Public Works and Government Services Canada	High Level, Alberta RCMP Detachment	Addendum No. 1 1 Page(s) in Total
Project No.: R.022267.001		February 29, 2012

The following changes to the tender documents are effective immediately and will form part of the contract documents:

1. ARCHITECTURAL SPECIFICATIONS

1.1 Section 00 31 00
Information Documents

.1 Geotechnical Report and Appendix to Geotechnical Report referred to in clause 1.4.1 is attached to this Addendum entitled *"Report No: PR4099-8, Preliminary Geotechnical Investigation"*

1.2 Section 08 36 19
Upward Acting Sectional Steel Doors

.1 Clause 2.6.5.1: Revise to "Key operated model Camden CI-1KFS c/w Abloy CY415 cylinder".

.2 Clause 2.6.6: Revise to "Key operated model Camden CI-KXS c/w Abloy CY415 cylinder".

.3 Clause 2.6.7.1 to read: "Safety switch mechanism c/w one set of photo eyes and reflector."

1.3 Section 08 71 10
Hardware Schedule

.1 General: All Abloy CLIQ cylinders to be CYL415N throughout not CYL403N. All Abloy cylinders to be CY415N

.2 Base Building Requirements: revise to read

ITEM 71: **CLIQ REMOTE SYSTEM** – consisting of the following:
1 Programming Key NQ415
30 Programmable Keys NQ407
2 Abloy Cylinders CY415N (spares)
2 Abloy CLIQ Cylinders CYL415 (spares)

1.4 Section 12 21 13
Horizontal Blinds

.1 Clause 3.1.1: Add blinds to door sidelights in rooms 105, 107, 110 and 133.

2. MECHANICAL SPECIFICATIONS

2.1 Section 21 13 13:

.1 Delete reference to local codes.

.2 Delete reference to Fire Marshall.

.3 Delete reference to NFPA 20.

2.2 Section 21 24 00:

.1 Delete reference to NFPA 17.

.2 Delete reference to Fire Commissioner of Canada.

2.3 Mechanical drawing M-01.1

.1 The volume and pressure of public water supply to be determined from conducting a water flow test near the proposed site. Sprinkler contractor to provide sprinkler system design drawings for review and comments prior to any installation on site.

2.4 Mechanical drawing M-03.1

.1 Add fire extinguisher on the south wall of room 105, on the corridor site ofthe wall. Refer to mechanical specification for details.

.2 Fire extinguishers serving Garage 162 and the east end of Corridor 109 to be installed in fire rated cabinets.

2.5 Mechanical drawing W-M05.1

.1 Note 5: provide fire dampers on all ducts passing into / through rooms: 111, and 124. Refer to attached sketches SKM-1,2 & 3.

.2 Provide motorized dampers and static pressure sensors on 1450 x 550 S/A and 900 X400 E/A ducts serving administration area interlock with AHU-2. During occupied time MDs to be in open position. During un-occupied time dampers to be in closed position. Refer to attached sketch SKM-1.

.3 Re-route S/A duct serving 109 as per attached sketch SKM-1.

.4 Delete motorized dampers on S/A and E/A ducts serving change rooms and exercise room, typical of 6.

2.6 Mechanical drawing M-09.1

.1 Revise expansion tank capacity to 200l, expansion tank to be diaphragm type with PRV. Delete meter serving glycol injection and PRV.

.2 Provide 50gal barrel serving drains from boiler and expansion tank PRVs.

2.7 Mechanical drawing M-10.1

.1 Delete pumps P-6. Pump P-5 to be 120/1/60. Pumps performance to remain as per original schedule.

.2 Delete VFDs serving S/A and R/A fans in AHU-1 serving cell block. Electrical to provide starters serving AHU-1.

.3 Future Humidifiers – provision shall be provided inside of mechanical room to install gas fired humidifiers in the future. Provide 40mm capped gas and water lines inside mech. Room.

.4 Boilers B-1&2 to be c/w fully modulating gas valve and 150mm diameter stainless steel vent.

2.8 Mechanical drawing W-M11.01

.1 Replace glycol loops serving sprinkler system in secure garage bays with dry sprinkler system. Provide air compressor with all required accessories serving dry sprinkler system (including flow and tamper switches).

3 ELECTRICAL ADDENDUM

3.1 Section 26 53 00 Exit Signs

.1 Revise Item 2.1.4 to read “Green pictogram international exit symbol (Running Man) in accordance with NBCC 3.4.5.1.2b”.

3.2 Section 28 31 00.01 Multiplex Fire Alarm System

.1 Replace subsection 2.2 System Operation: Two Stage – Signals Only in its entirety with the following.

a. A two-stage fire alarm system to cause an alert signal at the 1st stage as stipulated in (b), and an alarm signal at the 2nd stage as stipulated in (c).

b. The operation of any manual pull station, fire detector, or fire suppression system shall at the 1st stage

  i. cause an alert signal on all audible signal appliances throughout the building and at the central alarm and control facility, except as stipulated in (iii) and (iv);

  ii. indicate the floor or zone from which the fire alarm system was actuated by means of a visual signal at the central alarm and control facility and at the annunciator(s);

  iii. transmit a signal to the fire department;

  iv. cause any recirculating air handling system to shut down or function so as to provide the required control of smoke movement, when such system serves an area as described in the NBC;

  v. cause all required fire doors and smoke control doors, if normally held open, to close automatically;

  vi. cause all locking devices on exit doors, if in the locked position, to release;

c. The operation of any manual pull station by means of keys accessible to authorized persons only or the actuation of the means provided at the central alarm and control facility shall cause an alarm signal on all audible signal appliances throughout the building in lieu of the alert signal.

d. The alert signal or alarm signal shall be capable of being silenced from the central alarm and control facility, but only after a minimum period of operation of 1 min. from the initial actuation of the alert signal.

e. The alert signal as required in shall automatically be changed to an alarm signal as required after a period of not more than 5 min., unless

  i. the alert signal has been manually acknowledged at the central alarm and control facility, cancelling the automatic alarm signal, but allowing the alert signal to continue to operate;

- ii. the alert signal has been manually silenced at the central alarm and control facility;
- iii. the fire alarm system has been manually switched from the 1st stage to the 2nd stage; or
- iv. the fire alarm system has been restored to normal.

f. Audible signal appliances shall continue to operate until the system has been restored to normal or until silenced from the central alarm and control facility, as stipulated in subsection 4.10, except as permitted (i).

g. In the case of buildings where at certain times there may not be any persons on duty to respond to an alarm, the audible signal appliances may be silenced automatically after a period of not less than 20 min.

h. The alarm signal shall sound in a temporal pattern.

3.3 Drawing WE-04 Main Floor & Crawlspace Auxiliary Layouts

.1 Delete heat detectors and associated line isolation modules, monitor module and end of line resistor in Crawlspace.

.2 Revise Note 4 to read "...Duct type smoke detectors shall be installed in accordance with Item 5.8.2 CAN/ULC-S524-06 Installation of Fire Alarm Systems".

3.4 Drawing WE-07 Electrical Details

.1 Refer to Detail 17 – Fire Alarm Riser Diagram. Delete heat detectors and associated line isolation modules, monitor module and end of line resistor in Crawlspace.

3.5 Drawing WE-02 Main Floor & Crawlspace Power Layouts as well as Drawing WE-05 Electrical Schedules

.1 Provide power service to dry sprinkler system air compressor rated at 2.0 HP, 208 Volt, 3 Phase (coordinate final location with mechanical / sprinkler trade). Supply stand alone size 1 starter for new air compressor. Service from 3P15A on circuit E - 68, 70, 72. Feeder to be 19C, 3#10, 1#10 GND.

3.6 Drawing WE-02 Main Floor & Crawlspace Lighting Layouts

.1 Provide four (4) Type E2 dual remote emergency heads within the crawlspace and service from battery pack located in cell block above (adjust battery pack capacity accordingly to accommodate this additional load).

3.7 Drawing WE-04 Main Floor & Crawlspace Auxiliary Layouts

.1 Provide fire alarm horn strobe at west end of secure cell block corridor 138 immediately outside of Interview Room.

3.8 Drawing WE-01 Electrical Site Plan (Electrical Single Line Diagram), Drawing WE-03 Main Floor & Crawlspace Power Layouts, Drawing WE-05 Electrical Schedules as well as Mechanical Addendum M1

.1 Revise Pump P-5 from 600 Volt, 3 phase to 120 Volt, single phase. Service on 1P15A breaker on circuit E-34 (delete previously identified 3P30A breaker). Revise feeder to 21C, 2#12, 1#12 gnd.

.2 Delete all services related to Pump P-6.

.3 Revise service to AHU-1 from single point connection to two 600 Volt, 3 phase connections – one for supply fan and one for return fan. Each fan to have magnetic motor starter located in electrical room, 3P30A breaker in MDP, 21C, 3#10, 1#12 gnd feeder and weather proof fused disconnect at unit with fusing sized to suit each fan (confirm at shop drawing submission).

- END -

J.R. Paine & Associates Ltd.

