hot Mix Plants:

Can we use certified scales on the asphalt silo to weigh the asphalt mix?

Answer: Yes, it can be used, as long as it is certified. You still need a weigh scale for Base Material unit cost item.

Question #4: Section 32 12 16.3.11.4.4.2. Page 35 - Asphalt Paving:

Can a straight milled edge be substituted for a saw-cut joint?

Answer: No.

Question #5: Section 32 15 10.3.4.1 Repair of Soft Areas:

Will the removal of defective material be paid for in Item 6 – Common Excavation and will the granular base be paid for in Item 7 – 25mm size granular base material?

Answer: Yes.

Question #6: Section 32 12 16.2.4.2 – Equipment General Requirements:

Referring to the Project Drawing C02 Section 3 C2, will the contractor be penalized if the specified densities can not be met because of the use of lighter compaction equipment so that the existing pavement structure will not be damaged?

Answer: No, however, contractor will use the lighter and different equipment to achieve the densities. All it indicates is that lighter and different equipment will be required for runway 07-25 compared to other airside pavements.

Question #7: Section 32 12 16.4.12 Table 8, Page 47 Longitudinal Joint Compaction:

Should the "lot" and "sub-lot" column headings in Table 8 be reversed?

Answer: Yes.

Question #8: Referring to Drawing C05 Loop Road Section and Parking Lot Section and C06 Typical Sections:

Is the bottom lift on the access road 25mm HMAC and the top lift 12.5mm HMAC?

Answer: Yes

Question #9: Referring to drawing C05, Median Sections:

Is there steel reinforcing in the concrete median infill?

Answer: No

Question #10: Referring to Drawing C02, Section 1:

Clarify the total depth and lift thickness of the HMAC that is required on the new shoulders.

Answer: It is already indicated, total 80mm, 40 mm bottom, and 40mm surface course.

Question #11: Section 32.12.16.1.5 Page 3 Definition:

Historically the aggregate in this area that is incorporated into HMAC has not exhibited stripping of the asphalt cement and an anti-stripping addition is not required. The British Columbia Ministry of Transportation and Infrastructure allows the use of redi-cote to use an anti-stripping agent. Should an anti-stripping agent be required, can redi-cote be substituted for hydrated lime?

Answer: Yes, it can be used if required.

Question #12: Section 32.12.16.3.2.2 Page 26 Preparation:

What quantity of 1000mm wide grinding and patching of the full depth of the existing asphalt is anticipated? If the quantity is indeterminate at this time, could the item be treated as a Provisional Sum?

Answer: See Section 32 12 16.1.2.2- The work items will be measured under related unit cost items.

Question 13: Section 31.00.00.01.3.4.2 Excavation:

Is there an on-site dump site for the excavation?

Answer: Yes, excavated materials can be dumped on airport designated sites. Dumping of any garbage and contaminated materials will be off-site.

Project No. R.034893.001 **Date: 03 April 2012**

Rehabilitate Runway 11-29, Taxi 'B', Aprons, Maintenance Road,
Airport Access Road, and Parking Lot
Port Hardy Airport, Port Hardy, British Columbia.

Addendum #2

Question #14: Referring to Drawing C05 Median Sections:

Will the excavation be paid as Item 6 and the granular backfill as Item 7?

Answer: No, the unit cost includes all related items. See Section 03 30.00.01 -1.2 for measurement of this item.

Question #15: After June 16, 2012 will the aircrafts be allowed to land on Runway 11-29 on a milled surface?

Answer: No.

Question #16: Will there be an extension to the Runway 11-29 closure that is scheduled for June 16, 2012 due to rain days that suspend work?

Answer: No.

Question #17: Does the Stage 2 Constriction have to be completed each night so that the runway is operational during the day?

Answer: Yes

Question #18: Is the core sample information that has been done available?

Answer: Yes, see attached " Port Hardy Airport Geotechnical Report March 29, 2011".

Question #19: Can Stage 2 and Stage 3A be done at the same time (combined into one stage)?

Answer: No

Question #20: Is there any routing and crack-filling required in concrete or only in asphalt?

Answer: Routing and Crack filling is required only for asphalt surface.

END OF ADDENDUM #2

Klohn Crippen Berger

March 29, 2011

File No. P09625 A05
Log No. LTR-001

Public Works and Government Services Canada
Architectural and Engineering Services
Real Property Services
#641 – 800 Burrard Street
Vancouver, BC V6Z 2V8

Mr. Gouin Barford, P.Eng.
Geotechnical Engineer

Dear Mr. Barford:

Port Hardy Airport Runway Pavement Rehabilitation
Geotechnical Investigation

This letter summarizes our geotechnical investigation for the proposed runway pavement rehabilitation at the Port Hardy Airport in Port Hardy, BC. The scope of work was outlined in our proposal of September 23, 2010. Authorization to proceed was by given by email on September 24, 2010.

1. BACKGROUND INFORMATION

From PWGSC, we understand that the paved airside and groundside surfaces at the Port Hardy Airport will be rehabilitated, and the airside maintenance road widened. Locations of the existing facilities and the test holes for this investigation are shown on Figure 1.

2. 2010 SITE INVESTIGATION

On October 14, 2010, the site investigation was conducted using an auger drill rig with a continuous Dynamic Cone Penetration Test (DCPT) and Standard Penetration Tests (SPT). Drilling was conducted by Downrite Drilling Ltd. of Chilliwack, BC. During the investigation a KCB geotechnical engineer logged the drill holes and took soil samples.

Prior to drilling, all hole locations were swept by Western Locate of Coquitlam to check for underground utilities. Upon completion of drilling, all holes were backfilled with gravel. Holes located on paved areas were backfilled with gravel and completed with an asphalt cold-patch. In order to minimize cutting and patching of asphalt, DCPTs were performed at the drill hole locations, followed by drilling over the DCPT path.

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Drill hole locations are shown on Figure 1. Drill holes were located by measuring the distances from existing features on site. Drill hole logs are included in Appendix I. Laboratory testing results are presented in Appendix II. Selected photographs are presented in Appendix III.

3. SITE DESCRIPTION AND SUBSURFACE CONDITIONS

Auger drill holes at the airside maintenance road (AH10-01 and AH10-02) encountered compact sand and gravel subbase to about 0.8 m depth, underlain by a 0.7 m thick layer of peat, followed by soft to stiff clay to the end of the hole at 3.3 m and 2.4 m depth for AH10-01 and AH10-02 respectively.

Auger drill holes along Byng Road to the west of the airport (AH10-03, AH10-04 and AH10-04a) encountered 65 mm thick asphalt underlain by very dense sand and gravel to about 1.5 m depth where the auger drill refused. AH10-04a was drilled following the refusals at AH10-03 and AH10-04 in an attempt to reach the target depth of 2.0 m. The refusal was inferred to be on cobbles or boulders, given the absence of visible bedrock outcrops in the area.

Auger drill holes on Runway 07-25 (AH10-05 and AH10-06) encountered asphalt 220 mm to 250 mm thick. AH10-05 encountered very dense sand and gravel subbase to 1.3 m, underlain by clay to the end of the test hole at 3.3 m depth. At AH10-06 the granular subbase was not present and the asphalt was underlain by hard clay to the end of the hole at 2.0 m depth.

Auger hole AH10-07 at the end of Runway 11-29, adjacent to an existing sinkhole, encountered asphalt 100 mm thick, underlain by 1.5 m very loose sand subbase, followed by very stiff clay to the end of the test hole at 3.3 m depth.

Groundwater was not directly observed in the auger holes, but retrieved samples from the auger indicate moisture contents from 17% to 34% in the clay subgrade.

4. LABORATORY TESTING

Samples from the auger drill holes were collected for laboratory testing in Vancouver. Testing included water content, Atterberg Limits, washed sieve and California Bearing Ratio Test.

4.1 Water Content

Water content in AH10-01 in the peat layer beneath the maintenance road was 465%. Water content in the underlying clay layer was 34% and 30% in AH10-01 and AH01-02, respectively. The water content in the clay at AH10-01 and AH10-02 was unusually high due to the proximity of the clay samples to the peat layer above, where free water from the peat was mixed with the clay.

Water content in the two granular samples (AH10-03) alongside Byng Road was 10%.

Water content in the clay subgrade at the three airside holes was 21%, 17% and 22% in AH10-05, AH10-6 and AH10-07, respectively.

4.2 Atterberg Limits

Atterberg limits were conducted on one clay sample from each drill hole with the exception of AH10-03 and AH10-04 alongside Byng Road where no fine-grained soils were encountered. Atterberg limits showed the subgrade material to be a low to intermediate plasticity clay.

4.3 Washed Sieve

Washed sieve tests were conducted on the granular subbase layer in each hole with the exception of AH10-06 where the existing pavement is directly on the silt subgrade, and no granular layer was present.

The granular layer encountered in AH10-03 along Byng Road consisted of sand or silty sand. The granular layer encountered in all other holes consisted of well graded sand and gravel with fines content (< 0.075 mm) varying from 7% to 20%.

4.4 California Bearing Ratio Test

California Bearing Ratio (CBR) tests were performed on three subgrade samples from the airside drill holes, AH10-05, AH10-06, and AH10-7. Sample size (mass) for these tests was limited to material collected from auger flights, and was adequate for a single test at the natural water content but insufficient for multi-point testing per ASTM standards. No CBR tests were performed on the two drill holes along Byng Road (AH10-03 and AH10-04) since not enough sample could be obtained from the dense sand and gravel. CBR tests were attempted on the clay beneath the peat layer in AH10-01, but the high natural water content, greater than or close to the liquid limit, made sample preparation and testing unreliable.

