ARCADIS Design & Consultancy for natural and built assets

Conseil scolaire Viamonde

PRE-RENOVATION DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY

École élémentaire Renaissance

1226 Lockhart Road, Burlington, Ontario

January 11, 2023

30156922

Viraj Daruwala, M. Eng.

Occupational Hygiene Specialist

Jean Daigle

Senior Technical Specialist - Project Manager

PRE-RENOVATION DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY

École élémentaire Renaissance

1226 Lockhart Road, Burlington, Ontario

Prepared for:

Conseil scolaire Viamonde

116 Cornelius Parkway

Toronto, Ontario M6L 2K5

Attention: Mr. David Café-Fébrissy

Project Manager

Prepared by:

Arcadis Canada Inc.

121 Granton Drive, Suite 12

Richmond Hill, Ontario L4B 3N4

Tel 905 764 9380

Our Ref.:

30156922

Date:

January 11, 2023

CONTENTS

1 INTRODUCTION 1-1
1.1 Scope of Work 1-1
2 REGULATORY DISCUSSION AND METHODOLOGY 2-1
2.1 Asbestos 2-2
2.2 Lead 2-3
2.3 Mercury 2-3
2.4 Silica 2-4
2.5 Vinyl Chloride 2-4
2.6 Acrylonitrile 2-5
2.7 Other Designated Substances 2-5
2.8 Polychlorinated Biphenyls (PCBs) 2-5
2.9 Ozone-Depleting Substances (ODS) and Other Halocarbons 2-7
2.10 Mould 2-7
3 RESULTS AND DISCUSSION 3-1
3.1 Asbestos 3-1
3.2 Lead 3-9
3.3 Mercury 3-10
3.4 Silica 3-11
3.5 Vinyl Chloride 3-11
3.6 Acrylonitrile 3-11
3.7 Other Designated Substances 3-11
3.8 Polychlorinated Biphenyls (PCBs) 3-12
3.9 Ozone-Depleting Substances (ODS) and Other Halocarbons 3-12
3.10 Mould 3-12
4 USE AND LIMITATIONS OF THIS PRE-RENOVATION DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY REPORT 4-1

TABLES

Table 3.1. Summary of Results of Analyses of Bulk Samples for Asbestos Content 3-1

Table 3.2. Summary of Results of Analyses of Bulk Samples for Lead Content 3-9

APPENDICES

A Floor Plans

B Laboratory Reports

C Summary of Asbestos, Lead and Silica Work Classifications

1 INTRODUCTION

Arcadis Canada Inc. (Arcadis) was retained by Conseil scolaire Viamonde (CSV) to conduct a pre-renovation designated substances and hazardous materials survey in designated areas of École élémentaire Renaissance located at 1226 Lockhart Road, Burlington, Ontario.

The information in this report is to be provided to all bidders on a project in accordance with the requirements of the *Occupational Health and Safety Act*.

The site is a two-storey building.

It is our understanding that several renovations are to take place in designated areas of the building. The survey was limited to inspecting and testing materials in the designated study areas that may be affected by the renovation project based on information provided by CSV.

The designated study areas are shown on the floor plan provided in Appendix A.

The survey was undertaken to report on the presence or suspected presence of readily observable designated substances and hazardous materials.

1.1 Scope of Work

The scope of work for our investigation included:

- review of existing information;
- investigation of readily-accessible areas in the designated study areas for the presence of designated substances and hazardous materials used in building construction materials; and
- preparation of a report outlining the findings of the investigation.

Mr. Viraj Daruwala of Arcadis visited the site on December 1, 2022 to conduct the designated substances and hazardous materials survey at École élémentaire Renaissance.

2 REGULATORY DISCUSSION AND METHODOLOGY

Ontario Occupational Health and Safety Act (OHSA)

The Ontario *Occupational Health and Safety Act* (OHSA) sets out, in very general terms, the duties of employers and others to protect workers from health and safety hazards on the job. These duties include, but are not limited to:

- taking all reasonable precautions to protect the health and safety of workers [clause 25(2)(h)];
- ensuring that equipment, materials and protective equipment are maintained in good condition [clause 25(1)(b)];
- providing information, instruction and supervision to protect worker health and safety [clause 25(2)(a)]; and
- acquainting a worker or a person in authority over a worker with any hazard in the work and in the handling, storage, use, disposal and transport of any article, device, equipment or a biological, chemical or physical agent [clause 25(2)(d)].

In addition, Section 30 of the OHSA deals with the presence of designated substances on construction projects. Compliance with the OHSA and its regulations requires action to be taken where there is a designated substance hazard on a construction project.

Section 30 of the OHSA requires the owner of a project to determine if designated substances are present on a project and, if so, to inform all potential contractors as part of the bidding process. Contractors who receive this information are to pass it onto other contractors and subcontractors who are bidding for work on the project.

Regulation for Construction Projects, O.Reg. 213/91

The *Regulation for Construction Projects*, O.Reg. 213/91, applies to all construction projects. The following sections of the regulation would apply to situations where there is the potential for workers to be exposed to designated substances:

Section 14	(5)	A competent person shall perform tests and observations necessary for the detection of hazardous conditions on a project.
Section 21	(1)	A worker shall wear such protective clothing and use such personal protective equipment or devices as are necessary to protect the worker against the hazards to which the worker may be exposed.
	(2)	A worker's employer shall require the worker to comply with subsection (1).

(3) A worker required to wear personal protective clothing or use personal protective equipment or devices shall be adequately instructed and trained in the care and use of the clothing, equipment or device before wearing or using it.

Section 30 Workers who handle or use substances likely to endanger their health shall be provided with washing facilities with clean water, soap and individual towels.

Section 46 (1) A project shall be adequately ventilated by natural or mechanical means,

(a) if a worker may be injured by inhaling a noxious...dust or fume;

(2) If it is not practicable to provide natural or mechanical ventilation in the circumstances described in clause (1)(a), respiratory protective equipment suitable for the hazard shall be provided and be used by the workers.

Section 59 If the dissemination of dust is a hazard to a worker, the dust shall be adequately controlled or each worker who may be exposed to the hazard shall be provided with adequate personal protective equipment.

Regulation for Designated Substances (O.Reg. 490/09)

The *Designated Substance Regulation* (O.Reg. 490/09) specifies occupational exposure limits (OELs) for designated substances and requires an assessment and a control program to ensure compliance with these OELs.

Although, O.Reg. 490/09 and the OELs do not apply to an employer on a construction project, or to their workers at the project, employers still have a responsibility to protect the health of their workers and to comply with the OHSA and other applicable regulations. Section 25(2)(h) of the OHSA requires that employers take "every precaution reasonable in the circumstances for the protection of a worker".

Other regulatory requirements (and guidelines) which apply to control of exposure to designated substances and hazardous materials are referenced in the sections below.

2.1 Asbestos

Asbestos has been widely used in buildings, both in friable applications (materials which can be crumbled, pulverized or powdered by hand pressure, when dry) such as pipe and tank insulation, sprayed-on fireproofing and acoustic texture material and in non-friable manufactured products such as floor tile, gaskets, cement board and so on. The use of asbestos in friable applications was curtailed around the mid-1970s and, as such, most buildings constructed prior to about 1975 contain some form of friable construction material with an asbestos content. The use of asbestos in certain non-friable materials continued beyond the mid-1970s.

Control of exposure to asbestos is governed in Ontario by Regulation 278/05 – *Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations*. Disposal of asbestos waste

(friable and non-friable materials) is governed by Ontario Regulation 278/05 and by Ontario Regulation 347, *Waste Management – General*. O.Reg. 278/05 classifies asbestos work operations into three types (Type 1, 2 and 3), as shown in Table C-1 in Appendix C, and specifies procedures to be followed in conducting asbestos abatement work.

2.2 Lead

Lead is a heavy metal that can be found in construction materials such as paints, coatings, mortar, concrete, pipes, solder, packings, sheet metal, caulking, glazed ceramic products and cable splices. Lead has been used historically in exterior and interior paints.

The *Surface Coating Materials Regulations* (SOR/2016-193) made pursuant to the Canada Consumer Product Safety Act states that a surface coating material must not contain more than 90 mg/kg total lead. Health Canada defines a lead-containing surface coating as a paint or similar material that dries to a solid film that contains over 90 mg/kg dry weight of lead.

Information from the United States Occupational Health and Safety Administration (OSHA) suggests that the improper removal of lead paint containing 600 mg/kg lead results in airborne lead concentrations that exceed half of the permissible exposure limit. Lead concentrations as low as 90 mg/kg may present a risk to pregnant women and children[(1)].

The *National Plumbing Code* allowed lead as an acceptable material for pipes until 1975 and in solder until 1986.

The Ministry of Labour *Guideline, Lead on Construction Projects*, dated April 2011, provides guidance in the measures and procedures that should be followed when handling lead containing materials during construction projects. In the guideline, lead-containing construction operations are classified into three groups - Type 1 (low risk), Type 2 (medium risk) and Type 3 (high risk) based on presumed airborne concentrations of lead, as shown in Appendix C, Table C-2. Any operation that may expose a worker to lead that is not a Type 1, Type 2, or Type 3b operation, is classified as a Type 3a operation.

2.3 Mercury

Mercury has been used in electrical equipment such as alkaline batteries, fluorescent light bulbs (lamps), high intensity discharge (HID) lights (mercury vapour, high pressure sodium and metal halide), “silent switches” and in instruments such as thermometers, manometers and barometers, pressure gauges, float and level switches and flow meters. Mercury-containing lamps, the bulk of which are 1.22 m (four foot) fluorescent lamps contain between 7 and 40 mg of mercury each. Mercury compounds have also been

(1) *Lead-Containing Paints and Coatings: Preventing Exposure in the Construction Industry.* WorkSafe BC, 2011.

used historically as additives in latex paint to protect the paint from mildew and bacteria during production and storage.

The intentional addition of mercury to Canadian-produced consumer paints for interior use was prohibited in 1991. Mercury may have remained in paints after 1991, however, as a result of impurities in the paint ingredients or cross-contamination due to other manufacturing processes. The *Surface Coating Materials Regulations* made under the *Hazardous Products Act* set a maximum total mercury concentration of 10 mg/kg (0.001 percent) for surface coating materials (including paint). This criterion level applies to the sale and importation of new surface coating materials.

Mercury-containing thermostats and silent light switches are mercury tilt switches which are small tubes with electrical contacts at one end of the tube. A mercury tilt switch is usually present when no switch is visible. Mercury switches often have the word “TOP” stamped on the upper end of the switch, which is visible after removing the cover plate. If mercury switches are to be removed, the entire switch should be removed and placed into a suitable container for storage and disposal.

Waste light tubes generated during renovations or building demolition and waste mercury from equipment must either be recycled or disposed of in accordance with the requirements of Ont. Reg. 347 - *Waste Management, General*.

Waste mercury in amounts less than 5 kg (per month) are exempt from the generator registration requirements prescribed by O.Reg. 347 – *Waste Management – General*. Waste mercury from mercury switches or gauges should, however, be properly collected and shipped to a recycling facility or disposed of as a hazardous waste. Removal of mercury-containing equipment (e.g., switches, gauges, controls, etc.) should be carried out in a manner which prevents spillage and exposure to workers.

2.4 Silica

Silica exists in several forms of which crystalline silica is of most concern with respect to potential worker exposures. Quartz is the most abundant type of crystalline silica. Some commonly used construction materials containing silica include brick, refractory brick, concrete, concrete block, cement, mortar, rock and stone, sand, fill dirt, topsoil and asphalt containing rock or stone.

The Ministry of Labour *Guideline, Silica on Construction Projects*, dated April 2011, provides guidance in controlling exposure to silica dust during construction activities. In the guideline, silica-containing construction operations are classified into three groups - Type 1 (low risk), Type 2 (medium risk) and Type 3 (high risk) based on presumed airborne concentrations of respirable crystalline silica in the form of cristobalite, tridymite, quartz and tripoli as shown in Appendix C, Table C-3.

2.5 Vinyl Chloride

Vinyl chloride vapours may be released from polyvinyl chloride (PVC) products in the event of heating or as a result of decomposition during fire. PVC is used in numerous materials that may be found in building

construction, including, for example, piping, conduits, siding, window and door frames, plastics, garden hoses, flooring and wire and cable protection.

2.6 Acrylonitrile

Acrylonitrile is used to produce nitrile-butadiene rubber, acrylonitrile-butadiene-styrene (ABS) polymers and styrene-acrylonitrile (SAN) polymers. Products made with ABS resins which may be found in buildings include telephones, bottles, packaging, refrigerator door liners, plastic pipe, building panels and shower stalls. Acrylonitrile can be released into the air by combustion of products containing ABS.

2.7 Other Designated Substances

Isocyanates are a class of chemicals used in the manufacture of certain types of plastics, foams, coatings and other products. Isocyanate-based building construction materials may include rigid foam products such as foam-core panels and spray-on insulation and paints, coatings, sealants and adhesives. Isocyanates may be inhaled if they are present in the air in the form of a vapour, a mist or a dust.

Benzene is a clear, highly flammable liquid used mainly in the manufacture of other chemicals. The commercial use of benzene as a solvent has practically been eliminated, however it continues to be used as a solvent and reactant in laboratories.

Arsenic is a heavy metal used historically in pesticides and herbicides. The primary use in building construction materials was its use in the wood preservative chromated copper arsenate (CCA). CCA was used to pressure treat lumber since the 1940's. Pressure-treated wood containing CCA is no longer being produced for use in most residential settings.

Ethylene oxide is a colourless gas at room temperature. it has been used primarily for the manufacture of other chemicals, as a fumigant and fungicide and for sterilization of hospital equipment.

Coke oven emissions are airborne contaminants emitted from coke ovens and are not a potential hazard associated with building construction materials.

2.8 Polychlorinated Biphenyls (PCBs)

The management of equipment classified as waste and containing Polychlorinated Biphenyls (PCBs) at concentrations of 50 parts per million (mg/kg) or greater is regulated by Ontario Regulation 362*, Waste Management – PCBs*. Under this regulation, PCB waste is defined as any waste material containing PCBs in concentrations of 50 mg/kg or greater. Any equipment containing PCBs at or greater than this level, such as transformers, switchgear, light ballasts and capacitors, which is removed from service due to age, failure or as a result of decommissioning, is considered to constitute a PCB waste. Although current federal legislation (effective 1 July 1980) has prohibited the manufacture and sale of new equipment containing PCBs since that time, continued operation of equipment supplied prior to this date and containing PCBs is still permitted. Handling, storage and disposition of such equipment is, however, tightly regulated and must

be managed in accordance with provincial and federal government requirements as soon as it is taken out of service or becomes unserviceable.

In most institutional, commercial facilities and in smaller industrial facilities, the primary source of equipment potentially containing PCBs is fluorescent and H.I.D. light ballasts. Small transformers may also be present. In larger industrial facilities, larger transformers and switch gear containing, or potentially containing, PCBs may also be present.

PCBs were also commonly added to industrial paints from the 1940s to the late 1970s. PCBs were added directly to the paint mixture to act as a fungicide, to increase durability and flexibility, to improve resistance to fires and to increase moisture resistance. The use of PCBs in new products was banned in Canada in the 1970s. PCB amended paints were used in speciality industrial/institutional applications prior to the 1970s including government buildings and equipment such as industrial plants, radar sites, ships as well as non-government rail cars, ships, grain bins, automobiles and appliances.

Removal of in-service equipment containing PCBs, such as fluorescent light ballasts, capacitors and transformers, is subject to the requirements of the federal *PCB Regulations* (discussed below).

The *PCB Regulations*, which came into force on 5 September 2008, were made under the *Canadian Environmental Protection Act*, 1999 (CEPA 1999) with the objective of addressing the risks posed by the use, storage and release to the environment of PCBs, and to accelerate their destruction. The *PCB Regulations* set different end-of-use deadlines for equipment containing PCBs at various concentration levels.

The Regulations Amending the PCB Regulations and Repealing the Federal Mobile PCB Treatment and Destruction Regulations were published on 23 April 2014, in the Canada Gazette, Part II, and came into force on 1 January 2015. The most notable part of the amendments is the addition of an end-of-use deadline date of 31 December 2025 for specific electrical equipment located at electrical generation, transmission and distribution facilities.

When the PCB materials are classified as waste, jurisdiction falls under the Ontario Ministry of the Environment and Climate Change (MOECC) and O.Reg. 362. All remedial and PCB management work must be carried out under the terms of a Director's Instruction issued by an MOECC District Office (for quantities of PCB fluid greater than 50 litres). The PCB waste stream, regardless of quantity, must be registered with the MOECC, in accordance with O.Reg. 347, *General - Waste Management*. O.Reg. 362 applies to any equipment containing greater than 1 kg of PCBs.

2.9 Ozone-Depleting Substances (ODS) and Other Halocarbons

Ontario Regulation 463/10 – *Ozone Depleting Substances and Other Halocarbons*, applies to the use, handling and disposal of Class 1 ozone-depleting substances, including various chlorofluorocarbons (CFCs), halons and other halocarbons, Class 2 ozone-depleting substances, including various hydrochlorofluorocarbons (HCFCs) and halocarbons, and other halocarbons, including fluorocarbons (FCs) and hydrofluorocarbons (CFCs). The most significant requirements for handling of ozone-depleting substances (ODS) and other Halocarbons, which include, for example, refrigerants used in refrigeration equipment and chillers, include the following:

- certification is required for all persons testing, repairing, filling or emptying equipment containing ODS and other halocarbons;
- the discharge of a Class 1 ODS or anything that contains a Class 1 ODS to the natural environment or within a building is prohibited;
- the making, use of, selling of or transferring of a Class 1 ODS is restricted to certain conditions;
- the discharge of a solvent or sterilant that contains a Class 2 ODS is prohibited;
- the making, use of, selling of or transferring of a solvent or sterilant that contains a Class 2 ODS is restricted to certain conditions;
- fire extinguishing equipment that contains a halon may be discharged to fight fires, except fires for firefighting training purposes;
- portable fire extinguishing equipment that contains a halon may be used or stored if the extinguisher was sold for use for the first time before 1 January 1996;
- records of the servicing and repair of equipment containing ODS and other halocarbons must be prepared and maintained by the owner of the equipment; and
- equipment no longer containing ODS and other halocarbons must be posted with a notice completed by a certified person.

Ontario Regulation 347, *General – Waste Management*, has also been amended to provide for more strict control of CFCs. The requirements under the amended regulation apply primarily to the keeping of records for the receipt or recycling of CFC waste.

2.10 Mould

Moulds are forms of fungi that are found everywhere both indoors and outdoors all year round. Outdoors, moulds live in the soil, on plants and on dead and decaying matter. More than 1000 different kinds of indoor

moulds have been found in buildings. Moulds spread and reproduce by making spores, which are all small and light-weight, able to travel through air, capable of resisting dry, adverse environmental conditions, and hence capable of surviving a long time. Moulds need moisture and nutrients to grow and their growth is stimulated by warm, damp and humid conditions.

Control of exposure to mould is required under Section 25(2)(h) of the Ontario *Occupational Health and Safety Act*, which states that employers shall take every precaution reasonable in the circumstances for the protection of workers. Recommended work practices are outlined in the following documents:

- *Mould Guidelines for the Canadian Construction Industry*. Standard Construction Document CCA 82 2004. Canadian Construction Association.
- *Mould Abatement Guidelines*. Environmental Abatement Council of Ontario. Edition 3. 2015.

3 RESULTS AND DISCUSSION

3.1 Asbestos

Arcadis reviewed a report prepared by Arcadis for the Conseil scolaire Viamonde entitled Revised *Pre-Renovation Designated Substances and Hazardous Materials Survey, École élémentaire Renaissance, 1226 Lockhart Road, Burlington, Ontario* dated March 2, 2022. Information and bulk sample analysis results obtained from this existing report was utilized by Arcadis during the course of our investigation and in the preparation of this report.

During the course of our site investigation, no representative bulk samples of material were collected by Arcadis staff. Locations of accessible asbestos-containing materials are outlined on the floor plan provided in Appendix A.

Table 3.1. Summary of Results of Analyses of Bulk Samples for Asbestos Content

École élémentaire Renaissance

Sample No.	Location	Description	Asbestos Content
1A	Room 216	Vinyl sheet flooring – Yellow with brown, green and white fleck	None detected (PLM) (1) None detected (TEM)(1)
1B	Room 216	Vinyl sheet flooring – Yellow with brown, green and white fleck	None detected (1)
1C	Room 216	Vinyl sheet flooring – Yellow with brown, green and white fleck	None detected (1)
1A	Room 207	Brown paper between ceiling tile and wood joist (brown/black-coloured paper located above acoustic ceiling tile)	None detected (1)
1B	Room 207	Brown paper between ceiling tile and wood joist (brown/black-coloured paper located above acoustic ceiling tile)	None detected (1)
1C	Room 207	Brown paper between ceiling tile and wood joist (brown/black-coloured paper located above acoustic ceiling tile)	None detected (1)
2A	Room 203	Brown paper between ceiling tile and wood joist (brown-coloured paper with foil backing located above acoustic ceiling tile)	None detected (1)
2B	Room 203	Brown paper between ceiling tile and wood joist (brown-coloured paper with foil backing located above acoustic ceiling tile)	None detected (1)
2C	Room 203	Brown paper between ceiling tile and wood joist (brown-coloured paper with foil backing located above acoustic ceiling tile)	None detected (1)
1A	109	Tectum panel, spaghetti pattern	None detected (1)
1B	109	Tectum panel, spaghetti pattern	None detected (1)
1C	109	Tectum panel, spaghetti pattern	None detected (1)

Sample No.	Location	Description	Asbestos Content
1A	Room 105	Interior Window Caulking – Grey	None detected (PLM) (1) None detected (TEM) (1)
1B	Room 107	Interior Window Caulking – Grey	None detected (1)
1C	Room 109	Interior Window Caulking – Grey	None detected (1)
2A	Room A2	Door Caulking- Grey	None detected (PLM) (1) None detected (TEM) (1)
2B	Room B1	Door Caulking- Grey	None detected (1)
2C	Room B2	Door Caulking- Grey	None detected (1)
3A	Room B2	Interior Window Frame Caulking- Grey	None detected (PLM) (1) None detected (TEM) (1)
3B	Room B2	Interior Window Frame Caulking- Grey	None detected (1)
3C	Room B2	Interior Window Frame Caulking- Grey	None detected (1)
4A	Room 109	Exterior Window Caulking – Grey	None detected (PLM) (1) None detected (TEM) (1)
4B	Room 111	Exterior Window Caulking – Grey	None detected (1)
4C	Room 112	Exterior Window Caulking – Grey	None detected (1)
5A	Room 109	Exterior Caulking on Window Soffit - Grey Coloured	**1.6% chrysotile (1,3)**
6A	Room 110	Exterior Window Caulking – White	**0.87% chrysotile (1,3)**
7A	Room 207	Interior Window Caulking – Black	None detected (PLM) (1) None detected (TEM) (1)
7B	Room 209	Interior Window Caulking – Black	None detected (1)
7C	Room 211	Interior Window Caulking – Black	None detected (1)
8A	Room B2	Interior Window Caulking- White	None detected (PLM) (1) None detected (TEM) (1)
8B	Room 103	Interior Window Caulking- White	None detected (1)
8C	Room 110	Interior Window Caulking- White	None detected (1)
9A	Room 109	Exterior Brick Mortar	None detected (1)
9B	Room 110	Exterior Brick Mortar	None detected (1)
9C	Room 111	Exterior Brick Mortar	None detected (1)
10A	Room B1	12”x12” vinyl floor tiles (Turquoise) – Mastic only	None detected (1)
10B	Room 102	12”x12” vinyl floor tiles (Turquoise) - Mastic only	None detected (1)
10C	Room A1	12”x12” vinyl floor tiles (Turquoise) - Mastic only	None detected (1)
11A	Room A2	12”x12” vinyl floor tiles (beige with brown streaks) - Mastic only	None detected (1)
11B	Room A2	12”x12” vinyl floor tiles (beige with brown streaks) - Mastic only	None detected (1)
11C	Room A2 Stairs	12”x12” vinyl floor tiles (beige with brown streaks) - Mastic only	None detected (1)

Sample No.	Location	Description	Asbestos Content
12A	Room 110	2'x4' ceiling tile – Random thin fissures with pinhole	None detected (1)
12B	Room 112	2'x4' ceiling tile – Random thin fissures with pinhole	None detected (1)
12C	Room 114	2'x4' ceiling tile – Random thin fissures with pinhole	None detected (1)
13A	Room 214	Paint on concrete block – light blue	None detected (1)
13B	Room 103	Paint on concrete block – green	None detected (1)
13C	Room 212	Paint on concrete block – pink	None detected (1)
14A	Room M21	9"x9" Vinyl Floor Tiles (Green)- Black Mastic	None detected (1)
14B	Room M21	9"x9" Vinyl Floor Tiles (Green)- Black Mastic	None detected (1)
14C	Room M21	9"x9" Vinyl Floor Tiles (Green)- Black Mastic	None detected (1)
15A	Room M21	9"x9" Vinyl Floor Tiles-Green	**0.65% chrysotile (1,3)**
16A	Room 101	9"x9" vinyl floor tiles (Brown) – Mastic only	None detected (1)
16B	Room 101	9"x9" vinyl floor tiles (Brown) - Mastic only	None detected (1)
16C	Room 101	9"x9" vinyl floor tiles (Brown) - Mastic only	None detected (1)
17A	Room B3	Light grey vinyl baseboard	None detected (PLM) (1) None detected (TEM) (1)
17B	Room B3	Light grey vinyl baseboard	None detected (1)
17C	Room B3	Light grey vinyl baseboard	None detected (1)
18A	Room B3	Light grey vinyl baseboard – Brown Mastic only	None detected (1)
18B	Room B3	Light grey vinyl baseboard – Brown Mastic only	None detected (1)
18C	Room B3	Light grey vinyl baseboard – Brown Mastic only	None detected (1)
19A	Room B2	Dark grey vinyl baseboard	None detected (PLM) (1) None detected (TEM) (1)
19B	Room B2	Dark grey vinyl baseboard	None detected (1)
19C	Room B2	Dark grey vinyl baseboard	None detected (1)
20A	Room B2	Dark grey vinyl baseboard – Light Brown Mastic only	None detected (1)
20B	Room B2	Dark grey vinyl baseboard – Light Brown Mastic only	None detected (1)
20C	Room B2	Dark grey vinyl baseboard – Light Brown Mastic only	None detected (1)
21A	Room 103	Exterior textured coat	None detected (1)
21A	Room 103	Exterior textured coat – cementitious layer	None detected (1)
21B	Room 109	Exterior textured coat	None detected (1)
21B	Room 109	Exterior textured coat – cementitious layer	None detected (1)
21C	Room 203	Exterior textured coat	None detected (1)
21C	Room 203	Exterior textured coat – cementitious layer	None detected (1)

Sample No.	Location	Description	Asbestos Content
22A	Room 101	9”x9” vinyl floor tiles (Light brown) – Mastic only	None detected (1)
22B	Room 101	9”x9” vinyl floor tiles (Light brown) – Mastic only	None detected (1)
22C	Room 101	9”x9” vinyl floor tiles (Light brown) – Mastic only	None detected (1)
23A	Room 101	9”x9” vinyl Floor Tiles (Red) – Black Mastic only	None detected (1)
23B	Room 101	9”x9” vinyl Floor Tiles (Red) – Black Mastic only	None detected (1)
23C	Room 101	9”x9” vinyl Floor Tiles (Red) – Black Mastic only	None detected (1)
102-DW-1A	Rm 102	Drywall joint compound (new)	None detected (1)
111B-DW-1B	Rm 111B	Drywall joint compound (new)	None detected (1)
111B-DW-1C	Rm 111B	Drywall joint compound (new)	None detected (1)
101-DW-2A	Rm 101	Drywall joint compound	None detected (1)
104-DW-2B	Rm 104	Drywall joint compound	None detected (1)
118-DW-2C	Rm 118	Drywall joint compound	None detected (1)
112-DW-2D	Rm 112	Drywall joint compound	None detected (1)
B1-DW-2E	Rm B1	Drywall joint compound	None detected (1)
101-DW-2F	Stair 101	Drywall joint compound	None detected (1)
202-DW-2G	Rm 202	Drywall joint compound	None detected (1)
102-CT-1A	Rm 102	2’x4’ suspended ceiling tiles; CF pattern whit back	None detected (1)
101-CT-1B	Rm 101	2’x4’ suspended ceiling tiles; CF pattern whit back	None detected (1)
C102-CT-1C	Rm C102	2’x4’ suspended ceiling tiles; CF pattern whit back	None detected (1)
101-CT-2A	Rm 101	2’x4’ suspended ceiling tile; fissure and dot on 2’ brown back	None detected (1)
101-CT-2B	Rm101	2’x4’ suspended ceiling tile; fissure and dot on 2’ brown back	None detected (1)
101-CT-2C	Rm 101	2’x4’ suspended ceiling tile; fissure and dot on 2’ brown back	None detected (1)
104-CT-3A	Rm 104	2’x4’ suspended ceiling tile; random fissure wavy brown back	None detected (1)
104-CT-3B	Rm 104	2’x4’ suspended ceiling tile; random fissure wavy brown back	None detected (1)
C201-CT-3C	Rm C201	2’x4’ suspended ceiling tile; random fissure wavy brown back	None detected (1)
102-Ft-1A	Rm 102	12”x12” floor tile; turquoise	None detected (TEM) (1)
B1-FT-1B	Rm B1	12”x12” floor tile; turquoise	None detected (1)
C201-FT-1C	Rm C201	12”x12” floor tile; turquoise	None detected (1)

