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GROUNDWATER FLOW MODELLING OF THE NEAR SURFACE DISPOSAL FACILITY

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Revision 5

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Accepted by:

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Groundwater Flow Modelling of the Near Surface Disposal Facility

Revision 2

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Revision 1.1	April 24, 2017	Updated corrupted figures (to CNL Rev. 3)	Nick Bishop	Scott Donald	
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Version	Date	Document	Prepared By	Reviewed By
		 Sensitivity analysis expanded to assess: The effect of an increase/decrease to the hydraulic conductivity of the blast damaged zone The effect of an ineffective/compromised sacrificial liner The effect of evapotranspiration for the calculation of infiltration to the storm water management ponds The effect of an increase to the rate of discharge from the Waste Water Treatment Plant to the exfiltration gallery 		
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1.0 INTRODUCTION

1.1 Background

Canadian Nuclear Laboratories (CNL) is proposing to construct a Near Surface Disposal Facility (NSDF) for the disposal of radioactive waste at Chalk River Laboratories (CRL) (the NSDF Project). To support the future plans for the CRL site, CNL identified the need for a disposal facility capable of accepting radioactive waste from legacy waste management areas, current operations, and decommissioning projects at CRL and its other business locations.

The NSDF Project is designed to include an engineered containment mound (ECM), built at a near-surface level on the CRL site, located in Renfrew County, Ontario (see Figure 1.1). The facility is expected to be operational for approximately 50 years and will be expandable to receive up to 1,000,000 cubic metres (m³) of low-level radioactive waste. The placement of the wastes in the ECM will be completed in stages as following:

- Stage 1, with a design capacity of 525,000 m³ to accommodate wastes currently in storage and to be generated over the next 20 to 25 years. During this period a sacrificial liner is to be placed over the Phase 2 area; and
- Stage 2, during which the design fill capacity is expanded to 1,000,000 m³ to accommodate wastes expected to be generated following the first stage.

This capability will allow for the inclusion of waste from future operations, decommissioning, and remediation at CRL and off-site CNL facilities (e.g., Whiteshell Laboratories), as well as commercial wastes (i.e., from hospitals, universities, and laboratories) if needed. The main physical works related to the NSDF Project are the ECM that will contain the waste, the waste water treatment plant (WWTP) and supporting infrastructure.

1.2 Objectives

CNL retained Golder Associates Ltd. (Golder) to assist in completing an environmental assessment of the NSDF Project. The work described in this report was completed as a part of the technical support for hydrogeological aspects of the environmental assessment, including evaluation of the short-term (operations phase) and long-term (closure and post-closure phase) potential project-related effects to the groundwater flow regime. Results of the hydrogeological assessment are incorporated into the overall environmental impact assessment, documented in Section 5.3.2 of the NSDF Project Environmental Impact Statement (EIS) (Golder 2017) (note that the contaminant transport component of the assessment was completed by CNL). This analysis includes evaluation of groundwater flow pathways from the NSDF Project site (i.e., the NSDF Project footprint, where Project activities would be undertaken including proposed facilities, buildings and infrastructure), and the rates of groundwater flow from the NSDF Project components to downstream receptors.

1.3 Scope of Work

The following tasks were completed in order to meet the above objectives:

Review of Existing Data – Data provided by CNL were reviewed. These included geological contact data, groundwater elevations, stream flow data, groundwater quality data, and reports that detail the existing conceptual hydrogeological model of the NSDF Project site and surrounding areas. Design data for the ECM and WWTP exfiltration gallery were also reviewed.

- Construction and Calibration of the Current-Conditions Groundwater Flow Model Following a review of the data and conceptual model, a groundwater flow model was constructed and calibrated to typical groundwater conditions (i.e., groundwater elevations and flow directions). A separate model calibration to high water table conditions was also completed.
- Construction of the Operations and Post-closure Groundwater Flow Simulations The calibrated groundwater flow model was adapted to evaluate the potential impacts associated with the NSDF Project during operations and under post-closure conditions.
- Sensitivity Analysis The tasks noted above were completed for the "base case" model parameterization. In order to evaluate the potential uncertainty associated with the predictive simulations, a sensitivity analysis was completed using the base case as a point of comparison.

This document is organized as follows: Section 2 provides an overview of the conceptual hydrogeological model, which serves as the basis for the numerical model; Section 3 outlines the construction and calibration of the groundwater flow model; Section 4 presents the operations phase and post-closure phase simulations; while a summary of the assessment is provided in Section 5.

2.0 PHYSICAL SETTING

The physical setting of the CRL site has been described in detail in numerous historical investigations (CNL 2016b was the primary reference used herein) as well as in Section 5.3 of the NSDF Project EIS (Golder 2019). This section summarizes the key findings from those investigations that relate to the conceptual hydrogeological model, including the site topography and drainage, geology, and groundwater conditions.

2.1 **Topography and Drainage**

The CRL site and surrounding area lies within the Ottawa River watershed. A number of drainage basins exist within the CRL site, including the Perch Lake Basin, which encompasses the location of the NSDF Project. The topography of the lower portion of the Perch Lake basin where the NSDF Project site is located is shown in the context of the CRL site topography on Figure 2.1. Ground surface elevation within the basin ranges from approximately 197 metres above sea level (mASL) at the crest of the hill south of Plant Road and east of the East Swamp, to 156 mASL at the outlet for Perch Lake.

As shown on Figure 2.1, several significant surface water features are located within the Perch Lake Basin (which has an overall drainage area of approximately 6,289,000 m²), including Main Stream, T-16 Stream, East Swamp Stream, Perch Lake, and Perch Creek. Wetlands are a predominant feature of the basin. These are found in the low-relief areas east of Main Stream and north of Perch Lake, as well as in the vicinity of the East Swamp Stream. East Swamp Stream and T-16 Stream flow into Main Stream, which discharges to Perch Lake. Perch Lake drains through the outlet at Perch Creek, which in turn discharges to the Ottawa River. A number of gauging stations record monthly flow volumes in these surface water features at the locations shown on Figure 2.1. Review of these data completed by others indicates that September is considered to be representative of low-flow conditions, and April is considered to be representative of high-flow conditions (CNL 2016b).





Previous studies have identified the portions of East Swamp Stream that are upstream (i.e., north) of the East Swamp Stream Weir to be dominated by groundwater discharge, and portions of the East Swamp Stream downstream (i.e., south) of the weir to be dominated by groundwater recharge. Similarly, T-16 Stream is also considered to be dominated by groundwater recharge.

2.2 Geology

CNL completed previous studies in support of proposed geological waste management facilities at the CRL site in which data on the geological environment were compiled and used to develop a descriptive geosphere model of the site. These studies are documented in CNL's Geologic Waste Management Facility Descriptive Geosphere Site Model Report (CNL 2016c) and Geologic Waste Management Facility Integrated Geosynthesis Report (CNL 2016d). Data presented in these reports forms the basis of the current geological and hydrostratigraphic interpretations at the site (including hydraulic response testing of the overburden and shallow bedrock), and provides context on the anticipated evolution of the geological conditions at the CRL site over the assessment timeframe (10,000 years). A description of the CNL Chalk River Site geology also is provided in Section 5.3 of the NSDF Project EIS (Golder 2019). This information is repeated herein for completeness in the context of this modelling report. Regardless, the reader is referred to the CNL documents for further details.

2.2.1 Regional Geological Conditions

The CRL site is located within the Central Gneiss belt of the Grenville Structural Province of the Canadian Shield. Bedrock in the area consists of highly altered gneissic rock and felsic igneous rock (upper amphibolite to granulite grade metamorphism under dynamic ductile conditions during the Grenville Orogeny) of late Precambrian-early Paleozoic age (Figure 2.2). Structurally, the CRL site is located within the Ottawa-Bonnechere Graben or rift valley, which trends from northwest to southeast from Lake Nipissing to the St. Lawrence River occupying a 60 kilometre (km) wide by 70 km long area. The Ottawa River occupies the eastern bounding fault of the rift valley, with the CRL site located on the western edge of the river. Secondary faulting (also oriented northwest to southeast) has a considerable effect on surface drainage and bedrock topography (CNL 2016b, CNL 2016c) in the vicinity of the NSDF Project site. Historical glaciations have generated a knobby bedrock surface (CNL 2016b, CNL 2016b, CNL 2016b), which outcrops in several locations in the region.

Bedrock in the area consists of highly altered gneissic rock and felsic igneous rock (upper amphibolite to granulite grade metamorphism under dynamic ductile conditions during the Grenville Orogeny) of late Precambrian-early Paleozoic age. Bedrock at the CRL site has been grouped into 3 main assemblages as shown on Figure 2.2 (from CNL 2016a). The bedrock within the Perch Lake basin and the NSDF Project site has been mapped as quartz monzonitic, monzonitic, and monzodioritic gneisses of Assemblage B. Assemblage C (composed of granitic, granodioritic, and leucodioritic gneisses) has been mapped at the bedrock surface under the eastern portion of the NSDF Project site, while a mafic dyke has been mapped near the north-west corner of the Project Site. Transitions between these relatively low permeability rock types are not expected to be significant to this assessment.

The regional surficial geology of the CRL site is shown on Figure 2.3 (from King and Killey 1994). A widespread, but thin deposit of glacial till, overlies the bedrock in most areas where overburden is present (Catto et al. 1982). Following the last glacial retreat, the early post-glacial Ottawa River covered most of the CRL site and deposited fluvial sands and silts throughout the region. These fluvial deposits filled the depressions in the bedrock and glacial till surfaces. A brief period of Aeolian reworking of the fluvial sands into dune and sheet deposits occurred as the



Ottawa River dropped to its current level and location. Recent sediment accumulation has been in the form of organic deposits in the low-lying and wetland areas of the region. The thickness of the unconsolidated sediments is variable as a result of the variable bedrock topography and the historical location of the Ottawa River. In general, the sediments are thickest towards the centre of the rift valley and thinnest to the west and east towards the bounding faults. As shown on Figure 2.3, surficial geology within the low lying areas of the Perch Lake Basin is predominately composed of recent organic soils. Sand and glacial till are present at surface near topographic highs, such as the NSDF Project site.

2.2.2 Local and NSDF Project Site Geological Conditions

The local geological conditions in the following subsection describe the lower portion of the Perch Lake Basin, and the NSDF Project site on the basis of previous investigations of the waste management areas, and recent drilling at the NSDF Project site.

2.2.3 Bedrock Topography and Geology

A bedrock topography map (Figure 2.4) was generated for the NSDF Project site using stratigraphic data provided by CNL, Golder (2016a) borehole and geophysics data, and AMEC (2017a, 2017b and 2018) borehole data. Logs for the boreholes completed in 2016 and 2017 are provided for reference in Appendix A. The bedrock topography is dominated by the ridge that delineates the eastern boundary of the Perch Lake Basin and the depression or valley that runs from the northwest corner of Waste Management Area A, to the south east towards Perch Creek. The bedrock ridge reaches an elevation of approximately 192 mASL and dips to the northwest and southeast, to an elevation of 165 mASL at Plant Road and 155 mASL at Perch Creek. The bedrock valley is comprised of a western portion that slopes irregularly from north to south and a southern portion that slopes irregularly from east to west. These two portions meet just north of where Main Stream discharges to Perch Lake. Bedrock in that area is at an elevation of 120 mASL. The northwestern portion of the NSDF Project site is underlain by a spur from the bedrock valley, at an elevation of 151 mASL. The ridge that delineates the western boundary of the Perch Lake Basin is shown reaching an elevation of 175 mASL at the limit of the map on Figure 2.4.

Two main fracture or faulting zones are present in the CRL site: the Mattawa Fault, which lies below the Ottawa River and consists of the northeast boundary of the property, and; the Maskinonge Lake lineament in the southwest area of the property. Within the Perch Lake basin a moderate probable fracture zone extends from approximately east to west through the upper portion of the basin (Raven Beck Environmental Ltd. 1994). Bedrock within the Perch Lake Basin and surroundings is primarily composed of quartz monzonitic, monzonitic, and monzodioritic gneisses with some occurrence of granitic-granodioritic, and leucodioritic gneisses (CNL 2016a).

A total of 66 historical measurements of hydraulic conductivity have been made in the upper 50 m of bedrock throughout the CRL site (including within the Perch Lake Basin), as summarized in Table 2.1. The geometric mean hydraulic conductivity from these tests was 5.2×10^{-8} m/s, with a range of 2×10^{-11} m/s to 7.8×10^{-4} m/s. The fracture porosity of the bedrock is estimated to range from 0.0002 to 0.005 (CNL 2016b, CNL 2016c).

Recent investigations by AMEC (2017a, 2018) included the advancement of 18 boreholes to depths of up to 13.2 m below the top of the bedrock surface. Borehole logs included in AMEC (2017a and 2018) indicate that the upper several metres of bedrock generally consist of a pink gneiss, with the exception of boreholes W7, W8, BH2-1, BH2-6, and GH1-4, in which diorite was logged. This transition in rock types in the eastern portion of the NSDF Project site appears to be consistent with the mapping shown on Figure 2.2.

Interpretation of hydraulic response testing of the bedrock completed at the NSDF Project site by AMEC and Golder has been summarized in AMEC (2017a) and AMEC (2017b). In addition to the 66 site-wide tests noted above a total of 41 hydraulic response tests were completed in the bedrock at 24 borehole locations within the NSDF Project site. Of these tests, 26 were suitable for analysis and interpretation and the remainder were not analyzable due to slow recovery or instrument malfunction. Hydraulic conductivity was found to range from 2.3×10^{-9} to 1.5×10^{-5} m/s with a geometric mean of 1.4×10^{-7} m/s, which is within the range of values from historical testing, as noted above. No significant trend in hydraulic conductivity with depth is observed through the tested interval; however, at depths greater than 6 m below the top of the bedrock surface the hydraulic conductivity did not exceed 2×10^{-6} m/s.

2.2.4 Overburden Geology

The overburden geology at the NSDF Project site consists primarily of fine sands, underlain locally by glacial till. The sands are interpreted to be the result of aeolian reworking of precursor fluvial sands and silts laid down in the late Pleistocene/early Holocene period by an early phase of the Ottawa River. Unconsolidated glacial and post-glacial deposits in the Perch Lake Basin (which includes the Local Study Area (LSA) and NSDF Project site) have been subdivided into six main units:

- glacial till;
- basal sand and gravel;
- clayey silt;
- middle sand;
- interstratified silt and sand; and
- upper sand.

More recent organic deposits are also present in the Basin, but are not considered substantial hydrostratigraphic units.

The total thickness of the unconsolidated deposits is shown by an isopach map on Figure 2.5. The thickness of the unconsolidated sediments is generally lowest on the eastern bedrock ridge (in the vicinity of the NSDF Project site). The thickness of these sediments increases to the west and is highest in the bedrock valley, reaching over 36 m in the bedrock low. Within the area of the NSDF Project site unconsolidated deposits are locally thicker in the area to the north and east, reaching over 26 m thick at the northern terminus of the bedrock ridge (Figure 2.5). Elsewhere on the CRL site, overburden thickness ranges from 0 m to greater than 25 m, being greatest in topographic lows (Raven Beck Environmental Ltd. 1994). Logging of overburden at the 2016 and 2017 boreholes was not sufficient to delineate the conceptual model geological units (per the list above). Therefore, interpolation of the overburden surfaces in the area of the ECM was based on the assumption that the till thickness was at least 1 m, with the remaining overburden thickness comprised of upper sand.

Hydraulic testing of the overburden has been completed using multiple methods on each of the stratigraphic units. These are provided in the discussion below along with additional details on the characterization of the overburden units.



Glacial Till

The thickness of the glacial till unit within the NSDF Project site is shown by an isopach on Figure 2.6a. Glacial till covers a large portion of the bedrock surface and is thickest in the areas of the bedrock lows. Glacial till thins to the east towards the bedrock ridge. Where present, glacial till is generally less than 12 m thick, but reaches thicknesses of up to 15 m within the bedrock valley, and 24 m in the area to the north of the eastern bedrock ridge. Glacial till is locally thicker along a line that extends from the northern edge of the eastern bedrock ridge to the south of the East Swamp, ending approximately 250 m northeast of where the East Stream meets the Main Stream. In this area, the glacial till ranges from 3 to 8 m in thickness. Within the southern portion of the NSDF Project site (where bedrock is close to ground surface) the till is generally less than 1 m thick.

Glacial till within the Perch Lake Basin consists of poorly sorted boulders, cobbles, and gravel in a silty sand to sandy silt matrix (Golder 2016a), with no visible stratification (CNL 2016b). Grain size analyses indicate a low silt content (less than 10%) and a negligible clay content (CNL 2016b).

A total of 42 single well response tests have been completed in the glacial till across the CRL Site and the resulting mean hydraulic conductivity is 1.5×10^{-6} m/s with a one log standard deviation of 4.0×10^{-7} to 5.8×10^{-6} m/s. The results of permeameter tests indicate that vertical hydraulic conductivity may be almost five times lower than these values. However, as only five permeameter tests have been completed and no visible layering is present in the till, this unit is not considered anisotropic (CNL 2016b).

Interpretation of hydraulic response testing of the till completed at the NSDF Project site by AMEC and Golder has been summarized in AMEC (2017a) and AMEC (2017b) (see table 2.1). Till hydraulic conductivity was found to range from $5.7x10^{-7}$ to $1.6x10^{-5}$ m/s with a geometric mean of $1.6x10^{-6}$ m/s based on the results of hydraulic response tests completed at 14 locations. Two additional tests were completed at the bedrock overburden interface, resulting in a slightly higher range of hydraulic conductivity (from 7.2 x 10^{-6} to 3.1×10^{-5} m/s).

Basal Sand and Gravel

A basal sand and gravel unit overlies the glacial till in a limited area of the western portion of the Perch Lake Basin. The areal extent and thickness of this unit is shown by an isopach map on Figure 2.6b. This unit ranges from 3.5 to 5.5 m in thickness within the bedrock valley to the north of Perch Lake and Perch Creek. The unit has also been found to underlie Waste Management Area A and the South Swamp, in thicknesses ranging from 1 to 4 m. This unit is not present in the NSDF Project site.

Given the limited extent of this unit, testing of the basal sand and gravel has been limited. Sand within this unit is characterized as a moderately to poorly sorted medium sand (CNL 2016b). The mean vertical hydraulic conductivity of the basal sand and gravel is 1.1×10^{-4} m/s based on the results of two permeameter tests. The porosity of this unit has not been measured, but is assumed to be 0.38 (CNL 2016b).

Clayey Silt

The thickness and areal extent of the clayey silt unit is shown as an isopach map on Figure 2.6c. The clayey silt is generally present in the southwest portion of the Perch Lake Basin, where there are depressions in the surfaces of the till and the bedrock. Where present, the clayey silt is generally less than 2 m thick, but is more than 5 m thick in the bedrock depression approximately 200 m north of Perch Lake. North of the NSDF Project site, the clayey silt unit ranges in thickness from 0.5 to 1.5 m, being thickest to the east along Emergency Route 3.





Clayey silt in the Perch Lake Basin is fluvial in origin and consists of laminations of coarser and finer fractions. The clay content of this unit, as determined through grain size analysis, is less than 20% by weight (CNL 2016b). Given the laminated nature of this material, a degree of hydraulic conductivity anisotropy is expected. The vertical mean hydraulic conductivity of this unit, based on the results of 12 permeameter tests, is 5.5×10^{-9} m/s, with a one log standard deviation ranging from 4.6×10^{-10} to 6.5×10^{-8} m/s. The horizontal hydraulic conductivity of this unit has been inferred from the results of six single well response tests. The mean horizontal hydraulic conductivity is 1.3×10^{-7} m/s, with a one log standard deviation ranging from 3.5×10^{-8} to 4.3×10^{-7} m/s.

Middle Sand

The extent and thickness of the middle sand unit is shown by an isopach map on Figure 2.6d. As with the other sedimentary units, the middle sand is thickest in the areas of the bedrock depressions. This unit generally fills the bedrock valley and ranges in thickness from 2 m to 9 m in this area. Middle sand is also present in the southern portion of Reactor Pit 2 (up to 4 m in thickness) and on the northern and southern flanks of the eastern bedrock ridge that delineates the Perch Lake Basin (up to 3 m in thickness in the south and 2 m thickness in the north).

The middle sand has been classified as moderately well sorted fine sand through the results of grain size analyses. The vertical mean hydraulic conductivity of this unit, based on the results of 53 permeameter tests, is 8.7×10^{-6} m/s, with a one log standard deviation ranging from 3.6×10^{-6} m/s to 2.1×10^{-5} m/s. The horizontal hydraulic conductivity of this unit is 7.8×10^{-5} m/s, based on the geometric mean of the results of 13 borehole dilution tests (CNL 2016b). The porosity of this unit is 0.38 (CNL 2016b).

Interstratified Silt and Sand

The extent and thickness of the interstratified sand and silt unit is shown by an isopach map on Figure 2.6e. Where present, this unit is generally less than 0.4 m thick, but can reach thicknesses of up to 2 m locally (i.e., near the point of discharge from Perch Lake to Perch Creek and to the south and west of Waste Management Area A). This unit has been encountered in the northern portion of the NSDF Project site at thicknesses of less than 0.4 m.

The interstratified silt and sand consists of alternating layers of fine to very fine sand and sandy silts. Individual layers are on the order of several centimetres (CNL 2016b). The vertical mean hydraulic conductivity of this unit, based on the results of 14 permeameter tests, is 3.6×10^{-8} m/s, with a one log standard deviation ranging from 1.76×10^{-9} m/s to 7.5×10^{-7} m/s. Due to the limited thickness of this unit, only one single well response test was completed and the mean horizontal hydraulic conductivity of 1.8×10^{-5} m/s is estimated from the results of grain size analyses (CNL 2016b). The one log standard deviation of horizontal hydraulic conductivity based on the grain size analyses ranges from 5.5×10^{-6} to 8.6×10^{-5} m/s. The measured porosity of this unit is 0.39 (CNL 2016b).

Upper Sand

The upper sand unit is the uppermost sand unit in the Perch Lake Basin. The base of the upper sand unit is defined by either the top of the interstratified silt and sand unit, or by an inferred contact with the middle sand. The thickness of the upper sand unit is shown as an isopach map on Figure 2.6f. The unit is thickest where the bedrock valley abuts the bedrock ridge that delineates the western boundary of the Perch Lake Basin. In this area, the unit can be up to 13 m thick. The upper sand unit is also locally thicker through an area extending from Plant Road, south through Reactor Pit 1 and Reactor Pit 2, then extending west through the southern portion of Waste Management Area A. In this area the unit reaches thicknesses of up to 10 m. The upper sand unit is present



in the NSDF Project site, at a relatively uniform thickness of approximately 1 m. There is a localized area to the immediate south west of the NSDF Project site, where the upper sand thickness increases to approximately 5 m.

In comparison to the middle sand, the upper sand is slightly coarser and better sorted (CNL 2016b). The vertical mean hydraulic conductivity of this unit, based on the results of 103 permeameter tests, is 1.4×10^{-5} m/s, with a one log standard deviation ranging from 5.3×10^{-6} to 3.8×10^{-5} m/s. The horizontal hydraulic conductivity of this unit is 4.8×10^{-5} m/s, based on the geometric mean of the results of 38 borehole dilution tests (CNL 2016b). The porosity of this unit is 0.38 (CNL 2016b).

2.2.5 Future Evolution of Site Geology

Previous studies completed by CNL in support of proposed geological waste management facilities at the CRL site include discussion on the long-term future evolution of geological conditions (CNL, 2016c). Although the focus of these studies is on factors that influence the deep geological setting (as compared to the shallow geological setting of the NSDF) over timeframes on the order of 100,000 years (as compared to the shorter NSDF assessment timeframe of 10,000 years) the presented information is relevant to the current assessment. The natural processes identified as having potential to influence the geological conditions at the CRL site include glaciation (glacial erosion and deposition of surficial material, glacial loading, permafrost formation, changes in sea level, changes in topography, isostatic adjustment, post-glacial effects such as flooding), tectonism (fault rupture or reactivation) and volcanism. A summary of the findings for each of these factors is provided as follows:

- Long-term future climate predictions indicate that the next major glaciation will occur at least 60,000 years after the present time. Therefore, the effects of glacial erosion, permafrost, and associated changes to the groundwater flow system are expected to be minimal over the NSDF assessment timeframe (10,000 years);
- The potential for fault reactivation at the NSDF site exists, but the effects are expected to be minimal on the existing system. Evidence from bedrock fractures that have been subjected to historical tectonic stresses and glacial loading and unloading indicates that the rock is inherently stable. No evidence of post-glacial structural disruption has been found. A detailed seismic analysis of the site was completed as a part of the design package (AECOM 2018d), which discusses the potential for future seismic events in greater detail.
- Volcanic activity and orogenic events are not considered to be factors that could potentially influence the geological setting over the assessment timeframe.

In consideration of the above findings, the primary factors influencing the future geological evolution in the vicinity of the CRL site over the 10,000-year assessment timeframe are erosion and deposition of the overburden and weathering of the shallow bedrock. The future climate will be the primary natural control on these factors. Golder's 2019 report entitled "*Climate Change Assessment for the Near Surface Disposal Facility Project*" provides an assessment of long-term future climate for the CRL site, which concludes that the climate will be warmer (by up to 8 degrees C) and wetter (by up to 20%) in the early portion (the first 1,000 years) of the assessment timeframe. Because of the uncertainty associated with estimating future climate in the long-term the predictions are limited to this early portion of the assessment timeframe.

Given the uncertainty associated with future climate predictions, one approach to evaluating future geological changes to the CRL site is to qualitatively extrapolate future conditions based on historical geological evolution. This assumes that processes that have in the past (and at present) influenced the geological conditions will continue to do so in the future. The recent geological evolution has been primarily controlled through glacial activity;



the last major deposition of sediment in Perch Lake basin occurred during the draining of Glacial Lake Agassiz via the early post-glacial Ottawa River, which ceased approximately 9,800 years before present (Teller, 1988). Since that time the geological setting in the Perch Lake Basin has been stable, as indicated by the development of organic deposits in Perch Lake (Boyko-Diakonow and Terasmae, 1975). Because glacial activity has been the primary factor influencing the near-surface geological evolution at the site, and glacial activity is not expected to occur within the assessment timeframe (CNL 2016c), it is inferred that the geological conditions will be relatively stable over the assessment timeframe. Groundwater Conditions

A description of the CNL Chalk River Site hydrogeology is provided in Section 5.3 of the NSDF Project EIS (Golder 2017). This information is repeated herein for completeness in the context of this modelling report. Regardless, the reader is referred to the NSDF Project EIS for further details.

2.2.6 Groundwater Elevations

The water table elevation within the NSDF Project site, and throughout the lower Perch Lake Basin is shown on Figure 2.7a. A summary of the NSDF Project site groundwater elevation data is provided in Table 2.2. Elevation contours shown on Figure 2.7a were generated based on average water levels from historical information in the areas outside the NSDF Project site and from more recent information in the NSDF Project site (AMEC 2017a; AMEC 2018). The seasonal high water table elevation within the NSDF Project site is shown on Figure 2.7b. The high water table elevation contours were generated based on the maximum groundwater elevation from the transducer records collected by AMEC between October 2016 and June 2018. On average, the maximum value from the transducer record was 1.2 m above the average values, and approximately 3 m above the minimum value. The high water table position occurred in April or May at most locations. Elsewhere within the Perch Lake Basin the water table elevation is expected to vary seasonally by 1 m to 2 m (depending on location), with the high water table position occurring in April and May (CNL 2016b). It should be noted that the transducer record lengths vary at individual wells depending on the date of installation. For the most recent installations the transducer records span a period of approximately 6 months. Figure 2.7c provides a "snapshot" of the seasonal high water table elevation from April 26, 2018 when the most recent seasonal high elevation was measured for most wells. A comparison of Figures 2.7b and 2.7c shows that the groundwater elevations and flow directions are similar for the absolute maximum and snapshot (April 26, 2018) readings.

Within the Lower Perch Lake Basin, groundwater flow within the overburden is influenced by local topography (and bedrock topography) and is interpreted to be primarily horizontal (CNL 2016b). In the overburden deposits, groundwater flow occurs mainly within the basal sand and gravel, middle sand, and upper sand units where present (CNL 2016b). As the silty clay and interstratified silt and sand units that separate these aquifers are not continuous throughout the valley, groundwater elevations, groundwater flow directions, and horizontal hydraulic gradients are not differentiated between units. The available data includes monitoring wells located at the peak of the bedrock ridge to the northeast of the ECM (e.g., W8, PH17-005, PH17-008, PH17-009, BH2-6, etc.). Data from these locations indicate the presence of a northeast to southwest groundwater divide corresponding to the topographic high along the ridge. Hydrogeological mapping of the CRL site completed by Raven Beck Environmental Limited (1994) also infers the presence of a groundwater divide along this ridge.

The depth to the water table within the NSDF Project site was calculated based on the average groundwater elevation data from transducers (collected between October 2016 and June 2018). Average groundwater depths ranged from 0.06 metres below ground surface (m bgs) (at SH-4) to 15.95 m bgs (at PH17-001). The seasonal high water table elevations range from 0.26 meters above ground surface (m ags) (at W-4) to 15.43 m bgs

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(at PH17-001). The average water table depth across the NSDF Project site is 4.81 m bgs under average groundwater conditions, and 3.61 m bgs under seasonal high water table conditions. Depth to the water table is generally greatest near the top of the bedrock ridge, and decreases to the south, west, and north, towards the low-lying wetland areas.

2.2.7 Groundwater Flow Directions

Within the NSDF Project site, groundwater flow to the north of the Powerline Cut is generally to the northwest towards the East Swamp. In this area hydraulic gradients are low, and minor variations in groundwater elevations can result in a component of groundwater flow towards the northeast for the northernmost portion of the NSDF study area. Based on the transducer records from the PH-series monitoring wells, these reversals in groundwater flow direction are sustained for a period of less than a month. To the south of the Powerline Cut groundwater flow is generally to the southwest and south towards the Perch Lake Swamp and Perch Creek. Within the southern portion of the Perch Lake Basin, groundwater flow is generally to wards Perch Lake to the south with a component of flow to the southeast towards Perch Creek.

The bedrock ridges and topographic highs at the eastern and western boundaries of the Perch Lake Basin act as groundwater (and surface water) divides. A groundwater divide is also present to the north, along Plant Road (CNL 2016b). The shallow groundwater flow system is expected to be recharged through precipitation at these topographic highs. Groundwater discharge generally occurs at the surface water features within the low-lying portions of the Perch Lake Basin. Groundwater springs are observed in the East Swamp stream to the north of Powerline Road and in Perch Creek, downstream of the Perch Lake Outlet Weir. Based on stream gauge data groundwater discharge to the East Swamp stream to the north of Powerline Road vas observed to range from 25 m³/day to 770 m³/day during low-flow periods. Groundwater discharge to Perch Creek during low-flow periods (i.e., September, when runoff is minimized and flows in the streams are dominated by groundwater discharge) is estimated to be approximately 790 m³/day based on the difference in average flow measurements between the Perch Lake Outlet Weir and the Perch Creek weir (see Section 2.1 of this report). It is noted that the East Swamp Stream south of Powerline Road and the T-16 Stream act as sources of groundwater recharge to the upper sand unit, however, no quantitative estimates are available for these areas.

Surface water within the East Swamp receives groundwater discharge from the Chemical Pit (CNL 2014) and to a lesser degree from Reactor Pit 2. Groundwater flow from the Chemical Pit to the East Swamp follows a relatively short groundwater flow path, with a travel time of approximately four months. Groundwater from Waste Management Area A, and the most of Reactor Pit 2 discharges to surface water in the South Swamp (CNL 2015a and CNL 2015b).

2.2.8 Hydraulic Gradients

Horizontal hydraulic gradients within the NSDF Project site were calculated based on average groundwater levels collected by AMEC in between October 2016 and June 2018 and the groundwater elevation mapping shown on Figure 2.7a. The horizontal hydraulic gradient within the overburden in the northern portion the NSDF Project site was approximately 0.04 metres per metre (m/m) to the northwest (between W2-S and PH17-003). In the southern portion of the NSDF Project site the horizontal hydraulic gradient is approximately 0.05 m/m to the southwest in the overburden between BH-15-8 and SH-5 and approximately 0.07 m/m to the southwest in the bedrock between W4 and BH2-3.



Under high water table conditions (as shown on Figure 2.7b) the horizontal hydraulic gradient within the overburden in the northern portion of the NSDF Project site is increased to approximately 0.05 m/m to the northwest (between W2-S and PH17-003). In the southern portion of the NSDF Project site the horizontal hydraulic gradient to the southwest in the overburden (between BH15-8 and SH-5) is 0.05 m/m (unchanged from average conditions), while the horizontal hydraulic gradient to the southwest in the overburden (between BH15-8 and SH-5) is 0.05 m/m (unchanged from average conditions), while the horizontal hydraulic gradient to the southwest in the bedrock (between W4 and BH2-3) is increased to 0.09 m/m.

Vertical hydraulic gradients between the overburden and the bedrock were calculated for monitoring well pairs W2-S/D and BH2-2S/D based on groundwater elevation data collected between December 2017 and June 2018. At W2-S/D downward vertical gradients of 0.13 m/m and 0.16 m/m, under average and high water table positions respectively, from the overburden to the bedrock were calculated, indicating recharging conditions at the topographic high. At BH2-2S/D a downward gradient of 0.03 m/m was calculated under average water table conditions. A very slight upward gradient of 0.006 m/m was calculated at this location under high water table conditions. From June 2017 to December 2017, vertical gradients at BH2-S/D were predominately downwards, while vertical gradients at this location were predominately upwards between December 2017 and June 2018.

Average horizontal hydraulic gradients measured in low-lying portions of the Perch Lake Basin range from 0.006 to 0.03 m/m in the area between Reactor Pit 2 and the South Swamp (CNL 2016b). The average horizontal hydraulic gradient is slightly higher, 0.05 m/m, between the South Swamp and Perch Lake Swamp, as measured between AA-183 and PLS-44. In the aquifers underlying the Perch Lake swamp, the average horizontal hydraulic gradients decrease in a southerly direction, from 0.009 m/m (between PLS-44 and PLS-36) to 0.002 m/m (between PLS-32 and PLS-39). Average horizontal hydraulic gradients were found to increase slightly (to 0.006 m/m) between PLS-39 and the zone of groundwater discharge at Perch Creek. In general, the horizontal hydraulic gradients observed in the low-lying areas of the Basin are lower than those observed at the NSDF Project site.

3.0 MODEL CONSTRUCTION AND CALIBRATION

3.1 Modelling Approach

The objective of the numerical modelling was to estimate the potential influence of the NSDF Project components (ECM, stormwater management (SWM) ponds, and WWTP) on local hydrogeological conditions during operations and post-closure conditions. To achieve this objective, a deterministic approach was used where a 3D numerical (MODFLOW) groundwater model was constructed and calibrated to represent the "best estimate" of groundwater flow conditions based on the conceptual model described above. The calibrated model was subsequently adapted to include the NSDF Project so that it could be used for the predictive simulations. In order to address the uncertainty associated with the "best estimate" configuration, a sensitivity analysis was completed, which involved perturbation of some of the key model input parameters and comparison to the base case results.



3.2 Code Description

MODFLOW-2005 (Harbaugh 2005) was used to complete the simulations. MODFLOW is a multi-purpose three-dimensional groundwater flow code developed by the United States Geological Survey. It is modular in nature and uses the finite difference formulation of the groundwater flow equation in its solution. Visual MODFLOW® (Version 4.6.0.156) was used as the numeric flow engine for the simulations presented in this report. The MODFLOW-NWT solver was used to solve the groundwater flow equations (Niswonger et al. 2011). MODPATH (Pollock 1989), a companion code to MODFLOW, was used to complete the particle tracking analyses necessary to illustrate the flow paths from the WWTP and ECM components of the NSDF Project. General modelling assumptions are provided in Table 3.1.

3.3 Model Construction

3.3.1 Model Extent and Discretization

The extents of the numerical model are illustrated on Figure 3.1. The model extends from Plant Road in the north (corresponding to the location of an interpreted groundwater flow divide), eastwards to the topographic divide located approximately 2 km east of Waste Management Area A. The southern model boundary is defined by Perch Creek and Perch Lake. Main Stream and an interpreted groundwater flow divide between Main Stream and Plant Road form the western limits of the model.

The model grid was discretized horizontally into 5 m by 5 m grid cells in the central portions of the model domain, transitioning to a 10 m by 10 m cell size on the edges. Vertically, the model is discretized into 23 numerical layers, ranging in thickness from 0.1 m to 25 m. The total number of grid cells was 1,209,800. Details on vertical discretization are provided with reference to the hydrostratigraphic units in Section 3.3.3 below.

3.3.2 Boundary Conditions

The model flow boundaries are illustrated on Figure 3.1. As shown in the figure, constant head boundaries were specified for Main Stream, T-16 Stream, Perch Creek, the North Shore of Perch Lake, and the north-eastern portion of the model domain. Portions of East Swamp Stream downstream of the weir are dominated by groundwater recharge, whereas portions upstream of the weir are dominated by groundwater discharge. As such, the East Swamp Stream has been represented in the model using drain boundaries (which only permit the discharge of groundwater) for the upstream portions and constant head boundaries for the downstream portions. Swampy areas (defined by CNL mapping) were assigned drain boundary conditions at ground surface elevation to allow for groundwater to discharge at these locations). Elevations of all boundaries are based on LiDAR data (surface topography), with the exception of the north-eastern constant head model boundary, which was specified at an elevation of 164 mASL based on the interpreted groundwater elevations in that area. No flow boundaries were assigned to the remaining portions of the model perimeter that correspond to inferred groundwater flow divides, as indicated on Figure 3.1. Recharge, a boundary condition applied to the top of the model domain, is discussed later in Section 3.3.3.2.



3.3.3 Hydrostratigraphy and Parameterization

3.3.3.1 *Material Properties*

Figure 3.2 and Table 2.1 show the hydrostratigraphic parameterization of the model, as described below. Based on groundwater velocity calculations completed by CNL (CNL 2016b), values corresponding to the geometric mean plus one log standard deviation ("GM+1LSD") of the measured hydraulic conductivities were used as a starting point for model parameterization. These were adjusted and refined through the calibration process until an acceptable model calibration was achieved (this is discussed further in Section 3.4). Final (i.e., calibrated) model parameters are provided on Figure 3.2, and compared to measured values in Table 2.1. The model values were generally less than the GM+1LSD value; for sand units (where the primary groundwater flow pathways occur), the calibrated model value was approximately 30%-40% lower. Anisotropy ratios assigned to the hydrostratigraphic units in the model were generally within the ranges of measured data. The hydraulic conductivity values applied in the model are summarized below with respect to the model layering.

- Model Layers 1 through 3 represent the upper sand unit from ground surface to the underlying geological contact. The total thickness of this unit across three numerical layers ranged from 1 m in the northern portions of the model to approximately 12 m along portions of Main Stream. The hydraulic conductivity distribution of this unit was based on the existing conceptual model (detailed in Section 2.0) and ultimately resulted from the model calibration process. Three zones of hydraulic conductivity were used in the model to represent the upper sand unit, with horizontal hydraulic conductivity ranging from 3.0x10⁻⁵ to 1.7x10⁻⁴ m/s and vertical hydraulic conductivity ranging from 1x10⁻⁵ m/s to 5x10⁻⁵ m/s. Total porosity is a measure of the total pore space per unit volume of material and effective porosity is a measure of the connected pore space per unit volume (i.e., the total volume available for fluid flow). The total and effective porosities assigned to this unit were 0.38 and 0.3, respectively.
- Model Layer 4 represents the interstratified silt and sand unit. Model thickness of this unit ranged from zero to 2.7 m. Horizontal hydraulic conductivity of this unit was 6x10⁻⁵ m/s, with a vertical hydraulic conductivity of 6x10⁻⁷ m/s (i.e., the horizontal to vertical anisotropy ratio is 100:1). The total and effective porosities assigned to this unit were 0.39 and 0.3, respectively.
- Model Layers 5 and 6 represent the middle sand unit. Model thickness of this unit ranged from zero to 11 m. Horizontal hydraulic conductivity of this unit was 1x10⁻⁴ m/s, with a vertical hydraulic conductivity of 2x10⁻⁵ m/s (i.e., the horizontal to vertical anisotropy ratio is 5:1). The total and effective porosities assigned to this unit were 0.38 and 0.3, respectively.
- Model Layers 7 and 8 represent the clayey silt unit. Model thickness of this unit ranged from zero to 10 m. Horizontal hydraulic conductivity of this unit was 9.5x10⁻⁷ m/s, with a vertical hydraulic conductivity of 5.5x10⁻⁹ m/s (i.e., the horizontal to vertical anisotropy ratio is 173:1). The total and effective porosities assigned to this unit were 0.48 and 0.3, respectively.
- Model Layers 9 and 10 represent the basal sand unit. Model thickness of this unit ranged from zero to 3 m. Horizontal hydraulic conductivity of this unit was 1.2x10⁻⁴ m/s, with a vertical hydraulic conductivity of 1.0x10⁻⁴ m/s (i.e., the horizontal to vertical anisotropy ratio is 1.2:1). The total and effective porosities assigned to this unit were 0.38 and 0.3, respectively.





- Model Layers 11 and 12 represent the till. Model thickness of this unit ranged from approximately 0.2 m to 38 m. Horizontal hydraulic conductivity of this unit was 9.0x10⁻⁷ m/s, with a vertical hydraulic conductivity of 7.0x10⁻⁷ m/s (i.e., the horizontal to vertical anisotropy ratio is 1.3:1). The total and effective porosities assigned to this unit were 0.26 and 0.2, respectively.
- Model Layers 13 through 23 represent the bedrock. This unit is divided into two subunits: the upper bedrock, which is comprised of a continuous 6 m thick layer below the overburden-bedrock contact (Layers 13 through 18), and the lower bedrock (Layers 19 through 23), which is comprised of a 44 m thick layer that underlies the upper bedrock. Horizontal and vertical hydraulic conductivity was 9.0x10⁻⁷ m/s for the upper bedrock and 4x10⁻⁸ m/s for the lower bedrock (i.e., the horizontal to vertical anisotropy ratio is 1:1). The total and effective porosities assigned to the bedrock units were equivalent and equal to 0.001.

A minimum numerical layer thicknesses of 0.1 m was maintained. Where the hydrostratigraphic unit thickness was less than this value the material properties of the underlying unit were applied.

3.3.3.2 Recharge

An infiltration (groundwater recharge) boundary was applied at the top surface of the groundwater flow model. The distribution of recharge rates was estimated using methods outlined in Ontario Ministry of the Environment (MOEE) guidance documents (MOEE 1995). The MOEE approach involves partitioning the available surplus water (i.e., total precipitation minus evapotranspiration) into runoff and recharge components based on several physical factors: slope, surficial soil type, and land use. Rasterized maps of the study area were created in a GIS platform for slope percentage (based on LiDAR data), soil type (based on provincial mapping data), and land use (based on provincial mapping data) on a 5 m by 5 m grid. "Infiltration factors" were assigned to each raster grid element based on the MOEE guidance tables, and the three maps were summed to create a map of the total infiltration factor. This was multiplied by the surplus water amount (300 mm/yr for the CNL site; CNL 2016b) to create a spatially-variable recharge distribution map, which was applied to the groundwater flow model. It should be noted that recharge applied over the East Swamp and Perch Lake Swamp areas will report to the drain cell boundaries representing these features in areas where the drain cells are saturated.

The slope, surficial soil type, and land use rasters and the infiltration factors assigned to each raster component are provided on Figure 3.3. This figure also provides the groundwater recharge distribution resulting from the calculation described above. As shown on the figure, surficial recharge ranged from 100 mm/yr to 245 mm/yr (equivalent to 33% to 80% of the available surplus amount).

Subsequent adjustments were made to one of the recharge zones within the NSDF Project site to improve model calibration to the average and high water table condition (as discussed in Section 3.4). This area is shown as the dark purple coloured zone on Figure 3.3, as indicated by the label. This area was originally estimated to be 135 mm/yr based on the MOEE methodology but was later assigned a value of 165 mm/year based on calibration to the average water table condition and a value of 400 mm/yr for calibration to the high water table condition.



3.4 Model Calibration

Calibration of the groundwater flow model involved refinement of the material properties of the main hydrostratigraphic units until the simulated hydraulic head distribution and rates of groundwater flow to and from surface water boundaries compared reasonably well with measured conditions in the study area.

Historical groundwater elevation data was used as targets for model calibration. These data were comprised of a set of average measured groundwater elevations at over 20,400 measurements from 1,500 monitoring points at 374 spatial locations spanning the period from 1982 to 2018. Due to the varying frequency of groundwater level measurement collection between monitoring locations these data represent time-averaged conditions, and are not representative of a single "snapshot". Groundwater elevation data from recently installed monitoring locations within the NSDF Project site comprised the primary calibration targets (as provided in Table 2.2). At these locations the average value up to the most recent available groundwater elevation measurement (from the transducer data collected during the June 2018 monitoring event) was used as the target value. This calibration set is referred to as the average water table condition.

The model was also calibrated to a seasonal high water table condition where the model output was compared to the maximum observed groundwater elevation for each monitoring well. This was achieved through increasing the surficial recharge rate from 165 mm/yr to 400 mm/yr within the predominate recharge zone located in the ECM area (see Figure 3.3). The maximum observed groundwater elevations used in the high water table assessment are limited to the wells with transducer records only (in the NSDF area). It should be noted that the maximum groundwater elevations occurred on different dates depending on the well, with dates ranging from 11 April, 2017 (at W7 and W8) to 4 September, 2017 (at W2-D). This reflects the variability in hydraulic characteristics at the different monitoring locations, both as a function of the material in which the monitoring well is situated and its degree of connectivity to infiltration from surface or other hydraulic boundaries (e.g., Perch Lake Swamp).

Low-flow periods from monthly streamflow volume data at monitored streams within the model domain were also used to check model calibration for the average water table condition. In particular, the measured flows at the East Swamp Stream weir (which span from 1957 to 2015) were used for this purpose, as the full catchment of the stream is included within the model domain. The remaining streamflow data (for catchments not entirely within the groundwater flow model) were used to estimate the equivalent recharge rate for the catchment, which was compared against the average recharge applied to the groundwater flow model.

Groundwater velocity calculations completed by others (CNL 2016b), which were based on tracking measured tritium concentrations in groundwater between Reactor Pit 2 and Perch Creek through time, were compared to the simulated advective travel times in the average water table condition model. As indicated in CNL 2016b, Reactor Pit 2 is the primary source of tritium in the Perch Creek Basin. As such, groundwater flow particles were released from this location in the model and forward-tracked through the flow system to the downgradient receptor. It should be noted that advective particle tracking does not consider the effect of dispersion.

The results of the model calibration are summarized on Figure 3.4a and Figure 3.4b (showing plan view contours of the simulated water table and calibration statistics for the average and high water table conditions), Figure 3.5 (showing the simulated water table in cross-section for the average and high water table condition), Figure 3.6 (comparing simulated and observed baseflow and recharge), and Figure 3.7 (comparing simulated groundwater flow paths and mapped tritium plume).