Clay subgrade samples were compacted by Modified Proctor energy (ASTM D1557) using a 150 mm diameter mold with 56 blows per layer. Samples were prepared at the natural water content to reflect existing in-situ conditions.

After compaction, a surcharge of 4.45 kg was applied, and samples were allowed to soak for 96 hours. After soaking, the stress required to push the penetration piston into the sample was recorded.

In all three samples, the recorded CBR value was less than one.

5. LIMITATIONS OF GEOTECHNICAL REPORT

This report is an instrument of service of Klohn Crippen Berger Ltd. The report has been prepared for the exclusive use of PWGSC for the specific application to the Port Hardy Airport Runway Pavement Rehabilitation Project. The report's contents may not be relied upon by any other party without the express written permission of Klohn Crippen Berger. In this report, Klohn Crippen Berger has endeavoured to comply with generally accepted geotechnical practice common to the local area. Klohn Crippen Berger makes no warranty, express or implied.

The analyses, conclusions and recommendations contained in this report are based on data derived from a limited number of test holes obtained from widely spaced subsurface explorations. The methods used indicate subsurface conditions only at the specific locations where samples were obtained or where in-situ tests would infer, only at the time they were obtained, and only to the depths penetrated. The samples and tests cannot be relied on to accurately reflect the nature and extent of strata variations that usually exist between sampling or testing locations.

The recommendations included in this report have been based in part on assumptions about strata variations between test holes that will not become evident until construction or further investigation. Accordingly, Klohn Crippen Berger should be retained to perform construction observation and thereby provide a complete professional geotechnical engineering service through the observational method. If variations or other latent conditions become evident during construction, Klohn Crippen Berger will re-evaluate this report's recommendations. Klohn Crippen Berger cannot assume responsibility or liability for the adequacy of its recommendations when they are used in the field without Klohn Crippen Berger being retained to observe construction.

Although Klohn Crippen Berger has explored subsurface conditions as part of this program, Klohn Crippen Berger has not evaluated the site for potential presence of contaminated soil, and has not evaluated groundwater conditions.

We trust this letter meets your current requirements. Please call if you have any further questions.

Yours truly,

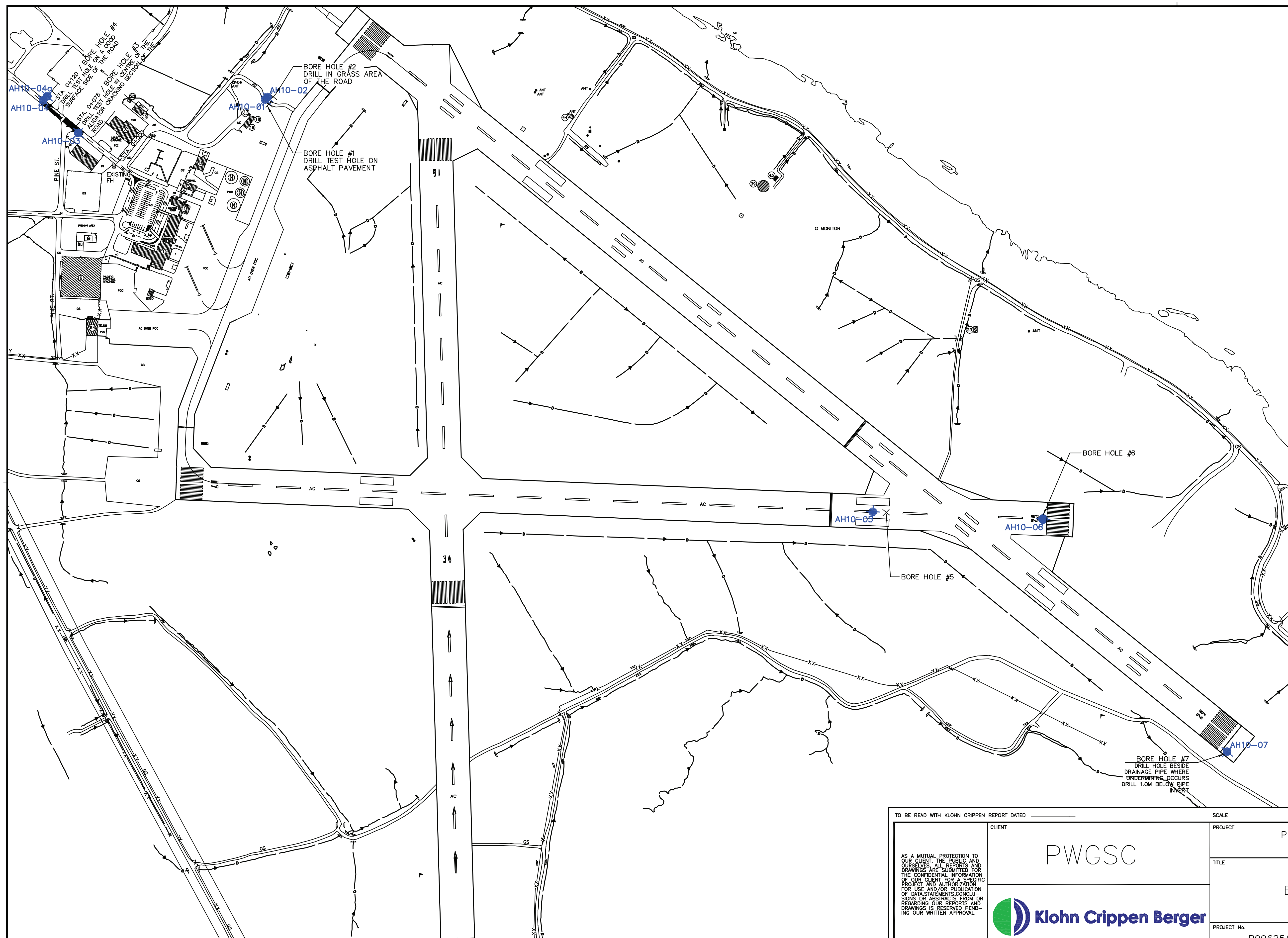
KLOHN CRIPPEN BERGER LTD.

Monta Maeda, E.I.T.
Geotechnical Engineer

Andrew Port, P.Eng.
Project Manager

FIGURES

Figure 1 Site Plan – Drill Hole Locations



TO BE READ WITH KLOHN CRIPPEN REPORT DATED ____________

SCALE

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA,STATEMENTS,CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

CLIENT

PWGSC

Klohn Crippen Berger

PROJECT

PORT HARDY AIRPORT RUNWAY
PAVEMENT REHABILITATION

TITLE

SITE PLAN
BORE HOLE LOCATIONS

PROJECT No. P09625A05

FIG. No. 01

KCR-DM

APPENDIX I

Drill Hole Logs

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SYMBOLS AND TERMS

FOR SOIL DESCRIPTION AND TEST HOLE LOGS

BASIC SYMBOLS

SAND | SILT | CLAY | GRAVEL | ORGANICS | FILL | ROCK

SYMBOL VARIATIONS - EXAMPLES[(1)]

SAND and GRAVEL | GRAVEL, clayey | SAND, silty | ORGANIC SILT or CLAY, low plasticity | ORGANIC SILT or CLAY, high plasticity

CLASSIFICATION BY PARTICLE SIZE

Name		Size Range (mm) [(3)]	U.S. Standard Sieve Size Retained	U.S. Standard Sieve Size Passing
Boulders		> 200	8 inch	-
Cobbles		75 - 200	3 inch	8 inch
Gravel:	coarse	19 - 75	0.75 inch	3 inch
	fine	5 - 19	No. 4	0.75 inch
Sand:	coarse	2 - 5	No. 10	No. 4
	medium	0.4 - 2	No. 40	No. 10
	fine	0.075 - 0.4	No. 200	No. 40
Fines (Silt or Clay) [(4)]		< 0.075	-	No. 200

PROPORTION OF MINOR COMPONENTS BY WEIGHT[(2)]

and	35 - 50%
y/ey	20 - 35%
some	10 - 20%
trace	0 - 10%

PARTICLE SHAPE

Flat	width/thickness > 3
Elongated	length/width > 3

DENSITY OF GRANULAR SOILS

Description	SPT N [(5)]	SPT $(N_1)_{60}$ [(6)]
Very Loose	0 - 4	0 - 3
Loose	4 - 10	3 - 8
Compact	10 - 30	8 - 25
Dense	30 - 50	25 - 42
Very Dense	> 50	> 42

CONSISTENCY OF COHESIVE SOILS

Description	S_u [(7)] (kPa)[(3)]	S_u [(7)] (ksf)[(8)]	SPT N[(9)]
Very Soft	< 12	< 0.25	< 2
Soft	12 - 25	0.25 - 0.5	2 - 4
Firm	25 - 50	0.5 - 1	4 - 8
Stiff	50 - 100	1 - 2	8 - 15
Very Stiff	100 - 200	2 - 4	15 - 30
Hard	> 200	> 4	> 30

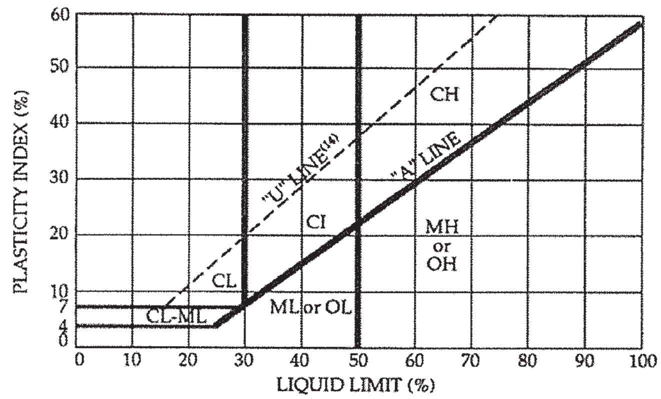
(1) Only selected examples of the possible variations or combinations of the basic symbols are illustrated.
(2) Example: SAND, silty, trace of gravel = sand with 20% to 35% silt and up to 10% gravel, by weight.
(3) Approximate metric conversion.
(4) Fines are classified as silt or clay on the basis of Atterberg limits (refer to Plasticity Chart).
(5) Standard Penetration Test (SPT) blow count (uncorrected), after Terzaghi and Peck, 1948.
(6) Standard Penetration Test blow count, based on above N value corrected to 60% hammer efficiency and 96 kPa (1.0 ton/ft²) effective overburden pressure, after Skempton, 1986.
(7) Undrained shear strength can be estimated by vane (gives S_u), pocket penetrometer (gives unconfined compressive strength, i.e., 2 S_u), or unconfined compression test (gives 2 S_u).
(8) ksf = 1000 pounds per square foot = 0.5 tsf (ton/ft²) = approximately 0.5 kg/cm².
(9) Very approximate correlation with Standard Penetration Test blow counts, after Terzaghi and Peck, 1948.