Sample No.	Location	Description	Asbestos Content
101-FT-2A	Rm 101	9”x9” floor tile; brown	**15.8% chrysotile (TEM) [1,3]**
117-FT-3A	Rm 117	12”x12” floor tile; white with baby blue fleck	None detected (TEM) [1]
117-FT-3B	Rm 117	12”x12” floor tile; white with baby blue fleck	None detected [1]
117-FT-3C	Rm 117	12”x12” floor tile; white with baby blue fleck	None detected [1]
101-FT-4A	Stair 101	12”x12” floor tile; beige with brown streaks	**4.7% chrysotile (TEM) [1,3]**
214-FT-5A	Rm 214	Sheet flooring; beige terrazzo look (paper back)	None detected (TEM) [1]
214-FT-5B	Rm 214	Sheet flooring; beige terrazzo look (paper back)	None detected [1]
214-FT-5C	Rm 214	Sheet flooring; beige terrazzo look (paper back)	None detected [1]
215-FT-6A	Rm 215	Sheet flooring; old black paper back	None detected (TEM) [1]
215-FT-6B	Rm 215	Sheet flooring; old black paper back	None detected [1]
215-FT-6C	Rm 215	Sheet flooring; old black paper back	None detected [1]
209-FT-7A	Rm 209	12”x12” floor tile; beige with brown and red brown	**5.7% chrysotile (TEM) [1]**
100A-TS-1A	Soffit 100A	Acoustic spray	None detected [1]
109-TS-1B	Exterior window 109	Acoustic spray	None detected [1]
111-TS-1C	Exterior window 111	Acoustic spray	None detected [1]
100B-TS-1D	Exterior wall 100B	Acoustic spray	None detected [1]
111-TS-1E	Exterior window 111	Acoustic spray	None detected [1]
102-TH-2A	Rm 102	Pipe straight insulation; black	None detected (TEM) [1]
102-TH-2B	Rm 102	Pipe straight insulation; black	None detected [1]
102-TH-2C	Rm 102	Pipe straight insulation; black	None detected [1]
106-TH-3A	Rm 106	Pipe straight insulation anti sweat black paper	None detected (TEM) [1]
106-TH-3B	Rm 106	Pipe straight insulation anti sweat black paper	None detected [1]
106-TH-3C	Rm 106	Pipe straight insulation anti sweat black paper	None detected [1]
102-TH-1	Rm 102	Pipe fitting insulation	**43% chrysotile [1]**
115-TH-4	Rm 115	Pipe straight insulation air cell	**45% chrysotile [1]**
B001-THE-5	Rm B001 inside incinerator	Loose parging material	**76% chrysotile [1,3]**
1-A	Room 207	Mastic on non-asbestos vinyl floor tiles – black coloured	None detected (TEM) [1,3]
1-B	Room 208	Mastic on non-asbestos vinyl floor tiles – black coloured	None detected [1,3]
1-C	Room 211	Mastic on non-asbestos vinyl floor tiles – black coloured	None detected [1,3]

Sample No.	Location	Description	Asbestos Content
2-A	Room 207	Vinyl flooring – green coloured	None detected (TEM) (1,3)
2-B	Room 207	Vinyl flooring – green coloured	None detected (1,3)
2-C	Room 208	Vinyl flooring – green coloured	None detected (1,3)
3-A	Room 207	Paper backing on vinyl flooring	**1.2% chrysotile (1)**
4-A	Room 207	Vinyl baseboard – green coloured	None detected (TEM) (1,3)
4-B	Room 208	Vinyl baseboard – green coloured	None detected (1,3)
4-C	Room 216	Vinyl baseboard – blue coloured	None detected (1,3)
5-A	Room 207	Mastic on vinyl baseboard – light brown coloured	None detected (TEM) (1)
5-B	Room 208	Mastic on vinyl baseboard – light brown coloured	None detected (1)
5-C	Room 216	Mastic on vinyl baseboard – light brown coloured	None detected (1)
6-A	Room 209	Mastic on asbestos vinyl floor tiles – black coloured	None detected (TEM) (1)
6-B	Room 209	Mastic on asbestos vinyl floor tiles – black coloured	None detected (1)
6-C	Room 209	Mastic on asbestos vinyl floor tiles – black coloured	None detected (1)
7-A	Room 209	Vinyl baseboard – black coloured	None detected (TEM) (1,3)
7-B	Room 209	Vinyl baseboard – black coloured	None detected (1,3)
7-C	Room 209	Vinyl baseboard – black coloured	None detected (1,3)
8-A	Room 209	Mastic on black vinyl baseboard – dark brown coloured	None detected (TEM) (1)
8-B	Room 209	Mastic on black vinyl baseboard – dark brown coloured	None detected (1)
8-C	Room 209	Mastic on black vinyl baseboard – dark brown coloured	None Detected (1)
1-A	Room 104	Mortar in concrete block wall	None detected (TEM) (1)
1-B	Room 104	Mortar in concrete block wall	None detected (1)
1-C	Room 104	Mortar in concrete block wall	None detected (1)
2-A	Room 104	Mastic on non-asbestos 12” vinyl floor tile – black coloured	0.37% chrysotile (PLM) (1,2) 0.37% chrysotile (TEM) (1,2)
2-B	Room 108	Mastic on non-asbestos 12” vinyl floor tile – black coloured	None detected (1)
2-C	Room 111	Mastic on non-asbestos 12” vinyl floor tile – black coloured	None detected (1)
3-A	Room 104	Vinyl baseboard – turquoise coloured	None detected (TEM) (1,3)
3-B	Room 108	Vinyl baseboard – turquoise coloured	None detected (1,3)
3-C	Room 111	Vinyl baseboard – turquoise coloured	None detected (1,3)
4-A	Room 104	Mastic on vinyl baseboard – brown coloured	None detected (TEM) (1)

Sample No.	Location	Description	Asbestos Content
4-B	Room 108	Mastic on vinyl baseboard – brown coloured	None detected (1)
4-C	Room 111	Mastic on vinyl baseboard – brown coloured	None detected (1)
5-A	Room 104	Textured finish on south concrete block wall	None detected (1)
5-B	Room 104	Textured finish on south concrete block wall	None detected (1)
5-C	Room 104	Textured finish on south concrete block wall	None detected (1)
6-A	Room 108	Horse hair thermal insulation on cast iron piping	None detected (1)
6-B	Room 108	Horse hair thermal insulation on cast iron piping	None detected (1)
6-C	Room 108	Horse hair thermal insulation on cast iron piping	None detected (1)
7-A	Room 118	Cementitious finish on lower half of concrete block walls – green coloured	None detected (TEM) (1)
7-B	Room 118	Cementitious finish on lower half of concrete block walls – green coloured	None detected (1)
7-C	Room 118	Cementitious finish on lower half of concrete block walls – green coloured	None detected (1)
8-A	Room 118	Mortar base for ceramic floor tile and marble finish	None detected (TEM) (1,3)
8-B	Room 118	Mortar base for ceramic floor tile and marble finish	None detected (1,3)
8-C	Room 118	Mortar base for ceramic floor tile and marble finish	None detected (1,3)
9-A	Room 108	Caulking on exterior window frames – white coloured	**3.2% chrysotile (1,3)**
10-A	Room 111	12” x 12” ceiling tile – large and small hole style (cellulose)	None detected (1)
10-B	Room 111B	12” x 12” ceiling tile – large and small hole style (cellulose)	None detected (1)
10-C	Corridor C101	12” x 12” ceiling tile – large and small hole style (cellulose)	None detected (1)
11-A	Room 111	2’ x 4’ ceiling tile – random fissure with a brown coloured back	None detected (1)
11-B	Room 111B	2’ x 4’ ceiling tile – random fissure with a brown coloured back	None detected (1)
11-C	Corridor C101	2’ x 4’ ceiling tile – random fissure with a brown coloured back	None detected (1)
12-A	Room 108	Drywall joint compound on drywall wall between windows	None detected (1)
12-B	Room 111	Drywall joint compound on drywall wall between windows	None detected (1)
1A	Room B0	Mastic under 9” vinyl floor tile	None detected (1)
1B	Room B0	Mastic under 9” vinyl floor tile	None detected (1)

Sample No.	Location	Description	Asbestos Content
1C	Room B0	Mastic under 9” vinyl floor tile	None detected (1)
2A	Room B0	Concrete block mortar	None detected (1)
2B	Room B0	Concrete block mortar	None detected (1)
2C	Room B0	Concrete block mortar	None detected (1)
3A	Room 001	Refractory brick	None detected (1)
3B	Room 001	Refractory brick	None detected (1)
3C	Room 001	Refractory brick	None detected (1)
4A	Room 001	Cement parging at wall penetration	None detected (1)
4B	Room 001	Cement parging at wall penetration	None detected (1)
4C	Room 001	Cement parging at wall penetration	None detected (1)

NOTES:

(1) Sample results derived from a report prepared by Arcadis Canada Inc. for the Conseil scolaire Viamonde entitled *Pre-Renovation Designated Substances and Hazardous Materials Survey, École élémentaire Renaissance, 1226 Lockhart Road, Burlington, Ontario* dated March 2, 2022.

(2) “Asbestos-containing material” is defined as material that contains 0.5% or more asbestos by dry weight.

(3) Material collected in the area have since been removed and are provided here for references purposes only.

Bulk samples were analyzed by Polarized Light Microscopy (PLM) analysis, except where “TEM” is noted, in which case Transmission Electron Microscopy analysis was also performed.

< = less than.

Chrysotile = Chrysotile asbestos.

Determination of the locations of asbestos-containing material was made based on review of existing information, the results of bulk sample analysis, visual observations and physical characteristics of the applications as well as our knowledge of the uses of asbestos in building materials.

Based on visual observations and results of laboratory analyses of samples collected by Arcadis Canada Inc., the following asbestos-containing materials were found to be present in the designated study areas:

- Thermal insulation applied to pipe fittings above ceilings in Room 110.

As part of previous survey work in the school, Arcadis staff had previously accessed cavities in exterior concrete block walls in several different locations throughout the designated study areas where renovation activities may disturb the concrete block walls. Materials suspected of containing asbestos (e.g. vermiculite block-fill insulation) was not observed in all block wall cavities accessed.

Asbestos-containing thermal insulation applied to pipe fittings is a white-coloured cementitious material.

Glass fibre insulation is readily visually distinguishable (typically yellow in colour) from asbestos-containing insulation materials and was, therefore, not tested for asbestos content.

Thermal insulation is a friable material. The removal, alteration and/or disturbance of less than 1 m^2 of friable asbestos-containing materials is classified as a Type 2 enclosure operation as specified in O.Reg. 278/05. The removal, alteration and/or disturbance of more than 1 m^2 of friable asbestos-containing materials is classified as a Type 3 operation.

Asbestos may also be present in materials which were not sampled during the course of the asbestos survey carried out by Arcadis, including, but not limited to, areas outside the designated study areas, roofing materials, fire doors, gaskets in piping, internal components of boilers, components of electrical equipment (e.g. electric wiring insulation, non-metallic sheathed cable, electrical panel partitions, arc chutes, high-grade electrical paper, etc.), concrete, asphaltic pavement, etc., and/or in locations that are presently inaccessible (e.g., in pipe chases, behind walls, and above suspended gypsum board or plaster ceilings). Confirmatory testing of any such materials could be undertaken as the need arises (i.e., at the time of renovations, modifications or demolition) or the materials can be assumed to contain asbestos based on findings in adjacent areas.

If any materials which may contain asbestos and which were not tested during the course of the designated substances and hazardous materials survey are discovered during any construction activities, the work shall not proceed until such time as the required notifications have been made and an appropriate course of action is determined.

3.2 Lead

Arcadis reviewed a report entitled *Pre-Renovation Designated Substances and Hazardous Materials Survey, École élémentaire Renaissance, 1226 Lockhart Road, Burlington, Ontario* dated May 10, 2021. Information and/or bulk sample analysis results obtained from this existing report was utilized by Arcadis during the course of our investigation and in the preparation of this report.

During the course of our site investigation, the predominant colour of paint observed in the designated study areas was grey and white. Samples of similar paint were previously collected at the facility and are used to represent the paint observed in the designated study areas. Results of bulk sample analysis for lead content obtained from the existing report are provided in Table 3.2.

Table 3.2. Summary of Results of Analyses of Bulk Samples for Lead Content

École élémentaire Renaissance

Sample No.	Sample Location	Sample Description	Lead Content
P01	Room 117	Grey paint on concrete block wall	**2,000 mg/kg** (1)
P02	Room 109	White paint on concrete block wall	**270 mg/kg** (1)

P03	Room 103	Grey paint on radiator	**20,000 mg/kg (1)**

NOTE:

(1) Sample results derived from a report prepared by Arcadis Canada Inc. for the Conseil scolaire Viamonde entitled *Pre-Renovation Designated Substances and Hazardous Materials Survey, École élémentaire Renaissance, 1226 Lockhart Road, Burlington, Ontario* dated May 10, 2021.

< = less than.

mg/Kg = milligrams lead per kilogram paint.

1 mg/Kg - 1 part per million (ppm).

Lead was detected at levels above 90 mg/kg (Surface Coating Materials Regulations criterion value) in all samples of paint collected in the designated study areas.

Lead may also be present in lead pipe, mortar, glazing on ceramic tiles, in the solder on the seals of bell joints of any cast iron drainpipe and in the solder on the sweated-on joints between copper pipe and fittings.

The Ministry of Labour *Guideline – Lead on Construction Projects*, dated April 2011, provides guidance in the measures and procedures that should be followed when handling lead containing materials during construction projects. In the guideline, lead-containing construction operations are classified into three groups - Type 1 (low risk), Type 2 (medium risk) and Type 3 (high risk) based on presumed airborne concentrations of lead, as shown in Appendix C, Table C-2. Any operation that may expose a worker to lead that is not a Type 1, Type 2, or Type 3b operation, is classified as a Type 3a operation.

In addition, the *EACO Lead Abatement Guidelines*, *2014 — Edition 1,* Environmental Abatement Council of Ontario, also provides guidance and recommended work practices.

3.3 Mercury

During the course of our site investigation, fluorescent lights were observed in the designated study areas. Mercury should be assumed to be present as a gas in all fluorescent light tubes and in all paint applications, albeit at low levels. The fluorescent light tubes should be recycled for mercury, if the lights are removed.

Proper procedures for removing mercury-containing equipment (thermostats, for example, and any other mercury-containing equipment found to be present at the time of renovations or demolition) typically involve:

Proper procedures for removing and handling mercury-containing fluorescent light tubes typically involve:

- ensuring that electrical power to light fixtures has been disconnected and locked out;
- taking all necessary precautions to ensure that fluorescent lamp tubes are removed in a manner that prevents breakage; and

- transporting fluorescent lamp tubes to a licensed processing location for separation and recovery of mercury.

The measures and procedures outlined in the MOL *Guideline, Lead on Construction Projects* for control of potential exposure to lead in paint during construction activities will also serve to control potential exposure to any mercury in paint.

3.4 Silica

Materials observed in the designated study areas which should be considered to contain silica included gypsum board, joint compound, concrete, concrete mortar, cement block wall, ceramic tile wall bases, cementitious mortar on the back side of ceramic tile bases, ceramic flooring, and cementitious levelling compound under vinyl floor tiles.

Silica can also be assumed to be present in any gravel ballast on roofs and will also be found in asphalt roofing materials if rock or stone are present in the asphalt.

The Ministry of Labour *Guideline, Silica on Construction Projects*, April 2011, provides guidance in controlling exposure to silica dust during construction activities. In the guideline, silica-containing construction operations are classified into three groups - Type 1 (low risk), Type 2 (medium risk) and Type 3 (high risk) based on presumed airborne concentrations of silica, as shown in Appendix C, Table C-3.

Additional precautionary measures should also be implemented for certain types of materials (e.g., plaster and texture coat materials, including non-asbestos applications, concrete block, etc.). For minor disturbances such as drilling, a HEPA-filtered attachment should be used. For removal of more than a minor amount of material, enclosures should be constructed for dust control and separation of the work area from adjacent areas.

3.5 Vinyl Chloride

As mentioned in Section 2.5 above, vinyl chloride would only be a potential exposure concern in the event of combustion of PVC products.

3.6 Acrylonitrile

As mentioned in Section 2.6 above, acrylonitrile would only be a potential exposure concern in the event of combustion of ABS products.

3.7 Other Designated Substances

No other designated substances (benzene, isocyanates, arsenic, ethylene oxide and coke oven emissions) were observed to be present in the designated study areas, and none would be expected to be encountered in any building materials in a form that would represent an exposure concern. Arsenic may be present at low levels in paint applications. The measures and procedures outlined in the MOL *Guideline, Lead on*

Construction Projects for control of potential exposure to lead in paint during construction activities will also serve to control potential exposure to any arsenic (or mercury) in paint.

3.8 Polychlorinated Biphenyls (PCBs)

Fluorescent lights were observed in the designated study areas during the course of our site investigation. Light ballasts, such as those associated with the type of fluorescent lights (T8s) observed in the designated study areas, are usually an electronic-type which do not contain PCBs, however, this would be confirmed by an electrician at the time of dismantling of the lights.

3.9 Ozone-Depleting Substances (ODS) and Other Halocarbons

Portable air-conditioning units potentially containing ODS were observed in the windows of Rooms 102, 102A, 103, 109 and 111 during the course of the site investigation.

If any ODS-containing equipment is to be removed, then they must be handled in the following manner:

- any equipment designated for disposal as scrap must be drained of its contents by a licensed technician and equipped with a label indicating that the equipment no longer contains any refrigerant. The specific requirements for information on the label, as specified in the regulation, must be adhered to;
- equipment designated for relocation to another facility owned by Board must be drained and labelled, as above; and
- any equipment that is drained to facilitate relocation to another facility owned by Board must be tested for leaks prior to re-filling. The equipment must be re-filled within six months of the leak test.

3.10 Mould

Readily evident mould was not observed during the course of the site investigation. The inspection of mould was limited to visual observations of readily-accessible surfaces and did not include intrusive inspections of wall cavities. During renovations or interior demolition work, any mould-impacted materials uncovered/discovered should be remediated following the measures and procedures outlined in the *Canadian Construction Association Standard Construction Document CCA-82 2004 - Mould Guidelines for the Canadian Construction Industry*.

4 USE AND LIMITATIONS OF THIS PRE-RENOVATION DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY REPORT

This report, prepared for Conseil scolaire Viamonde does not provide certification or warranty, expressed or implied, that the investigation conducted by Arcadis Canada Inc. identified all designated substances (as defined in the Ontario *Occupational Health and Safety Act*) in the designated study areas at the subject facility. The work undertaken by Arcadis Canada Inc. was directed to provide information on the presence of designated substances in building construction materials based on review of existing information, visual investigation of readily accessible areas in the designated study areas of the building and on the results of laboratory analysis of a limited number of bulk samples of material for asbestos content and laboratory analysis of a limited number of paint (and mortar, if applicable) samples for lead content. The survey did not include for identification of asbestos in process materials, equipment (including electrical equipment and wiring), furniture (e.g., chairs, table tops, chalkboards, etc.), nor material outside of the building (e.g., asphaltic pavement).

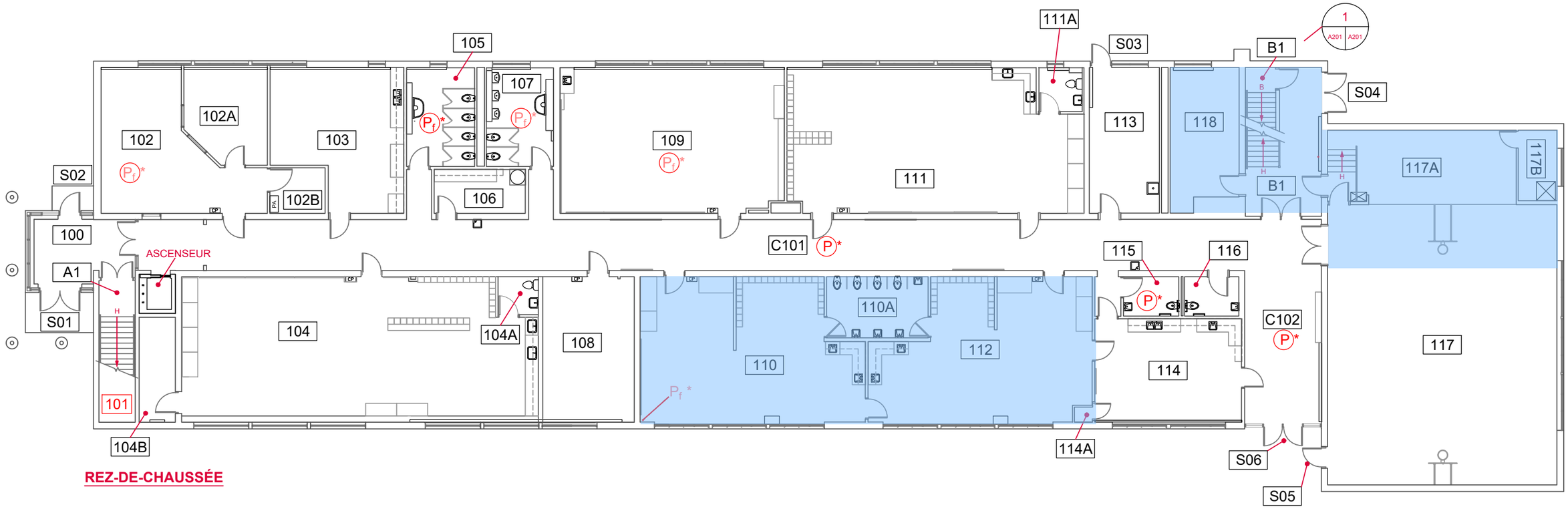
The material in this report reflects Arcadis Canada Inc.'s best judgment in light of the information available at the time of the investigation, which was performed on December 1, 2022.

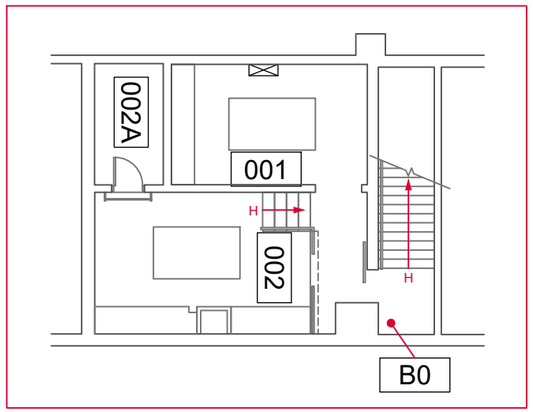
This report is not intended to be used as a scope of work or technical specification for remediation of designated substances or hazardous materials.

This report was prepared by Arcadis Canada Inc. for Conseil scolaire Viamonde. Any use which any other party makes of the report, or reliance on, or decisions to be based on it, is the responsibility of such parties.

APPENDIX A

Floor Plans





1 / A201 / A201 **SOUS-SOL**

LEGEND:

- 109 — FUNCTIONAL SPACE
- ◯ — THROUGHOUT FUNCTIONAL SPACE
- * — ABOVE CEILING ASSEMBLY
- P_f — ASBESTOS ON PIPE FITTINGS ONLY
- FT — ASBESTOS FLOORING
- P — ASBESTOS ON PIPE (STRAIGHTS AND FITTINGS)
- STUDY AREA

NOTES:

ARCADIS

Conseil scolaire Viamonde

PRE-RENOVATION DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY

LOCATIONS OF ASBESTOS-CONTAINING MATERIALS

ÉCOLE ÉLÉMENTAIRE RENAISSANCE

REZ-DE-CHAUSSÉE & SOUS - SOL

Drawn By: GEC.	Approved By: V.D	Project No: 30156922
Date: JAN 2023	Scale: N.T.S	Drawing No: 30156922-1

APPENDIX B

Laboratory Reports

APPENDIX C

Summary of Asbestos, Lead and Silica Work Classifications

TABLE C-1
SUMMARY OF CLASSIFICATION OF TYPE 1, 2 AND 3 OPERATIONS (Ont. Reg. 278/05)

TYPE 1 OPERATIONS

- removing less than 7.5 m^2 asbestos-containing ceiling tiles;
- removing non-friable asbestos-containing material other than ceiling tiles, if the material is removed without being broken, cut, drilled, abraded, ground, sanded or vibrated;
- breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material if the material is wetted and the work is done only using non-powered, hand-held tools; and
- removing less than 1 m^2 of drywall in which asbestos-containing joint compounds have been used.

TYPE 2 OPERATIONS

- removing all or part of a false ceiling to obtain access to a work area, if asbestos-containing material is likely to be lying on the surface of the false ceiling;
- removal of one square metre or less of friable asbestos-containing material;
- enclosing friable asbestos-containing material;
- applying tape or a sealant or other covering to asbestos-containing pipe or boiler insulation;
- removing 7.5 m^2 or more asbestos-containing ceiling tiles (if removed without being broken, cut, drilled, abraded, ground, sanded or vibrated);
- breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material if the material is not wetted and the work is done only using non-powered, hand-held tools;
- removal of one square metre or more of drywall in which asbestos-containing joint compounds have been used;
- breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material if the work is done using power tools that are attached to dust-collecting devices equipped with HEPA filters;
- cleaning or removing filters used in air-handling equipment in a building that has asbestos-containing sprayed fireproofing.

TABLE C-1 (Continued)
SUMMARY OF CLASSIFICATION OF TYPE 1, 2 AND 3 OPERATIONS (Ont. Reg. 278/05)

TYPE 3 OPERATIONS

- removal of more than one square metre of friable asbestos-containing material;
- spray application of a sealant to friable asbestos-containing material;
- cleaning or removing air-handling equipment, including rigid ducting but not including filters, in a building that has sprayed asbestos-containing fireproofing;
- repairing or demolishing a kiln, metallurgical furnace or similar structure that is made in part of asbestos-containing refractory materials;
- breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing materials, if the work is done using power tools that are not attached to dust-collecting devices equipped with HEPA filters.

TABLE C-2
SUMMARY OF CLASSIFICATION OF LEAD-CONTAINING CONSTRUCTION TASKS
MOL GUIDELINE – LEAD ON CONSTRUCTION PROJECTS, APRIL 2011

Type 1 Operations	Type 2 Operations		Type 3 Operations	
	Type 2a	Type 2b	Type 3a	Type 3b
<0.05 mg/m^3	>0.05 to 0.50 mg/m^3	>0.50 to 1.25 mg/m^3	>1.25 to 2.50 mg/m^3	>2.50 mg/m^3

Note: The classification of Type 1, 2 and 3 operations is based on presumed airborne concentrations of lead, as shown above.

TYPE 1 OPERATIONS

- application of lead-containing coatings with a brush or roller;
- removal of lead-containing coatings with a chemical gel or paste and fibrous laminated cloth wrap;
- removal of lead-containing coatings or materials using a power tool that has an effective dust collection system equipped with a HEPA filter;
- installation or removal of lead-containing sheet metal;
- installation or removal of lead-containing packing, babbit or similar material;
- removal of lead-containing coatings or materials using non-powered hand tools, other than manual scraping or sanding;
- soldering.

TYPE 2 OPERATIONS

Type 2a Operations

- welding or high temperature cutting of lead-containing coatings or materials outdoors. This operation is considered a Type 2a operation only if it is short-term, not repeated, and if the material has been stripped prior to welding or high temperature cutting. Otherwise it will be considered a Type 3a operation;
- removal of lead-containing coatings or materials by scraping or sanding using non-powered hand tools;
- manual demolition of lead-painted plaster walls or building components by striking a wall with a sledgehammer or similar tool.

Type 2b Operations

- spray application of lead-containing coatings.

TABLE C-2 (Continued)
SUMMARY OF CLASSIFICATION OF LEAD-CONTAINING CONSTRUCTION TASKS
MOL GUIDELINE – LEAD ON CONSTRUCTION PROJECTS, APRIL 2011

TYPE 3 OPERATIONS

Type 3a Operations

- welding or high temperature cutting of lead-containing coatings or materials indoors or in a confined space;
- burning of a surface containing lead;
- dry removal of lead-containing mortar using an electric or pneumatic cutting device;
- removal of lead-containing coatings or materials using power tools without an effective dust collection system equipped with a HEPA filter;
- removal or repair of a ventilation system used for controlling lead exposure;
- demolition or cleanup of a facility where lead-containing products were manufactured;
- an operation that may expose a worker to lead dust, fume or mist that is not a Type 1, Type 2, or Type 3b operation

Type 3b Operations

- abrasive blasting of lead-containing coatings or materials;
- removal of lead-containing dust using an air mist extraction system.