REPORT NO: PR4099-8

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RCMP BUILDING
LOT 17E, BLOCK 22, PLAN 094 0169
10203 – 100 AVENUE
HIGH LEVEL, ALBERTA

November, 2009

J.R. PAINE & ASSOCIATES LTD.
7710 – 102 Avenue
Peace River, Alberta
T8S 1M5

PHONE: (780)624-4966
FAX: (780)624-3430

REPORT NO: PR4099-8

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RCMP BUILDING
LOT 17E, BLOCK 22, PLAN 094 0169
10203 – 100 AVENUE
HIGH LEVEL, ALBERTA

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 SITE AND PROJECT DESCRIPTION 1

3.0 FIELD INVESTIGATION 2

4.0 LABORATORY TESTING 3

5.0 SOIL CONDITIONS 3

6.0 GROUNDWATER CONDITIONS 4

7.0 RECOMMENDATIONS 5
- 7.1 Footings 5
- 7.2 Cast-In-Place Piles 6
- 7.3 Driven Piles 7
- 7.4 Slab-on-Grade 9
- 7.5 Surface Utilities 10
- 7.6 Cement 11

8.0 CLOSURE 11

APPENDIX 13

PRELIMINARY GEOTECHNICAL INVESTIGATION

PROJECT: Proposed RCMP Building

LOCATION: 10203 – 100 Avenue
High Level, Alberta

CLIENT: Public Works Government Services Canada
5th Floor, Telus Plaza North
10205 Jasper Avenue
Edmonton, Alberta
T5J 1S6

ATTENTION: Mr. Brian Creighton

1.0 INTRODUCTION

This report presents the results of the limited geotechnical investigation and analysis made on the site of the potential future site of the RCMP building in High Level, Alberta. The objective of the investigation was to determine the nature and condition of the existing subsurface soil to determine the feasibility of various foundation types. This information would then be used by the owner to assess this site and to make purchase decisions. It should be noted that a further, more detailed geotechnical investigation should be conducted once more information is available on the size, type, and location of the buildings on this site, and once access to the actual building location is possible. This further geotechnical work should be used to confirm the preliminary soil parameters and to provide details in addition to the recommendations given in this report.

Any environmental or previous land issues are beyond the scope of this report. Authorization to proceed was received from Brian Creighton of Public Works Government Services Canada (PWGSC) on October 22, 2009. Fieldwork was completed on October 29, 2009.

2.0 SITE AND PROJECT DESCRIPTION

The study lot is located on the southeast corner of 100 Avenue and 103 Street in High Level, Alberta, approximately 600 metres northwest of the intersection of 100 Avenue and Highway 35. The legal address of the study lot is Lot 17E, Block 22, Plan 094 0169, and the municipal address is 10203 – 100 Avenue. At the time of the investigation, the study lot area was a vacant, undeveloped lot, and was mostly tree-covered. Access to the likely building site was not available at the time of drilling due to the tree cover, and testhole locations were chosen based on site accessibility. The High Level Fire Station is located immediately east of the study lot, and various retail commercial businesses were noted across 100 Avenue north of the study lot. An open area featuring playground equipment was noted southeast of the study lot, and single family and multi-family residential development was noted south of the study lot and across 103 Street to the west.

No detailed information on the exact size or location of the proposed RCMP building has been provided at this time, although it is envisioned that it will likely be a one story building, and that the building will likely be supported by a footing foundation or a cast-in-place pile foundation with a slab-on-grade. It is not believed that a basement is planned for this site, and it is also understood that the structure will be heated year-round.

3.0 FIELD INVESTIGATION

The soils investigation for this project was undertaken on October 22, 2009, utilizing a track mounted drill rig owned and operated by Frontier Enviro-Drilling Ltd. of Grande Prairie, Alberta. A total of four foundation testholes were advanced at locations around the study lot. The testholes were to extend to a minimum of 12.3 metres below ground surface, however due to the presence of an unknown gas encountered at a depth of approximately 12 metres in Testhole 09-1, it was decided that the remaining three testholes would be terminated at a depth of 9.3 metres. Testhole 09-2 was only advanced to a depth of 6.3 metres due to the presence of a large rock in the testhole. The testholes were advanced at locations chosen by our firm, based on drill rig accessibility. The locations of the testholes are illustrated on the site plan located in the Appendix. The elevations of the testholes were obtained by surveying from the known elevation of the Alberta Survey Control Monument located on the east side of 102 Street, north of the study area.

The testholes were advanced with 150 millimetre diameter solid stem augers in 1.5 metre increments. A continuous visual description was recorded on site, which included the soil types, depths, moisture, transitions, and other pertinent observations. Disturbed samples were removed from the auger cuttings at 750 millimetre intervals for laboratory testing. Shelby Tube samples or Standard Penetration Tests with split spoon sampling were also taken at regular 1.5 metre intervals in the testholes.

As mentioned, at a depth of approximately 12 metres in Testhole 09-1, an unknown, sour smelling gas was noted entering the bottom of the testhole. At that time, a member of the High

Level Fire Department was summoned to site, and a gas detector/monitor was used to test the gas at ground surface level above the testhole. The tests indicated a lower explosive limit (LEL) of approximately 50 percent, and a hydrogen sulfide (H_2S) concentration of approximately 33 parts per million. Contact was also made with an Environmental Protection Officer for Alberta Environment, who recommended that the testhole should be capped as soon as possible. This testhole was then backfilled with available drill cuttings and bentonite. Concrete was then brought to site and used to backfill the remaining upper 3 metres of the testhole. No standpipe was installed in this testhole.

In Testholes 09-2, 09-3, and 09-4, slotted piezometric standpipes were inserted following drilling for watertable level determination. These three testholes were backfilled with cuttings, with bentonite seals placed at the surface of the testholes. Watertable readings were obtained 14 days and 33 days after drilling by J.R. Paine & Associates Ltd. personnel.

4.0 LABORATORY TESTING

All disturbed bag samples returned to the laboratory were tested for moisture content. In addition, the plastic and liquid Atterberg Limits and soluble soil sulphate concentrations were determined on selected samples. The Shelby Tube samples were tested for unconfined compressive strength, dry density, and moisture content. Lab results are included on the attached testhole logs located in the Appendix.

5.0 SOIL CONDITIONS

A detailed description of the soils encountered is found on the attached testhole logs in the Appendix. In general, the soils in the testholes at this site consisted of surficial topsoil and/or native clayey silt or silty clay materials, followed by a high plastic silty clay material, underlain by clay till materials. A sand layer was noted at depth in the clay till material in the deepest testhole.

The first soil encountered in Testhole 09-4 was a surficial topsoil material. The topsoil was silty, black and dark brown in colour, and was generally damp. Approximately 50 millimetres of topsoil was encountered in the testhole. Topsoil depths are known only at the testhole locations, and may vary away from the testhole locations.

Below the topsoil in Testholes 09-4, and at the surface of Testholes 09-1, 09-2, and 09-3, native deposits ranging from clayey silt to silty clay were encountered. These materials were brown or light brown in colour, and were generally damp to moist and slightly friable, with a stiff consistency. The clay portions of the material were generally medium plastic, with the silt portions of the material low to medium plastic. These silt and clay materials were encountered to a depth of approximately 0.5 to 1.3 metres in the four testholes.

Below the silt or clay materials, a deposit of high plastic, silty clay was encountered. This material was greyish brown in colour, and typically had a damp to moist, stiff to very stiff consistency in the upper portions of the material, becoming more moist at depth. The high plastic clay materials were noted to depths of approximately 5.2 to 6.5 metres below the existing ground surface.

Below the high plastic clay, a deposit of clay till material was encountered. This material was silty and sandy, with a medium plasticity, and typically had a moist, stiff consistency in the upper portion of the material. Below a depth of approximately 5.7 to 7.3 metres, the till became slightly less plastic, and had a damp to moist, very stiff to hard consistency. Occasional bedrock pieces were noted mixed within this portion of the till, and slightly difficult drilling and disturbed or ground up auger samples were noted. The till was grey in colour throughout, and contained traces of gravel, pebbles, and coal, as well as various silt and sand lenses and laminations. The clay till was still being encountered at termination depth in Testholes 09-2, 09-3, and 09-4, at depths of 6.3 or 9.3 metres below existing ground surface.

In Testhole 09-1, at a depth of approximately 11.0 metres below existing ground, a silty sand material was encountered. This sand material was silty, fine grained, and was grey in colour. The sand was moist to very moist with a medium dense consistency. After advancing the augers into this sand material, an unknown gas could be heard entering the testhole through this sand. The sand was still being encountered at termination depth of this testhole at approximately 12.0 metres below ground surface.

No accumulations of free water or slough material were noted either during drilling or at completion of any of the testholes, with the exception of the sand encountered below 11.0 metres in Testhole 09-1, where slight accumulations of water and slough were noted.

6.0 GROUNDWATER CONDITIONS

The groundwater table within the study area was low, and was observed to be in the upper portion of the clay till materials at a depth of approximately 5 to 6 metres below existing ground surface. The watertable reading results are as follows:

Groundwater Table Readings
(Metres Below Ground Surface)

Testhole #	Testhole Elevation	Depth to Watertable November 12/09 (14 day)	Depth to Watertable December 1/09 (33 day)	Watertable Elevation December 1/09 (33 day)
09-2	326.73	5.50	4.77	321.96
09-3	327.19	dry @ 9.30	dry @ 9.30	<317.89
09-4	327.39	dry @ 9.30	dry @ 9.30	<318.09

It should be noted that watertable levels may fluctuate on a seasonal or yearly basis with the highest readings obtained in the spring or after periods of heavy rainfall. The above noted levels would be estimated to be below the seasonal average values.

7.0 RECOMMENDATIONS

7.1 Footings

1. A footing foundation system is considered geotechnically satisfactory for this project. The footing must be founded on undisturbed, native non-organic soil. Surficial topsoil was encountered in one of the testholes, and this topsoil is not suitable for footing support.