SYMBOLS AND TERMS
FOR SOIL DESCRIPTION AND TEST HOLE LOGS

PLASTICITY OF COHESIVE SOILS[10]		
Description	Silt	Clay
High	W_L[11] > 50	W_L > 50
Medium	–	30 < W_L < 50
Low	W_L < 50	W_L < 30
Non-Plastic	NP[12]	–

SENSITIVITY OF COHESIVE SOILS	
Description	Undisturbed Strength / Remoulded Strength [13]
High	> 8
Medium	4 to 8
Low	< 4

PLASTICITY CHART FOR SOILS PASSING NO. 40 SIEVE[10]



CLASSIFICATION OF GROUND ICE[15]			
GROUP		SUBGROUP	
Symbol	Description	Symbol	Description
N	Ice not visible by unaided eye	Nf	Poorly bonded or friable
		Nbn	Well bonded, no excess ice
		Nbe	Well bonded, excess ice
V	Visible ice less than 25 mm thick	Vx	Individual ice crystals or inclusions
		Vc	Ice coatings on soil particles
		Vr	Random or irregularly oriented ice
		Vs	Stratified or distinctly oriented ice
ICE	Visible ice greater than 25 mm thick	ICE + (soil type)	Ice with soil inclusions
		ICE	Ice without soil inclusions

(10) This plasticity classification conforms to the Unified Soil Classification System (USCS) and the ASTM D-2487 plasticity chart, except for the addition of an intermediate category for clay, where the liquid limit is between 30% and 50% (CI). Under ASTM and USCS, all clays with a liquid limit less than 50% are classified as low plasticity (CL).
(11) W_L = Liquid Limit (%).
(12) NP = Non Plastic (silts only).
(13) Dimensionless ratio.
(14) "U" Line marks typical upper limit. "A" Line divides clays from silts and organic soils.
(15) For soil descriptions, estimate percentage of ground ice based on volume, after National Research Council of Canada, 1963.

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SYMBOLS AND TERMS

FOR SOIL TEST HOLE LOGS

TEST TYPES[1]

DH	Drill Hole - *typical drilling methods include tricone, percussion, wash boring, machine auger with SPT or thin-walled tube samples and coring.*
BK	Becker hammer drill hole - *both open and closed test at the same location.*
BKS	Becker hammer drill hole - *open casing, sampled.*
BPT	Becker penetration test - *closed casing.*
TP	Test pit - *machine or hand dug.*
CPT	Electric cone penetration test with pore pressure measurements.
DCT	Dynamic cone penetration test.
VST	Vane shear test.
AH	Auger hole - *machine or hand auger, no SPT or thin-walled tube samples taken.*

IN SITU TESTS OR DOWNHOLE INSTRUMENTATION[2]

BM	Benchmark
DMT	Dilatometer test
IN	Inclinometer
PMT	Pressuremeter test
PT	Permeability test
PZ	Piezometer
SW	Shear wave velocity test

LABORATORY AND/OR FIELD TESTS[3]

S_u Undrained shear strength, measured by:[4]

◆	Field Vane (peak)
◇	Field Vane (remoulded)
■	Lab Vane (peak)
□	Lab Vane (remoulded)
▲	Unconfined Compression
△	Pocket penetrometer

●		Standard Penetration Test (SPT) blow count, uncorrected (N)
○	W%	In situ moisture content
✕	W_P%	Plastic limit
✕	W_L%	Liquid limit
⌐		Becker penetration test blow counts, closed casing
≷		Becker penetration test blow counts, open casing
▼ or ▽		Water level, measured on date and from piezometer indicated on log

OTHER LABORATORY TESTS[5]

CD	Consolidated, drained triaxial test
CUP	Consolidated, undrained triaxial test with pore pressure measurements
CUCY	Consolidated, undrained triaxial test with cyclic loading
UU	Unconsolidated, undrained triaxial test
UC	Unconfined (uniaxial) compression test
DS	Direct shear test
DSS	Direct simple shear test
GSD	Grain size distribution *(by sieve or hydrometer)*
MDR	Moisture-density relationship *(i.e. standard or modified Proctor test)*
ORG	Organic content
OED	Oedometer consolidation test
RD	Relative density *(also known as density index)*
GS	Specific gravity
K	Permeability
UW	Unit Weight

(1) Test type abbreviation is typically followed by a two-part number indicating year and chronological sequence of test. Example: CPT93-1 indicates the first electric cone penetration test at a particular site in 1993.
(2) In situ test or downhole instrumentation abbreviations are typically shown in brackets following the appropriate test type designation. Example: DH93-1(PZ) indicates a piezometer was installed in drill hole 93-1.
(3) These symbols are for laboratory and/or field test results shown on the test hole log.
(4) Vane gives S_u. Pocket penetrometer and unconfined compression tests give 2 S_u, so results are divided by 2 for plotting on log.
(5) Where other laboratory test results are available but not shown on the test hole log, the applicable abbreviation appears under the heading *"Other Tests"* on the log.

TEST HOLE LOG

STARTED: 10/14/2010 **FINISHED:** 10/14/2010
DRILL METHOD: Solid Stem Auger
GROUND ELEV. (m):
COORDINATES (m):

DYNAMIC CONE PENETRATION TEST

Rod O.D.: 5"	Shoe O.D.: n/a
Hammer Weight: 140 lb	Height Drop: 30"

● SPT N ★% FINES △ P.PEN/2 (psi) DCPT (blows/0.3m)
W_P% W% W_L% — 20 40 60 80

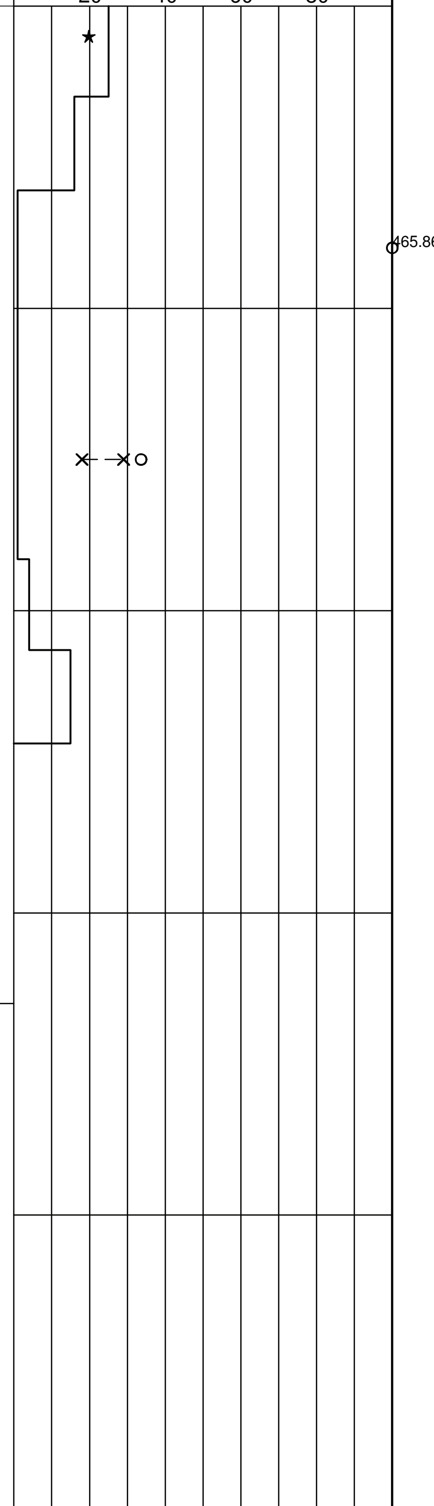
DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	SYMBOL	DESCRIPTION OF MATERIALS	INSTRUMENT DETAILS
0.1					Asphalt (thickness not recorded)	
0.6		Grab	1		SAND and GRAVEL (SP-GP), coarse sand, fine gravel, some silt, poorly graded, compact, max size recovered 10 mm, angular gravel, brown.	
1.5		Grab	2		Peat, wet, fine, fibrous, dark brown.	
3.3		Grab	3		CLAY (CL), trace fine sand, low to intermediate plasticity, soft to firm above 2.1 m, grey, moist. Very soft near peat contact. Stiff from 2.1 m depth.	

End of Hole at 3.3 m

Hole drilled using solid stem auger drill operated by Downrite Drilling of Chilliwack, BC.

End of solid stem auger hole at 3.3 m. End of DCPT at 2.4 m.

Backfill with crushed rock to asphalt depth. Cold-mix asphalt patch at surface.