TABLE C-3

SUMMARY OF CLASSIFICATION OF SILICA-CONTAINING CONSTRUCTION TASKS

MOL GUIDELINE, SILICA ON CONSTRUCTION PROJECTS, APRIL 2011

	Type 1 Operations	Type 2 Operations	Type 3 Operations
Cristobalite and Tridymite	>0.05 to 0.50 mg/m^3	>0.50 to 2.50 mg/m^3	>2.5 mg/m^3
Quartz and Tripoli	>0.10 to 1.0 mg/m^3	>1.0 to 5.0 mg/m^3	>5.0 mg/m^3

Note: The classification of silica-containing construction tasks is based on presumed concentrations of respirable crystalline silica, as shown above.

TYPE 1 OPERATIONS

- The drilling of holes in concrete or rock that is not part of a tunnelling operation or road construction.
- Milling of asphalt from concrete highway pavement.
- Charging mixers and hoppers with silica sand (sand consisting of at least 95 per cent silica) or silica flour (finely ground sand consisting of at least 95 per cent silica).
- Any other operation at a project that requires the handling of silica-containing material in a way that may result in a worker being exposed to airborne silica.
- Entry into a dry mortar removal or abrasive blasting area while airborne dust is visible for less than 15 minutes for inspection and/or sampling.
- Working within 25 metres of an area where compressed air is being used to remove silica-containing dust outdoors.

TYPE 2 OPERATIONS

- Removal of silica containing refractory materials with a jackhammer.
- The drilling of holes in concrete or rock that is part of a tunnelling or road construction.
- The use of a power tool to cut, grind, or polish concrete, masonry, terrazzo or refractory materials.
- The use of a power tool to remove silica containing materials.
- Tunnelling (operation of the tunnel boring machine, tunnel drilling, tunnel mesh installation).
- Tuckpoint and surface grinding.
- Dry mortar removal with an electric or pneumatic cutting device.
- Dry method dust cleanup from abrasive blasting operations.
- The use of compressed air outdoors for removing silica dust.
- Entry into area where abrasive blasting is being carried out for more than 15 minutes.

TABLE C-3 (Continued)
SUMMARY OF CLASSIFICATION OF SILICA-CONTAINING CONSTRUCTION TASKS
MOL GUIDELINE, SILICA ON CONSTRUCTION PROJECTS, APRIL 2011

TYPE 3 OPERATIONS

- Abrasive blasting with an abrasive that contains ≥ 1 per cent silica.
- Abrasive blasting of a material that contains ≥ 1 per cent silica.

Arcadis Canada Inc.

121 Granton Drive, Suite 12, Richmond Hill, Ontario L4B 3N4

Tel 905 764 9380

www.arcadis.com

FINAL

Geotechnical Investigation – Proposed Building Addition

1226 Lockhart Road, Burlington, Ontario

Prepared for:

Workshop Architecture Inc. c/o
Conseil Scolaire Viamonde
116 Cornelius Parkway
Toronto, Ontario M6L 2K5

February 7, 2023

Pinchin File: 313698

Issued to:	**Workshop Architecture Inc. c/o Conseil Scolaire Viamonde**
Issued on:	**February 7, 2023**
Pinchin File:	**313698**
Issuing Office:	**Waterloo, ON**

Author:
Karanveer Singh
Senior Project Technologist
226.808.7014
ksingh@pinchin.com

Reviewer:
Vanessa Marshall, M.Eng., P.Eng.
National Practice Leader, Geotechnical Services
519.904.4660
vmarshall@pinchin.com

Reviewer:
Jeff Dietz, P.Eng.
Senior Technical Manager, Geotechnical Services
519.589.3768
jdietz@pinchin.com

TABLE OF CONTENTS

1.0 INTRODUCTION AND SCOPE 1
2.0 SITE DESCTIPTION AND GEOLOGICAL SETTING 2
3.0 GEOTECHNICAL FIELD INVESTIGATION AND METHODOLOGY 2
4.0 LIMITED ENVIRONMENTAL SOIL SAMPLING PROGRAM AND METHODOLOGY 3
4.1 Scope of Work 3
4.2 Analytical Laboratory 3
4.3 Site Condition Standards and Analytical Results 4
5.0 SUBSURFACE CONDITIONS 5
5.1 Borehole Soil Stratigraphy 5
5.2 Test Pit Soil Stratigraphy 5
5.3 Groundwater Conditions 6
6.0 GEOTECHNICAL DESIGN RECOMMENDATIONS 7
6.1 General Information 7
6.2 Site Preparation 7
6.3 Open Cut Excavations 8
6.4 Foundation Design 9
6.4.1 Shallow Foundations Bearing on Glacial Till or Engineered Fill 9
6.4.2 Soil Corrosivity and Sulphate Attack on Concrete 10
6.4.3 Site Classification for Seismic Site Response & Soil Behaviour 11
6.4.4 Estimated Settlement 12
6.4.5 Building Drainage 12
6.4.6 Shallow Foundations Frost Protection & Foundation Backfill 12
6.5 Floor Slabs 13
6.6 Asphaltic Concrete Pavement Structure Design for Parking Lot and Playground 14
6.6.1 Discussion 14
6.6.2 Pavement Structure 14
6.6.3 Pavement Structure Subgrade Preparation and Granular up Fill 14
6.6.4 Drainage 15
7.0 SITE SUPERVISION & QUALITY CONTROL 15
8.0 TERMS AND LIMITATIONS 16

FIGURES

Figure 1	Key Map
Figure 2	Borehole Location Plan

APPENDICES

APPENDIX I	Abbreviations, Terminology and Principle Symbols used in Report and Borehole Logs
APPENDIX II	Pinchin's Borehole Logs
APPENDIX III	Laboratory Testing Reports for Soil Samples
APPENDIX IV	Analytical Laboratory Testing Reports for Soil Samples
APPENDIX V	Report Limitations and Guidelines for Use

1.0 INTRODUCTION AND SCOPE

Pinchin Ltd. (Pinchin) was retained by Workshop Architecture Inc. c/o Conseil Scolaire Viamonde (Client) to conduct a Geotechnical Investigation and provide subsequent geotechnical design recommendations for the proposed building addition (Site) to be located at 1226 Lockhart Road, Burlington, Ontario. The Site location is shown on Figure 1.

Based on information provided by the Client, it is Pinchin's understanding that the development will consist of a 550 m^2 single-storey slab-on-grade (i.e. no basement level) building addition to the south of the west end of the school existing building located at the Site.

Pinchin's geotechnical comments and recommendations are based on the results of the Geotechnical Investigation and our understanding of the project scope.

The purpose of the Geotechnical Investigation was to delineate the subsurface conditions and soil engineering characteristics by advancing a total of six (6) sampled boreholes (Boreholes BH1 to BH6), and one test pit (TP1) at the Site.

Based on a desk top review and the results of the Geotechnical Investigation, the following geotechnical data and engineering design recommendations are provided herein:

- A detailed description of the soil and groundwater conditions;
- Site preparation recommendations;
- Open cut excavations;
- Anticipated groundwater management;
- Foundation design recommendations including soil bearing resistances at Ultimate Limit States (ULS) and Serviceability Limit States (SLS) design;
- Potential total and differential settlements;
- Foundation frost protection and engineered fill specifications and installation;
- Seismic Site classification for seismic Site response;
- Concrete floor slab-on-grade support recommendations;
- Asphaltic concrete pavement structure design for parking areas and playground; and
- Potential construction concerns.

Abbreviations terminology and principle symbols commonly used throughout the report, borehole logs and appendices are enclosed in Appendix I.

2.0 SITE DESCTIPTION AND GEOLOGICAL SETTING

The Site is located on the south corner of the intersection of Maple Avenue and Lockhart Road in Burlington, Ontario. The Site is currently developed with a single-storey school building with a mechanical room basement along a portion of the south edge of the building, near the west end. There are parking lots on the east and west side and a playground on the south side of the existing building.

Data obtained from the Ontario Geological Survey Maps, as published by the Ontario Ministry of Energy, Northern Development and Mines, indicates that the Site is located on fine-textured glaciolacustrine deposits of silt and clay, minor sand and gravel (Ontario Geological Survey 2010, Surficial geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 128-REV). The underlying bedrock at this Site is of the Queenston formation consisting of limestone (Armstrong, D.K. and Dodge, J.E.P. 2007, Paleozoic geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 219).

3.0 GEOTECHNICAL FIELD INVESTIGATION AND METHODOLOGY

Pinchin completed field investigations at the Site on October 24 and November 5, 2022 by advancing a total of six (6) sampled boreholes (Boreholes BH1 to BH6) and a test pit (TP1) throughout the Site. The boreholes were advanced to depths of approximately 3.8 to 4.6 metres below existing ground surface and the test pit was advanced to depths of approximately 3.3 metres below existing ground surface (mbgs). The approximate spatial locations of the boreholes/test pit advanced at the Site are shown on Figure 2.

The boreholes were advanced with the use of a Geoprobe 7822 DT direct push drill rig which was equipped with standard soil sampling equipment. Soil samples were collected at 0.75 m intervals using a 51 mm outside diameter (OD) split spoon barrel in conjunction with Standard Penetration Tests (SPT) “N” values (ASTM D1586). The SPT “N” values were used to assess the compactness condition of the non-cohesive soil. Approximate shear strengths of the cohesive deposits were measured using a handheld pocket penetrometer and the results are presented on the appended borehole logs.

Groundwater observations and measurements were obtained from the open boreholes during and upon completion of drilling. The groundwater observations and measurements recorded are included on the appended borehole logs.

The field investigation was monitored by experienced Pinchin personnel. Pinchin logged the drilling operations and identified the soil samples as they were retrieved. The recovered soil samples were sealed into plastic bags and carefully transported to Pinchin’s accredited materials testing laboratory for detailed analysis and testing. All soil samples were classified according to visual and index properties by the project engineer.

The field logging of the soil and groundwater conditions was performed to collect geotechnical engineering design information. The borehole logs include textural descriptions of the subsoil in

accordance with a modified Unified Soil Classification System (USCS) and indicate the soil boundaries inferred from non-continuous sampling and observations made during the borehole advancement. These boundaries reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The modified USCS classification is explained in further detail in Appendix I. Details of the soil and groundwater conditions encountered within the boreholes are included on the Borehole Logs within Appendix II.

Select soil samples collected from the boreholes were submitted to Pinchin's material testing laboratory to determine the grain size distribution of the soil. A copy of the laboratory analytical reports is included in Appendix III. In addition, the collected samples were compared against previous geotechnical information from the area, for consistency and calibration of results.

4.0 LIMITED ENVIRONMENTAL SOIL SAMPLING PROGRAM AND METHODOLOGY

This Limited Soil Sampling Program was completed in general accordance with the Canadian Standards Association document entitled "*Phase II Environmental Site Assessment, CSA Standard Z769-00 (R2018)*", dated 2000 and reaffirmed in 2018.

It is noted that this soil sampling plan does not meet the requirements of Ontario Regulation 406/19, On-Site and Excess Soil Management and additional studies including sampling, analysis and reporting will be required for excess soil generated at the Site in order to meet the requirements of Ontario Regulation 406/19.

4.1 Scope of Work

The scope of work for the Limited Soil Sampling Program included the following activities:

- Submit a total of three most-apparent "worst case" soil sample, based on the field screening methodologies, from the geotechnical borehole for chemical analyses of soil conductivity, pH, oxidation-reduction potential, sulfides, and moisture.
- Compare the soil and groundwater laboratory analytical results with the applicable standards stipulated in the *MECP Standards*; and
- Incorporate the laboratory analytical results into the geotechnical report.

4.2 Analytical Laboratory

Selected soil samples were delivered to ALS Environmental in Waterloo for analysis. ALS Environmental is an independent laboratory accredited by the Standards Council of Canada and the Canadian Association for Laboratory Accreditation. Formal chain of custody records of the sample submissions were maintained between Pinchin and the staff at ALS Environmental.

4.3 Site Condition Standards and Analytical Results

The Site is located within the City of Burlington. It is Pinchin's understanding that potable water for the Site and surrounding area is supplied by the City of Burlington drinking water system, with Lake Ontario as the water source, therefore non-potable conditions apply.

Ontario Regulation 153/04 (as amended) states that a Site is classified as an "environmentally sensitive area" if the pH of the surface soil (less than 1.5 mbgs) is less than 5 or greater than 9, the pH of the subsurface soil (greater than 1.5 mbgs) is less than 5 or greater than 11, or if the Site is an area of natural significance or is adjacent to or contains land within 30 metres of an area of natural significance.

Based on Pinchin's understanding of the Site, the Site is not located in or adjacent to, nor does it contain land within 30 m of, an area of natural significance. It is understood that soil will be removed from the Site during the construction of the building addition. Therefore, Pinchin compared the analytical results to the following Excess Soil Quality Standards (ESQS) provided in the Excess Soil Rules in order to provide information for evaluating potential reuse sites:

- *"Table 1: Full Depth Background Site Condition Standards"* for agricultural and other property use *(Table 1 SCS) and*
- *"Table 3.1: Full Depth Excess Soil Quality Standards in a Non Potable Ground Water"* for residential/parkland/institutional property use *(Table 3.1 ESQS)*.

As noted in the analytical results provided in Appendix IV reported concentrations of Barium exceeded the Table 1 SCS for the sample tested from Borehole BH6. Therefore the material from in and around Borehole BH6 can not be reused at a Site need to meet Table 1 SCS criteria.

Exceedances to Table 1 SCS were also noted for Sodium Adsorption Ratio (SAR) and Electrical Conductivity (EC) for each sample. When compared to Table 3.1 ESQS, exceedance for Sodium Absorption Ratio (SAR) and Electrical Conductivity (EC) were noted for the samples obtained from Boreholes BH1 and BH6 and exceedance for Electrical Conductivity (EC) was noted for the sample tested for Test Pit TP1. It is noted that concentrations of SAR and EC with results above the applicable standards are deemed to meet the soil quality standards if the exceedance is a result of de-icing / snow removal activities. These soils may be reused in areas exposed to de-icing activities and other suitable sites as per the applicable standards and regulations.

5.0 SUBSURFACE CONDITIONS

5.1 Borehole Soil Stratigraphy

In general, the soil stratigraphy at the Site consists of fill underlain by glacial till, which is intern underlain by bedrock. The appended borehole logs provide detailed soil descriptions and stratigraphies, results of SPT and pocket penetrometer testing, moisture content profiles, and groundwater measurements.

Asphaltic concrete was encountered surficially at all borehole locations except borehole BH6 and was found to be approximately 80 to 100 mm thick. Fill material was encountered below the asphaltic concrete in those boreholes as well as surficially in borehole BH6 and extended to depths ranging from 1.1 to 2.0 mbgs. The fill below the asphalt to depths of 0.5 to 1.5 mbgs ranged in composition from sand and gravel to silty sand with trace gravel and may be part of the pavement structure. The remainder of the fill material varied in composition from silty sand to clayey silt, trace sand and gravel. The fill material has a loose to dense relative density based on SPT 'N' values of 7 to 30 blows per 300 mm penetration of a split spoon sampler. At the time of sampling, the fill material was generally moist to wet.

Glacial till was encountered underlying the asphalt and granular fill within all boreholes and extended to depths ranging between 3.8 and 4.6 mbgs. The lower limit of the glacial till in the depth ranges noted may have comprised highly weathered shale bedrock. The glacial till generally comprised sandy silt trace clay and gravel to clayey silt trace sand and gravel. The cohesive glacial till had a very stiff to hard consistency based on shear strengths measured with a handheld pocket penetrometer of 100 kPa to greater than 225 kPa and on SPT 'N' values of 16 to greater than 50 blows per 300 mm penetration of a split spoon sampler.

The results of two particle size distribution analyses completed on samples of the glacial till are provided in Appendix III and are also presented in the following table:

Borehole and Sample No.	Sample Depth (mbgs)	% Gravel	% Sand	% Silt	% Clay
BH2 SS3	1.5 - 2.1	1	24	70	5
BH5 SS3	1.5 – 2.1	10	24	50	16

5.2 Test Pit Soil Stratigraphy

Pinchin completed one test pit adjacent to the proposed addition, in the area of the existing building's mechanical room basement, to confirm the existing foundation wall/footing dimensions and soils at the existing foundation depth; however, at the time of test pit completion the founding soils could not be confirmed as an existing clay tile was encountered at 3.3 mbgs and the test pit was terminated at this depth. The soil stratigraphy as observed at the test pit location consisted of surficial pavement structure underlain by fill and possible fill material which extended beyond the test pit termination depth of

3.3 mbgs. Upon completion of the test pit, 0.05 m of free water were noted within the open test pit. It is possible that this water accumulation is a result of the hydro-vac activities. The following table summarizes the observations and measurements at test pit TP1 location:

Test Pit No.	Depth (mbgs)	Stratigraphy
TP1	0.0 – 0.1	Asphalt – 100 mm in thickness
	0.1 – 0.6	Fill – Brown sand and gravel, some silt
	0.6 – 2.0	Fill – Reddish brown silt, trace sand, trace to some gravel, moist; pieces of brick visible in sidewall at 1.0 mbgs
	2.0 – 3.1	Fill – Grey brown silt, trace sand and gravel, wet to saturated (observed moisture could be result from hydro-vac activity) Gas like odor noted
	3.1 – 3.3	Possible Fill – Grey brown silt, trace sand, some gravel to gravelly, some cobbles, pieces of shale
	3.3	Top of clay tile encountered at 3.3 mbgs. Unable to visually verify footing projection or depth of footing underside.

The foundation wall consisted of concrete blocks and was exposed in the side of the test pit to the depth of the top of clay tile.

5.3 Groundwater Conditions

Groundwater observations and measurements were obtained in the open boreholes at the completion of drilling and are summarized on the appended borehole logs. No free groundwater was encountered during and after completion of drilling/test pit excavation indicating that the stabilized groundwater level is below the depth of exploration; or, that groundwater is within the depth of exploration but was not observed because it is contained within the relatively impermeable portions of the glacial till.

Seasonal variations in the water table should be expected, with higher levels occurring during wet weather conditions in the spring and fall and lower levels occurring during dry weather conditions.

6.0 GEOTECHNICAL DESIGN RECOMMENDATIONS

6.1 General Information

The recommendations presented in the following sections of this report are based on the information available regarding the proposed construction, the results obtained from the geotechnical investigation, and Pinchin's experience with similar projects. Since the investigation only represents a portion of the subsurface conditions, it is possible that conditions may be encountered during construction that are substantially different than those encountered during the investigation. If these situations are encountered, adjustments to the design may be necessary. A qualified geotechnical engineer should be on-Site during the foundation preparation to ensure the subsurface conditions are the same/similar to what was observed during the investigation.

It is Pinchin's understanding that the development will consist of a 550 m^2 single storey slab-on-grade (i.e. no basement level) building addition to the south of the west end of the existing building located at 1226 Lockhart Road, Burlington, Ontario.

6.2 Site Preparation

The existing fill is not considered suitable to remain below the proposed building, driveways and parking areas and will need to be removed. In calculating the approximate quantity of topsoil/fill to be stripped, we recommend that the topsoil/fill thicknesses provided on the individual borehole logs be increased by 50 mm to account for variations and some stripping of the mineral soil below. It is noted that the 3.3 m of fill encountered in the test pit is expected to be backfill for the existing building's basement wall. The fill below the majority of the proposed addition is expected to be in the order of 1 to 2 m thick.

Pinchin recommends that any engineered fill required at the Site be compacted in accordance with the criteria stated in the following table:

Type of Engineered Fill	Maximum Loose Lift Thickness (mm)	Compaction Requirements	Moisture Content (Percent of Optimum)
Structural fill to support foundations and floor slabs	200	100% SPMDD	Plus 2 to minus 4
Subgrade fill beneath parking lots and access roadways	300	98% SPMDD	Plus 2 to minus 4

Prior to placing any fill material at the Site, the subgrade should be inspected by a qualified geotechnical engineer and loosened/soft pockets should be sub excavated and replaced with engineered fill.

Structural fill must extend at least 1 m beyond the proposed edge of footing and then downwards and outwards at 1 horizontal to 1 vertical to competent subgrade.

It is recommended that any fill required to raise grades below the proposed building addition comprise imported Ontario Provincial Standards and Specifications (OPSS) 1010 Granular 'B' or Select Subgrade Material (SSM). If the work is carried out during very dry weather, water may have to be added to the material to improve compaction.

A qualified geotechnical engineering technician should be on site to observe fill placement operations and perform field density tests at random locations throughout each lift, to indicate the specified compaction is being achieved.

6.3 Open Cut Excavations

Excavations for removal of existing fill below the proposed addition will extend to the bottom of the existing building's basement. Based on the results of Test Pit 1, excavations may be up to about 3.5 m deep.

Based on the subsurface information obtained from within the boreholes, it is anticipated that the excavated material will predominately consist of granular fill and native glacial till material. No free groundwater was encountered in the open boreholes at the time of field investigation.

Where workers must enter trench excavations deeper than 1.2 m, the trench excavations should be suitably sloped and/or braced in accordance with the Occupational Health and Safety Act (OHSA), Ontario Regulation 213/91, Construction Projects, July 1, 2011, Part III - Excavations, Section 226. Alternatively, the excavation walls may be supported by either closed shoring, bracing, or trench boxes complying with sections 235 to 239 and 241 under O. Reg. 231/91, s. 234(1). The use of trench boxes can most likely be used for temporary support of vertical side walls. The appropriate trench should be designed/confirmed for use in this soil deposit.

Based on the OHSA, the glacial till soils would be classified as Type 2 soil and temporary excavations in these soils may be cut vertical in the bottom 1.2 m and must be sloped back at an inclination of 1 horizontal to 1 vertical (H to V) above this Excavations extending below the groundwater table would be classified as a Type 4 soil and temporary excavations will have to be sloped back at 3 horizontal to 1 vertical from the base of the excavation. Excavations through more than one soil type must be completed in accordance with the requirements for the soil type with the highest number.

In addition to compliance with the OHSA, the excavation procedures must also be in compliance to any potential other regulatory authorities, such as federal and municipal safety standards.

Alternatively, the excavation walls may be supported by either closed shoring, or bracing, complying with sections 235 to 239 and 241 under O. Reg. 231/91, s. 234(1). Pinchin would be pleased to provide further recommendations on shoring design once the building plans have been completed.

6.4 Foundation Design

As per the results of the borehole investigation it is understood that the bedrock at the site is below frost depth, and it is assumed that footings for the addition will bear on native mineral soil or engineered fill and will not be extended down to bedrock. Pinchin can provide additional recommendations related to extending footings down to bedrock, if required.

6.4.1 Shallow Foundations Bearing on Glacial Till or Engineered Fill

The existing glacial till soil is considered suitable to support the proposed building, provided all of the pavement structure, fill, topsoil are removed, and the subgrade prepared as above. E*ngineered structural fill will be needed following removal of the existing fill below the footprint of the proposed addition. Engineered fill placed as per the requirements noted in Section 6.2 of this report will also be suitable to support footings for the proposed building.*

Conventional shallow strip footings established on the inorganic stiff/very stiff silt or approved engineered fill, may be designed using a bearing resistance for 25 mm of settlement at Serviceability Limit States of 150 kPa, and a factored geotechnical bearing resistance of 225 kPa at Ultimate Limit States (ULS).

New footings adjacent to the existing building's foundations should be constructed at the same level as the existing footings. The new footings can be stepped up at 0.6 m increments, with at least 0.6 m horizontal distance between steps.

As the actual service loads were not known at the time of this report, these should be reviewed by the project structural engineer to determine if SLS or ULS governs the footing design.

It is noted that there is a potential for weaker subgrade soil to be encountered between the investigation locations. Pinchin presumes that any areas of weaker subgrade soil will consist of small pockets of soft/loose natural soil which can be compacted to match the density of the remainder of the Site. As such, the material must be compacted to a minimum of 100% Standard Proctor Maximum Dry Density (SPMDD) prior to installing the concrete formwork. Any soft/loose areas which are not able to achieve the recommended 100% SPMDD are to be removed and replaced with a low strength concrete.

Pinchin notes that a qualified geotechnical engineering consultant should be on-Site during the proof roll and foundation preparation activities to verify the recommended level of compaction is achieved and to verify the design assumptions and recommendations. This is especially critical with respect to the recommended soil bearing pressures. If variations occur in the soil conditions between the borehole locations, site verification and site review by Pinchin is recommended to provide appropriate recommendations at that time.

The natural subgrade soil is sensitive to change in moisture content and can become loose/soft if subjected to additional water or precipitation. As well, it could be easily disturbed if travelled on during construction. Once it becomes disturbed it is no longer considered adequate to support the recommended design bearing pressures. It is recommended that a working slab of lean concrete (mud slab) be placed in the footing areas immediately after excavation and inspection to protect the founding soils during placement of formwork and reinforcing steel.

In addition, to ensure and protect the integrity of the subgrade soil during construction operations, the following is recommended:

- Prior to commencing excavations, it is critical that all existing surface water, potential surface water and perched groundwater are controlled and diverted away from the work Site to prevent infiltration and subgrade softening. At no time should excavations be left open for a period of time that will expose them to inclement weather conditions and cause subgrade softening;
- The subgrade should be sloped to a sump outside the excavation to promote surface drainage and the collected water pumped out of the excavation. Any potential precipitation or seepage entering the excavations should be pumped away immediately (not allowed to pond);
- The footing areas should be cleaned of all deleterious materials such as topsoil, organics, fill, disturbed, caved materials or loosened bedrock pieces;
- Any potential large cobbles or boulders (i.e. greater than 200 mm in diameter) within the subgrade material are to be removed and replaced with a similar soil type not containing particles greater than 200 mm in diameter. It is critical that particles greater than 200 mm in diameter are not in contact with the foundation to prevent point loading and overstressing; and
- If the excavated subgrade soil remains open to weather conditions and groundwater seepage, sidewall stability and suitability of the subgrade soil will need to be verified prior to construction.

If construction proceeds during freezing weather conditions, adequate temporary frost protection for the footing bases and concrete must be provided and maintained above freezing at all times.

6.4.2 Soil Corrosivity and Sulphate Attack on Concrete

Two soil sample were submitted to ALS Laboratories Ltd. in Waterloo to assess the corrosivity of the soil and potential for sulphate attack on concrete. The assessment was completed using the 10-point soil evaluation procedure, provided in the Appendix to the American Water Works Association A21.5 Standard, as recommended by the Ductile Iron Pipe Research Association (DIPRA). The soil sample was

evaluated for the following parameters: soil resistivity, pH, redox potential, sulfides, and moisture. Each parameter is assessed and assigned a point value, and the points are totalled. If the total is equal or greater than 10, the soil is considered corrosive to ductile iron pipe. In this case, protective measure must be undertaken. The following table summarizes the 10-point soil evaluation for the tested samples:

Parameter	BH1, SS3 1.5 - 2.1 mbgs		BH3, SS3 1.5 – 2.1 mbgs	
	Results	Points	Results	Points
Resistivity (ohm-cm)	530	10	960	10
pH	7.8	0	7.9	0
Redox Potential (mV)	405	0	329	0
Sulfide (mg/kg)	0.62	2	0.68	2
Moisture	Poor drainage, continuously wet	2	Poor drainage, continuously wet	2
Total Points		**14**		**14**

In summary, the tested samples indicate a high potential for soil corrosivity, and additional protective measures are required and this should be reviewed by the project engineer.

Parameter	BH1, SS3 1.5 – 2.1 mbgs	BH3, SS3 1.5 – 2.1 mbgs
	Results	Results
Sulphate (µg/g)	**399**	**39**
Chloride (µg/g)	753	579

The results indicate that a low degree of potential sulphate attack is expected for concrete in contact with the soil. Type GU Portland Cement can be considered for use in buried concrete structures at the Site. The results should be reviewed by the structural engineer to ensure conformance to the concrete exposures.

6.4.3 Site Classification for Seismic Site Response & Soil Behaviour

The following information has been provided to assist the building designer from a geotechnical perspective only. These geotechnical seismic design parameters should be reviewed in detail by the structural engineer and be incorporated into the design as required.

The seismic site classification has been based on the 2012 OBC. The parameters for determination of Site Classification for Seismic Site Response are set out in Table 4.1.8.4.A of the OBC. The site classification is based on the average shear wave velocity in the top 30 m of the site stratigraphy. If the average shear wave velocity is not known, the site class can be estimated from energy corrected

Standard Penetration Resistance (N60) and/or the average undrained shear strength of the soil in the top 30 m.

The boreholes advanced at this Site extended to depths of approximately 3.8 to 4.6 mbgs and encountered glacial till with SPT "N' values of 16 to >50 blows per 300 mm. As such, based on Table 4.1.8.4.A of the OBC, this Site has been classified as Class D. A Site Class D has an average shear wave velocity (Vs) of between 180 and 360 m/s.