Assuming that the footings bear on undisturbed, native, non-organic soil, the preliminary factored bearing capacities that may be used are as follows. It should be noted that the bearing capacities given are slightly less than what the soils could bear from a strength perspective, but are given as such to limit settlements to tolerable amounts.

Soil Stratum	Geotechnical Resistance Factor	Factored Bearing Resistance (Strip Footing)	Factored Bearing Resistance (Spread Footing)
TOPSOIL	0.4	0 kPa	0 kPa
SILT and CLAY	0.4	100 kPa	115 kPa

These figures include the total of all live and dead loads. All footings within a continuously heated structure should have a minimum 1.5 metres frost cover, with a minimum cover of 2.5 metres for a non-continuously heated structure or exterior isolated footings.

In addition, the above bearing capacities may be altered once more information is obtained from testholes advanced in the actual building location during the detailed geotechnical investigation, which should be undertaken prior to foundation design.

2. The native clay materials encountered in the testholes are believed to be normally to slightly over-consolidated, indicating that settlements should be considered if footing foundations

are chosen. Consolidation testing should be conducted as part of the future detailed geotechnical investigation at this site. The results of this testing may allow slightly higher bearing capacities to be utilized for footing foundations than those given above.

3. It is not recommended that footings be constructed below the watertable, as this will require dewatering efforts. The watertable levels in the standpipes at 33 days was approximately 4.8 metres or more below ground surface, and as such, no difficulties with footing foundations and excavations related to the watertable are envisioned.

7.2 Cast-In-Place Piles

1. The soils encountered at this site are suitable for a cast-in-place pile foundation, although slower drilling of pileholes can be expected in the very stiff clay till material encountered at depth. The presence of occasional large rocks may cause additional delays if they are encountered in pileholes, especially if they are encountered at the design belling depth. Piles may have to be extended deeper than the design depth in this case. In addition, an unknown thickness of silty sand material was noted starting at a depth of approximately 11 metres below ground surface in Testhole 09-1. The ingressing water and sloughing soils associated with this sand layer will make the construction of end-bearing piles impossible and straight-shaft piles difficult within the sand material. It is recommended if at all possible that piles be designed to terminate above this sand layer. In addition, care must also be taken during pile construction to not penetrate the sand layer in any cases where the presence of large rocks require end-bearing piles to be advanced deeper than design depths.

2. The structure may be founded on an adequately reinforced grade beam or pile cap supported by bored, cast-in-place, concrete piles. The design capacity can be calculated on the basis of factored skin friction or end bearing values. A combination of the two bearing modes is not recommended for individual piles. The preliminary factored skin friction values that may be used are as follows:

Soil Stratum	Geotechnical Resistance Factor	Factored Skin Friction Resistance
SILT and CLAY (above 6.5 m)	0.4	24 kPa
CLAY TILL (below 6.5 m)	0.4	30 kPa

The above values include the total of all live and dead loads. Considering the effects of frost and seasonal moisture changes, the friction value for the first 1.5 metres of pile should not be considered in design. This may be reduced to 0.6 metres for interior piles in continuously heated buildings.

In addition, the above skin friction values may be altered once more information is obtained from testholes advanced in the actual building location during the detailed geotechnical investigation, which should be undertaken prior to foundation design.

3. The recommended minimum pile depths at this site for frost uplift prevention in straight shaft piles are 4.5 metres in a continuously heated structure and 6.0 metres in a non-continuously heated structure. The minimum pile diameter for all piles should be 400 millimetres, with a minimum skin friction pile spacing of 2.5 pile diameters on center.

4. The preliminary factored end-bearing values that may be used are as follows:

Soil Stratum	**Geotechnical Resistance Factor**	**Factored End-Bearing Resistance**
CLAY TILL (below 6.5 m)	0.4	500 kPa

The above values include the total of all live and dead loads. Skin friction should not be included in the design of end bearing piles. End bearing piles should extend to a minimum of three bell diameters below ground surface, and should have a maximum bell to shaft ratio of 3:1. The bell should be fully formed in the very stiff clay till, with the bottom of the bell penetrating this material by a minimum of 1.0 metre.

5. All pile holes should be carefully inspected to ensure that no water or slough material is present prior to concrete placement. No significant accumulations of free water or slough material were noted in the testholes, other than in the sand layer encountered below a depth of 11 metres in Testhole 09-1. Therefore, assuming that piles do not penetrate this sand layer, casing will likely not be required, although it is commended that casing be readily available in the event that it is required. The pile concrete should be placed as soon as possible after the pile has been bored to minimize the volume of ingressing groundwater.

7.3 Driven Piles

1. Driven piles are considered suitable at this site, although hard driving will likely be encountered in the very stiff clay till soils at depth. The driven piles should be steel H or pipe piles. All piles supporting the structure should be driven to refusal or to resistance as computed by a dynamic pile driving formula, such as the Hiley formula. The recommended maximum blow count in order to prevent pile damage for steel piles is 12

to 15 blows per 25 millimetres, although this should be confirmed after a review of the pile type, loads, and hammer data. It is recommended that all pile driving be conducted under the full-time supervision of geotechnical personnel.

2. With respect to driven piles, the preliminary design length can be calculated based on total stress analysis. The theoretical capacity of driven steel H or pipe pile is as follows:

$$Q = r_s A_s D + r_t A_t$$

where:

Q = Factored load on the piles (kN)
r_s =Average factored skin friction between piles and soil over applicable length (kPa)
A_s =Minimum perimeter of the pile section (m)
D =Effective Depth of the pile embedment (m)
r_t =Factored end-bearing (kPa)
A_t =Gross cross-sectional area of the pile tip (m^2)

3. The preliminary factored skin friction and end-bearing values are given as follows. For driven piles, the end bearing and skin friction bearing modes may be combined.

Soil Stratum	Factored Skin Friction Resistance	Factored End-Bearing Resistance
SILT/CLAY (above 6.5 m)	24 kPa	190 kPa
CLAY TILL (below 6.5 m)	30 kPa	500 kPa

4. The actual capacity of a driven pile can only be determined accurately by a pile load test. J.R. Paine recommends that a pile driving formulae with a factor of safety of 3 be utilized for determining pile capacity at the subject site. Alternatively, a wave equation and pile driving analyser (PDA) may be utilized. Our firm does not have such equipment and would need to sub-consult this work. The latest practice suggests that the PDA be utilized, and pile driving formulae should not be utilized. However, for this site, the cost and complexity of the PDA may be unwarranted.

5. The recommended minimum pile depths at this site to prevent frost uplift are 4.5 metres in a continuously heated structure and 6.0 metres in a non-continuously heated structure. The top 1.5 metres of the pile should be neglected due to frost and seasonal moisture changes. In the event that hard driving is encountered, guidelines for refusal criteria can be provided once the pile design and driving equipment have been finalized. Refusal criteria are directly dependent on such factors as pile size, length and wall thickness as well as the specified design load and driving energy. The above estimated values are considered applicable for downward (compressive) static loads.

7.4 Slab-on-Grade

1. Surficial topsoil material was encountered to a depth of approximately 50 millimetres in one of the testholes. This topsoil material is not suitable for slab-on-grade support. The native clay and silt materials located below these organic soils are considered suitable for slab-on-grade support. However, it should be noted that the clay materials starting at approximately 0.5 to 1.4 metres below existing ground surface are high plastic and have a swelling potential. It is important to moisture condition these soils to above optimum moisture content, and then to avoid changes in moisture content both during construction and throughout the life of the project. In addition, building owners must accept some risk of slab movement from the high plastic clays. The risk will be lowered by using a low to medium plastic clay fill material to provide a minimum of 1.0 metre separation between the slab and the high plastic clay.

2. If the slab is placed near the high plastic clay, there is a potential for large slab movement due to shrinkage or swelling. When using a slab-on-grade, all interior walls supported by the slab must have design and finishing details which allow for movement. Joints between interior slab-supported walls and exterior foundation supported walls must be flexible. A 75 millimetre gap is recommended for the top of slab-supported walls to allow for swelling.

   It is also recommended that grade-supported floor slabs be structurally separated from other components of the proposed structure. The slabs can be dowelled to the beam at doorways, with a crack control joint placed within 1.5 metres. The slabs should contain sufficient reinforcing to control cracking due to vertical movement caused by shrinkage and swelling of the underlying material. Adequate crack control joints should be provided. If movement cannot be tolerated, a structural floor slab is recommended.

3. Any imported clay fill material used for slab support should be placed in 150 millimetre lifts and compacted to an equivalent of at least 98 percent of the corresponding Standard Proctor Density at optimum moisture content. This fill should be low to medium plastic in nature, and free of organic content.

4. Water dispersed on the property from the roof leaders must not be allowed to accumulate against the foundation walls. To ensure positive drainage, the soil surface should be made sloping away from the building. This will require a positive lot grading of at least five percent away from the foundation walls for a minimum of 1.5 metres.