Klohn Crippen Berger

PROJECT NO.: P09625A05	
PROJECT: Port Hardy Airport Runway	
LOCATION: Port Hardy, BC	
LOGGED BY: MM	**CHECKED BY:** AP
SHEET 1 **OF** 1	**HOLE NO.:** AH10-01

TEST HOLE LOG

STARTED: 10/14/2010 **FINISHED:** 10/14/2010
DRILL METHOD: Solid Stem Auger
GROUND ELEV. (m):
COORDINATES (m):

DYNAMIC CONE PENETRATION TEST

Rod O.D.: 5"	Shoe O.D.: n/a
Hammer Weight: 140 lb	Height Drop: 30"

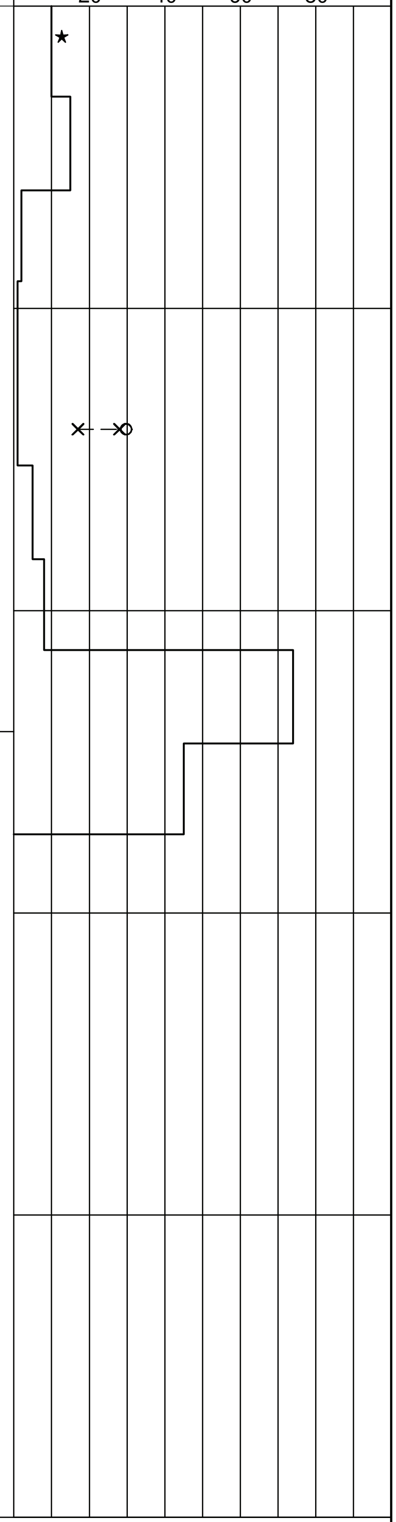
Legend: ● SPT N ★ % FINES △ P.PEN/2 (psi) — DCPT (blows/0.3m); W_P% × — W% ○ — W_L% ×; scale 20, 40, 60, 80

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	SYMBOL	DESCRIPTION OF MATERIALS	INSTRUMENT DETAILS
0 – 0.6		Grab	1		SAND and GRAVEL (SP-GP), medium sand, fine gravel, some silt and organics, poorly graded, compact, brown, moist.	
0.6 – 1.4					Peat, moist, fine, fibrous, dark brown.	
1.4 – 2.4		Grab	2		CLAY (CL), low to intermediate plasticity, firm above 2.1 m, grey, moist. Hard below 2.1 m.	
2.4					End of Hole at 2.4 m	

Hole drilled using solid stem auger drill operated by Downrite Drilling of Chilliwack, BC.

End of solid stem auger holle at 2.4 m. End of DCPT at 2.7 m.

Backfill with gravel.



Klohn Crippen Berger

PROJECT NO.: P09625A05	
PROJECT: Port Hardy Airport Runway	
LOCATION: Port Hardy, BC	
LOGGED BY: MM	**CHECKED BY:** AP
SHEET 1 **OF** 1	**HOLE NO.:** AH10-02

TEST HOLE LOG

STARTED: 10/14/2010 **FINISHED:** 10/14/2010
DRILL METHOD: Solid Stem Auger
GROUND ELEV. (m):
COORDINATES (m):

DYNAMIC CONE PENETRATION TEST

Rod O.D.: 5"	Shoe O.D.: n/a
Hammer Weight: 140 lb	Height Drop: 30"

● SPT N ★ % FINES △ P.PEN/2 (psi) — DCPT (blows/0.3m)
W_P% × — W% o — W_L% × ; 20 40 60 80

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	DESCRIPTION OF MATERIALS
0.1				Asphalt (65mm thickness)
0.4	40/55/45	Grab	1	GRAVEL (GP), fine, sandy, medium, poorly graded, very dense, max size recovered 20 mm, subrounded, grey.
1.0		Grab	2	SAND (SP), fine, some silt, trace fine gravel, poorly graded, very dense, brown.
1.4	25/35/50	Grab	3	SAND (SM), fine, silty, trace fine gravel, poorly graded, very dense, grey.
1.5		Grab	4	Rock, grey. Inferred boulder; no visible bedrock outcrops nearby. Auger refusal at 1.5m.

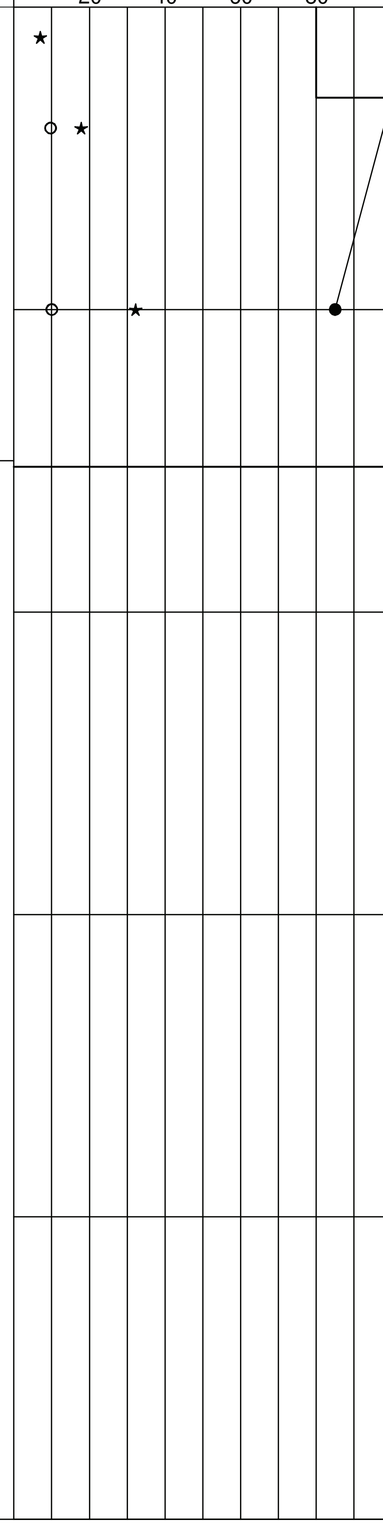
End of Hole at 1.5 m

Hole drilled using solid stem auger drill operated by Downrite Drilling of Chilliwack, BC.

End of solid stem auger hole 1.5 m (practical refusal).

DCPT from 0 m to 1.2 m depth (1 ft to 4 ft): 80, 140, 180, 230 blows per 0.3 m. DCPT refusal at 1.4 m (5ft) after 400 blows for 0.15 m.

Backfill with sand to asphalt depth. Cold-mix asphalt patch at surface.



Depth scale (m): 1, 2, 3, 4, 5

Klohn Crippen Berger

PROJECT NO.: P09625A05
PROJECT: Port Hardy Airport Runway
LOCATION: Port Hardy, BC
LOGGED BY: MM **CHECKED BY:** AP
SHEET 1 **OF** 1 **HOLE NO.:** AH10-03

TEST HOLE LOG

STARTED: 10/14/2010 **FINISHED:** 10/14/2010
DRILL METHOD: Solid Stem Auger
GROUND ELEV. (m):
COORDINATES (m):

DYNAMIC CONE PENETRATION TEST
Rod O.D.: 5" | Shoe O.D.: n/a
Hammer Weight: 140 lb | Height Drop: 30"
● SPT N ★% FINES △ P.PEN/2 (psi) DCPT (blows/0.3m)
W_P% W% W_L% — 20 40 60 80

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	SYMBOL	DESCRIPTION OF MATERIALS	INSTRUMENT DETAILS
0.1		Grab			Asphalt (65mm thickness)	
0.8			1		GRAVEL (GP-SP), coarse to fine, sandy, medium, poorly graded, very dense, max size recovered 50 mm, subrounded. Auger refusal at 0.8m.	

End of Hole at 0.8 m

Hole drilled using solid stem auger drill operated by Downrite Drilling of Chilliwack, BC.

End of solid stem auger hole 0.8 m (practical refusal). DCPT refusal at 0.25 m (100 blows for 0.25 m).

Backfill with crushed rock to asphalt depth. Cold-mix asphalt patch at surface.

Depth scale: 1, 2, 3, 4, 5

Klohn Crippen Berger

PROJECT NO.: P09625A05
PROJECT: Port Hardy Airport Runway
LOCATION: Port Hardy, BC
LOGGED BY: MM **CHECKED BY:** AP
SHEET 1 **OF** 1 **HOLE NO.:** AH10-04

KCBL_DCT-SI PORT HARDY AIRPORT.GPJ KC_DATA.GDT 10/12/17

TEST HOLE LOG

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	SYMBOL	DESCRIPTION OF MATERIALS	INSTRUMENT DETAILS
0–0.5	30/60/60 for 1"	Grab	1		SAND (SP-GP), medium, gravelly, fine, poorly graded, very dense, max size recovered 20 mm, sub-angular, brown. Auger refusal at 0.5m.	
0.5					End of Hole at 0.5 m Hole drilled using solid stem auger drill operated by Downrite Drilling of Chilliwack, BC. End of solid stem auger hole at 0.5 m (practical refusal). Backfill with gravel.	