6.4.4 Estimated Settlement

All individual spread footings should be founded on uniform subgrade soils, reviewed and approved by a licensed geotechnical engineer.

Foundations installed in accordance with the recommendations outlined in the preceding sections are not expected to exceed total settlements of 25 mm and differential settlements of 19 mm.

All foundations are to be designed and constructed to the minimum widths as detailed in the 2012 OBC.

6.4.5 Building Drainage

To assist in maintaining the building dry from surface water seepage, it is recommended that exterior grades around the buildings be sloped away at a 2% gradient or more, for a distance of at least 2.0 m. Roof drains should discharge a minimum of 1.5 m away from the structure to a drainage swale or appropriate storm drainage system.

Exterior perimeter foundations drains are not required, where the finished floor elevation is established a minimum of 150 mm above the exterior final grades or that the exterior gradient is properly sloped to divert surface water away from the building.

The existing clay tile adjacent footings must be repaired/replaced if it is damaged or removed during placement of engineered fill below the proposed addition.

6.4.6 Shallow Foundations Frost Protection & Foundation Backfill

In the City of Burlington, Ontario area, exterior perimeter foundations for heated buildings require a minimum of 1.2 m of soil cover above the underside of the footing to provide soil cover for frost protection.

Where the foundations for heated buildings do not have the minimum 1.2 m of soil cover frost protection, they should be protected from frost with a combination of soil cover and rigid polystyrene insulation, such as Dow Styrofoam or equivalent product. If required, Pinchin can provide appropriate foundation frost protection recommendations as part of the design review.

To minimize potential frost movements from soil frost adhesion, the perimeter foundation backfill should consist of a free draining granular material, such as a Granular 'B' Type I (OPSS 1010) or an approved

sand fill, extending a minimum lateral distance of 600 mm beyond the foundation. Backfill must be brought up evenly on both sides of any wall not designed to resist lateral earth pressure. All granular backfill material is to be placed in maximum 300 mm thick lifts compacted to a minimum of 100% SPMDD below the interior of the building and exterior hard landscaping areas; and, 95% SPMDD below exterior soft landscaping areas. It is recommended that inspection and testing be carried out during construction to confirm backfill quality, thickness and to ensure compaction requirements are achieved.

6.5 Floor Slabs

Prior to the installation of the engineered fill material, all pre-existing fill/topsoil materials should be removed to the underlying organic free in-situ soil. The natural subgrade soil is to be proof roll compacted with a minimum 10 tonne non-vibratory steel drum roller to observe for weak/soft spots. It is noted that some locations will not be accessible by the steel drum roller; as such, these locations can be proof roll compacted with a minimum 450 kg vibratory plate compactor.

The in-situ inorganic glacial till material encountered within the boreholes, and engineered fill placed as recommended in Section 6.2 of this report, are considered adequate for the support of the concrete floor slabs provided it is proof roll compacted as outlined above. Any soft area(s) encountered during proof rolling should be excavated and replaced with a similar soil type.

Once the subgrade soil is exposed it is to be inspected and approved by a qualified geotechnical engineering consultant to ensure that the material conforms to the soil type and consistency observed during the subsurface investigation work.

Based on the in-situ soil conditions, it is recommended to establish the concrete floor slab on a minimum 300 mm thick layer of Granular “A” (OPSS 1010) compacted to 100% SPMDD. Alternatively, consideration may also be given to using a 200 mm thick layer of uniformly compacted 19 mm clear stone placed over the approved subgrade. Any required up fill should consist of a Granular “B” Type I or Type II (OPSS 1010).

The following table provides the unfactored modulus of subgrade reaction values:

Material Type	Modulus of Subgrade Reaction (kN/m^3)
Granular A (OPSS 1010)	85,000
Granular “B” Type I (OPSS 1010)	75,000
Granular “B” Type II (OPSS 1010)	85,000
Glacial Till	45,000
Engineered Fill	25,000

The values in the table above are for loaded areas of 0.3 m by 0.3 m.

6.6 Asphaltic Concrete Pavement Structure Design for Parking Lot and Playground

6.6.1 Discussion

It is Pinchin's understanding that new parking areas and a turf playground will be constructed around the proposed building addition. The in-situ glacial till is considered a sufficient bearing material for an asphaltic concrete pavement structure provided all organics and deleterious materials are removed prior to installing the engineered fill material.

6.6.2 Pavement Structure

The following table presents the minimum specifications for a flexible asphaltic concrete pavement structure:

Pavement Layer	Compaction Requirements	Parking Areas	Playground
Surface Course Asphaltic Concrete HL-4 (OPSS 1150)	92% MRD as per OPSS 310	35 mm	35 mm
Binder Course Asphaltic Concrete HL-8 (OPSS 1150)	92 % MRD as per OPSS 310	55 mm	N/A
Base Course: Granular "A" (OPSS 1010)	100% Standard Proctor Maximum Dry Density (ASTM-D698)	150 mm	150 mm
Subbase Course: Granular "B" Type I (OPSS 1010)	100% Standard Proctor Maximum Dry Density (ASTM D698)	450 mm	450 mm

Notes:

I. Prior to placing the pavement structure, the subgrade soil is to be proof rolled with a smooth drum roller without vibration to observe weak spots and the deflection of the soil.
II. It is understood that the playground area will not be subjected to any heavy loads such as school bus traffic, etc.; and
III. The recommended pavement structure may have to be adjusted according to the City of Burlington standards. Also, if construction takes place during times of substantial precipitation and the subgrade soil becomes wet and disturbed, the granular thickness may have to be increased to compensate for the weaker subgrade soil. In addition, the granular fill material thickness may have to be temporarily increased to allow heavy construction equipment access the Site, in order to avoid the subgrade from "pumping" up into the granular material.

Transitions in pavement structure thickness between existing and new pavements should be made at slopes of 10 horizontal to 1 vertical in order to reduce potential for differential frost heave.

Performance grade PG 58-28 asphaltic concrete should be specified for Marshall mixes.

6.6.3 Pavement Structure Subgrade Preparation and Granular up Fill

The proper placement of base and subbase fill materials becomes very important in addressing the proper load distribution to provide a durable pavement structure.

The pavement subgrade materials should be thoroughly proof-rolled prior to placement of the Granular 'B' subbase course. If any unstable areas are noted, then the Granular 'B' thickness may need to be increased to support pavement construction traffic. This should be left as a field decision by a qualified

geotechnical engineer at the time of construction, but it is recommended that additional Granular 'B' be carried as a provisional item under the construction contract.

Where fill material is required to increase the grade to the underside of the pavement structure it should consist of Granular 'B' Type I (OPSS 1010). The up fill material is to be placed in maximum 300 mm thick lifts compacted to 98% SPMDD within 4% of the optimum moisture content.

Samples of both the Granular 'A' and Granular 'B' Type I aggregates should be tested for conformance to OPSS 1010 prior to utilization on Site and during construction. All stockpiled material should be protected from deleterious materials, additional moisture and be kept from freezing.

Post compaction settlement of fine grained soil can be expected, even when placed to compaction specifications. As such, fill material should be installed as far in advance as possible before finishing the parking lot and access roadways for best grade integrity.

Where the subgrade material types differ below the underside of the pavement structure, the transition between the materials should be sloped as per frost heave taper OPSD 205.60.

6.6.4 Drainage

Control of surface water is a critical factor in achieving good pavement structure life. The pavement thickness designs are based on a drained pavement subgrade via sub-drains or ditches.

The silt soils have poor natural drainage and therefore it is recommended that pavement subdrains be installed in the lower areas and be connected to the catch basins. Subdrains should comprise 150 mm diameter perforated pipe in filter sock, bedded in concrete sand. The top of the concrete sand bedding should be at the bottom of the pavement subbase, with the subgrade below the subbase sloped towards the subdrain.

The surface of the roadways should be free of depressions and be sloped at a minimum grade of 1% in order to drain to appropriate drainage areas. Subgrade soil should slope a minimum of 3% toward stormwater collection points. Positive slopes are very important for the proper performance of the drainage system. The granular base and subbase materials should extend horizontally to any potential ditches or swales.

In addition, routine maintenance of the drainage systems will assist with the longevity of the pavement structure. Ditches, culverts, sewers and catch basins should be regularly cleared of debris and vegetation.

7.0 SITE SUPERVISION & QUALITY CONTROL

It is recommended that all geotechnical aspects of the project be reviewed and confirmed under the appropriate geotechnical supervision, to routinely check such items. This includes but is not limited to

inspection and confirmation of the undisturbed natural subgrade material prior to subgrade preparation, pouring any foundations or footings, backfilling, or engineered fill installation to ensure that the actual conditions are not markedly different than what was observed at the borehole locations and geotechnical components are constructed as per Pinchin's recommendations. Compaction quality control of engineered fill material (full-time monitoring) is recommended as standard practice, as well as regular sampling and testing of aggregates and concrete, to ensure that physical characteristics of materials for compliance during installation and satisfies all specifications presented within this report.

8.0 TERMS AND LIMITATIONS

This Geotechnical Investigation was performed for the exclusive use of Workshop Architecture Inc. c/o Conseil Scolaire Viamonde (Client) in order to evaluate the subsurface conditions at 1226 Lockhart Road, Burlington, Ontario. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practises in the field of geotechnical engineering for the Site. Classification and identification of soil, and geologic units have been based upon commonly accepted methods employed in professional geotechnical practice. No warranty or other conditions, expressed or implied, should be understood. Conclusions derived are specific to the immediate area of study and cannot be extrapolated extensively away from sample locations.

Performance of this Geotechnical Investigation to the standards established by Pinchin is intended to reduce, but not eliminate, uncertainty regarding the subgrade soil at the Site, and recognizes reasonable limits on time and cost.

Regardless how exhaustive a Geotechnical Investigation is performed, the investigation cannot identify all the subsurface conditions. Therefore, no warranty is expressed or implied that the entire Site is representative of the subsurface information obtained at the specific locations of our investigation. If during construction, subsurface conditions differ from then what was encountered within our test location and the additional subsurface information provided to us, Pinchin should be contacted to review our recommendations. This report does not alleviate the contractor, owner, or any other parties of their respective responsibilities.

This report has been prepared for the exclusive use of the Client and their authorized agents. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third parties. If additional parties require reliance on this report, written authorization from Pinchin will be required. Pinchin disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No other warranties are implied or expressed. Furthermore, this report should not be construed as legal advice.

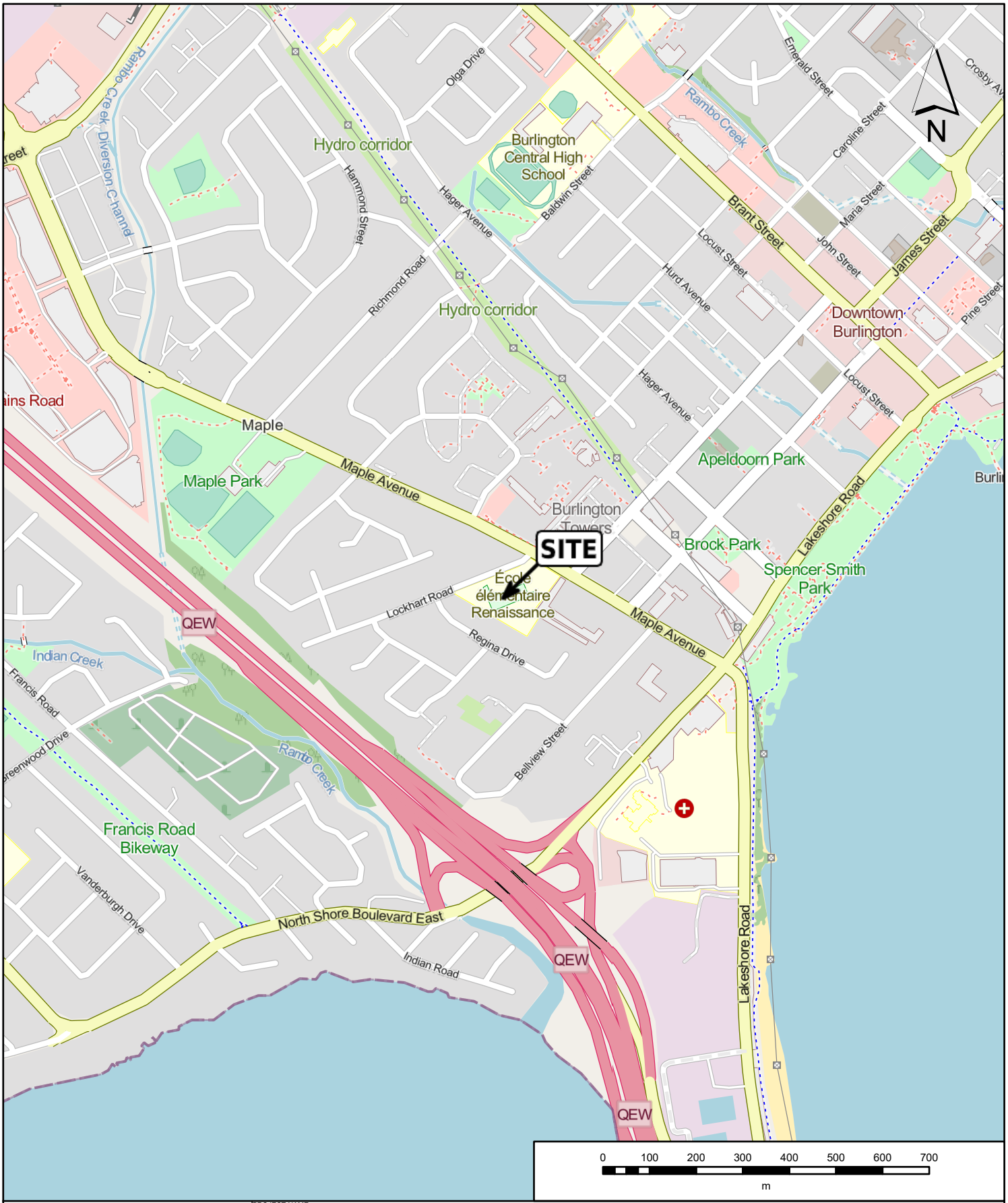
The liability of Pinchin or our officers, directors, shareholders or staff will be limited to the lesser of the fees paid or actual damages incurred by the Client. Pinchin will not be responsible for any consequential or indirect damages. Pinchin will only be liable for damages resulting from the negligence of Pinchin. Pinchin will not be liable for any losses or damage if the Client has failed, within a period of two years following the date upon which the claim is discovered (Claim Period), to commence legal proceedings against Pinchin to recover such losses or damage unless the laws of the jurisdiction which governs the Claim Period which is applicable to such claim provides that the applicable Claim Period is greater than two years and cannot be abridged by the contract between the Client and Pinchin, in which case the Claim Period shall be deemed to be extended by the shortest additional period which results in this provision being legally enforceable.

Pinchin makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and these interpretations may change over time. Please refer to Appendix IV, Report Limitations and Guidelines for Use, which pertains to this report.

Specific limitations related to the legal and financial and limitations to the scope of the current work are outlined in our proposal, the attached Methodology and the Authorization to Proceed, Limitation of Liability and Terms of Engagement which accompanied the proposal.

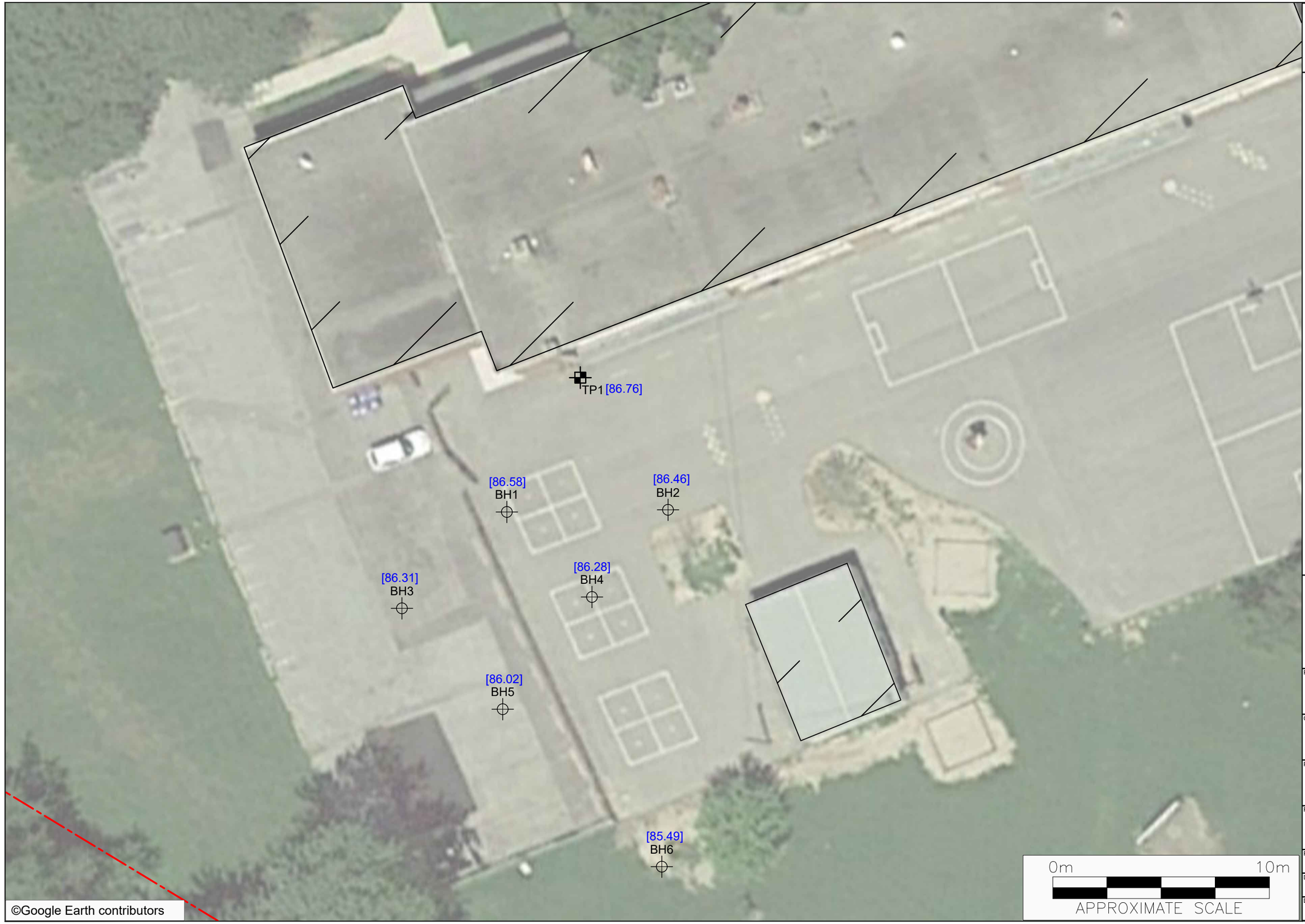
Information provided by Pinchin is intended for Client use only. Pinchin will not provide results or information to any party unless disclosure by Pinchin is required by law. Any use by a third party of reports or documents authored by Pinchin or any reliance by a third party on or decisions made by a third party based on the findings described in said documents, is the sole responsibility of such third parties. Pinchin accepts no responsibility for damages suffered by any third party as a result of decisions made or actions conducted. No other warranties are implied or expressed.

FIGURES



PINCHIN

PROJECT NAME:	PROPOSED SCHOOL BUILDING INVESTIGATION				
CLIENT NAME:	CONSEIL SCOLAIRE VIAMONDE				
PROJECT LOCATION:	1226 LOCKHART ROAD, BURLINGTON, ONTARIO				
FIGURE NAME:	KEY MAP				FIGURE NUMBER: 1
PROJECT NUMBER: 313698	SCALE: 1:15,000	DRAWN BY: AMG	REVIEWED BY: KT	DATE: NOV. 2022	



N

LEGEND

- SITE BOUNDARY
- SITE BUILDING
- APPROXIMATE BOREHOLE LOCATION
- TEST PIT
- [XX.X] GROUNDWATER ELEVATION (MASL)

LEGEND IS COLOUR DEPENDENT. NON-COLOUR COPIES MAY ALTER INTERPRETATION.

PINCHIN

PROJECT NAME:
PROPOSED SCHOOL BUILDING INVESTIGATION

CLIENT NAME:
CONSEIL SCOLAIRE VIAMONDE

PROJECT LOCATION:
1226 LOCKHART ROAD, BURLINGTON, ONTARIO

FIGURE NAME:
BOREHOLE LOCATION PLAN

PROJECT NUMBER:	SCALE:
313698	AS SHOWN
DRAWN BY: AMG	REVIEWED BY: KT
DATE: JAN. 2023	FIGURE NUMBER: 2

APPENDIX I

Abbreviations, Terminology and Principle Symbols used in Report and Borehole Logs

ABBREVIATIONS, TERMINOLOGY & PRINCIPAL SYMBOLS USED

Sampling Method

AS	Auger Sample	**w**	Washed Sample
SS	Split Spoon Sample	**HQ**	Rock Core (63.5 mm diam.)
ST	Thin Walled Shelby Tube	**NQ**	Rock Core (47.5 mm diam.)
BS	Block Sample	**BQ**	Rock Core (36.5 mm diam.)

In-Situ Soil Testing

Standard Penetration Test (SPT), "N" value is the number of blows required to drive a 51 mm outside diameter spilt barrel sampler into the soil a distance of 300 mm with a 63.5 kg weight free falling a distance of 760 mm after an initial penetration of 150 mm has been achieved. The SPT, "N" value is a qualitative term used to interpret the compactness condition of cohesionless soils and is used only as a very approximation to estimate the consistency and undrained shear strength of cohesive soils.

Dynamic Cone Penetration Test (DCPT) is the number of blows required to drive a cone with a 60 degree apex attached to "A" size drill rods continuously into the soil for each 300 mm penetration with a 63.5 kg weight free falling a distance of 760 mm.

Cone Penetration Test (CPT) is an electronic cone point with a 10 cm2 base area with a 60 degree apex pushed through the soil at a penetration rate of 2 cm/s.

Field Vane Test (FVT) consists of a vane blade, a set of rods and torque measuring apparatus used to determine the undrained shear strength of cohesive soils.

Soil Descriptions

The soil descriptions and classifications are based on an expanded Unified Soil Classification System (USCS). The USCS classifies soils on the basis of engineering properties. The system divides soils into three major categories; coarse grained, fine grained and highly organic soils. The soil is then subdivided based on either gradation or plasticity characteristics. The classification excludes particles larger than 75 mm. To aid in quantifying material amounts by weight within the respective grain size fractions the following terms have been included to expand the USCS:

Soil Classification		Terminology	Proportion
Clay	< 0.002 mm		
Silt	0.002 to 0.06 mm	“trace”, trace sand, etc.	1 to 10%
Sand	0.075 to 4.75 mm	“some”, some sand, etc.	10 to 20%
Gravel	4.75 to 75 mm	Adjective, sandy, gravelly, etc.	20 to 35%
Cobbles	75 to 200 mm	And, and gravel, and silt, etc.	>35%
Boulders	>200 mm	Noun, Sand, Gravel, Silt, etc.	>35% and main fraction

Notes:

- Soil properties, such as strength, gradation, plasticity, structure, etcetera, dictate the soils engineering behaviour over grain size fractions; and
- With the exception of soil samples tested for grain size distribution or plasticity, all soil samples have been classified based on visual and tactile observations. The accuracy of visual and tactile observation is not sufficient to differentiate between changes in soil classification or precise grain size and is therefore an approximate description.

The following table outlines the qualitative terms used to describe the compactness condition of cohesionless soil:

Cohesionless Soil	
Compactness Condition	**SPT N-Index (blows per 300 mm)**
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	> 50

The following table outlines the qualitative terms used to describe the consistency of cohesive soils related to undrained shear strength and SPT, N-Index:

Cohesive Soil		
Consistency	**Undrained Shear Strength (kPa)**	**SPT N-Index (blows per 300 mm)**
Very Soft	<12	<2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

Note: Utilizing the SPT, N-Index value to correlate the consistency and undrained shear strength of cohesive soils is only very approximate and needs to be used with caution.

Soil & Rock Physical Properties

General

W Natural water content or moisture content within soil sample

γ Unit weight

γ' Effective unit weight

γ_d Dry unit weight

γ_{sat} Saturated unit weight

ρ Density

ρ_s Density of solid particles

ρ_w Density of Water

ρ_d Dry density

ρ_{sat} Saturated density e Void ratio

n Porosity

S_r Degree of saturation

E_{50} Strain at 50% maximum stress (cohesive soil)

Consistency

W_L	Liquid limit
W_P	Plastic Limit
I_P	Plasticity Index
W_S	Shrinkage Limit
I_L	Liquidity Index
I_C	Consistency Index
e_{max}	Void ratio in loosest state
e_{min}	Void ratio in densest state
I_D	Density Index (formerly relative density)

Shear Strength

C_u, S_u	Undrained shear strength parameter (total stress)
C'_d	Drained shear strength parameter (effective stress)
r	Remolded shear strength
τ_p	Peak residual shear strength
τ_r	Residual shear strength
ø’	Angle of interface friction, coefficient of friction = tan ø’

Consolidation (One Dimensional)

C_C	Compression index (normally consolidated range)
C_r	Recompression index (over consolidated range)
C_S	Swelling index
m_V	Coefficient of volume change
c_V	Coefficient of consolidation
T_V	Time factor (vertical direction)
U	Degree of consolidation
σ'_O	Overburden pressure
σ'_p	Preconsolidation pressure (most probable)
OCR	Overconsolidation ratio

Permeability

The following table outlines the terms used to describe the degree of permeability of soil and common soil types associated with the permeability rates**:**

Permeability (k cm/s)	Degree of Permeability	Common Associated Soil Type
$> 10^{-1}$	Very High	Clean gravel
10^{-1} to 10^{-3}	High	Clean sand, Clean sand and gravel
10^{-3} to 10^{-5}	Medium	Fine sand to silty sand
10^{-5} to 10^{-7}	Low	Silt and clayey silt (low plasticity)
$>10^{-7}$	Practically Impermeable	Silty clay (medium to high plasticity)

Rock Coring

Rock Quality Designation (RQD) is an indirect measure of the number of fractures within a rock mass, Deere et al. (1967). It is the sum of sound pieces of rock core equal to or greater than 100 mm recovered from the core run, divided by the total length of the core run, expressed as a percentage. If the core section is broken due to mechanical or handling, the pieces are fitted together and if 100 mm or greater included in the total sum**.**

RQD is calculated as follows:

$$\text{RQD (\%)} = \frac{\Sigma \text{ Length of core pieces} > 100 \text{ mm} \times 100}{\text{Total length of core run}}$$

The following is the Classification of Rock with Respect to RQD Value:

RQD Classification	RQD Value (%)
Very poor quality	**<25**
Poor quality	25 to 50
Fair quality	50 to 75
Good quality	75 to 90
Excellent quality	90 to 100

APPENDIX II

Pinchin's Borehole Logs

Log of Borehole: BH1

Project #: 313698 **Logged By:** JD

Project: Geotechnical Investigation

Client: Conseil Scolaire Viamonde

Location: 1226 Lockhart Road, Burlington, Ontario

Drill Date: October 24, 2022 **Project Manager:** KT

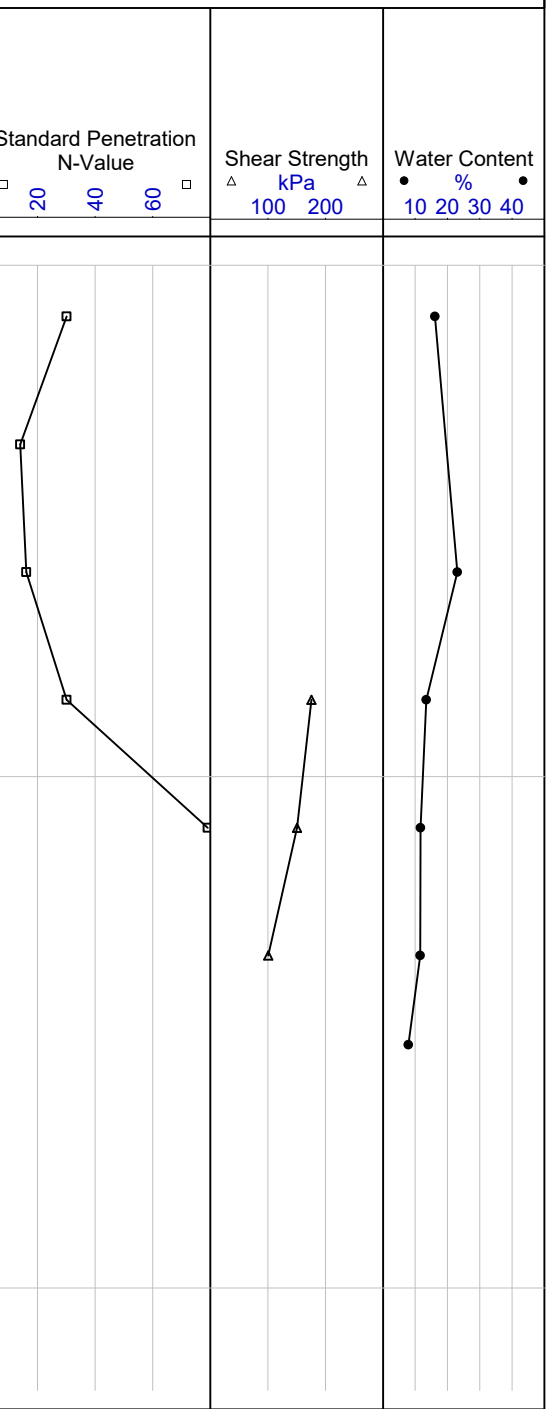
SUBSURFACE PROFILE

Depth (m)	Description	Elevation (m)
0	Ground Surface	86.58
	Asphalt Asphaltic concrete - 80mm	
	Fill Brown silty sand to sandy silt, trace gravel, compact to dense, moist to wet	
1		85.06
	Silty Sand to Sandy Silt Brown silty sand to sandy silt, trace gravel, compact, wet/dilatant	
2		84.30
	Silt Till Reddish brown sandy silt, trace to some gravel and clay, compact to dense, moist to very moist; with clay seams	
3		83.54
	Very dense, moist to wet; with wet seams and some shale pockets	
		82.77
	Till/Shale Complex Reddish brown sandy silt till/ highly weathered shale complex, trace gravel, some clay, very dense, moist to very moist	
4		82.01
	Shale Highly weathered shale	
5	End of Borehole	
	Borehole terminated at 4.6 mbgs. At drilling completion the borehole was open and dry.	
6		