Simulated groundwater elevations are compared to the calibration targets for the monitoring locations within the vicinity of the NSDF Project site in Table 2.2. A review of the above figures and tables allows for the following observations:

- The overall calibrated average water table model achieved a normalized root mean squared (nRMS) error of 1.3%, with an absolute mean difference of 0.34 m and a residual mean error of -0.08 m (Figure 3.4a). For the NSDF-area piezometers, the nRMS error was 2.8%, with an absolute mean difference of 0.69 m and a residual mean error of -0.08 m.
- On Figure 3.4b the residual error map and statistics encompass the maximum observed groundwater elevation at NSDF-area piezometers, and (due to infrequent measurements) average values for the remaining CRL Site water level data. The high water table simulation achieved a normalized root mean squared (nRMS) error of 1.2%, with an absolute mean difference of 0.30 m and a residual mean error of 0.07 m (Figure 3.4b). For the NSDF-area piezometers, the nRMS error was 3.2%, with an absolute mean difference of 0.86 m and a residual mean error of 0.13 m.
- The simulated head was generally within 0.5 m of the measured value, and was within a range of -2.0 m to 2.3 m across all data for the mean water table condition. For the high water table model, the simulated head was generally within 0.5 m of the measured value, and was within a range of -1.5 m to 3.5 m across all data. A review of the spatial distribution of residual error (Figure 3.4a and Figure 3.4b) does not show any significant spatial bias.
- A visual comparison of the simulated (Figure 3.4a) and measured (Figure 2.7) groundwater head distribution and groundwater flow paths show that the simulated groundwater flow patterns are reasonable. Groundwater flow is generally simulated to follow surface water divides, with convergence towards the surface water features.
- Table 2.2 compares the simulated groundwater elevation to recent observations for the NSDF Project site wells. The model results are acceptable given the average calibration target and the seasonal range in observed groundwater elevations for the monitoring locations. Due to limitations in the period of record for the most recently installed wells (the PH-series) it is unknown whether the range in observed groundwater elevations is representative of typical seasonal variability.
- Groundwater discharge to the portion of East Swamp Stream upstream of the weir was estimated to be 70 m³/d (Figure 3.6). This is within the lower portion of the range of measured September flows (25 m³/d to 770 m³/d) from the East Swamp Stream weir (as discussed above September is taken to represent the low-flow period for the CNL property; CNL 2016b). For the portion of East Swamp Stream downstream of the weir, the net recharge to groundwater from the constant head boundary was 97 m³/d. Though no quantitative estimates are available for this portion of the stream, this result is in general agreement with the conceptual model discussed in Section 2.1.
- The estimated net infiltration rate based on September flows from East Swamp Stream, Inlet 2, Perch Lake Outlet, and Perch Creek weirs ranged from 100 mm/yr (at the Perch Lake Outlet Weir) to 222 mm/yr (at the East Swamp Stream Weir). The average recharge rate applied over the model domain was 159 mm/yr, which is within the range of estimates from streamflow data during the low flow period (Figure 3.6). Variability





in the equivalent recharge estimates could reflect differences between infiltration characteristics of the individual basins and/or variation in the periods of record.

The simulated advective particle tracks released from Reactor Pit 2 and the East Stream Swamp follow a similar pathway to the interpreted groundwater flow path based on the tritium data (Figure 3.7). The simulated groundwater velocity compares well to the estimated velocity calculated based on tritium travel times between Reactor Pit 2 and monitor PLS-32 (CNL 2016b).

The mass balance within the overall model was acceptable from a numerical convergence perspective, with a global mass balance error of less than 0.01%. Based on the calibration statistics in combination with the general patterns of groundwater flow and the checks on model recharge and groundwater flow paths noted above, the simulated groundwater elevations provide a reasonable match to observed conditions in the site. The calibrated groundwater model, as described above, is subsequently used as the basis for construction of the forecast groundwater model (presented in Section 4.0 below).

4.0 FORECAST SIMULATIONS

4.1 NSDF Project Design

Detailed documentation of the proposed design of the NSDF Project is provided in AECOM (2019b), while an overview illustration of the design is provided on Figure 4.1. This is referred to as the "100% design", and it is anticipated that no refinements to the design will be made. The proposed (100%) NSDF Project design consists of an excavation and regrading on the face of the hill to the east of East Swamp Stream that will form a base grade for the ECM. Along the southwestern portion of the ECM (in the area shown on Figure 4.1) overburden will be removed and replaced with compacted granular material for liguefaction mitigation purposes. Under current (average) conditions the water table elevation beneath the ECM is below the elevation of the primary liner over the western portion of the ECM, and above the primary liner over the eastern portion of the ECM, reaching a maximum of approximately 4 m above the liner elevation in the area of well PH-17-007. Construction of the ECM will require excavation into bedrock along the eastern reach of the ECM. This will be performed by blasting, which will also serve to establish an enhanced zone of permeability in the bedrock beneath the ECM. This will have the effect of increasing drainage of the bedrock and lowering groundwater elevations beneath the facility such that a minimum separation distance of 1.5 m between the water table and the primary liner elevation is achieved (AECOM 2019c) (referred to as the blast-damaged zone). The purpose of the minimum separation distance of 1.5 m is to facilitate the ECM base grade excavation and clay liner construction, especially where the compacted clay layer is founded on native fine sand to silty fine sand soils (AECOM 2019a). If saturated at the founding elevation of the clay liner, these soils can become very loose/weak under the live loading of the construction equipment. The minimum separation distance is not intended for contamination attenuation purposes. Control of contaminant migration from the ECM is provided by the proposed liner and the Leachate Collection System without any reliance on the underlying native soils and soil fill conditions.

An impermeable liner will extend from the base of the excavation to the crest of the berm surrounding the ECM. This will incorporate a leachate collection system, which, during the operations phase of the NSDF Project, will capture leachate from waste placed in the ECM as well as surface runoff from open or active cells. The collected leachate and runoff from the active cell will be sent to a WWTP, which will discharge treated water to both Perch Lake and an exfiltration gallery near the East Swamp. Discharge water generated by the operations



facility (not in contact with the waste) will be sent to a leaching bed located to the north of the WWTP infiltration area.

A sacrificial liner will be installed over the Phase 2 (northern) area of the ECM during operation of Phase 1. This, combined with the impermeable liner over the Phase 1 area, will have the effect of limiting recharge to the water table and thereby lowering groundwater elevations in the ECM area.

The ECM will be comprised of 10 waste cells. Construction of the ECM will be such that only one cell is active at a given time during operations. Upon filling of each waste cell a cover will be installed that will effectively limit the infiltration into the ECM to zero. Following cover placement, runoff from the top surface of the ECM will be directed to one of three lined ponds via a perimeter ditch. The ponds are designed with outflows that will direct water towards East Swamp and Perch Lake Swamp. Estimates of water collection volumes and surface runoff from the ECM (completed by others) were used as inputs for the groundwater flow modelling in this assessment (AECOM 2018b and 2018c).

4.2 Modelling Approach

As discussed in Section 1.2, the objective of the hydrogeological modelling was to estimate the groundwater flow pathways and rates of groundwater flow from the NSDF Project site to downstream receptors. This was accomplished by using the calibrated groundwater flow model as a starting point and making subsequent modifications to the model to represent the NSDF Project site under operating and post-closure condition, as described below.

4.2.1 Operating Conditions

The blast-damaged zone was incorporated into both the operations and post closure models through modification of the hydraulic conductivity of the bedrock within the footprint of the zone as shown on Figure 4.1. For the purposes of this assessment the modified hydraulic conductivity zone was extended vertically 3 m below the subgrade. It is noted that the potential influence of the blasting was estimated to extend 3 m below the bottom of the overburden and bedrock excavation, and that the elevation of the subgrade is (in most places) 1 m to 2 m higher than the bottom of the excavation. As such, the base of the blast-damaged zone within the groundwater model was (conservatively) specified approximately 1 m to 2 m higher than the estimated depth of blast influence. The blast damaged zone was assigned a hydraulic conductivity of $1x10^{-4}$ m/s (representing an increase of 2,500 times the intact bedrock hydraulic conductivity as applied in the model. This lies within the 1,000 to 10,000 times increase for the intact bedrock range provided by AECOM (2019c).

The liquefaction mitigation measure along the southwest portion of the ECM was incorporated into the model as an independent material zone with a hydraulic conductivity of 1×10^{-3} m/s (representing coarse granular fill material) throughout the full depth of the overburden. The coarse granular fill material was present for all operations and post-closure simulations.

During operating conditions approximately 2,190 m³/year of sanitary water is sent to the leaching bed and applied in the model as surficial recharge at the leaching bed location. Further, approximately 11,000 m³/year of contact water and leachate will be collected within ECM operating cell, which is sent to the WWTP for treatment and discharged via a combination of the WWTP exfiltration gallery and Perch Lake outfall (AECOM 2018a, 2018b, 2018c). It is anticipated that the majority of water collection will occur during the spring, summer, and autumn with less collection occurring in the winter. The relative portion of discharge routed to the exfiltration gallery and



Perch Lake outfall will depend on the volume of discharge and groundwater table elevations and is therefore unknown. Based on preliminary groundwater flow simulations it is anticipated that the capacity of the exfiltration gallery will be equivalent to approximately half of the contact water and leachate collection rate. As such, two scenarios were evaluated using the groundwater model under the operating conditions. These are illustrated on Figure 4.2 and summarized below.

Operations Scenario A – Discharge to the WWTP Outfall under Average Water Table Conditions

The objective of this simulation was to evaluate the groundwater elevations and flow directions under normal operating conditions. This was represented in the Operations Scenario A model based on the following criteria:

- Phase 1 is active, a sacrificial liner is in place over Phase 2, and active leachate collection is occurring. The presence of the phase 1 development and sacrificial liner was represented as zero infiltration over these areas.
- Approximately 11,000 m³/year of water collected within the footprint of one open cell, with half of this volume applied in the model as surficial recharge at the WWTP exfiltration gallery location. It was assumed that the recharge would occur over a 4-month period for the purposes of calculation of a recharge rate to apply to the steady-state simulation.
- The natural/background infiltration distribution in the model was representative of the average water table condition.
- Zero infiltration is applied over the footprint of the open and closed cells (precipitation is being collected via the liner).
- Runoff is collected from the remaining nine cells at a rate corresponding to the average annual precipitation (839 mm/yr) and an equivalent volume is applied as recharge in the model to the SWM pond outfall areas. This conservatively assumes zero loss of water through evaporation, or leakage along the perimeter ditches.
- The area of closed cells (9 total) is approximately 104,400 m², corresponding to approximately 87,600 m³/yr of runoff collection.

Operations Scenario B – All WWTP Discharge Directed to Perch Lake

The objective of this scenario was to evaluate the groundwater conditions for the case where no discharge is applied to the exfiltration gallery. This was represented based on the following criteria:

- The infiltration area for the exfiltration gallery was restored to average "natural" conditions (i.e., 165 mm/yr), under the assumption that all WWTP effluent is directed to Perch Lake.
- The natural/background infiltration distribution in the model was representative of the high water table condition.
- Remaining conditions are unchanged from Operations Scenario A.

4.2.2 Post-closure Conditions

Three scenarios were evaluated using the model under post-closure conditions. The "high water table" calibrated groundwater flow model was used as a starting point and subsequently modified as described below to complete the post-closure simulations.Illustrations of the scenarios are provided on Figure 4.2.

Post Closure – Final Cover Intact

- A final cover is in place above the waste in the ECM, extending to the crest of the berm surrounding the ECM. In this area zero recharge is applied in the groundwater flow model.
- Runoff that occurs from precipitation falling on the final cover is directed to the SWM ponds. Approximately 94,000 m³/yr of runoff is divided equally and directed to the SWM ponds, based on the mean annual precipitation (839 mm/yr) and the total area of closed cells (approximately 112,000 m²). It is assumed that during the post-closure period the pond liners will no longer be effective, and the runoff collecting in the ponds will infiltrate through the bottom of the pond.
- The infiltration areas for the water treatment plant outfall, leaching bed and SWM pond overflows were restored to average "natural" conditions (i.e., 165 mm/yr).

Post Closure – Final Cover Compromised

- The final cover is assumed to be compromised resulting in infiltration through the mound into the waste materials. The rate of infiltration was assumed to be 0.3 m/yr, which is equivalent to the mean net precipitation minus the evapotranspirational losses at the Chalk River Laboratory site, as estimated previously by others (CNL 2016b).
- The base liner is assumed to remain intact resulting in a "bathtub" effect with spillover along the low point of the base liner, located in the southern portion of the ECM. For the purposes of this scenario it was assumed that the spillover would occur in areas along the downslope side of the perimeter berm bounded laterally by the lowermost 2 m of the liner edge along the berm crest (illustrated as the grey-shaded area on Figure 4.2).
- For this scenario the surface runoff from the ECM was assumed to have a negligible impact on local groundwater conditions, and no additional water was applied beyond the natural surficial recharge.

Post Closure – Final Cover and Liner Compromised

Both the final cover and liner are assumed to be compromised resulting in infiltration through the waste materials and into the underlying geological materials. As with the previous scenario the rate of infiltration was assumed to be 0.3 m/yr.



4.3 Results

The results of the forecast simulations are presented on Figures 4.3 through Figure 4.7 in terms of the groundwater flow paths and travel times from key areas and changes in the elevation of the simulated groundwater table. Figure 4.8 provides an illustration of the simulated groundwater table elevation for all scenarios. Figure 4.9 compares the simulated water table elevation to the top of the clay liner beneath the ECM. A review of the results in the above noted figures allows for the observations:

- For the operations period scenario A (where discharge to the WWTP exfiltration gallery occurs) groundwater particles released from the WWTP exfiltration gallery area travel towards the west, ultimately discharging via a short flow path to the East Swamp, or via a longer flow path to the East Swamp Stream. The majority of particles discharge to the East Swamp immediately downgradient from the WWTP exfiltration gallery area, whereas the remaining particles follow a deeper flow path and discharge at the East Swamp Stream after approximately three years (see Figure 4.3).
- For Operations Scenario A and B (i.e., scenarios where the SWM ponds are lined) there was localized drawdown in the simulated water table in the vicinity of the SWM Ponds. The maximum drawdown for all scenarios was approximately 1 m and was limited to the area of SWM Pond 1. The extent of the drawdown beneath the lined ponds is limited by infiltration applied at the pond spillover location (i.e., immediately downgradient of the pond locations).
- For the Post-closure Scenario with an intact final cover (i.e., the scenario where runoff is directed to the SWM ponds, and the pond liners are compromised) there were localized rises in the simulated water table in the vicinity of the SWM ponds. The maximum rise was approximately 2 m in the vicinity of the northern SWM pond (Figure 4.5). The extent of the rise in water table was limited to the area located between the northern SWM pond and the boundary of East Swamp, extending approximately 50 m northwest of the northern SWM pond (as defined by the -1 m drawdown contour). The simulated change in groundwater elevation in the area of the ponds remained below ground surface (under high water table conditions). As such, the infiltration of runoff applied in the pond areas is anticipated to have a limited impact on the surface water regime. Simulated changes to groundwater discharge at surface water features are discussed further as a part of sensitivity analysis 8 in Section 4.4.
- Collection of water (infiltration and/or runoff) over the ECM footprint resulted in a lowering of the water table for all simulations, though this was generally limited to the local footprint of the ECM and the area to the north east of the ECM (i.e., towards the groundwater flow divide). The maximum simulated reduction in groundwater elevation occurred over the central and eastern portions of the ECM, to a maximum of approximately 7 m for average water table conditions and 9 m for high water table conditions. The magnitude and distribution of water table lowering was approximately equal among the high water table condition scenarios (Operations Scenario B, and the Post-closure scenarios). For the Post-closure Scenario where the cover and liner were assumed to be compromised the recharge applied over the ECM footprint (300 mm/yr) was less than the recharge applied over the same area in the "high water table" calibrated model; this resulted in a lowering of the water table of up to approximately 8 m in the northern portion of the ECM compared to high water table conditions (see Figure 4.7).



- For the Post-closure Scenario where the final cover was assumed to be compromised the groundwater particles follow a flow path towards the south-southeast, with the majority of particles discharging to Perch Creek (a small portion of the particles released from the westernmost and easternmost spillover area locations discharged at surface to the Perch Lake Swamp). Groundwater travel times between the ECM and Perch Creek ranged from approximately 5 years to 15 years with the majority of particles arriving between approximately 7 and 10 years (Figure 4.6). Based on the position of the water table the groundwater particles began at the spillover location travelling through the till unit, then transitioned to the travelling through the upper sand units before reaching their ultimate discharge location. An example of a conservative (i.e., early-arriving) groundwater particle is illustrated on Figure 4.6 (see the path with points marked from A through D). At this location the groundwater particle reaches Perch Creek in approximately six years, and has a groundwater velocity ranging from 0.15 m/d to 0.26 m/d depending on its position in the groundwater flow path.
- Between the ECM and Perch Creek a similar groundwater particle flow path to that described above was simulated for the Post-closure Scenario where the final cover and liner were assumed to be compromised. Some particles that originated from the northwestern perimeter of the ECM travelled through a longer flow path to the west before ultimately discharging to Perch Lake. The conservative example illustrated on Figure 4.7 is based on a flow path from the southern end of the ECM to Perch Creek, where groundwater velocities ranged from 0.12 m/d to 0.25 m/d (depending on the position along the flow path). Groundwater travel times between the ECM and Perch Creek ranged from approximately 6.5 to 12 years.
- Simulated groundwater pathway flow rates from the spillover location to Perch Creek were approximately 141 m³/d for the Post-closure Scenario with a compromised cover (as measured from the groundwater discharge location in Perch Creek). Of this, approximately 92 m³/d originates from the ECM leachate (i.e., the spillover) and 49 m³/d originates from upgradient sources (see Figure 4.6).
- For the Post-closure scenario with a compromised cover and liner, the simulated groundwater pathway flow rates from the ECM location to Perch Creek were approximately 137 m³/d (as measured from the groundwater discharge location in Perch Creek). Of this, approximately 92 m³/d originates from the ECM leachate and 45 m³/d originates from upgradient sources (see Figure 4.7).
- As shown on Figure 4.8, minor localized changes to the directions of groundwater flow occur in the vicinity of the NSDF Project site as a result of captured and/or redirected water, while the overall (global) groundwater flow paths are the same as under current conditions (i.e., the average and high water table calibrated model).
- As shown on Figure 4.9 the simulated water table remains beneath the threshold value of 1.5 m below the primary liner elevation for all scenarios. In general, the minimum separation distance between the liner and the simulated water table occurred in the southern portion of the ECM.

4.4 Sensitivity Analysis

4.4.1 Definition of Sensitivity Simulations

The results presented above were completed using the best estimates of input parameters. Additional simulations were completed in order to examine the sensitivity of model results to some of the key controlling parameters of the hydrogeological system and assumptions made in the development of the conceptual model. The Post-closure Scenario where the final cover is assumed to have been compromised was used as a starting point for evaluation



of the sensitivity of the model to selected input parameter variation (note that it was also necessary to vary input parameters in the calibrated model in order for comparisons to be made). A total of nine sensitivity scenarios were evaluated, which addressed potential variation in the hydraulic conductivity of the bedrock and sand units, the recharge distribution, the position of the model boundary, and various aspects of the ECM design (e.g., the liner, blast zone, cover evapotranspiration, and exfiltration gallery flow). A summary of the sensitivity runs is provided below.

- Sensitivity Run 1 (SR1) Global increase in the hydraulic conductivity of the upper portion of the bedrock unit. In this sensitivity run the horizontal and vertical hydraulic conductivity of the uppermost 6 m of the bedrock was increased throughout the model domain from 9x10⁻⁷ m/s to 1.8x10⁻⁶ m/s (i.e., doubling the value in the calibrated model).
- Sensitivity Run 2 (SR2) Local increase in the hydraulic conductivity of the upper portion of the bedrock unit. In this sensitivity run the hydraulic conductivity of the uppermost 6 m of the bedrock was increased in all areas where the bedrock elevation was above 164 mASL. This area encompasses most of the hill to the southeast of the East Swamp where the NSDF Project site is located. As was the case for SR1, the upper 6 m of the bedrock unit were assigned horizontal and vertical hydraulic conductivities of 1.8x10⁻⁶ m/s in this area.
- Sensitivity Run 3 (SR3) Global increase in the hydraulic conductivity of the upper sand units. In this sensitivity run the horizontal and vertical hydraulic conductivities of the upper sand, interstratified sand and silt, and middle sand units was made equivalent to the geometric mean plus one log standard deviation values (refer to Table 2.1).
- Sensitivity Run 4 (SR4) Global 30% increase in the surficial recharge. In this sensitivity run the recharge rate applied to the uppermost surface of the model was increased uniformly by 30%. For the Post-closure Scenario the recharge over the footprint of the ECM remained as zero, and the amount of recharge applied to the spillover location was unchanged.
- Sensitivity Run 5 (SR5) Lateral extension of the model boundary. This sensitivity run was completed to evaluate the potential influence of the no-flow boundary located to the east of the ECM in the base case model. For this simulation the active area of the model domain was expanded to include the area shown on Figure 4.10. As shown on the figure this includes the eastern portion of the hill where the ECM is located to Perch Creek. To capture the outflow of groundwater towards Perch Creek additional constant head boundaries were added within the expanded model area at elevations based on topography. Surficial recharge within the expanded area was specified according to the methods described in Section 3.3.3.2.
- Sensitivity Run 6 (SR6) Compromised Sacrificial Liner over Phase 2. The sacrificial liner was assumed in the base case operations simulations to reduce infiltration to zero over the Phase 2 portion of the ECM. This sensitivity run was completed to evaluate the potential increase in groundwater elevations beneath the ECM should surficial infiltration occur in the area of the sacrificial liner (i.e., if the liner is compromised). This was represented in the sensitivity simulation by applying a surficial recharge of 300 mm/yr over the Phase 2 footprint (corresponding to average annual precipitation less evapotranspiration) and "high water table" recharge conditions over the remaining portions of the model.



- Sensitivity Run 7 (SR7) Blast-damaged zone hydraulic conductivity. A zone of enhanced permeability in the bedrock beneath the ECM will be achieved through blasting of the bedrock during construction of the facility. AECOM (2019c)estimated that for the Chalk River site the increase in hydraulic conductivity within the blast damage zone would be on the order of 1,000 to 10,000 times that of the intact rock. A hydraulic conductivity of 1x10⁻⁴ m/s was applied for the base case simulations, representing an increase of approximately 2,500 times that of the intact rock (note: the intact rock was assigned a hydraulic conductivity of 4x10⁻⁸ m/s whereas the upper 6 m of bedrock was assigned a hydraulic conductivity of 9x10⁻⁷ m/s in the calibrated model). An additional five simulations were completed to evaluate the relative sensitivity of the model results to the blast-damage zone hydraulic conductivity value, with blast zone hydraulic conductivities ranging from 6x10⁻⁴ m/s (15,000 times that of the intact rock) to 1x10⁻⁶ m/s (25 times that of the intact rock). It should be noted that these simulations were completed without the presence of the coarse granular fill material for liquefaction mitigation.
- Sensitivity Run 8 (SR8) Evapotranspiration applied to ponds in Post-closure. For the post-closure simulation with an intact final cover it was conservatively assumed that 100% of the mean annual precipitation (839 mm/yr) would be collected and infiltrated at the SWM ponds during the post-closure period. A more realistic approach would be to consider evapotranspiration (ET) losses from the vegetated cover system. This sensitivity simulation was completed using the post-closure model to evaluate the groundwater conditions when ET is considered in the calculation of the SWM pond infiltration rate. This was represented in the model by assuming 50% of the mean annual precipitation from the ECM footprint (47,000 m³/yr) would contribute to runoff and occur as infiltration to the SWM pond outfall locations, distributed equally.
- Sensitivity Run 9 (SR9) Increase in recharge applied at Exfiltration Gallery. Discharge of treated effluent from the WWTP will be routed to both the exfiltration gallery and Perch Lake such that groundwater elevations in the vicinity of the exfiltration gallery will remain below ground surface (i.e., no overland flow will occur as the result of this discharge). In order to address the uncertainty in the relative portion of discharge to the exfiltration gallery and Perch Lake this sensitivity simulation was completed using five alternative discharge rates applied to the exfiltration gallery ranging from 10 m³/d to 75 m³/d. All simulations were completed using the high water table configuration of the model.
- Sensitivity Run 10 (SR10) Groundwater Discharge Location. Consideration was given to the uncertainty associated with the discharge location of seepage from the ECM area. Potential future changes to the location of the groundwater discharge zone at Perch Creek over the assessment timeframe are unknown. This scenario evaluates the hypothetical case where the discharge location occurs at the current edge of Perch Lake Swamp (in the vicinity of the toe of the ECM, approximately 340 m closer to the ECM as compared to the current location of the creek).



4.4.2 Results of Sensitivity Simulations

The sensitivity simulations that evaluated model sensitivity to baseline input parameters (i.e., SR1 through SR5) resulted in slight changes to the goodness of fit to model calibration data, though in all cases the results were reasonable. For SR5, the groundwater flow divide (which is assumed to follow the topographic divide along the hill where the ECM is located) was reproduced in the model (see Figure 4.10). Results of the sensitivity simulations are illustrated on Figures 4.11 through Figure 4.19. A summary of these results is provided below.

- In general, the overall groundwater flow paths from the ECM to Perch Creek estimated using the sensitivity simulations are similar to the results of the calibrated model (shown on Figure 4.6).
- For SR1 and SR2 (increase in the bedrock hydraulic conductivity) the lateral extent of the lowering of the water table beneath the ECM was slightly decreased over the base case simulation, and generally remained within the footprint of the facility. For SR1 and SR2 the maximum lowering of the water table occurred towards the northeast portion of the ECM, in a similar manner to the base case. For SR1 and SR2 the water table position was lower compared to the base case, and therefore remained below the threshold separation of 1.5 m below the primary liner.
- For SR3 (increase in the sand hydraulic conductivity), the extent and magnitude of water table lowering was similar to the base case, as was the position of the water table relative to top of the clay liner. Based on the groundwater particle tracking the travel time between the ECM and Perch Creek was reduced compared to the base case. This reduction was estimated to be on the order of one year (approximately 14%).
- For SR4 (increase in recharge) the extent and magnitude of water table lowering is similar to the base case, as was the position of the water table relative to the top elevation of the clay liner.
- For SR5, the extent of lowering of the water table was similar to the Base Case scenario, with a localized portion of the drawdown extending beyond the original model boundary. This indicates that the no-flow boundary condition at the northeastern edge of the model has a limited effect on the results of the simulation.
- The rate of upgradient groundwater flow through the pathway from the ECM to Perch Creek varied between the simulations. For all sensitivity runs, the upgradient groundwater flow was similar to the base case (i.e., 42 m³/d for SR1, 41 m³/d SR2, 51 m³/d for SR3, 57 m³/d for SR4, 39 m³/d for SR5, compared to 49 m³/d for the base case).
- For SR6 groundwater elevations below the ECM are increased relative to the Operations A Scenario. However, a separation of greater than 1.5 m between the primary liner and the water table was maintained. The travel time and particle tracks from the exfiltration gallery to the East Swamp and East Swamp stream were similar to Operations Scenario A. For each of the five scenarios evaluated as a part of SR7 the simulated groundwater elevation was compared to the elevation of the primary liner within the footprint of the ECM. The simulated water table elevation remained within the design criteria (i.e., greater than 1.5 m separation was maintained between the primary liner and the water table) for Scenarios 1 and 2 of SR7. For Scenarios 3 and 4, where the blast-influenced rock was assigned a hydraulic conductivity of 250 and 200 times that of competent rock, the simulated water table was within 1.5 m of the primary liner elevation over a localized area on the eastern margin of the ECM and was more than 2 m below the primary liner elevation over the remaining portion of the ECM. For Scenario 5, where the blast-influenced rock was assigned a hydraulic conductivity of 25 times that of the competent rock, the simulated water table was within 1.5 m of the primary liner elevation over the primary liner elevation by the primary liner elevat



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liner elevation over the northeastern portion of the ECM. Interpretation of the groundwater model results indicates that a 1.5 m separation between the primary liner and the water table is expected to be maintained under post-closure conditions provided a bedrock hydraulic conductivity of 5x10⁻⁵ m/s or more is achieved through blasting within a 3 m thick zone beneath the ECM subgrade (this represents an increase of 1,250 times the intact bedrock hydraulic conductivity as applied in the model).

- For SR8, the assumption that 50% of the mean annual precipitation is available for runoff resulted in localized increases in groundwater elevation on the order of up to 2 m (e.g., beneath Pond 1) compared to the current conditions (calibrated) model. This water table response is of a similar magnitude although reduced spatial extent as compared to the base case post closure simulation (See Figure 4.5). For SR8, the extent of groundwater mounding (as defined by a 1 m rise in groundwater elevation) was limited to the area directly beneath the pond. The assumption regarding ET translates to changes in the simulated groundwater discharge/recharge to model boundaries. For the post-closure scenario (without ET effects) the additional runoff collection resulted in an overall increase in groundwater discharge in the lower Perch Lake Basin of 149 m³/d compared to the calibrated (high water table) groundwater model. Much of this was from changes in calculated groundwater discharge/recharge at East Swamp and Perch Lake Swamp. Following the inclusion of evapotranspiration in the runoff collection volumes an overall decrease in groundwater discharge of 52 m³/d was calculated for the lower Perch Lake Basin, At East Swamp the addition of ET resulted in a reduction to groundwater discharge of approximately 32% upstream of the weir and an increase in infiltration of 31% downstream of the weir. Compared to the high water table (calibrated) model the Post Closure simulation with ET resulted in an overall decrease in groundwater discharge to model boundaries of approximately 52 m³/d. When ET was not considered an increase in overall discharge of 149 m³/d was calculated.
- For SR 9 groundwater elevations below the ECM are unchanged from the Operations A Scenario. The travel times and particle tracks from the exfiltration gallery to the East Swamp and East Swamp Stream are similar to Operations Scenario A. At higher rates of flow (over 60 m³/d) a small portion of particle pathlines trend towards the north-east boundary of the model. This path results from localized mounding of the water table at the exfiltration gallery (while still below ground surface). This pathway is characterized by particles migrating vertically downwards, and travelling through the bedrock towards the north-eastern boundary over long travel times (approximately 25 years). It should be noted that this sensitivity scenario was evaluated using the high water table configuration of the model, which is applicable to a relatively short period (approximately 1 month) of seasonal variability in the water table.
- For SR10 an explicit groundwater simulation was not completed. Rather this scenario was evaluated qualitatively based on the results of the post-closure simulation with a compromised liner. For the case where groundwater discharge occurs in the vicinity of the northern edge of Perch Lake Swamp, the travel time through the groundwater flow pathway is estimated to be approximately 2 years (represented by pathway A-B on Figure 4.6).

The response of the model to variability in some of its key input parameters has been evaluated through a sensitivity analysis and used as an analogue for model uncertainty. Model uncertainty could be reduced through collection of additional data. In particular, long-term records of groundwater elevation in the NSDF area would help to refine the model calibration dataset, and therefore improve model calibration.



5.0 SUMMARY

Canadian Nuclear Laboratories (CNL) is proposing to construct the NSDF Project for the disposal of radioactive waste at the CRL site. The NSDF Project is designed as an engineered containment mound (ECM), built at a near-surface level on the CRL site. The facility is expected to be operational for approximately 50 years and will be expandable to receive up to 1,000,000 cubic metres (m³) of low-level radioactive waste. The current assessment is based on the "100% project design", which involves excavation and regrading of the overburden and bedrock in the NSDF Project site and replacement of overburden with coarse granular fill material where necessary for liquefaction mitigation. An enhanced permeability zone in the bedrock beneath the ECM will be established through blasting to promote drainage and lower groundwater elevations beneath the facility. The design incorporates placement of a double liner and leachate collection system beneath the ECM, and a final cover (installed at closure).

As a part of the work being completed to support the EIS for the NSDF Project, a conceptual model was developed for the study area that identified the key hydrostratigraphic units controlling groundwater flow, the hydraulic properties of these units, and the directions and rates of groundwater flow. The general findings from this assessment indicated that groundwater flow primarily occurs through the sandy overburden units (the Upper Sand, Middle Sand, and Basal Sand/Till), whereas the bedrock is considered to be of low transmissivity. Groundwater flow patterns generally follow topography, with recharge occurring in the upland areas and with the ultimate discharge location at Perch Lake or Perch Creek. Groundwater recharge and discharge occurs locally in streams within the lower Perch Lake basin.

Hydrogeological modelling was completed to estimate the groundwater flow pathways from the ECM, and the rates of groundwater flow from the NSDF Project site to downstream receptors. This was accomplished by constructing a groundwater flow model based on the conceptual model and calibrating it to the existing conditions. Calibration involved an iterative process where steady-state model runs were completed with adjustments to the model input parameters (within acceptable ranges) until model results provided an acceptable match to observed conditions (groundwater elevations, groundwater flow directions, baseflow estimates, and advective flow paths from the Reactor Pit 2 source area). It should be noted the model calibration dataset included groundwater elevations collected via transducer from October 2016 through June 2018 in the area of the ECM. Both average water table conditions and high water table conditions (based on the period of record noted above) were considered as a part of the model calibration. After an acceptable model calibration was achieved, the calibrated model was then modified to represent the NSDF Project site under operations and post-closure conditions and steady-state simulations were completed to evaluate the changes in groundwater flow patterns and water table elevations from the NSDF Project site. Three operations phase scenarios and three post-closure phase scenarios were evaluated with the model. The main findings from the forecast simulations are presented below:

- For Operations Scenario A (when the WWTP exfiltration gallery is operational) groundwater particles released from the WWTP exfiltration gallery area travel towards the west, ultimately discharging at the East Swamp. The majority of groundwater particles arrive at East Swamp within a year of travel time.
- For the simulations where runoff is directed to the SWM ponds, localized mounding of the water table on the order of 1 m occurred in the area of the ponds. The extent of the rise in the water table was limited to the area directly beneath the SWM ponds. Simulated groundwater elevations in this area remained below ground surface under high water table conditions. As such, the infiltration and runoff applied to the pond areas is anticipated to have a negligible impact on the surface water regime.





- Collection of water (infiltration and/or runoff) over the ECM footprint resulted in a lowering of the water table for all simulations, though this was generally limited to the footprint of the ECM and the area northeast of the ECM towards the groundwater flow divide. The maximum simulated reduction in groundwater elevation occurred over the central and eastern portions of the ECM, to a maximum of approximately 7 m for average water table conditions and 9 m for high water table conditions.
- For the Post-closure Scenario where the final cover was assumed to be compromised the groundwater particles follow a flow path from the ECM towards the south-southeast, with discharge occurring to Perch Creek. For the majority of particles groundwater travel times between the spillover location and Perch Creek ranged from approximately 7 years to 10 years, with travel initially through the till and transitioning into the upper sand units (the overall range in travel times was approximately 5 to 15 years). For this simulation the groundwater pathway flow rates from the spillover location to Perch Creek were approximately 141 m³/d for the Post-closure Scenario with a compromised cover. Of this, approximately 92 m³/d originates from the ECM leachate (i.e., the spillover) and 49 m³/d originates from upgradient sources based on the groundwater discharge occurring to Perch Creek within particle the flow path. It should be noted that this simulation was based on the "high water table" condition, and travel times noted above would be longer for the average water table condition.
- For the Post-closure Scenario where the final cover and liner were assumed to be compromised the groundwater particles follow a similar flow path to that described above. Groundwater travel times between the spillover location and Perch Creek ranged from approximately 6.5 years to 12 years for the majority of groundwater particles. For this simulation the groundwater pathway flow rates from the base of the ECM to Perch Creek were approximately 137 m³/d for the Post-closure Scenario with a compromised cover. Of this, approximately 92 m³/d originates from the ECM leachate and 45 m³/d originates from upgradient sources.
- Minor localized changes to the directions of groundwater flow occur in the vicinity of the NSDF Project site as a result of captured and/or redirected water, while the overall (global) groundwater flow paths are the same as under current conditions.
- The simulated water table remains beneath the threshold value of 1.5 m below the primary liner for all Scenarios. The separation between the top of the clay liner and the water table generally ranged from 2 m to 9 m. In general, the least separation occurred in the southern portion of the ECM.

The results summarized above reflect the groundwater conditions forecast using best estimates of the key controlling input parameters. Additional simulations were completed in order to examine the sensitivity of model results to some of those parameters. The findings from these sensitivity simulations are summarized below:

SR1 – Global Increase in the Bedrock Hydraulic Conductivity. For this simulation the hydraulic conductivity of the upper 6 m of bedrock was increased by a factor of 2. Results showed that the lateral extent of the lowering of the water table beneath the ECM was slightly decreased over the base case simulation, and generally remained within the footprint of the ECM. The simulated water table position was lower for SR1 compared to the base case, and therefore remained below the threshold separation of 1.5 m below the top of the clay liner.



- SR2 Global Increase in the Bedrock Hydraulic Conductivity. For this simulation the hydraulic conductivity of the upper 6 m of bedrock was increased by a factor of 2 compared to the base case simulation where bedrock was above elevation 164 mASL. Results of this simulation were similar to SR1.
- SR3 Increase in the Sand Hydraulic Conductivity. For this simulation the main sand units (Upper Sand, Interstratified Sand and Silt, and Middle Sand) were assigned hydraulic conductivity values at the geometric mean plus one log standard deviation (based on the available measured values). The extent and magnitude of water table lowering is similar for this simulation as compared to the base case. Based on the groundwater particle tracking the travel time between the ECM and Perch Creek was reduced compared to the base case and was estimated to be on the order of one year (approximately 14%).
- SR4 Global 30% Increase in Recharge. The extent and magnitude of water table lowering for the case where recharge was globally increased by 30% was similar to the base case.
- SR5 Lateral Extension of Model Boundary. For this simulation the model boundary was extended laterally to the east to evaluate the influence of the no-flow boundary near the ECM. Results of this simulation indicate that the extent of lowering of the water table was similar to the Base Case scenario, and therefore that the no-flow boundary condition at the northeastern edge of the model has a limited effect on the model results.
- SR6 Compromised Sacrificial Liner over Phase 2. This sensitivity run was completed to evaluate the potential increase in groundwater elevations beneath the ECM should surficial infiltration occur in the area of the sacrificial liner (i.e. should the liner become compromised). Results of this simulation show that though groundwater elevations increased beneath the ECM a separation of greater than 1.5 m between the primary liner and the water table was maintained and groundwater travel times from the exfiltration gallery to the East Swamp were unchanged.
- SR7 Hydraulic Conductivity of the Blast-Damaged Zone. This sensitivity run was completed to evaluate the model sensitivity of the hydraulic conductivity of the blast-damaged zone. Results of the simulation indicate that the water table remained within the design criteria (i.e., at least 1.5 m separation from the primary liner) throughout the footprint of the ECM when the blast-induced hydraulic conductivity was at least 2,500 times that of the intact rock. For blast-zone hydraulic conductivity values ranging from 1,250 to 250 times that of the intact rock the design criteria was met throughout the ECM footprint with the exception of a localized area on the southeastern margin. At 25 times that of the competent rock, the simulated water table was within 1.5 m of the primary liner elevation over the northeastern portion of the ECM.
- SR8 Evapotranspiration Applied to Pond Infiltration. This sensitivity run was completed to evaluate the model sensitivity to the recharge rate applied to SWM pond liners during the post-closure period. The assumption regarding ET translates to changes in the simulated groundwater discharge/recharge to model boundaries. For the post-closure scenario (without ET effects) the additional runoff collection resulted in an overall increase in groundwater discharge in the lower Perch Lake Basin of 149 m³/d compared to the calibrated (high water table) groundwater model. Much of this was from changes in calculated groundwater discharge/recharge at East Swamp and Perch Lake Swamp. Following the inclusion of evapotranspiration in the runoff collection volumes an overall decrease in groundwater discharge of 52 m³/d was calculated for the lower Perch Lake Basin. At East Swamp the addition of ET resulted in a reduction to groundwater discharge of approximately 32% upstream of the weir and an increase in infiltration of 31% downstream of the weir.



- SR9 Increase in recharge applied at Exfiltration Gallery. For this simulation the recharge applied to the exfiltration gallery was varied to address the uncertainty in the relative portion of discharge to the exfiltration gallery and Perch Lake. This scenario was evaluated using high water table conditions. Results of the simulations indicated that groundwater pathways and travel times are similar to Operations Scenario A. It was noted that at higher exfiltration gallery flow rates (greater than 60 m³/d) a small portion of groundwater particles the resulting particle tracks were directed to the northern model boundary due to localized groundwater mounding beneath the exfiltration gallery.
- SR10 This scenario was evaluated qualitatively based on the results of the post-closure simulation with a compromised liner to quantify the changes to groundwater travel times for an alternative groundwater discharge location. For the case where groundwater discharge occurs in the vicinity of the northern edge of Perch Lake Swamp, the travel time through the groundwater flow pathway is estimated to be approximately 2 years.
- For the post-closure period simulations with a compromised cover over the ECM (SR1 through SR5)the rate of upgradient groundwater flow through the pathway from the ECM to Perch Creek was similar for all simulations, ranging from 39 m³/d to 57 m³/d (compared to a base case value of 49 m³/d).
- In general, the overall groundwater flow paths from the ECM to Perch Creek estimated using the sensitivity simulations are similar to the results of the calibrated model (i.e., current conditions at the site).



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Hydrogeologic investigations and groundwater modelling are dynamic and inexact sciences. They are dynamic in the sense that the state of any hydrological system is changing with time, and in the sense that the science is continually developing new techniques to evaluate these systems. They are inexact in the sense that groundwater systems are complex, and invariably limited data are available for the purposes of hydrogeological evaluation. A groundwater model uses the laws of science and mathematics to draw together the available data into a mathematical or computer-based representation of the essential features of an existing hydrogeologic system. While the model itself obviously lacks the detailed reality of the existing hydrogeologic system, the behaviour of a valid groundwater model reasonably approximates that of the real system. The validity and accuracy of the model depends on the amount of data available relative to the degree of complexity of the geologic formations and on the quality and degree of accuracy of the data entered. Therefore, every groundwater model is a simplification of a reality and the model described herein is not an exception.

The services performed as described in this report were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and geoscience professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

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Report Signature Page

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TABLES



Table 2.1 - Summary of Hydraulic Conductivity Data

July 2019

		Me	asured Va	lues					
Material	Geometr Hydra Conductiv	aulic	Kh:Kv	Min. Kh (m/s)	h. Kh Max. Kh Cond		1LSD Hydraulic ductivity (m/s)		Total Porosity
	Horizontal					Horizontal	Vertical	Kh:Kv	-
Historical Testing throughout the CRL	Property (CN	L, 2016b)			-				
Upper Sand	4.8E-05	1.4E-05	3.4	-	-	1.4E-04	3.8E-05	3.7	0.38
Interstratified Sand and Silt	1.8E-05	3.6E-08	500	-	-	8.6E-05	7.5E-07	115	0.39
Middle Sand	7.8E-05	8.7E-06	9.0	-	-	1.6E-04	2.1E-05	7.6	0.38
Clayey Silt	1.3E-07	5.5E-09	24	-	-	4.3E-07	6.5E-08	7	0.48
Basal Sands	1.0E-04	1.1E-04	0.9	-	-	1.7E-04	1.4E-04	1.2	0.38
Till	1.5E-06	-	-	-	-	5.8E-06	-	-	0.26
Bedrock (upper 50 m)	5.2E-08	-	-	2.0E-11	7.8E-04	3.0E-06	-	-	0.0002 to 0.005
Recent Testing in the NSDF Area (AME	C, 2016, 2017	′, 2018)							
Till	1.6E-06	-	-	5.7E-07	1.6E-05	4.3E-06	-	-	
Bedrock	1.4E-07	-	-	2.3E-09	1.5E-05	1.3E-06	-	-	
	-	Calibr	ated Mode						
Material			Hydrauli	c Conductivity (m/s)					osity
		Iorizontal			Vertical		Kh:Kv	Total	Effective
Upper Sand	3.0	E-5 to 1.7e-	04	1.	.0E-5 to 5.0	E-5	3 - 3.4	0.38	0.3
Interstratified Sand and Silt		6.0E-05			6.0E-07		100	0.39	0.3
Middle Sand		1.0E-04			2.0E-05		5.0	0.38	0.3
Clayey Silt		9.5E-07			5.5E-09		173	0.48	0.3
Basal Sands		1.2E-04			1.0E-04		1.2	0.38	0.3
Till		9.0E-07			7.0E-07		1.3	0.26	0.2
Upper Bedrock		9.0E-07 4.0E-08			9.0E-07 4.0E-08		1	0.001	0.001
Bedrock		4.00-00			4.0⊏-08		I	0.001	0.001

Table 2.2 - Summary of NSDF-Area Groundwater Elevation Data

		Ground Surface		Groundwater Elevation (mASL)			Model Results				
Well	Transducer Data Start Date	Elevation (mASL)	Unit Screened	Average	Minimum	Maximum	Maximum	Average Conditions (mASL)	Difference (m)	High Water Table Value (mASL)	Difference (m
BH-15-6	25-Oct-2016	174.63	Overburden/Shallow Rock	173.58	170.12	174.42	174.42	173.66	0.07	173.94	-0.48
BH-15-7	26-Oct-2016	173.93	Overburden	171.01	170.23	172.85	172.85	171.11	0.11	171.69	-1.17
BH-15-8	26-Oct-2016	173.95	Overburden	166.80	165.30	167.92	167.92	166.60	-0.21	166.89	-1.03
BH2-2S	14-Oct-2016	163.76	Shallow rock	162.31	161.61	162.97	162.97	162.22	-0.09	162.35	-0.62
BH2-2D	14-Oct-2016	163.8	Deep Rock	162.22	161.11	162.99	162.99	162.22	0.00	162.35	-0.63
BH2-3	14-Oct-2016	157.29	Shallow Rock	156.81	156.39	157.14	157.14	157.18	0.37	157.46	0.32
BH2-6	18-Oct-2016	191.66	Deep Rock	185.20	182.58	186.73	186.73	185.01	-0.18	187.94	1.21
BH2-7	18-Oct-2016	191.26	Shallow Rock	186.06	183.86	189.16	189.16	185.37	-0.68	188.72	-0.44
SH-4	14-Oct-2016	156.4	Overburden / Top of Rock	156.34	156.07	156.53	156.53	156.58	0.23	156.93	0.39
SH-5	19-Oct-2016	160.96	Overburden	158.10	157.46	159.35	159.35	158.58	0.47	158.60	-0.75
SH-6	19-Oct-2016	174.67	Overburden	169.11	168.51	169.93	169.93	168.46	-0.64	168.76	-1.17
W1A	09-Dec-2016	188.86	Shallow Rock	184.01	179.06	185.66	185.66	182.83	-1.17	185.24	-0.42
W1B	09-Dec-2016	188.28	Deep Rock	184.01	174.21	185.65	185.65	183.74	-0.27	185.61	-0.04
W2-D	30-Nov-2016	188.6	Shallow Rock	177.55	168.83	178.87	178.87	178.28	0.73	180.54	1.68
W2-S	30-Nov-2016	188.6	Overburden	178.50	177.11	180.06	180.06	178.27	-0.23	180.53	0.48
W3	30-Nov-2016	171.99	Overburden	169.64	169.17	170.44	170.44	170.48	0.85	170.64	0.20
W4	07-Dec-2016	171.51	Shallow Rock	171.00	168.50	171.77	171.77	171.13	0.13	171.46	-0.32
W5	06-Dec-2016	165.06	Shallow Rock	162.36	160.63	164.23	164.23	164.45	2.09	164.80	0.57
W6	30-Nov-2016	184.78	Overburden	175.96	174.17	177.65	177.65	177.39	1.43	179.70	2.05
W7	09-Dec-2016	180.56	Shallow Rock	176.45	174.98	178.74	178.74	177.83	1.39	179.73	0.99
W8	09-Dec-2016	193.16	Deep Rock	186.98	180.36	190.67	190.67	186.66	-0.32	189.81	-0.86
PLS-16	25-Nov-2016	157.7	Overburden (East Swamp)	157.55	153.34	157.94	157.94	157.52	-0.02	157.64	-0.30
PLS-17	25-Nov-2016	159.01	Overburden (East Swamp)	158.32	156.71	158.96	158.96	158.45	0.13	158.47	-0.49
PH17-001	22-Dec-2017	185.94	Overburden	169.95	169.68	170.47	170.47	172.29	2.34	173.32	2.85
PH17-002	22-Dec-2017	181.74	Overburden	168.21	167.92	168.69	168.69	167.11	-1.10	167.34	-1.35
PH17-003	22-Dec-2017	169.99	Overburden	168.86	168.43	169.68	169.68	168.67	-0.19	168.81	-0.87
PH17-004	22-Dec-2017	179.2	Overburden	169.42	169.11	169.83	169.83	170.03	0.62	170.50	0.67
PH17-005	15-Dec-2017	193.77	Shallow rock	182.50	181.92	183.58	183.58	183.87	1.36	187.09	3.51
PH17-006	12-Dec-2017	190.56	Deep Rock	187.68	186.85	189.39	189.39	186.16	-1.52	188.62	-0.77
PH17-007	12-Dec-2017	189.31	Deep Rock	186.14	185.64	186.96	186.96	185.82	-0.32	187.50	0.55
PH17-008	08-Dec-2017	195.39	Deep Rock	188.96	187.91	191.01	191.01	189.20	0.24	191.72	0.71
PH17-009	06-Dec-2017	191.27	Deep Rock	190.41	190.27	190.60	190.60	188.38	-2.03	190.84	0.24
PH17-010	22-Dec-2017	171.32	Overburden	168.16	167.85	169.03	169.03	167.90	-0.26	168.07	-0.96

All transducer data continues through to 5-Jun-2018

"shallow" = < 6 m below top of rock

Table 3.1 Summary of Model Assumptions

Numerical Model (MODFLOW)

- Flow is laminar and steady, and is governed by Darcy's Law.
- Groundwater flow is represented by an equivalent porous media.
- Hydraulic heads are vertically averaged within a given model layer.
- Groundwater travel times are simulated using advective particle tracks, which does not account for dispersive or diffusive processes.