7.5 Surface Utilities

1. The subsurface soil conditions encountered at this site are considered fair to satisfactory for the construction of roads and parking facilities. The native silt and clay materials located either at the surface or below the surficial topsoil are considered adequate as subgrade, although some minor amounts of moisture conditioning may be required to get this material near optimum moisture content. Care must be taken not to allow any excess moisture into these soils, as these soils are sensitive to moisture content.
2. If fill is required to bring the subgrade up to design elevation, it is recommended that a medium plastic clay be used. All fill should be placed in lifts not greater than 150 millimetres in thickness, and should be compacted to a minimum of 98 percent of Standard Proctor Density, near optimum moisture content.
3. The minimum recommended subgrade preparation should consist of scarification of the top 150 millimetres of soil, adjusting the moisture content to near optimum moisture content, and re-compaction to at least 100 percent of Standard Proctor Density. Any occasional very moist areas may require deeper drying up to approximately 300 millimetres. All subgrade should be proof rolled after final compaction and any areas showing visible deflections should be inspected and repaired as required. It is recommended that in all cases the subgrade be inspected by qualified personnel during construction to determine the recommended subgrade treatment.
4. Positive drainage of at least 2 percent of the subgrade and surface should be maintained throughout the parking and access areas. All subgrade and pavement should be sloped to provide adequate drainage, as this is critical for good long-term structure performance.
5. The following 20 year preliminary parking lot design is proposed for this site. An estimated California Bearing Ratio of 3.0 percent is used in the design, as well as an estimated traffic volume of 4.0×10^4 ESALs for the light traffic areas. No information was available regarding traffic volumes or estimated loads for the heavy traffic areas, so the heavy duty pavement designs presented are typical of heavy truck parking lot loading. Structures for heavy traffic areas may be modified if more accurate traffic loading estimates are provided.

Preliminary Pavement Structures
Proposed RCMP Building

Light Traffic Area - Asphalt Surface		
Asphaltic Concrete	75 mm	(3")
Crushed Gravel (20 mm)	250 mm	(10")
Heavy Traffic Area - Asphalt Surface		
Asphaltic Concrete	125 mm	(5")
Crushed Gravel (20 mm)	350 mm	(14")

Note: All gravel should be compacted to 100 percent of Standard Proctor Density, in maximum 200 mm thick lifts.

7.6 Cement

1. Tests on selected soil samples indicated negligible to moderate concentrations of water soluble soil sulphates in the near surface soil deposits. Based on C.S.A. Standards A23.1-09, class of exposure S-3 should be applied to the design requirements for concrete in ontact with the soil and susceptible to sulphate degradation. The class S-3 exposure requires Type MS (moderate sulphate resistant hydraulic cement) or Type HS (high sulphate resistant hydraulic cement) and a minimum 56 day concrete strength of 30 MPa, as well as other requirements as given in the noted C.S.A. guideline. All concrete exposed to freezing conditions should be air entrained to between 5 and 7 percent. Other exposure factors should be considered when choosing a minimum strength for the concrete. Concrete should conform to CSA Standards A23.1-09.

8.0 CLOSURE

This preliminary report has been prepared for the exclusive and confidential use of Public Works Government Services Canada and their agents. Use of this report is limited to the subject proposed RCMP site only. The recommendations given are based on the subsurface soil conditions encountered during test boring, current construction techniques and generally accepted engineering practices. No other warranty, expressed or implied, is made. Due to geological randomness of many soils formations, no interpolation of soil conditions between or away from the testholes has been made or implied. Soil conditions are known only at the test boring location. Should other soils be encountered during construction, or other information pertinent become available, the undersigned should be contacted as the recommendations may be altered or modified.

We trust this information is satisfactory. If you should have any further questions, please contact our office.

Respectfully Submitted:

J.R. PAINE & ASSOCIATES LTD.

ROBERT L. RAU

Rob Rau

December 14/09

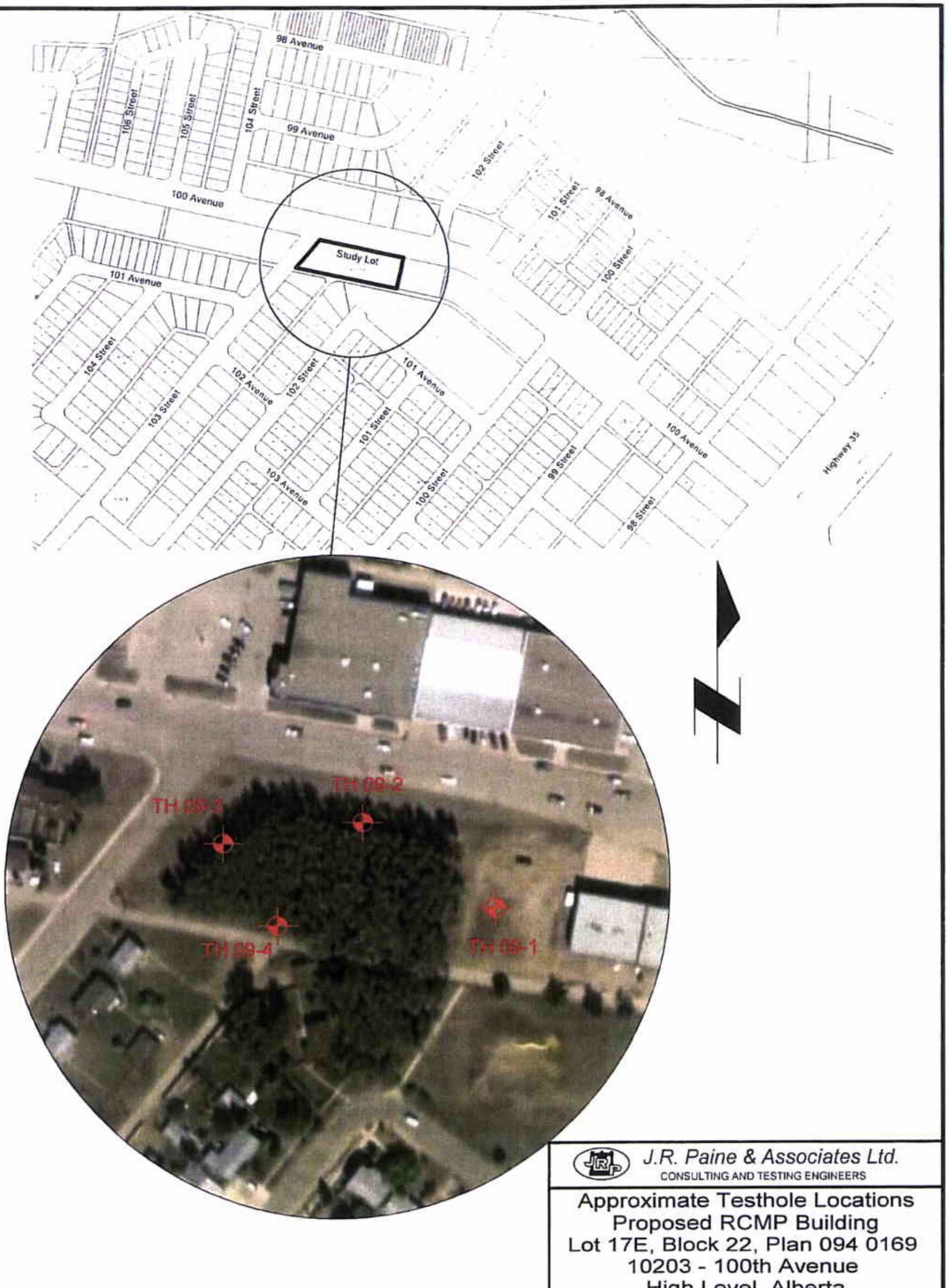
PERMIT TO PRACTICE
JR PAINE & ASSOCIATES LTD.
Signature
Date Dec. 14/09
PERMIT NUMBER: P 0401
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

Robert Rau, P. Eng.

Reviewed By: Wilbur (Bud) Kofoed, M. Eng., P. Eng.