Monitoring Well Details: No Monitoring Well Installed

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	60	30
SS	2	60	14
SS	3	70	16
SS	4	80	30
SS	5	80	79
SS	6	80	>50
SS	7	30	>50



Contractor: Strata Drilling Inc. **Grade Elevation:** 86.58 masl

Drilling Method: Hollow Stem Augers / Split Spoon Sampler **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH2

Project #: 313698 **Logged By:** JD

Project: Proposed Building Addition

Client: Conseil Scolaire Viamonde

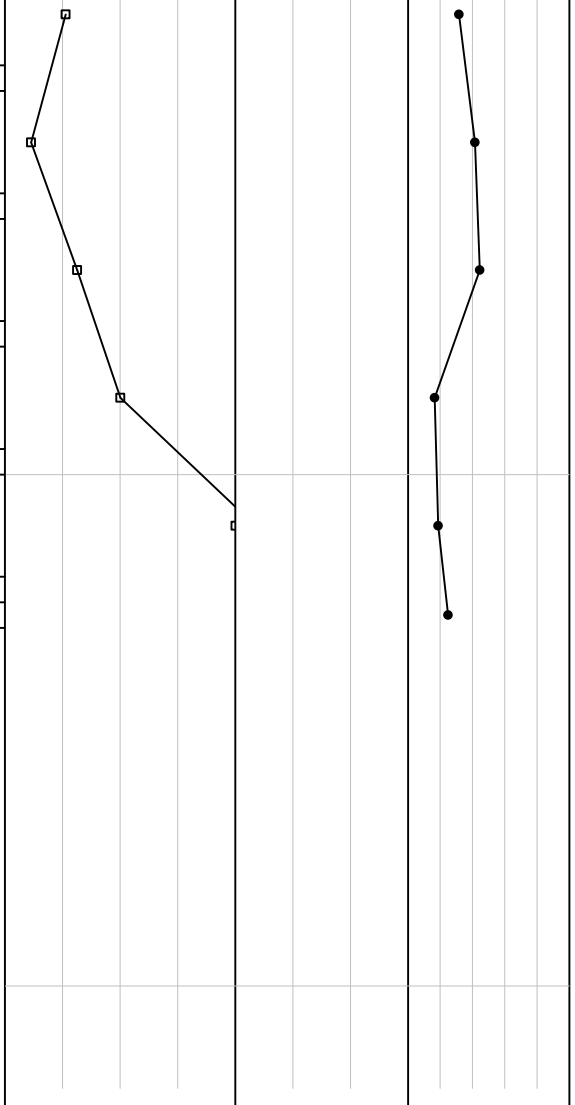
Location: 1226 Lockhart Road, Burlington, Ontario

Drill Date: October 24, 2022 **Project Manager:** KT

Depth (m)	Description	Elevation (m)
0	Ground Surface	86.46
	Asphalt Asphalt - 80 mm	
	Fill Brown silty sand, some gravel, compact, moist	85.70
1	Loose, moist to wet	85.39
	Silt Dark brown silt, some sand, trace organics, loose, moist to wet	84.94
	Sandy Silt Brown sandy silt, trace to some clay and gravel, compact, wet/dilatant; with wet sand seams	84.17
2	**Sandy Silt Till** Brown sandy silt, trace to some gravel, trace clay, dense; with trace sahle pieces	83.41
3	Reddish brown sandy silt till/ highly weathered shale, trace gravel, some clay, very dense, moist to very moist	82.56
4	End of Borehole	
5	Upon refusal on probable bedrock, borehole terminated at 3.9 mbgs. At drilling completion the borehole was open and dry.	
6		

Monitoring Well Details: No Monitoring Well Installed

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	60	21
SS	2	70	9
SS	3	80	25
SS	4	70	40
SS	5	90	87
SS	6	30	>50



Contractor: Strata Drilling Inc. **Grade Elevation:** 86.46 masl

Drilling Method: Hollow Stem Augers / Split Spoon Sampler **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH3

Project #: 313698 **Logged By:** KS

Project: Proposed Building Addition

Client: Conseil Scolaire Viamonde

Location: 1226 Lockhart Road, Burlington, Ontario

Drill Date: November 5, 2022 **Project Manager:** KT

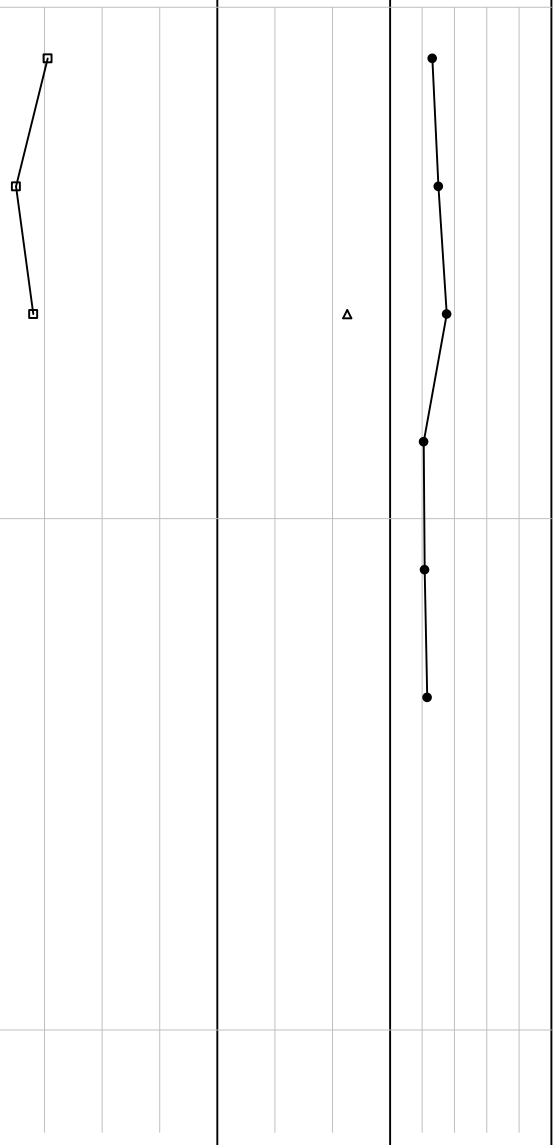
SUBSURFACE PROFILE

Depth (m)	Description	Elevation (m)
0	Ground Surface	86.31
	Asphalt Asphalt - 100 mm	85.90
	Fill Brown to grey sand and gravel, compact, moist	85.45
1	Brown sand, trace gravel, loose to compact, very moist	
	Brown clayey silt, trace gravel, stiff to very stiff, DTPL	84.79
	Dark brown/black to brown, sandy silt, trace to some organics, loose to compact, very moist to wet; organic odour	
2	**Clayey Silt Till** Reddish brown clayey silt, some sand, trace gravel, hard DTPL; with silt seams	
		83.26
3	**Till/Shale Complex** Reddish brown sandy silt till/ highly weathered shale, very dense, moist to very moist	
4		81.71
	End of Borehole	
5	Borehole terminated at 4.6 mbgs, At drilling completion the borehole was open and dry.	
6		

Monitoring Well Details: No Monitoring Well Installed

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	60	21
SS	2	70	10
SS	3	70	16
SS	4	50	>50
SS	5	20	>50
SS	6	20	>50
SS	7	5	>50



Contractor: Strata Drilling Inc. **Grade Elevation:** 86.31 masl

Drilling Method: Solid Stem Augers / Split Spoon Sampler **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH4

Project #: 313698 **Logged By:** JD

Project: Proposed Building Addition

Client: Conseil Scolaire Viamonde

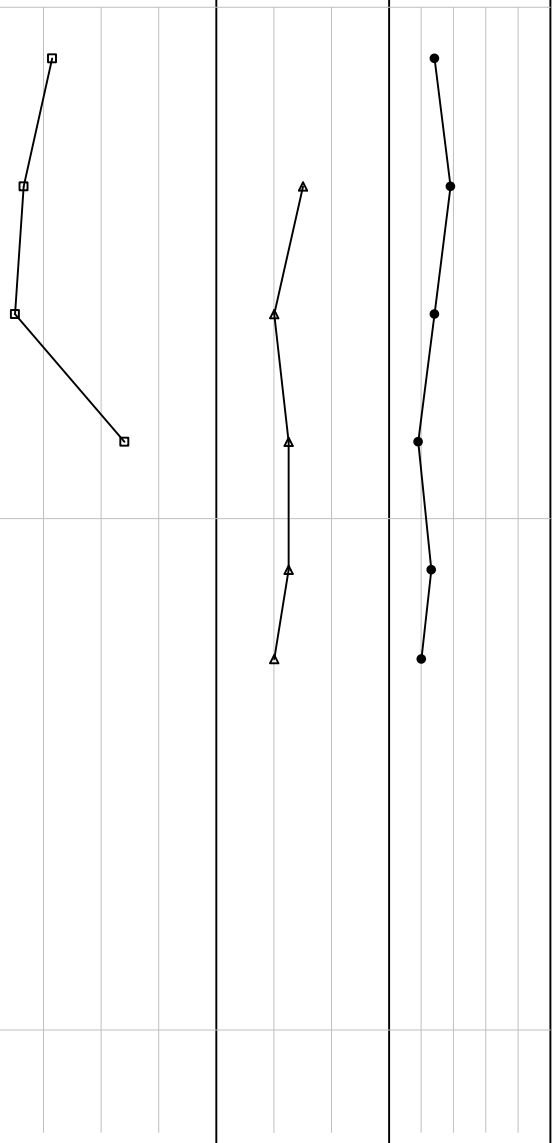
Location: 1226 Lockhart Road, Burlington, Ontario

Drill Date: October 24, 2022 **Project Manager:** KT

Depth (m)	Description	Elevation (m)
0	Ground Surface	86.28
	Asphalt Asphalt - 80 mm	
	Fill Brown silty sand, trace gravel, compact, moist to wet	
1		85.21
	Dark brown silt, some sand, trace organics, compact, moist	
		84.76
	Possible Fill Brown sandy silt, trace organics, loose to compact, wet/dilatant	
2		84.30
	Sandy Silt Till Brown sandy silt, some clay, trace gravel, loose to compact, moist; clay seams and inclusions	83.99
	Dense	
3		83.23
	Till/Shale Complex Reddish brown sandy silt till/ highly weathered shale, trace gravel, some clay, very dense, moist to very moist	
		82.45
4	End of Borehole	
5	Upon Auger refusal on possible shale bedrock, borehole terminated at 3.8 mbgs.. At drilling completion the borehole was open and dry	
6		

Monitoring Well Details: No Monitoring Well Installed

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	70	23
SS	2	80	13
SS	3	80	10
SS	4	70	48
SS	5	90	>50
SS	6	30	>50



Contractor: Strata Drilling Inc.

Grade Elevation: 86.28 masl

Drilling Method: Hollow Stem Augers / Split Spoon Sampler

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH5

Project #: 313698 **Logged By:** KS

Project: Proposed Building Addition

Client: Conseil Scolaire Viamonde

Location: 1226 Lockhart Road, Burlington, Ontario

Drill Date: November 5, 2022 **Project Manager:** KT

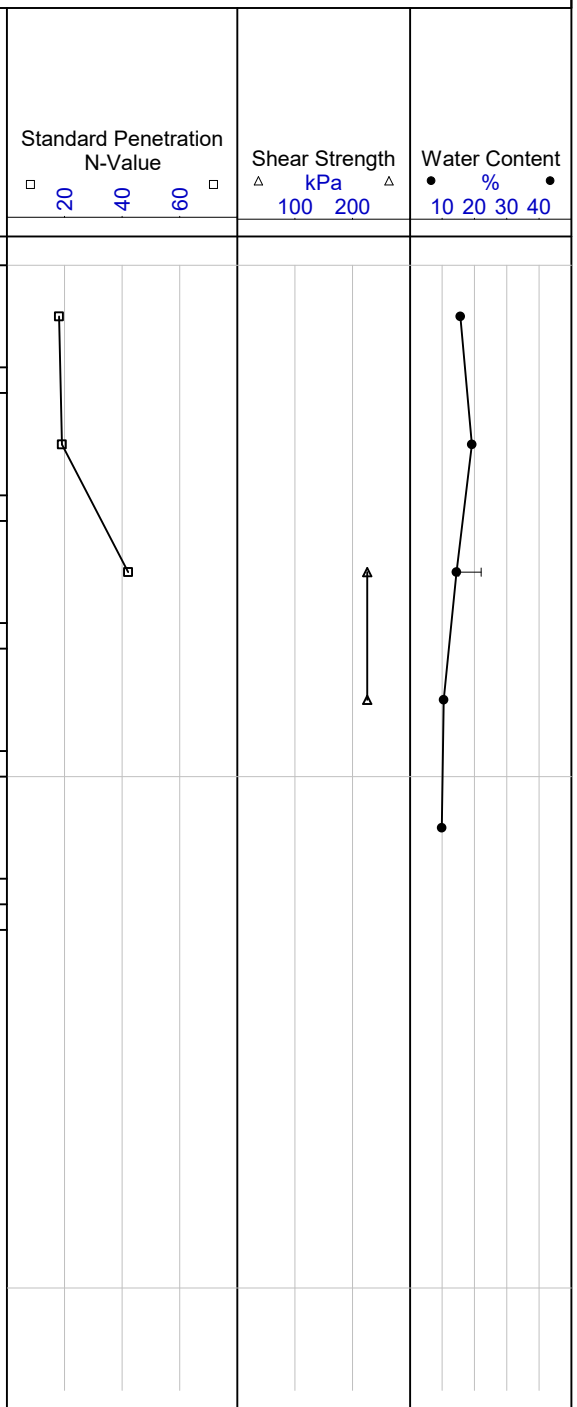
SUBSURFACE PROFILE

Depth (m)	Description	Elevation (m)
0	Ground Surface	86.02
	Asphalt Asphalt - 100 mm	85.77
	Fill Grey sand and gravel, compact, moist	85.51
1	Brown sand, some silt, compact, very moist to wet	84.95
	Dark brown/black silty sand, some clay, trace to some organics, compact, very moist to wet	84.50
2	**Silty Sand Till** Reddish brown silty sand, trace gravel, compact, very moist to wet	83.73
	Clayey Silt Till Reddish brown clayey silt gravel to clayey silt, trace gravel, hard, DTPL to APL	
3	with fractured cobble pieces	82.97
	Till/Shale Complex Reddish brown sandy silt/ highly weathered shale complex	82.21
4	**Shale** Highly weathered shale	
	End of Borehole	
	Upon auger refusal on possible shale bedrock, borehole terminated at 3.9 mbgs. AT drilling completion the borehole was open and dry.	
5		
6		

Monitoring Well Details: No Monitoring Well Installed

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	70	18
SS	2	70	19
SS	3	80	42
SS	4	20	>50
SS	5	10	>50
SS	6	20	>50



Contractor: Strata Drilling Inc. **Grade Elevation:** 86.02 masl

Drilling Method: Solid Stem Augers / Split Spoon Sampler **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH6

Project #: 313698 **Logged By:** JD

Project: Proposed Building Addition

Client: Conseil Scolaire Viamonde

Location: 1226 Lockhart Road, Burlington, Ontario

Drill Date: October 24, 2022 **Project Manager:** KT

Depth (m)	Description	Elevation (m)	Sample Type	Sampler #	Recovery (%)	SPT N-Value
0	Ground Surface	85.49				
	Topsoil Topsoil - 50 mm		SS	1	90	7
	Fill dark brown silt, some sand, trace gravel, loose, moist	84.73				
1	**Possible Fill** Dark brown Silty clay, trace gravel and sand, stiff to very stiff, DTPL to APL	83.97	SS	2	80	7
	Silty Clay Reddish brown silty clay, some sand, trace gravel, very stiff, DTPL to APL	83.20	SS	3	80	23
2	**Sandy Silt to Silty Sand** Brown sandy silt to silty sand, trace gravel, very dense, wet	82.44	SS	4	90	>50
3	**Till/Shale Complex** Reddish brown sandy silt till/ highly weathered shale complex	81.63	SS	5	50	>50
	End of Borehole		SS	6	5	>50
4	Upon auger refusal on possible shale bedrock, borehole terminated at 3.9 mbgs. At drilling completion the borehole was open and dry.					
5						
6						

Monitoring Well Details: No Monitoring Well Installed

Standard Penetration N-Value: 20, 40, 60

Shear Strength kPa: 100, 200

Water Content %: 10, 20, 30, 40

Contractor: Strata Drilling Inc.

Grade Elevation: 85.49 masl

Drilling Method: Hollow Stem Augers / Split Spoon Sampler

Top of Casing Elevation: NA

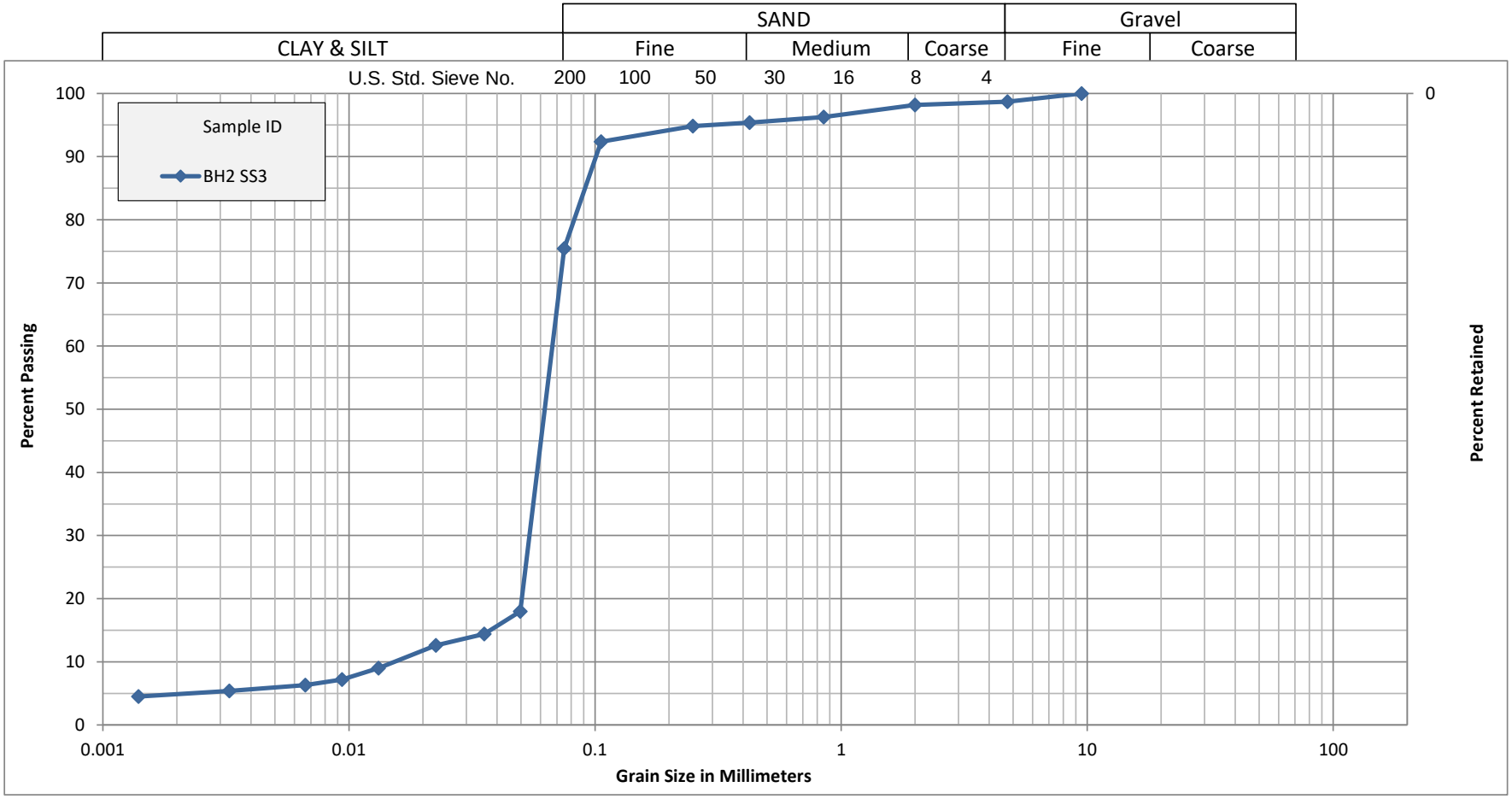
Well Casing Size: NA

Sheet: 1 of 1

APPENDIX III

Laboratory Testing Reports for Soil Samples

Unified Soil Classification System



Sample ID	Depth (ft)	% Gravel	% Sand	% Silt	% Clay
BH2 SS3	5.0-7.0	1.0	23.6	70.4	5.0

PINCHIN

Pinchin Waterloo - 225 Labrador Drive,
Unit 1, Waterloo, Ontario N2K 4M8

PARTICLE SIZE DISTRIBUTION ANALYSIS

Proposed Building Addition - 1226 Lockhart Rd, Burlington
Conseil Scolaire Viamonde

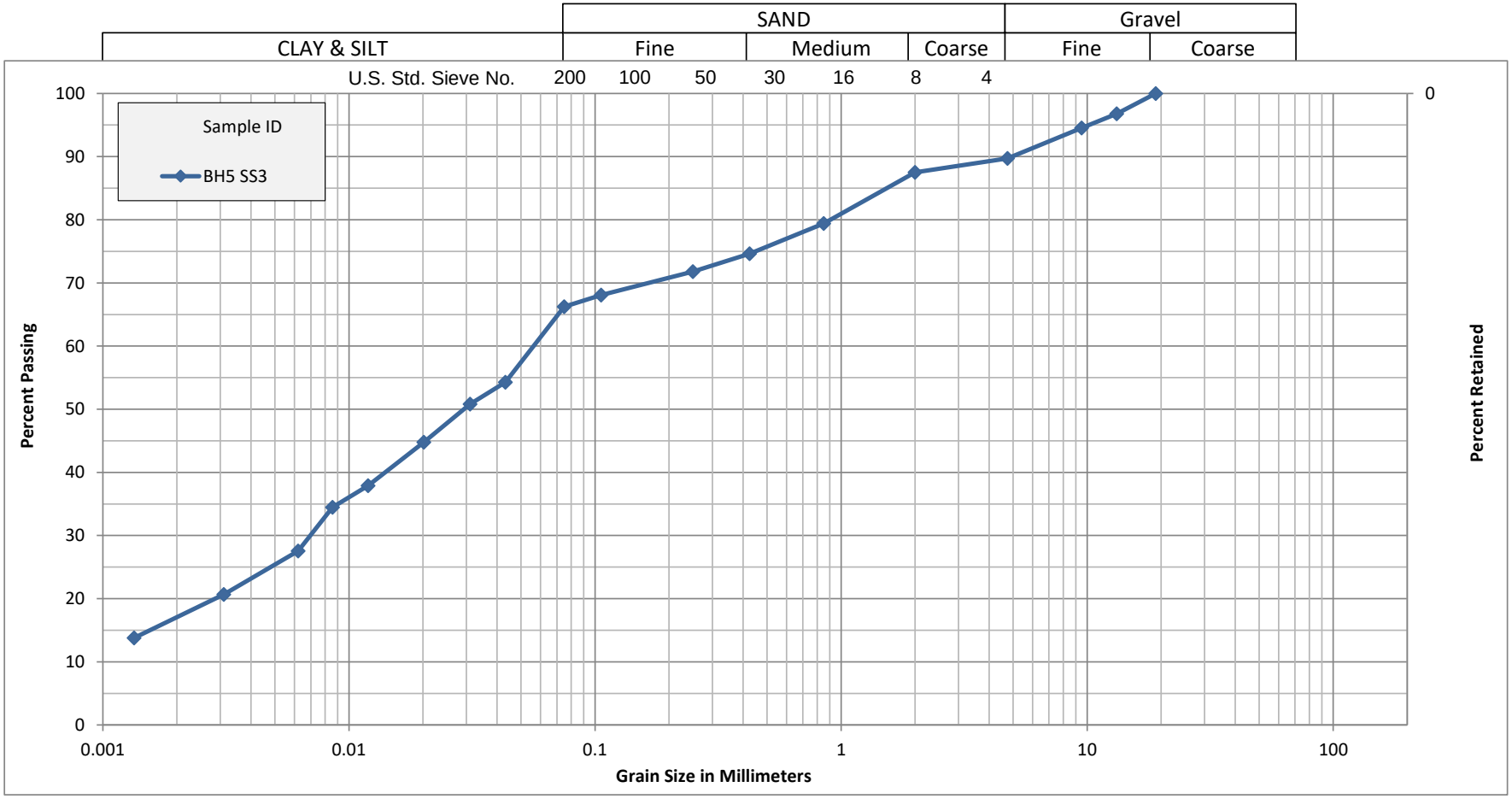
Figure No. 1

313698.000

Reviewed By:

More information available upon request

Unified Soil Classification System



Sample ID	Depth (ft)	% Gravel	% Sand	% Silt	% Clay
BH5 SS3	5.0-7.0	10.0	23.8	50.2	16.0

PINCHIN

Pinchin Waterloo - 225 Labrador Drive,
Unit 1, Waterloo, Ontario N2K 4M8

PARTICLE SIZE DISTRIBUTION ANALYSIS

Proposed Building Addition - 1226 Lockhart Rd, Burlington
Conseil Scolaire Viamonde

Figure No. 2

313698.000

Reviewed By:

More information available upon request

Atterberg Limits

LS 703&704 / AASHTO T89

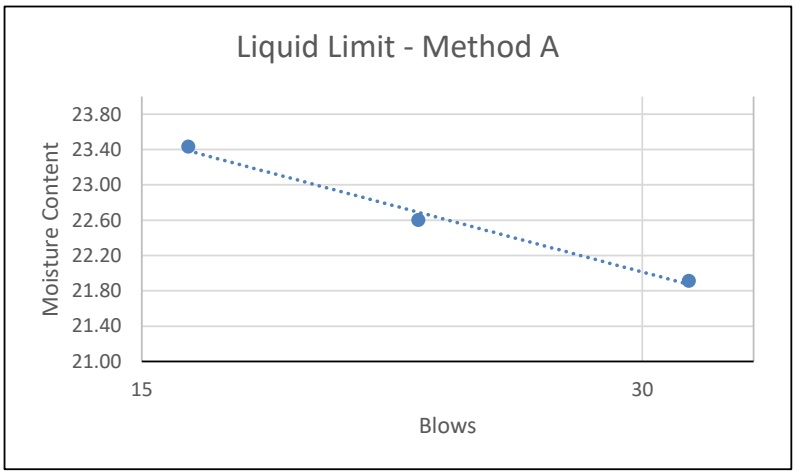
Project Name: Proposed Building Addition
Project No. 313698.000
Client: Conseil Scolaire Viamonde
Location: 1226 Lockhart Rd, Burlington
Material: Soil
Sample: BH5 SS3 5.0-7.0'

Test Date: November 9, 2022
Tested By: B Frank
Sample Date: November 5, 2022
Sampled By: K Singh
Reviewed By: V Marshall

Liquid Limit - Method A						
Pot Number	1	2	3			
Number of blows	32	22	16			
Wet mass + pot	37.32	34.79	34.85			
Dry mass + pot	33.47	31.23	31.19			
Tare	15.90	15.48	15.57			
Water content %	21.91	22.60	23.43			

Plastic Limit			
Pot Number	1	2	
Wet mass + pot	26.10	24.71	
Dry mass + pot	24.77	23.55	
Tare	15.72	15.69	
Water content %	14.7	14.8	

PI = LL - PL	
Liquid Limit %	**22**
Plastic Limit %	**15**
Plastic Index	**8**
Non Plastic	



APPENDIX IV

Analytical Laboratory Testing Reports for Soil Samples

ALS Canada Ltd.

right solutions.
right partner.

CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WT2219347**	Page	: 1 of 8
Client	: **Pinchin Ltd.**	Laboratory	: Waterloo - Environmental
Contact	: Karen Thrams	Account Manager	: Amanda Overholster
Address	: 225 Labrador Drive Unit #1 Waterloo ON Canada N2K 4M8	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: ----	Telephone	: 1 416 817 2944
Project	: 313698.000	Date Samples Received	: 25-Oct-2022 13:00
PO	: ----	Date Analysis Commenced	: 28-Oct-2022
C-O-C number	: ----	Issue Date	: 10-Nov-2022 15:54
Sampler	: CLIENT		
Site	: ----		
Quote number	: 2022 SOA		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Centralized Prep, Waterloo, Ontario
Andrea Armstrong	Department Manager - Air Quality and Volatiles	Organics, Waterloo, Ontario
Danielle Gravel	Supervisor - Semi-Volatile Instrumentation	Organics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Metals, Waterloo, Ontario

Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
BH-1/SS-2/2.5-5'	Soil/Solid	conductivity (1:2 leachate)		ON406/20	T1-RPIICC	1.71 mS/cm	0.57 mS/cm
	Soil/Solid	sodium adsorption ratio [SAR]		ON406/20	T1-RPIICC	5.83 -	2.4 -
	Soil/Solid	conductivity (1:2 leachate)		ON406/20	T3.1-S-RPI	1.71 mS/cm	0.7 mS/cm
	Soil/Solid	sodium adsorption ratio [SAR]		ON406/20	T3.1-S-RPI	5.83 -	5 -
BH6/SS3/5-7'	Soil/Solid	conductivity (1:2 leachate)		ON406/20	T1-RPIICC	1.57 mS/cm	0.57 mS/cm
	Soil/Solid	sodium adsorption ratio [SAR]		ON406/20	T1-RPIICC	7.96 -	2.4 -
	Soil/Solid	barium		ON406/20	T1-RPIICC	238 mg/kg	220 mg/kg
	Soil/Solid	conductivity (1:2 leachate)		ON406/20	T3.1-S-RPI	1.57 mS/cm	0.7 mS/cm
	Soil/Solid	sodium adsorption ratio [SAR]		ON406/20	T3.1-S-RPI	7.96 -	5 -
TP1/SA4/2.5M	Soil/Solid	conductivity (1:2 leachate)		ON406/20	T1-RPIICC	0.765 mS/cm	0.57 mS/cm
	Soil/Solid	sodium adsorption ratio [SAR]		ON406/20	T1-RPIICC	3.30 -	2.4 -
	Soil/Solid	conductivity (1:2 leachate)		ON406/20	T3.1-S-RPI	0.765 mS/cm	0.7 mS/cm

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
mS/cm	millisiemens per centimetre
pH units	pH units

>: greater than.
<: less than.
Red shading is applied where the result is greater than the Guideline Upper Limit or the result is lower than the Guideline Lower Limit.
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit.

Analytical Results Evaluation

Matrix: **Soil**

Analyte	CAS Number	Unit	Client sample ID	BH6/SS3/5-7'	TP1/SA4/2.5M	BH-1/SS-2/2.5-5'	----	----	----	----
			Sampling date/time	24-Oct-2022 10:30	24-Oct-2022 09:55	24-Oct-2022 14:35	----	----	----	----
			Sub-Matrix	Soil	Soil	Soil	----	----	----	----
				WT2219347-001	WT2219347-002	WT2219347-003	--------	--------	--------	--------
Physical Tests										
conductivity (1:2 leachate)	----	mS/cm		1.57	0.765	1.71	----	----	----	----
moisture	----	%		12.2	24.5	15.4	----	----	----	----
pH (1:2 soil:CaCl2-aq)	----	pH units		7.78	7.59	7.46	----	----	----	----
Cyanides										
cyanide, weak acid dissociable	----	mg/kg		<0.050	<0.050	<0.050	----	----	----	----
Fixed-Ratio Extractables										
calcium, soluble ion content	7440-70-2	mg/L		50.5	44.7	96.2	----	----	----	----
magnesium, soluble ion content	7439-95-4	mg/L		3.59	5.72	8.86	----	----	----	----
sodium, soluble ion content	17341-25-2	mg/L		217	88.2	223	----	----	----	----
sodium adsorption ratio [SAR]	----	-		7.96	3.30	5.83	----	----	----	----
Metals										
antimony	7440-36-0	mg/kg		0.26	0.14	0.15	----	----	----	----
arsenic	7440-38-2	mg/kg		7.63	4.54	3.90	----	----	----	----
barium	7440-39-3	mg/kg		238	136	58.9	----	----	----	----
beryllium	7440-41-7	mg/kg		0.89	0.41	0.38	----	----	----	----
boron	7440-42-8	mg/kg		18.8	7.6	<5.0	----	----	----	----
boron, hot water soluble	7440-42-8	mg/kg		0.23	0.19	0.37	----	----	----	----
cadmium	7440-43-9	mg/kg		0.116	0.088	0.088	----	----	----	----
chromium	7440-47-3	mg/kg		28.6	14.4	13.5	----	----	----	----
cobalt	7440-48-4	mg/kg		16.3	6.54	5.17	----	----	----	----
copper	7440-50-8	mg/kg		61.5	21.0	12.9	----	----	----	----
lead	7439-92-1	mg/kg		11.0	9.75	14.5	----	----	----	----
mercury	7439-97-6	mg/kg		0.0099	0.0088	0.0242	----	----	----	----
molybdenum	7439-98-7	mg/kg		1.19	0.33	0.28	----	----	----	----
nickel	7440-02-0	mg/kg		34.2	13.6	9.47	----	----	----	----
selenium	7782-49-2	mg/kg		<0.20	<0.20	<0.20	----	----	----	----
silver	7440-22-4	mg/kg		<0.10	<0.10	<0.10	----	----	----	----

Analytical Results Evaluation

Matrix: **Soil**

Analyte	CAS Number	Unit	Client sample ID	BH6/SS3/5-7'	TP1/SA4/2.5M	BH-1/SS-2/2.5-5'	----	----	----	----
			Sampling date/time	24-Oct-2022 10:30	24-Oct-2022 09:55	24-Oct-2022 14:35	----	----	----	----
			Sub-Matrix	Soil	Soil	Soil	----	----	----	----
				WT2219347-001	WT2219347-002	WT2219347-003	--------	--------	--------	--------
Metals										
thallium	7440-28-0	mg/kg		0.143	0.063	0.053	----	----	----	----
uranium	7440-61-1	mg/kg		0.708	0.483	0.574	----	----	----	----
vanadium	7440-62-2	mg/kg		38.1	23.3	23.5	----	----	----	----
zinc	7440-66-6	mg/kg		71.4	41.2	28.6	----	----	----	----
Speciated Metals										
chromium, hexavalent [Cr VI]	18540-29-9	mg/kg		<0.10	<0.10	<0.10	----	----	----	----
Volatile Organic Compounds										
benzene	71-43-2	mg/kg		<0.0050	<0.0050	<0.0050	----	----	----	----
ethylbenzene	100-41-4	mg/kg		<0.015	<0.015	<0.015	----	----	----	----
toluene	108-88-3	mg/kg		<0.050	<0.050	<0.050	----	----	----	----
xylene, m+p-	179601-23-1	mg/kg		<0.030	<0.030	<0.030	----	----	----	----
xylene, o-	95-47-6	mg/kg		<0.030	<0.030	<0.030	----	----	----	----
xylenes, total	1330-20-7	mg/kg		<0.050	<0.050	<0.050	----	----	----	----
BTEX, total	----	mg/kg		<0.10	<0.10	<0.10	----	----	----	----
Hydrocarbons										
F1 (C6-C10)	----	mg/kg		<5.0	<5.0	<5.0	----	----	----	----
F2 (C10-C16)	----	mg/kg		<10	10	<10	----	----	----	----
F3 (C16-C34)	----	mg/kg		<50	<50	<50	----	----	----	----
F4 (C34-C50)	----	mg/kg		<50	<50	<50	----	----	----	----
F1-BTEX	----	mg/kg		<5.0	<5.0	<5.0	----	----	----	----
hydrocarbons, total (C6-C50)	----	mg/kg		<80	<80	<80	----	----	----	----
chromatogram to baseline at nC50	n/a	-		YES	YES	YES	----	----	----	----
Hydrocarbons Surrogates										
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	%		70.3	74.1	70.0	----	----	----	----
dichlorotoluene, 3,4-	97-75-0	%		140	116	131	----	----	----	----
Volatile Organic Compounds Surrogates										
bromofluorobenzene, 4-	460-00-4	%		119	107	106	----	----	----	----
difluorobenzene, 1,4-	540-36-3	%		114	105	111	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

Summary of Guideline Limits

Analyte	CAS Number	Unit	ON406/20 T1-RPIICC	ON406/20 T3.1-S-RPI
Physical Tests				
conductivity (1:2 leachate)	----	mS/cm	0.57 mS/cm	0.7 mS/cm
moisture	----	%		
pH (1:2 soil:CaCl2-aq)	----	pH units		
Cyanides				
cyanide, weak acid dissociable	----	mg/kg	0.051 mg/kg	0.051 mg/kg
Fixed-Ratio Extractables				
calcium, soluble ion content	7440-70-2	mg/L		
magnesium, soluble ion content	7439-95-4	mg/L		
sodium adsorption ratio [SAR]	----	-	2.4 -	5 -
sodium, soluble ion content	17341-25-2	mg/L		
Metals				
antimony	7440-36-0	mg/kg	1.3 mg/kg	7.5 mg/kg
arsenic	7440-38-2	mg/kg	18 mg/kg	18 mg/kg
barium	7440-39-3	mg/kg	220 mg/kg	390 mg/kg
beryllium	7440-41-7	mg/kg	2.5 mg/kg	4 mg/kg
boron, hot water soluble	7440-42-8	mg/kg		1.5 mg/kg
boron	7440-42-8	mg/kg	36 mg/kg	120 mg/kg
cadmium	7440-43-9	mg/kg	1.2 mg/kg	1.2 mg/kg
chromium	7440-47-3	mg/kg	70 mg/kg	160 mg/kg
cobalt	7440-48-4	mg/kg	21 mg/kg	22 mg/kg
copper	7440-50-8	mg/kg	92 mg/kg	140 mg/kg
lead	7439-92-1	mg/kg	120 mg/kg	120 mg/kg
mercury	7439-97-6	mg/kg	0.27 mg/kg	0.27 mg/kg
molybdenum	7439-98-7	mg/kg	2 mg/kg	6.9 mg/kg
nickel	7440-02-0	mg/kg	82 mg/kg	100 mg/kg
selenium	7782-49-2	mg/kg	1.5 mg/kg	2.4 mg/kg
silver	7440-22-4	mg/kg	0.5 mg/kg	20 mg/kg
thallium	7440-28-0	mg/kg	1 mg/kg	1 mg/kg
uranium	7440-61-1	mg/kg	2.5 mg/kg	23 mg/kg
vanadium	7440-62-2	mg/kg	86 mg/kg	86 mg/kg
zinc	7440-66-6	mg/kg	290 mg/kg	340 mg/kg
Speciated Metals				
chromium, hexavalent [Cr VI]	18540-29-9	mg/kg	0.66 mg/kg	8 mg/kg
Volatile Organic Compounds				
benzene	71-43-2	mg/kg	0.02 mg/kg	0.02 mg/kg
BTEX, total	----	mg/kg		
ethylbenzene	100-41-4	mg/kg	0.05 mg/kg	1.9 mg/kg

Analyte	CAS Number	Unit	ON406/20 T1-RPIICC	ON406/20 T3.1-S-RPI					
Volatile Organic Compounds - Continued									
toluene	108-88-3	mg/kg	**0.2 mg/kg**	**0.99 mg/kg**					
xylene, m+p-	179601-23-1	mg/kg							
xylene, o-	95-47-6	mg/kg							
xylenes, total	1330-20-7	mg/kg	**0.05 mg/kg**	**0.9 mg/kg**					
Hydrocarbons									
chromatogram to baseline at nC50	n/a	-							
F1 (C6-C10)	----	mg/kg	**25 mg/kg**	**25 mg/kg**					
F1-BTEX	----	mg/kg	**25 mg/kg**	**25 mg/kg**					
F2 (C10-C16)	----	mg/kg	**10 mg/kg**	**10 mg/kg**					
F3 (C16-C34)	----	mg/kg	**240 mg/kg**	**300 mg/kg**					
F4 (C34-C50)	----	mg/kg	**120 mg/kg**	**2800 mg/kg**					
hydrocarbons, total (C6-C50)	----	mg/kg							

Please refer to the General Comments section for an explanation of any qualifiers detected.

Key:

ON406/20	Ontario Regulation 406/19 - Excess Soils - 17-December-20
T1-RPIICC	406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use
T3.1-S-RPI	406 T3.1 - Volume Independent Soil - Res/Park/Inst Property Use

QUALITY CONTROL REPORT

Work Order	: **WT2219347**	Page	: 1 of 11
Client	: Pinchin Ltd.	Laboratory	: Waterloo - Environmental
Contact	: Karen Thrams	Account Manager	: Amanda Overholster
Address	: 225 Labrador Drive Unit #1 Waterloo ON Canada N2K 4M8	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: 1 416 817 2944
Project	: 313698.000	Date Samples Received	: 25-Oct-2022 13:00
PO	: ----	Date Analysis Commenced	: 28-Oct-2022
C-O-C number	: ----	Issue Date	: 10-Nov-2022 15:52
Sampler	: CLIENT ----		
Site	: ----		
Quote number	: 2022 SOA		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Waterloo Centralized Prep, Waterloo, Ontario
Andrea Armstrong	Department Manager - Air Quality and Volatiles	Waterloo Organics, Waterloo, Ontario
Danielle Gravel	Supervisor - Semi-Volatile Instrumentation	Waterloo Organics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Metals, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 719849)											
WT2219319-003	Anonymous	pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units	11.0	11.0	0.00%	5%	----
Physical Tests (QC Lot: 721523)											
WT2219988-003	Anonymous	moisture	----	E144	0.25	%	20.0	20.1	0.218%	20%	----
Physical Tests (QC Lot: 721789)											
WT2219347-001	BH6/SS3/5-7'	conductivity (1:2 leachate)	----	E100-L	5.00	µS/cm	1.57 mS/cm	1540	2.25%	20%	----
Cyanides (QC Lot: 719845)											
WT2219319-002	Anonymous	cyanide, weak acid dissociable	----	E336A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
Metals (QC Lot: 721786)											
WT2219347-001	BH6/SS3/5-7'	mercury	7439-97-6	E510	0.0050	mg/kg	0.0099	0.0100	0.0001	Diff <2x LOR	----
Metals (QC Lot: 721787)											
WT2219347-001	BH6/SS3/5-7'	antimony	7440-36-0	E440	0.10	mg/kg	0.26	0.23	0.02	Diff <2x LOR	----
		arsenic	7440-38-2	E440	0.10	mg/kg	7.63	6.41	17.4%	30%	----
		barium	7440-39-3	E440	0.50	mg/kg	238	204	15.3%	40%	----
		beryllium	7440-41-7	E440	0.10	mg/kg	0.89	0.75	17.4%	30%	----
		boron	7440-42-8	E440	5.0	mg/kg	18.8	14.6	4.1	Diff <2x LOR	----
		cadmium	7440-43-9	E440	0.020	mg/kg	0.116	0.104	0.012	Diff <2x LOR	----
		chromium	7440-47-3	E440	0.50	mg/kg	28.6	23.5	19.8%	30%	----
		cobalt	7440-48-4	E440	0.10	mg/kg	16.3	14.0	14.7%	30%	----
		copper	7440-50-8	E440	0.50	mg/kg	61.5	52.9	15.1%	30%	----
		lead	7439-92-1	E440	0.50	mg/kg	11.0	9.27	17.3%	40%	----
		molybdenum	7439-98-7	E440	0.10	mg/kg	1.19	1.05	12.8%	40%	----
		nickel	7440-02-0	E440	0.50	mg/kg	34.2	29.1	16.3%	30%	----
		selenium	7782-49-2	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
		silver	7440-22-4	E440	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	----
		thallium	7440-28-0	E440	0.050	mg/kg	0.143	0.115	0.028	Diff <2x LOR	----
		uranium	7440-61-1	E440	0.050	mg/kg	0.708	0.566	22.4%	30%	----
		vanadium	7440-62-2	E440	0.20	mg/kg	38.1	31.8	18.0%	30%	----
		zinc	7440-66-6	E440	2.0	mg/kg	71.4	62.0	14.0%	30%	----
Metals (QC Lot: 721788)											
WT2219347-001	BH6/SS3/5-7'	calcium, soluble ion content	7440-70-2	E484	0.50	mg/L	50.5	50.5	0.00%	30%	----

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 721788) - continued											
WT2219347-001	BH6/SS3/5-7'	magnesium, soluble ion content	7439-95-4	E484	0.50	mg/L	3.59	3.55	1.12%	30%	----
		sodium, soluble ion content	17341-25-2	E484	0.50	mg/L	217	224	3.17%	30%	----
Metals (QC Lot: 721790)											
WT2219347-001	BH6/SS3/5-7'	boron, hot water soluble	7440-42-8	E487	0.10	mg/kg	0.23	0.24	0.002	Diff <2x LOR	----
Speciated Metals (QC Lot: 719844)											
WT2219319-001	Anonymous	chromium, hexavalent [Cr VI]	18540-29-9	E532	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	----
Volatile Organic Compounds (QC Lot: 722928)											
WT2219347-002	TP1/SA4/2.5M	benzene	71-43-2	E611A	0.0050	mg/kg	<0.0050	<0.0050	0	Diff <2x LOR	----
		ethylbenzene	100-41-4	E611A	0.015	mg/kg	<0.015	<0.015	0	Diff <2x LOR	----
		toluene	108-88-3	E611A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		xylene, m+p-	179601-23-1	E611A	0.030	mg/kg	<0.030	<0.030	0	Diff <2x LOR	----
		xylene, o-	95-47-6	E611A	0.030	mg/kg	<0.030	<0.030	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 719848)											
WT2219319-001	Anonymous	F2 (C10-C16)	----	E601.SG-L	10	mg/kg	<10	<10	0	Diff <2x LOR	----
		F3 (C16-C34)	----	E601.SG-L	50	mg/kg	276	226	19.6%	40%	----
		F4 (C34-C50)	----	E601.SG-L	50	mg/kg	367	307	17.8%	40%	----
Hydrocarbons (QC Lot: 722929)											
WT2219347-002	TP1/SA4/2.5M	F1 (C6-C10)	----	E581.F1	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 721523)						
moisture	----	E144	0.25	%	<0.25	----
Physical Tests (QCLot: 721789)						
conductivity (1:2 leachate)	----	E100-L	5	µS/cm	<5.00	----
Cyanides (QCLot: 719845)						
cyanide, weak acid dissociable	----	E336A	0.05	mg/kg	<0.050	----
Metals (QCLot: 721786)						
mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	----
Metals (QCLot: 721787)						
antimony	7440-36-0	E440	0.1	mg/kg	<0.10	----
arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	----
barium	7440-39-3	E440	0.5	mg/kg	<0.50	----
beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	----
boron	7440-42-8	E440	5	mg/kg	<5.0	----
cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	----
chromium	7440-47-3	E440	0.5	mg/kg	<0.50	----
cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	----
copper	7440-50-8	E440	0.5	mg/kg	<0.50	----
lead	7439-92-1	E440	0.5	mg/kg	<0.50	----
molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	----
nickel	7440-02-0	E440	0.5	mg/kg	<0.50	----
selenium	7782-49-2	E440	0.2	mg/kg	<0.20	----
silver	7440-22-4	E440	0.1	mg/kg	<0.10	----
thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----
uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----
vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
zinc	7440-66-6	E440	2	mg/kg	<2.0	----
Metals (QCLot: 721788)						
calcium, soluble ion content	7440-70-2	E484	0.5	mg/L	<0.50	----
magnesium, soluble ion content	7439-95-4	E484	0.5	mg/L	<0.50	----
sodium, soluble ion content	17341-25-2	E484	0.5	mg/L	<0.50	----
Metals (QCLot: 721790)						
boron, hot water soluble	7440-42-8	E487	0.1	mg/kg	<0.10	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Speciated Metals (QCLot: 719844)						
chromium, hexavalent [Cr VI]	18540-29-9	E532	0.1	mg/kg	<0.10	----
Volatile Organic Compounds (QCLot: 722928)						
benzene	71-43-2	E611A	0.005	mg/kg	<0.0050	----
ethylbenzene	100-41-4	E611A	0.015	mg/kg	<0.015	----
toluene	108-88-3	E611A	0.05	mg/kg	<0.050	----
xylene, m+p-	179601-23-1	E611A	0.03	mg/kg	<0.030	----
xylene, o-	95-47-6	E611A	0.03	mg/kg	<0.030	----
Hydrocarbons (QCLot: 719848)						
F2 (C10-C16)	----	E601.SG-L	10	mg/kg	<10	----
F3 (C16-C34)	----	E601.SG-L	50	mg/kg	<50	----
F4 (C34-C50)	----	E601.SG-L	50	mg/kg	<50	----
Hydrocarbons (QCLot: 722929)						
F1 (C6-C10)	----	E581.F1	5	mg/kg	<5.0	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 719849)									
pH (1:2 soil:CaCl2-aq)	----	E108A	----	pH units	7 pH units	101	98.0	102	----
Physical Tests (QCLot: 721523)									
moisture	----	E144	0.25	%	50 %	100	90.0	110	----
Physical Tests (QCLot: 721789)									
conductivity (1:2 leachate)	----	E100-L	5	µS/cm	1409 µS/cm	94.7	90.0	110	----
Cyanides (QCLot: 719845)									
cyanide, weak acid dissociable	----	E336A	0.05	mg/kg	5 mg/kg	108	80.0	125	----
Metals (QCLot: 721786)									
mercury	7439-97-6	E510	0.005	mg/kg	0.1 mg/kg	100	80.0	120	----
Metals (QCLot: 721787)									
antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	107	80.0	120	----
arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	110	80.0	120	----
barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	104	80.0	120	----
beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	101	80.0	120	----
boron	7440-42-8	E440	5	mg/kg	100 mg/kg	100	80.0	120	----
cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	103	80.0	120	----
chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	106	80.0	120	----
cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	104	80.0	120	----
copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	102	80.0	120	----
lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	98.8	80.0	120	----
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	106	80.0	120	----
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	102	80.0	120	----
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	107	80.0	120	----
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	98.6	80.0	120	----
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	99.6	80.0	120	----
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	94.9	80.0	120	----
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	108	80.0	120	----
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	103	80.0	120	----
Metals (QCLot: 721788)									
calcium, soluble ion content	7440-70-2	E484	0.5	mg/L	300 mg/L	105	80.0	120	----
magnesium, soluble ion content	7439-95-4	E484	0.5	mg/L	50 mg/L	98.6	80.0	120	----

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 721788) - continued									
sodium, soluble ion content	17341-25-2	E484	0.5	mg/L	50 mg/L	95.2	80.0	120	----
Metals (QCLot: 721790)									
boron, hot water soluble	7440-42-8	E487	0.1	mg/kg	1.33333 mg/kg	102	70.0	130	----
Speciated Metals (QCLot: 719844)									
chromium, hexavalent [Cr VI]	18540-29-9	E532	0.1	mg/kg	0.8 mg/kg	88.7	80.0	120	----
Volatile Organic Compounds (QCLot: 722928)									
benzene	71-43-2	E611A	0.005	mg/kg	3.475 mg/kg	112	70.0	130	----
ethylbenzene	100-41-4	E611A	0.015	mg/kg	3.475 mg/kg	93.5	70.0	130	----
toluene	108-88-3	E611A	0.05	mg/kg	3.475 mg/kg	99.9	70.0	130	----
xylene, m+p-	179601-23-1	E611A	0.03	mg/kg	6.95 mg/kg	99.2	70.0	130	----
xylene, o-	95-47-6	E611A	0.03	mg/kg	3.475 mg/kg	95.6	70.0	130	----
Hydrocarbons (QCLot: 719848)									
F2 (C10-C16)	----	E601.SG-L	10	mg/kg	916.995 mg/kg	92.6	70.0	130	----
F3 (C16-C34)	----	E601.SG-L	50	mg/kg	1190.25 mg/kg	92.1	70.0	130	----
F4 (C34-C50)	----	E601.SG-L	50	mg/kg	879.735 mg/kg	72.1	70.0	130	----
Hydrocarbons (QCLot: 722929)									
F1 (C6-C10)	----	E581.F1	5	mg/kg	69.1875 mg/kg	98.5	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Cyanides (QCLot: 719845)										
WT2219319-002	Anonymous	cyanide, weak acid dissociable	----	E336A	1.34 mg/kg	2.5 mg/kg	109	70.0	130	----
Volatile Organic Compounds (QCLot: 722928)										
WT2219347-002	TP1/SA4/2.5M	benzene	71-43-2	E611A	2.20 mg/kg	3.125 mg/kg	103	60.0	140	----
		ethylbenzene	100-41-4	E611A	1.92 mg/kg	3.125 mg/kg	89.8	60.0	140	----
		toluene	108-88-3	E611A	2.00 mg/kg	3.125 mg/kg	93.7	60.0	140	----
		xylene, m+p-	179601-23-1	E611A	3.83 mg/kg	6.25 mg/kg	89.6	60.0	140	----
		xylene, o-	95-47-6	E611A	1.97 mg/kg	3.125 mg/kg	92.3	60.0	140	----
Hydrocarbons (QCLot: 719848)										
WT2219319-001	Anonymous	F2 (C10-C16)	----	E601.SG-L	556 mg/kg	924.49 mg/kg	77.8	60.0	140	----
		F3 (C16-C34)	----	E601.SG-L	693 mg/kg	1108.95 mg/kg	80.8	60.0	140	----
		F4 (C34-C50)	----	E601.SG-L	640 mg/kg	1071.36 mg/kg	77.3	60.0	140	----
Hydrocarbons (QCLot: 722929)										
WT2219347-002	TP1/SA4/2.5M	F1 (C6-C10)	----	E581.F1	34.6 mg/kg	62.5 mg/kg	80.8	60.0	140	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Physical Tests (QCLot: 721789)									
	RM	conductivity (1:2 leachate)	----	E100-L	1031.5 µS/cm	86.7	70.0	130	----
Metals (QCLot: 721786)									
	RM	mercury	7439-97-6	E510	0.0585 mg/kg	107	70.0	130	----
Metals (QCLot: 721787)									
	RM	antimony	7440-36-0	E440	3.99 mg/kg	91.1	70.0	130	----
	RM	arsenic	7440-38-2	E440	3.73 mg/kg	98.3	70.0	130	----
	RM	barium	7440-39-3	E440	105 mg/kg	104	70.0	130	----
	RM	beryllium	7440-41-7	E440	0.349 mg/kg	101	70.0	130	----
	RM	boron	7440-42-8	E440	8.5 mg/kg	99.4	40.0	160	----
	RM	cadmium	7440-43-9	E440	0.91 mg/kg	98.8	70.0	130	----
	RM	chromium	7440-47-3	E440	101 mg/kg	94.4	70.0	130	----
	RM	cobalt	7440-48-4	E440	6.9 mg/kg	97.8	70.0	130	----
	RM	copper	7440-50-8	E440	123 mg/kg	105	70.0	130	----
	RM	lead	7439-92-1	E440	267 mg/kg	102	70.0	130	----
	RM	molybdenum	7439-98-7	E440	1.03 mg/kg	98.4	70.0	130	----
	RM	nickel	7440-02-0	E440	26.7 mg/kg	99.0	70.0	130	----
	RM	silver	7440-22-4	E440	4.06 mg/kg	115	70.0	130	----
	RM	thallium	7440-28-0	E440	0.0786 mg/kg	85.1	40.0	160	----
	RM	uranium	7440-61-1	E440	0.52 mg/kg	84.9	70.0	130	----
	RM	vanadium	7440-62-2	E440	32.7 mg/kg	97.5	70.0	130	----
	RM	zinc	7440-66-6	E440	297 mg/kg	100	70.0	130	----
Metals (QCLot: 721788)									
	RM	calcium, soluble ion content	7440-70-2	E484	86.59 mg/L	104	70.0	130	----
	RM	magnesium, soluble ion content	7439-95-4	E484	25.74 mg/L	106	70.0	130	----
	RM	sodium, soluble ion content	17341-25-2	E484	30.05 mg/L	105	70.0	130	----
Metals (QCLot: 721790)									
	RM	boron, hot water soluble	7440-42-8	E487	1.4938 mg/kg	109	60.0	140	----
Speciated Metals (QCLot: 719844)									