STARTED: 10/14/2010 **FINISHED:** 10/14/2010

DRILL METHOD: Solid Stem Auger

GROUND ELEV. (m):

COORDINATES (m):

Depth scale (m): 1, 2, 3, 4, 5

DYNAMIC CONE PENETRATION TEST

Rod O.D.: 5"	Shoe O.D.: n/a
Hammer Weight: 140 lb	Height Drop: 30"

● SPT N ★% FINES △ P.PEN/2 (psi) DCPT (blows/0.3m)

W_P% W% W_L%

20 40 60 80

Klohn Crippen Berger

PROJECT NO.: P09625A05

PROJECT: Port Hardy Airport Runway

LOCATION: Port Hardy, BC

LOGGED BY: MM **CHECKED BY:** AP

SHEET 1 **OF** 1 **HOLE NO.:** AH10-04a

TEST HOLE LOG

STARTED: 10/14/2010 **FINISHED:** 10/14/2010
DRILL METHOD: Solid Stem Auger
GROUND ELEV. (m):
COORDINATES (m):

DYNAMIC CONE PENETRATION TEST

Rod O.D.: 5"	Shoe O.D.: n/a
Hammer Weight: 140 lb	Height Drop: 30"

● SPT N ★% FINES △ P.PEN/2 (psi) DCPT (blows/0.3m)

W_P% W% W_L% — 20 40 60 80

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	SYMBOL	DESCRIPTION OF MATERIALS	INSTRUMENT DETAILS	Test results
0–0.2					Asphalt (220mm thickness)		
0.2–1.3		Grab	1		SAND and GRAVEL (SP-GP), medium sand, coarse to fine gravel, trace silt, poorly graded, very dense, max size recovered 25 mm, sub-angular, brown.		★ (% fines)
1.3–3.3		Grab	2		CLAY (CL), some coarse sand, low to intermediate plasticity, firm, grey-brown, moist.		W_P, W, W_L plotted at approx. 20

End of Hole at 3.3 m

Hole drilled using solid stem auger drill operated by Downrite Drilling of Chilliwack, BC.

End of solid stem auger hole at 3.3 m. DCPT refusal at 0.6 m (100 blows for 0.2 m).

Backfill with crushed rock to asphalt depth. Cold-mix asphalt patch at surface.

CBR test conducted on sample collected from 1.3m to 3.3m depth.

KCBL_DCT-SI PORT HARDY AIRPORT.GPJ KC_DATA.GDT 10/12/17

Klohn Crippen Berger

PROJECT NO.: P09625A05	
PROJECT: Port Hardy Airport Runway	
LOCATION: Port Hardy, BC	
LOGGED BY: MM	**CHECKED BY:** AP
SHEET 1 **OF** 1	**HOLE NO.:** AH10-05

TEST HOLE LOG

STARTED: 10/14/2010 **FINISHED:** 10/14/2010
DRILL METHOD: Solid Stem Auger
GROUND ELEV. (m):
COORDINATES (m):

DYNAMIC CONE PENETRATION TEST

Rod O.D.: 5"	Shoe O.D.: n/a
Hammer Weight: 140 lb	Height Drop: 30"

● SPT N ★% FINES DCPT (blows/0.3m)
△ P.PEN/2 (psi)

W_P% W% W_L%
20 40 60 80

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	SYMBOL	DESCRIPTION OF MATERIALS	INSTRUMENT DETAILS
0.0–0.3					Asphalt (250mm thickness)	
0.3–2.0		Grab	1		CLAY (CL), trace fine sand, low to intermediate plasticity, hard, grey, moist.	
2.0					End of Hole at 2.0 m	

End of Hole at 2.0 m

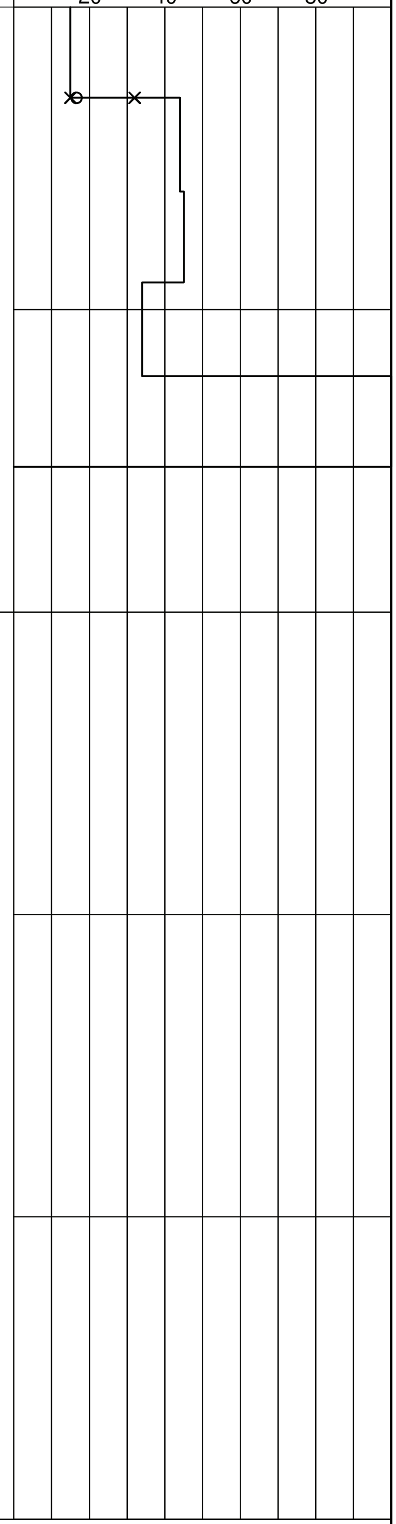
Hole drilled using solid stem auger drill operated by Downrite Drilling of Chilliwack, BC.

End of solid stem auger hole at 2.0 m. DCPT refusal at 1.5 m (100 blows for 0.3 m).

Backfill with crushed rock to asphalt depth. Cold-mix asphalt patch at surface.

CBR test conducted on sample collected from 0.25m to 2.0m depth.

Depth scale (m): 1, 2, 3, 4, 5



Klohn Crippen Berger

PROJECT NO.: P09625A05
PROJECT: Port Hardy Airport Runway
LOCATION: Port Hardy, BC
LOGGED BY: MM **CHECKED BY:** AP
SHEET 1 **OF** 1 **HOLE NO.:** AH10-06

KCBL_DCT-SI PORT HARDY AIRPORT.GPJ KC_DATA.GDT 10/12/17

TEST HOLE LOG

STARTED: 10/14/2010 **FINISHED:** 10/14/2010

DRILL METHOD: Solid Stem Auger

GROUND ELEV. (m):

COORDINATES (m):

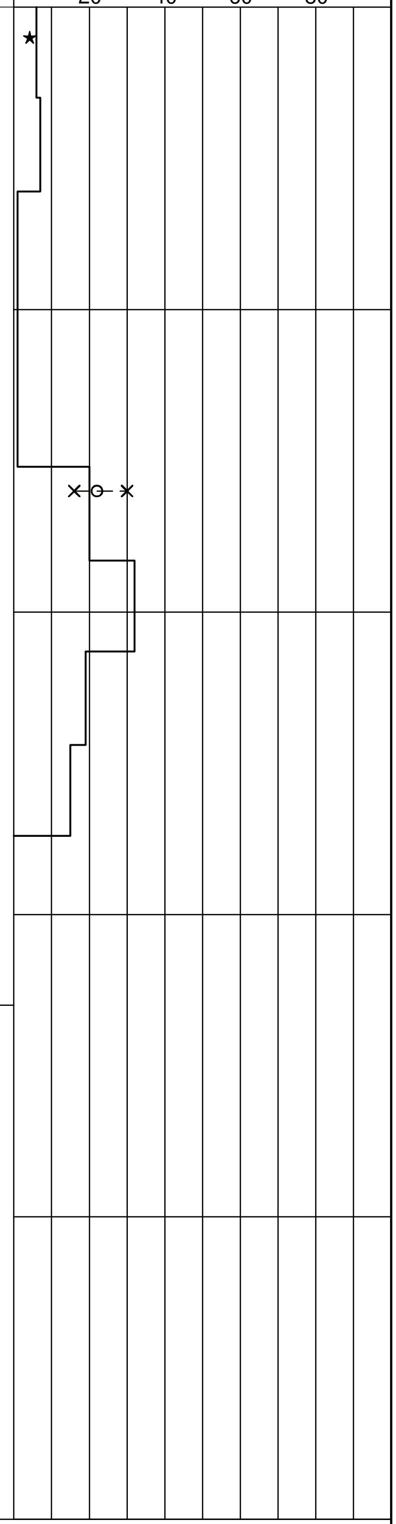
DYNAMIC CONE PENETRATION TEST

Rod O.D.: 5"	Shoe O.D.: n/a
Hammer Weight: 140 lb	Height Drop: 30"

● SPT N ★% FINES △ P.PEN/2 (psi) DCPT (blows/0.3m)

W_P% — W% — W_L% (20, 40, 60, 80)

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	DESCRIPTION OF MATERIALS	INSTRUMENT DETAILS
0.1				Asphalt (100mm thickness)	
0.1–1.6		Grab	1	SAND (SP), medium, gravelly, fine, trace silt, poorly graded, very loose, max size recovered 20 mm, sub-rounded, brown.	
1.6–3.3		Grab	2	CLAY (CL), low to intermediate plasticity, very stiff, grey, moist.	
3.3					



End of Hole at 3.3 m

Hole drilled using solid stem auger drill operated by Downrite Drilling of Chilliwack, BC.