H:\DATA 2009\Peace River\PR4099-8 PWGSC High Level RCMP\r2154pwg.doc

APPENDIX



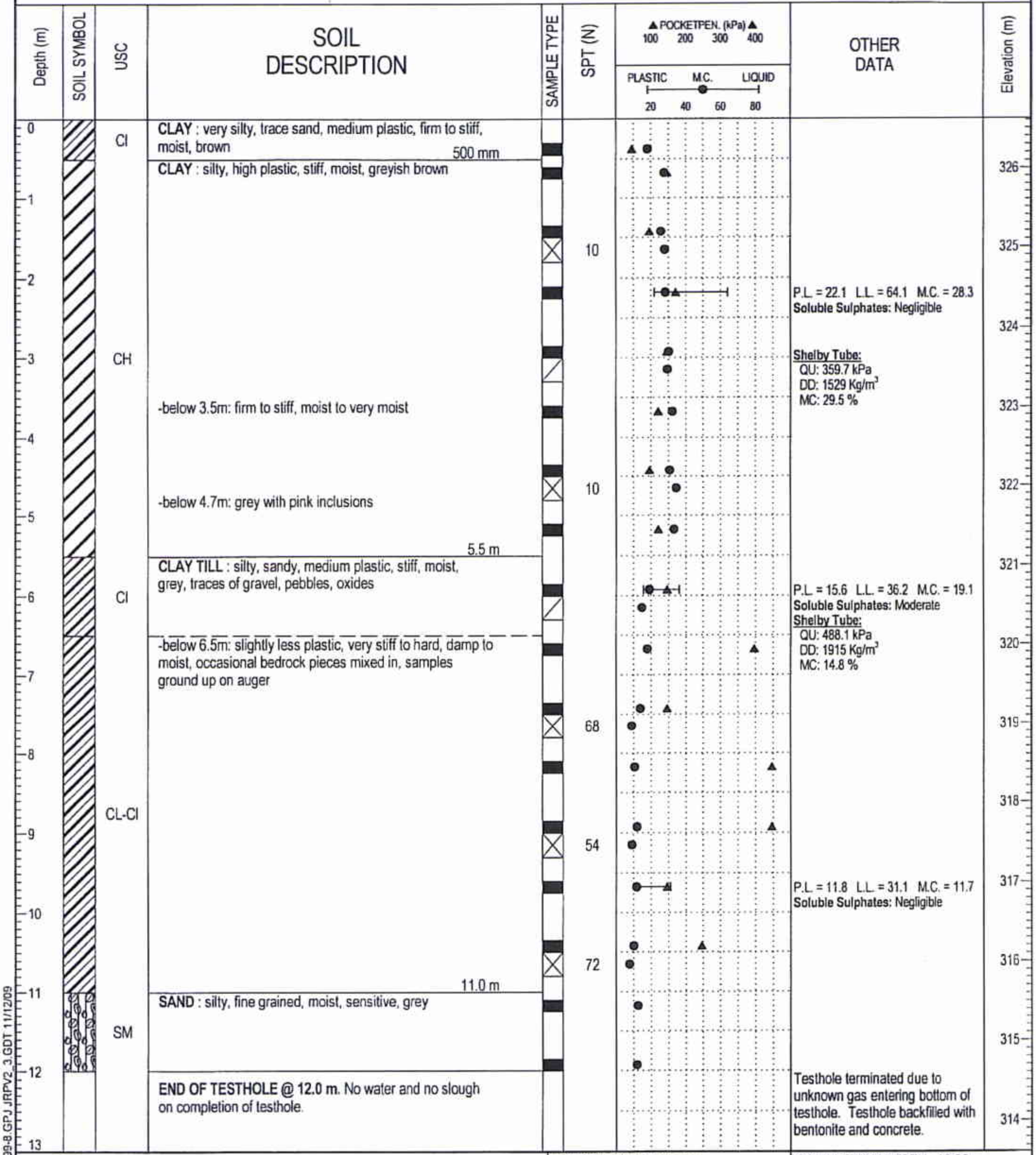
J.R. Paine & Associates Ltd.
CONSULTING AND TESTING ENGINEERS

Approximate Testhole Locations
Proposed RCMP Building
Lot 17E, Block 22, Plan 094 0169
10203 - 100th Avenue
High Level, Alberta

SCALE: NTS	DATE: October 29, 2009
FILE #: PR4099-8	FIGURE #: 1

PROJECT: Preliminary Geotechnical Investigation - Proposed RCMP Building		PROJECT NO: PR4099-8	BOREHOLE NO: 09-1
CLIENT: Public Works Government Services Canada	DRILL METHOD: Solid Stem Auger		ELEVATION: 326.62 m
OWNER:	LOCATION: Lot 17E, Block 22, Plan 094 0169, 10203 - 100th Avenue, High Level, Alberta		

SAMPLE TYPE ⧄ SHELBY TUBE ◩ CORE SAMPLE ☒ SPT SAMPLE ■ GRAB SAMPLE ▥ NO RECOVERY



Depth	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA
0	CI	**CLAY** : very silty, trace sand, medium plastic, firm to stiff, moist, brown		
500 mm	CH	**CLAY** : silty, high plastic, stiff, moist, greyish brown	10	P.L. = 22.1 L.L. = 64.1 M.C. = 28.3 **Soluble Sulphates: Negligible** **Shelby Tube:** QU: 359.7 kPa DD: 1529 Kg/m³ MC: 29.5 %
		-below 3.5m: firm to stiff, moist to very moist		
		-below 4.7m: grey with pink inclusions	10	
5.5 m	CI	**CLAY TILL** : silty, sandy, medium plastic, stiff, moist, grey, traces of gravel, pebbles, oxides		P.L. = 15.6 L.L. = 36.2 M.C. = 19.1 **Soluble Sulphates: Moderate** **Shelby Tube:** QU: 488.1 kPa DD: 1915 Kg/m³ MC: 14.8 %
	CL-CI	-below 6.5m: slightly less plastic, very stiff to hard, damp to moist, occasional bedrock pieces mixed in, samples ground up on auger	68 54 72	P.L. = 11.8 L.L. = 31.1 M.C. = 11.7 **Soluble Sulphates: Negligible**
11.0 m	SM	**SAND** : silty, fine grained, moist, sensitive, grey		
12		**END OF TESTHOLE @ 12.0 m.** No water and no slough on completion of testhole.		Testhole terminated due to unknown gas entering bottom of testhole. Testhole backfilled with bentonite and concrete.

J.R. Paine & Associates Ltd.
CONSULTING & TESTING ENGINEERS
- GEOTECHNICAL - ENVIRONMENTAL - MATERIALS -

17505 - 106 Avenue
Edmonton, AB T5S 1E7
Phone: (780) 489-0700
Fax: (780) 489-0800

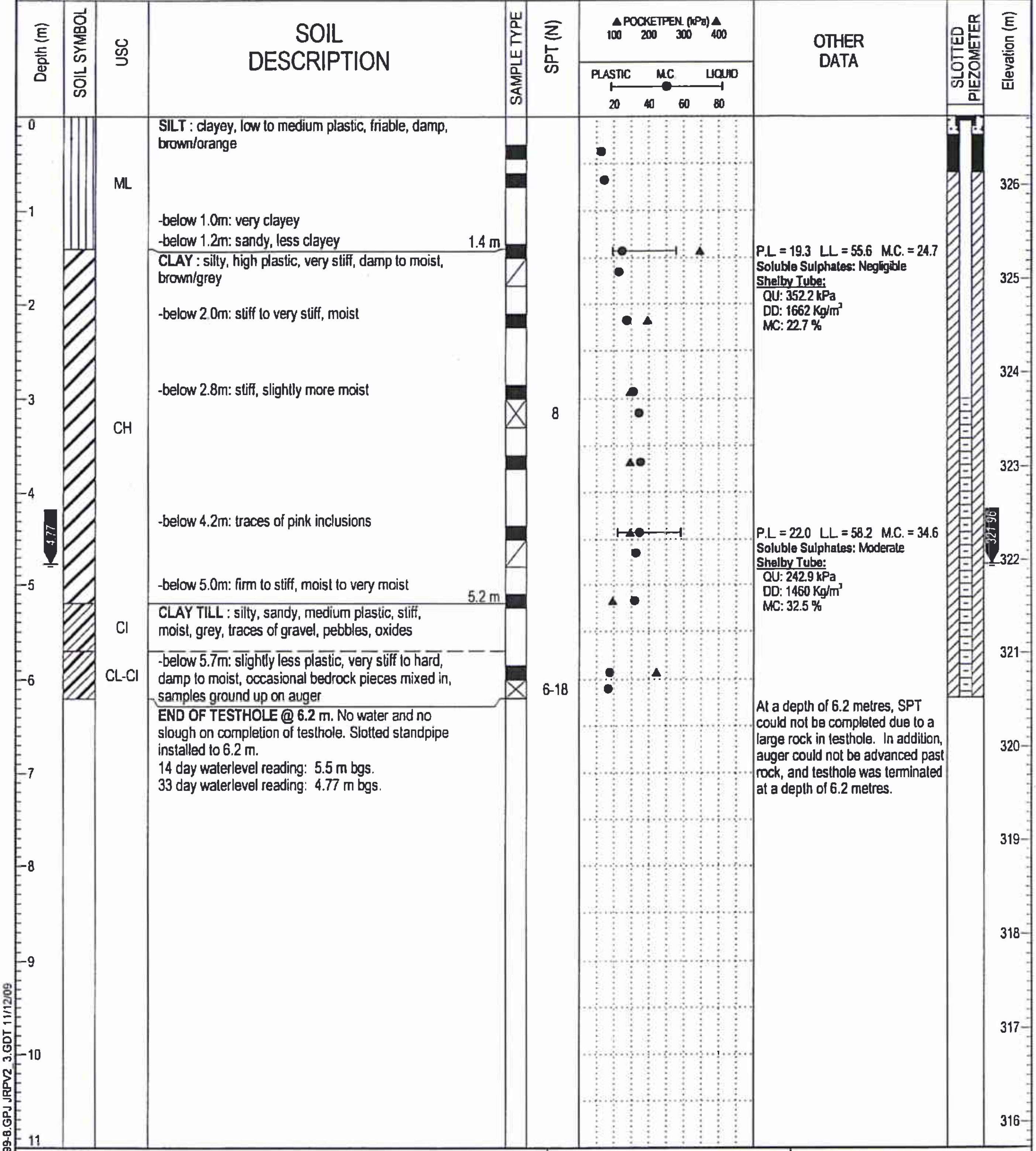
LOGGED BY: D Rohatyn	COMPLETION DEPTH: 12.00 m
REVIEWED BY: R Rau	COMPLETION DATE: 29/10/09
Fig. No: 2	Page 1 of 1

JRP PR 4099-8.GPJ JRPV2_3.GDT 11/12/09

PROJECT: Preliminary Geotechnical Investigation - Proposed RCMP Building	PROJECT NO: PR4099-8	BOREHOLE NO: 09-2
CLIENT: Public Works Government Services Canada	DRILL METHOD: Solid Stem Auger	ELEVATION: 326.73 m
OWNER:	LOCATION: Lot 17E, Block 22, Plan 094 0169, 10203 - 100th Avenue, High Level, Alberta	

SAMPLE TYPE: ▨ SHELBY TUBE ◩ CORE SAMPLE ☒ SPT SAMPLE ■ GRAB SAMPLE ▥ NO RECOVERY

BACKFILL TYPE: ■ BENTONITE ⁙ PEA GRAVEL ▥ SLOUGH ⁙ GROUT ▨ DRILL CUTTINGS ⁙ SAND



SILT : clayey, low to medium plastic, friable, damp, brown/orange

-below 1.0m: very clayey

-below 1.2m: sandy, less clayey

1.4 m

CLAY : silty, high plastic, very stiff, damp to moist, brown/grey

-below 2.0m: stiff to very stiff, moist

-below 2.8m: stiff, slightly more moist

-below 4.2m: traces of pink inclusions

-below 5.0m: firm to stiff, moist to very moist

5.2 m

CLAY TILL : silty, sandy, medium plastic, stiff, moist, grey, traces of gravel, pebbles, oxides

-below 5.7m: slightly less plastic, very stiff to hard, damp to moist, occasional bedrock pieces mixed in, samples ground up on auger

END OF TESTHOLE @ 6.2 m. No water and no slough on completion of testhole. Slotted standpipe installed to 6.2 m.
14 day waterlevel reading: 5.5 m bgs.
33 day waterlevel reading: 4.77 m bgs.