Sub-Matrix:

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report: RM Target Concentration	Reference Material (RM) Report: Recovery (%) RM	Reference Material (RM) Report: Recovery Limits (%) Low	Reference Material (RM) Report: Recovery Limits (%) High	Reference Material (RM) Report: Qualifier
Speciated Metals (QCLot: 719844) - continued									
	RM	chromium, hexavalent [Cr VI]	18540-29-9	E532	172 mg/kg	93.3	70.0	130	----

ALS Canada Ltd.

right solutions.
right partner.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2219347**	Page	: 1 of 12
Client	: **Pinchin Ltd.**	Laboratory	: Waterloo - Environmental
Contact	: Karen Thrams	Account Manager	: Amanda Overholster
Address	: 225 Labrador Drive Unit #1 Waterloo ON Canada N2K 4M8	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: ----	Telephone	: 1 416 817 2944
Project	: 313698.000	Date Samples Received	: 25-Oct-2022 13:00
PO	: ----	Issue Date	: 10-Nov-2022 15:53
C-O-C number	: ----		
Sampler	: CLIENT		
Site	: ----		
Quote number	: 2022 SOA		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Cyanides : WAD Cyanide (0.01M NaOH Extraction)										
Glass soil jar/Teflon lined cap										
BH-1/SS-2/2.5-5'	E336A	24-Oct-2022	28-Oct-2022	14 days	4 days	✓	02-Nov-2022	14 days	5 days	✓
Cyanides : WAD Cyanide (0.01M NaOH Extraction)										
Glass soil jar/Teflon lined cap										
BH6/SS3/5-7'	E336A	24-Oct-2022	28-Oct-2022	14 days	4 days	✓	02-Nov-2022	14 days	5 days	✓
Cyanides : WAD Cyanide (0.01M NaOH Extraction)										
Glass soil jar/Teflon lined cap										
TP1/SA4/2.5M	E336A	24-Oct-2022	28-Oct-2022	14 days	4 days	✓	02-Nov-2022	14 days	5 days	✓
Fixed-Ratio Extractables : Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)										
Glass soil jar/Teflon lined cap										
BH-1/SS-2/2.5-5'	E484	24-Oct-2022	09-Nov-2022	180 days	16 days	✓	09-Nov-2022	180 days	0 days	✓
Fixed-Ratio Extractables : Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)										
Glass soil jar/Teflon lined cap										
BH6/SS3/5-7'	E484	24-Oct-2022	09-Nov-2022	180 days	16 days	✓	09-Nov-2022	180 days	0 days	✓
Fixed-Ratio Extractables : Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)										
Glass soil jar/Teflon lined cap										
TP1/SA4/2.5M	E484	24-Oct-2022	09-Nov-2022	180 days	16 days	✓	09-Nov-2022	180 days	0 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial [ON MECP]										
BH-1/SS-2/2.5-5'	E581.F1	24-Oct-2022	31-Oct-2022	14 days	7 days	✓	31-Oct-2022	40 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial [ON MECP] BH6/SS3/5-7'	E581.F1	24-Oct-2022	31-Oct-2022	14 days	7 days	✓	31-Oct-2022	40 days	0 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial [ON MECP] TP1/SA4/2.5M	E581.F1	24-Oct-2022	31-Oct-2022	14 days	7 days	✓	31-Oct-2022	40 days	0 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap BH-1/SS-2/2.5-5'	E601.SG-L	24-Oct-2022	28-Oct-2022	14 days	4 days	✓	09-Nov-2022	40 days	12 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap BH6/SS3/5-7'	E601.SG-L	24-Oct-2022	28-Oct-2022	14 days	4 days	✓	09-Nov-2022	40 days	12 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap TP1/SA4/2.5M	E601.SG-L	24-Oct-2022	28-Oct-2022	14 days	4 days	✓	09-Nov-2022	40 days	12 days	✓
Metals : Boron-Hot Water Extractable by ICPOES										
Glass soil jar/Teflon lined cap BH-1/SS-2/2.5-5'	E487	24-Oct-2022	09-Nov-2022	180 days	16 days	✓	09-Nov-2022	180 days	0 days	✓
Metals : Boron-Hot Water Extractable by ICPOES										
Glass soil jar/Teflon lined cap BH6/SS3/5-7'	E487	24-Oct-2022	09-Nov-2022	180 days	16 days	✓	09-Nov-2022	180 days	0 days	✓
Metals : Boron-Hot Water Extractable by ICPOES										
Glass soil jar/Teflon lined cap TP1/SA4/2.5M	E487	24-Oct-2022	09-Nov-2022	180 days	16 days	✓	09-Nov-2022	180 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap BH-1/SS-2/2.5-5'	E510	24-Oct-2022	09-Nov-2022	----	----		10-Nov-2022	28 days	17 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
BH6/SS3/5-7'	E510	24-Oct-2022	09-Nov-2022	----	----		10-Nov-2022	28 days	17 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
TP1/SA4/2.5M	E510	24-Oct-2022	09-Nov-2022	----	----		10-Nov-2022	28 days	17 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
BH-1/SS-2/2.5-5'	E440	24-Oct-2022	09-Nov-2022	----	----		09-Nov-2022	180 days	16 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
BH6/SS3/5-7'	E440	24-Oct-2022	09-Nov-2022	----	----		09-Nov-2022	180 days	16 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
TP1/SA4/2.5M	E440	24-Oct-2022	09-Nov-2022	----	----		09-Nov-2022	180 days	16 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
BH-1/SS-2/2.5-5'	E100-L	24-Oct-2022	09-Nov-2022	----	----		10-Nov-2022	30 days	17 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
BH6/SS3/5-7'	E100-L	24-Oct-2022	09-Nov-2022	----	----		10-Nov-2022	30 days	17 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
TP1/SA4/2.5M	E100-L	24-Oct-2022	09-Nov-2022	----	----		10-Nov-2022	30 days	17 days	✓
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
BH-1/SS-2/2.5-5'	E144	24-Oct-2022	----	----	----		29-Oct-2022	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
BH6/SS3/5-7'	E144	24-Oct-2022	----	----	----		29-Oct-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
TP1/SA4/2.5M	E144	24-Oct-2022	----	----	----		29-Oct-2022	----	----	
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
BH-1/SS-2/2.5-5'	E108A	24-Oct-2022	28-Oct-2022	----	----		02-Nov-2022	30 days	9 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
BH6/SS3/5-7'	E108A	24-Oct-2022	28-Oct-2022	----	----		02-Nov-2022	30 days	9 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
TP1/SA4/2.5M	E108A	24-Oct-2022	28-Oct-2022	----	----		02-Nov-2022	30 days	9 days	✓
Speciated Metals : Hexavalent Chromium (Cr VI) by IC										
Glass soil jar/Teflon lined cap										
BH-1/SS-2/2.5-5'	E532	24-Oct-2022	28-Oct-2022	30 days	4 days	✓	04-Nov-2022	7 days	7 days	✓
Speciated Metals : Hexavalent Chromium (Cr VI) by IC										
Glass soil jar/Teflon lined cap										
BH6/SS3/5-7'	E532	24-Oct-2022	28-Oct-2022	30 days	4 days	✓	04-Nov-2022	7 days	7 days	✓
Speciated Metals : Hexavalent Chromium (Cr VI) by IC										
Glass soil jar/Teflon lined cap										
TP1/SA4/2.5M	E532	24-Oct-2022	28-Oct-2022	30 days	4 days	✓	04-Nov-2022	7 days	7 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial [ON MECP]										
BH-1/SS-2/2.5-5'	E611A	24-Oct-2022	31-Oct-2022	14 days	7 days	✓	31-Oct-2022	40 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial [ON MECP] BH6/SS3/5-7'	E611A	24-Oct-2022	31-Oct-2022	14 days	7 days	✓	31-Oct-2022	40 days	0 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial [ON MECP] TP1/SA4/2.5M	E611A	24-Oct-2022	31-Oct-2022	14 days	7 days	✓	31-Oct-2022	40 days	0 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Boron-Hot Water Extractable by ICPOES	E487	721790	1	14	7.1	5.0	✓
BTEX by Headspace GC-MS	E611A	722928	1	20	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	722929	1	19	5.2	5.0	✓
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L	719848	1	20	5.0	5.0	✓
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	721789	1	14	7.1	5.0	✓
Hexavalent Chromium (Cr VI) by IC	E532	719844	1	20	5.0	5.0	✓
Mercury in Soil/Solid by CVAAS	E510	721786	1	14	7.1	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	721787	1	14	7.1	5.0	✓
Moisture Content by Gravimetry	E144	721523	1	20	5.0	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	719849	1	20	5.0	5.0	✓
Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)	E484	721788	1	14	7.1	5.0	✓
WAD Cyanide (0.01M NaOH Extraction)	E336A	719845	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Boron-Hot Water Extractable by ICPOES	E487	721790	2	14	14.2	10.0	✓
BTEX by Headspace GC-MS	E611A	722928	1	20	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	722929	1	19	5.2	5.0	✓
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L	719848	1	20	5.0	5.0	✓
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	721789	2	14	14.2	10.0	✓
Hexavalent Chromium (Cr VI) by IC	E532	719844	2	20	10.0	10.0	✓
Mercury in Soil/Solid by CVAAS	E510	721786	2	14	14.2	10.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	721787	2	14	14.2	10.0	✓
Moisture Content by Gravimetry	E144	721523	1	20	5.0	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	719849	1	20	5.0	5.0	✓
Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)	E484	721788	2	14	14.2	10.0	✓
WAD Cyanide (0.01M NaOH Extraction)	E336A	719845	1	20	5.0	5.0	✓
Method Blanks (MB)							
Boron-Hot Water Extractable by ICPOES	E487	721790	1	14	7.1	5.0	✓
BTEX by Headspace GC-MS	E611A	722928	1	20	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	722929	1	19	5.2	5.0	✓
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L	719848	1	20	5.0	5.0	✓
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	721789	1	14	7.1	5.0	✓
Hexavalent Chromium (Cr VI) by IC	E532	719844	1	20	5.0	5.0	✓
Mercury in Soil/Solid by CVAAS	E510	721786	1	14	7.1	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	721787	1	14	7.1	5.0	✓
Moisture Content by Gravimetry	E144	721523	1	20	5.0	5.0	✓

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)	E484	721788	1	14	7.1	5.0	✓
WAD Cyanide (0.01M NaOH Extraction)	E336A	719845	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
BTEX by Headspace GC-MS	E611A	722928	1	20	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	722929	1	19	5.2	5.0	✓
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L	719848	1	20	5.0	5.0	✓
WAD Cyanide (0.01M NaOH Extraction)	E336A	719845	1	20	5.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L Waterloo - Environmental	Soil/Solid	CSSS Ch. 15 (mod)/APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Conductance is measured in the fluid that is observed in the upper layer.
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A Waterloo - Environmental	Soil/Solid	MOEE E3137A	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C) and is carried out in accordance with procedures described in the Analytical Protocol (prescriptive method). A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling, or decanting and then analyzed using a pH meter and electrode.
Moisture Content by Gravimetry	E144 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
WAD Cyanide (0.01M NaOH Extraction)	E336A Waterloo - Environmental	Soil/Solid	APHA 4500-CN I (mod)	Weak Acid Dissociable (WAD) cyanide is determined after extraction by Continuous Flow Analyzer (CFA) with in-line distillation followed by colourmetric analysis.
Metals in Soil/Solid by CRC ICPMS	E440 Waterloo - Environmental	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. This method does not adequately recover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines. Analysis is by Collision/Reaction Cell ICPMS.
Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)	E484 Waterloo - Environmental	Soil/Solid	SW846 6010C	A dried, disaggregated solid sample is extracted with deionized water, the aqueous extract is separated from the solid, acidified and then analyzed using a ICP/OES. The concentrations of Na, Ca and Mg are reported as per CALA requirements for calculated parameters. These individual parameters are not for comparison to any guideline.
Boron-Hot Water Extractable by ICPOES	E487 Waterloo - Environmental	Soil/Solid	HW EXTR, EPA 6010B	A dried solid sample is extracted with calcium chloride, the sample undergoes a heating process. After cooling the sample is filtered and analyzed by ICP/OES. Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

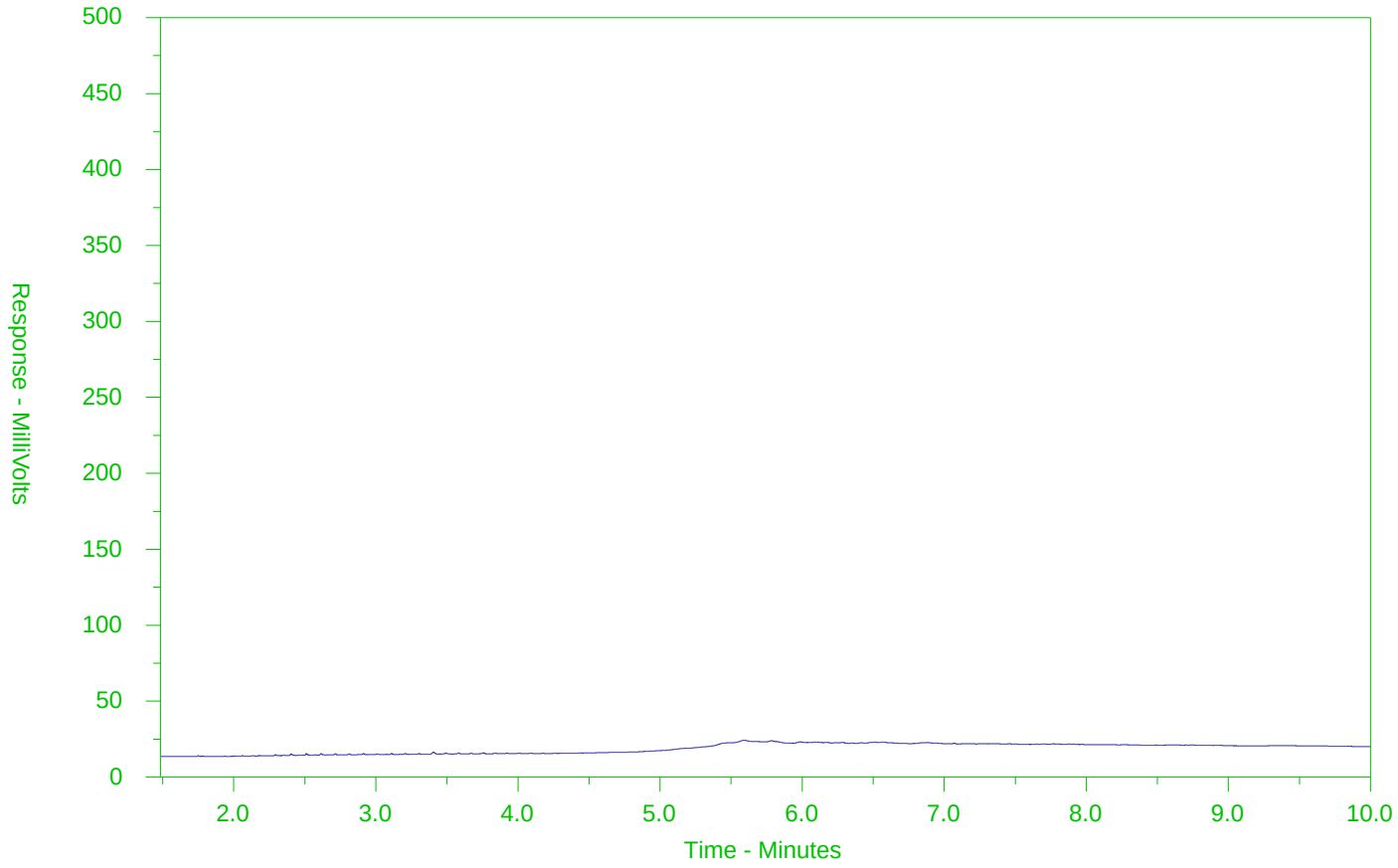
Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Mercury in Soil/Solid by CVAAS	E510 Waterloo - Environmental	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO_3 and HCl, followed by CVAAS analysis.
Hexavalent Chromium (Cr VI) by IC	E532 Waterloo - Environmental	Soil/Solid	APHA 3500-CR C	Instrumental analysis is performed by ion chromatography with UV detection.
CCME PHC - F1 by Headspace GC-FID	E581.F1 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	CCME Fraction 1 (F1) is analyzed by static headspace GC-FID. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Sample extracts are subjected to in-situ silica gel treatment prior to analysis by GC-FID for CCME hydrocarbon fractions (F2-F4).
BTEX by Headspace GC-MS	E611A Waterloo - Environmental	Soil/Solid	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
F1-BTEX	EC580 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	F1-BTEX is calculated as follows: F1-BTEX = F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).
Sum F1 to F4 (C6-C50)	EC581 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Hydrocarbons, total (C6-C50) is the sum of CCME Fractions F1(C6-C10), F2(C10-C16), F3(C16-C34), and F4(C34-C50). F4G-sg is not used within this calculation due to overlap with other fractions.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 Waterloo - Environmental	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.
Leach 1:2 Soil : 0.01$CaCl_2$ - As Received for pH	EP108A Waterloo - Environmental	Soil/Solid	MOEE E3137A	A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling or decanting and then analyzed using a pH meter and electrode.
Cyanide Extraction for CFA (0.01M NaOH)	EP333A Waterloo - Environmental	Soil/Solid	ON MECP E3015 (mod)	Extraction for various cyanide analysis is by rotary extraction of the soil with 0.01M Sodium Hydroxide.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for Metals and Mercury	EP440 Waterloo - Environmental	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO_3 and HCl. This method is intended to liberate metals that may be environmentally available.
Boron-Hot Water Extractable	EP487 Waterloo - Environmental	Soil/Solid	HW EXTR, EPA 6010B	A dried solid sample is extracted with weak calcium chloride, the sample undergoes a heating process. After cooling the sample is filtered and analyzed by ICP/OES. Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011)
Preparation of Hexavalent Chromium (Cr VI) for IC	EP532 Waterloo - Environmental	Soil/Solid	EPA 3060A	Field moist samples are digested with a sodium hydroxide/sodium carbonate solution as described in EPA 3060A.
VOCs Methanol Extraction for Headspace Analysis	EP581 Waterloo - Environmental	Soil/Solid	EPA 5035A (mod)	VOCs in samples are extracted with methanol. Extracts are then prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
PHCs and PAHs Hexane-Acetone Tumbler Extraction	EP601 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1 (mod)	Samples are subsampled and Petroleum Hydrocarbons (PHC) and PAHs are extracted with 1:1 hexane:acetone using a rotary extractor.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: 1123446 _9
Client Sample ID: BH6/SS3/5-7'



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

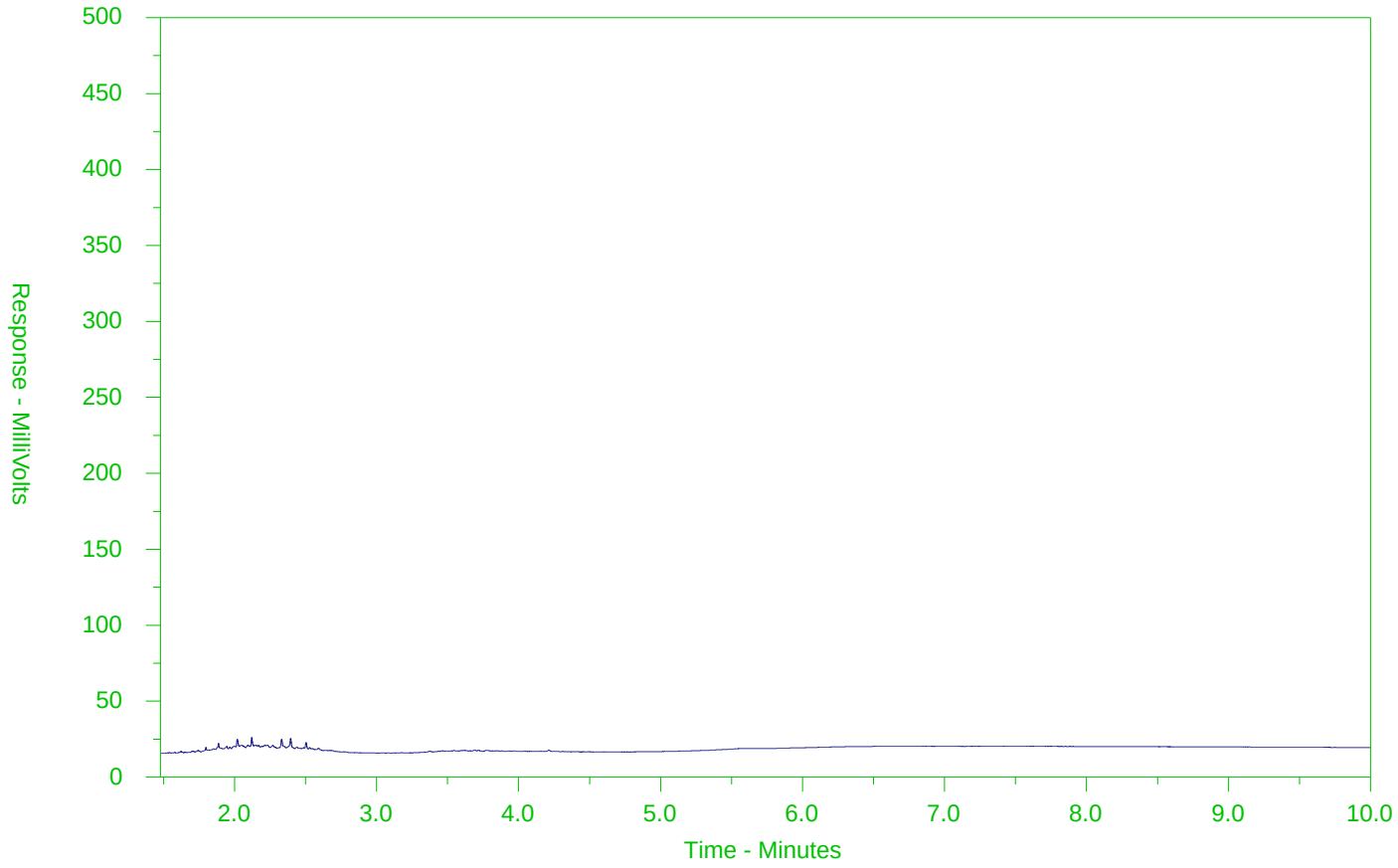
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: 1123446 _10
Client Sample ID: TP1/SA4/2.5M



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

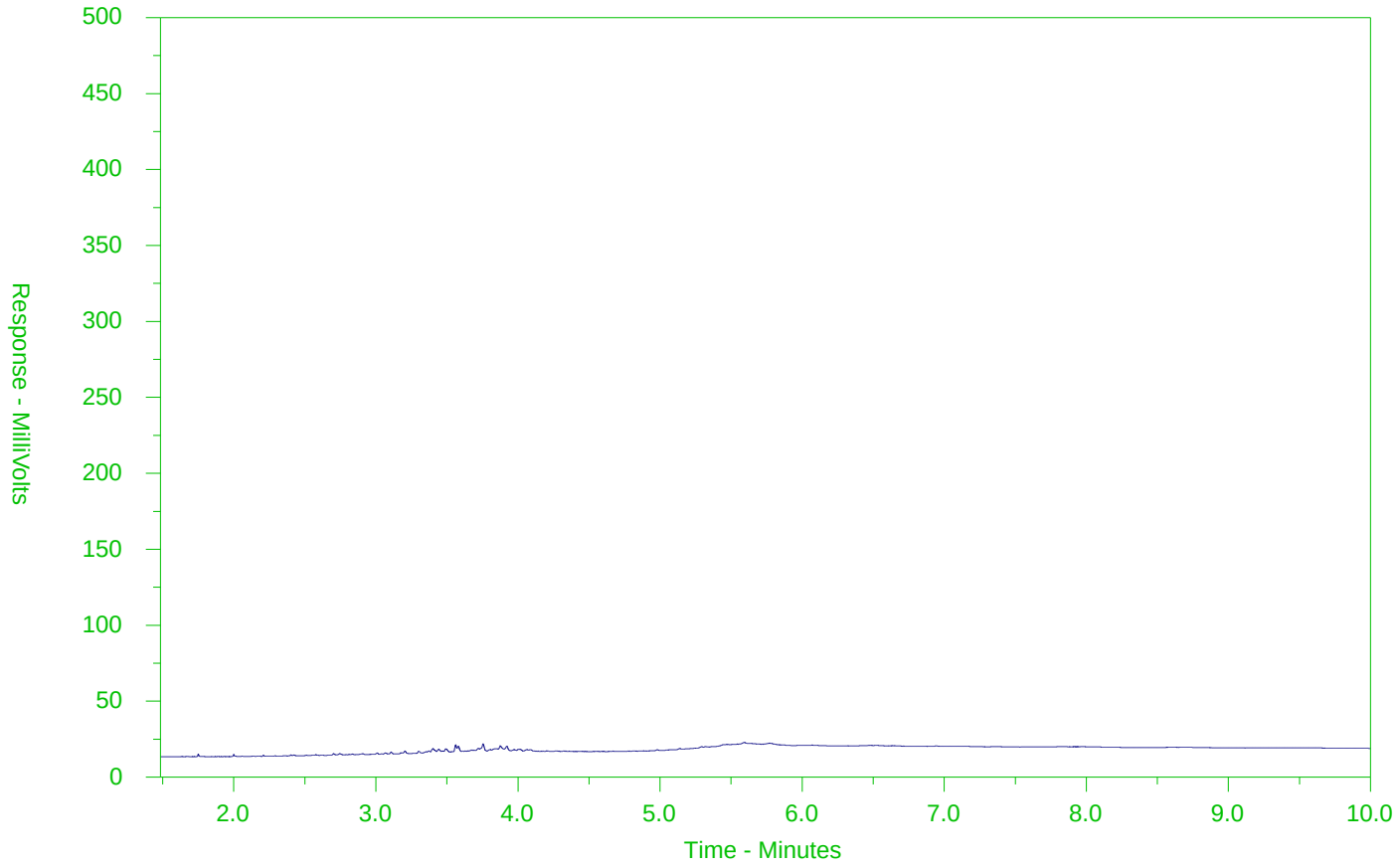
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: 1123446 _11
Client Sample ID: BH-1/SS-2/2.5-5'



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CERTIFICATE OF ANALYSIS

Work Order	: **WT2220122**	Page	: 1 of 3
Client	: **Pinchin Ltd.**	Laboratory	: Waterloo - Environmental
Contact	: Karen Thrams	Account Manager	: Amanda Overholster
Address	: 225 Labrador Drive Unit #1 Waterloo ON Canada N2K 4M8	Address	: 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	: ----	Telephone	: 1 416 817 2944
Project	: 313698.000	Date Samples Received	: 29-Oct-2022 09:50
PO	: ----	Date Analysis Commenced	: 03-Nov-2022
C-O-C number	: ----	Issue Date	: 08-Nov-2022 15:49
Sampler	: CLIENT		
Site	: ----		
Quote number	: 2022 SOA		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Joseph Scharbach		Centralized Prep, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances

LOR: Limit of Reporting (detection limit).

Unit	*Description*
%	percent
µS/cm	Microsiemens per centimetre
mg/kg	milligrams per kilogram
mV	millivolts
ohm cm	ohm centimetre (resistivity)
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	BH1, SS3 5-7.5 FT	----	----	----	----
					Client sampling date / time	24-Oct-2022 15:00	----	----	----	----
						WT2220122-001	--------	--------	--------	--------
						Result	----	----	----	----
Physical Tests										
conductivity (1:2 leachate)	----	E100-L	5.00	µS/cm		1880	----	----	----	----
moisture	----	E144	0.25	%		18.2	----	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV		405	----	----	----	----
pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units		7.82	----	----	----	----
resistivity	----	EC100R	100	ohm cm		530	----	----	----	----
Inorganic Parameters										
sulfides, acid volatile	----	E396-L	0.20	mg/kg		0.62	----	----	----	----
Leachable Anions & Nutrients										
chloride, soluble ion content	16887-00-6	E236.Cl	5.0	mg/kg		753	----	----	----	----
sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg		399	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Canada Ltd.

right solutions.
right partner.