Conceptual Model

- The geometric mean plus one log standard deviation of the measured hydraulic conductivities were used as a starting point for model parameterization
- The conceptual model was based upon geologic data compiled by CNL, and provided to Golder. This includes data received up to June 2018.
- The lower bedrock unit is represented by a low hydraulic conductivity value, and groundwater flow is dominated by the overburden and upper bedrock units.

Calibration

- Average and maximum groundwater elevations were used in the calibration process (where available). These are assumed to be representative of typical conditions. For NSDF-area wells the data were based on average readings from transducer measurements up to June 2018. Record lengths varied for each individual transducer.
- Recharge estimates reflect deeper recharge and discharge characteristics of the groundwater flow system, and do not account for shallow infiltration and intermittent discharge (i.e. interflow).
- A "regionalized" approach to model calibration was employed, such that parameter values were established for the hydrostratigraphic units on a regional scale, with the exception of the Upper Sand, which was represented using three unique hydraulic conductivity zones.

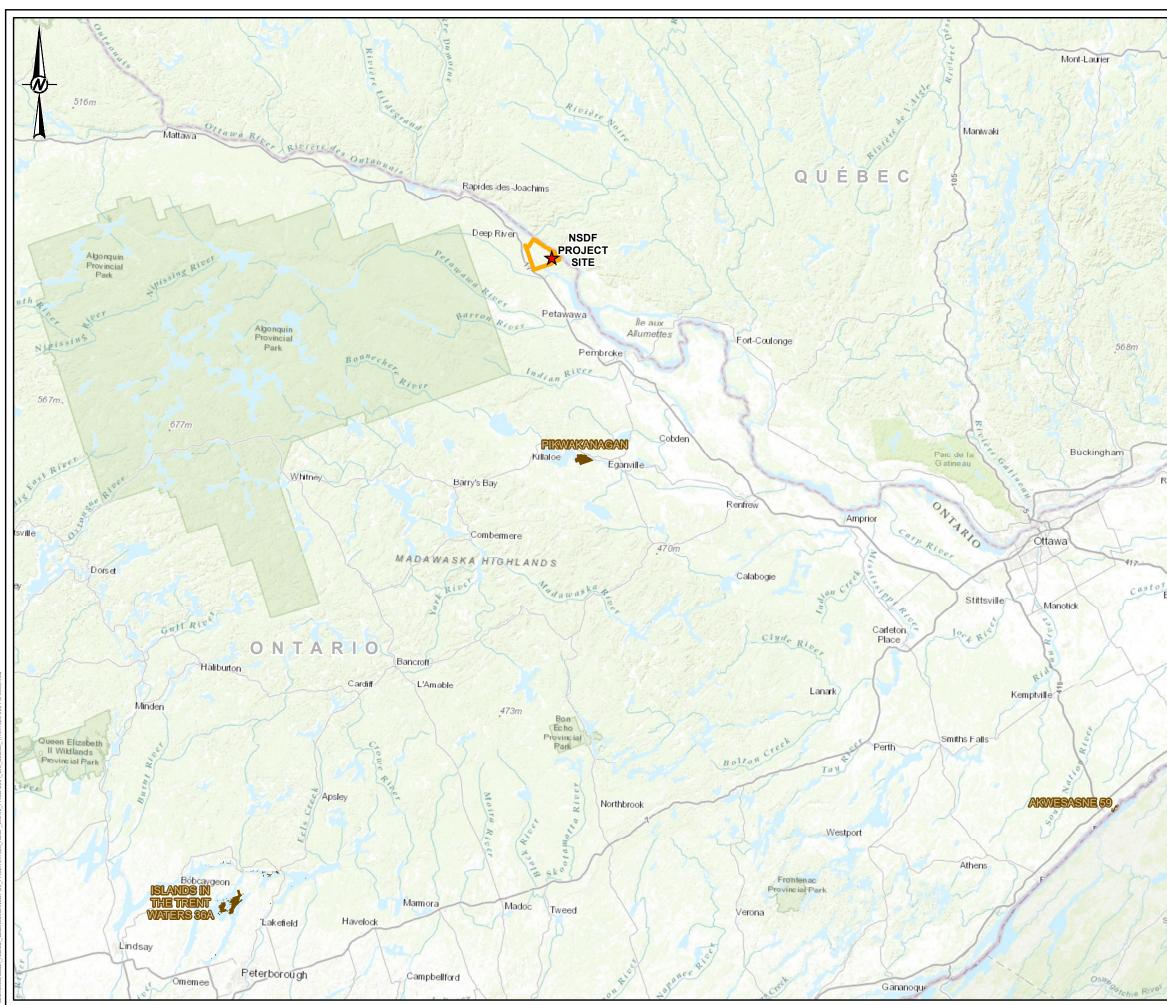
Forecast Simulations

- No evapostranspirational or leakage losses are considered when applying redirected runoff from closed cells of the NSDF
- 0.3 m/yr infiltration occurs through the compromised engineered cover as a part of the "failed cover" and "failed cover and liner" scenarios
- The base liner and intact cover are 100% impermeable for all other scenarios
- Flow rates at the WWTP exfiltration gallery are assumed to occur over 4 months of the year.



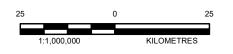
FIGURES







NSDF PROJECT SITE CRL PROPERTY FIRST NATION RESERVE



REFERENCE(S)

Frr

A BASEMAP SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS

USER COMMUNITY 2. HIGHWAYS AND FIRST NATION RESERVES MNRF 2016 2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE18N

CANADIAN NUCLEAR LABORATORIES LTD.

PROJECT NEAR SURFACE DISPOSAL FACILITY CHALK RIVER, ONTARIO

TITLE

CLIENT

REGIONAL OVERVIEW

CONSULTANT

PROJECT NO.

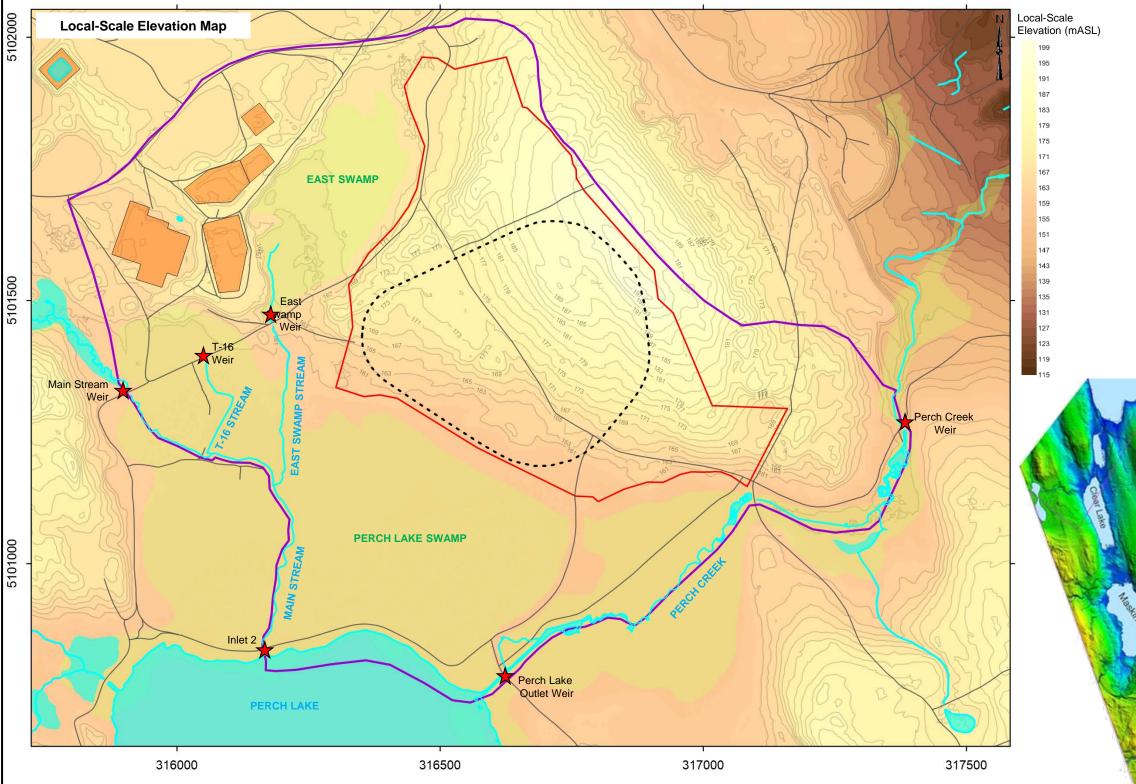
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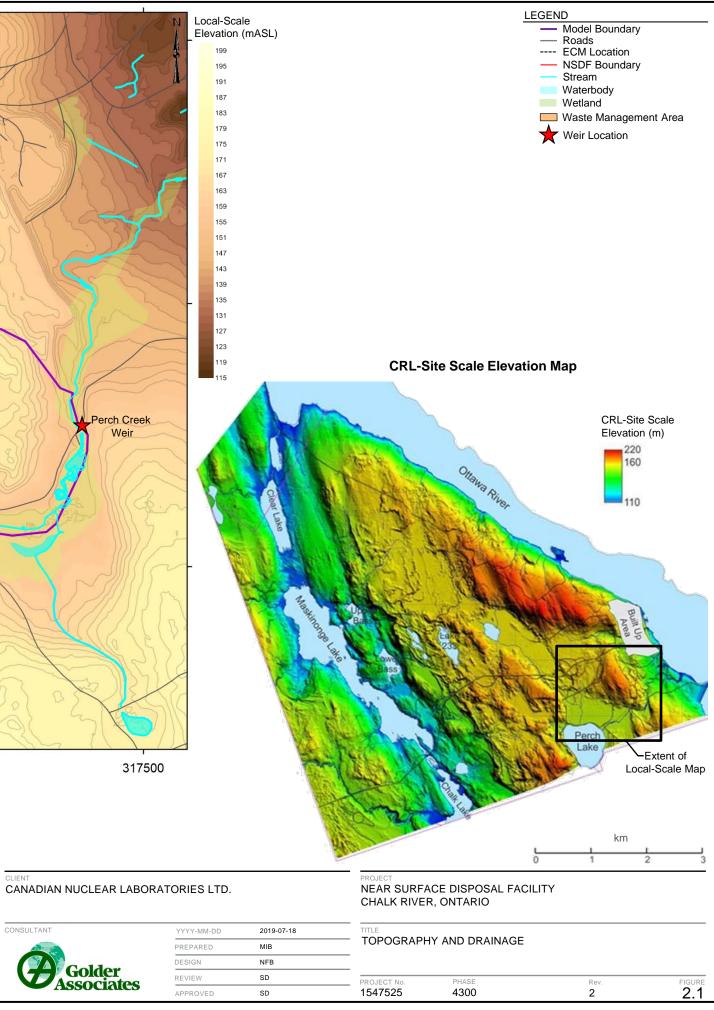
CONTROL

0001

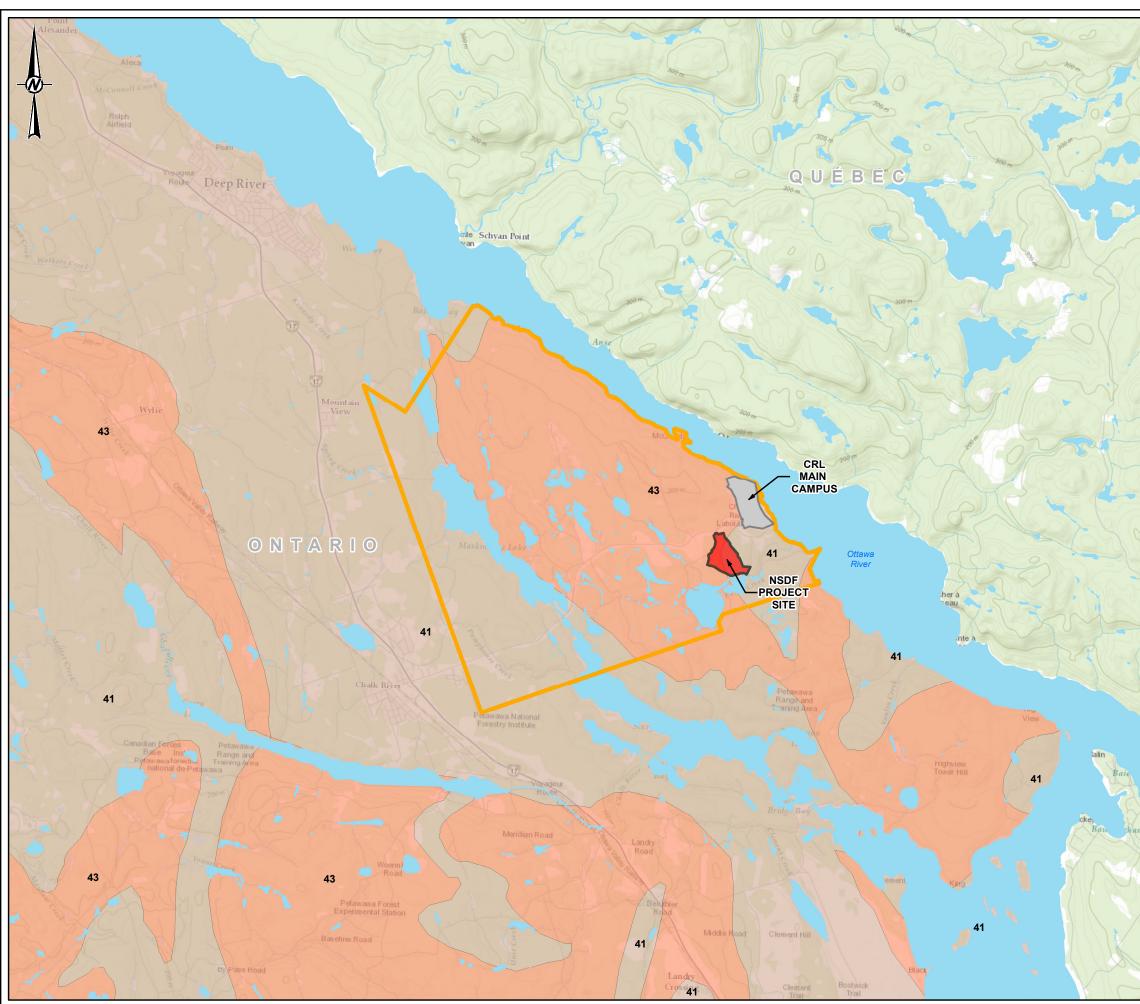
YYYY-MM-DD		JULY 2019	
DESIGNED		SO	
PREPARED		SO	
REVIEWED		MM	
APPROVED		AB	
	REV.		FIGURE
	2		1.1

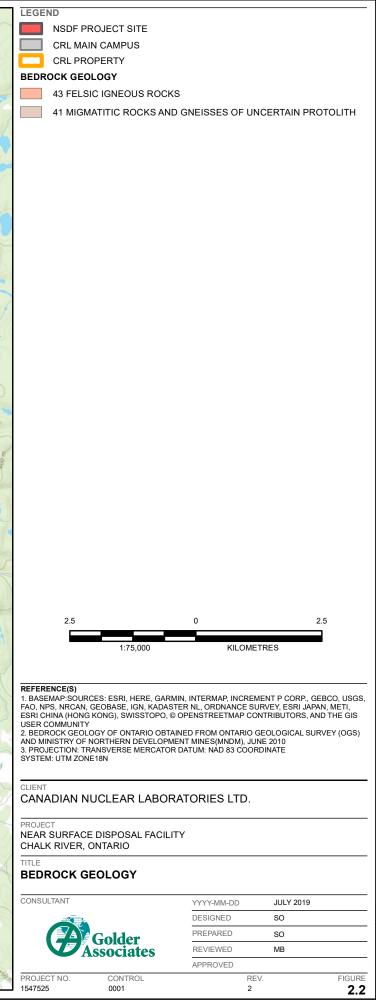


CANADIAN NUCLEAR LABORATORIES LTD.

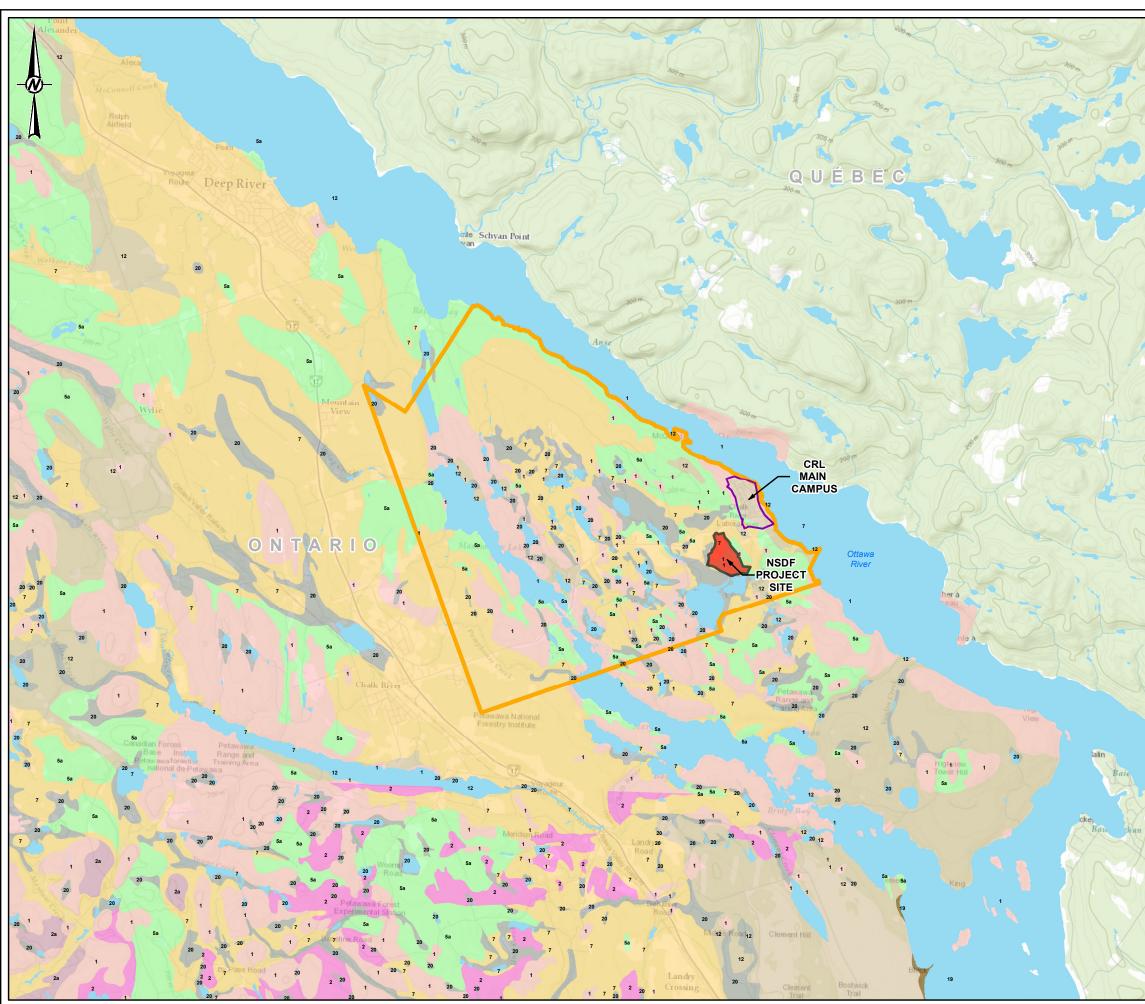


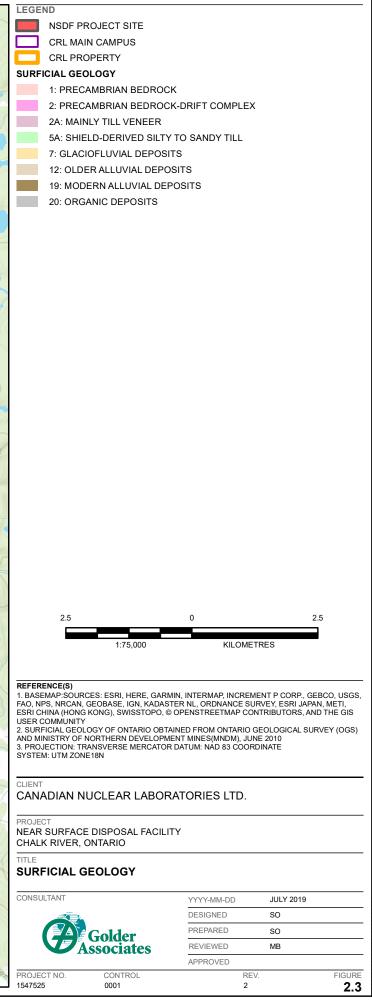




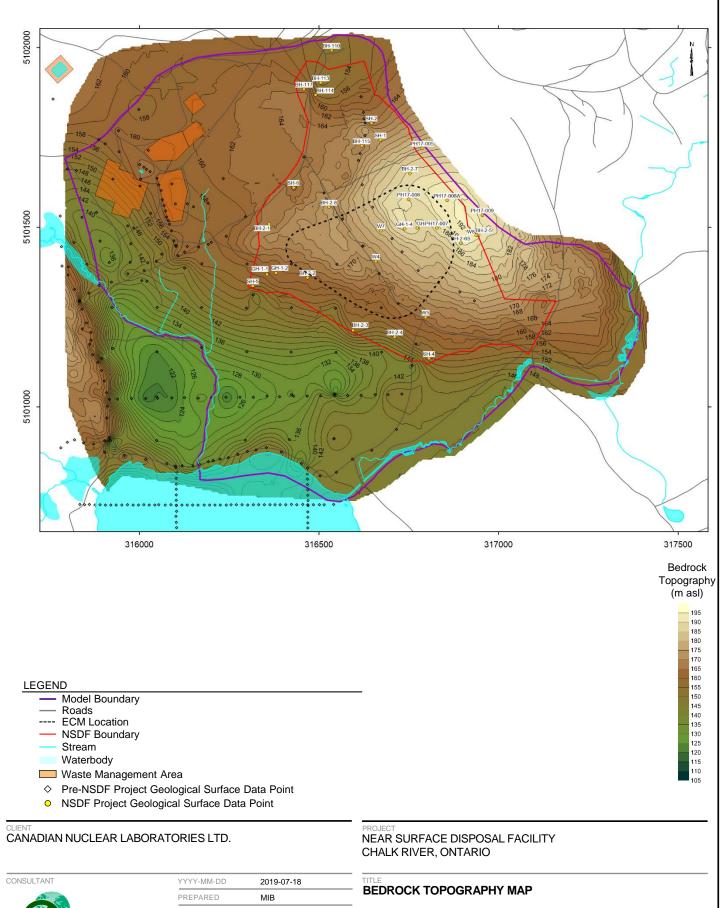


25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MC





25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MOD



PROJECT No

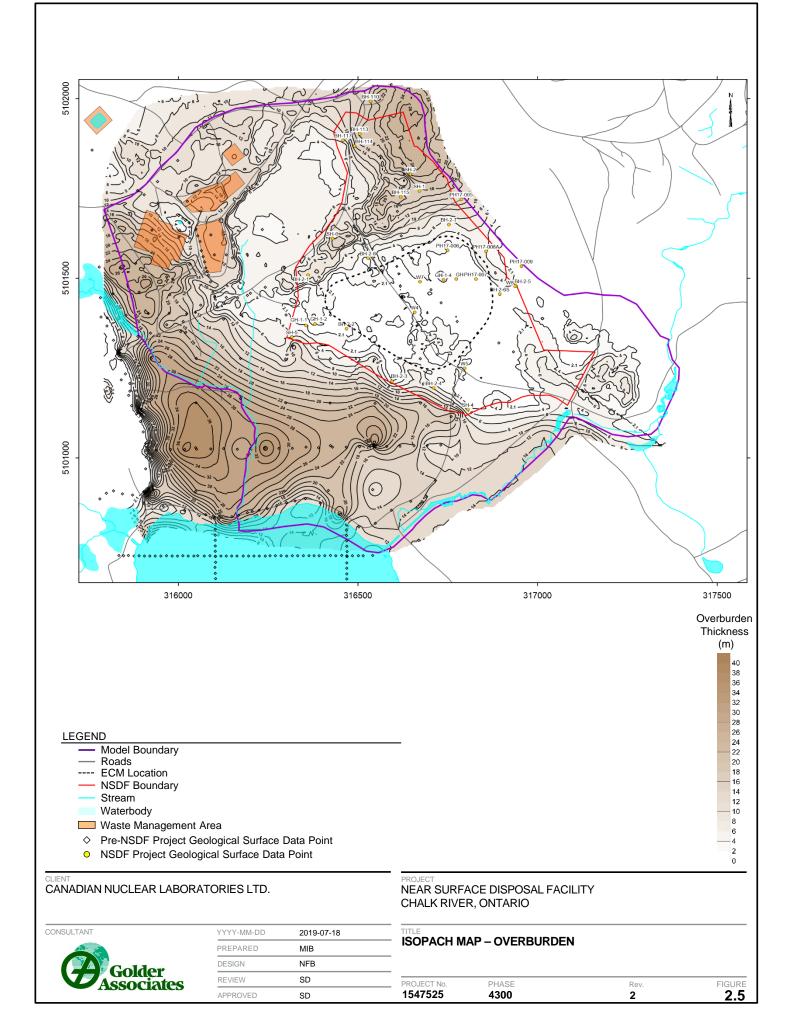
1547525

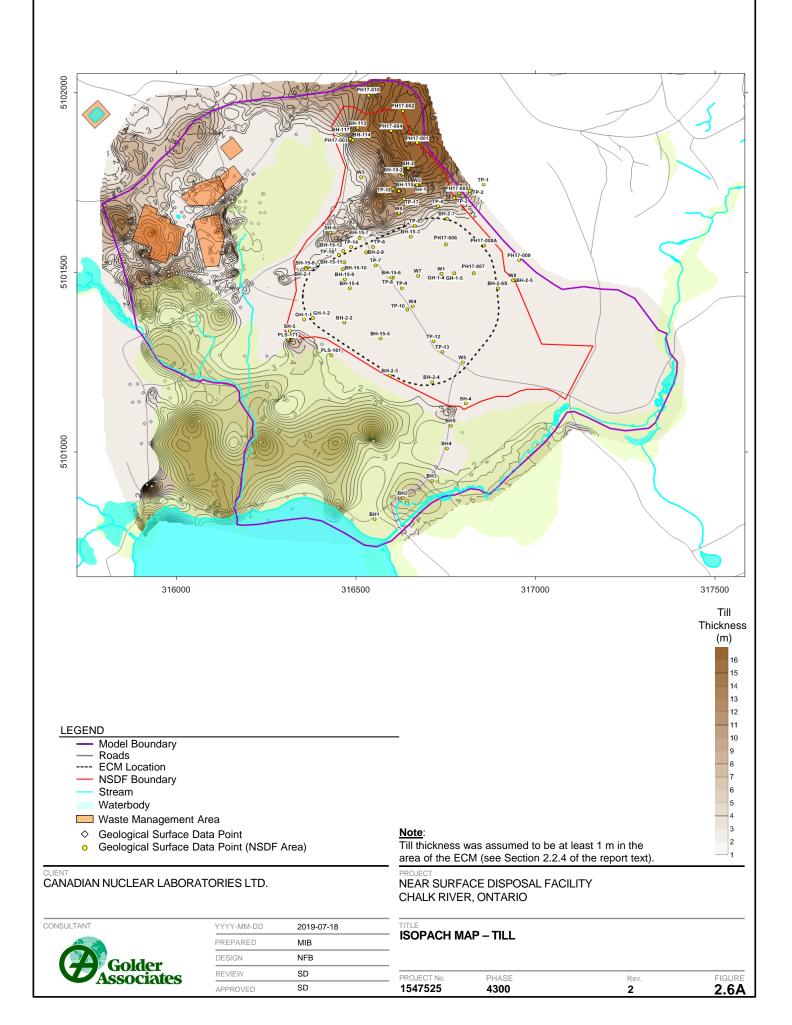
DESIGN NFB REVIEW SD ssociates APPROVED SD