End of solid stem auger hole at 3.3 m. End of DCPT at 2.7 m.

Backfill with crushed rock to asphalt depth. Cold-mix asphalt patch at surface.

CBR test conducted on sample collected from 1.6m to 3.3m depth.

Klohn Crippen Berger

PROJECT NO.: P09625A05

PROJECT: Port Hardy Airport Runway

LOCATION: Port Hardy, BC

LOGGED BY: MM **CHECKED BY:** AP

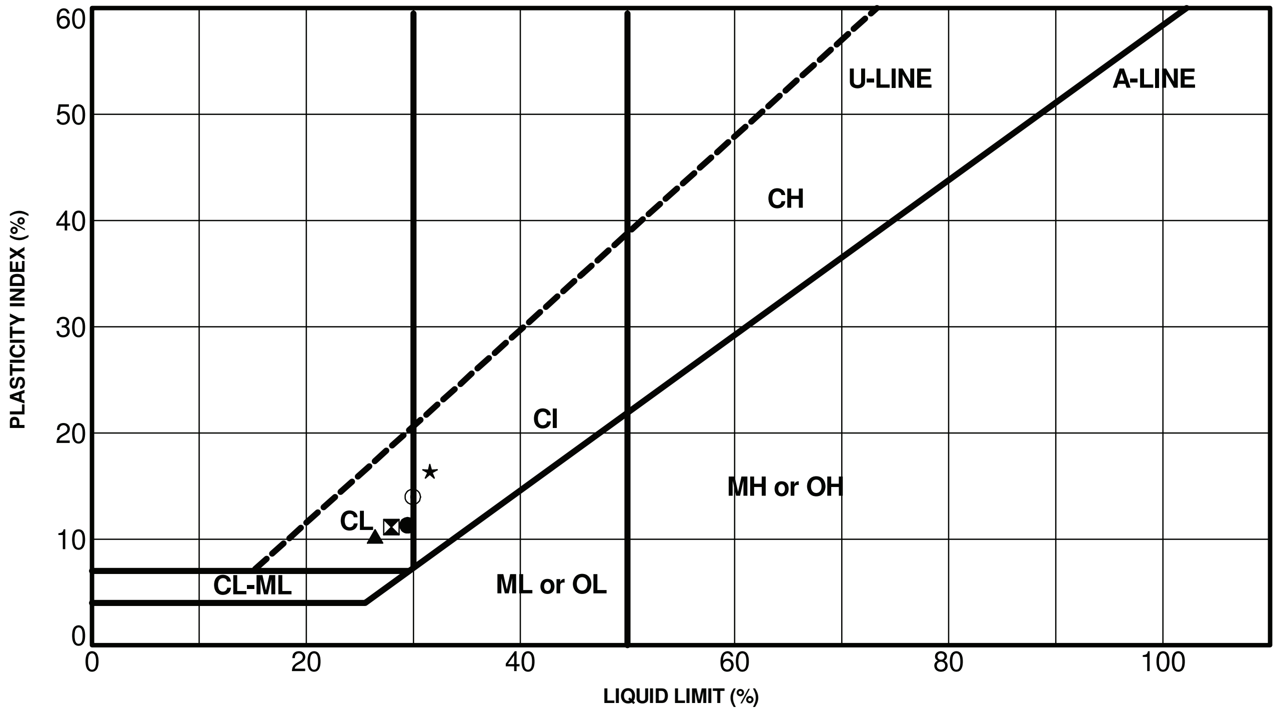
SHEET 1 **OF** 1 **HOLE NO.:** AH10-07

KCBL_DCT-SI PORT HARDY AIRPORT.GPJ KC_DATA.GDT 10/12/17

APPENDIX II

Geotechnical Laboratory Data

PLASTICITY CHART



	HOLE	SAMPLE	DEPTH (m)	W_L	W_P	PI	% FINES	REMARKS/SAMPLE DESCRIPTION
●	AH10-01	3	1.5	29	18	11		Bag Sample
⧗	AH10-02	2	1.4	28	17	11		Bag Sample
▲	AH10-05	2	1.3	26	16	10		Bag Sample
★	AH10-06	1	0.3	32	15	16		Bag Sample
⊙	AH10-07	2	1.6	30	16	14		Bag Sample

Klohn Crippen Berger

PROJECT NO.: P09625A05
PROJECT: Port Hardy Airport 2010
LOCATION: Port Hardy, B.C.
FIGURE:
DRAWN BY: JJ, MM, MC **CHECKED BY:** NG, JG

WATER CONTENT OF SOIL

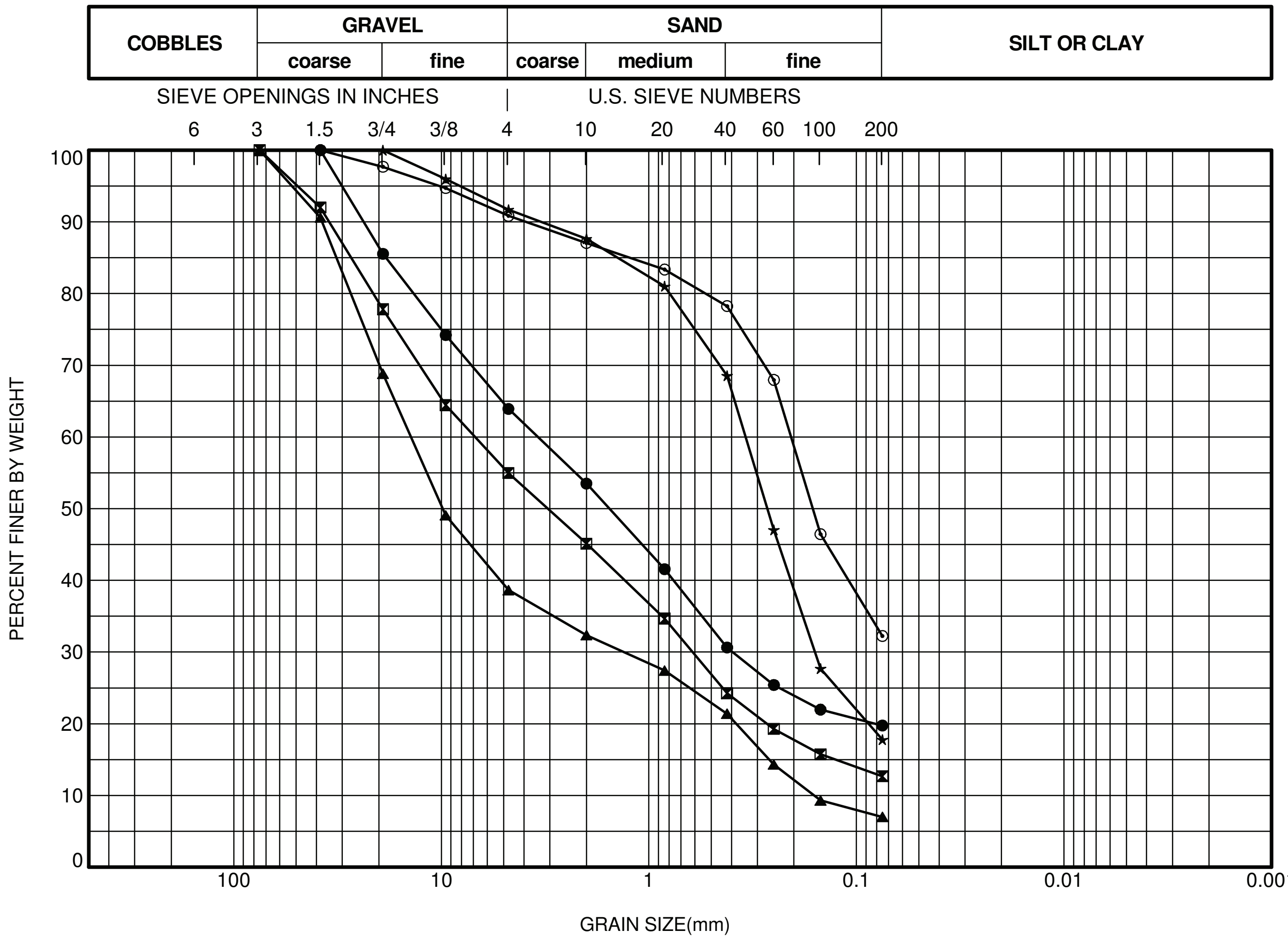
(ASTM D2216)

Hole Number	Sample Number	Depth (m)	ID Number	Wet Weight + Tare (g)	Dry Weight + Tare (g)	Tare (g)	Water Weight (g)	Total Dry Weight (g)	Water Content (%)
AH10-01	2	0.80		156.89	31.20	4.22	125.69	26.98	**465.86**
AH10-01	3	1.50		209.54	157.90	4.27	51.64	153.63	**33.61**
AH10-02	2	1.40		255.77	198.08	4.24	57.69	193.84	**29.76**
AH10-03	2	0.40		3191.51	2934.55	290.84	256.96	2643.71	**9.72**
AH10-03	3	1.00		1306.00	1202.05	166.86	103.95	1035.19	**10.04**
AH10-05	2	1.30		185.76	154.53	4.20	31.23	150.33	**20.77**
AH10-06	1	0.25		193.95	166.95	4.23	27.00	162.72	**16.59**
AH10-07	2	1.60		183.53	151.19	4.24	32.34	146.95	**22.01**

Klohn Crippen Berger

JOB NO.:	P09625A05
PROJECT:	Port Hardy Airport
LOCATION:	Port Hardy, BC
DATE:	November 2, 2010
TESTED BY: NG	CHECKED BY: JG