QUALITY CONTROL REPORT

Work Order	: **WT2220122**	Page	: 1 of 5
Client	: Pinchin Ltd.	Laboratory	: Waterloo - Environmental
Contact	: Karen Thrams	Account Manager	: Amanda Overholster
Address	: 225 Labrador Drive Unit #1 Waterloo ON Canada N2K 4M8	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: 1 416 817 2944
Project	: 313698.000	Date Samples Received	: 29-Oct-2022 09:50
PO	: ----	Date Analysis Commenced	: 03-Nov-2022
C-O-C number	: ----	Issue Date	: 08-Nov-2022 15:49
Sampler	: CLIENT ----		
Site	: ----		
Quote number	: 2022 SOA		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Joseph Scharbach		Waterloo Centralized Prep, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 726079)											
WT2219778-001	Anonymous	conductivity (1:2 leachate)	----	E100-L	5.00	µS/cm	0.721 mS/cm	728	0.966%	20%	----
Physical Tests (QC Lot: 729227)											
WT2220122-001	BH1, SS3 5-7.5 FT	moisture	----	E144	0.25	%	18.2	18.4	1.02%	20%	----
Physical Tests (QC Lot: 732157)											
WT2220174-021	Anonymous	pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units	7.55	7.77	2.87%	5%	----
Physical Tests (QC Lot: 732162)											
CG2215038-001	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	478	469	1.90%	25%	----
Inorganic Parameters (QC Lot: 728314)											
CG2215039-017	Anonymous	sulfides, acid volatile	----	E396-L	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
Leachable Anions & Nutrients (QC Lot: 726081)											
WT2220122-001	BH1, SS3 5-7.5 FT	sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	399	417	4.25%	30%	----
Leachable Anions & Nutrients (QC Lot: 726082)											
WT2220122-001	BH1, SS3 5-7.5 FT	chloride, soluble ion content	16887-00-6	E236.Cl	5.0	mg/kg	753	806	6.81%	30%	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	*Result*	*Qualifier*
Physical Tests (QCLot: 726079)						
conductivity (1:2 leachate)	----	E100-L	5	µS/cm	<5.00	----
Physical Tests (QCLot: 729227)						
moisture	----	E144	0.25	%	<0.25	----
Inorganic Parameters (QCLot: 728314)						
sulfides, acid volatile	----	E396-L	0.2	mg/kg	<0.20	----
Leachable Anions & Nutrients (QCLot: 726081)						
sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	<20	----
Leachable Anions & Nutrients (QCLot: 726082)						
chloride, soluble ion content	16887-00-6	E236.Cl	5	mg/kg	<5.0	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 726079)									
conductivity (1:2 leachate)	----	E100-L	5	µS/cm	1409 µS/cm	97.6	90.0	110	----
Physical Tests (QCLot: 729227)									
moisture	----	E144	0.25	%	50 %	100	90.0	110	----
Physical Tests (QCLot: 732157)									
pH (1:2 soil:CaCl2-aq)	----	E108A	----	pH units	7 pH units	100	98.0	102	----
Inorganic Parameters (QCLot: 728314)									
sulfides, acid volatile	----	E396-L	0.2	mg/kg	2.544 mg/kg	73.1	70.0	130	----
Leachable Anions & Nutrients (QCLot: 726081)									
sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	5000 mg/kg	99.1	70.0	130	----
Leachable Anions & Nutrients (QCLot: 726082)									
chloride, soluble ion content	16887-00-6	E236.Cl	5	mg/kg	5000 mg/kg	99.6	80.0	120	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

Reference Material (RM) Report									
					RM Target Concentration	Recovery (%) RM	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method					
Physical Tests (QCLot: 726079)									
	RM	conductivity (1:2 leachate)	----	E100-L	1031.5 µS/cm	124	70.0	130	----
Physical Tests (QCLot: 732162)									
	RM	oxidation-reduction potential [ORP]	----	E125	475 mV	103	80.0	120	----
Leachable Anions & Nutrients (QCLot: 726081)									
	RM	sulfate, soluble ion content	14808-79-8	E236.SO4	217 mg/kg	119	60.0	140	----
Leachable Anions & Nutrients (QCLot: 726082)									
	RM	chloride, soluble ion content	16887-00-6	E236.Cl	673 mg/kg	109	70.0	130	----

ALS Canada Ltd.

right solutions.
right partner.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2220122**	Page	: 1 of 7
Client	: **Pinchin Ltd.**	Laboratory	: Waterloo - Environmental
Contact	: Karen Thrams	Account Manager	: Amanda Overholster
Address	: 225 Labrador Drive Unit #1 Waterloo ON Canada N2K 4M8	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: ----	Telephone	: 1 416 817 2944
Project	: 313698.000	Date Samples Received	: 29-Oct-2022 09:50
PO	: ----	Issue Date	: 08-Nov-2022 15:49
C-O-C number	: ----		
Sampler	: CLIENT		
Site	: ----		
Quote number	: 2022 SOA		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Inorganic Parameters : Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)										
LDPE bag BH1, SS3 5-7.5 FT	E396-L	24-Oct-2022	03-Nov-2022	14 days	10 days	✓	03-Nov-2022	7 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
LDPE bag BH1, SS3 5-7.5 FT	E236.Cl	24-Oct-2022	04-Nov-2022	30 days	11 days	✓	04-Nov-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
LDPE bag BH1, SS3 5-7.5 FT	E236.SO4	24-Oct-2022	04-Nov-2022	30 days	11 days	✓	04-Nov-2022	28 days	0 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
LDPE bag BH1, SS3 5-7.5 FT	E100-L	24-Oct-2022	04-Nov-2022	30 days	11 days	✓	07-Nov-2022	19 days	3 days	✓
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BH1, SS3 5-7.5 FT	E144	24-Oct-2022	----	----	----		03-Nov-2022	----	----	
Physical Tests : ORP by Electrode										
LDPE bag BH1, SS3 5-7.5 FT	E125	24-Oct-2022	05-Nov-2022	180 days	12 days	✓	07-Nov-2022	168 days	2 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
LDPE bag BH1, SS3 5-7.5 FT	E108A	24-Oct-2022	05-Nov-2022	----	----		08-Nov-2022	30 days	15 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)	E396-L	728314	1	14	7.1	4.7	✓
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	726079	1	4	25.0	5.0	✓
Moisture Content by Gravimetry	E144	729227	1	20	5.0	5.0	✓
ORP by Electrode	E125	732162	1	11	9.0	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	732157	1	11	9.0	5.0	✓
Water Extractable Chloride by IC	E236.Cl	726082	1	2	50.0	5.0	✓
Water Extractable Sulfate by IC	E236.SO4	726081	1	2	50.0	5.0	✓
Laboratory Control Samples (LCS)							
Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)	E396-L	728314	1	14	7.1	4.7	✓
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	726079	2	4	50.0	10.0	✓
Moisture Content by Gravimetry	E144	729227	1	20	5.0	5.0	✓
ORP by Electrode	E125	732162	1	11	9.0	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	732157	1	11	9.0	5.0	✓
Water Extractable Chloride by IC	E236.Cl	726082	2	2	100.0	10.0	✓
Water Extractable Sulfate by IC	E236.SO4	726081	2	2	100.0	10.0	✓
Method Blanks (MB)							
Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)	E396-L	728314	1	14	7.1	4.7	✓
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	726079	1	4	25.0	5.0	✓
Moisture Content by Gravimetry	E144	729227	1	20	5.0	5.0	✓
Water Extractable Chloride by IC	E236.Cl	726082	1	2	50.0	5.0	✓
Water Extractable Sulfate by IC	E236.SO4	726081	1	2	50.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L Waterloo - Environmental	Soil/Solid	CSSS Ch. 15 (mod)/APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Conductance is measured in the fluid that is observed in the upper layer.
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A Waterloo - Environmental	Soil/Solid	MOEE E3137A	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C) and is carried out in accordance with procedures described in the Analytical Protocol (prescriptive method). A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling, or decanting and then analyzed using a pH meter and electrode.
ORP by Electrode	E125 Waterloo - Environmental	Soil/Solid	APHA 2580 (mod)	Oxidation Redution Potential (ORP) is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed in the analysis, measured in mV.
Moisture Content by Gravimetry	E144 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
Water Extractable Chloride by IC	E236.Cl Waterloo - Environmental	Soil/Solid	EPA 300.1	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection using a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Anions are measured in the fluid that is observed in the upper layer.
Water Extractable Sulfate by IC	E236.SO4 Waterloo - Environmental	Soil/Solid	EPA 300.1	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection using a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Anions are measured in the fluid that is observed in the upper layer.
Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)	E396-L Waterloo - Environmental	Soil/Solid	APHA 4500S2J	This analysis is carried out in accordance with the method described in APHA 4500 S2-J. After extraction the Acid Volatile Sulphide is determined colourimetrically.
Resistivity Calculation for Soil Using E100-L	EC100R Waterloo - Environmental	Soil/Solid	APHA 2510 B	Soil Resistivity (calculated) is determined as the inverse of the conductivity of a 2:1 water:soil leachate (dry weight). This method is intended as a rapid approximation for Soil Resistivity. Where high accuracy results are required, direct measurement of Soil Resistivity by the Wenner Four-Electrode Method (ASTM G57) is recommended.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 Waterloo - Environmental	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.
Leach 1:2 Soil : 0.01CaCl2 - As Received for pH	EP108A Waterloo - Environmental	Soil/Solid	MOEE E3137A	A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling or decanting and then analyzed using a pH meter and electrode.
Preparation of ORP by Electrode	EP125 Waterloo - Environmental	Soil/Solid	APHA 2580 (mod)	Field-moist sample is extracted in a 1:2 ratio with DI water and then analyzed by ORP meter.
Anions Leach 1:10 Soil:Water (Dry)	EP236 Waterloo - Environmental	Soil/Solid	EPA 300.1	5 grams of dried soil is mixed with 50 grams of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.
Distillation for Acid Volatile Sulfide in Soil	EP396-L Waterloo - Environmental	Soil/Solid	APHA 4500S2J	Acid Volatile Sulfide is determined by colourimetric measurement on a sediment sample that has been treated with hydrochloric acid within a purge and trap system, where the evolved hydrogen sulfide gas is carried into a basic solution by argon gas for analysis.

Chain of Custody (COC) / Analytical Request Form

COC Number: 22 -

Page of

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Environmental Division Waterloo

Work Order Reference

WT2220122

Telephone : +1 519 886 6910

Report To	Contact and company name below will appear on the final report
Company:	Pinchin Ltd.
Contact:	Karen Thrams
Phone:	519.404.6483
	Company address below will appear on the final report
Street:	
City/Province:	
Postal Code:	

Reports / Recipients

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Merge QC/QCI Reports with COA ☑ YES ☐ NO ☐ N/A

☑ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: kthrams@pinchin.com

Email 2: ksingh@pinchin.com

Email 3:

Turnaround Time (TAT) Requested

☑ Routine [R] if received by 3pm M-F - no surcharges app

☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharg

☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharg

☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharg

☐ 1 day [E] if received by 3pm M-F - 100% rush surcharg

☐ Same day [E2] if received by 10am M-S - 200% rush su

Additional fees may apply to rush requests on w

Date and Time Required for all E&P TATs:

For all tests with rush TATs requested, please contact your AM to confirm availability.

Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	Pinchin Ltd.
Contact:	Accounts Payables

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: ap@pinchin.com

Email 2:

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	PINC100 / 2022 SOA	AFE/Cost Center:	PO#
Job #:	313698.000	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (ALS use only): WT2220122

ALS Contact: Amanda Overholster

Sampler:

Analysis Request

NUMBER OF CONTAINERS

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Corrosivity Package	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	BH1, SS3 5-7.5 FT	Oct 24, 2022	15:00	SOIL	R			

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

☐ YES ☐ NO

Are samples for human consumption/ use?

☐ YES ☐ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

Login: Please log into GEL

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☐ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				14.3			

SHIPMENT RELEASE (client use)				INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Karen Thrams	Date: 28-Oct-22	Time: 19:45	Received by:	Date:	Time:	Received by: MA	Date: 2022-10-29	Time: 09:50

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

FEB 2022 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

SW-022

CERTIFICATE OF ANALYSIS

Work Order	: **WT2220986**	Page	: 1 of 3
Client	: **Pinchin Ltd.**	Laboratory	: Waterloo - Environmental
Contact	: Karen Thrams	Account Manager	: Amanda Overholster
Address	: 225 Labrador Drive Unit #1 Waterloo ON Canada N2K 4M8	Address	: 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	: ----	Telephone	: 1 416 817 2944
Project	: 313698	Date Samples Received	: 07-Nov-2022 16:40
PO	: ----	Date Analysis Commenced	: 08-Nov-2022
C-O-C number	: ----	Issue Date	: 18-Nov-2022 19:48
Sampler	: CLIENT		
Site	: ----		
Quote number	: 2022 SOA		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Jon Fisher	Department Manager - Inorganics	Inorganics, Waterloo, Ontario
Niral Patel		Centralized Prep, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances

LOR: Limit of Reporting (detection limit).

Unit	*Description*
%	percent
µS/cm	microsiemens per centimetre
mg/kg	milligrams per kilogram
mV	millivolts
ohm cm	ohm centimetre (resistivity)
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	BH3-SS-3-5-7'	----	----	----	----
					Client sampling date / time	05-Nov-2022 10:00	----	----	----	----
					WT2220986-001	--------	--------	--------	--------	--------
					Result	----	----	----	----
Physical Tests										
conductivity (1:2 leachate)	----	E100-L	5.00	µS/cm		1040	----	----	----	----
moisture	----	E144	0.25	%		15.4	----	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV		329	----	----	----	----
pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units		7.88	----	----	----	----
resistivity	----	EC100R	100	ohm cm		960	----	----	----	----
Inorganics										
sulfides, acid volatile	----	E396-L	0.20	mg/kg		0.68	----	----	----	----
Leachable Anions & Nutrients										
chloride, soluble ion content	16887-00-6	E236.Cl	5.0	mg/kg		579	----	----	----	----
sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg		39	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Canada Ltd.

right solutions.
right partner.

QUALITY CONTROL REPORT

Work Order	: **WT2220986**	Page	: 1 of 5
Client	: Pinchin Ltd.	Laboratory	: Waterloo - Environmental
Contact	: Karen Thrams	Account Manager	: Amanda Overholster
Address	: 225 Labrador Drive Unit #1 Waterloo ON Canada N2K 4M8	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: 1 416 817 2944
Project	: 313698	Date Samples Received	: 07-Nov-2022 16:40
PO	: ----	Date Analysis Commenced	: 08-Nov-2022
C-O-C number	: ----	Issue Date	: 18-Nov-2022 19:49
Sampler	: CLIENT ----		
Site	: ----		
Quote number	: 2022 SOA		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Jon Fisher	Department Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario
Niral Patel		Waterloo Centralized Prep, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 734554)											
CG2215342-001	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	514	463	10.4%	25%	----
Physical Tests (QC Lot: 734824)											
WT2220981-006	Anonymous	conductivity (1:2 leachate)	----	E100-L	5.00	µS/cm	0.198 mS/cm	198	0.0506%	20%	----
Physical Tests (QC Lot: 736132)											
WT2220895-001	Anonymous	moisture	----	E144	0.25	%	14.7	14.5	1.45%	20%	----
Physical Tests (QC Lot: 740325)											
WT2220986-001	BH3-SS-3-5-7'	pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units	7.88	7.89	0.127%	5%	----
Inorganics (QC Lot: 736900)											
WT2220986-001	BH3-SS-3-5-7'	sulfides, acid volatile	----	E396-L	0.20	mg/kg	0.68	0.39	0.30	Diff <2x LOR	----
Leachable Anions & Nutrients (QC Lot: 743705)											
CG2215342-004	Anonymous	chloride, soluble ion content	16887-00-6	E236.Cl	5.0	mg/kg	16.3	15.8	0.6	Diff <2x LOR	----
Leachable Anions & Nutrients (QC Lot: 743706)											
CG2215342-004	Anonymous	sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	26	28	2	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 734824)						
conductivity (1:2 leachate)	----	E100-L	5	µS/cm	<5.00	----
Physical Tests (QCLot: 736132)						
moisture	----	E144	0.25	%	<0.25	----
Inorganics (QCLot: 736900)						
sulfides, acid volatile	----	E396-L	0.2	mg/kg	<0.20	----
Leachable Anions & Nutrients (QCLot: 743705)						
chloride, soluble ion content	16887-00-6	E236.Cl	5	mg/kg	<5.0	----
Leachable Anions & Nutrients (QCLot: 743706)						
sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	<20	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 734824)									
conductivity (1:2 leachate)	----	E100-L	5	µS/cm	1409 µS/cm	95.9	90.0	110	----
Physical Tests (QCLot: 736132)									
moisture	----	E144	0.25	%	50 %	99.2	90.0	110	----
Physical Tests (QCLot: 740325)									
pH (1:2 soil:CaCl2-aq)	----	E108A	----	pH units	7 pH units	100	98.0	102	----
Inorganics (QCLot: 736900)									
sulfides, acid volatile	----	E396-L	0.2	mg/kg	2.544 mg/kg	72.3	70.0	130	----
Leachable Anions & Nutrients (QCLot: 743705)									
chloride, soluble ion content	16887-00-6	E236.Cl	5	mg/kg	5000 mg/kg	101	80.0	120	----
Leachable Anions & Nutrients (QCLot: 743706)									
sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	5000 mg/kg	100	70.0	130	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Physical Tests (QCLot: 734554)									
	RM	oxidation-reduction potential [ORP]	----	E125	475 mV	94.9	80.0	120	----
Physical Tests (QCLot: 734824)									
	RM	conductivity (1:2 leachate)	----	E100-L	1031.5 µS/cm	105	70.0	130	----
Leachable Anions & Nutrients (QCLot: 743705)									
	RM	chloride, soluble ion content	16887-00-6	E236.Cl	673 mg/kg	102	70.0	130	----
Leachable Anions & Nutrients (QCLot: 743706)									
	RM	sulfate, soluble ion content	14808-79-8	E236.SO4	217 mg/kg	103	60.0	140	----

ALS Canada Ltd.

right solutions.
right partner.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2220986**	Page	: 1 of 7
Client	: **Pinchin Ltd.**	Laboratory	: Waterloo - Environmental
Contact	: Karen Thrams	Account Manager	: Amanda Overholster
Address	: 225 Labrador Drive Unit #1 Waterloo ON Canada N2K 4M8	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: ----	Telephone	: 1 416 817 2944
Project	: 313698	Date Samples Received	: 07-Nov-2022 16:40
PO	: ----	Issue Date	: 18-Nov-2022 19:49
C-O-C number	: ----		
Sampler	: CLIENT		
Site	: ----		
Quote number	: 2022 SOA		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Inorganics : Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)										
Glass soil jar/Teflon lined cap BH3-SS-3-5-7'	E396-L	05-Nov-2022	09-Nov-2022	14 days	4 days	✓	09-Nov-2022	7 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap BH3-SS-3-5-7'	E236.Cl	05-Nov-2022	15-Nov-2022	30 days	10 days	✓	15-Nov-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
Glass soil jar/Teflon lined cap BH3-SS-3-5-7'	E236.SO4	05-Nov-2022	15-Nov-2022	30 days	10 days	✓	15-Nov-2022	28 days	0 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap BH3-SS-3-5-7'	E100-L	05-Nov-2022	18-Nov-2022	----	----		18-Nov-2022	30 days	13 days	✓
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap BH3-SS-3-5-7'	E144	05-Nov-2022	----	----	----		08-Nov-2022	----	----	
Physical Tests : ORP by Electrode										
Glass soil jar/Teflon lined cap BH3-SS-3-5-7'	E125	05-Nov-2022	08-Nov-2022	----	----		08-Nov-2022	180 days	3 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap BH3-SS-3-5-7'	E108A	05-Nov-2022	11-Nov-2022	----	----		14-Nov-2022	30 days	9 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)	E396-L	736900	1	10	10.0	4.7	✓
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	734824	1	15	6.6	5.0	✓
Moisture Content by Gravimetry	E144	736132	1	20	5.0	5.0	✓
ORP by Electrode	E125	734554	1	8	12.5	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	740325	1	20	5.0	5.0	✓
Water Extractable Chloride by IC	E236.Cl	743705	1	19	5.2	5.0	✓
Water Extractable Sulfate by IC	E236.SO4	743706	1	19	5.2	5.0	✓
Laboratory Control Samples (LCS)							
Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)	E396-L	736900	1	10	10.0	4.7	✓
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	734824	2	15	13.3	10.0	✓
Moisture Content by Gravimetry	E144	736132	1	20	5.0	5.0	✓
ORP by Electrode	E125	734554	1	8	12.5	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	740325	1	20	5.0	5.0	✓
Water Extractable Chloride by IC	E236.Cl	743705	2	19	10.5	10.0	✓
Water Extractable Sulfate by IC	E236.SO4	743706	2	19	10.5	10.0	✓
Method Blanks (MB)							
Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)	E396-L	736900	1	10	10.0	4.7	✓
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	734824	1	15	6.6	5.0	✓
Moisture Content by Gravimetry	E144	736132	1	20	5.0	5.0	✓
Water Extractable Chloride by IC	E236.Cl	743705	1	19	5.2	5.0	✓
Water Extractable Sulfate by IC	E236.SO4	743706	1	19	5.2	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L Waterloo - Environmental	Soil/Solid	CSSS Ch. 15 (mod)/APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Conductance is measured in the fluid that is observed in the upper layer.
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A Waterloo - Environmental	Soil/Solid	MOEE E3137A	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C) and is carried out in accordance with procedures described in the Analytical Protocol (prescriptive method). A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling, or decanting and then analyzed using a pH meter and electrode.
ORP by Electrode	E125 Waterloo - Environmental	Soil/Solid	APHA 2580 (mod)	Oxidation Redution Potential (ORP) is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed in the analysis, measured in mV.
Moisture Content by Gravimetry	E144 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
Water Extractable Chloride by IC	E236.Cl Waterloo - Environmental	Soil/Solid	EPA 300.1	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection using a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Anions are measured in the fluid that is observed in the upper layer.
Water Extractable Sulfate by IC	E236.SO4 Waterloo - Environmental	Soil/Solid	EPA 300.1	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection using a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Anions are measured in the fluid that is observed in the upper layer.
Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)	E396-L Waterloo - Environmental	Soil/Solid	APHA 4500S2J	This analysis is carried out in accordance with the method described in APHA 4500 S2-J. After extraction the Acid Volatile Sulphide is determined colourimetrically.
Resistivity Calculation for Soil Using E100-L	EC100R Waterloo - Environmental	Soil/Solid	APHA 2510 B	Soil Resistivity (calculated) is determined as the inverse of the conductivity of a 2:1 water:soil leachate (dry weight). This method is intended as a rapid approximation for Soil Resistivity. Where high accuracy results are required, direct measurement of Soil Resistivity by the Wenner Four-Electrode Method (ASTM G57) is recommended.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 Waterloo - Environmental	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.
Leach 1:2 Soil : 0.01CaCl2 - As Received for pH	EP108A Waterloo - Environmental	Soil/Solid	MOEE E3137A	A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling or decanting and then analyzed using a pH meter and electrode.
Preparation of ORP by Electrode	EP125 Waterloo - Environmental	Soil/Solid	APHA 2580 (mod)	Field-moist sample is extracted in a 1:2 ratio with DI water and then analyzed by ORP meter.
Anions Leach 1:10 Soil:Water (Dry)	EP236 Waterloo - Environmental	Soil/Solid	EPA 300.1	5 grams of dried soil is mixed with 50 grams of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.
Distillation for Acid Volatile Sulfide in Soil	EP396-L Waterloo - Environmental	Soil/Solid	APHA 4500S2J	Acid Volatile Sulfide is determined by colourimetric measurement on a sediment sample that has been treated with hydrochloric acid within a purge and trap system, where the evolved hydrogen sulfide gas is carried into a basic solution by argon gas for analysis.

Chain of Custody (COC) / Analytical Request Form

COC Number: 22 -

Page of

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Environmental Division Waterloo

Work Order Reference WT2220986

Telephone : +1 519 886 6910

Report To	Contact and company name below will appear on the final report
Company:	Pinchin Ltd.
Contact:	Karen Thrams / Karanveer Singh
Phone:	
	Company address below will appear on the final report
Street:	
City/Province:	
Postal Code:	
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	Pinchin Ltd.
Contact:	Accounts Payables

Reports / Recipients

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Merge QC/QCI Reports with COA ☑ YES ☐ NO ☐ N/A

☑ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax kthrams@pinchin.com

Email 2 ksingh@pinchin.com

Email 3

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax ap@pinchin.com

Email 2

Turnaround Time (TAT) Requested

☑ Routine [R] if received by 3pm M-F - no surcharges appl
☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge
☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharg
☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharg
☐ 1 day [E] if received by 3pm M-F - 100% rush surcharg
☐ Same day [E2] if received by 10am M-S - 200% rush si

Additional fees may apply to rush requests on

Date and Time Required for all E&P TATs:

For all tests with rush TATs requested

Analy

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	PINC100 / 2022 SOA	AFE/Cost Center:	PO#
Job #:	313698	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (ALS use only): WT2220986 ALS Contact: Amanda Overholster Sampler:

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	corrosivity package	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	BH3-SS-3 - 5-7'	Nov 5	10:00	Soil		R				

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

Login: Please log into GEL

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☐ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	1.2

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
K.Singh	Nov 7 /2022	4:30					7-NOV-22	16:40

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

FES 2022 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

SOL-499

APPENDIX V

Report Limitations and Guidelines for Use

REPORT LIMITATIONS & GUIDELINES FOR USE

This information has been provided to help manage risks with respect to the use of this report.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS AND PROJECTS

This report was prepared for the exclusive use of the Client and their authorized agents, subject to the conditions and limitations contained within the duly authorized work plan. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third parties. If additional parties require reliance on this report, written authorization from Pinchin will be required. Pinchin disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No other warranties are implied or expressed. Furthermore, this report should not be construed as legal advice.

SUBSURFACE CONDITIONS CAN CHANGE

This geotechnical report is based on the existing conditions at the time the study was performed, and Pinchin's opinion of soil conditions are strictly based on soil samples collected at specific test hole locations. The findings and conclusions of Pinchin's reports may be affected by the passage of time, by manmade events such as construction on or adjacent to the Site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations.

LIMITATIONS TO PROFESSIONAL OPINIONS

Interpretations of subsurface conditions are based on field observations from test holes that were spaced to capture a 'representative' snap shot of subsurface conditions. Site exploration identifies subsurface conditions only at points of sampling. Pinchin reviews field and laboratory data and then applies professional judgment to formulate an opinion of subsurface conditions throughout the Site. Actual subsurface conditions may differ, between sampling locations, from those indicated in this report.

LIMITATIONS OF RECOMMENDATIONS

Subsurface soil conditions should be verified by a qualified geotechnical engineer during construction. Pinchin should be notified if any discrepancies to this report or unusual conditions are found during construction.

Sufficient monitoring, testing and consultation should be provided by Pinchin during construction and/or excavation activities, to confirm that the conditions encountered are consistent with those indicated by the test hole investigation, and to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated. In addition, monitoring, testing and consultation by Pinchin should be completed to evaluate whether or not earthwork activities are completed in

accordance with our recommendations. Retaining Pinchin for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions. However, please be advised that any construction/excavation observations by Pinchin is over and above the mandate of this geotechnical evaluation and therefore, additional fees would apply.

MISINTERPRETATION OF GEOTECHNICAL ENGINEERING REPORT

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having Pinchin confer with appropriate members of the design team after submitting the report. Also retain Pinchin to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having Pinchin participate in pre-bid and preconstruction conferences, and by providing construction observation. Please be advised that retaining Pinchin to participation in any 'other' activities associated with this project is over and above the mandate of this geotechnical investigation and therefore, additional fees would apply.

CONTRACTORS RESPONSIBILITY FOR SITE SAFETY

This geotechnical report is not intended to direct the contractor's procedures, methods, schedule or management of the work Site. The contractor is solely responsible for job Site safety and for managing construction operations to minimize risks to on-Site personnel and to adjacent properties. It is ultimately the contractor's responsibility that the Ontario Occupational Health and Safety Act is adhered to, and Site conditions satisfy all 'other' acts, regulations and/or legislation that may be mandated by federal, provincial and/or municipal authorities.

SUBSURFACE SOIL AND/OR GROUNDWATER CONTAMINATION

This report is geotechnical in nature and was not performed in accordance with any environmental guidelines. As such, any environmental comments are very preliminary in nature and based solely on field observations. Accordingly, the scope of services do not include any interpretations, recommendations, findings, or conclusions regarding the, assessment, prevention or abatement of contaminants, and no conclusions or inferences should be drawn regarding contamination, as they may relate to this project. The term "contamination" includes, but is not limited to, molds, fungi, spores, bacteria, viruses, PCBs, petroleum hydrocarbons, inorganics, pesticides/insecticides, volatile organic compounds, polycyclic aromatic hydrocarbons and/or any of their by-products.

Pinchin will not be responsible for any consequential or indirect damages. Pinchin will only be held liable for damages resulting from the negligence of Pinchin. Pinchin will not be liable for any losses or damage if the Client has failed, within a period of two years following the date upon which the claim is discovered within the meaning of the Limitations Act, 2002 (Ontario), to commence legal proceedings against Pinchin to recover such losses or damage.