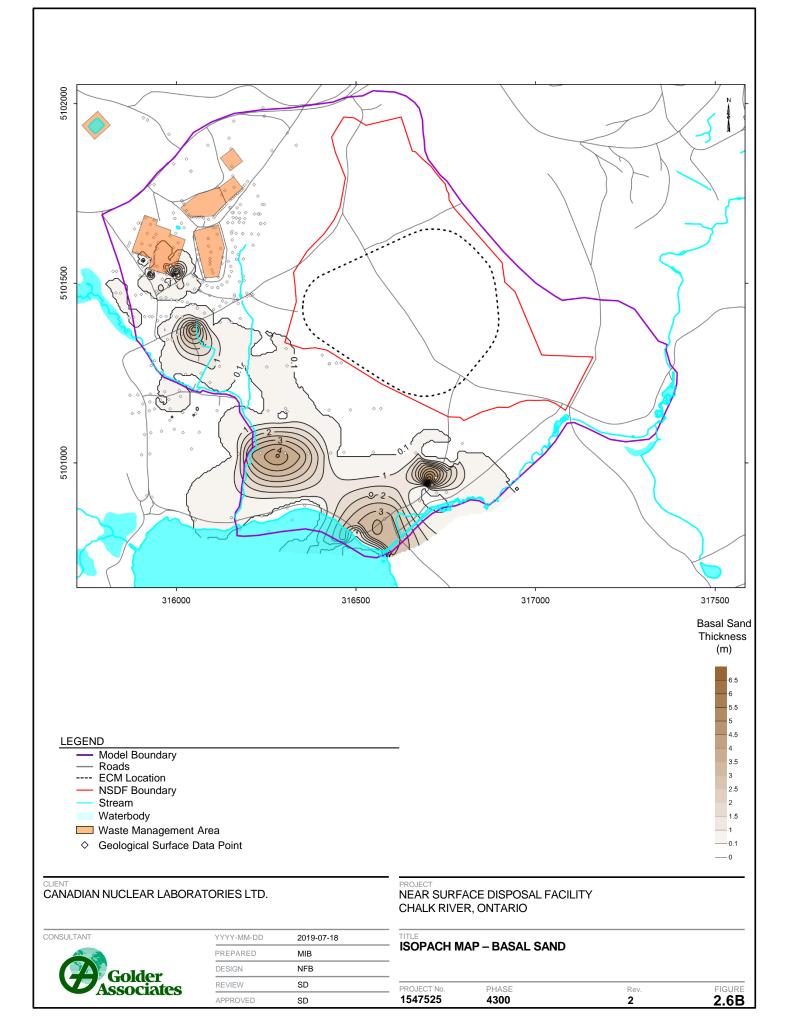
Golder

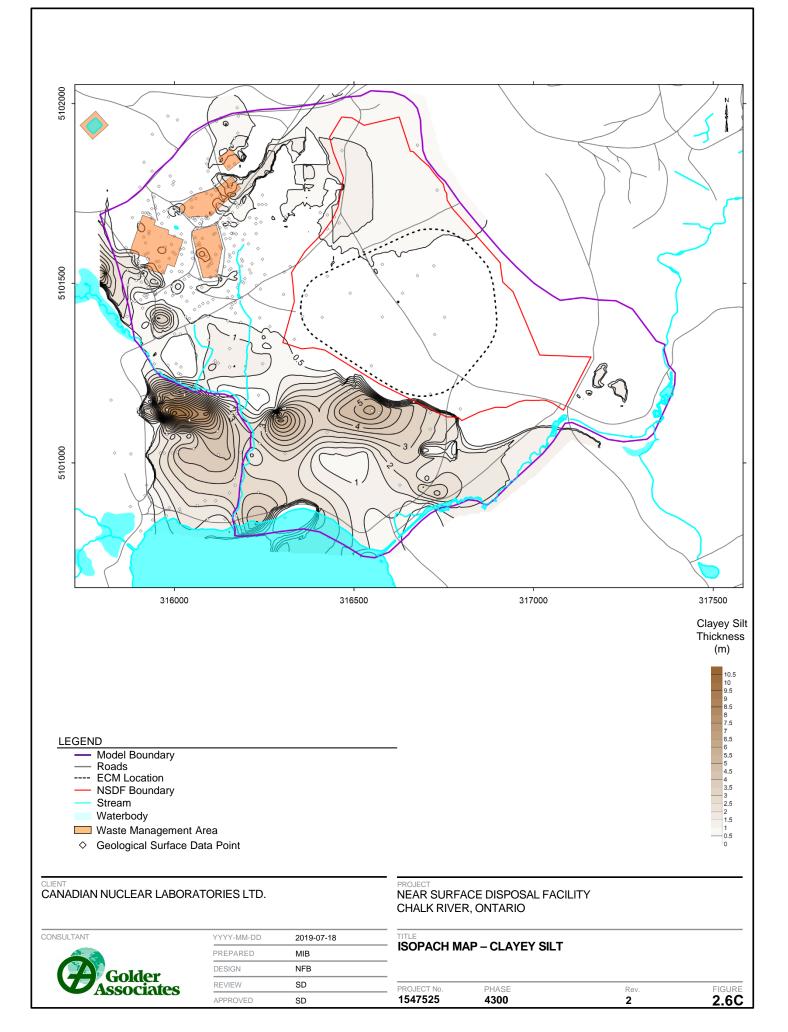
PHASE 4300 Rev. 2

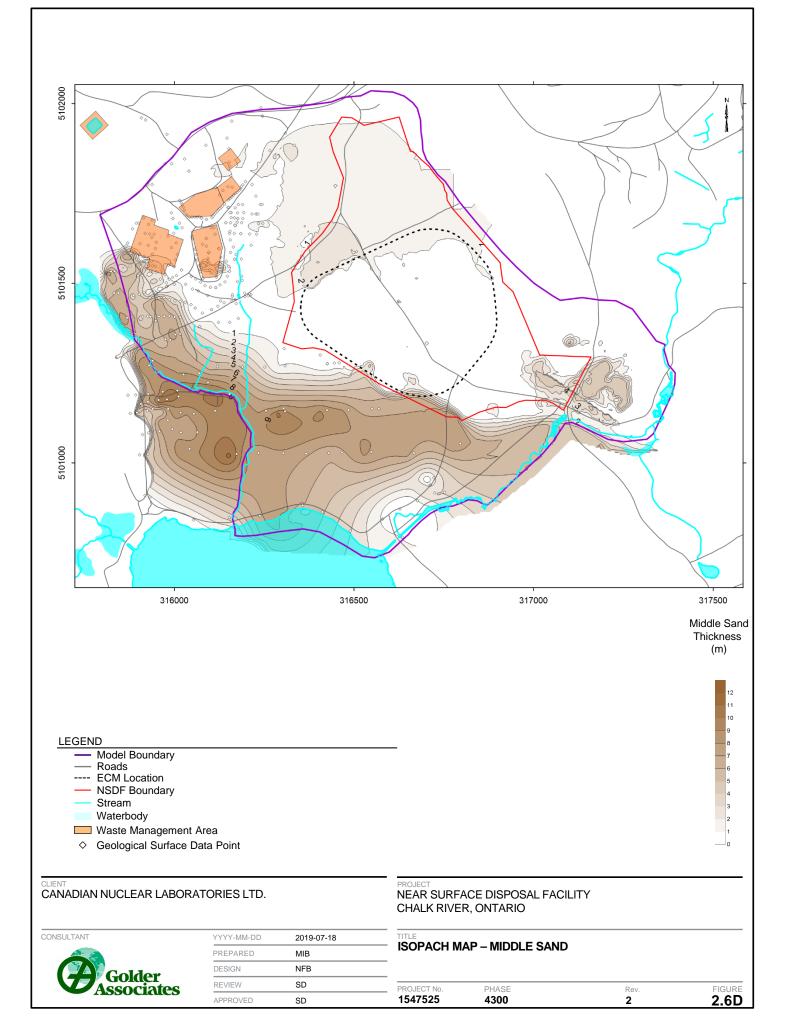
FIGURE **2.4**

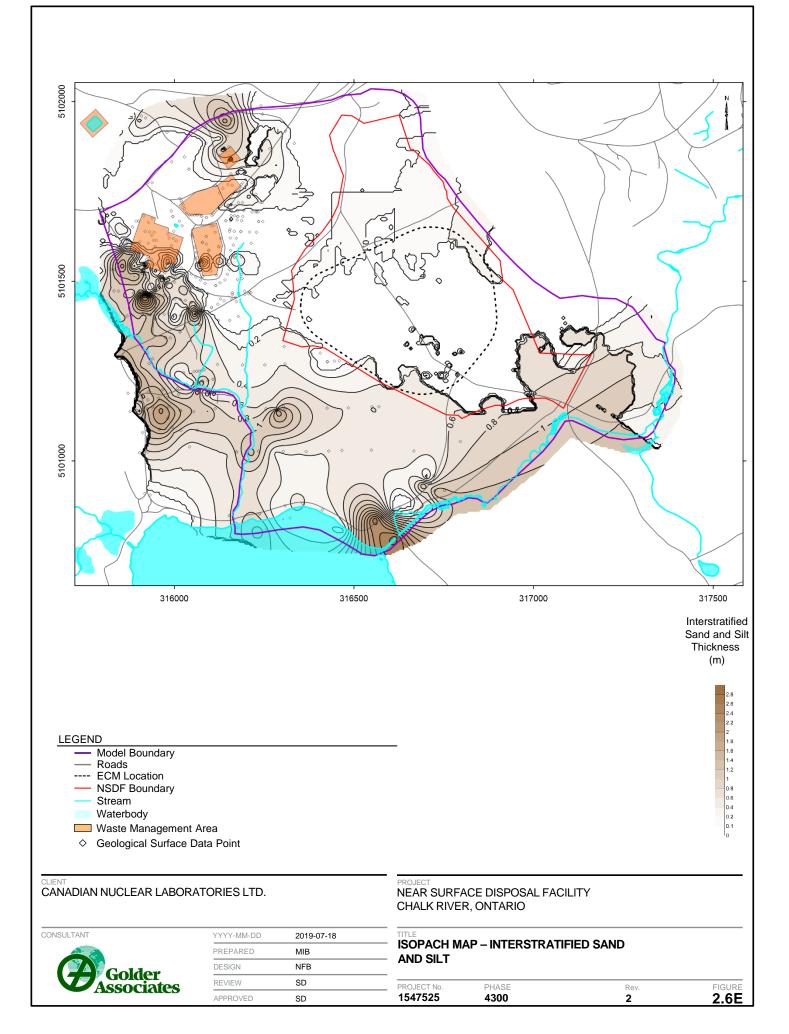


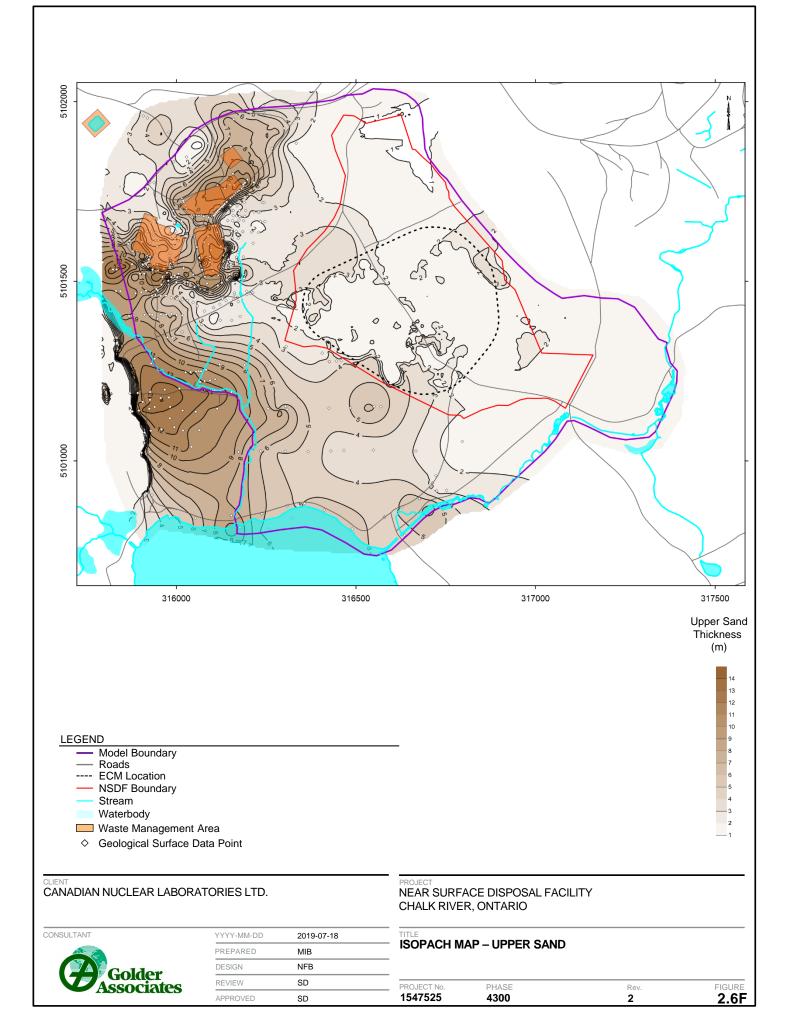


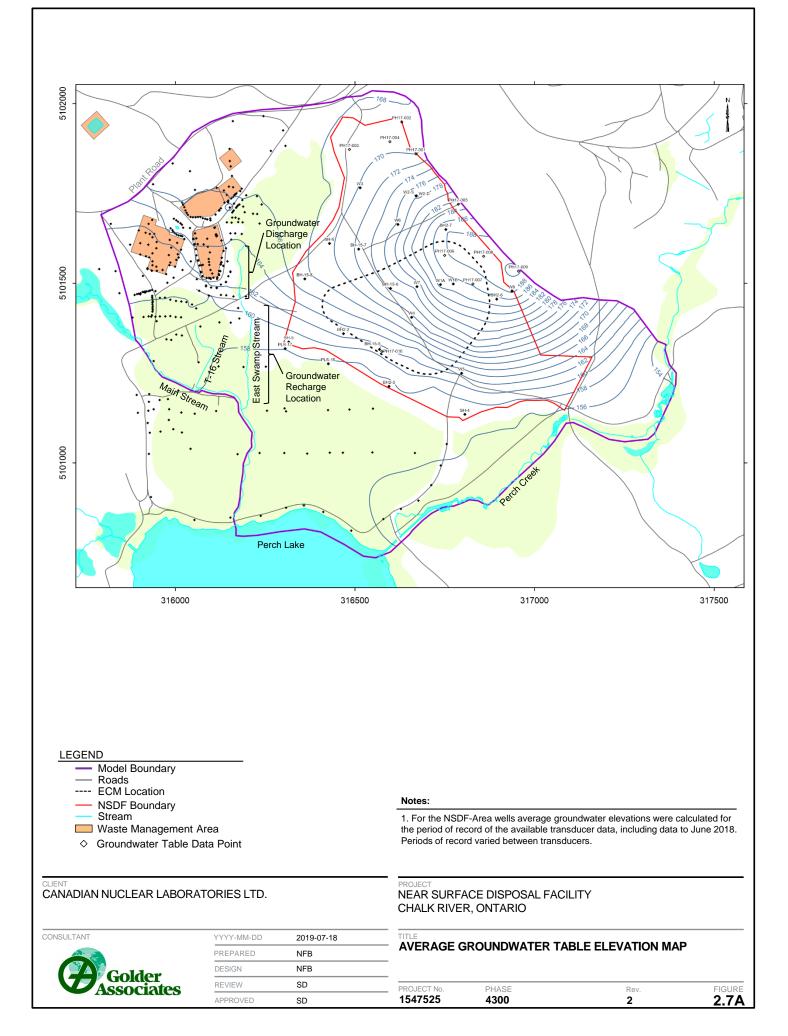


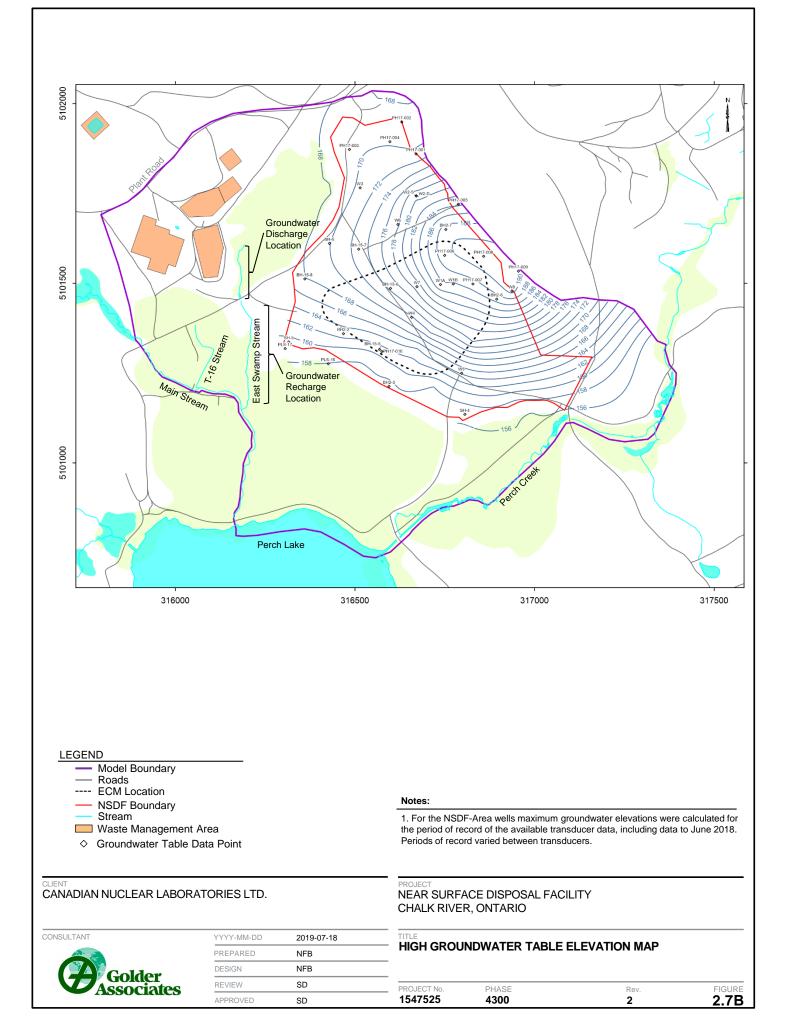


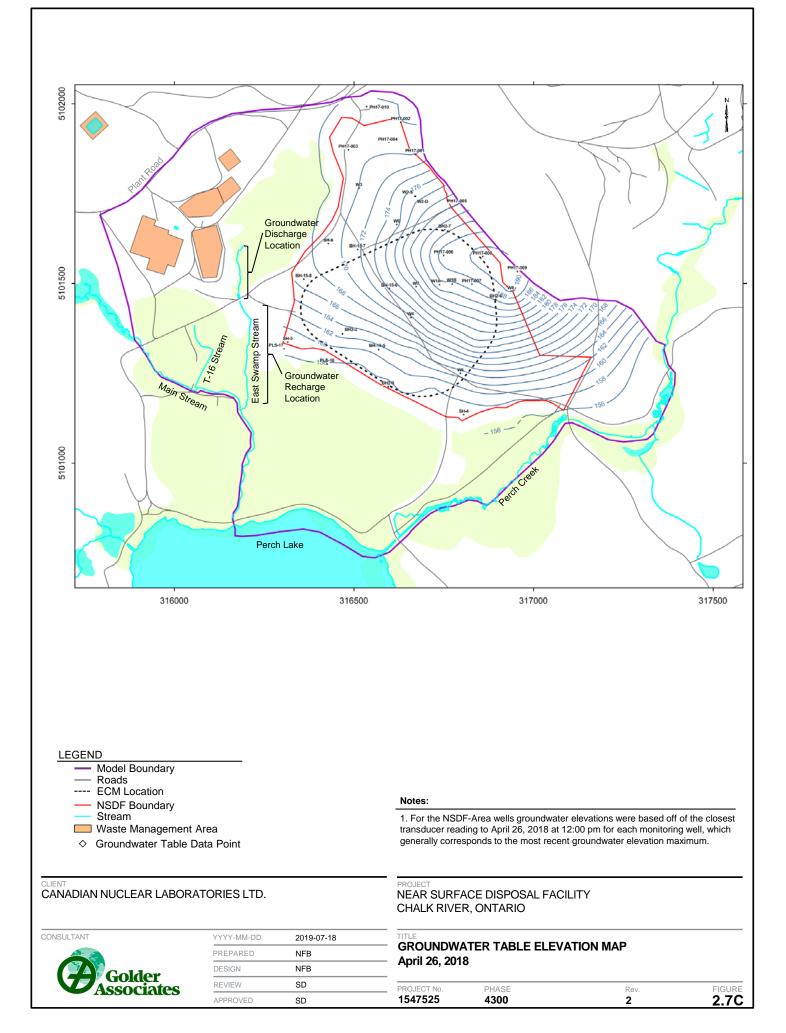


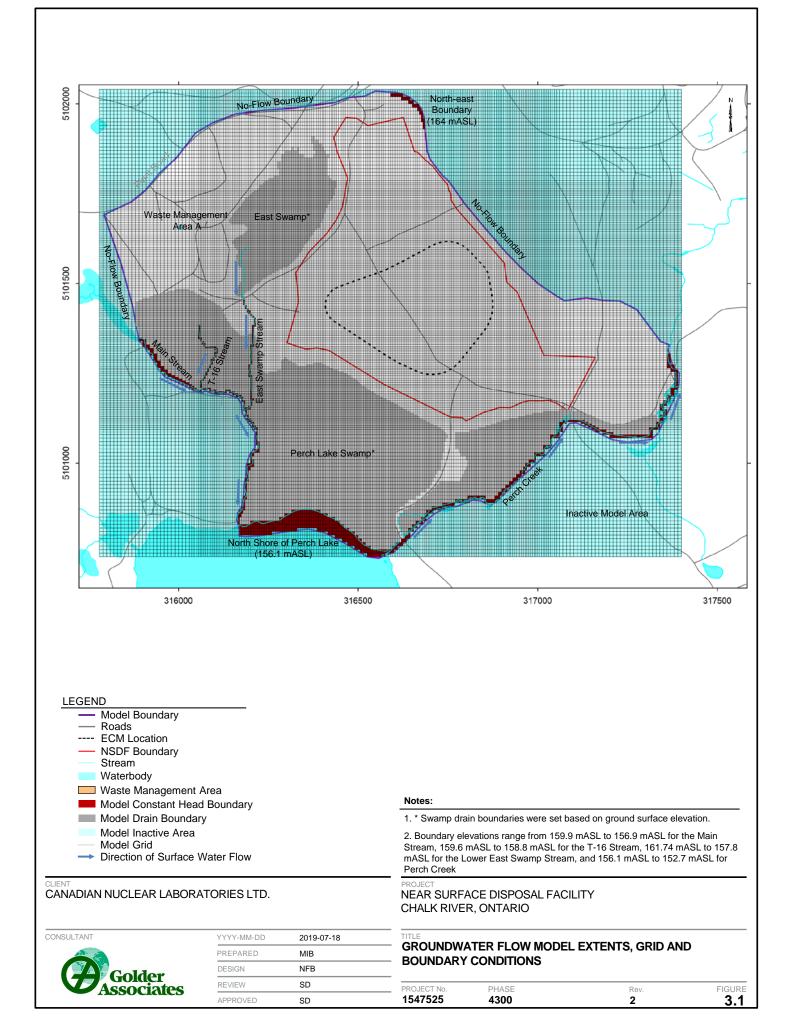


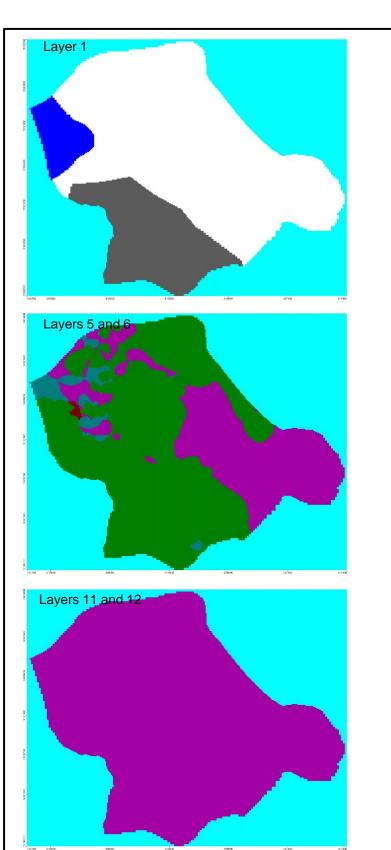


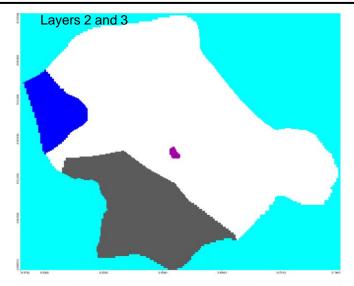


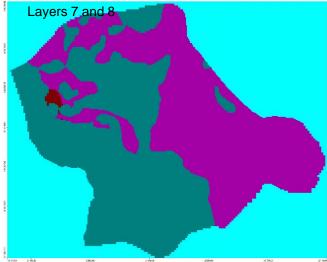


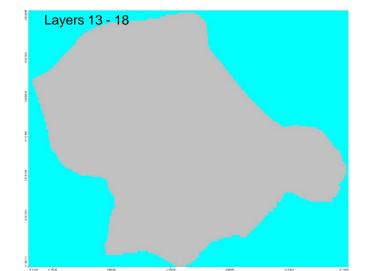




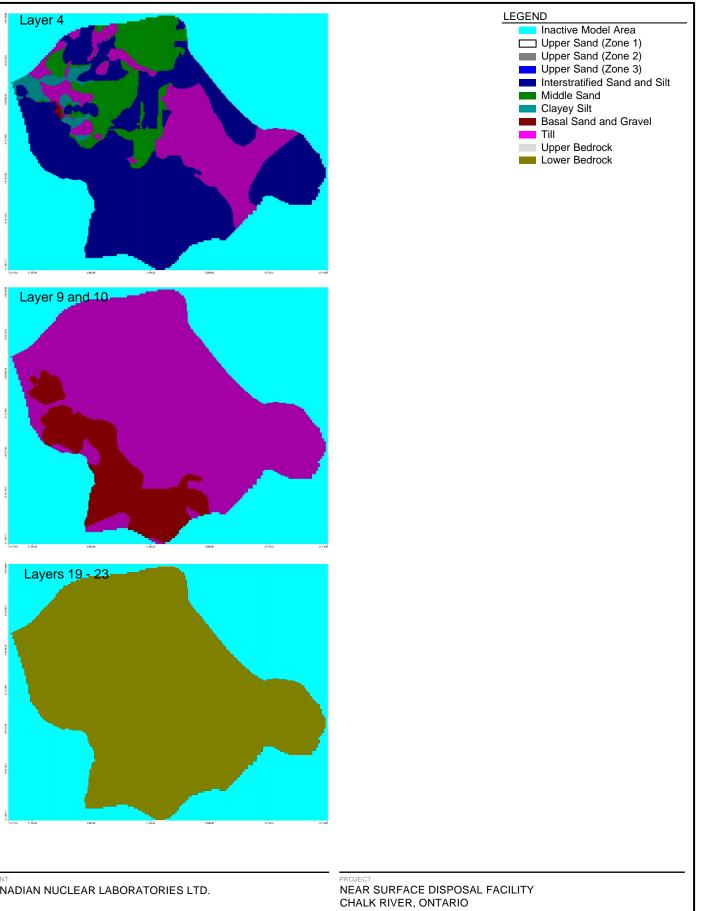


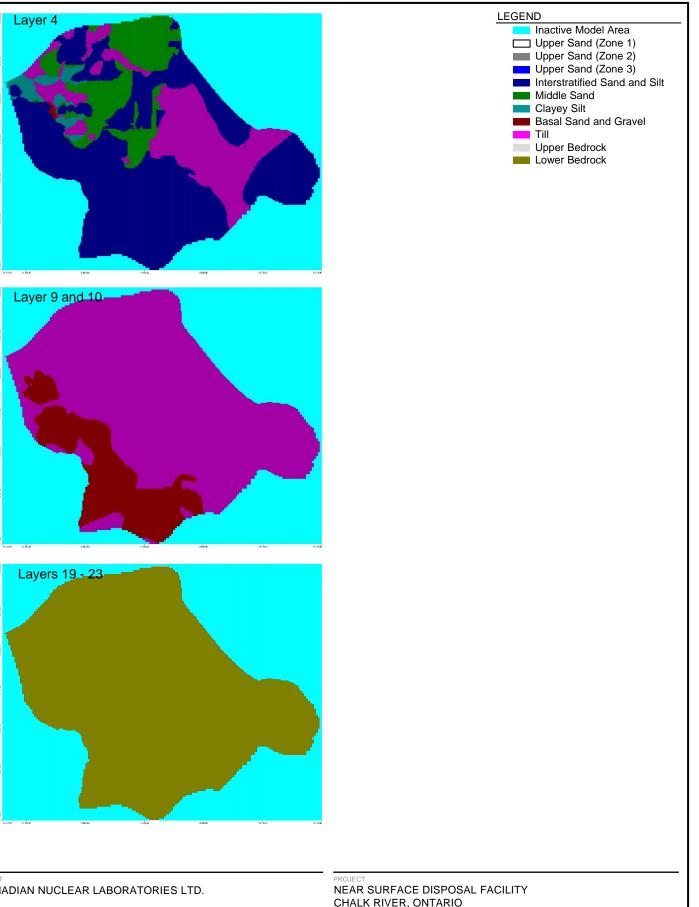


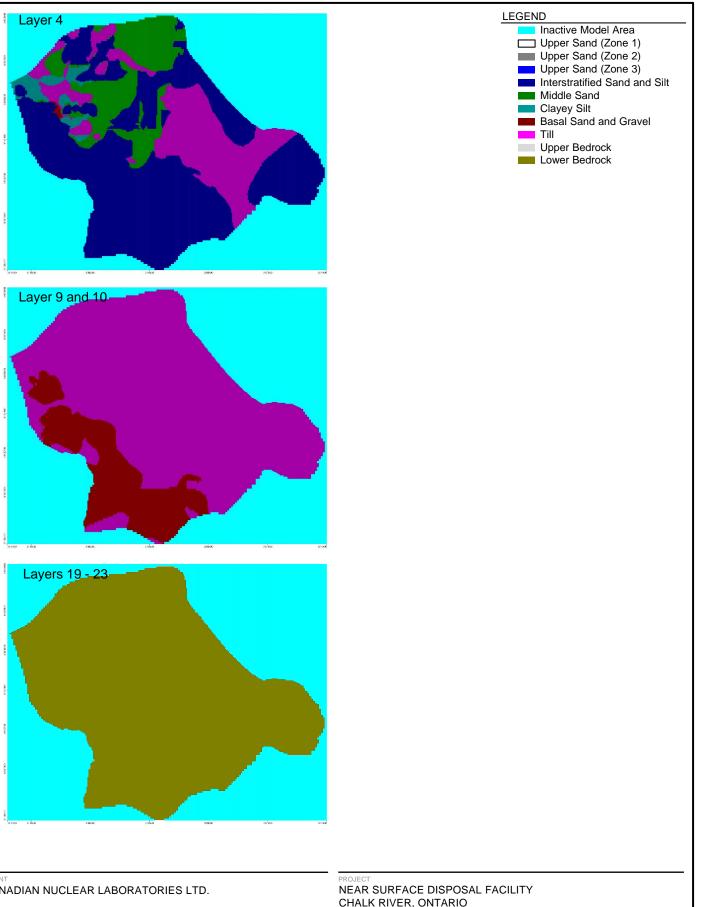




Material	Hydraulic Con	ductivity (m/s)	Khalka	Poi	Porosity	
Material	Horizontal	Vertical	Kh:Kv	Total	Effective	
Upper Sand (Zone 1)	1.0E-04	3.0E-05	3.3	0.38	0.3	
Upper Sand (Zone 2)	1.7E-4	5.0E-5	3	0.38	0.3	
Upper Sand (Zone 3)	3.0E-5	1.0E-5	3.4	0.38	0.3	
Interstratified Sand and Silt	6.0E-05	6.0E-07	100	0.39	0.3	
Middle Sand	1.0E-04	2.0E-05	5.0	0.38	0.3	
Clayey Silt	9.5E-07	5.5E-09	173	0.48	0.3	
Basal Sands	1.2E-04	1.0E-04	1.2	0.38	0.3	
Till	9.0E-07	7.0E-07	1.3	0.26	0.2	
Upper Bedrock	9.0E-07	9.0E-07	1	0.001	0.001	
Lower Bedrock	4.0E-08	4.0E-08	1	0.001	0.001	





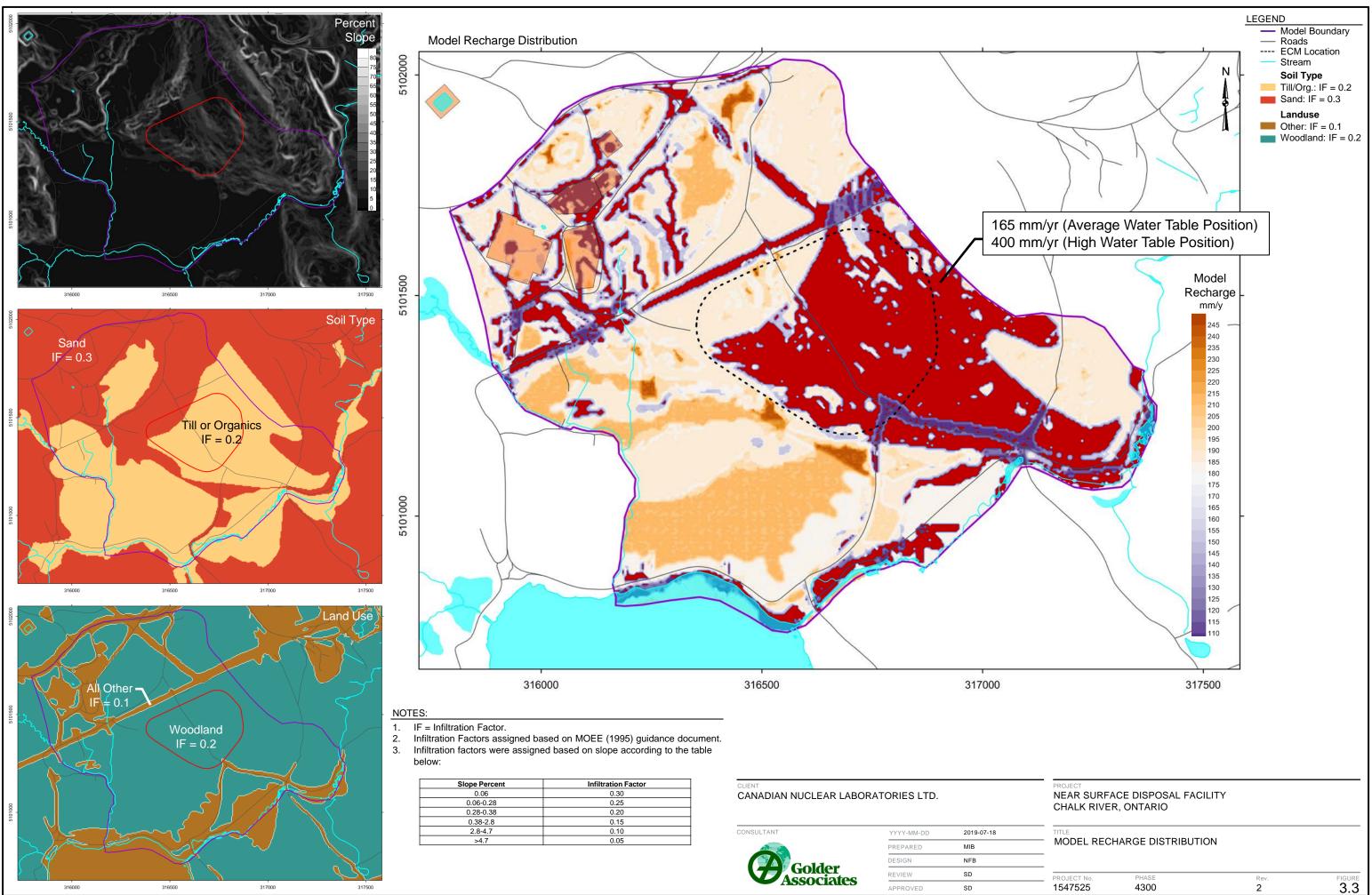


CLIEN CANADIAN NUCLEAR LABORATORIES LTD.

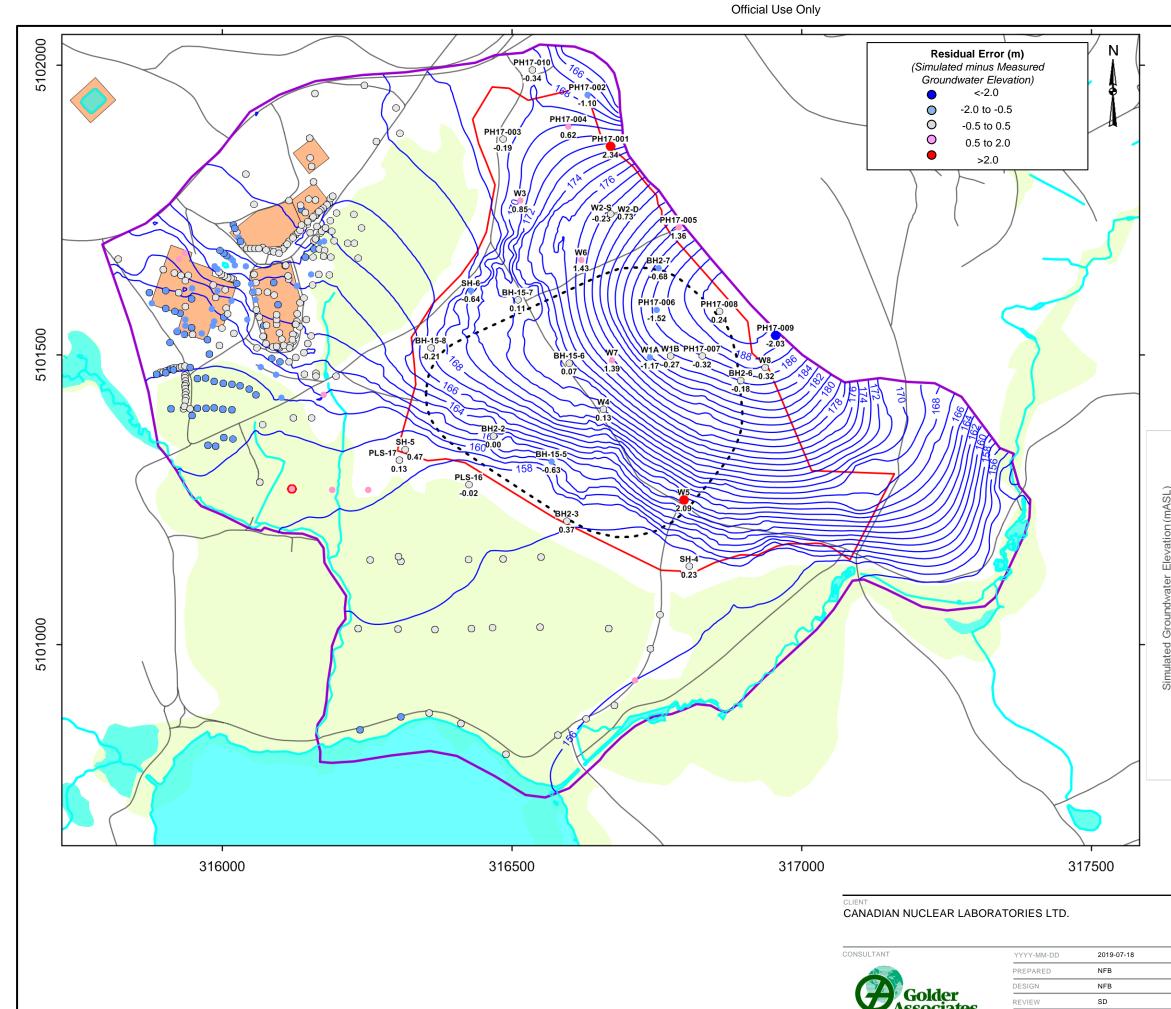
CONSULTANT	YYYY-MM-DD	2019-07-18
	PREPARED	NFB
	DESIGN	NFB
Golder	REVIEW	SD
ASSOCIAICS	APPROVED	SD

TITLE MODEL LAYER HYDRAULIC CONDUCTIVITY DISTRIBUTION

PROJECT No. PHASE Rev. FIGURE		1547525	4300	2	3.2
	_		PHASE	Rev.	FIGURE



232-509249-REPT-001 Rev 5

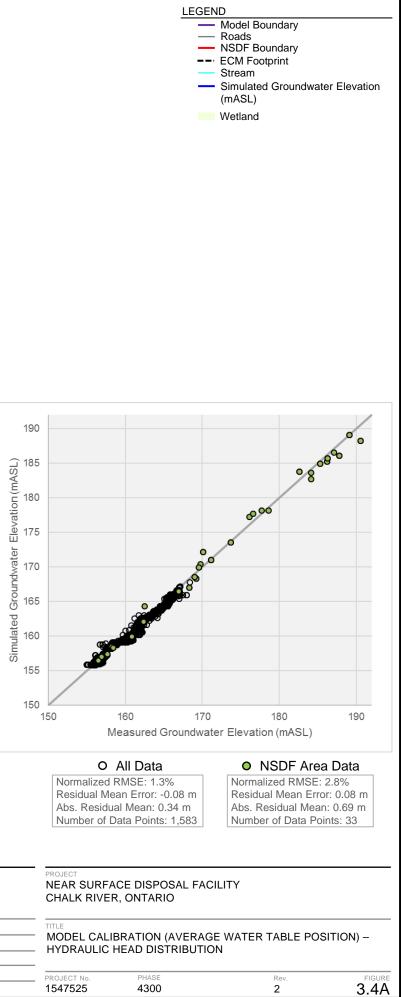


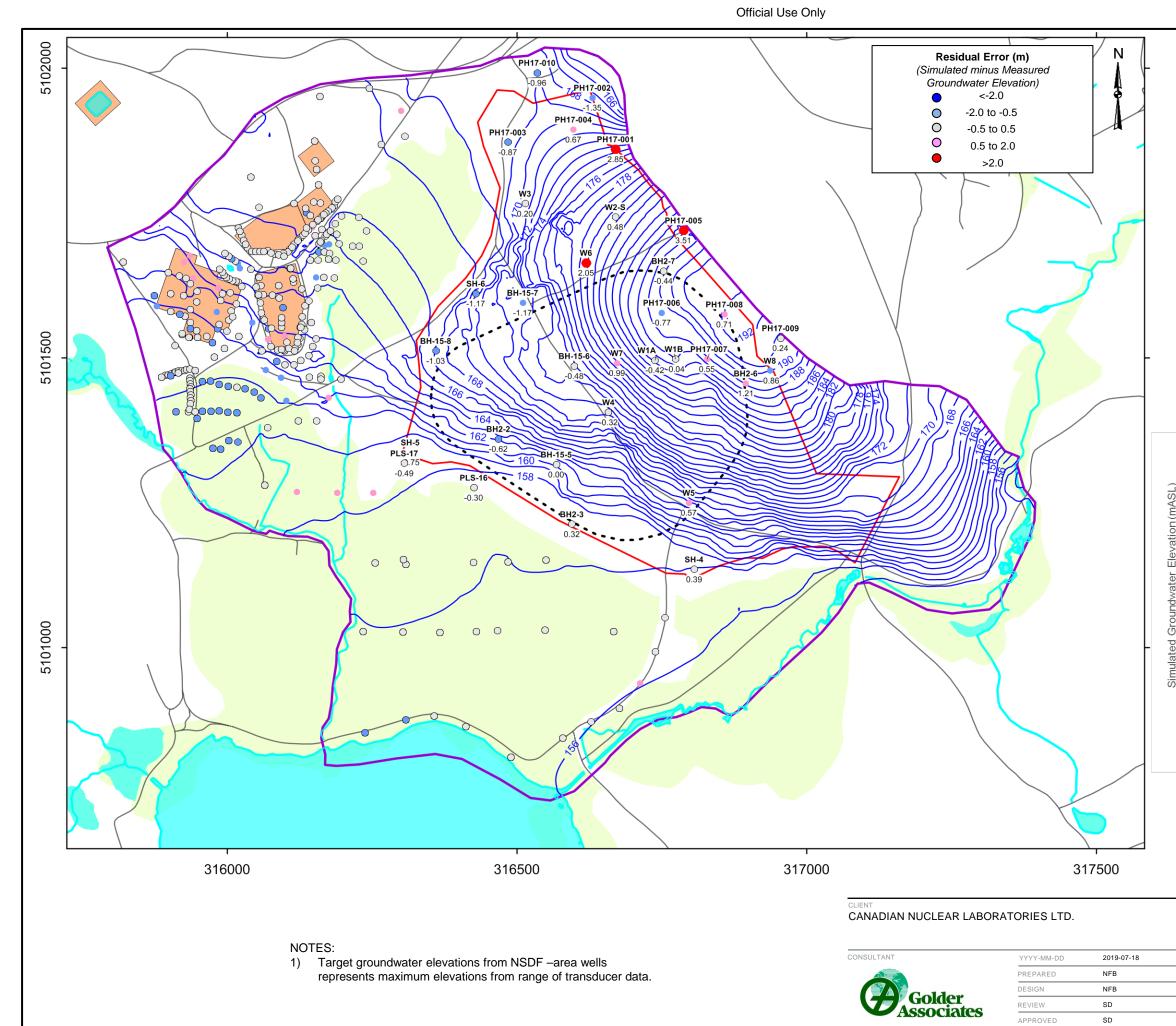
Associates

APPROVED

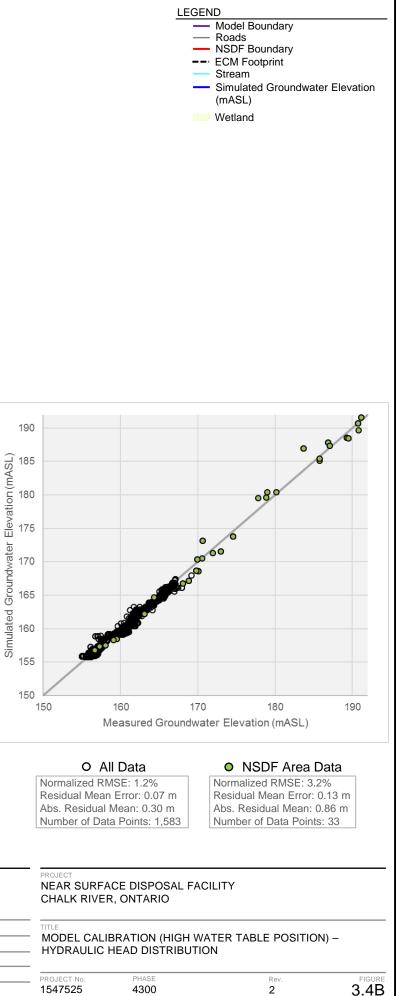
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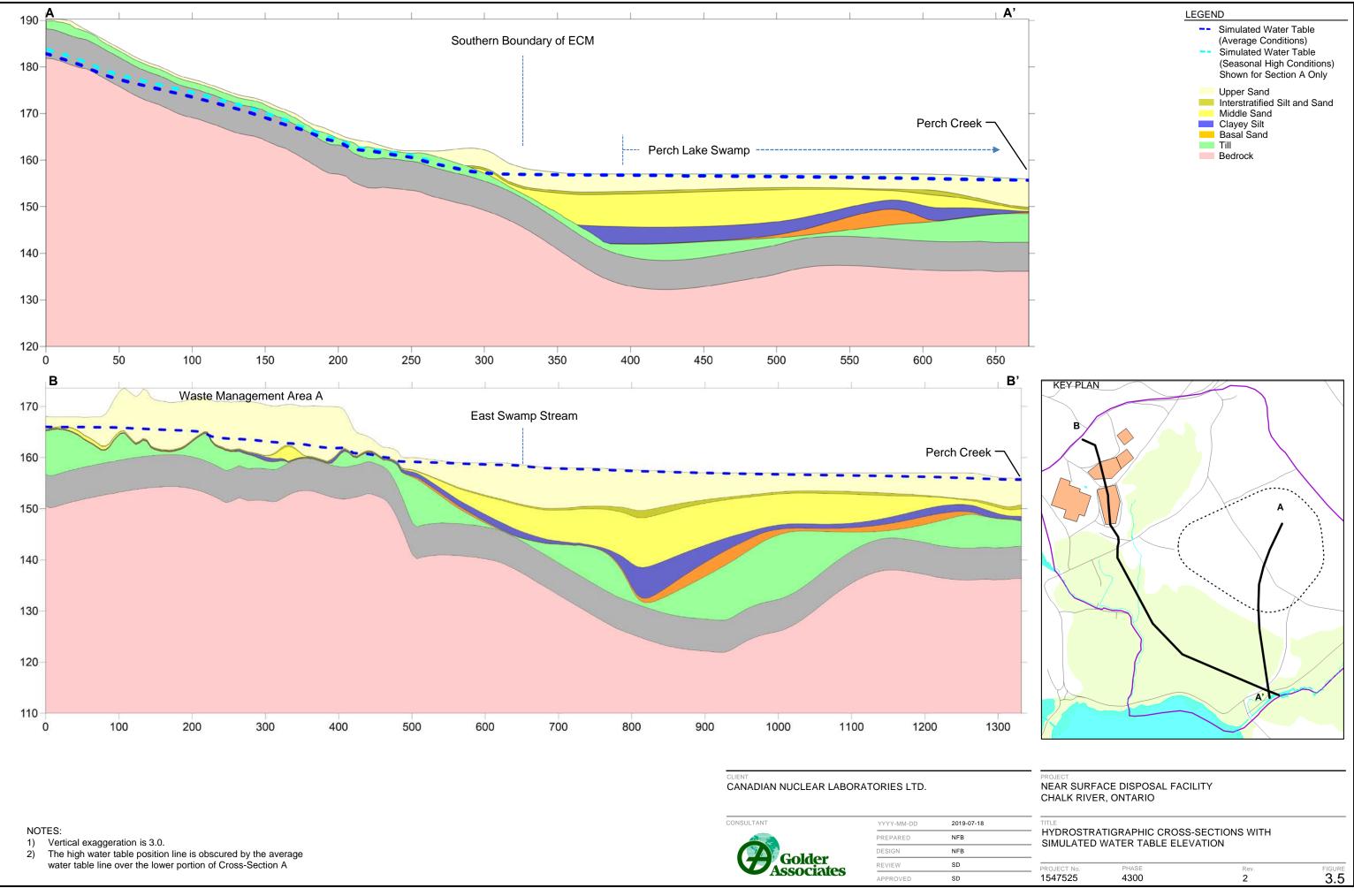


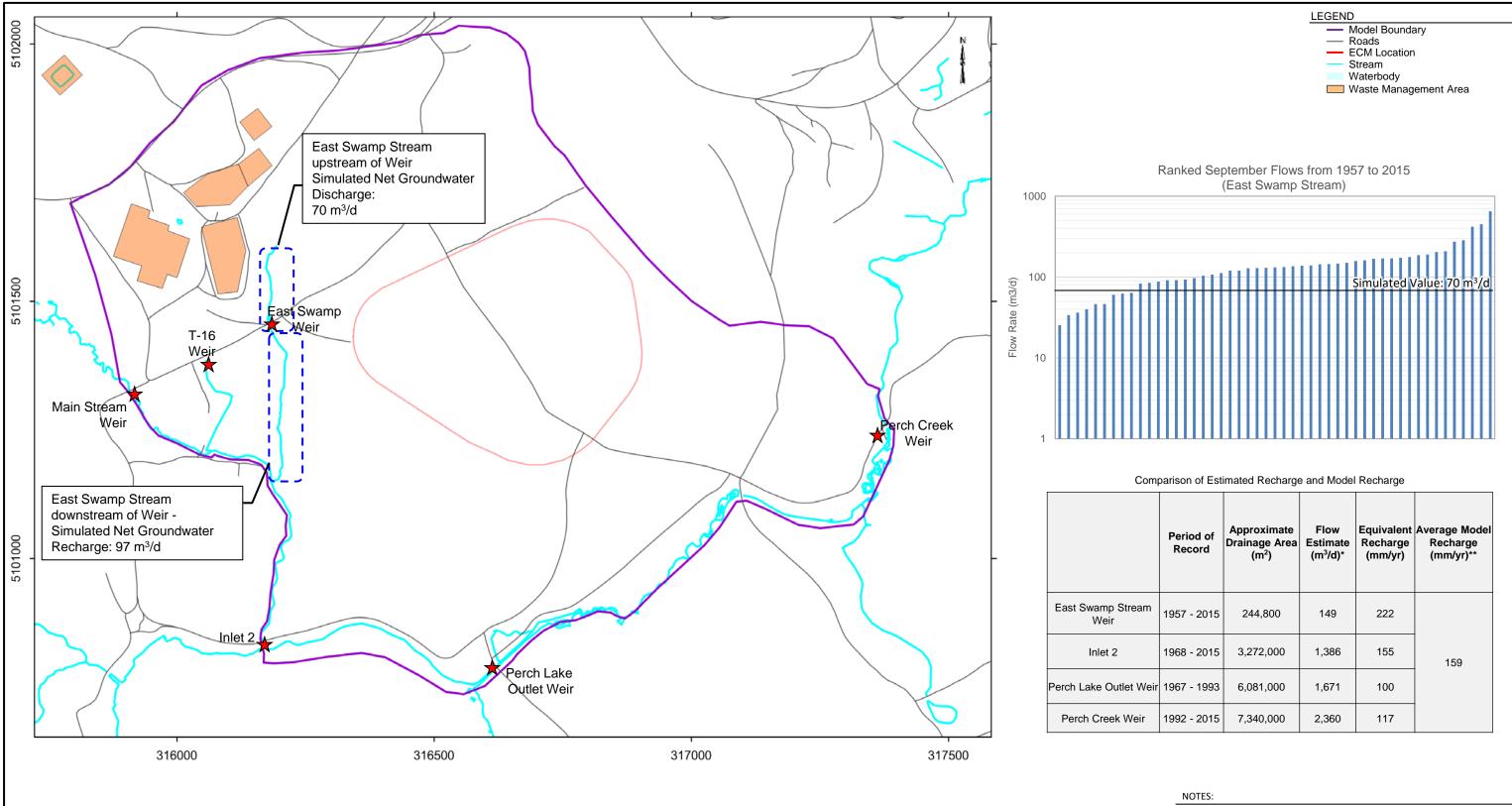












CANADIAN NUCLEAR LABORATORIES



232-509249-REPT-001 Rev 5

	Period of Record	Approximate Drainage Area (m²)	Flow Estimate (m³/d)*	Equivalent Recharge (mm/yr)	Average Model Recharge (mm/yr)**
eam	1957 - 2015	244,800	149	222	
	1968 - 2015	3,272,000	1,386	155	159
Weir	1967 - 1993	6,081,000	1,671	100	
eir	1992 - 2015	7,340,000	2,360	117	

* Average September flow rate over period of record.

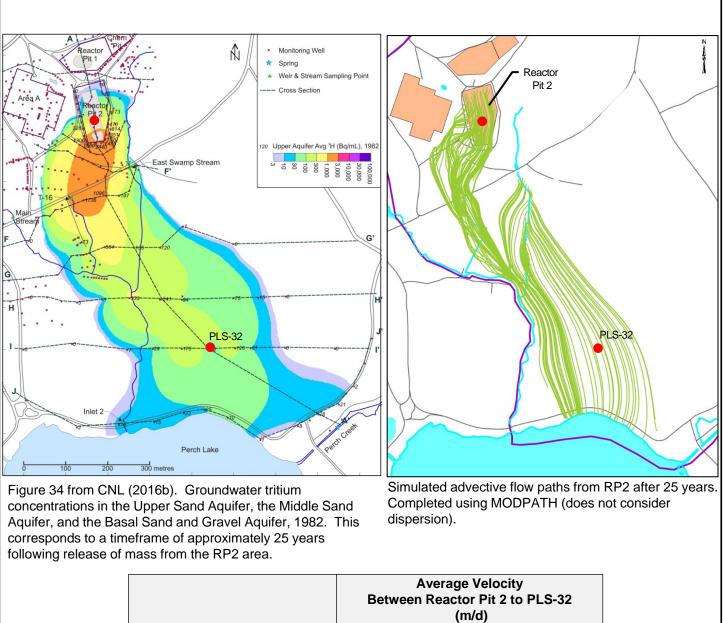
** The total recharge applied in the model divided by the model area.

NEAR SURFACE DISPOSAL FACILITY

MODEL CALIBRATION – STREAM BASEFLOW

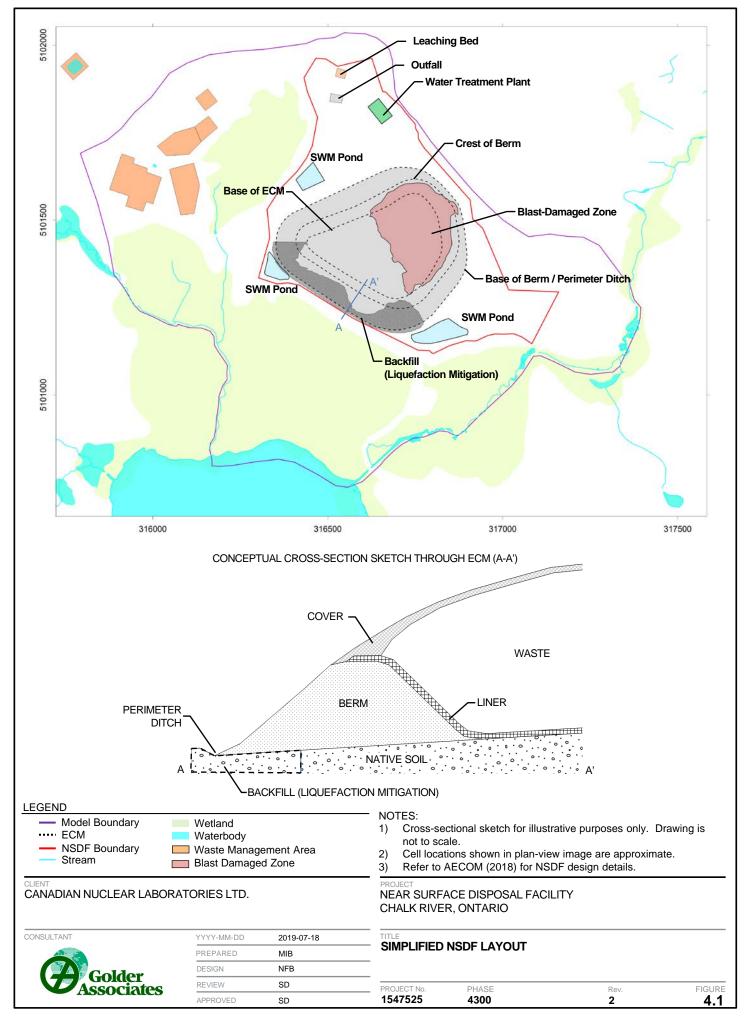
PROJECT No.	PHASE	Rev.	FIGURE
1547525	4300	2	3.6

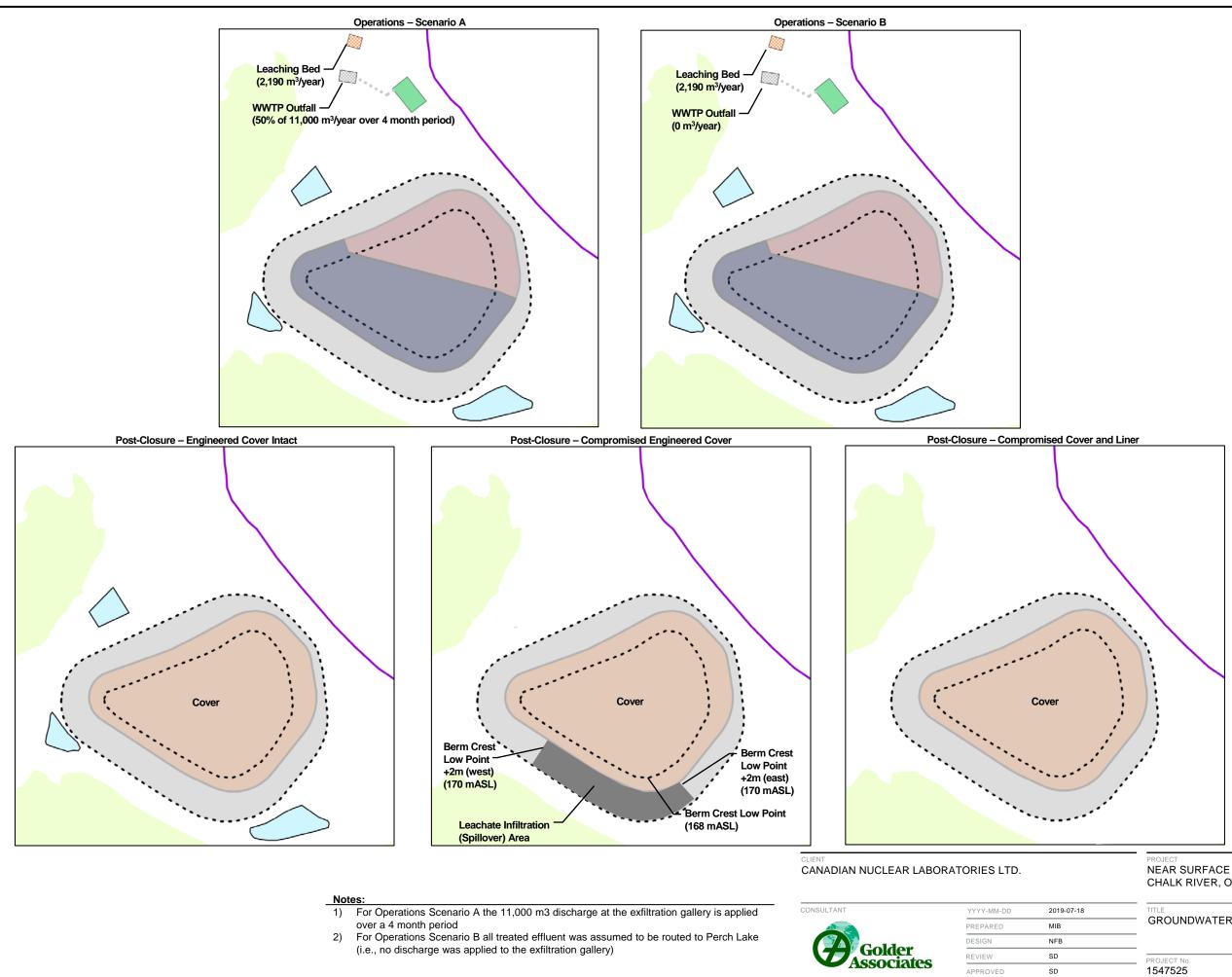
FIGURE

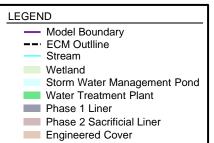


	Between Reactor Pit 2 to PLS-32 (m/d)
Estimate Based on CNL, 2016	0.25
Groundwater Flow Model	0.26

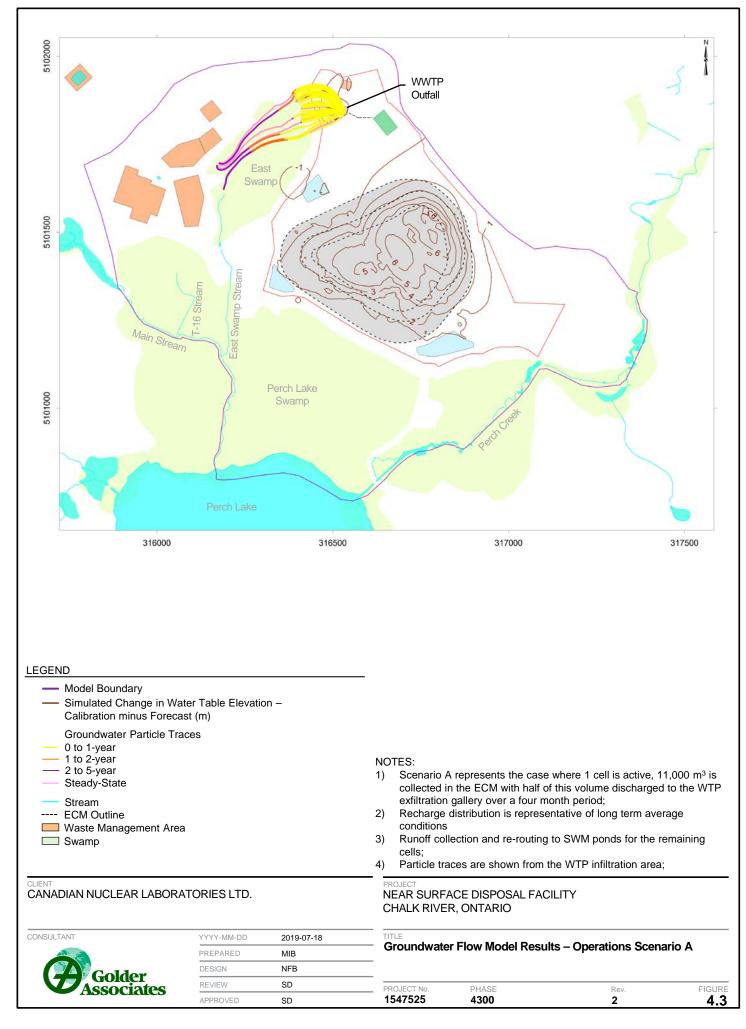
LEGEND Simulated Groundwater Flow Path Model Boundary Roads Stream Waterbody Waste Management Area CANADIAN NUCLEAR LABORATORIES LTD. NEAR SURFACE DISPOSAL FACILITY CHALK RIVER, ONTARIO CONSULTANT YYYY-MM-DD 2019-07-18 **MODEL CALIBRATION - COMPARISON OF** PREPARED MIB **GROUNDWATER FLOW PATHS AND TRITIUM PLUME** DESIGN NFB MAPPING Golder REVIEW SD ssociates PHASE Rev 1547525 4300 APPROVED SD 2