P.L = 19.3 L.L = 55.6 M.C. = 24.7
Soluble Sulphates: Negligible
Shelby Tube:
QU: 352.2 kPa
DD: 1662 Kg/m^3
MC: 22.7 %

P.L = 22.0 L.L = 58.2 M.C. = 34.6
Soluble Sulphates: Moderate
Shelby Tube:
QU: 242.9 kPa
DD: 1460 Kg/m^3
MC: 32.5 %

At a depth of 6.2 metres, SPT could not be completed due to a large rock in testhole. In addition, auger could not be advanced past rock, and testhole was terminated at a depth of 6.2 metres.

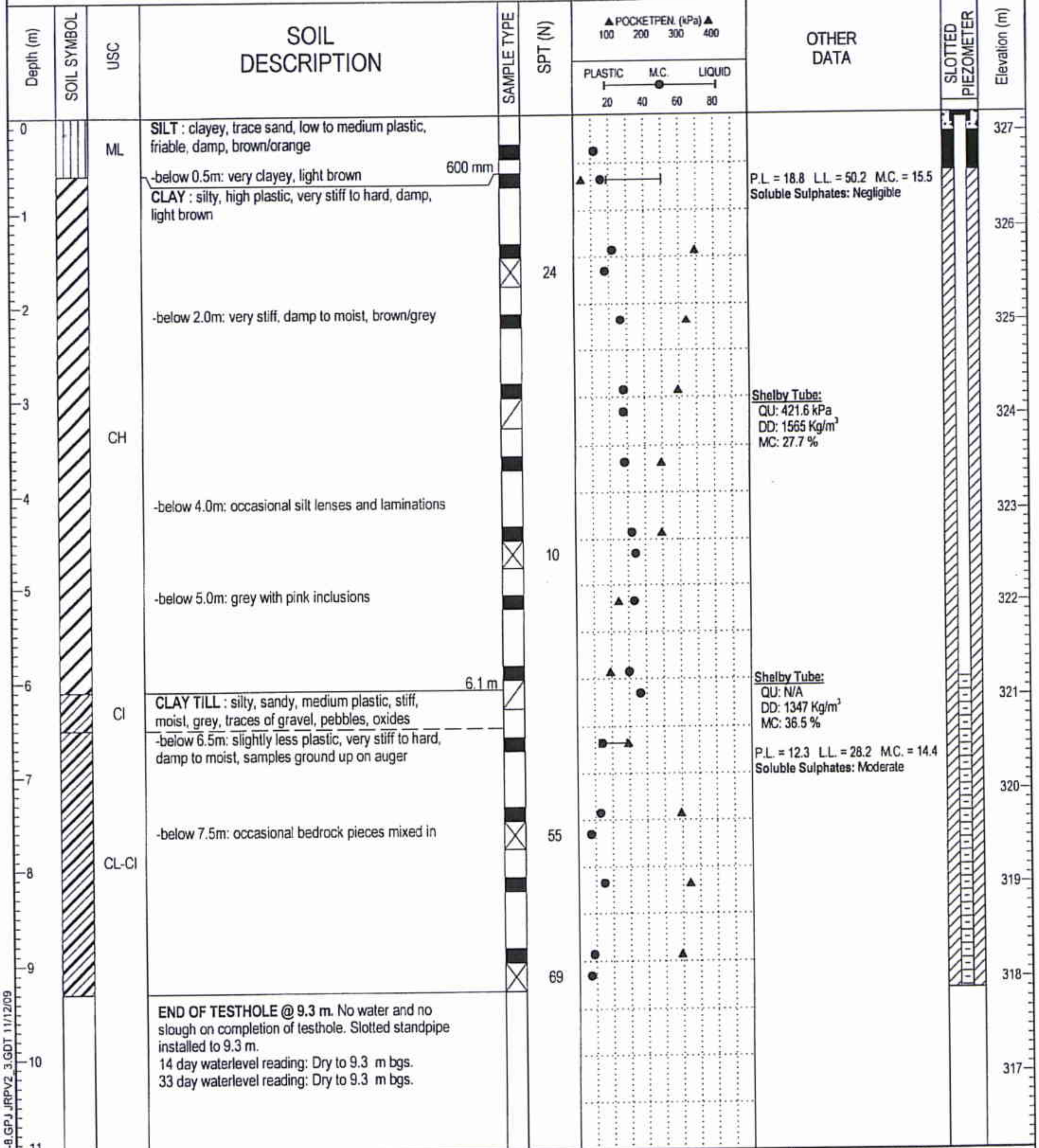
J.R. Paine & Associates Ltd. CONSULTING & TESTING ENGINEERS · GEOTECHNICAL · ENVIRONMENTAL · MATERIALS · 17505 - 106 Avenue Edmonton, AB T5S 1E7 Phone: (780) 489-0700 Fax: (780) 489-0800	LOGGED BY: D Rohatyn	COMPLETION DEPTH: 6.20 m
	REVIEWED BY: R Rau	COMPLETION DATE: 29/10/09
	Fig. No: 3	Page 1 of 1

JRP PR 4099-8.GPJ JRPV2 3.GDT 11/12/09

PROJECT: Preliminary Geotechnical Investigation - Proposed RCMP Building	PROJECT NO: PR4099-8	BOREHOLE NO: 09-3
CLIENT: Public Works Government Services Canada	DRILL METHOD: Solid Stem Auger	ELEVATION: 327.19 m
OWNER:	LOCATION: Lot 17E, Block 22, Plan 094 0169, 10203 - 100th Avenue, High Level, Alberta	

SAMPLE TYPE: ▨ SHELBY TUBE ◪ CORE SAMPLE ☒ SPT SAMPLE ■ GRAB SAMPLE ▥ NO RECOVERY

BACKFILL TYPE: ■ BENTONITE ☐ PEA GRAVEL ▥ SLOUGH ⁙ GROUT ▨ DRILL CUTTINGS ⁙ SAND



SOIL DESCRIPTION

SILT : clayey, trace sand, low to medium plastic, friable, damp, brown/orange

-below 0.5m: very clayey, light brown

CLAY : silty, high plastic, very stiff to hard, damp, light brown

-below 2.0m: very stiff, damp to moist, brown/grey

-below 4.0m: occasional silt lenses and laminations

-below 5.0m: grey with pink inclusions

CLAY TILL : silty, sandy, medium plastic, stiff, moist, grey, traces of gravel, pebbles, oxides

-below 6.5m: slightly less plastic, very stiff to hard, damp to moist, samples ground up on auger

-below 7.5m: occasional bedrock pieces mixed in

END OF TESTHOLE @ 9.3 m. No water and no slough on completion of testhole. Slotted standpipe installed to 9.3 m.
14 day waterlevel reading: Dry to 9.3 m bgs.
33 day waterlevel reading: Dry to 9.3 m bgs.