GRAIN SIZE DISTRIBUTION



	HOLE	DEPTH (m)	D85	D60	D50	D15	D10	CU	%GRAVEL	%SAND	%FINES
●	AH10-01	0.10	18.474	3.432	1.551				36.1	44.2	19.8
⊠	AH10-02	0.10	27.129	6.874	3.071	0.126			45.0	42.3	12.7
▲	AH10-03	0.07	31.959	13.993	9.838	0.263	0.160	87.449	61.4	31.6	7.0
★	AH10-03	0.40	1.416	0.342	0.268				8.3	73.9	17.8
⊙	AH10-03	1.00	1.236	0.206	0.162				9.2	58.6	32.2

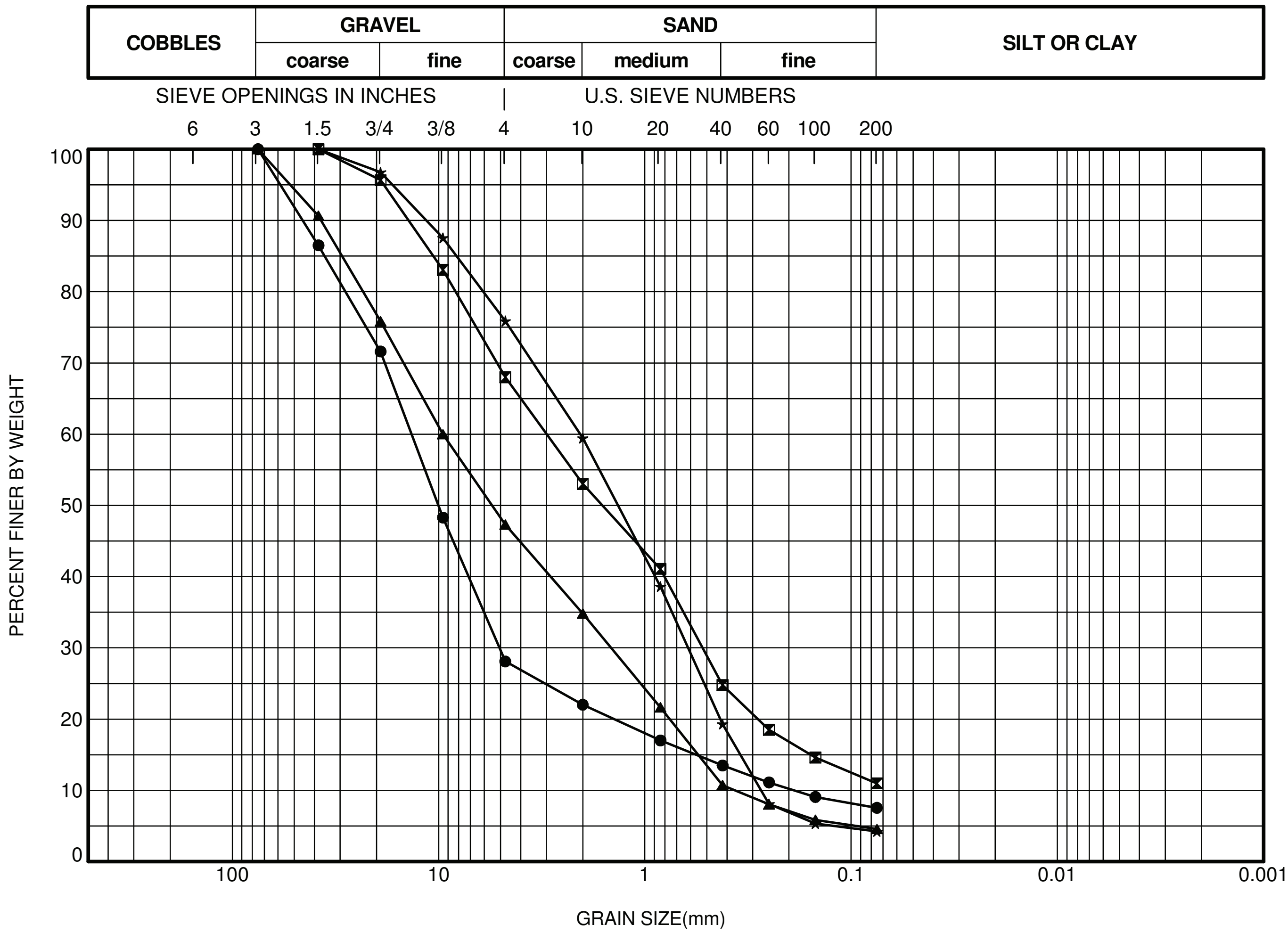
	HOLE	SAMPLE	DEPTH (m)	W%	W_L	W_P	PI	REMARKS / SAMPLE DESCRIPTION
●	AH10-01	1	0.10					Bag Sample
⊠	AH10-02	1	0.10					Bag Sample
▲	AH10-03	1	0.07					Bag Sample
★	AH10-03	2	0.40	9.7				Bag Sample
⊙	AH10-03	3	1.00	10.0				Bag Sample

CU = COEFFICIENT OF UNIFORMITY = D60/D10 **PARTICLE SIZES, e.g. D85, in mm** **Tested by Wet Sieving Method (ASTM D1140 & D422)**

Klohn Crippen Berger

PROJECT NO.: P09625A05
PROJECT: Port Hardy Airport 2010
LOCATION: Port Hardy, B.C.
FIGURE:
DRAWN BY: JJ, MM, MC **CHECKED BY:** NG, JG

GRAIN SIZE DISTRIBUTION



	HOLE	DEPTH (m)	D85	D60	D50	D15	D10	CU	%GRAVEL	%SAND	%FINES
●	AH10-04	0.07	35.619	13.505	10.017	0.565	0.189	71.540	71.9	20.6	7.5
⊠	AH10-04a	0.00	10.593	2.993	1.607	0.157		48.130	32.0	57.0	11.0
▲	AH10-05	0.22	29.308	9.524	5.507	0.551	0.365	26.108	52.7	42.7	4.6
★	AH10-07	0.10	8.170	2.059	1.350	0.344	0.273	7.546	24.1	71.7	4.2

	HOLE	SAMPLE	DEPTH (m)	W%	W_L	W_P	PI	REMARKS / SAMPLE DESCRIPTION
●	AH10-04	1	0.07					Bag Sample
⊠	AH10-04a	1	0.00					Bag Sample
▲	AH10-05	1	0.22					Bag Sample
★	AH10-07	1	0.10					Bag Sample

CU = COEFFICIENT OF UNIFORMITY = D60/D10 **PARTICLE SIZES, e.g. D85, in mm** **Tested by Wet Sieving Method (ASTM D1140 & D422)**

Klohn Crippen Berger

PROJECT NO.: P09625A05

PROJECT: Port Hardy Airport 2010

LOCATION: Port Hardy, B.C.

FIGURE:

DRAWN BY: JJ, MM, MC **CHECKED BY:** NG, JG

KCB_GRAIN_SIZE-SI P09625A05 PORT HARDY T1047 OCT 19, 2010.GPJ SIEVE.GDT 10/12/14

CALIFORNIA BEARING RATIO (CBR) TEST

(ASTM D1883)

Sample Information

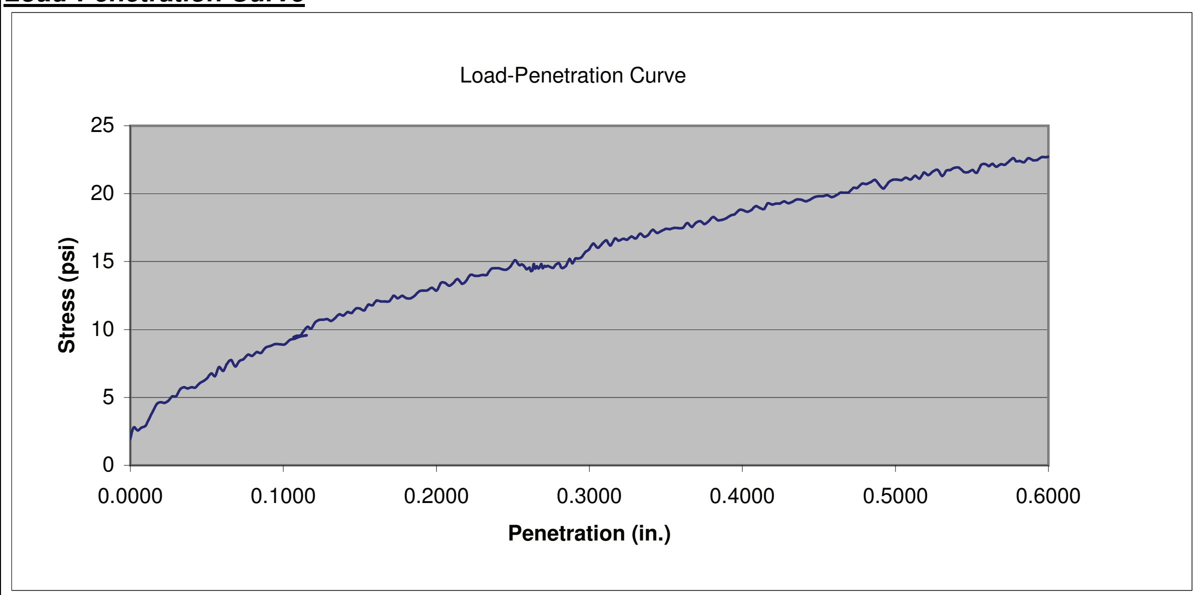
Hole Number/Sample Number:	AH10-05
Depth (m):	1.3-3.3
Method of Compaction:	Modified Proctor Method C - ASTM D1557 - 6" Mold - 56 Blows/Layer
Sample Condition:	Soaked
Surcharge (kg):	4.54 (10 lbs)