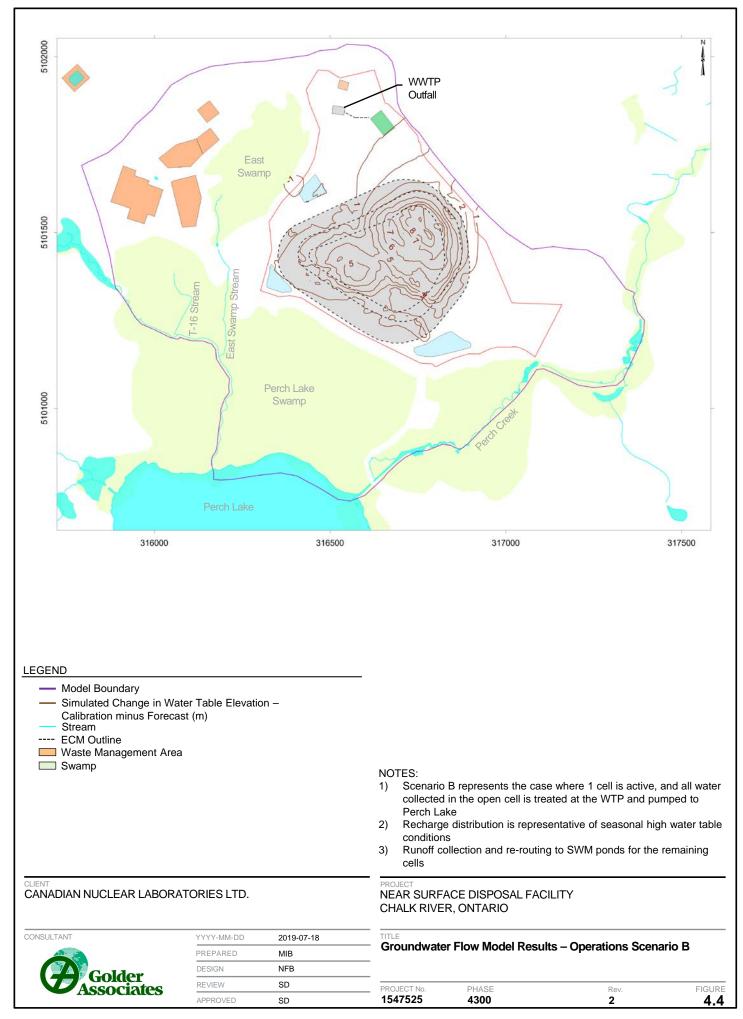


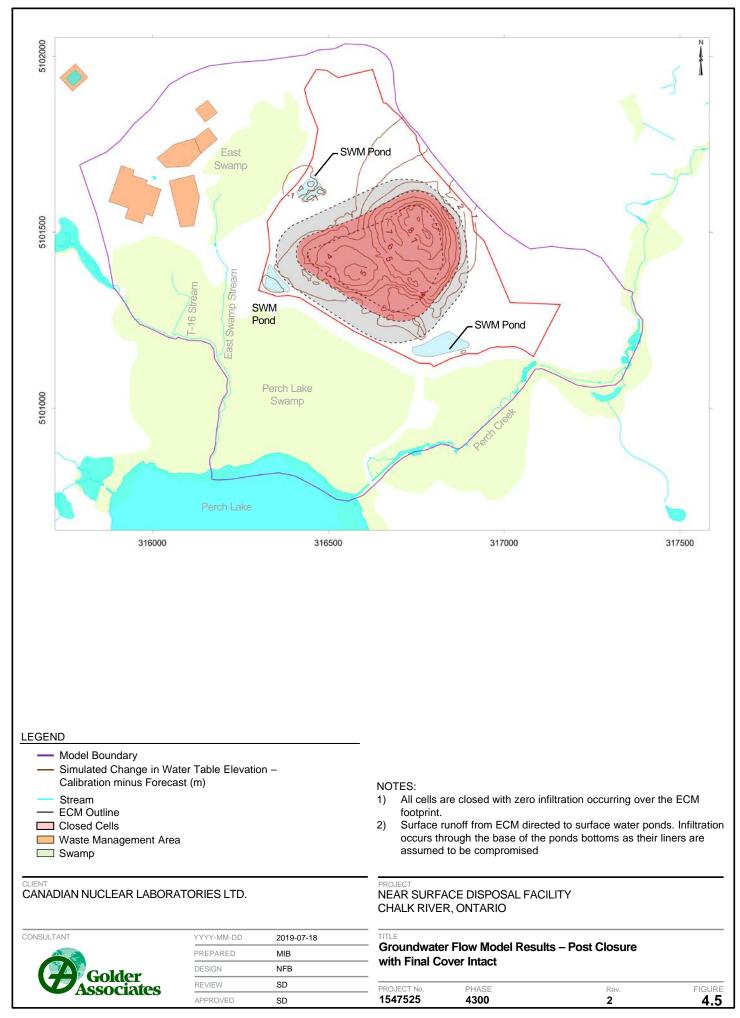


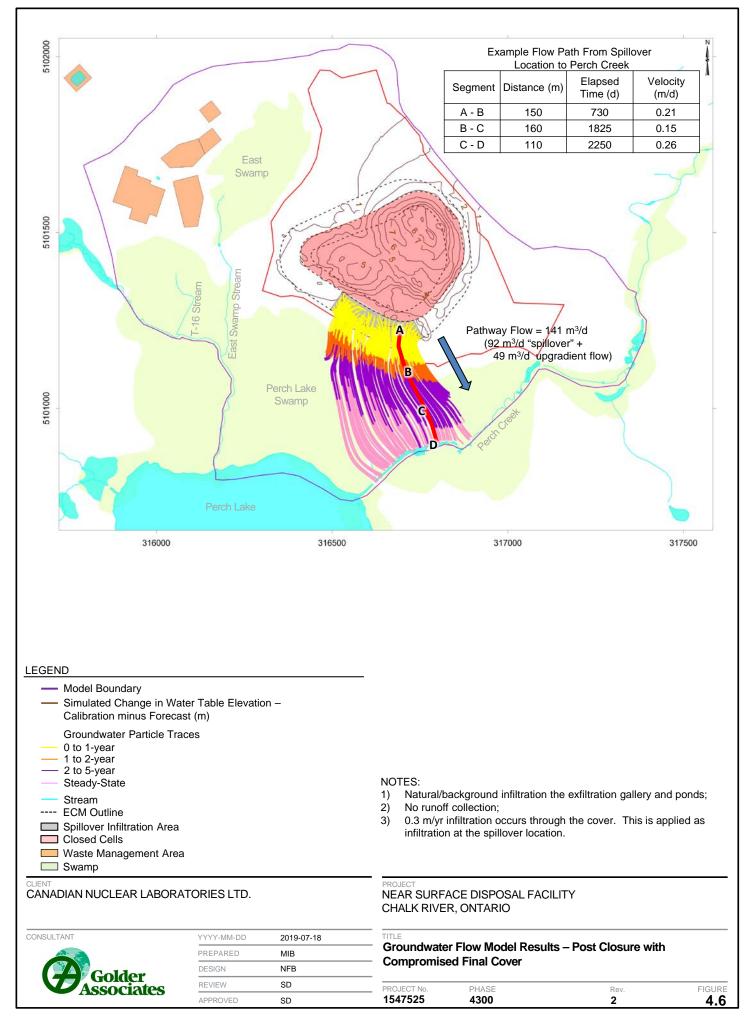


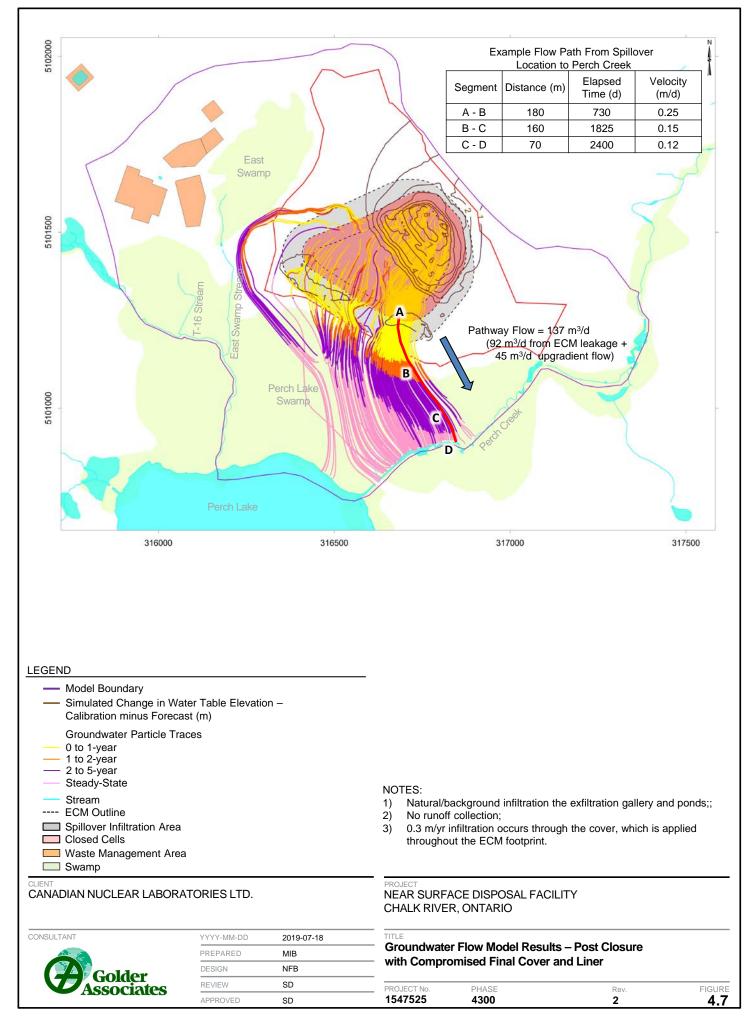
PROJECT NEAR SURF/ CHALK RIVE	ACE DISPOSAL FAG R, ONTARIO	CILITY	
GROUNDWA	TER MODELLING S	SCENARIOS	
PROJECT №. 1547525	PHASE 4300	Rev. 2	FIGURE 4.2



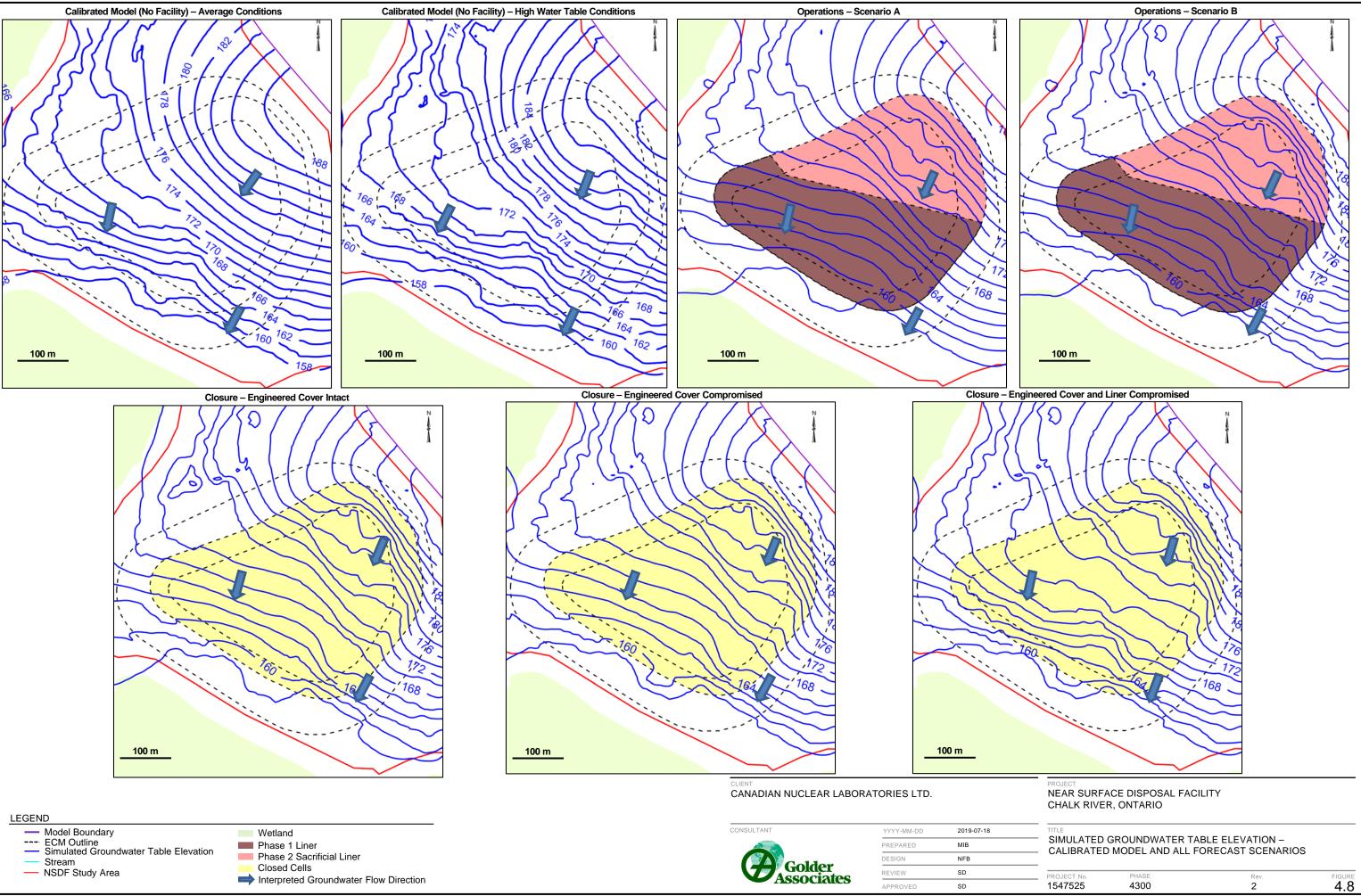








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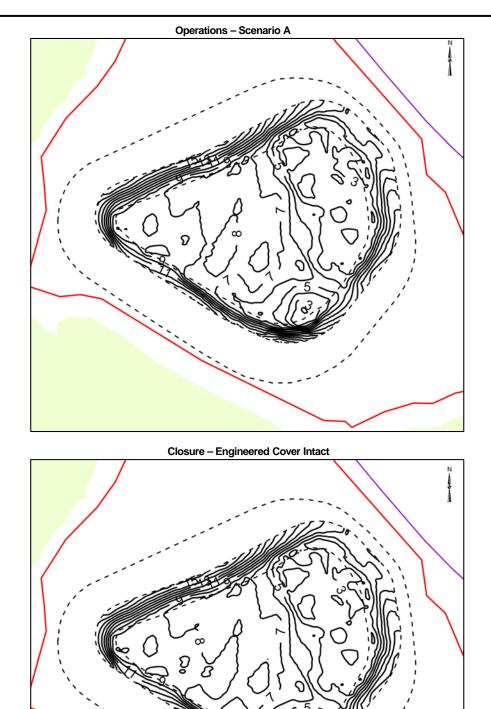


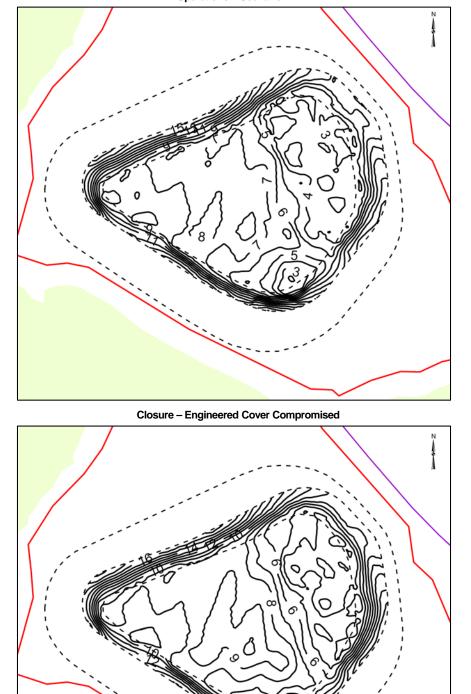


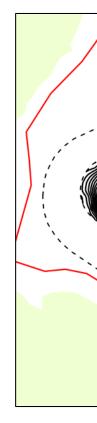
YYYY-MM-DD	2019-07-18
PREPARED	MIB
DESIGN	NFB
REVIEW	SD
APPROVED	SD

Official Use Only

Operations – Scenario B







LEGEND

- Model Boundary
- --- ECM Outline
- NSDF Study Area
- Top of Clay Liner minus Simulated Water Table
- Wetland

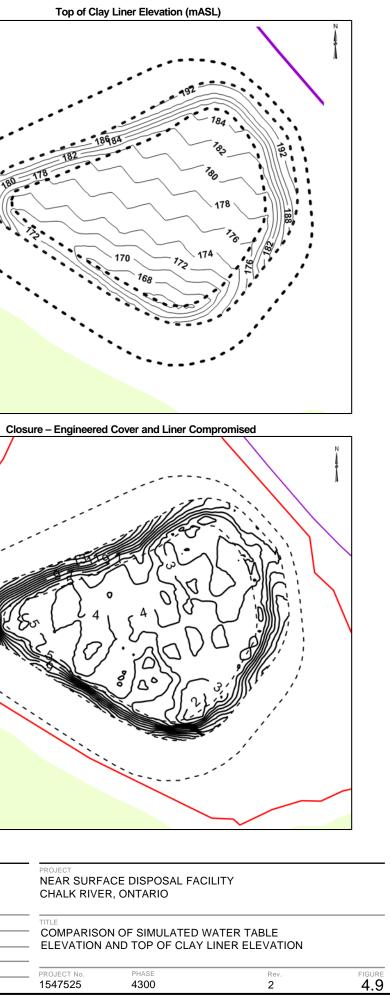
Notes:

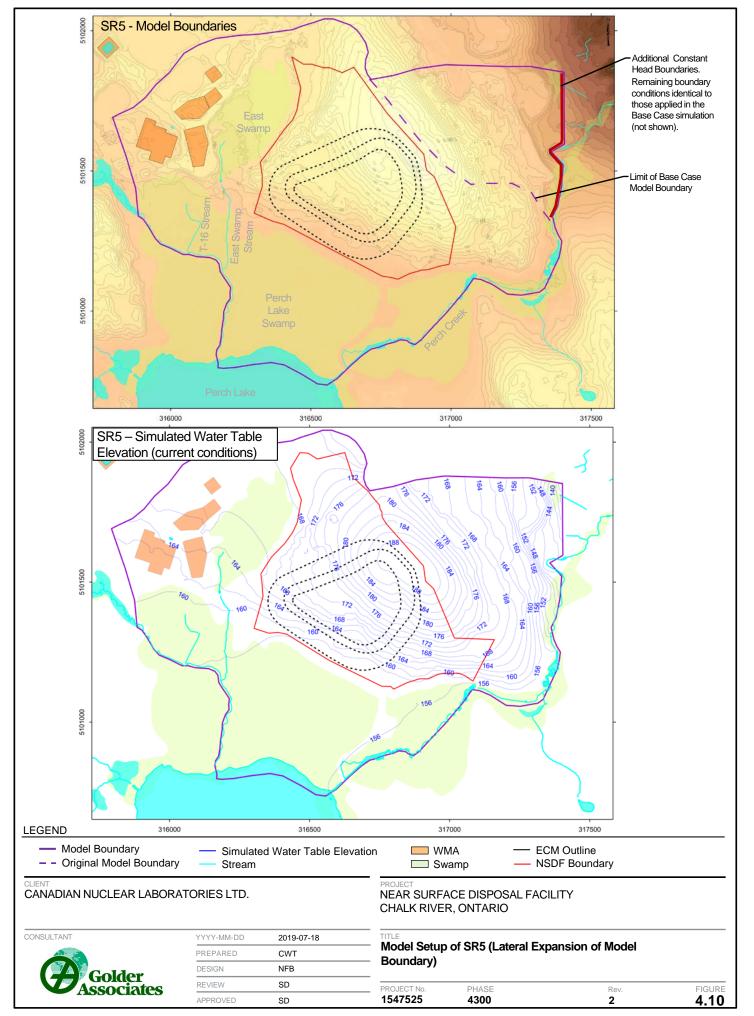
1. Maps calculated as the difference between the top of the primary liner (shown on the image to the right) and the simulated water table elevations (shown on Figure 4.8).

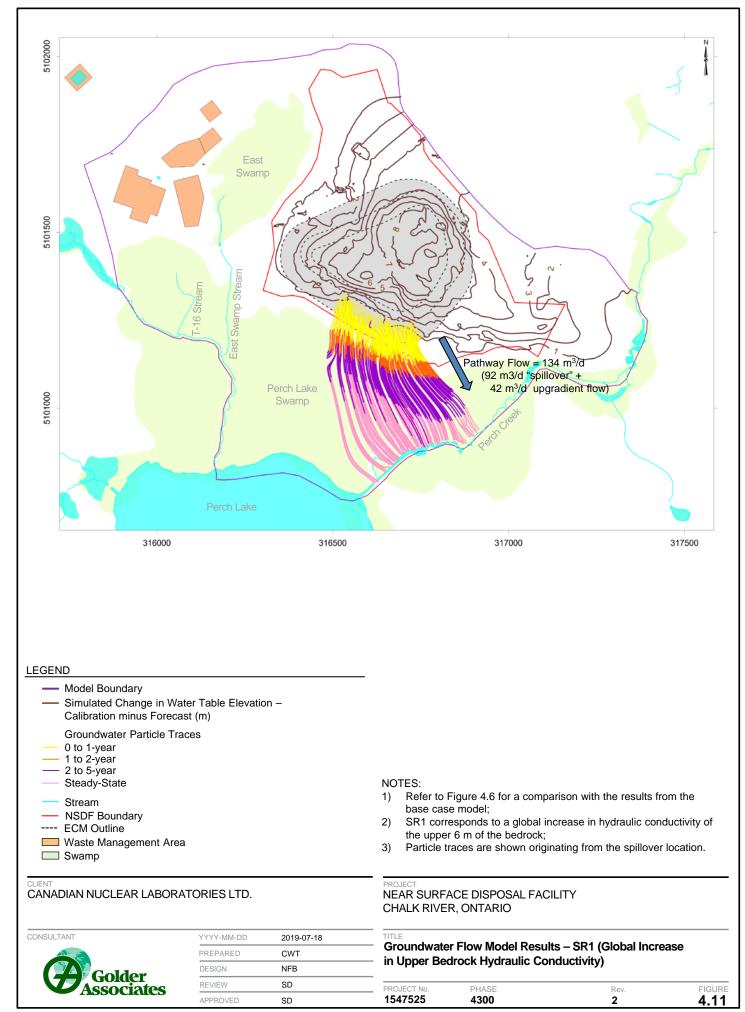


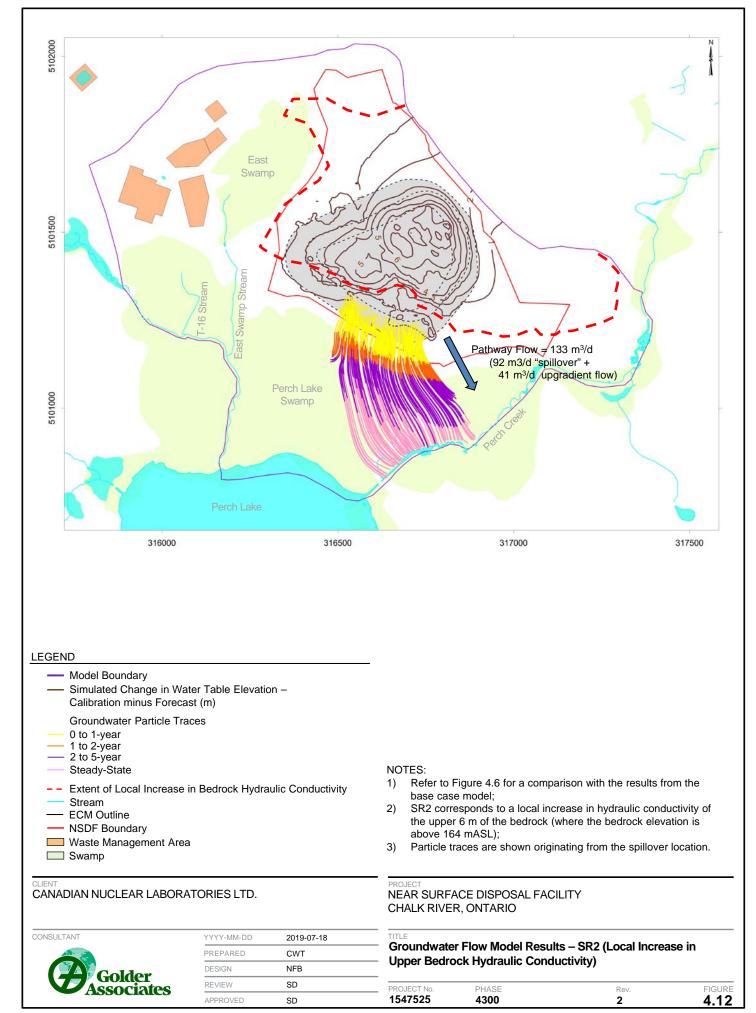
CANADIAN NUCLEAR LABORATORIES LTD.

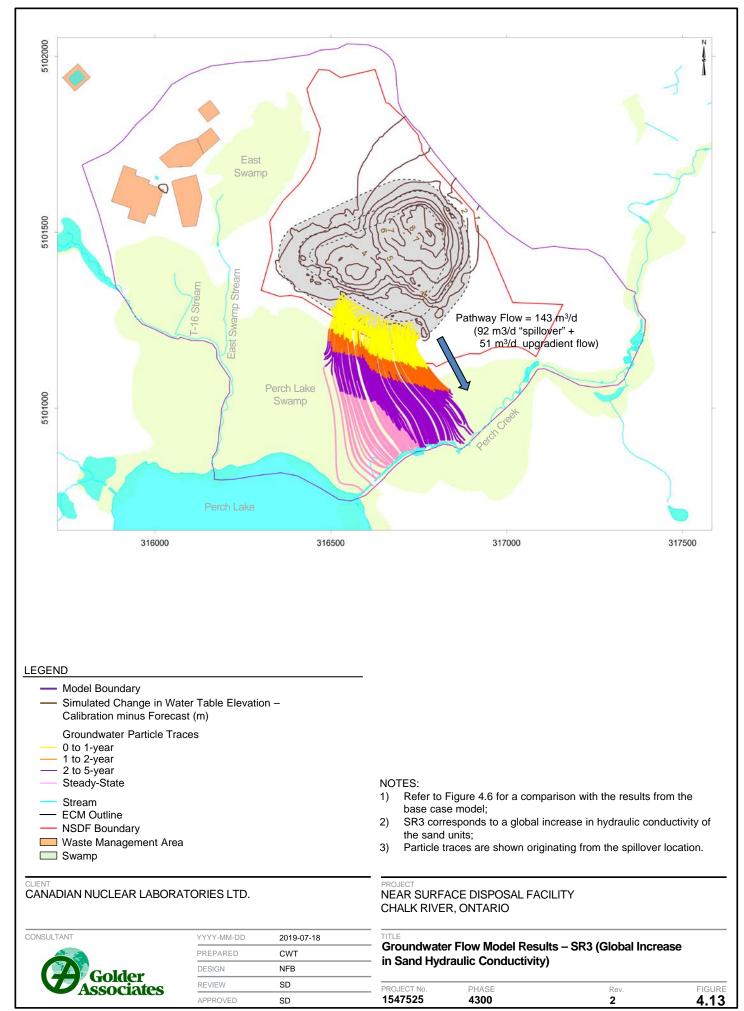
YYYY-MM-DD	2019-07-18
PREPARED	CWT
DESIGN	NFB
REVIEW	SD
APPROVED	SD

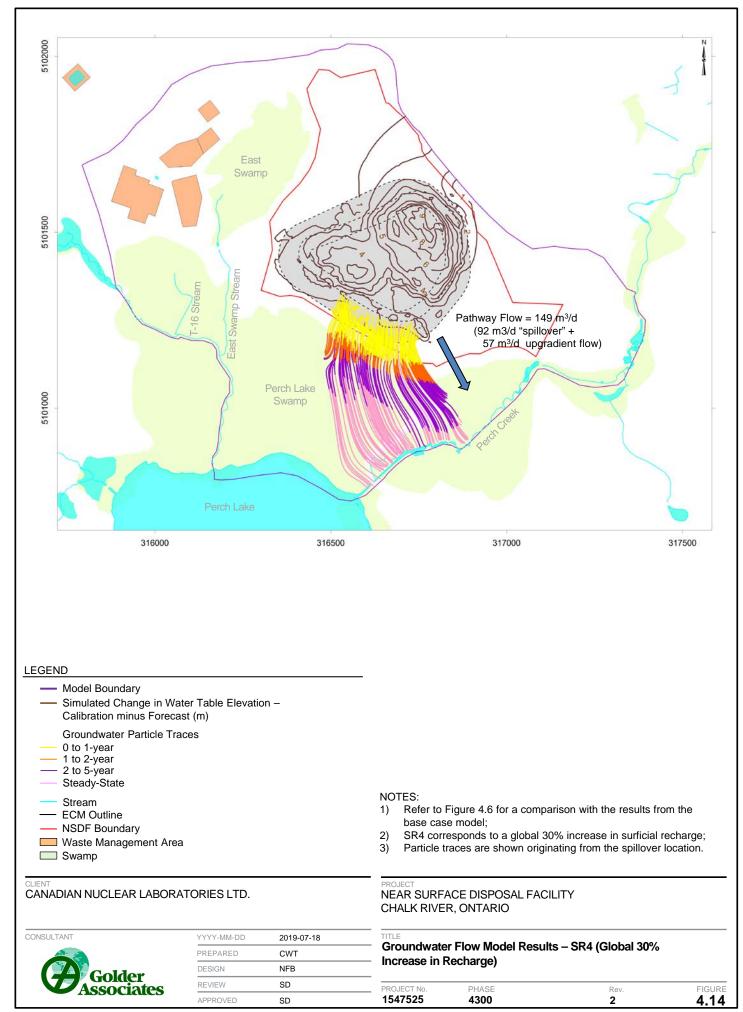


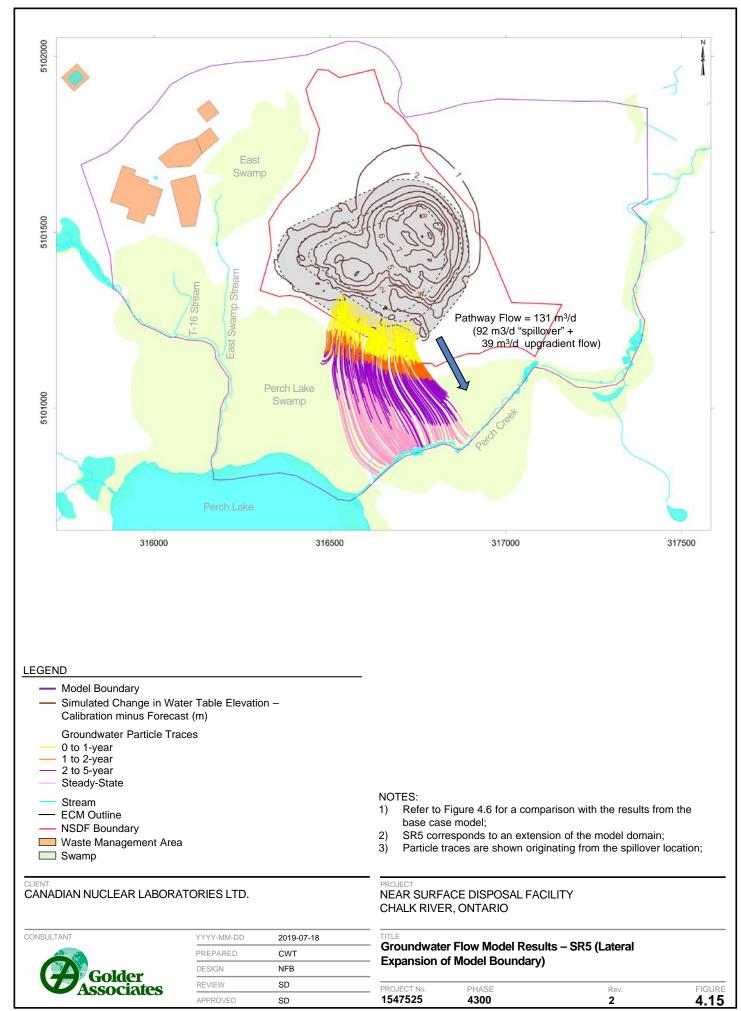


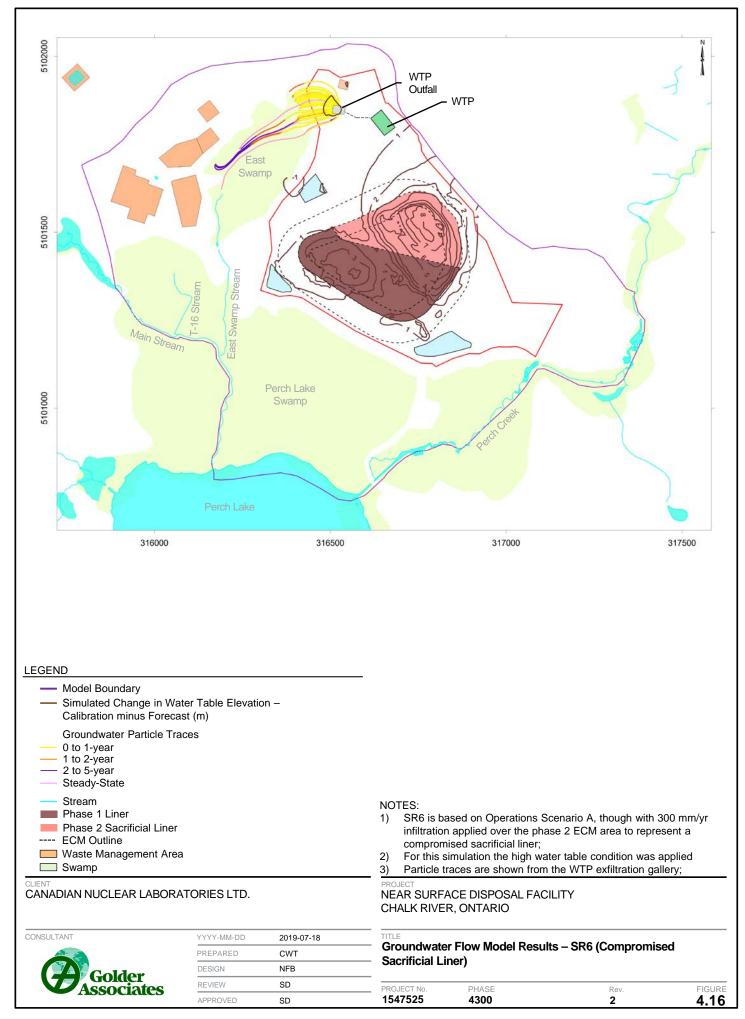


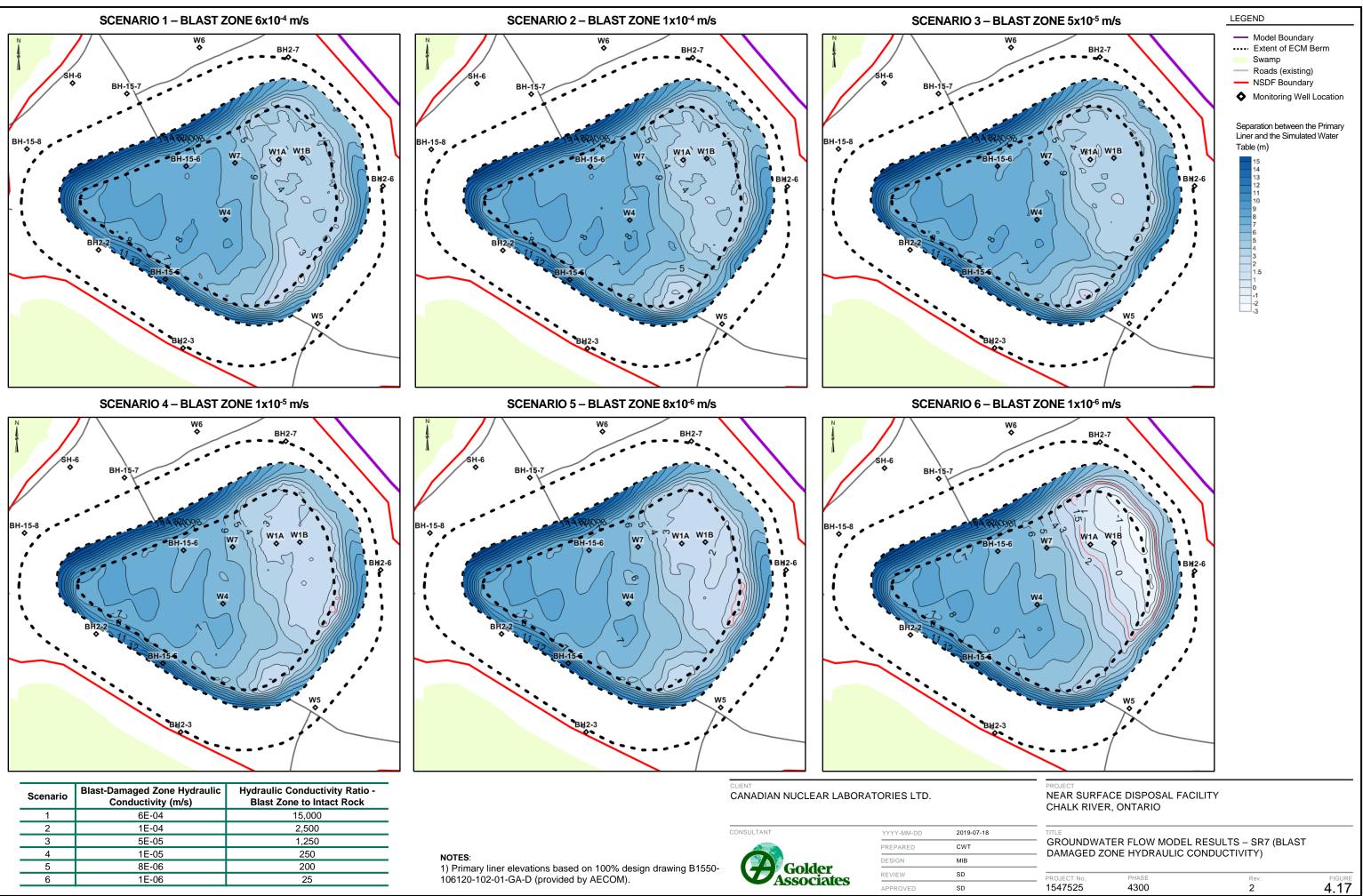










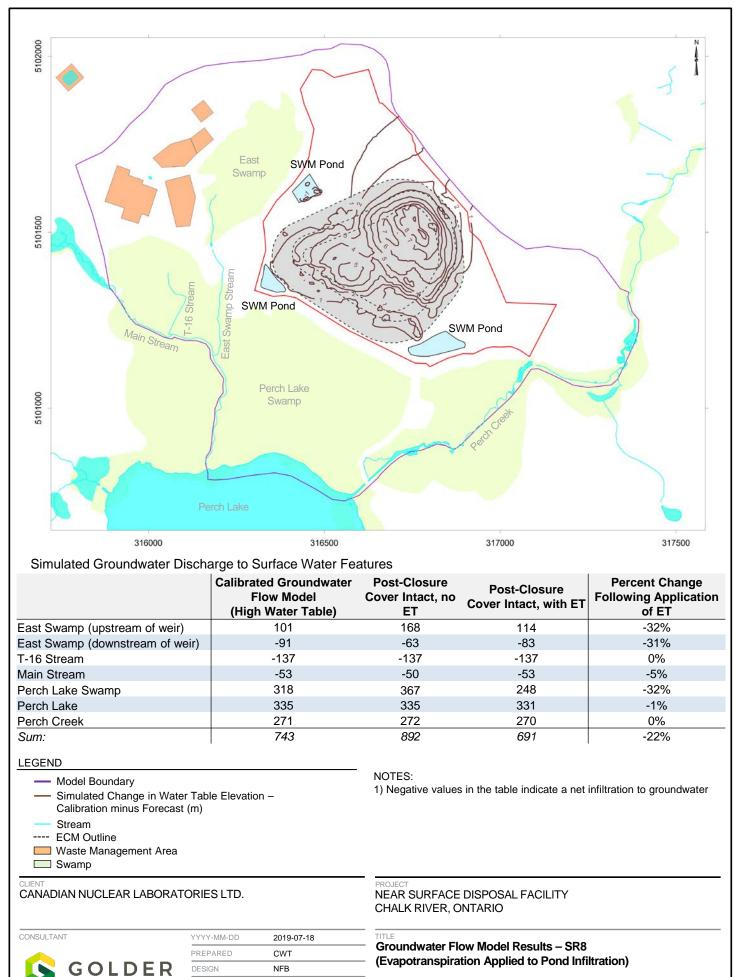


Scenario	Blast-Damaged Zone Hydraulic Conductivity (m/s)	Hydraulic Conductivity Ratio - Blast Zone to Intact Rock
1	6E-04	15,000
2	1E-04	2,500
3	5E-05	1,250
4	1E-05	250
5	8E-06	200
6	1E-06	25



YYYY-MM-DD	2019-07-18
PREPARED	CWT
DESIGN	MIB
REVIEW	SD
APPROVED	SD





REVIEW

APPROVED

SD

SD

PROJECT No

1547525

PHASE

4300

Rev

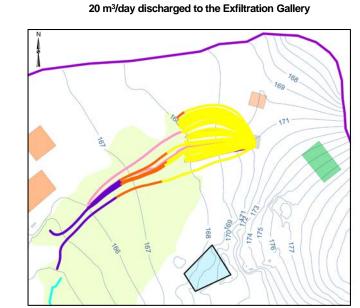
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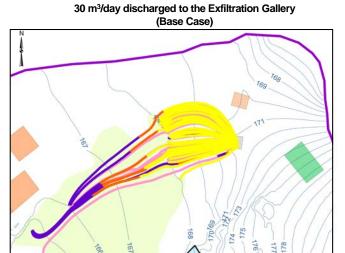
FIGURE

4.18

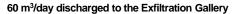
10 m³/day discharged to the Exfiltration Gallery



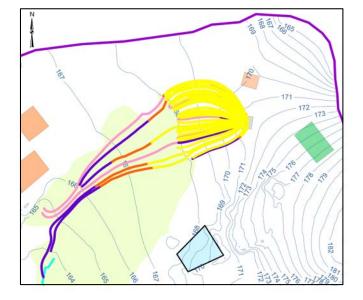


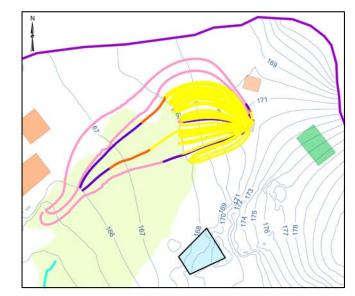


50 m³/day discharged to the Exfiltration Gallery



70 m³/day discharged to the Exfiltration Gallery







LEGEND

— Model Boundary

- Simulated Water Table Elevation (masl)
- Groundwater Particle Traces
- 0 to 1-year
- 1 to 2-year
- 2 to 5-year
- 5 to 25-year
- Stream
- ---- ECM Outline Waste Management Area
- Swamp

Notes:

1. Groundwater elevations and particle tracking based on High Water Table recharge conditions.

CANADIAN NUCLEAR LABORATORIES LTD.