OTHER DATA

P.L. = 18.8 L.L. = 50.2 M.C. = 15.5
Soluble Sulphates: Negligible

Shelby Tube:
QU: 421.6 kPa
DD: 1565 Kg/m^3
MC: 27.7 %

Shelby Tube:
QU: N/A
DD: 1347 Kg/m^3
MC: 36.5 %

P.L. = 12.3 L.L. = 28.2 M.C. = 14.4
Soluble Sulphates: Moderate

J.R. Paine & Associates Ltd.
CONSULTING & TESTING ENGINEERS
- GEOTECHNICAL - ENVIRONMENTAL - MATERIALS -

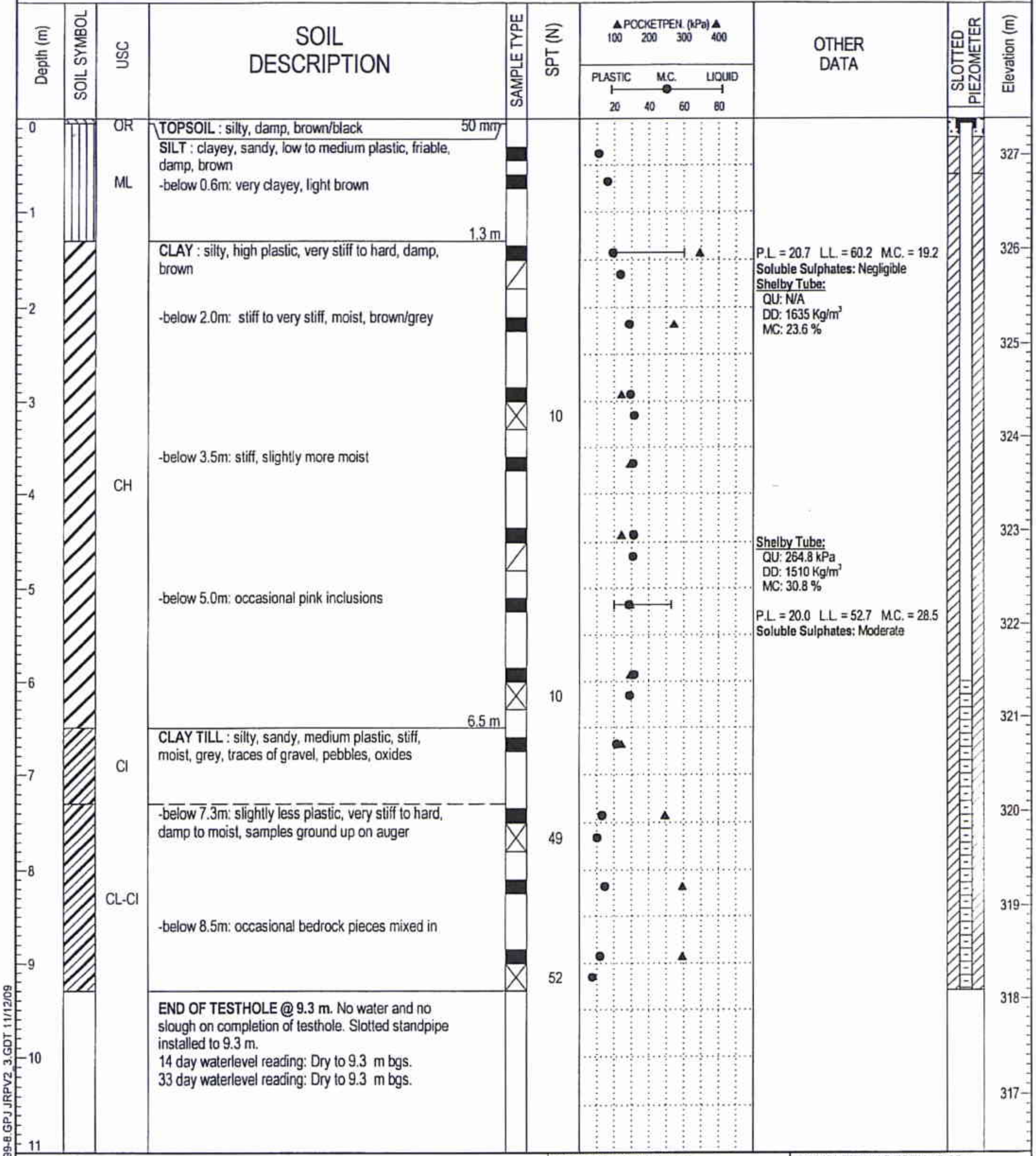
17505 - 106 Avenue
Edmonton, AB T5S 1E7
Phone: (780) 489-0700
Fax: (780) 489-0600

LOGGED BY: D Rohatyn	COMPLETION DEPTH: 9.30 m
REVIEWED BY: R Rau	COMPLETION DATE: 29/10/09
Fig. No: 4	Page 1 of 1

PROJECT: Preliminary Geotechnical Investigation - Proposed RCMP Building	PROJECT NO: PR4099-8	BOREHOLE NO: **09-4**
CLIENT: Public Works Government Services Canada	DRILL METHOD: Solid Stem Auger	ELEVATION: 327.39 m
OWNER:	LOCATION: Lot 17E, Block 22, Plan 094 0169, 10203 - 100th Avenue, High Level, Alberta	

SAMPLE TYPE ▨ SHELBY TUBE ◩ CORE SAMPLE ☒ SPT SAMPLE ■ GRAB SAMPLE ▥ NO RECOVERY

BACKFILL TYPE ■ BENTONITE ⬚ PEA GRAVEL ▥ SLOUGH ⬚ GROUT ▨ DRILL CUTTINGS ⬚ SAND



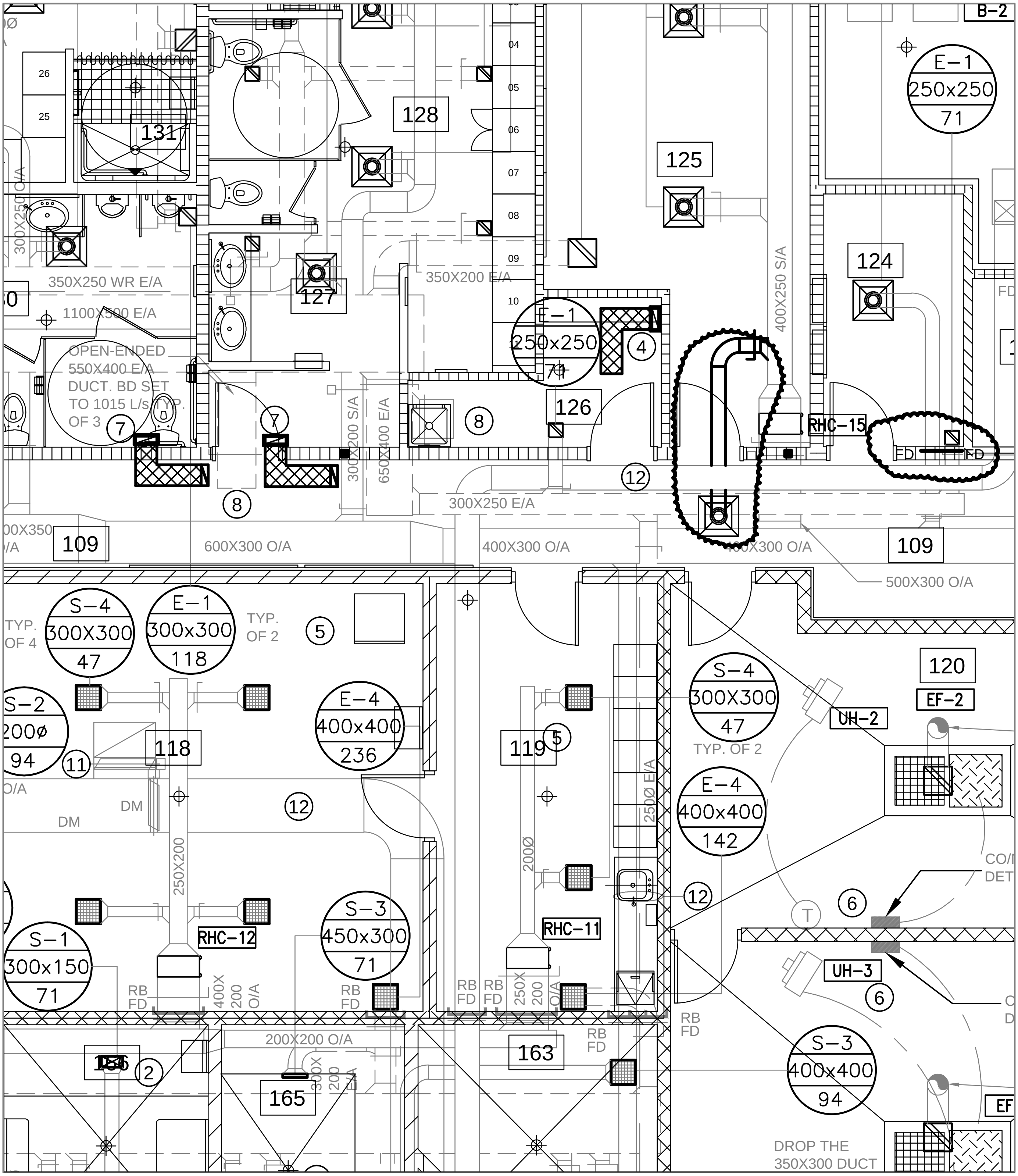
Depth (m)	USC	SOIL DESCRIPTION	SPT (N)	OTHER DATA
0	OR	**TOPSOIL** : silty, damp, brown/black 50 mm		
	ML	**SILT** : clayey, sandy, low to medium plastic, friable, damp, brown -below 0.6m: very clayey, light brown		
1.3 m	CH	**CLAY** : silty, high plastic, very stiff to hard, damp, brown		P.L. = 20.7 L.L. = 60.2 M.C. = 19.2 **Soluble Sulphates: Negligible** **Shelby Tube:** QU: N/A DD: 1635 Kg/m^3 MC: 23.6 %
		-below 2.0m: stiff to very stiff, moist, brown/grey	10	
		-below 3.5m: stiff, slightly more moist		**Shelby Tube:** QU: 264.8 kPa DD: 1510 Kg/m^3 MC: 30.8 %
		-below 5.0m: occasional pink inclusions	10	P.L. = 20.0 L.L. = 52.7 M.C. = 28.5 **Soluble Sulphates: Moderate**
6.5 m	CI	**CLAY TILL** : silty, sandy, medium plastic, stiff, moist, grey, traces of gravel, pebbles, oxides		
	CL-CI	-below 7.3m: slightly less plastic, very stiff to hard, damp to moist, samples ground up on auger	49	
		-below 8.5m: occasional bedrock pieces mixed in	52	

END OF TESTHOLE @ 9.3 m. No water and no slough on completion of testhole. Slotted standpipe installed to 9.3 m.
14 day waterlevel reading: Dry to 9.3 m bgs.
33 day waterlevel reading: Dry to 9.3 m bgs.