Natural Water Content (%):	20.8	**Sample Height After Compaction (mm):**	114.68
Water Content Before Compaction (%):	20.2	**Sample Diameter (mm):**	152.11
Water Content After Compaction (%):	19.7	**Sample Weight After Compaction (g):**	4443
Water Content Top 1" Layer After Test (%):	21.0	**Wet Unit Weight (kg/m^3):**	2123
Water Content Bot. 2-4" Layer After Test (%):	20.6	**Dry unit Weight (kg/m^3):**	1781
Sample Height Before Soaking (mm):	114.68	*Note: Moisture content after compaction is used to calculate dry unit weight*	
Sample Height After Soaking (mm):	115.74		
Swell (%):	0.93		

Bearing Ratio Calculation

Adjusted Penetration Depth @ 0.100 in. (in.):	0.100
Adjusted Penetration Depth @ 0.200 in. (in.):	0.200
Stress @ Adjusted 0.100 inch Penetration (psi):	8.91
Stress @ Adjusted 0.200 inch Penetration (psi):	12.87
Standard Stress @ 0.100 in. Penetration (psi):	1000
Standard Stress @ 0.200 in. Pneetration (psi):	1500
CBR @ 0.100 in. Penetration:	***0.89***
CBR @ 0.200 in. Penetration:	***0.86***

Load-Penetration Curve



Klohn Crippen Berger

JOB NO.:	P09625A05		
PROJECT:	Port Hardy Airport		
LOCATION:	Port Hardy, BC		
DATE:	November 29, 2010		
TESTED BY:	NG	CHECKED BY:	BY

CALIFORNIA BEARING RATIO (CBR) TEST

(ASTM D1883)

Sample Information

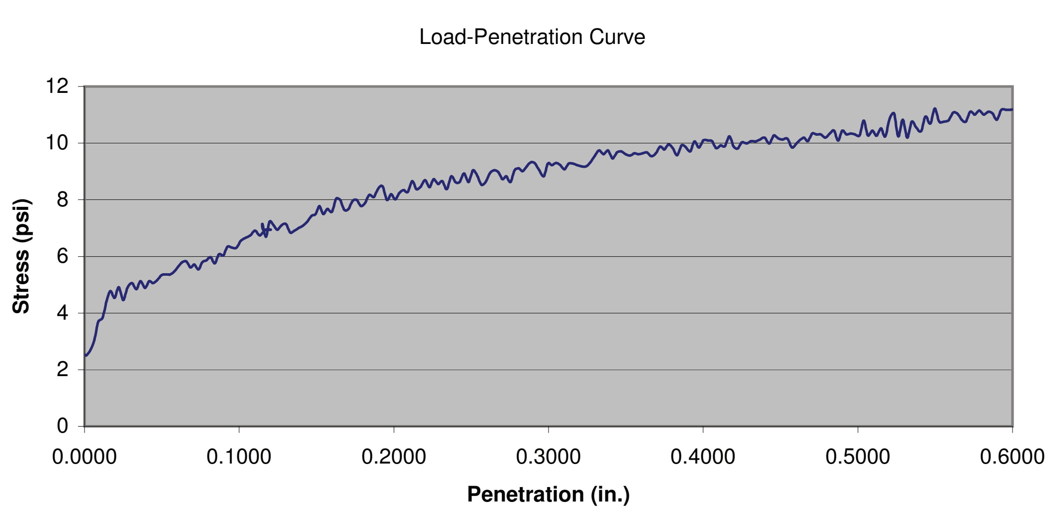
Hole Number/Sample Number:	AH10-06
Depth (m):	0.25-2.0
Method of Compaction:	Modified Proctor Method C - ASTM D1557 - 6" Mold - 56 Blows/Layer
Sample Condition:	Soaked
Surcharge (kg):	4.54 (10 lbs)

Natural Water Content (%):	16.6	**Sample Height After Compaction (mm):**	110.08
Water Content Before Compaction (%):	16.5	**Sample Diameter (mm):**	151.57
Water Content After Compaction (%):	16.2	**Sample Weight After Compaction (g):**	4480
Water Content Top 1" Layer After Test (%):	15.6	**Wet Unit Weight (kg/m^3):**	2241
Water Content Bot. 2-4" Layer After Test (%):	16.1	**Dry unit Weight (kg/m^3):**	1928
Sample Height Before Soaking (mm):	110.08	*Note: Moisture content after compaction is used to calculate dry unit weight*	
Sample Height After Soaking (mm):	112.61		
Swell (%):	1.62		

Bearing Ratio Calculation

Adjusted Penetration Depth @ 0.100 in. (in.):	0.100
Adjusted Penetration Depth @ 0.200 in. (in.):	0.200
Stress @ Adjusted 0.100 inch Penetration (psi):	6.56
Stress @ Adjusted 0.200 inch Penetration (psi):	8.02
Standard Stress @ 0.100 in. Penetration (psi):	1000
Standard Stress @ 0.200 in. Pneetration (psi):	1500
CBR @ 0.100 in. Penetration:	***0.66***
CBR @ 0.200 in. Penetration:	***0.53***

Load-Penetration Curve



Klohn Crippen Berger

JOB NO.:	P09625A05		
PROJECT:	Port Hardy Airport		
LOCATION:	Port Hardy, BC		
DATE:	November 29, 2010		
TESTED BY:	NG	CHECKED BY:	BY

CALIFORNIA BEARING RATIO (CBR) TEST

(ASTM D1883)

Sample Information

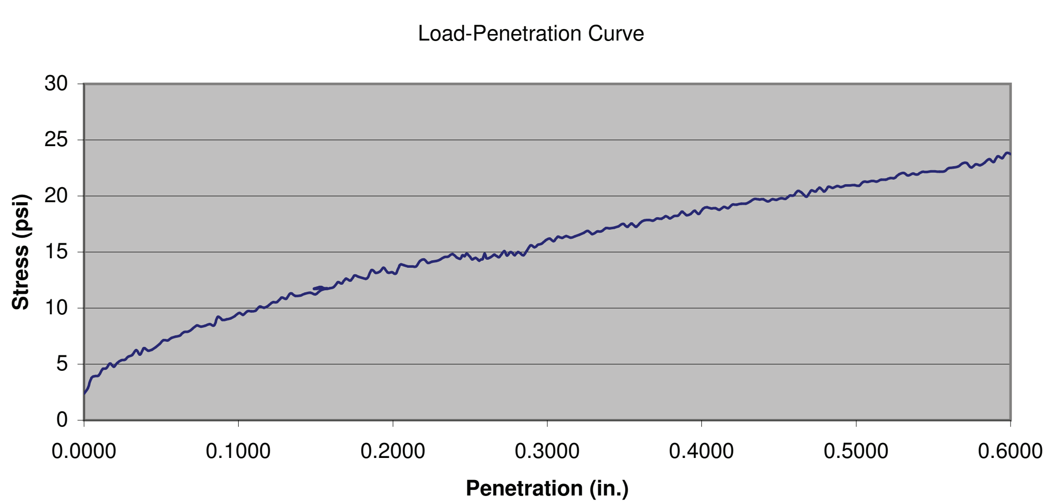
Hole Number/Sample Number:	AH10-07
Depth (m):	1.6-3.3
Method of Compaction:	Modified Proctor Method C - ASTM D1557 - 6" Mold - 56 Blows/Layer
Sample Condition:	Soaked
Surcharge (kg):	4.54 (10 lbs)

Natural Water Content (%):	22.0	**Sample Height After Compaction (mm):**	115.49
Water Content Before Compaction (%):	21.1	**Sample Diameter (mm):**	151.81
Water Content After Compaction (%):	21.7	**Sample Weight After Compaction (g):**	4328
Water Content Top 1" Layer After Test (%):	22.7	**Wet Unit Weight (kg/m^3):**	2070
Water Content Bot. 2-4" Layer After Test (%):	21.9	**Dry unit Weight (kg/m^3):**	1701
Sample Height Before Soaking (mm):	115.49	*Note: Moisture content after compaction is used to calculate dry unit weight*	
Sample Height After Soaking (mm):	117.18		
Swell (%):	1.46		

Bearing Ratio Calculation

Adjusted Penetration Depth @ 0.100 in. (in.):	0.100
Adjusted Penetration Depth @ 0.200 in. (in.):	0.200
Stress @ Adjusted 0.100 inch Penetration (psi):	9.57
Stress @ Adjusted 0.200 inch Penetration (psi):	13.07
Standard Stress @ 0.100 in. Penetration (psi):	1000
Standard Stress @ 0.200 in. Pneetration (psi):	1500
CBR @ 0.100 in. Penetration:	***0.96***
CBR @ 0.200 in. Penetration:	***0.87***

Load-Penetration Curve



Klohn Crippen Berger

JOB NO.:	P09625A05		
PROJECT:	Port Hardy Airport		
LOCATION:	Port Hardy, BC		
DATE:	November 29, 2010		
TESTED BY:	NG	CHECKED BY:	BY

APPENDIX III

Photographs from Site Investigation

Photo 1: Conducting DCPT at AH10-03.

Photo 2: Practical refusal of solid stem auger hole at AH10-03. Cobbles pulverized by drilling (light grey) shown on auger flights.

Photo 3: Drilling underway at AH10-04.


Photo 4: Drill rig set up at AH10-05.

Photo 5: Placing and compacting asphalt patch at AH10-05.

Photo 6: Asphalt patch complete at AH10-05.

Photo 7: Drill rig set up at AH10-06.

Photo 8: Preparing asphalt patch at AH10-06.