CLIEN

CONSULTANT

Т	YYYY-MM-DD	2019-07-18
	PREPARED	CWT
Coldon	DESIGN	MIB
Golder Associates	REVIEW	SD
ASSOCIAICS	APPROVED	SD



40 m³/day discharged to the Exfiltration Gallery

NEAR SURFACE DISPOSAL FACILITY CHALK RIVER, ONTARIO

GROUNDWATER FLOW MODEL RESULTS – SR9 (EXFILTRATION GALLERY DISCHARGE RATE)

1547525	4300	2	4.19
PROJECT No.	PHASE	Rev.	FIGURE



CNL NEAR SURFACE DISPOSAL FACILITY GROUNDWATER FLOW MODELLING REVISION 2



Borehole Logs



PROJECT: 1546969

LOCATION: N 5101773.0 ;E 316630.0

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: February 3-4, 2016

SHEET 1 OF 2

DATUM:

<u> </u>	ПОН	SOIL PROFILE	- <u> .</u>	s	AMPL		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m	HYDRAULIC CONDUCTIVITY, k, cm/s	
METRES	BORING METHOD	DECODINTION -	STRATA PLOT mag and and and and and and and and and and	V. B	Ж	BLOWS/0.30m	20 40 60 80 SHEAR STRENGTH nat V. + Q -	10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³	OR OS EE STANDPIPE
Ē	ORING	DESCRIPTION	DEP (m	ᆐᆋ	ТҮРЕ	OWS/	SHEAR STRENGTH nat V. + Q - ● Cu, kPa rem V. ⊕ U - ○		
	ă	GROUND SURFACE			_	B	20 40 60 80	20 40 60 80	
0		TOPSOIL - (ML) sandy SILT; dark browr	185 1 EEE 0	.80					
		to black (SM) SILTY SAND; brown;	- 엄마	.15	SS	4		0	
		non-cohesive, moist, loose (SM) SILTY SAND, trace to some	0	.34 .46					
		gravel; brown to grey brown, contains cobbles and/or boulders (GLACIAL			_				
1		TILL); non-cohesive, moist, dense to very dense		2	SS	34		0	
					_				
				3	SS	62		0	
2					_				
				4		>50		0	
				-	-				
3									
				5	SS	100		0	
4				6	ss	90		0	
				0	55	90			
	(me								
	er low Ste			7	ss	>50		0	
5	Power Auger Diam. (Hollov								
	200 mm Diam. (Hollow Stem)								
	200 r			8	SS	>50		0	
6					_				
				9	SS	>50		0	
		(SM) SILTY SAND, trace to some	178	96	_				
7		gravel; grey brown, contains cobbles and/or boulders (GLACIAL TILL);		.00 10	SS	>50		0	
		non-cohesive, moist, very dense							
				11		>50		0	
8				\vdash	- 33				
5									
				12	ss	>50		o	
9									
				13	ss	>50		0	
					-				
10	_L		_6884 _		+-	-	+	┟── ──┼── ──┼──	
DEI	PTH S	SCALE				1	A STATE OF STATE		LOGGED: RI
1:{	50					1	Golder		CHECKED: AM

6969

BORING DATE: February 3-4, 2016

SHEET 2 OF 2

DATUM:

LOCATION: N 5101773.0 ;E 316630.0 SAMPLER HAMMER, 64kg; DROP, 760mm

	ЧОР	SOIL PROFILE			SA	AMPLI		DYNAMI RESIST/			ON 5/0.3m	Ì,		k, cm/s			AL NG	PIEZOMETER
METRES	BORING METHOD		STRATA PLOT	ELEV.	3ER	ш	BLOWS/0.30m	20 SHEAR				80	10 W/		D ⁻⁵ 10 L ONTENT	0 ⁻³	ADDITIONAL LAB. TESTING	OR STANDPIPE
Ξ	DRINC	DESCRIPTION	RATA	DEPTH	NUMBER	ТҮРЕ	/SMC	Cu, kPa	SIREN	GTH	rem V. €	= Q-● ● U- ○					ADDI - AB.	INSTALLATION
-	BC		_	(m)			BL(20	4	0	60	80	20			30		
10		CONTINUED FROM PREVIOUS PAGE (SM) SILTY SAND, trace to some	81981														_	
	tem)	gravel; grey brown, contains cobbles and/or boulders (GLACIAL TILL);																
	ger ollow S	non-cohesive, moist, very dense																
	Power Auger Diam. (Hollov				14	ss	>50						0					
11	Power Auger 200 mm Diam. (Hollow Stem)																	
	200 m																	
		End of Borehole		174.39														
		Auger Refusal																Open borehole dry
12																		Open borehole dry upon completion of drilling
13																		
14																		
15																		
16																		
17																		
18																		
19																		
20																		
DE	PTH S	CALE							C-	Jda	r						L	OGGED: RI
1:	50							D	Ass	OCi	r <u>ates</u>						CH	ECKED: AM

PROJECT: 1546969

LOCATION: N 5101600.0 ;E 316652.0

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: February 5, 2016

SHEET 1 OF 1

DATUM:

S	BORING METHOD	SOIL PROFILE	۲			MPL		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10 ^{.6} 10 ^{.5} 10 ^{.4} 10 ^{.3}	NAL	PIEZOMETER OR
METRES	ING ME	DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.30m	20 40 60 80 → → → → → → → → → → → → → → → → → → →	WATER CONTENT PERCENT	ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATION
1	BOR		STRA	(m)	R		BLOV	20 40 60 80	Wp	LAI	
0		GROUND SURFACE		186.30							
		(SM) SILTY SAND; brown to dark brown, contains organic matter, rootlets and ash; non-cohesive, moist, very loose (SM) SILTY SAND, trace to some gravel; brown to grey brown; non-cohesive, moist to wet, compact to		0.00 185.97 0.33		SS	1		0		
1		very dense			2	ss	17		0		
2	uger Hollow Stem)	(SM) SILTY SAND, trace to some gravel; brown to grey brown, contains cobbles and/or boulders (GLACIAL TILL); non-cohesive, moist, dense to very dense		184.78	3	ss	82		0		
3	Power Auger 200 mm Diam. (Hollow Stem)				4	SS	55		0		
-					5	ss	33		0		
4					6	ss	53		0		
		End of Borehole Auger Refusal		181.73 4.57	7	ss	>50				
5											Open borehole dry upon completion of drilling
7											
8											
9											
10											
DEI		SCALE	_I	1		<u>ı </u>		Golder			OGGED: RI ECKED: AM

PROJECT: 15	46969
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BORING DATE: February 8, 2016

SHEET 1 OF 1

DATUM:

LOCATION: N 5101456.0 ;E 316482.0 SAMPLER HAMMER, 64kg; DROP, 760mm

	BORING METHOD	SOIL PROFILE			SA	MPLE		DYNAMIC PENETRA RESISTANCE, BLOV	TION VS/0.3m			C CONDUC cm/s			AL	PIEZOMETER
METRES	ME		STRATA PLOT	ELEV.	ER	_	BLOWS/0.30m	20 40	60 80					10 ⁻³	ADDITIONAL LAB. TESTING	OR STANDPIPE
Ψ	RING	DESCRIPTION	ATA	DEPTH	NUMBER	TYPE	//S//(SHEAR STRENGTH Cu, kPa	nat v. + Q - ● rem V. ⊕ U - ○						ADDI AB. T	INSTALLATION
1	BO		STF	(m)			BLC	20 40	60 80		20			80		
0	2	GROUND SURFACE TOPSOIL - (SM) SILTY SAND; black		171.70									_			
1	Power Auger 200 mm Dia.	(SM) SILTY SAND, trace gravel; dark brown, contains rootlets (GLACIAL TILL); non-cohesive, moist, very dense End of Borehole Auger Refusal		0.05 171.1 <u>9</u> 0.51	1	SS	51			C	D I I I I I I I I I I I I I I I I I I I					Open borehole dry upon completion of drilling
2																
3																
5																
6																
7																
8																
9																
10																
DEI	PTH S	CALE				. 1		Gold	er	-1						DGGED: RI ECKED: AM

PROJECT: 1546969

LOCATION: N 5101316.0 ;E 316568.0

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: February 9, 2016

SHEET 1 OF 1

DATUM:

Ļ	머님	SOIL PROFILE			SA	MPL		DYNAMIC PENETR RESISTANCE, BLO				NDUCTIVIT	- ,	Ęμ	PIEZOMETER
DEPTH SCALE METRES	BORING METHOD		STRATA PLOT		н.		BLOWS/0.30m	20 40	60 80		10 ⁻⁶ 10		10 ⁻³	ADDITIONAL LAB. TESTING	OR
WE1	5NG	DESCRIPTION	TA F	ELEV. DEPTH	NUMBER	ТҮРЕ	VS/0.	SHEAR STRENGTH Cu, kPa	nat V. + Q - ● rem V. ⊕ U - ○			NTENT PEF		DDIT B. TE	INSTALLATION
5	BOR		STRA	(m)	z		3LOV			- N		W		[§§]	
		GROUND SURFACE		160.90			-	20 40	60 80		20 40	0 60	80	1	
0		TOPSOIL - (SM) SILTY SAND, trace		0.00											
	er (H.S.	gravel; black, with cobbles; non-cohesive, wet, very loose	10000	160.67 0.23	1	SS	3					0			Bentonite Seal
	Power Auger 200 mm Diam. (H.S.)	(SM) SILTY SAND, trace to some													Б.
	Powe mm [gravel; grey brown, contains cobbles and/or boulders (GLACIAL TILL);													Silica Sand
1	200	non-cohesive, wet, very dense		450.00	2	SS	>50				•				32 mm Diam. PVC #10 Slot Screen
' ŀ		End of Borehole		159.83 1.07											li-le
		Auger Refusal													WL in open borehole at 0.20 m depth below ground surface upon completion of drilling
															ground surface
															drilling
2															
3															
4															
5															
6															
7															
8															
9															
10															
									<u> </u>			I	1		
DEF	PTH S	CALE						Gold	0.12					L	OGGED: RI

PROJECT: 1546969

RECORD OF BOREHOLE: 15-6

SHEET 1 OF 1

DATUM:

LOCATION: N 5101486.0 ;E 316599.0

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: February 9, 2016

Ц	BORING METHOD	SOIL PROFILE	1.		SA	AMPL		DYNAMIC PENETRA RESISTANCE, BLOV		HYDRAL	JLIC CO k, cm/s	NDUCT	IVITY,		4 ^c F	PIEZOMETER
DEPTH SCALE METRES	MET		PLOT		۲.		.30m	20 40	60 80	10-6				0 ⁻³	TONA	OR
Ш	RING	DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.30m	SHEAR STRENGTH Cu, kPa	nat V. + Q - ● rem V. ⊕ U - ○	WA			PERCE		ADDITIONAL LAB. TESTING	INSTALLATION
ā	BOF		STR/	(m)	Ĭ	Ľ	BLO	20 40	60 80	Wp 20	40	₩) 6	י ו א מ	WI 80	 [∢]	
		GROUND SURFACE		174.80								, 0	0 0			
0		TOPSOIL - (ML) sandy SILT; black	222	0.00										326	þ	
	Ê	(SM) SILTY SAND, trace gravel; brown to grey brown; non-cohesive, moist to		0.15	1	SS	11				0					Bentonite Seal
	w Stem)	wet, compact														
	Power Auger 200 mm Diam. (Hollow															Silica Sand
1	ower /															꼬(
				173.58	2	SS	14									32 mm Diam. PVC
	200	(SM) SILTY SAND, trace to some gravel; grey brown, contains cobbles		1.22	<u> </u>	-										#10 Slot Screen
		and/or boulders (GLACIAL TILL); non-cohesive, moist to wet, compact		173.07	3	ss	>50			0						
		End of Borehole		1.73		1										
2		Auger Refusal														WL in Screen at 0.96 m depth
																below ground surface on Feb. 10,
																2016
3																
4																
~																
5																
6																
7																
8																
9																
10																
.0																
		1		1		1								1	1	1
		SCALE					(Gold	er							OGGED: RI
1:	50							Assoc	iates						CH	ECKED: AM

PROJECT: 1546969

RECORD OF BOREHOLE: 15-7

BORING DATE: February 9, 2016

SHEET 1 OF 1

DATUM:

LOCATION: N 5101595.0 ;E 316510.0 SAMPLER HAMMER, 64kg; DROP, 760mm

, F	BORING METHOD	SOIL PROFILE	L	1	SA	MPL		DYNAMIC PENETRATI RESISTANCE, BLOWS	S/0.3m <	k, cm/s		AL	PIEZOMETER
TRES	MET		PLOT	ELEV.	н	ш	0.30m		60 80		10 ⁻⁵ 10 ⁻⁴ 10 ⁻³	TION	OR STANDPIPE
DEPTH SUALE METRES	RING	DESCRIPTION	STRATA PLOT	DEPTH	NUMBER	түре	BLOWS/0.30m	SHEAR STRENGTH Cu, kPa	nat V. + Q - ● rem V. ⊕ U - ○			ADDITIONAL LAB. TESTING	INSTALLATION
·	BO		STF	(m)			BLC	20 40	60 80		40 60 80		
0				174.50									
ŕ		TOPSOIL - (SM) SILTY SAND; dark brown to black		0.05]								Native Backfill
		(SM) SILTY SAND; dark brown; non-cohesive, moist, loose	- [11]	174.09	1	SS	7			0			Bentonite Seal
		(SP) SAND; brown to grey brown,		0.41	<u> </u>	-							
		stratified; non-cohesive, moist, loose											
1					2	SS	6			0			
		(SM) SILTY SAND, trace to some		172.98 1.52						0			
		gravel; brown to grey brown, contains cobbles and/or boulders (GLACIAL		1.02	3	SS	10			0			Nativo Daalefil
2		TILL); non-cohesive, moist, compact to											Native Backfill
	1	dense €											
	5												
	Auger				4	SS	27			0			
	Power Auger												
3	Power Auger												Native Backfill
		D N			5	SS	30			0			Bentonite Seal
													Silica Sand
4													
		(SW) SAND, fine to coarse; brown;		170.08 4.42									32 mm Diam. PVC
		(SM) SILTY SAND, trace to some		4.57	6	SS	36			0			#10 Slot Screen
5		gravel; grey brown, contains cobbles and/or boulders (GLACIAL TILL);											
-		non-cohesive, wet, dense											
				169.01									Cave
	_	End of Borehole Auger Refusal		5.49									
													WL in Screen at 3.21 m depth
6													below ground surface on Feb. 10, 2016
													2010
7													
8													
9													
10													
DE	РТН	SCALE						Golde				L	OGGED: RI
								Golde	r				ECKED: AM

PROJECT: 1546969

RECORD OF BOREHOLE: 15-8

BORING DATE: February 8, 2016

SHEET 1 OF 1

DATUM:

LOCATION: N 5101512.0 ;E 316360.0 SAMPLER HAMMER, 64kg; DROP, 760mm

METRES	BORING METHOD	SOIL PROFILE			SA	MPL		DYNAMIC PENETR RESISTANCE, BLO	WS/0.3m <			k, cm/s				ING	PIEZOMETER
TREE	G ME	DECODERTICU	STRATA PLOT	ELEV.	BER	Ы	BLOWS/0.30m	20 40 SHEAR STRENGTH	60 80		10 W		i	10 ⁻⁴ T PERCI	10 ⁻³	ADDITIONAL LAB. TESTING	OR STANDPIPE
ME	DRING	DESCRIPTION	RATA	DEPTH	NUMBER	түре	OWS/	Cu, kPa	rem V. \oplus U -	ŏ						ADD.	INSTALLATION
	BO		STI	(m)	<u> </u>		BL	20 40	60 80		2				80		
0	_	GROUND SURFACE TOPSOIL - (SM) SILTY SAND; dark	FFF	174.30	_												Native Backfill
		(SM) SILTY SAND; dark brown, contains rootlets; non-cohesive, moist, very loose		0.05	1	SS	3					0					Bentonite Seal
1		(SP) SAND; brown to grey brown, contains silty sand seams; non-cohesive, moist, loose to compact		173.61 0.69	2	SS	5				0						
						-					0						
2					3	SS	9				0						
					4	SS	11				0						
3						-					0						
					5	SS	8				0						Native Backfill
4	Stem)				6	SS	~				0						
	Power Auger 200 mm Diam. (Hollow Stem)				0	-	21				0						
5	200 mm D				7	SS	13				0						Native Backfill
		(SM) SILTY SAND, some gravel; grey brown, contains cobbles and/or boulders (GLACIAL TILL); non-cohesive, moist to		168.66 5.64	8	SS	23				0						
6		wet, compact to very dense			-												
					9	SS	22				0						
7																	Bentonite Seal
					10	SS	50				0						Silica Sand
8					11	SS	73				0						32 mm Diam. PVC #10 Slot Screen
				165.46													
9		End of Borehole Auger Refusal	<u>r.X.Xo</u> K.	8.84													WL in Screen at 7.24 m depth below ground surface on Feb. 10, 2016
10																	
DEF	PTH S	I	1	1	1	1		Gold	ler				<u> </u>			LC	DGGED: RI

									e Only			232	2-50924	9-REP	T-001 Rev 5
REC	ORD OF BOREHO	LE No	o. [BH2	<u>2-1 -</u>	Ov	erb	urde	<u>en</u>						
Project	Number: TZ16018							Drilling	g Location:	ECM (N51	01509, E3	316361)			_
Project	Client: Canadian Nuclear Lab	oratories	s Ltd.					Drilling	g Method:		Hollow St	tem Aug	jering / Ro	ck Corin	
Project	Name: Multidisciplinary Subs	surface In	nvestig	ation	for NS	DF		Drilling	g Machine:	(HQ) Truck Mo	unted Dri	1			amec 🔊
Project	Location: Chalk River, ON							Date S	Started:	14 Oct 16	D	ate Corr	pleted: 14	Oct 16	foster wheeler
.oggec	by: MA	Comn	iled by		SC			Revie	wed by:	SC/NR	R	evision l		31/10/16	
.09900		Comp	-		MPL					TESTING		AB TES			
						(%)		ê		ationTesting			Reading TOV (LEL) 6 8	TION	COMMENTS &
Geog	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	MTO Vane* △ Intact ▲ Remould	Nilcon Van ◇ Intact ◆ Remould	e* CO 100 Wp	V (ppm) 200 3 W stic	TOV (ppm)	INSTRUMENTATION INSTALLATION	GRAIN SIZE DISTRIBUTION (%) GR SA SI C
	light brown (Disturbed) SILTY SAND trace gravel moist		SS	1	63	2	-	174 -	Ð		°9				
			SS	2	67	6	+ - - - - 1		0		° ₅				
	light brown to brown SAND / SILTY SAND	<u>173.1</u> 1.4						173 -							
	trace gravel compact to very dense moist		SS	3	71	11	- - 2 -		0		°3				
			SS	4	75	10		172 -	0		° ₆	· · · · · · · · · · · · · · · · · · ·			- 91 (9)
			SS	5	75	14		171 -	0		°.				
			SS	6	75	32	- - - - - - -	-	0		°7				
			SS	7	75	18		170 -	O.		o	· · · · · · · · · · · · · · · · · · ·			
								169 —							
	grey sand seam		SS	8	67	17		-	0		°6				
			SS	9	88	40		168 -	0		9				3 62 32 3
							- - 7 -	-							
			SS	10	75	70	- - - - - 8	167 -		0	0				
								166 -							
							- - - 9 -								Note: Where N-value is in format,
			SS	11	63	96/28		165 —		2	96 28 13				e.g., 96/28, N-value is 96 blows fo 28 cm penetration.
nviron	oster Wheeler ment & Infrastructure	Groundwa in rock co	ater at c ring.	ompleti	 on of bo	 prehole (Could n	ot be me	asured due to	o drilling fluid u	ised			<u> </u>	
carboro anada	ough, Ontario, M1R 3C3 (416) 751-6565		chnical E	ngineer.	Also, bo	rehole in	formatio	n should	nding of all pote be read in conji					sistance fro	Scale: 1 : Page: 1 of

232-509249-REPT-001 Rev 5

Official Use Only 232-509249-REPT-001 Rev 5 RECORD OF BOREHOLE No. BH2-1 - Overburden												
RECORD OF I	BOREHOLE N	lo.	BH2	2-1 -	Ove	erbu	rde	<u>n</u>				
Project Number: TZ160	18		_ 1	Project	Name:	Multidi	scipli	nary Subsurface Investiga	ation for NSDF			mec
roject Location: Chalk	River, ON										fo	bster heeler
LITHOLOG	Y PROFILE	sc	DIL SA		NG			FIELD TESTING	LAB TESTING			
								PenetrationTesting	Soil Vapour Reading	NO	COM	MENTS
			lber		SPT 'N' / RQD (%)		Ē	O SPT 🗆 PPT 🍨 DCPT	2 4 6 8 △ COV (ppm) ▲ TOV (ppm)	INSTRUMENTATION INSTALLATION	GRA	& IN SIZE
	RIPTION	Type	Num	"ry (%	/RQ	E)	TION	MTO Vane* Nilcon Vane* △ Intact ◇ Intact	100 200 300 400 W _P W W _L	JME LATI	DISTR	
		Sample Type	Sample Number	Recovery (%)	N. Lo	DEPTH (m)	ELEVATION	 Remould Remould * Undrained Shear Strength (kPa) 	Plastic Liquid	STRI		(%)
5 	101.0	—	ທຶ 12	67	්ර 50/10	ā	Ξ	20 40 60 80	20 40 60 80	ZZ	GR SA	SI
	164.3 n Drilling Due to Auger10.2 ofusal		12	67	50/10	_		10	0 15			
	pring Started											
	DROCK											
(for rock core deta BOREHOLE N	ils, see "RECORD OF o.: BH2-1 - Rock")											
	,											
		1										
End of Rock Cor	ing at 20.7 m depth											

							Offic	ial Us	se Only				232-	509249	9-REP	T-001	Rev 5		
R	ECORD OF B	OREHOLE N	lo.	BH2	2-2 -	Ov	erb	urde	<u>en</u>										0
Pr	oject Number: TZ16018	3						Drilling	g Location:	ECM (N5	101	360, E316	468)				1		
Pr	oject Client: Canadia	an Nuclear Laboratori	es Ltd.					Drilling	g Method:		Но	llow Stem	n Auger	ing / Roo	ck Corin	g			
Pr	oject Name: Multidis	ciplinary Subsurface	Investig	gation	for NS	DF		Drilling	g Machine:	(HQ) Truck Mo	ount	ed Drill					ame	20	Y
Pr	oject Location: Chalk R	iver, ON						Date	Started:	11 Oct 16	6	Date	Compl	eted: <u>11</u>	Oct 16		fost	eler	
Lo	gged by: BC	Com	piled by	y:	SC			Revie	wed by:	SC/NR		Revi	sion No	.: 0,	31/10/16	3	mile		
	LITHOLOGY			·	AMPL	NG				TESTING	;	LAB	TEST	ING					
						(%)		Ê		ationTesting		COV (LE	′apour Rea EL) ■ 4 6		INSTRUMENTATION INSTALLATION		COMN 8		
ot	DESCR	IPTION	be	mber	(%)			(m) N0	O SPT □ MTO Vane*	PPT Definition Value		△ COV (pp		TOV (ppm)	TION			N SIZE BUTION	
ogy P			Sample Type	le Nu	Recovery (%)	SPT 'N' / RQD	H (m	ELEVATION	∆ Intact ▲ Remould	 ♦ Intact ♦ Remout 		W _P	W	WL	RUM		013 I KII (%		
Lithology Plot	Geodetic Ground Surface Elevat	tion: 163.6 m	Samp	Sample Number	Reco	SPT -	DEPTH	ELEV	* Undrained Sh 20 40	ear Strength (k 60 80		Plastic	40 60	Liquid 80	INSTI INST	GR	SA	SI	CL
		m TOPSOIL	ř				-									e.g., 50	/3, N-value	lue is in for is 50 blows	
	(Disturbed) \$		SS	1	75	8	E					о 13				3 cm pe	netration.		
	mo	bist 163.0					F	163 -											
	SILTY trace to so	SAND me gravel 162.6	, ss	2	90	50/3	Ē.			50 3		°10							
	\ mo	pist 1.(/				·												
		Drilling Due to Auger usal																	
	Rock Corir	ng Started																	
	BEDR	POCK																	
	For rock core details																		
	BOREHOLE No.																		
												-							
												-							
												-							
												-							
	End of Rock Corin	ng at 10.2 m depth	-									-							
		gat for maopan										-							
												-							
												-							
														-					
														-					
	nec Foster Wheeler vironment & Infrastructure	Ground	water at	complet	ion of bo	orehole	could n	ot be me	easured due to	drilling fluid	used	b							
104	4 Crockford Boulevard		coring.																
Ca	arborough, Ontario, M1R 3C3 nada . No.: (416) 751-6565	Borehole detail a qualified Geo	technica	Engineer	Also, bo	rehole in	formatio	on shou l d	nding of all pote be read in conji	ntial condition	s pre e geo	sent and req	uire interport for w	pretative as	sistance fro	om		Scale:	: 1 : 53
	ecfw.com	commissioned	and the a	ccompan	iying'Expl	anation o	of Boreh	ole Log'.										Page: 7	1 of 1

_									se Only		232-	509249)-REP	T-001 Rev 5
R	ECORD OF BOREH	OLE No	o.]	<u>BH2</u>	<u>2-3 -</u>	<u>- Ov</u>	<u>erb</u>	urde	<u>ən</u>					
Pro	oject Number: TZ16018							_ Drillin	g Location:	ECM (N510 ⁻	1213, E316595)			_
Pro	oject Client: Canadian Nuclear L	aboratories	s Ltd.					_ Drilling	g Method:	<u>200 mm He</u> (HQ)	ollow Stem Auge	ring / Roc	<u>:k Corin</u>	
Pro	oject Name: Multidisciplinary Su	ubsurface Ir	nvestig	jation	for NS	DF		_ Drillin	g Machine:	Truck Mour	nted Drill			amec foster
Pro	oject Location: Chalk River, ON							_ Date :	Started:	7 Oct 16	Date Comp	leted: 70	<u>) 201 201 201 201 201 201 201 201 201 201</u>	wheeler
Lo	ogged by: MA	Comp	oiled by	/:	SC			Revie	ewed by:	SC/NR	Revision N	o.: 0, :	31/10/16	
	LITHOLOGY PROFILE		SC	JIL SA	AMPLI	NG	\square		FIELD	TESTING	LAB TES Soil Vapour Re			COMMENTS
				5		(%)		(E		ationTesting	COV (LEL)	TOV (LEL)	INSTRUMENTATION INSTALLATION	COMMENTS
Plot	DESCRIPTION		ype	Iumbe	(%)	RQD	Ê		MTO Vane*		△ COV (ppm) ▲	TOV (ppm) 10 400	AENT	GRAIN SIZE DISTRIBUTION
Lithology Plot			Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD	DEPTH (m)	ELEVATION	△ Intact ▲ Remould	 Remould hear Strength (kPa) 	W _P W	W _L	TALL	(%)
	Geodetic Ground Surface Elevation: 157.5 m brown to grey	157.3	Sar	Sar	Rec	SP	B		20 40		Plastic 20 40 60	Liquid 0 80	<u>N</u> N NN	GR SA SI CL Note: Where N-value is in format,
	(Disturbed) SAND / SILTY SAN some gravel, some clay	ND 0.2	SS	1	75	7	F				°20			e.g., 50/10, N-value is 50 blows for 10 cm penetration.
	brown to				<u> </u>	<u> </u>	F	157 -	-		20			
	SILTY SAND trace gravel moist					+	ŧ		-					
			SS	2	38	11					°29			
	End of Overburden Drilling Due to	156.1 o Auger 1.4		-3-	+100-	50/10	╡			50 10	43			
	Refusal	J.												
	Rock Coring Started													
	BEDROCK											-		
	(for rock core details, see "RECOR													
	BOREHOLE No.: BH BH2-3 - Ro													
												-		
												-		
	End of Rock Coring at 12.2 m de	lepth												
		-												
												-		
												-		
												-		
												-		
												-		
												-		
	nec Foster Wheeler	Groundwa	ater at c		ion of h			not be mu	easured due t	o drilling fluid use				
	vironment & Infrastructure 4 Crockford Boulevard	$\frac{\nabla}{2}$ in rock co	ring.	Jonipiot		51011010	oodia n	lot bo m		o aniing ilala aoc	54			
Sca Car	arborough, Ontario, M1R 3C3 Inada Bo	orehole details	as prese	nted, do	not cons	stitute a t	horough	1 understa	anding of all pot	ential conditions pr	resent and require inte	rpretative ass	sistance fro	om Scale: 1 : 53
	I. No.: (416) 751-6565 a co	qualified Geote ommissioned ar	nd the ac	.ogineer.	ying'Exp	lanation	of Boreh	nole Log'.	n be read in conj	unction with the ge	eotechnical report for v	mich it was		Page: 1 of 1

					′	Offic	ial Us	se Only		23	32-509249)-REP	T-001	1 Rev 5		
R	ECORD OF BOREHOLE N	0.	BH2	<u>2-4 -</u>	<u>• Ov</u>	<u>erb</u>	<u>urrd</u>	en						l		
Prc	oject Number: TZ16018						_ Drillin	g Location:	ECM (N5101	195, E316711	1)				A	-
Prc	oject Client: Canadian Nuclear Laboratorie	s Ltd.					Drilling	g Method:	200 mm Hc	ollow Stem Au	ugering / Roc	ck Corir	ia			
	oject Name: Multidisciplinary Subsurface I		aation	for NS	DF		-	g Machine:	(HQ) Truck Mount		0 0			ame		Y
	oject Location: Chalk River, ON							Started:	12 Oct 16		ompleted: <u>12</u>	Oct 16	_	foste	eler	
Lor	gged by: MA Comp	piled by	y:	SC	;		Revie	wed by:	SC/NR	Revisior	No.: 0, :	31/10/16	3			
	LITHOLOGY PROFILE			AMPLI	NG				TESTING	LAB TE	ESTING		'			
Plot	DESCRIPTION	Type	Sample Number	y (%)	SPT 'N' / RQD (%)	(m)	(m) NOI		ationTesting PPT ● DCPT [*] Nilcon Vane* ◇ Intact	□ COV (LEL) 2 4 △ COV (ppm) 100 200	6 8 ▲ TOV (ppm) 300 400	INSTRUMENTATION INSTALLATION		Commi & Grain Distrib	SIZE UTION	
Lithology Plot		Sample Type	nple I	Recovery (%)	,'N' T	DEPTH	ELEVATION	A Remould	Remould	W _P W ■ C	→ 	STALL		(%)	
Ľ.	Geodetic Ground Surface Elevation: 157.7 m		Sar	Rec	SP.	B		20 40	near Strength (kPa) 0 60 80	Plastic 20 40	Liquid 60 80		GR	SA Mhoro Ni vali	SI	CL
		ss	1	67	6	Ē	-						e.g., 50	Where N-valu 0/10, N-value penetration.	is 50 blow	vs for
	(Disturbed) SAND / SILTY SAND trace gravel moist157.1 grey/brown0.7		1				157 —			°30			TU GIT	репенанон.		
	SAND / SILTY SAND trace gravel loose to very dense moist to wet	SS	2	63	12	 1 	-	0		° ₂₉						
		ss	3	50	9		156 —	-		°23						
	some gravel	SS	4	38	24		-			° ₁₁			22	59	18	1
			<u> </u>	<u> </u>	+		155 -									
		SS	5	29	30		- - - 154 —			9						
	inferred cobbles/boulders				+				50							
	· · ·	SS	6	0	50/15		153 —		50 15							
	152.5	SS	7	31	50/10	- 5	-		50 10	° ₁₀			29	39	29	3
1.1	End of Overburden Drilling Due to Auger 5,2 Refusal		-	+	+	+		1	10							
	Refusal Rock Coring Started															
	BEDROCK (for rock core details, see "RECORD OF BOREHOLE No.: BH2-4 - Rock")															
	End of Rock Coring at 16.0 m depth															
	vironment & Infrastructure Groundw	/ater at c oring.	comp l eti	ion of bo	oreho l e /	could n	ot be me	asured due to	o drilling fluid used	d						
Sca Can Tel.	l Crockford Boulevard arborough, Ontario, M1R 3C3 nada Borehole details	as prese echnical E	Engineer.	r. Also, bo	orehole in	nformatio	on shou l d	nding of all pote be read in conji	ential conditions pre unction with the gec	esent and require otechnical report	interpretative ass for which it was	sistance fro	əm		Scale: Page: 1	

								e Only		232-509249	-REPT-0	01 Rev 5
R	ECORD OF BOREHOLI	E No.	<u>BH:</u>	2-5 -	· Ov	<u>erb</u>	<u>urde</u>	<u>en</u>				
Pr	oject Number: TZ16018						Drilling	g Location:	ECM (N5101	1478, E316940)		
Pr	oject Client: Canadian Nuclear Labora	atories Ltd.					Drilling	g Method:		ollow Stem Augering / Roo	k Coring	
Pr	oject Name: Multidisciplinary Subsur	face Investi	gation	for NS	DF		Drilling	g Machine:	(HQ) <u>Truck Moun</u>	nted Drill		amec
Pr	oject Location: Chalk River, ON						Date	Started:	27 Sep 16	Date Completed: 28	Sep 16	foster wheeler
Lo	gged by: BC	Compiled by	y:	SC			Revie	wed by:	SC/NR	Revision No.: 0,	31/10/16	milliocter
	LITHOLOGY PROFILE	S	DIL SA	AMPL	NG			FIELD	TESTING	LAB TESTING		·
					(%)		Ê		tionTesting	Soil Vapour Reading □ COV (LEL) ■ TOV (LEL) - 2 4 6 8	INSTRUMENTATION INSTALLATION	COMMENTS &
ot	DESCRIPTION	be	mber	(%)	ign (2	(m) No	O SPT □ MTO Vane*	PPT • DCPT Nilcon Vane*	△ COV (ppm) ▲ TOV (ppm) 100 200 300 400	TION	GRAIN SIZE
Lithology Plot		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD	DEPTH (m)	ELEVATION	∆ Intact ▲ Remould	Intact	W _P W W _L	ALLA	(%)
Litho	Geodetic Ground Surface Elevation: 193.1 m	Samp	Samp	Reco	SPT	DEP	ELEV	* Undrained Sh 20 40	ear Strength (kPa) 60 80	Plastic Liquid 20 40 60 80	LSNI G	R SA SI CL
	brown/light brown (Disturbed) SILTY SAND					F	193 -		· · ·		e.g.,	: Where N-value is in format, 50/10, N-value is 50 blows for
	trace gravel, with wood pieces and organic	s SS	1	42	9	-				° 18	10 cr	m penetration.
	grey	<u>192.4</u> 0.7				ł						
	SILTY SAND trace to some gravel, rock fragments	SS	2	44	50/10	- 1			50 0 10	°2		
	mosit	191.9				-	192 -					
	End of Overburden Drilling Due to Auge Refusal	er										
	Rock Coring Started											
	BEDROCK											
	(for rock core details, see "RECORD OF											
	BOREHOLE No.: BH2-5 - Rock")											
	End of Rock Coring at 12.2 m depth											
	nec Foster Wheeler		complet	ion of h			not be m		drilling fluid use			
En		rock coring.	complet		01611016	coula r	IUL DE ME	zasureu due to	drilling fluid use	5u		
Sca Ca	arborough, Ontario, M1R 3C3 nada Borehole	details as pres	ented, do	not cons	stitute a t	horough	understa	nding of all pote	ntial conditions pr	esent and require interpretative as	istance from	Coche 1 - 52
Tel	No · (416) 751-6565 a qualifie	d Geotechnical	∟ngineer ccompan	: Also, bo lying'Exp	orenole ir Ianation (nformati of Borel	on should 10le Log'	be read in conju	Inction with the ge	eotechnical report for which it was		Scale: 1 : 53

						Offic	ial Us	e Only		232-509249	9-REPT-0	01 Rev 5
RECORD	OF BOREHOLE N	lo.	BH2	2-6D) - ()ver	bur	<u>den</u>				
Project Number	TZ16018						Drilling	g Location:	ECM (N5101	I456, E316895)		
Project Client:	Canadian Nuclear Laboratorie	es Ltd.					Drilling	g Method:		ollow Stem Augering / Ro	ck Coring	
Project Name:	Multidisciplinary Subsurface	Investi	gation	for NS	DF		Drilling	g Machine:	(HQ) <u>Truck Moun</u>	ted Drill		amec foster
Project Locatior	: Chalk River, ON						_ Date :	Started:	27 Sep 16	Date Completed: 27	Sep 16	wheeler
Logged by:	BC Com	piled by	y:	SC			Revie	wed by:	SC/NR	Revision No.: 0,	31/10/16	-
LIT	HOLOGY PROFILE	SC	DIL SA	AMPL	NG			FIELD	TESTING	LAB TESTING Soil Vapour Reading	7	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	O SPT □ MTO Vane* △ Intact ▲ Remould	 Intact Remould ear Strength (kPa) 	□ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ▲ TOV (ppm) 100 200 300 400 W _P W W, ■ ○ ● Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) sr SA SI CL
	brown (Disturbed) SILTY SAND					-						
	trace gravel, with organics moist	SS	1	29	3	-				9		
	inferred cobbles/boulders with rock fragments 190.7					Ē	191 -					
End of (Overburden Drilling Due to Auger 0.9 Refusal					-						
	Rock Coring Started											
(for roo												
BO	k core details, see "RECORD OF REHOLE No.: BH2-6 - Rock")											
End o	f Rock Coring at 11.9 m depth	1										
Amon Fred MC	alar I											
Amec Foster Whe Environment & In	frastructure	vater at o oring.	complet	ion of bo	orehole	could n	not be me	easured due to	drilling fluid use	ed		
104 Crockford Bou Scarborough, Onta Canada	ario, M1R 3C3 Borehole details	s as prese	ented, do	not cons	titute a t	horouah	understa	nding of all pote	ntial conditions pro	esent and require interpretative as	sistance from	
Tel. No.: (416) 751 amecfw.com		echnical	Engineer	Also, bo	rehole ir	nformatio	on shou l d	be read in conju	inction with the ge	otechnical report for which it was		Scale: 1 : 53

								e Only		23	32-509249	9-REPT-(001 Rev 5
R	ECORD OF BOREHOLE N	0.	BH2	<u>2-6S</u>	- 0	ver	burc	<u>len</u>					
Proj	ect Number: TZ16018						Drilling	J Location:	ECM (N5101	456, E31689	5)		-
Proj	ect Client: Canadian Nuclear Laboratorie	s Ltd.					Drilling	g Method:	<u>200 mm Ho</u> (HQ)	llow Stem A	ugering / Ro	ck Coring	amec
Proj	ect Name: Multidisciplinary Subsurface I	nvesti	gation	for NS	DF		Drilling	g Machine:	Truck Moun	ted Drill			foster
Proj	ect Location: Chalk River, ON						Date S	Started:	27 Sep 16	Date Co	ompleted: 27	Sep 16	wheeler
Log	ged by: BC Com	piled by	y:	SC			Revie	wed by:	SC/NR	Revisio	n No.: 0 ,	31/10/16	
	LITHOLOGY PROFILE	SC	DIL SA	MPL	NG			FIELD	TESTING		ESTING our Reading	-	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	O SPT □ MTO Vane* △ Intact ▲ Remould * Undrained Sh	tionTesting PPT • DCPT Nilcon Vane* • Intact • Remould ear Strength (kPa)	□ COV (LEL) 2 4 △ COV (ppm) 100 200 W _P V Plastic	■ TOV (LEL) 6 8 ▲ TOV (ppm) 300 400 V WL Liquid	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Geodetic Ground Surface Elevation: 191.6 m brown (Disturbed) SILTY SAND 191.4	ഗ SS	თ 1	81	ى 3	-	<u> </u>	20 40 O	60 80	20 40 0 12	60 80		
1	(Disturbed) SILTY SAND 191.4 trace gravel, with organics 0.2 moist					-							
	End of Overburden Drilling Due to Auger Refusal												
	Rock Coring Started												
	BEDROCK												
	(for rock core details, see "RECORD OF BOREHOLE No.: BH2-6B - Rock")												
ŀ	End of Rock Coring at 10.7 m depth												
	c Foster Wheeler $ abla No freess$	anding	around	vater me	asured	Lin one	n boreho	le on completi	on of drilling			1	
104	Crockford Boulevard	9				- 001							
Cana		as prese	ented, do Engineer	not cons	titute a t	horough	understa	nding of all pote	ntial conditions pre	esent and require	interpretative as	sistance from	Scale: 1 : 53
	No.: (416) 751-6565 a qualified Geote commissioned a	nd the a	ccompan	ying'Expl	anation	of Boreh	ole Log'						Page: 1 of 1

								Offic	ial Us	se Only			23	32-509249	-REP	T-001	1 Rev 5		
R	ECORD	OF BOREH	IOLE N	o.	BH2	<u> 2-7 -</u>	Ov	<u>erb</u>	urde	<u>en</u>									
Pro	ject Number:	TZ16018							Drillin	g Location:	ECM (N	5101	650, E316753	3)					
Project Client:		Canadian Nuclear Laboratories Ltd.								g Method:	200 mm Hollow Stem Augering / Rock Coring					g			
Project Name:		Multidisciplinary Subsurface Investigation for NSDF							-	g Machine:	(HQ)	(HQ) Track Mounted Drill					ame		Y
Project Location:										Started:		<u>6 Oct 16</u> Date Completed: <u>6 Oct</u>			Oct 16	foster wheeler			
Logged by: MA C			Comr	ompiled by: SC					Reviewed by:		SC/NR		Revisior	No: 0.	31/10/16		YYIIC		
209				· · ·								G	LAB TE			I			
										Penet	rationTesting		Soil Vapou		NOI		COMM		
t.		DESCRIPTION			lber		SPT 'N' / RQD (%)		E .	O SPT [] РРТ	DCPT	2 4 △ COV (ppm)	6 8 ▲ TOV (ppm)	INSTRUMENTATION INSTALLATION		8 GRAIN		
Jy Plo		DESCRIPTION		Type	Num	ry (%	/RQ	E)	TION	MTO Vane △ Intact	Intact		100 200 W _P W	300 400	JMEN LATI		DISTRIE		
Lithology Plot				Sample Type	Sample Number	Recovery (%)	N, L	DEPTH (m)	ELEVATION	Remould * Undrained \$	I ◆ Remo Shear Strength (I		Plastic	Liquid	STRI		(%		
ٿ ا ا	Geodetic Ground S	urface Elevation: 191 <u>.8 m</u> light brown		Sa	Sa	Re	ц.	ä			0 60 80		20 40	60 80	<u>ZZ</u>	GR Note: V	SA Where N-val	SI ue is in forr	CL nat.
	(D	isturbed) SILTY SANE trace gravel	C	ss	1	63	21	_		-			° 10			e.g., 50	0/10, N-value penetration.		
		moist	101.1					Ē					10						
		light grey	<u> </u>					-	191 -	-									
	SILT	Y SAND / SAND AND S trace gravel very dense	5IL I	ss	2	21	50/13	- 1			50 13		° ₅						
	rock	moist fragments at tip of spo	200					-		-	13		5						
	TUCK	inagments at up of spe						1					· · · · · · · · · · · · · · · · · · ·			Augor	sample colle	ctod	
				ss	3	17	50/10	Ē	190 -	-	50 10		0			Ruger 8	50	38	4
						"	50/10	- 2		-	10		°5				50	50	7
								Ē		-									
				ss	4	0		-		-						Hard a	ugering / gri	naing	
								Ē	189 -]									
	int	ferred cobbles/boulders	s	ss	5	38	50/14	- 3		-	50 14		0			31	55	13	1
						50	30/14	-			14		8			51	55	10	'
								Ē		-									
								-	188 -										
								E 4	100	-									
								-		-									
			187.3	SS	6	0	50/8	<u> </u>		-	50								
	End of Ov	erburden Drilling Due Refusal	to Auger 4.5								8								
		Rock Coring Started																	
														· · ·					
		BEDROCK																	
	(for rock o	core details, see "RECO	ORD OF																
	BORE	EHOLE No.: BH2-7 - Ro	ock")																
										-									
	End of I	Rock Coring at 14.8 m	depth																
										-									
Ame	c Foster Wheel	er l	0	<u> </u>		 		<u> </u>	att-		ka alaitta a d	J							
Envi	ironment & Infra	structure	$\stackrel{\text{Groundwa}}{=}$ in rock co	ater at o pring.	:omplet	ion of bo	orenole (could n	ut be me	easured due	to drilling fluic	u useo	u						
Sca	Crockford Boule rborough, Ontario	o, M1R 3C3 🗖	Boreholo datail-	26 0700-	ntod d-	not corr	tituto o A	loroura	underst-	nding of all r -	tential conditi-	ne r**	esent and require i	interpretative c-	ejetanoo f-				
	ada No.: (416) 751-6 cfw.com	565	a qualified Geote commissioned a	chnical E	Engineer.	. Also, bo	orehole in	formati	on shou l d	be read in cor	junction with th	he geo	otechnical report f	for which it was				Scale:	
anne	0.111.00111																1	Pane 1	of 1

Official Use Only 232-509249-REPT-001 Rev 5													
R	ECORD OF BOREHOLE N	lo.	BH2	2-8 -	- Ov	erb	<u>urde</u>	<u>en</u>					
Project Number: TZ16018								g Location:	ECM (N51015				
Pro	ject Client: Canadian Nuclear Laboratorie	Canadian Nuclear Laboratories Ltd.								llow Stem Aug	ering / Roc	k Corin	
Pro	ject Name: Multidisciplinary Subsurface	Multidisciplinary Subsurface Investigation for NSDF							(NQ) Truck Mount	ed Drill			amec 🔊
Pro	ject Location: Chalk River, ON							Started:	27 Sep 16	Date Com	pleted: 27	Sep 16	foster wheeler
Log	gged by: MA Com	piled by: SC					Reviewed by:		SC/NR	Revision I	No.: 0, 3	31/10/16	
	LITHOLOGY PROFILE		DIL SA	MPL	NG				TESTING	LAB TES	STING		
					(%)		-		itionTesting	Soil Vapour COV (LEL)		INSTRUMENTATION INSTALLATION	COMMENTS &
ot	DESCRIPTION	e	mber	(%	aD (9		(m) N	O SPT □ MTO Vane*	PPT DCPT Nilcon Vane*	△ COV (ppm) ▲	TOV (ppm)	ENTA FION	GRAIN SIZE
ogy P		le Tyl	le Nu	/ery (N'/R	H (m	ATIO	△ Intact ▲ Remould	 ♦ Intact ♦ Remould 	100 200 3 W _P W	800 400 WL	RUME	DISTRIBUTION (%)
Lithology Plot	Geodetic Ground Surface Elevation: 174.5 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD	DEPTH (m)	ELEVATION		ear Strength (kPa)	Plastic	Liquid 60 80	NSTI NST	GR SA SI CL
	brown (Disturbed) SILTY SAND 174.2	SS	1	100	50/3	ŧ			3	°28			Note: Where N-value is in format, e.g., 50/3, N-value is 50 blows for
	somé gravel 0.2 moist					-	174 -						3 cm penetration.
	End of Overburden Drilling Due to Auger Refusal					-							
	Rock Coring Started					- 1			· · · · · · · · · · · · · · · · · · ·				
									· · · · · · · · · · · · · · · · · · ·				
						-	173 -				1		
						F							
						2	-						
						E							
						-	172 -						
						-							
						- 3				· · · · · · · · · · · · · · · · · · ·			
						E	171 -						
						-							
						4							
						-	170 -						
	BEDROCK					-							
	(for rock core details, see "RECORD OF BOREHOLE No.: BH SH-2 - Rock")					5							
						-	169 -						
						-			· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		
						6							
							168 -						
						E							
						- 7							
						-							
							167 -						
						E							
						8							
						-	100						
							166 -						
						É.		1					
						- 9			, , , , , , , , , , , , , , , , , , ,		1 1 1 1		
	End of Rock Coring at 10.2 m depth					Ē	165 -	.					
						Ē							
L_	- Footer Wheeler					<u>⊦</u> _10							
Env		vater at oring.	complet	ion of bo	orehole	cou l d n	ot be me	easured due to	drilling fluid used	ł			
Sca	Crockford Boulevard rborough, Ontario, M1R 3C3		onted -	notarr	tituto - "	hore'	under-+	nding of all and	ntial conditions and	cont and results 1	orprototi-	listano- f	
Tel.	ada No.: (416) 751-6565 a qualified Geot commissioned a	echnical	Engineer.	. Also, bo	orehole ir	formatio	on shou l d	be read in conju	ntial conditions pres Inction with the geo	technical report for	which it was	natance if C	Scale: 1:53
1													Page: 1 of 1