J.R. Paine & Associates Ltd.
CONSULTING & TESTING ENGINEERS
- GEOTECHNICAL - ENVIRONMENTAL - MATERIALS -

17505 - 106 Avenue
Edmonton, AB T5S 1E7
Phone: (780) 489-0700
Fax: (780) 489-0800

LOGGED BY: D Rohatyn	COMPLETION DEPTH: 9.30 m
REVIEWED BY: R Rau	COMPLETION DATE: 29/10/09
Fig. No: 5	Page 1 of 1



SKM-1

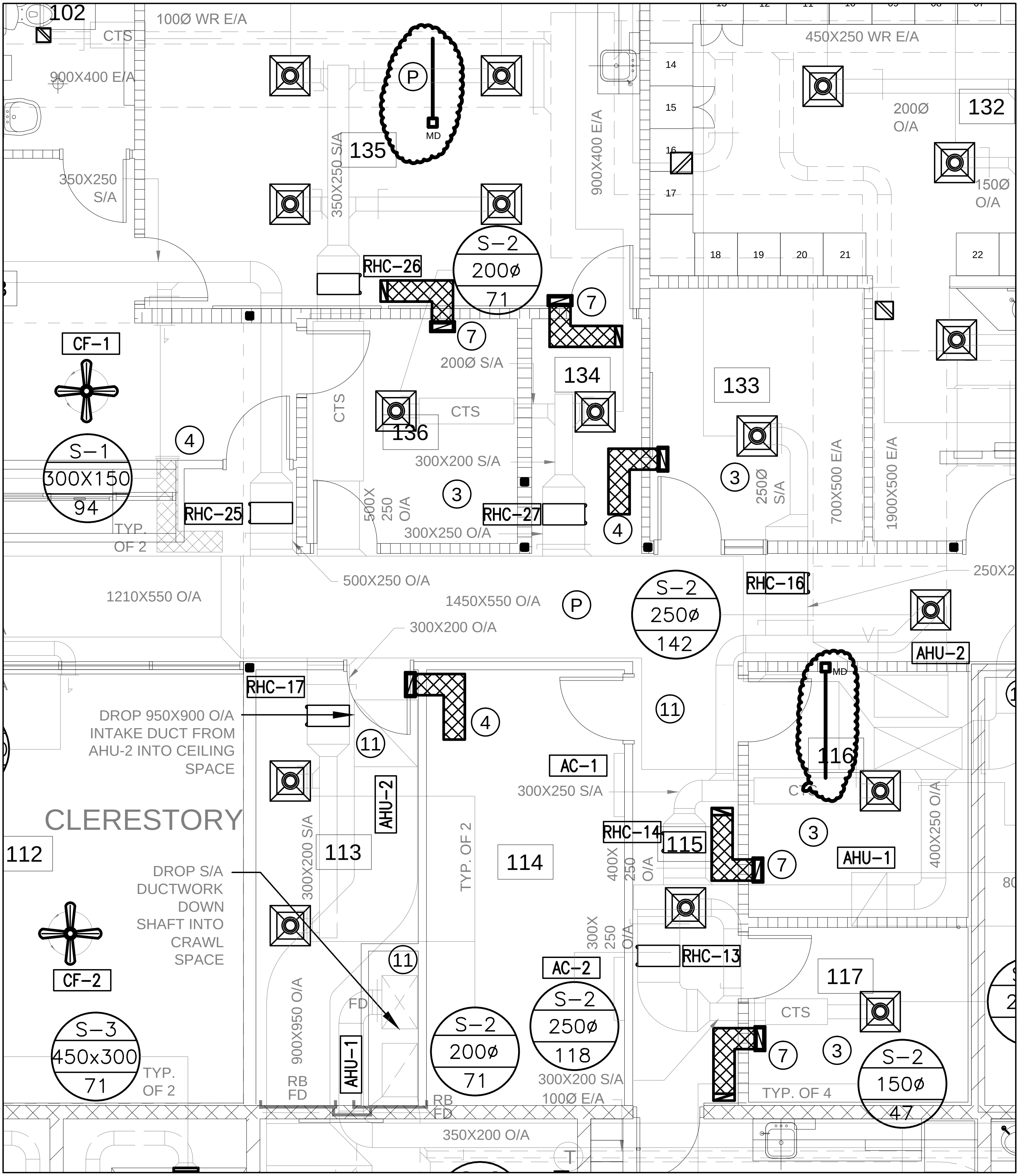
SCALE: 1:75

REVISION DATE:

Feb.22, 2012

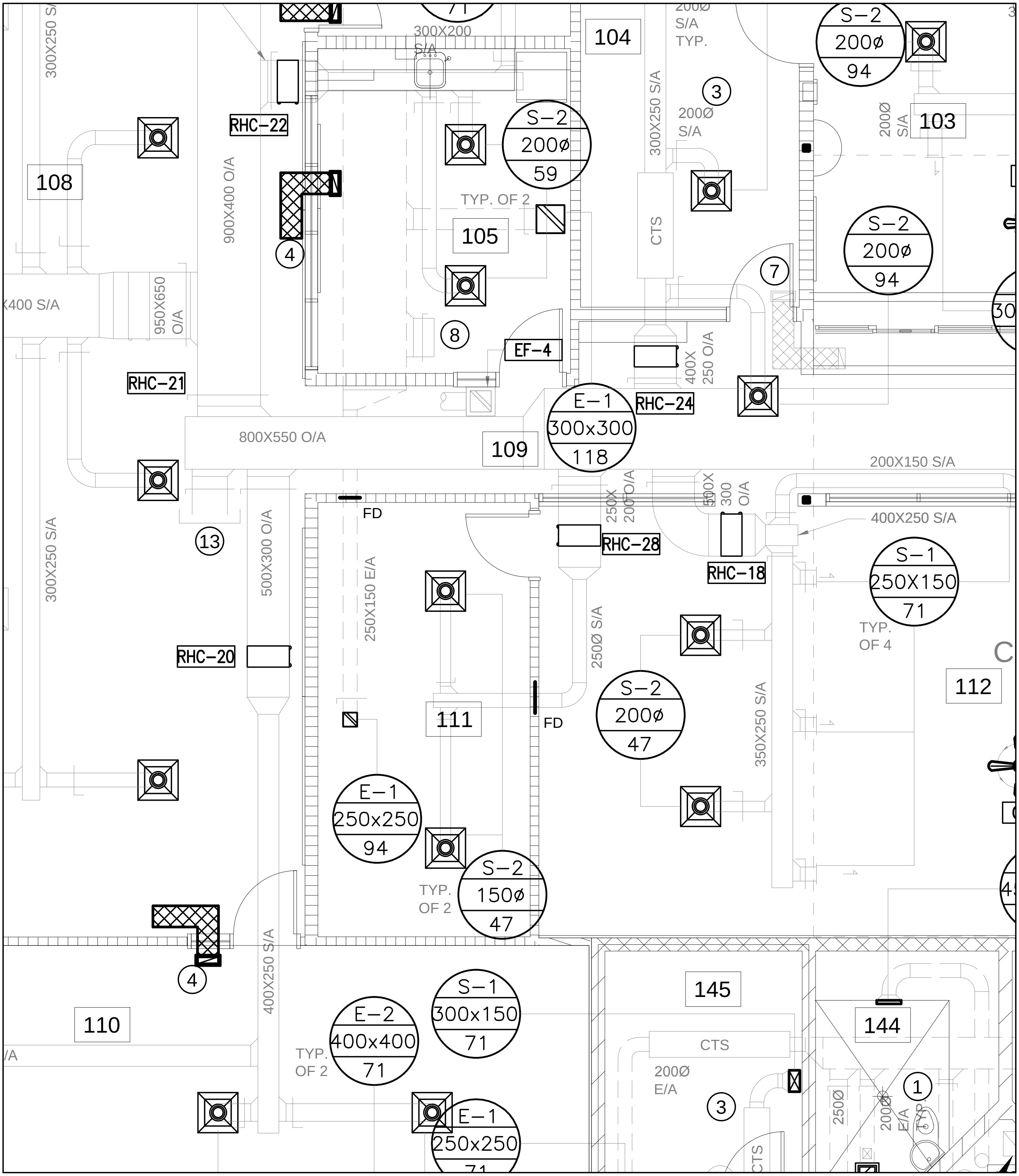
RCMP HIGH LEVEL DETACHMENT BUILDING

bacz ENGINEERING (2004) LTD.
10567-116St, Edmonton, Alberta, T5H-3L8
Phone: 780-428-0243
Fax: 780-426-7895
Email: bacz@caisnet.com



SKM-2 SCALE: 1:75	REVISION DATE:	Feb.22, 2012 RCMP HIGH LEVEL DETACHMENT BUILDING

bacz ENGINEERING (2004) LTD.
10567-116St, Edmonton, Alberta, T5H-3L8
Phone: 780-428-0243
Fax: 780-426-7895
Email: bacz@caisnet.com



SKM-3

SCALE: 1:75

REVISION DATE:

Feb.22, 2012

RCMP HIGH LEVEL DETACHMENT BUILDING

bacz ENGINEERING (2004) LTD.
10567–116St, Edmonton, Alberta, T5H–3L8
Phone: 780–428–0243
Fax: 780–426–7895
Email: bacz@caisnet.com