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R	ECORD	OF BOREI	HOLE N	o. <u>(</u>	<u>GH′</u>	<u>1-1 -</u>	<u>• Ov</u>	<u>erb</u>	urde	<u>en</u>				
Project Number: TZ16018								_ Drilling Location:		Geophysica	al (N5101369, E316355)		-	
Project Client: Canadian Nuclear Laboratories		s Ltd.					_ Drilling Method:		<u>200 mm H</u> (NQ)	ollow Stem Augering / Roo	k Coring			
Project Name: Multidisciplinary Subsurface		nvestig	jation	for NS	DF		Drilling	g Machine:	Truck Mour	nted Drill		amec foster		
Pro	ject Location:	Chalk River, ON							_ Date Started:		12 Oct 16	Date Completed: 13	Oct 16	wheeler
Logged by: BC Compiled by:				SC	SC			wed by:	SC/NR	Revision No.: 0,	31/10/16			
		OLOGY PROFIL	.E	SC	JIL SA	AMPLI	NG			FIELD	TESTING	LAB TESTING Soil Vapour Reading	7	COMMENTS
Lithology Plot		DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	O SPT □ MTO Vane* △ Intact ▲ Remould	AtionTesting PPT	T COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ▲ TOV (ppm) 100 200 300 400 W _P W W _L	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Ë		Surface Elevation: 161.5 m bout 150 mm TOPSO		S	- S		<u><u></u></u>	-		20 40		20 40 60 80	No	GR SA SI CL ote: Where N-value is in format,
	(I tr	dark brown Disturbed) SILTY SAN ace gravel, with organi moist	0.2 ID	SS	1	63	6	-	161 -	0		°13	e.ç 10	g., 50/10, N-value is 50 blows for cm penetration.
		grey/brown						E						
	trace gravel, trace clay, inferred cobbles/boulders dense to very dense moist		SS	2	92	46	- 1 - - -			0	°2			
				SS	3	100	90	- - - - - 2	160 -		0	° ₁₀		
					-4	100	50/3	Ē			50 3			
			158.9					-	159 -					
	(for rock	BEDROCK BEDROCK core details, see "REC EHOLE No. 5 GH1-1 - 1	ORD OF											
		Rock Coring at 32.9 r	n depth	ater at d	complet	tion of bc		could n	not be me	sasured due to	o drilling fluid use	ed		
104 Sca Can Tel.	Crockford Boule rborough, Ontar nada No.: (416) 751-	evard io, M1R 3C3	Borehole details	as prese chnica l E	Engineer.	. Also, bo	orehole in	formati	on shou l d	be read in conju	ential conditions pr unction with the ge	resent and require interpretative ass eotechnical report for which it was	sistance from	Scale: 1 : 53 Page: 1 of 1

								e Only		232-509249	-REPT-0	01 Rev 5
R	ECORD OF BOREHOLE	No.	<u>GH</u>	<u> 1-2 -</u>	Ov	<u>erb</u>	<u>urde</u>	<u>en</u>				
Pr	oject Number: TZ16018						Drilling	g Location:	Geophysica	l (N5101373, E316380)		-
Pr	oject Client: Canadian Nuclear Laborate	ories Ltd.					Drilling	g Method:	<u>200 mm Ho</u> (NQ)	ollow Stem Augering / Ro	k Coring	
Pr	oject Name: Multidisciplinary Subsurfa	ce Investi	gation	for NS	DF		Drilling	g Machine:	Truck Moun			amec T
Pr	oject Location: Chalk River, ON						Date	Started:	13 Oct 16	Date Completed: <u>14</u>	Oct 16	wheeler
Lo		ompiled b		SC			Revie	wed by:	SC/NR		31/10/16	
	LITHOLOGY PROFILE	S	DIL S/	AMPLI	NG				TESTING	LAB TESTING Soil Vapour Reading	z	COMMENTS
ot	DESCRIPTION	e l	mber	(%	ad (%)		(m) N		tionTesting PPT • DCPT Nilcon Vane*	□ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ▲ TOV (ppm)	INSTRUMENTATION INSTALLATION	& GRAIN SIZE
Lithology Plot		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD	DEPTH (m)	ELEVATION	∆ Intact ▲ Remould	 ♦ Intact ♦ Remould 	100 200 300 400 W _P W W _L	ALLA	DISTRIBUTION (%)
Litho		Sam	Sam	Recc	SPT	DEP	ELEV	* Undrained Sh 20 40	ear Strength (kPa) 60 80	Plastic Liquid 20 40 60 80		GR SA SI CL
		0.2 SS	1	63	7	_	164 -			0		
	(Disturbed) SILTY SAND trace gravel, with organics	53.4		00	, '					°22		
	\	-0.7										
	trace gravel firm to dense moist	SS	2	92	34		163 —	0		°10		
	inferred cobbles/boulders	SS	3	200	14	-		0		° ₅		
	rock fragments	61.9				- 2	162 -					
	End of Overburden Drilling Due to Auger Refusal Rock Coring Started	2.2					102					
	BEDROCK (for rock core details, see "RECORD OF BOREHOLE No.: GH1-2 - Rock")											
	nec Foster Wheeler Grou	Indwater at	complet	tion of he	rehole		ot be m		drilling fluid use	d		
En 104	vironment & Infrastructure	ck coring.			nenule		JUDE 1116	aoureu uue IO	arning nulu use	u		
Ca Tel	No : (416) 751-6565 a qualified (etails as pres Geotechnical ned and the a	Engineer	. Also, bo	rehole in	formatio	on shou l d	nding of all pote be read in conju	ntial conditions pro Inction with the geo	esent and require interpretative as otechnical report for which it was	sistance from	Scale: 1 : 53

										se Only				23	2-509249	9-REP	00-T	1 Rev 5		
R	ECORD	OF BOREH	HOLE N	o. 🤉	<u>GH</u>	<u>1-4 -</u>	- Ov	erb	urde	<u>en</u>										
	ject Number:			_						g Location:	G	eophysica	I (N5101	496, 8	E316738)					
	, ject Client:	Canadian Nuclea	r Laboratorie	s Ltd.					Drillin	g Method:	_				igering / Ro	ck Corin	na			
	ject Name:	Multidisciplinary			ation	for NS	DE		-	g Machine:	(F	HQ) ruck Moun			3			ame		Y
	-	Chalk River, ON		Treotig						Started:		Oct 16			mpleted: 6	Oct 16		fost whe		
	ged by:	BC	Comr	oiled by		SC			Revie	wed by:	s	C/NR	Re	vision	No · 0	31/10/16	3	WIIC		
209		OLOGY PROFIL										STING	Ĩ.		STING		<u> </u>	1		
										Penet	tratior	Testing	So	il Vapou	r Reading TOV (LEL)	NO		COMM		
					ber		(%) O		Ê	O SPT	D PP	T OCPT	2	4	6 8 ▲ TOV (ppm)	DNT		8 GRAIN		
v Plo		DESCRIPTION		Type	Num	y (%	/ RQ	Ê		MTO Vane △ Intact	\diamond	lilcon Vane*	100	200	300 400	LATE		DISTRIE	BUTION	
Lithology Plot				Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD	DEPTH (m)	ELEVATION	Remoule * Undrained		 Remould Strength (kPa) 	W _P ■ Plast	W o	Liquid	INSTRUMENTATION INSTALLATION		(%	0)	
Ë	Geodetic Ground	Surface Elevation: 189_1 m brown		Sai	Sai	Re	SP	B				60 80	20	40	60 80	<u>zz</u>	GR	SA Where N-va	SI ue is in for	CL
		Disturbed) SILTY SAN		SS	1	29	2	E									e.g., 5	0/8, N-value		
	ti de	wet	063	00		23		-		Ĩ			⁰ 19)				Serieu auori.		
		reddish brown	<u>188.4</u>					ŧ												
	SILT trace	Y SAND / SAND AND gravel, trace clay, cobl	SILT bbles					E 1	100											
				SS	2	63	57	-	188 -			C	°9							
								E												
								-												
				SS	3	54	46	2					°10			1	1	52	43	4
								ŧ -	187 -											
				SS	4	67	50/8	E			50 8		6							
								-												
								- 3												
	End of O	verburden Drilling Due	185.9					ŀ	186 -							1				
	Lind of O	Refusal	e to Auger 3.2							-										
		Rock Coring Started												-						
														-						
										-			-	-						
														-						
										-			-	-						
														-						
														-						
										-										
		BEDROCK												-						
		core details, see "REC																		
	BORI	EHOLE No.: GH1-4 - R	Rock")							-			-							
														-						
														-						
										-			-							
										-										
														-						
										-			-							
													-							
	End of	Rock Coring at 30.0 m	n depth																	
													-							
	c Foster Whee		Groundwa	ater at c	: omplet	ion of bo	orehole	could n	iot be me	easured due	to dri	lling fluid use	d			•	•			
	ironment & Infr Crockford Boul		∑ in rock co	oring.								J 20								
	rborough, Ontar		Borehole details	as prese	nted, do	not cons	titute a tl	horough	understa	nding of all po	otentia	conditions pr	esent and r	equire i	nterpretative as	sistance fr	om			. 1 . 50
Tel.	No.: (416) 751-	6565	a qualified Geote commissioned a	chnical E	ingineer.	. Also, bo	orehole in	nformati	on shou l d	be read in co	njuncti	on with the ge	otechnica	report f	or which it was					:1:53 1 of 1

						(Offic	ial Us	e Only		232-509249	-REPT-00	1 Rev 5
RECOR	D OF BOREHOL	E No). <u>(</u>	<u>GH′</u>	<u>1-5 -</u>	Ov	erb	urde	<u>en</u>				
Project Numb	er: TZ16018							Drilling	g Location:	Geophysica	l (N5101498, E316774)		
Project Client:	Canadian Nuclear Labor	atories	Ltd.					Drilling	g Method:		ollow Stem Augering / Roo	k Coring	
Project Name	: Multidisciplinary Subsu	rface In	vestig	ation	for NS	DF		Drilling	g Machine:	(HQ) <u>Truck Moun</u>	ted Drill		amec 📐
Project Locati	on: Chalk River, ON							Date	Started:	29 Sep 16	Date Completed: 29	Sep 16	wheeler
Logged by:	BC	Compi	led by	:	SC			Revie	wed by:	SC/NR	Revision No.: 0,	31/10/16	
L	THOLOGY PROFILE		SO	IL SA	MPL	NG				TESTING	LAB TESTING Soil Vapour Reading	z	COMMENTS
				'n		(%)		(E		ationTesting PPT ● DCPT	□ COV (LEL) ■ TOV (LEL) 2 4 6 8	NSTRUMENTATION INSTALLATION B	&
Plot	DESCRIPTION		Type	Jumbe	(%)/	RQD	Ê		MTO Vane* △ Intact	Nilcon Vane* ◇ Intact	△ COV (ppm) ▲ TOV (ppm) 100 200 300 400	ATIO	GRAIN SIZE
Lithology Plot Geodetic Guo			Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD	DEPTH (m)	ELEVATION	Remould		W _P W W _L ■ O ● Plastic Liquid	STRUI	(%)
Geodetic Grou	und Surface Elevation: 188.5 m dark brown		Sai	Sai	Re	SP	DE	E	20 40) 60 80	20 40 60 80		SA SI CL
	(Disturbed) SILTY SAND trace gravel, with organics		SS	1	42	13	-		0		o25	e.g., 5	50/10, N-value is 50 blows for penetration.
	moist	187.8					-	188 -			<u></u>		
	grey/brown SILTY SAND	0.7	SS	2	100	50/10	-			50 10	03		
	very dense moist	1.9					- 1			10	3		
End o	f Overburden Drilling Due to Aug Refusal	er											
	Rock Coring Started												
	BEDROCK												
(for r	ock core details, see "RECORD OF	-											
	OREHOLE No.: GH1-5 - Rock")												
Enc	l of Rock Coring at 31.3 m depth												
Amec Foster W Environment &		roundwat rock cori	ter at c ing.	omp l eti	ion of bo	rehole o	ou l d n	ot be me	easured due to	o drilling fluid use	ed		
	oulevard			ntod d	not a	litute - 1'	orevel	underst	nding of all and	ntial conditions	esent and require interpretative ass	istance from	
Canada Tel. No.: (416) 7 amecfw.com	51-6565 a qualifi	ed Geoteci sioned and	hnica l E	ngineer.	. Also, bo	rehole in	ormatio	on shou l d	be read in conj	unction with the ge	otechnical report for which it was	in turned in Off	Scale: 1 : 53

						(Offic	ial Us	e Only				232	-509249	-REP	T-00	1 Rev 5		
	ECORD OF BOREHOL	E No). <u>-</u>	<u>SH-</u>	1 - (Over	<u>'bu</u>		g Location:	Suppor	rting \$	Structur	re (N51	01743, E31	6671)				
Pro	ject Client: Canadian Nuclear Labo	ratories	Ltd.					Drilling	g Method:		m Ho	llow Ste	em Aug	ering / Roo	k Corin	g			
Pro	ject Name: Multidisciplinary Subsu	Irface Inv	vestig	ation	for NS	DF		Drilling	g Machine:	(HQ) <u>Truck I</u>	Mount	ted Drill					ame		Y
Pro	ject Location: Chalk River, ON							Date	Started:	<u>18 Oct</u>	16	Da	te Com	pleted: <u>18</u>	Oct 16		fost whe	er eler	
Log	gged by: MA	Compil	ed by	:	SC			Revie	wed by:	SC/NR		Re	vision N	No.: 0,	31/10/16	;			
	LITHOLOGY PROFILE		SO	IL SA	MPL	NG			FIELD	TESTIN	IG		B TES		_				
				Ļ		(%)		(E		tionTestin PPT ●	g DCPT	□ cov 2	(LEL)	FOV (LEL)	INSTRUMENTATION INSTALLATION		COMM &		
blot	DESCRIPTION		ype	umbe	(%)	gD	Ê		MTO Vane*	Nilcon \	/ane*	△ COV 100		TOV (ppm) 800 400			GRAIN DISTRIE		
Lithology Plot			Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION	 △ Intact ▲ Remould 	♦ Intac♦ Rem	t Iou l d	W _P	w	W_	ALL		(%)	
Litho	Geodetic Ground Surface Elevation: 188.8 m		Sam	Sam	Reco	SPT	DEP	ELE	* Undrained Sh 20 40		(kPa) 80	Plasti 20		Liquid 60 80	INS7 INS7	GR	SA	SI	CL
	light brown (Disturbed) SAND / SILTY SAND						-									e.g., 5	Where N-value 0/10, N-value		
	trace gravel, with organics moist		SS	1	67	9						0 13				10 cm	penetration.		
		<u>188.1</u>					ŀ												
	SAND / SILTY SAND trace gravel, cobbles / boulders		~~		0.5	50/40	- 1	188 -	5	0									
	compact to very dense moist to wet		SS	2	25	50/10	E		1	0 0 0		2							
							-												
			SS	3	83	69		187 -											
			33	3	03	69	- 2	107 -		0		°5							
		þ					-												
			SS	4	33	54	-			0									
			55	4	00	04	E	186 -				°5							
							- 3	100											
			SS	5	42	50/13	-		5	0									
			00	5	72	00/13	_		1	3		6	-						
							+	185 -											
			SS	6	50	50/15	- 4		- 5	0 0 5						6	67	25	2
			55	0	00	00/13	-		1	5		°5				0	07	20	2
									·····										
	wet		SS	7	58	88/28	-	184 -			88 0 28								
			00	'		00/20	- 5				28	7	-						
							-												
			SS	8	42	50/10	-		5	0 0 0				1					
			00	0	74	00,10		183 -	1	ŏ		°9							
		F					6												
			SS	9	25	50/15	_		5	0		0							
				-			-		. 1	5		9 :							
							-	182 -											
							— 7 E												
							-												
		-																	
			SS	10	21	50/13	-	181 -	5	0		0							
							- 8		- 1	3		8							
							ŀ												
							-												
							Ė,	180 -	4										
		┝					- 9 -												
			SS	11	25	50/15	E		5	005		0 13							
							F			5		13							
							È 40	179 -					-						
Env		Groundwat n rock cori	ter at c ing.	ompleti	on of bo	orehole o	could n	ot be me	easured due to	drilling flu	id use	d							
Sca	Crockford Boulevard rborough, Ontario, M1R 3C3			ntod -	not a	tituto - 1	orevel	undorst		atial oo atia	000	cont and	oquire i- i	orprototi	listano- f				
Tel.	No.: (416) 751-6565 a qualifi	le details as ied Geotech ssioned and	hnica l E	ngineer.	Also, bo	prehole in	formatio	on shou l d	nding of all poter be read in conju	nction with	the geo	otechnical	equire int report for	which it was	nstance fro	/11			1:53
ame	Continued on Next Page							-										Page:	1 of 2

						Offici	al Us	e Only		232-509249	-REP	T-001	Rev 5		
RI	ECORD OF BOREHOLE N	0.	SH-	1 - (Ove	rbur	der						9	A	
Proj	ject Number: TZ16018		_ F	Project	Name	: <u>Multic</u>	liscipli	nary Subsurface Ir	vestig	ation for NSDF			ame		
Proj	ject Location: Chalk River, ON												fost whe	eler	
	LITHOLOGY PROFILE	SC	DIL SA	MPL	NG			FIELD TEST	NG	LAB TESTING					
								PenetrationTest		Soil Vapour Reading	NO		сомм		
			ber		%) O		E)	O SPT D PPT	DCPT		ITATI		& GRAIN		
y Plo	DESCRIPTION	Type	Num	ry (%	/RQ	E)	TION	△ Intact ◇ Int	n Vane* act	100 200 300 400	JMEN LATI		DISTRIB	UTION	
Lithology Plot		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION	Remould Remould Remould Remould Remould Remould Remound Remound Remound Remound Remound Remound Remound Remould Remound Rem		W _P W W _L ■ ● ● ● Plastic Liquid	INSTRUMENTATION INSTALLATION		(%		
Ĕ	arev / liaht arev	Sa	Sa	R.	L R	lä	<u> </u>	20 40 60	80	20 40 60 80	ŻŻ	GR	SA	SI	CL
	grey / light grey SAND / SILTY SAND trace gravel, cobbles / boulders					-									
	compact to very dense moist to wet					Ē	-								
						1	178 -	50							
		SS	12	13	50/8	- 11		50 8		o ₁₁		4	65	29	2
						ŧ	-								
						-	-								
						-	177 -								
						- 12									
	some gravel					÷									
	some gravel	SS	13	13	50/8	-		50 8		°7					
						-	176 —								
						13									
						-		50							
	175.4	SS	14	13	50/8	-		50 8		10					
φď	175.1 INFERRED COBBLES/BOULDERS 13.7					-	175 -								
	OR POSSIBLE SHATTER POOR BEDROCK					- 14									
RЯ						-	-								
φđ						Ē	-								
<u>b</u> 9						-	174 —								
Rд						- 15									
ğđ						E									
ВЧ						-									
νч						E	173 -								
þð						- 16									
64						-									
ßğ						-									
						E	172 —								
bЧ						- 17	-								
кđ	171.5 End of Overburden Drilling Due to Auger17.3														
	Refusal														
	Rock Coring Started														
	BEDROCK														
	(for rock core details, see "RECORD OF														
	BOREHOLE No.: SH-1 - Rock")														
[End of Rock Coring at 28.0 m depth														
									1						

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying Explanation of Borehole Log'.

					(Offic	ial Us	e Only				232	2-5092	49-R	EPT-00	1 Rev	5		
R	ECORD OF BOREHOLE N	0. 3	SH-	2 - (Over	'bu	rden												
	oject Number: TZ16018							Location:	Sup	portina	Structi	ure (N51	01790, E	316640	6)		-		
	pject Client: Canadian Nuclear Laboratories	s Ltd.						Method:					gering / F						
	pject Name: Multidisciplinary Subsurface Ir		ation	for NS	DE			Machine:	(HQ)				joinig/ i		enng	arr	iec		
		Ivestig	Jation										a a lata di	20.0	. 40		ster		
	oject Location: Chalk River, ON						Date 3	Started:	29 3	ep 16	U	ate Con	npleted:	<u>30 Sep</u>	010	wh	eele	er	
Loę	gged by: BC Comp	iled by	:	SC			Revie	wed by:	SC/N	١R	R	evision l	No.:	0, 31/1	0/16	1			
	LITHOLOGY PROFILE	SO	IL SA	MPL	NG			FIELD	TEST	ING		AB TES							
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	MTO Vane* △ Intact ▲ Remould	PPT Nilco ◇ Ir ◆ F	DCPT on Vane* ntact Remould	□ CO 2 △ CO 100 W _F	V (LEL)	TOV (LE 6 8 TOV (pr 300 400 W _L	AT AT	FALLATION	GRA DISTF	IMEN & IN SI IBUT (%)	ZE	
Lithe	Geodetic Ground Surface Elevation: 186.6 m	Sam	San	Rec	SPT	DEF	ELE	* Undrained Sh 20 40		ngth (kPa) 80	Pla 20		Liquid 60 80	INS.				SI	CL
	light brown (Disturbed) SILTY SAND trace gravel moist 	SS	1	75	3	-	- - - - - - - -	0			8				e.g., 1	Where N- 74/25, N-va 1 penetrati	alue is 7		
	light brown to brown 0.7 SAND / SILTY SAND / SAND AND SILT trace gravel, trace clay very dense moist to wet	SS	2	88	56	- - - - -	-		0		°5								
	cobbles grey/brown	SS	3	67	74/25	- - - - - 2	185		7	74 0 25	° 5								
		SS	4	100	59		- - - 184 —		0		°_6								
		SS	5	92	34	- 	-	0			08				5	56		35	3
		ss	6	58	54/23	- - - - - - - - - - - - - - - - - - -	183 —		54 23		°5								
							- - - 182 —				5								
		SS	7	50	50/13	- 5 	-		50 3		6				8 Auge	50 r sample c		38	4
		SS	8	42	50/10	- - - - - - 6	181 -		50 0		° ₆								
	some gravel	SS	9	13	50/13	-	180 —		50 13		⊙5								
						- 7 - - -	-												
		SS	10	58	94/23	- - - - - - - -	179 — - - - -			94 23	°7								
							∠ = 178 -								GWL driling	inferred at on 29 Se	t 8.5 m (p 2016.	depth d	uring
	grey/brown	SS	11	58	50/13		177		50 3		°10				28	41		29	2
Env 104 Sca	Crockford Boulevard rborough, Ontario, M1R 3C3	ring.						asured due to				-			I				
Car Tel.	No.: (416) 751-6565 scfw.com Continued on Next Page	chnica l E	ingineer.	Also, bo	rehole in	formati	on shou l d	nding of all pote be read in conju	ntial cor Inction v	nditions pre vith the geo	esent and otechnica	l require in I report fo	terpretative r which it w	assistan as	ice from			Scale: ′ ige: 1	

232-509249-REPT-001	Rev	5

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R	ECORD OF BOREHOLE N	0.	<u>SH-</u>	2 - (Dvei	bur	den						
Pro	ject Number: TZ16018		_ F	Project	Name	Multid	liscipli	nary Subsurface Investiga	ation for NSDF		am		
Pro	ject Location: Chalk River, ON											ster eeler	
	LITHOLOGY PROFILE	sc	DIL SA	MPL	NG			FIELD TESTING	LAB TESTING				
								PenetrationTesting	Soil Vapour Reading □ COV (LEL) ■ TOV (LEL)	NOI		IENTS	
t	DESCRIPTION	0	her		ND (%		E .	O SPT D PPT • DCPT	2 4 6 8 △ COV (ppm) ▲ TOV (ppm)	NTAT ION	GRAII	& N SIZE	
gy Plo	DESCRIPTION	Type	Nun	sry (%	/ RC	Ű.	NOL	MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould	100 200 300 400 W _P W W _L	UMEI -LATI	DISTRI	BUTION 6)	
Lithology Plot		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION	* Undrained Shear Strength (kPa)	Plastic Liquid	INSTRUMENTATION INSTALLATION			CI
	light brown to brown	ű	Ű	Ř	<u></u>			20 40 60 80	20 40 60 80	<u> </u>	GR SA	SI	CL
	SAND / SILTY SAND / SAND AND SILT trace gravel, trace clay					-	-						
	very dense moist to wet					Ē	- 176 —						
						ŀ		50					
		SS	12	25	50/13	- 11	-	50 13	°8				
	inferred cobbles/boulders					È	-						
						Ē	- 175 —						
						-							
						- 12	-						
						+	-						
		SS	13	0		Ē	- - 174 —						
						-	-						
						- 13	-						
						ŀ	-						
		ss	14	25	50/10	Ē	- 173 —	50 0 10	°_13				
						ŀ		10					
						- 14	-						
						-	-						
						-	172 —						
						È	-						
	trace to some clay	ss	15	21	50/13	- 15	-	50 0 13	°15				
	trace to some clay					È	-		15				
	170.9					-	171						
	grey/brown 15.7 GRAVELLY SAND / SAND AND GRAVEL	1				-	-						
0000	some silt to silty, trace clay very dense					- 16 -	-						
٥Q	moist to wet					Ē	-						
$\hat{\mathcal{O}}_{\mathcal{O}}$		ss	16	21	50/3	-	170 —	50 0 3	°10				
°0							-	3					
$\sum_{i=1}^{n}$						- 17	-						
0000						-	-						
						-	- 169 —						
00						E	-						
٥C		ss	17	13	50/5	- 18 -	-	50 5	° ₁₂				
00						Ē	-	5					
$^{\circ}$						-	168 —						
00						-	-						
0000 0000						- 19 -	-						
000						ŀ	-						
0		ss	18	13	50/8		167 —	50 0 8	° ₁₉				
Por						-	-	8	19				
0000						20	-						
						F	-						
000							166 —						
Po							-						
٥Ô		ss	19	25	50/13	- 21 -	-	50 0 13	0 ₁₁		39 36	23	2
0.1				-		L	-	13	11				

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying Explanation of Borehole Log'.

						Offici	al Us	e Only				23	2-50924	9-RE	РТ- 0	01 F	Rev 5		
Pro	ECORD OF BOREHOLE N oject Number: TZ16018 oject Location: Chalk River, ON	0.						<u>l</u> nary Subsu	urfac	e Investig	ation for	NSD	F				ame fost whe	er	
	LITHOLOGY PROFILE	SC	DIL SA	MPL	NG			FIELD	TE	STING			STING						
thology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	O SPT □ MTO Vane △ Intact ▲ Remould * Undrained S] PPT * Ni ⇔ ∳	Intact Remould trength (kPa)	□ COV 2 △ COV 100 W _P ■ Plastic	(LEL) 4 (ppm) 200 W 0 0	Liquid	∀z		(COMME & GRAIN ISTRIB (%) SA	SIZE UTION	CL
	grey/brown GRAVELLY SAND / SAND AND GRAVEL some silt to silty, trace clay very dense moist to wet with rock fragments	<u></u>	<u></u>	<u>~</u>	<u></u>	 22 	<u>ш</u> 165 —	20 4	<u>) e</u>	5 <u>0 80</u>	20	40	60 80				34	31	UL
	163.5 End of Overburden Drilling Due to Auger23.2	SS	20	50	50/5	- 23	164 -		50 5		°11								
	Refusal																		
	BEDROCK (for rock core details, see "RECORD OF BOREHOLE No.: BH SH-2 - Rock")																		

EBROCK (Periods.com defails.see "RECORD OF BORBIOLE No.: bH 3F 2 - Nood") End of Rock Coring at 30.1 m depth				
(for rook core details, see "RECORD OF BOREHOLE No.: BH SH-2 - Rock")				
End of Rock Coring at 30.1 m depth				
End of Rock Coring at 30,1 m depth				
End of Rock Coring at 30.1 m depth				
End of Rock Coring at 30.1 m depth				
	End of Rock Coring at 30.1 m depth			
commissioned and the accompanying Explanation of Borehole Log	Borehole details a qualified Geote commissioned a	as presented, do not constitute a thorough understa chnical Engineer. Also, borehole information should nd the accompanying Explanation of Borehole Log	nding of all potential conditions present and require interpretative be read in conjunction with the geotechnical report for which it v	a assistance from Scale: 1 : 5 vas Page: 3 of

						Offic	ial Us	e Only			232-509249	-REPT	-001 Rev 5
R	ECORD OF BOREHOLE N	0.	SH-	3									
Pro	ject Number: TZ16018						Drilling	g Location:	<u>Supporti</u>	ng S	tructure (N5101828, E310	6631)	
Pro	ject Client: Canadian Nuclear Laboratorie	s Ltd.					Drilling	g Method:	200 mm	Holl	low Stem Augering		
Pro	ject Name: Multidisciplinary Subsurface I	nvestig	gation	for NS	DF		Drilling	g Machine:	Truck Mo	ounte	ed Drill		amec 🔊
Pro	ject Location: Chalk River, ON						Date	Started:	<u>16 Oct 16</u>	3	Date Completed: 17	Oct 16	foster wheeler
Log	ged by: MA Com	oiled by	/:	SC			Revie	wed by:	SC/NR		Revision No.: 0, 3	31/10/16	
	LITHOLOGY PROFILE	sc	DIL SA		NG			FIELD	TESTING	;	LAB TESTING Soil Vapour Reading	-	COMMENTS
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 184.8 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	O SPT □ MTO Vane* △ Intact ▲ Remould	 Intact Remou ear Strength (ki 	CPT	□ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ▲ TOV (ppm) 100 200 300 400 W _P W W, ■ O V Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	light brown (Disturbed) SAND / SILTY SAND					-							
	trace gravel, with organics moist	SS	1	54	6						0 19		
						ŀ	184 -						
	SAND (SLTY SAND trace gravel compact to very dense moist	SS	2	54	79	- - - 1 - -	104		0		°4		
						ł							Note: Where N-value is in format,
		SS	3	67	91/28	- - - 2	183 -		2	91 28 28	° <mark>4</mark>	e	e.g., 91/28, N-value is 91 blows for 28 cm penetration.
	some gravel					+			0				
	J	SS	4	38	50/5	Ē	182 -		0 5		°3		1 64 30 5
						- 3	102						
		ss	5	8	50/13	F			50 3	·····ə	1		
		ss	6	21	50/13	- - 4 -	181 –		50 3		°5		
		ss	7	21	50/8	- - - - - - 5	180 -		50 8		°5		6 60 30 4
													Hard augering and below
		ss	8	13	50/8	- - - - - 6	179 -		50 8		0 14		
	INFERRED COBBLES/BOULDERS 6.6 OR POSSIBLE SHATTER POOR BEDROCK					-	178 -						
βÇ	some gravel, some sand moist	<u> </u>				- 7							
		SS	9	13	50/5				50 5				
۶Č							177 -						
5 C DC						- 8							
βČ						-							
<u>8</u> C						F							
ķč		SS	10	6	50/13	F	176 -	-	50 3				
ЬС С						- 9			2				
ßç						F							
						-	175 -						
Q Am	ec Foster Wheeler			l		<u>Г_10</u>	n har-!		on of definition		: : : :		
Env	ironment & Infrastructure	landing	ground	water me	easured	in ope	n boreho	ble on complet	on of arilling	•			
	Crockford Boulevard rborough, Ontario, M1R 3C3 ada Borehole details	as prese	nted, do	not cons	stitute a th	norough	understa	nding of all pote	ntial condition	s pres	sent and require interpretative ass	istance from	1
Tel.	No.: (416) 751-6565 a qualified Geote cfw.com	echnica l E	Engineer.	. Also, bo	orehole in	formatio	on shou l d	be read in conji	Inction with the	e geot	technical report for which it was		Scale: 1 : 53 Page: 1 of 3

Continued on Next Page

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	ECORD OF BOREHOLE N	10.						.			
	iject Number: TZ16018		_ F	Project	Name:	Multic	liscipli	nary Subsurface Investig	ation for NSDF		amec 🔊
TC	ject Location: Chalk River, ON										wheeler
	LITHOLOGY PROFILE		DIL SA		NG			FIELD TESTING PenetrationTesting	Soil Vapour Reading COV (LEL) TOV (LEL)	z	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	O SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould	2 4 6 8 △ COV (ppm) ▲ TOV (ppm) 100 200 300 400 W _P W W _L	NSTRUMENTATION INSTALLATION B	& GRAIN SIZE DISTRIBUTION (%)
	INFERRED COBBLES/BOULDERS	San	San	Rec	SPT	DEF	ELE	* Undrained Shear Strength (kPa) 20 40 60 80	Plastic Liquid 20 40 60 80		SA SI C
	OR POSSIBLE SHATTER POOR BEDROCK some gravel, some sand moist	SS	11	0	50/10	- - - - - - - - - - - - - - - - - - -	174 —	50 10			
							173 -	50			
	trace day	SS	12	21	50/5	- - 12 - -	-	50	°16	11	64 (25)
			12	47	50/45	- - - 13 -	172 -	50 15			
		SS	13	17	50/15	- - - - - - - - - - - - - - - - - - -	171 -	15	D 2		
		ss	14	8	50/5		170 —	50			
			14	0	50/5	- 15 - - -	-	5	3		
			15		50/15	- - - - - -	169 -	50			
		SS	15	4	50/15	- - - - - - 17 -	168 -	50 15	3		
		ss	16	8	50/15	- - - - - - - -	167 —	50	0,6		
							166 -				
		SS	17	8	50/8	- 	-	50			
						- 20	165 —				
		ss	18	8	50/15	- 21	164 -	50 15	5-2-2		

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RI	ECORD OF BOREHOLE N	0.	SH-	3				Se Only	232-309249	1121 1 00					
	ect Number: TZ16018		_ 1	Project	Name	Multic	discipl	nary Subsurface Investigati	on for NSDF		amec				
Proj	ect Location: Chalk River, ON							1 1			wheeler				
	LITHOLOGY PROFILE	SC	DIL SA		NG			FIELD TESTING	LAB TESTING Soil Vapour Reading	z	COMMENTS				
			Der		(%) (Ē	O SPT D PPT • DCPT	2 COV (LEL) ■ TOV (LEL) 2 4 6 8 2011(() 1 TO)(()	INSTRUMENTATION INSTALLATION BD	& GRAIN SIZE				
y Plot	DESCRIPTION	Type	Numt	N (%)	/ RQE	Ē	TION	MTO Vane* Nilcon Vane* △ Intact ◇ Intact	COV (ppm) ▲ TOV (ppm) 100 200 300 400 W _p W W ₁	TATIO	DISTRIBUTION				
tholog		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION	 Remould Remould * Undrained Shear Strength (kPa) 	Plastic Liquid	ISTRU	(%)				
⊑ D9		<i>i</i> ñ	00	Ľ.	ō	-	ш	20 40 60 80	20 40 60 80	<u>žž</u> gr	SA SI CL				
ЪЗ	OR POSSIBLE SHATTER POOR BEDROCK some gravel, some sand moist					-	163 -								
ßd						- 22	100								
83						-									
φď						-		-							
ЪЗ						-	162 -								
ßd						- 23									
83						-									
φď						E									
ЪЗ						-	161 -								
ßd		SS	19	8	50/5	- 24 -		50 5							
83															
φď															
<u>8</u> 0															
ßd															
88															
φď						-	159 -								
69						- 26									
ßğ						F									
83						-	158 -								
ģđ						- 27	150 -								
69 67		SS	20	0											
ßğ		<u> </u>				-									
89 8						-	157 -								
¢ď						- 28									
6 A						-									
ßğ						-									
КЯ							156 -								
þğ						- 29 -									
ВЧ						-									
	154.9					È	155 -								
	End of Borehole 29.9														
	Borehole details a qualified Geot commissioned a	echnical E	Engineer.	. Also, bo	rehole in	formatio	on should	nding of all potential conditions prese be read in conjunction with the geote	nt and require interpretative ass chnical report for which it was	stance from	Scale: 1 : 53 Page: 3 of 3				

								Offic	ial Us	e Only		23	32-509249	-REPT-00)1 Rev 5	
RECORD OF BOREHOLE No. SH-4 - Overburden Project Number: TZ16018 Drilling Location: Supporting Structure (N5101135, E316806) Project Client: Canadian Nuclear Laboratories Ltd. Drilling Method: 200 mm Hollow Stem Augering / Rock Coring (HQ) Project Numer: Multidiciplinary Suburfees Investigation for NSDE Drilling Method: 200 mm Hollow Stem Augering / Rock Coring (HQ)																
Pro	oject Number:	TZ16018							_ Drilling	g Location:	Supporting	Structure (N	5101135, E31	6806)		AR
Pro	oject Client:	Canadian Nuclear Lab	oratories	s Ltd.					_ Drilling	g Method:		ollow Stem A	ugering / Roc	k Coring		
Pro	oject Name:	Multidisciplinary Subs	urface i r	nvestig	jation	for NS	DF		_ Drilling	g Machine:	(HQ) Truck Moun	ted Drill				
Pro	oject Location:	Chalk River, ON							_ Date \$	Started:	11 Oct 16	Date Co	ompleted: 11	Oct 16	foste	
Lo	gged by:	кт	Comp	oiled by	/:	sc			Revie	wed by:	SC/NR	Revisio	n No.: 0, 3	31/10/16	-	
	LITH	OLOGY PROFILE		SC	JIL SA	MPLI	NG			FIELD	TESTING		ESTING ur Reading	_		
Lithology Plot		DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	O SPT □ MTO Vane* △ Intact ▲ Remould	♦ Intact♦ Remould	□ COV (LEL) 2 4 △ COV (ppm) 100 200 W _P V ■	■ TOV (LEL) 6 8 ▲ TOV (ppm) 300 400 V WL	INSTRUMENTATION INSTALLATION	COMM & GRAIN DISTRIB (%	SIZE BUTION
Lith	Geodetic Ground	Surface Elevation: 156.6 m		San	San	Rec	L L S	DEI		* Undrained Sh 20 40	ear Strength (kPa) 60 80	Plastic 20 40	Liquid 60 80		R SA	SI CL
		urbed) SAND / SILTY SAND ace gravel, with organics moist	155.9	SS	1	58	6		156 -	0			0 65			
		light grey / grey SAND / SILTY SAND trace gravel compact wet	0.7	SS	2	50	29	- - - - - -		0		°8				
				SS	3	48	16	- 2	155 —	0		° ₁₁		20	0 66	(14)
		some gravel		ss	4	93	27			0		°14				
	Er	d of Overburden Drilling	153.9 2.6		<u> </u>		<u> </u>	-	154 -			14				
		Due to Auger Refusal Rock Coring Started														
	BOR	BEDROCK core details, see "RECORD (EHOLE No.: SH-4 - Rock")														
Env 104 Sca Car Tel	ec Foster Whee vironment & Infr Crockford Bould arborough, Ontar nada . No.: (416) 751-1 ecfw.com	evard io, M1R 3C3	in rock co	oring. as prese chnical E	ented, do Engineer.	not cons	titute a th	horough	understa	nding of all pote	o drilling fluid use ntial conditions pre unction with the geo	esent and require	interpretative ass for which it was	istance from		Scale: 1 : 53

						Offic	ial Us	e Only		232-5092	19-REP	T-001	Rev 5	
R	ECORD OF BOREHOLE N	о.	<u>SH-</u>	<u>5 - C</u>	<u>Dvei</u>	rbu	rden	<u>1</u>						
	oject Number: TZ16018							J Location:	Supporting	Structure (N5101337, E	316316)			AR
Pro	oject Client: Canadian Nuclear Laboratorie	s Ltd.					Drilling	g Method:	200 mm Ho	ollow Stem Augering / R	ock Corir	g		
	bject Name: Multidisciplinary Subsurface I	nvestir	gation	for NSI	DF			g Machine:	(HQ) Truck Mount				ame	
	oject Location: Chalk River, ON							Started:	12 Oct 16	Date Completed:	2 Oct 16		foste	
Lo	gged by: BC Comp	piled by	y:	SC			Revie	wed by:	SC/NR	Revision No.:), 31/10/16	;		
	LITHOLOGY PROFILE	sc	DIL SA	MPL	NG			FIELD	TESTING	LAB TESTING				
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	(m) H	ELEVATION (m)		tionTesting PPT • DCPT Nilcon Vane*	Soil Vapour Reading COV (LEL) ■ TOV (LE 2 4 6 8 △ COV (ppm) ▲ TOV (ppi) 100 200 300 400 W _P W W _L 100 100	μĘΖ		COMM & GRAIN ISTRIB (%	SIZE
itholo		Sampl	ampl	Recov	PT "	DEPTH	ILEV	* Undrained Sh 20 40	ear Strength (kPa) 60 80	Plastic Liquid 20 40 60 80	NSTF	GR	SA	SI CL
	Geodetic Ground Surface Elevation: 161.1 m About 100 mm TOPSOIL 161.0		0,		0,	-	161 -	20 40	0,0 8,0	20 40 60 80	+==			
	(Disturbed) SILTY SAND trace gravel moist160.4	SS	1	63	4	-	-	0		°5				
	grey/brown 0.7 SAND / SILTY SAND / SANDY SILT trace to some gravel firm to very dense moist	ss	2	75	8	- - - - - -	160 -	0		°5				
		ss	3	67	8	- - - - - - 2	159 —	Ō		° ₆				
		ss	4	75	5		-	0		°5		-	98	(2)
	wet	ss	5	83	19	1	158 - Z -			O ₁₉		Wet spoo	n	
		SS	6	83	7	- - - - - - - -	157 —	0		°30		-	95	(5)
		SS	7	100	16	- - - - 5	156 -	0		° 16		13	36	49 2 Je is in format.
	inferred cobbles/boulders			100	50/40	F	150 -		iQ			e.g., 50/1		e is 50 blows for
	155.7 End of Overburden Drilling 5.4 Due to Auger Refusal Rock Coring Started		8	100	50/10	-			0	19		i o on po	in a la l	
	BEDROCK (for rock core details, see "RECORD OF BOREHOLE No.: SH-5 - Rock") End of Rock Coring at 15,5 m depth													
	ec Foster Wheeler Groundw	/ater wo	s inferro	dat 3.4	m on 1'	1 2 Oct 2	016 duri	na drillina. Gra	undwater at			L		
Env 104 Sca Car Tel.	tironment & Infrastructure Crockford Boulevard rborough, Ontario, M1R 3C3 ada Borehole details	as prese	ented, do Engineer.	not cons Also, bo	titute a th rehole in	horough	understa on should	nding of all pote	undwater at d in rock coring. ntial conditions pre nction with the geo	esent and require interpretative otechnical report for which it wa	assistance fr	om		Scale: 1 : 53 Page: 1 of 1

							Offic	ial Us	e Only		232-50924	9-REPT-0	01 Rev 5		
R	ECORD OF BOREHOI	LE N	o .	SH-	6 - 0	Dvei	rbu	rder	1						
Pro	ject Number: TZ16018							Drilling	g Location:	Supporting	Structure (N5101611, E3	6429)	_		
Pro	ject Client: Canadian Nuclear Labo	oratories	s Ltd.					Drilling	g Method:		ollow Stem Augering / Ro	ck Coring			
Pro	ject Name: Multidisciplinary Subs	urface Ir	nvestig	ation	for NS	DF		Drilling	g Machine:	(HQ) <u>Truck Moun</u>	ted Drill		amec 🔊		
Pro	ject Location: Chalk River, ON							Date	Started:	12 Oct 16	Date Completed: 13	Oct 16	foster		
	ged by: MA	Comp	ilad bu		SC			Davia		SC/NR	Devision No.	24/40/46	wheeler		
LOU	ged by: MA LITHOLOGY PROFILE	Comp	oiled by					Revie	wed by:	TESTING	Revision No.: 0,	31/10/16			
									1	ationTesting	Soil Vapour Reading □ COV (LEL) ■ TOV (LEL)	NO	COMMENTS		
ot	DESCRIPTION		Ð	nber	()	(%) Q		(E)		PPT • DCPT	2 4 6 8 △ COV (ppm) ▲ TOV (ppm)	INSTRUMENTATION INSTALLATION	& GRAIN SIZE		
gy Pl	DECONT NON		e Typ	e Nur	ery (°	I'/RC	E T	ATIOI	MTO Vane* △ Intact ▲ Remould	Nilcon Vane* ◇ Intact ◆ Remould	100 200 300 400 W _P W W _L		DISTRIBUTION (%)		
Lithology Plot			Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD	DEPTH (m)	ELEVATION	* Undrained Sh	ear Strength (kPa)	Plastic Liquid	USTR VSTR	GR SA SI CL		
	Geodetic Ground Surface Elevation: 174.9 m reddish brown (Diaturbed) SAND / SU TX SAND		0	<u></u> о	ĽĽ.	0	-	ш	20 40	60 80	20 40 60 80				
	(Disturbed) SAND / SILTY SAND trace gravel moist		SS	1	79	5	-		0		0 ₁₀				
		174.3					ŀ								
	grey / light grey SAND / SILTY SAND	0.7					 	174 -							
	compact to very dense moist to wet SS 2 79 14 0 0 brown														
	most to wet brown grey SS 3 58 36														
	grey SS 3 58 36														
	grey SS 3 58 36 2 173 0 0 4														
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$														
	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$														
			55	4	96	32					9				
							- 3	172 -							
			SS	5	42	20	-								
			55		42	20					4				
							1_ -								
			SS	6	63	32	- 4	171 -	0		°7				
							F								
			SS	7	13	25	-	170 -	0		0		- 69 (31)		
							- 5	170 -			10				
							F					Han	d augering		
			SS	8	79	31	-		0		° 14				
							- 6	169 -							
							ŧ								
			SS	9	79	73	Ē			• • • • •	o ₉				
							Ē								
							- 7	168 -							
							F]						
							Ē								
				40	50		Ē			<u>,</u>		Wet	t spoon		
			SS	10	58	82	- 8	167 -		O	14				
							Ē								
							È								
							È,	166 -]						
							- 9 -								
			SS	11	96	46	È]	0	0 ₁₀				
							ŧ								
	,						Ė ₁₀	165 -							
	ec Foster Wheeler ironment & Infrastructure	Groundwa	ater at c	completi	ion of bo	orehole (could n	ot be me	asured due to	o drilling fluid use	ed	_			
104	Crockford Boulevard	in rock co	ning.												
Can	No · (416) 751-6565 a quali	ified Geote	chnical E	Ingineer.	. Also, bo	rehole in	formatio	on shou l d	nding of all pote be read in conju	ntial conditions pro	esent and require interpretative as otechnical report for which it was	sistance from	Scale: 1 : 53		
	comm comm	issioned ar	nd the ac	compan	ying'Expl	anation o	of Boreh	ole Log'.					Page: 1 of 2		
_	Continued on Next Page				_	_		_							

	ECORD OF BOREHOLE N	0.														
	vject Number: TZ16018 vject Location: Chalk River, ON		_	Project	Name	Multic	liscipli	nary Subsi	urface	e Investiga	ation for NSDF			-	ame fost	ter
-10		90	DIL SA	MDI	NG	1		FIELD		TING	LAB TES	TING			whe	eler
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Peneti O SPT E MTO Vane △ Intact ▲ Remould * Undrained S	rationT] PPT * Nil ♦	esting DCPT con Vane* Intact Remould rength (kPa)	Soil Vapour I COV (LEL) 2 4 COV (ppm) 100 200 W _P W OPlastic	Reading TOV (LEL) 6 8	INSTRUMENTATION INSTALLATION	GR	COMMI & GRAIN DISTRIB (%	SIZE
	grey / light grey SAND / SILTY SAND trace gravel, cobbles / boulders compact to very dense moist to wet	ss	12	42	50/25				50 25	<u> </u>	0 17			Note: V	Where N-valu	ue is in format, is 50 blows for
						- - - - - - - - - - - - - - - - - - -	163 —		25		17				'	
		SS	13	25	50/15	- - - - - - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - - - - -		50 15		°11			Hard a	ugering 60	17 (2)
	inferred cobbles/boulders 161.2	SS	14	25	50/15	- - - -	-		50 0 15		°15					
	End of Overburden Drilling Due to Auger13.7 Refusal Rock Coring Started															
	BEDROCK (for rock core details, see "RECORD OF BOREHOLE No.: SH-6 - Rock")															
	End of Rock Coring at 26.9 m depth															

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Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying Explanation of Borehole Log'.

R	REC	ORD OF BOREHOL	E N.	o. <u>E</u>	<u>3H</u>	<mark>2-</mark> ′	1 -	Ro	C	<u>k</u>											
		T No. : TZ16018													ECM (N510150			6361)			amec
	.IENT ME /	: Canadian Nuclear Laborato : Multidisciplinary Subsurface			for N	ISDE	- Ch	nalk		DRILI INCL					: 14 Oct 16 - 14 (: Vertical	Oct	16				foster wheeler
	CATIC		moon	guion		ODI	01			AZIM			•	• /	: Vertical						DATUM: Geodetic
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.		LEV.	PENETRATION RATE (m/min)	SH COLOUR % RETURN		COVER	٦Y) GE		sym INIC	AL RO	d descriptions refer to CK DESCRIPTION TERMINOLO DISCONTINUITY DATA			ROCK STRENGTH INDEX	WEATHERING	INDEX	NOTES WATER LEVELS INSTRUMENTATION
	DRII	5 -	ගි ((m)	PENE	FLUSH				249 249		3339		(deg.) 응응응	DESCRIPTION	Jr	Ja	828888 X	8 5 5 5		
-		 For overburden details, see "RECORD OF BOREHOLE BH2-1 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - BH2-1" 																			
		Rock Coring Started on 14 October 2016																			
-10				64.30						Ш											-
		DIORITE BEDROCK	×.	10.21							l			•	JN, PL, SR, Ch		1				
		RC 13: Classification based on RQD: Excellent		R(1;										•	JN, PL, SR, Ch JN, PL, RO, Ch		1				- - - - -
-12		RC 14: Classification based on RQD: Excellent		R(14										•	JN, PL, RO, Ch JN, PL, SR, Ch JN, UN, RO, Ch		1 1 0.75				-
- - - 14 - -	14/10/2016 Ηα	RC 15: Classification based on RQD: Excellent		R(15										•	JN, PL, SM, Ch JN, PL, SR, Ch JN, PL, SR, Ch JN, PL, SR, Ch JN, PL, SR, Ch		0.75 1 0.75 1 1.5				- - - - - - - - - - - -
-16		RC 16: Classification based on RQD: Excellent		R(16	5									•	JN, PL, SR, Ch JN, UN, SR, Ch JN, PL, SR, Ch JN, PL, SR, Ch JN, UN, SR, Ch JN, PL, SR, Ch JN, PL, SR, Ch		1 1.5 1 1 1 1 0.75				- - - - - - -
		RC 17: Classification based on RQD: Poor		R(17	0								>	>			1				- - - - - - - - - - - - -
-18		RC 18: Classification based on RQD: Poor		R(18									>	>							-
	GROUNDWATER ELEVATIONS SHEET 1 of 2																				
	IN OPEN BOREHOLE ON COMPLETION LOGGED : MA WATER LEVEL (date) CHECKED : SC/NR																				
															GHEGRED	•	50/1	***			

F	RE	C	ord of Borehoi	_E	No.	E	<u>BH</u>	2- ′	<u>1 -</u>	R	C	: <u>k</u>											
			No. : TZ16018														ON	: ECM (N51015			6361)		amec
	-IEI Ame		: Canadian Nuclear Laborato : Multidisciplinary Subsurface			on fe	or N	SDF		halk				NG D ATIC			.)	: 14 Oct 16 - 14 : Vertical	Oct	16			foster wheeler
					Jougane	/// /(001	- 01	an				TH (C			J-)	: Vertical					DATUM: Geodetic
DEPTH SCALE (metres)		DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN	REC TOTAI CORE	COVE		R.Q	ND G		CHN FURE EX 1 m		s and ROC angle	d descriptions refer to CK DESCRIPTION TERMINO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	LOGY Jr	Ja	ROCK STRENGTH INDEX	WEATHERING	NOTES WATER LEVELS INSTRUMENTATION
	F		DIORITE BEDROCK			RC 18			0400		400	0.4		0,-,				JN, PL, K, Ch	+	1.5	242555		
-20 -20	14/10/2016	ΡH	RC 19: Classification based on RQD: Fair End of Rock Coring		<u>153.79</u> 20.72	18 RC 19										•		JN, PL, SM, Ch JN, PL, SR, Ch JN, PL, SR, Ch JN, PL, SM, Ch		1.5 1.5 1.5 1.5			
- - -22																							- - - - - -
- - - - -24 -																							
NOL NOL																					5	HEET	2 of 2
N N N N N				CON	MPLET	ON												LOGGED		MA			
			WATER LEVEL (date)															CHECKED	e :	SC/	NR		

F	RE	С	ORD OF BOREHOL	_E	No.	B	SH2	2-2	2 -	R	ο	ck											
CL N/	-IEM Ame	١T	TNo. : TZ16018 : Canadian Nuclear Laborator : Multidisciplinary Subsurface N River, ON			on fo	or NS	SDF	- C	hall	<	D II	RILL RILL NCLII ZIMU	ING VATI	DAT	E Deg.		: ECM (N510136 : 11 Oct 16 - 11 0 : Vertical : Vertical			6468)		amec foster wheeler DATUM: Geodetic
DEPTH SCALE (metres)		חעוררואפ אברטאח	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	는 굳	FLUSH COLOUR RETURN		COV				FRA IN PE			and ROC ngle	descriptions refer to K DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr	Ja	ROCK STRENGTH	WEATHERING	NOTES WATER LEVELS INSTRUMENTATION
-			 For overburden details, see "RECORD OF BOREHOLE BH2-2 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - BH2-2" 																				
ŀ			Rock Coring Started on 11 October 2016																				
- - -			QUARTZFELDSPATHIC GNEISS BEDROCK RC 3: Classification based on RQD: Excellent		<u>162.64</u> 1.01						>						• •	JN, CU, RO, Ca JN, PL, RO, Io JN, PL, RO, Io		0.75 0.75 0.75			
- -2 - - - -			RC 4: Classification based on RQD: Good			RC 4										•		JN, PL, RO, Io JN, PL, SR, Ch/Ca JN, PL, RO, Io JN, PL, RO, Io JN, PL, RO, Ca/Io JN, PL, RO, Ca/Io JN, PL, RO, Ch/Io		0.75 0.75 1 0.75 0.75 0.75 0.75 0.75 0.75			-
- - - - - - -			RC 5: Classification based on RQD: Good			RC 5				>	>					• • •	•	JN, PL, RO, Sa/Ch JN, PL, RO, Ch/lo JN, UN, RO, Io/Sa JN, PL, RO, Io JN, PL, RO, Ch/lo JN, PL, RO, Ch/lo		2 0.75 0.75 1 1			
-	11/10/2016	Н	RC 6: Classification based on RQD: Excellent			RC 6				>	>					•		JN, PL, RO, Ch/Ca JN, PL, RO, Ch/Ca		1			
			RC 7: Classification based on RQD: Excellent			RC 7																	
			RC 8: Classification based on RQD: Excellent			RC 8																	
			RC 9: Classification based on RQD: Excellent			RC 9																	
			GROUNDWATER ELEN IN OPEN BOREHOLE ON WATER LEVEL (date)															LOGGED CHECKED		BC SC/I		SHEET	1 of 2

F	REC	ORD OF BOREHOL	E No.	BH	2-2	2 -	R	oc	k												
		Г No. : TZ16018											NC	: ECM (N510136			6468	3)			amec
	LIENT AME /	: Canadian Nuclear Laborator : Multidisciplinary Subsurface		for N	ISDF	= - C	halk		DRIL INCL)	: 11 Oct 16 - 11 C : Vertical)ct 1	16					foster wheeler
	OCATIO					-			AZIM				-/	: Vertical							DATUM: Geodetic
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	ELEV. DEPTH (m)	SAMPLE NO. PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN	RE TOT/ CORE	ECOVE	RY OLID DRE %	R.Q.I) GEO). FR/ II PE	ACTURI NDEX ER 1 m	Alpha a (deg	and d ROCK angle	descriptions refer to (DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION)GY Jr	Ja	ROCK STRENGTH		WEATHERING INDEX		NOTES WATER LEVELS INSTRUMENTATION
-	<u> </u>	Fiel of Deals Carrier	10.16	-		% 6 %		488	548	َى 8	<u>849</u>	<u> </u>	500 000		$\left \right $		81888	222	000 000 000 000 000 000 000 000 000 00	*	
		End of Rock Coring	10.16																		
KOC																		S⊦	IEET	2	of 2
ECF		IN OPEN BOREHOLE ON WATER LEVEL (date)	COMPLETIO	N												BC SC/N	IR				
AM														UNEUNED	: 4	JU/N	11				

R	REC	ORD OF BOREHOL	_E	No.	B	H2	2-3	3 -	R	OC	: <u>k</u>												
		T No. : TZ16018 : Canadian Nuclear Laborato	rical	td												ION	ECM (N510121 : 7 Oct 16 - 7 Oct			6595	5)		amec
	.IENT ME /	: Multidisciplinary Subsurface			on fo	or NS	SDF	- Cl	halk	<				DA ⁻ ION		eg.)	: Vertical	. 10					foster wheeler
LC	CATIC	DN River, ON									AZ	ZIMU	JTH	(Deg	g.)		: Vertical						DATUM: Geodetic
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	μĘ			COVE	ERY SOL I D ORE 9	R	AND 8.Q.D. %	GEOT		symb NICA		DESCRIPTION	Jr	Ja	ROCK STRENGTH		WEATHERING INDEX	NOTES WATER LEVELS INSTRUMENTATION
 - -		 For overburden details, see "RECORD OF BOREHOLE BH2-3 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - BH2-3" 	[-		140		14.00	5	4.00								82 82 82 82 82 82 82 82 82 82 82 82 82 8		W1 W2 W3 W3 W5 W5 W5 W5 W5	
-		Rock Coring Started on 7 October 2016																					-
- - -2 -		GNEISS BEDROCK RC 4: Classification based on RQD: Good		<u>156.05</u> 1.45	RC 4												JN, PL, RO, Ch JN, PL, RO, Ch		0.75				
- - - -4		RC 5: Classification based on RQD: Fair			RC 5												JN, PL, RO, Io		1				
- - - - -	07/10/2016 HQ	RC 6: Classification based on RQD: Very Poor			RC 6												JN, PL, RO, Io		1				
-		RC 7: Classification based on RQD: Very Poor			RC 7																		
- 		RC 8: Classification based on RQD: Very Poor			RC 8																		-
- - -		RC 9: Classification based on RQD: Excellent			RC 9											•	JN, PL, SR, Ca/Ch/lo JN, PL, RO, Ca		1				
		GROUNDWATER ELE														<u>1 </u>	<u>I</u>	<u> </u>			SF	IEET	1 of 2
		☑ IN OPEN BOREHOLE ON WATER LEVEL (date)	CON	NPLET	ION												LOGGED CHECKED		MA SC/N	NR.			
		· · · · · ·															SHEORED		20/1		_		

F	R	EC	ORD OF BOREHOL	_E	No.	B	H	2-:	3 -	R	20	cl	<u> </u>											A
			Г No. : TZ16018															N : ECM (N51012		31	6595)			amec
		ENT 1E /	: Canadian Nuclear Laborato : Multidisciplinary Subsurface			on fr	or N	SUB	=	`ha	lk.		DRILL INCLI					: 7 Oct 16 - 7 Oc : Vertical	xt 16					foster wheeler
				IIIVe	suyauc			501	- 0	ma	IN		AZIMU					: Vertical						DATUM: Geode
DEPTH SCALE (metres)		DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)	FLUSH COLOUR % RETURN	RI TOT CORI 0.49	ECO AL E %	HOLO VERY SOLI CORE	D %		GEC		sym HNIC		IND descriptions refer to OCK DESCRIPTION TERMINOL DISCONTINUITY DATA gle TYPE AND SURFACE DESCRIPTION	.OGY Jr	Ja	ROCK STRENGTH INDEX	WEATHERING		NOTES WATER LEVELS INSTRUMENTATION
-	┢		GNEISS BEDROCK			RC	<u> </u>		40		110		2489	5 4	<u>,555</u>	Ň c			+		5155555	W3 W3 W3 W3 W3 W3 W3 W3 W3 W3 W3 W3 W3 W	88	
- - - - - - - - - - - - - - - - - - -	07/10/2016	HQ	RC 10: Classification based on RQD: Good		<u>145.30</u> 12.20	9 RC 10											•	JN, PL, RO, Ca/Ch/lo JN, PL, RO, Ch/Ca JN, PL, RO, Ch/Ca JN, PL, RO, Ch/Ca JN, PL, RO, Ch JN, PL, RO, Ch JN, PL, RO, Ch		1.5 1.5 1.5 1.5 1 1				
- - - - - - - - - - - - - - - - - - -																								
			GROUNDWATER ELE ☑ IN OPEN BOREHOLE ON WATER LEVEL (date)															LOGGED CHECKED		MA SC/I		HEE		of 2

R	RE	С	ORD OF BOREHOL	.E	No.	B	BH2	2-4	-	R	0	cł	<u><</u>												
CL	ROJ LIEN AME	IΤ	۲ No. : TZ16018 : Canadian Nuclear Laborator : Multidisciplinary Subsurface			on fo	or NS	DF	- C	hal	k	I	DRIL	LIN.	IG LO IG D/ ATIOI	ATE	Ξ		: ECM (N510119 : 12 Oct 16 - 12 (: Vertical			6711)		amec foster wheeler
LC	_		N River, ON				<u></u>					/	AZIN	1UT	Ή(D	eg.)		: Vertical				_		DATUM: Geodetic
DEPTH SCALE (metres)		אוררואפ אביסאם	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	뜬 힡	Ξį lo	RE TOTA CORE	ECOV	'ERY SOL CORE	D %	R.Q.I	D GE	RACTU INDE PER 1		Jpha (de	s and ROC angle	d descriptions refer to CK DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	DGY Jr	Ja	ROCK STRENGTH		WEATHERING INDEX	NOTES WATER LEVELS INSTRUMENTATION
 - -			 For overburden details, see "RECORD OF BOREHOLE BH2-4 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - BH2-4" 				ā	<u>ш</u> ;	20 60 60 60	00	54 50 50 50 50 50 50 50 50 50 50 50 50 50	80	69 69 69	80	100	20		00				81525	88	200 EW SW	
-			Rock Coring Started on 12 October 2016																						
			QUARTZFELDSPATHIC GNEISS BEDROCK RC 8: Classification based on RQD: Fair		152.53 5.21	RC 8											•	•	JN, PL, RO, Ch JN, UN, SR, Ch		1.5				
- - - - -			RC 9: Classification based on RQD: Excellent			RC 9									1		•	•	JN, PL, RO, Ch JN, PL, RO, Ch JN, PL, RO, Ch		1				-
- - - 8 - -			RC 10: Classification based on RQD: Excellent			RC 10											•		JN, PL, RO, Ca/Ch/Su JN, PL, RO, Su/Ca JN, PL, RO, Ch JN, PL, SR, Su/Ch		1 0.75 1 1				-
- - - - - - - - - - - - - - - - - - -	12/10/2016	НQ	RC 11: Classification based on RQD: Good			RC 11											•		JN, PL, SR, Ch/Ca JN, PL, RO, Ca/Ch/Su JN, PL, RO, Ca/Ch/Su JN, PL, RO, Ca/Ch/Su JN, ST, RO, Su/Ch JN, PL, RO, Su/Ch		1 1 1. 0.75 1				
			RC 12: Classification based on RQD: Excellent			RC 12											•		JN, PL, RO, Cə/Ch/Su		1				
-10			RC 13: Classification based on RQD: Excellent			RC 13											•		JN, PL, SR, Ca/Ch/Su JN, PL, RO, Ca/Ch		1				
- - - -						RC 14											•		JN, PL, RO, Ca/Ch/Su JN, PL, RO, Ca/Ch JN, PL, RO, Su/Ch JN, PL, RO, Ca		1 1.5 1 1.5				-
			GROUNDWATER ELEN																LOGGED CHECKED		MA SC/N	NR	SH	EET ·	1 of 2

PF CL N/		ECT IT	No. : TZ16018 : Canadian Nuclear Laborato : Multidisciplinary Subsurface N River, ON	ries l	Ltd.							<u>)</u> C	DF DF IN	RILL RILL ICLII ZIMU	.INC NA ⁻	G D TIO	ATI N (E Deg		 ECM (N510119 12 Oct 16 - 12 (Vertical Vertical 			6711)	l		amec foster wheeler DATUM: Geodetic
DEPTH SCALE (metres)			DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)	FLUSH COLOUR % RETURN	R TOT COR	ECC AL E %	VER SC	Y DL I D RE %			GEC		URE EX 7		s and ROC angle	d descriptions refer to CK DESCRIPTION TERMINOL(DISCONTINUITY DATA I TYPE AND SURFACE DESCRIPTION	OGY Jr	Ja	ROCK STRENGTH	WEATHERING	INDEX	NOTES WATER LEVELS INSTRUMENTATION
-	016		QUARTZFELDSPATHIC GNEISS BEDROCK RC 14: Classification based on RQD: Excellent			RC 14														JN, PL, RO, Su/Ch JN, PL, RO, Ca/Ch JN, PL, SR, Su/Ch JN, PL, SR, Su/Ch JN, PL, RO, Su/Ca JN, PL, RO, Ca/Ch		0.75 1 1.5 1.5 1				
- - - - - 16	12/10/2016	ФH	RC 15: Classification based on RQD: Fair		141.74													•		JN, PL, SM, Ch JN, PL, SR, Ch JN, PL, SR, Su/Ch JN, PL, RO, Ca JN, PL, RO, Ch/Ca JN, PL, RO, Ch/Ca JN, PL, SM, Ch		1.5 1 1.5 1.5 1 1.5 1.5 1.5				
			End of Rock Coring		16.00																					· · ·
- 18																										-
-																										
-20																										-
) - - - - - - - - - - - - - - - - -																										
-22																										
-22																										- - -
- - - - - - - - - - - - - - - - - - -			GROUNDWATER ELE																					SHF	Ш ЕТ 2	- - - -
			☑ IN OPEN BOREHOLE ON WATER LEVEL (date)																	LOGGED CHECKED	:	MA SC/			2	, _

F	RE	С	ORD OF BOREHOL	E	No.	B	H	2-!	5 -	R		ck	(1
C N	LIEI AMI	١T	T No. : TZ16018 : Canadian Nuclear Laborator : Multidisciplinary Subsurface N River, ON			on fc	or N	SDF	- C	hal	k		DRILL DRILL NCLI	-IN NA	G DA	TE I (D		: ECM (N5101478 : 27 Sep 16 - 28 S : Vertical : Vertical			940)		amec foster wheeler DATUM: Geodetic
DEPTH SCALE (metres)		DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN		COV	IOLOC /ERY SOLI			GEO		sym INIC RE		i descriptions refer to CK DESCRIPTION TERMINOLOG DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Y: Jr	a	ROCK STRENGTH INDEX	WEATHERING	NOTES WATER LEVELS INSTRUMENTATION
-			 For overburden details, see "RECORD OF BOREHOLE BH2-5 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - BH2-5" Rock Coring Started on 27 September 2016 						140		(140)									~			
-			QUARTZFELDSPATHIC GNEISS BEDROCK		<u>191.90</u> 1.22												•	JN, UN, RO, Si JN, UN, SR, Si JN, PL, RO, Si JN, UN, RO, Si JN, UN, RO, Si JN, PL, SR, Si	0.7 0.7 0.7 1 0.7	75 75 1 75			-
-2			RC 3: Classification based on RQD: Fair			RC 3											•	JN, UN, RO, Si JN, UN, YR, Si JN, UN, RO, Si JN, UN, VR, Si JN, JN, YR, Si JN, JN, YR, Si CON, UN, RO, Si JN, UN, RO, Bi	07 0 1 1 1 1				-
			SCHIST BEDROCK RC 4: Classification based on RQD: Very Poor			RC											•	JN, UN, RO, Bi JN, UN, RO, Bi JN, UN, RO, Bi/Mu JN, UN, RO, Bi/Si JN, UN, RO, Bi/Si JN, UN, RO, Bi/Mu	1 11 12 12 12	1			- - -
- - -4			RC 5: Classification based on RQD: Good			RC 5												JN, UN, RO, Bi/Mu JN, ST, RO, Si JN, PL, SR, Io	1.:	.5 1			-
			SCHIST BEDROCK		188.85 4.27 188.33 4.79	RC 6											•	CON, UN, SR, Bi/Mu JN, UN, RO, Bi/Mu JN, UN, SR, Bi/Io JN, UN, RO, Bi/Io CON, UN, RO, Bi/Mu JN, UN, SR, Io	1.3 1.3 1.3 1.3 1.3	.5 .5 .5			
-	27/09/2016		BEDROCK RC 6: Classification based on RQD: Good RC 7: Classification based on RQD: Very Poor			RC 7											•	JN, CU, SR, Io JN, CU, SR, Io JN, PL, SR, Io JN, UN, RO, Io	1 1 1.1 2	5			
	2		RC 8: Classification based on RQD: Good			RC 8												CON, UN, SR, Bi/Mu CON, UN, SR, Bi/Mu CON, UN, SR, Bi/Mu CON, PL, SR, Bi/Mu CON, PL, SR, Bi/Mu CON, PL, SR, Bi/Mu CON, UN, SR, Bi/Mu CON, UN, SR, Bi/Mu JN, UN, XR, Bi/Mu JN, UN, YR, Ca	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	22			-
			RC 9: Classification based on RQD: Good			RC 9											•	JN, UN, RO, SI/Bi JN, CU, SR, SI/Bi JN, UN, SR, Io/Ca JN, UN, RO, Ca JN, PL, SR, Ca/Io JN, PL, RO, Ca/Io	1 1 1 1 1	-5 1 1			-
			RC 10: Classification based on RQD: Fair			RC 10											• • • • •	-, PL, RO, Io(Ch/Ca -, PL, SR, Io -, PL, SR, Io -, PL, RO, Io -, PL, SR, Io/Bi -, PL, RO, Io	1 1 0.7 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	75 75 5.5 1			
			GROUNDWATER ELEN															LOGGED : CHECKED :	BC	C C/NF		HEET	1 of 2

			ORD OF BOREHOL	_E	No.	B	BH	2-	5 -	·F	Rc	C		-														
СІ	RO. LIEI AMI	١T	۲ No. : TZ16018 : Canadian Nuclear Laborato : Multidisciplinary Subsurface			on fo	or N	ISDF	=_(Cha	alk		D	RIL RIL NCL	LIN	IG [DAT	Έ			p 16 - 28				40)			amec foster wheeler
														ZIN					3-7	: Vertic								DATUM: Geodetic
DEPTH SCALE (metres)		DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN	TOT COR	RECC FAL E %	OVEF SC	RY DL I D RE 9		R.Q.I	D GE	FRAC INE PER	TURE DEX	/mbc ICAI Alph: (d	a angl	DISCONTI		OGY Jr	Ja	POCK STRENGTH	INDEX	WEATHERING	- I.	NOTES WATER LEVELS INSTRUMENTATION
	┢		QUARTZFELDSPATHIC GNEISS BEDROCK			RC	\vdash	<u> </u>	402	88	23	100		N 4 8	38	10	20	0,6	, <u>88</u>	-, PL, RO, Io -, PL, RO, Ca	lo	+	1	8.15	1 1 1 2 2 5 5 5 5 5 5 8 5 5 8 5 8 5 8 5 8 5 8	1000	**	
	016		MAFIC INTRUSIVE BEDROCK			10 RC 11												•	•	-, PL, RO, Io -, PL, RO, Ca -, PL, RO, Io -, PL, SR, Io/C -, PL, RO, Io -, PL, RO, Io/C -, PL, SR, Ch -, PL, SM, Ch	Ch Ch		1 1 1 0.75 1 1 1					-
	27/09/2016	Я	RC 11: Classification based on RQD: Very Poor RC 12: Classification based on RQD: Very Poor			RC 12												•	•	-, UN, RO, Ch -, PL, SR, Io/(-, PL, SR, Ch	ch		1 1 11.5					- - -
-12			RC 13: Classification based on RQD: Excellent End of Rock Coring		<u>180.88</u> 12.24														•	-, PL, SR, Ch -, PL, SR, Ch			1					-
- - -																												- - - -
14																												- - -
																												-
- 16																												- -
																												- - - -
																												-
			GROUNDWATER ELE	<u> </u> עסע																								
			$\overline{\mathcal{Y}}$ IN OPEN BOREHOLE ON				I														LOGGED	:	вс		S	HEE	:12	of 2
			WATER LEVEL (date)																		CHECKED		SC/	NR				

Г	R	EC	ORD OF BOREHOL	.E	No.	B	BH:	2-6	6D	-	R	00	ck	1											 A
			T No. : TZ16018 : Canadian Nuclear Laborator	ioo I	td													ЛС	: ECM (N5101456)		amec
		ENT ME /	: Multidisciplinary Subsurface			on fo	or N	SDF	- C	hall	k				g d, Tioi			I.)	: 29 Sep 16 - 29 S : Vertical	зер) 16				foster wheeler
L	LO	CATIC	N River, ON												H (D				: Vertical				_		DATUM: Geodetic
DEPTH SCALE	(metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR RETURN		COV		GICA		D GE				and ROC	TIFE AND SUNTAGE			ROCK STRENGTH INDEX		WEATHERING INDEX	NOTES WATER LEVELS INSTRUMENTATION
F	+	DR	- For overburden details, see "RECORD OF	0	(11)	-	ЪШ	2	248		248		248		111 292	3	<u></u>	88	DESCRIPTION	Jr	Ja	82882		5 8 8 8 8 8 8 8 8 8 8 8	
-			BOREHOLE BH2-6D- Overburden" - For core details, see "TABLE FOR ROCK CORE LOG - BH2-6D"																						-
F			Rock Coring Started on 29 September 2016		190.66																				
- - - - - - - -	-		DIORITE BEDROCK		0.94	RC 2											>>								
- - - - - - - - - - - - - - -						RC 3											•	8	JN, UN, RO, Sa/lo JN, UN, VR, Sa/lo		1.5 1.5 1.5 1.5 1.5				-
-		29/09/2016 HQ				RC 4												•	JN, UN, VR, Sa/lo JN, PL, VR, Sa/lo JN, UN, RO, Io JN, IR, RO, Io JN, PL, RO, IO		1 1 1 1				
			RC 5: Classification based on RQD: Good			RC 5											•	•	JN, PL, SR, Io/Ca JN, PL, SR, Io/Ch/Ca JN, PL, SR, Io/Ch/Ca JN, PL, SR, Ch JN, PL, RO, Ch/Ca JN, PL, SR, Ch/IO JN, PL, VR, Io/Ch JN, PL, VR, Ch JN, PL, RO, Io/Ch		1.5 1.5 1.5 1.5 1 1 1 1				
			RC 6: Classification based on RQD: Excellent			RC 6											•		JN, PL, VR, lo/Ch/Ca JN, PL, VR, lo/Ch/Ca JN, PL, RO, lo/Ch		1 1_ 1.5				
			RC 7: Classification based on RQD: Good			RC 7												•	JN, PL, RO, Io JN, PL, VR, Io/Ch JN, PL, VR, Io/Ch/Ca JN, PL, RO, Io/Ch/Ca JN, PL, SR, Io/Ch/Ca JN, PL, VR, Io/Ch/Ca		1 1.5 1 1.5 1				
			GROUNDWATER ELEV $\[equiv] \square$ IN OPEN BOREHOLE ON																100050		DC		SH	IEET	1 of 2
			WATER LEVEL (date)	501	vn LL														LOGGED CHECKED		BC SC/N	√R			

F	REC	ORD OF BOREHOL	E No.	B	<u>8H2-</u>	<u>6D</u>) =	Ro	ocl	2									
		CT No. : TZ16018												ECM (N5101456					amec
	LIENT	: Canadian Nuclear Laborato : Multidisciplinary Subsurface		n fa	or NSD	F - (hal	k			NG D. ATIO			: 29 Sep 16 - 29 S : Vertical	Sep 16	ò			foster wheeler
			invooliguto				mai	IX.			TH (D			: Vertical					DATUM: Geodetic
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min) FLUSH <u>COLOUR</u>	TOT COR	ECOV	ERY SOLID	R.(ND G Q.D.	FRACTI INDE PER 1	S, SYM CHNIC URE X AI	pha ang (deg.)	nd descriptions refer to DCK DESCRIPTION TERMINOLO DISCONTINUITY DATA Jet TYPE AND SURFACE DESCRIPTION	GY Jr Ja	ROCK STRENGTH INDEX	WEATHERING	INDEX	NOTES WATER LEVELS INSTRUMENTATION
		DIORITE BEDROCK				243	88 1	2488	8 24 8	88	1992 1992	28 4	-888 	B JN, PL, RO, Io/Ch/Ca	1	828888	2 10 21	8888	
- - - - -	29/09/2016 HQ	RC 8: Classification based on RQD: Excellent	179.69	RC 7 RC 8									•	JN, PL, RO, Io/Ch/Ca JN, PL, RO, Io/Ch/Ca JN, PL, SR, Io/Ch/Ca JN, PL, VR, Io/Ch/Ca JN, PL, RO, Io/Ch/Ca	1 1 1.5 1.5 1 1 1 1.5 1 1 1.5				- - - - - - - - - - - - - - - - - - -
- 12		End of Rock Coring	179.69																- - - - - - - - - - - - - - - - - - -
- 10																			- - - - - - - - - - - - - - - - - - -
																			-
																S	SHE	ET 2	of 2
		✓ IN OPEN BOREHOLE ON WATER LEVEL (date)	COMPLET	ON															
														CHECKED :	SC/	INFX			

R	REC	ORD OF BOREHOL	_E	No.	B	3H2 -	-63	5 -	R	00	: <u>k</u>												
		T No. : TZ16018													N : ECM				6895)		amec	
	.IENT ME /	: Canadian Nuclear Laborato : Multidisciplinary Subsurface			n fr	or NSF)F -	Cha	alk			ING I		E Deg.)		16 - 6 Oo al	t 16					foster wheele	er
	CATIC			onguno				One				ITH (: Vertic							DATUN	1: Geodetio
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min) FLUSH COLOUR	© OJ % RETURN	RECC DTAL RE %	HOLOG VERY SOLI CORE 2,98	GICA	R.Q.D.	FRAC	TURE DEX		nd descriptions re DCK DESCRIPTION DISCONTIL gle TYPE AND DESCI		.OGY Jr	Ja	ROCK STRENGTH	_		WATER	DTES R LEVELS MENTATION
-		 For overburden details, see "RECORD OF BOREHOLE BH2-6S - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - BH2-6S" Rock Coring Started on 6 October 2016 																	<u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u></u>				
ľ		DIORITE BEDROCK		191.38 0.22																			
-		RC 3: Classification based on RQD: Fair		0.22	RC 3									٠	JN, PL, RO, k	9		1					-
- -2 - -		RC 4: Classification based on RQD: Fair			RC 4										 JN, UN, RO, It JN, PL, RO, K JN, NP, RO, K JN, PL, RO, K 			1 1 1 1.5 1.5 1					- - - - - -
- - - - - - -)/2016 На	RC 5: Classification based on RQD: Very Poor			RC 5									>>	JN, PL, RO, K JN, PL, RO, K			1 1.5 1 1.5 1					
- - - - - -	11/10 H	RC 6: Classification based on RQD: Very Poor			RC 6									>> •	JN, PL, RO, K JN, PL, RO, C JN, PL, RO, C	h		1					- - - - -
- - - -		RC 7: Classification based on RQD: Fair			RC 7										JN, PL, RO, C JN, PL, SR, C JN, PL, SR, C JN, PL, SR, C JN, PL, RO, C JN, PL, RO, C JN, PL, RO, C	h h h h h h h		1.5 1.5 1 1.5 1.5 1.5 1.5 1.5 1.5					-
		RC 8: Classification based on RQD: Fair			RC 8									•	JN, PL, RO, C JN, PL, RO, C JN, PL, RO, C JN, PL, SR, C JN, PL, SR, C JN, IR, RO, C JN, PL, RO, C JN, PL, RO, C	h h h h h h		1.5 1 1.5 1 1.5 1 1.5 1.5					
																				SHE	ET 1	of 2	
		☑ IN OPEN BOREHOLE ON WATER LEVEL (date)	CON	//PLET	ON											LOGGED CHECKED		BC SC/N	١R				

		ORD OF BOREHO	_E	No.	B	BH	2-	<u>6S</u>	-	R														~
	ROJEC ⁻ LIENT	۲ No. : TZ16018 : Canadian Nuclear Laborato	ries I	td								DRILLI DRILLI					N : ECM (N51014) : 6 Oct 16 - 6 Oc			6895)			amec foster	
	AME /	: Multidisciplinary Subsurface			on fo	or N	ISDI	F - C	ha	lk		NCLIN				eg.)		. 10					wheeler	
LC	OCATIO	N River, ON									A	ZIMU	ΤH	(De	g.)		: Vertical						DATUM:	Geodetic
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)		RE TOT/ CORE 02.95	ECOV	HOLOG VERY SOLIE CORE 8 4 8	SICA		FR FR		Symb INICA RE n Alpi (and descriptions refer to OCK DESCRIPTION TERMINOL DISCONTINUITY DATA Igle TYPE AND SURFACE DESCRIPTION	Jr	Ja	ROCK STRENGTH		INDEX	NOT WATER	LEVELS
		DIORITE BEDROCK						040	000	040		0400	2			•	JN, PL, RO, Ch	+	1.5 1.5					
- - - - 10 - -	11/10/2016 HQ	RC 9: Classification based on RQD: Fair		180.93	RC 9											•	JN, IR, RO, Ch JN, PL, RO, Ch JN, PL, SR, Ch JN, UN, SR, Ch JN, PL, RO, Ch		1 1.5 1					- - - -
- - 12		End of Rock Coring		10.67																				- - - - -
																								-
																								- - - - - - - - - - - - - - - - - - -
CK 1210018 NSDF BEDROC		GROUNDWATER ELE																						-
M KO		$\overline{\mathcal{Y}}$ IN OPEN BOREHOLE ON															100055		D	ŝ	SHE	ET 2	2 of 2	
AMECE		WATER LEVEL (date)	501		5.1												LOGGED CHECKED		BC SC/N	NR				

F	RE	EC	ord of Borehol	.E	No.	B	BH	2-	7 -	·F	R	00	ck	(
			No. : TZ16018																	NC	: ECM (N510165			675	53)			amec
		NT E /	: Canadian Nuclear Laborator : Multidisciplinary Subsurface			n fo	or N	SDF	= _ (Cha	alk						i da 10n)	: 6 Oct 16 - 6 Oct : Vertical	16						foster wheeler
		ATIO															(De			-,	: Vertical							DATUM: Geodeti
DEPTH SCALE (metres)		DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)	FLUSH COLOUR % RETURN	F TO COR	RECO FAL RE %	OVE	RY SOLI	D %		ND G	FR. PI		syn HNIC RE		and ROC angle	d descriptions refer to CK DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr	Ja		INDEX		me INDEX	NOTES WATER LEVELS INSTRUMENTATION
	Γ		 For overburden details, see "RECORD OF BOREHOLE BH2-7 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - BH2-7" 													Π												
-4			Rock Coring Started on 6 October 2016																									
ŀ	╞		QUARTZFELDSPATHIC GNEISS		187.29 4.50							+																
- - - - - - -			BEDROCK RC 7: Classification based on RQD: Excellent			RC 7														٠	JN, PL, RO, Sa/lo JN, PL, RO, Ch JN, PL, RO, Sa/lo		0.75					
-			RC 8: Classification based on RQD: Good			RC 8													•	•	JN, PL, RO, Sa J JN, PL, RO, Sa JN, PL, RO, Sa/lo JN, PL, RO, Sa/lo JN, PL, RO, Sa/lo JN, PL, RO, Sa/lo		1.5 1 1 1 1 1					
- - 8 - 8 	06/10/2016	HQ	RC 9: Classification based on RQD: Fair			RC 9														•	JN, UN, RO, Ch/lo JN, PL, RO, Io		1					
- 10			RC 10: Classification based on RQD: Excellent			RC 10													•	•	JN, PL, RO, Ch/lo JN, PL, RO, lo/Ch/Sa		1					
			RC 11: Classification based on RQD: Excellent			RC 11																						
			RC 12: Classification based on RQD:			RC 12														•	JN, UN, RO, Io		0.75					
			GROUNDWATER ELEY IN OPEN BOREHOLE ON WATER LEVEL (date)																		LOGGED CHECKED		MA SC/	NR	s	HE	ET 1	of 2
																									_	_		

	R	EC	ORD OF BOREHOL	.E	No.	B	SH2	2-7	7 -	R	lo	C	<u>k</u>										
			T No. : TZ16018														N : ECM (N510			167	53)		amec
		ENT //E/	: Canadian Nuclear Laborato : Multidisciplinary Subsurface			on fo	or N	SDE	= _ C	ha	k		DRILL				: 6 Oct 16 - 6 : Vertical	6 Oct 1	16				foster wheeler
				inve	ongune		51 14	001	0	mai			AZIMU			eg.)	: Vertical						DATUM: Geodetic
DEPTH SCALE (matrae)	(200 BOLL)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)	FLUSH COLOUR % RETURN	RI TOTI CORE 8763	ECOV	/ERY SOL CORI	, .ID E %		GEO FR. PI	symi INIC. RE		nd descriptions refer to DCK DESCRIPTION TERM DISCONTINUITY D/ gle TYPE AND SURFA DESCRIPTION	ATA ACE	Y Jr Ja			WEATHERING	NOTES WATER LEVELS INSTRUMENTATION
-	T		Excellent QUARTZFELDSPATHIC GNEISS BEDROCK			RC 12		_	248	000	140	000	04.00		1 6	1	JN, PL, RO, Io/Ch/Sa		1.5	-			-
14		06/10/2016 HQ	RC 13: Classification based on RQD: Excellent End of Rock Coring		<u> 177.03</u> 14.76	RC 13										•	JN, PL, RO, Ca/Ch		1				
- - - - 16																							
- - - - - - - - - 18																							
- 20 - 20																							
J D D Z																					S	HEET	2 of 2
			☑ IN OPEN BOREHOLE ON WATER LEVEL (date)	CON	/IPLET	ON											LOGG		MA				
AIVI																	CHEC	KED :	SC	/NR			

F	RE	С	ORD OF BOREHOL	E	No.	B	H	2-8	3 -	R	00	:k											
С	LIEI	١T	۲ No. : TZ16018 : Canadian Nuclear Laborator			_							RILL RILL			ИС	: ECM (N5101556 : 27 Sep 16 - 27 S			6528 <u>)</u>)		amec foster wheeler
	ame DC <i>A</i>	= / \TIO	: Multidisciplinary Subsurface N River, ON	Inve	estigatio	on fo	or NS	SDF	- C	hall	k		ICLIN ZIMU			I.)	: Vertical : Vertical						DATUM: Geodetic
DEPTH SCALE (metres)		URILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)		RE	ECOV		F		FRAC INI PEF	CAL	s and ROC angle g.)	descriptions refer to K DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	I GY Jr	Ja	ROCK STRENGTH INDEX		WEATHERING	NOTES WATER LEVELS INSTRUMENTATION
	ſ		 For overburden details, see "RECORD OF BOREHOLE BH2-8 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - BH2-8" 				_		146				400	-15		00							
			Rock Coring Started on 27 September 2016																				
-0					174.23																		-
			QUARTZFELDSPATHIC GNEISS BEDROCK		0.23												JN, PL, RO, Io		1				
-			RC 2: Classification based on RQD: Poor			RC 2									•.		JN, PL, RO, Io JN, UN, RO, Io JN, PL, RO, Io JN, PL, RO, Io		1 1 0.75				-
															•	•	JN, PL, RO, Io JN, UN, RO, Io JN, PL, RO, Io JN, IR, RO, Io		1 1 1.5				
-2			RC 3: Classification based on RQD: Fair			RC 3									•		JN, PL, RO, Io JN, PL, RO, Io JN, PL, RO, Io		1 1 0.75				-
-						RC																	-
-4			RC 4: Classification based on RQD: Good			4									•	•	JN, PL, RO, Io JN, PL, RO, Io JN, IR, RO, Io JN, PL, RO, Io JN, PL, RO, Io		1 1.5 1 1.5 1				
	2016	~						1									JN, UN, RO, Io		0.75				
	27/09/2016	H	RC 5: Classification based on RQD: Fair			RC 5											JN, UN, RO, Ch		1				
GD1 31/10															•		JN, PL, RO, Ch JN, PL, RO, Io/Ca/Ch		1				
9								1									JN, IR, RO, Ch/Ca JN, PL, RO, Ch		1.5 1				
			RC 6: Classification based on RQD:			RC 6											JN, PL, RO, Ch		1.5				
			Excelletn												ľ		JN, PL, RO, lo/Ca/Ch		1				-
2400120								1		T							JN, PL, SR, Ca/IO		1.5				
						RC									•		JN, IR, RO, Ch JN, PL, RO, Ch		1 1				
-8 - -			RC 7: Classification based on RQD: Good														JN, PL, RO, Ch JN, PL, SR, Ch		1.5 1.5				
1/16018				X		RC 8									•		JN, PL, SR, Ch/lo		1.5				
KULN	<u> </u>					5	1				<u></u>						1				SH	EET ·	1 of 2
AMECEN			✓ IN OPEN BOREHOLE ON WATER LEVEL (date)	CON	MPLET	ION											LOGGED : CHECKED :		MA SC/N	IR			

Understand Understand <th>F</th> <th>REC</th> <th>ORD OF BOREHOL</th> <th>E No.</th> <th>B</th> <th>H2</th> <th>-8</th> <th>- F</th> <th>Ro</th> <th>c</th> <th>k</th> <th></th>	F	REC	ORD OF BOREHOL	E No.	B	H2	-8	- F	Ro	c	k													
Wheeler LOCATION River, ON River, ON DATUK Yearing DATUK Seed 10024710N River, ON River, ON AZMUTH (Deg.) : Vertical DATUK Out IV: Geo 10024710N River, ON BESCRIPTION 0 River, ON River, ON NOTES WATER LEVELS 10024710N BESCRIPTION 0 River, ON 0 River, ON NOTES WATER LEVELS 10024710N BESCRIPTION 0 River, ON 0 River, ON NOTES WATER LEVELS 10024710N BESCRIPTION 0 River, ON River, ON River, ON River, ON 10125070007007007007007007007007007007007007																N					3)			
LOCATION River, ON AZIMUTH (Deg.) : Vertical DATUM: Geod 1 DESORIPTION Bend of Rock Coring 0<					n fo	or NS	DF -	Cha	alk)		Sep	16					
Line Continued from non-core bornhole See Overhunden log report. Of End of Rock Coring Descontenue (m) RCD				Inteengane				•								•)								DATUM: Geodetic
Outert27ELDSPATIC CNEISS BEDROCK Close	DEPTH SCALE (metres)	DRILLING RECORD	Continued from non-cored borehole	SWBOLIC LOG DEPTH (m)	SAMPLE No.	1E 81		RECO OTAL DRE %	OVER SO COR	Y L I D RE %	R.Q.I	D GE	RACTU INDE PER 1	s, sym HNIC URE X AI	pha ar	and ROC	K DESCRIPTION TERMINOLO		Ja					NOTES WATER LEVELS INSTRUMENTATION
10 RC 8. Classification based on ROD: RC 8. 104 104.23 104 104.23 104 104.23 104 104.23 104 104.23 104 104.23 104 104.23 104 104.23 104 104.23 104 104.23 104 104.23 104 104.24 <t< td=""><td>\vdash</td><td></td><td>QUARTZFELDSPATHIC GNEISS</td><td></td><td></td><td></td><td></td><td>488</td><td><u>84</u></td><td></td><td>242</td><td>38</td><td></td><td></td><td></td><td></td><td></td><td>┝┤</td><td></td><td>8188</td><td>222</td><td></td><td>88</td><td></td></t<>	\vdash		QUARTZFELDSPATHIC GNEISS					488	<u>84</u>		242	38						┝┤		8188	222		88	
	- - - - 10 -	27/09/2016 HQ	RC 8: Classification based on RQD: Excelletn		RC 8										•		JN, PL, SR, Ch		1,5					- - - -
	-																							-
	- -12 - -																							- - -
	-																							-
GROUNDWATER ELEVATIONS SHEET 2 of 2 ✓ IN OPEN BOREHOLE ON COMPLETION LOGGED :: MA WATER LEVEL (date) CHECKED :: SCORE																								-
10 Image: Constraint of the second seco																								-
$\frac{18}{100} = 18$ $\frac{1}{100} = 18$ $\frac{1}{100} = 10$																								- - - -
Bit of 2 GROUNDWATER ELEVATIONS SHEET 2 of 2 IN OPEN BOREHOLE ON COMPLETION LOGGED : MA WATER LEVEL (date) CHECKED : SC/NR																								- - - - -
SP GROUNDWATER ELEVATIONS SHEET 2 of 2 IN OPEN BOREHOLE ON COMPLETION LOGGED : MA WATER LEVEL (date) CHECKED : SC/NR	0 00																							
GROUNDWATER ELEVATIONS SHEET 2 of 2 IN OPEN BOREHOLE ON COMPLETION LOGGED : MA WATER LEVEL (date) CHECKED : SC/NR	4																							
IN OPEN BOREHOLE ON COMPLETION LOGGED : MA WATER LEVEL (date) CHECKED : SC/NR																					SF	HEE	T 2	of 2
	MECTV			COMPLET	UN															١R				

F	RE	С	ORD OF BOREHOL	.E	No.	C	iΗ	1-1	-	F	lo	С	k												
			۲ No. : TZ16018 : Canadian Nuclear Laborator	ies	l td										NG L NG E			ION	N :Geophysical (N :12 Oct 16 - 13 0			9, E	31	6355	amec foster
N/	AME	Ξ/	: Multidisciplinary Subsurface			on fo	or NS	SDF	- C	ha	k		INC	LIN	ATIC	ON	(De	eg.)	: Vertical	501	10				wheeler
	_		N River, ON	_			ш	Jz					AZII	MU	TH (I	Deg			: Vertical				_		DATUM: Geodetic
DEPTH SCALE (metres)		חאובנואט אבטאט		CLOG		No.	ION RAT	COLOUR % RETURI		LITI	1010	GIC					ymbo		: nd descriptions refer to DCK DESCRIPTION TERMINOLO	OGY		ROCK STRENGTH		SNG XING	NOTES
PTH S (metre		א מ	DESCRIPTION Continued from non-cored borehole	SYMBOLIC LOG	ELEV. DEPTH	SAMPLE No.	μĘ		RE TOT/	RECOVERY		,	R.C	۱.D.	FRAC	TURE		ia ang	DISCONTINUITY DATA			CK STRE	INDE	WEATHERING INDEX	WATER LEVELS
DE		חאור	See Overburden log report.	sγ	(m)	ŝ	PENET		CORE ରବ୍ଷ		SOL CORE				PER		(0	ieg.) RGG	DESCRIPTION	Jr	Ja	BERS ROC	R4 R5 R6		
			 For overburden details, see "RECORD OF BOREHOLE GH1-1 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - GH1-1" 																						
			Rock Coring Started on 12 October 2016																						
-2																									-
ļ.																									
ŀ			GNEISS BEDROCK		158.89 2.59													•	JN, PL, VR, lo		1		$\parallel \mid$		
-			RC 5: Classification based on RQD: Excellent			5					>>								JN, PL, RO, Bi		0.75		Ш		
ŀ																									
ŀ			RC 6: Classification based on RQD:	Ň		RC 6																			
-4			Excellent	S																					-
ł				\mathbb{N}										Ħ											
-				K																					-
ŀ			RC 7: Classification based on RQD: Good			RC 7																			
-																									
ŀ				Ŋ		RC		-						╢											
-			RC 8: Classification based on RQD: Excellent	Ŵ		8								Ħ			lİ		JN, PL, RO, Ch/Ca		1				
-6				\bigotimes													ļİ.		JN, PL, SR, Ch/Ca JN, PL, RO, Ch		1.5				-
	6		RC 9: Classification based on RQD:	K		RC 9																			
	12/10/2016	ЙH	Excellent	K																					-
91./01	12/																								-
				Ž																					
20.10.61				Ŵ															JN, PL, RO, Ca/Ch JN, PL, RO, Ca/Ch		1 0.75				
8-8			RC 10: Classification based on RQD:	\bigotimes		RC 10											-		JN, PL, RO, Ca/Ch		1				-
			Excellent	K																					
				K																			Ш		
-19.0L																									
				Ŵ															JN, PL, SR, Ch/Ca		0.75				
7 7 7			RC 11: Classification based on RQD: Fair	\bigotimes		RC 11													JN, PL, RO, Ch/Ca		1				
				\mathbb{N}																					-
																		•	JN, PL, RO, Ch JN, PL, RO, Ch		0.75 0.75		Ш		
ž 2				K		RC												$\left \right $	JN, PL, RO, Io		0.75				
9171				Ŵ		12																			
																							Sł	IEET	1 of 4
ECFW			✓ IN OPEN BOREHOLE ON WATER LEVEL (date)	COI	MPLET	ION													LOGGED CHECKED		BC SC/N	١R			
Ĩ			. /																5.1E01(ED		- 5/1				

F	RECORD OF BOREHOLE No. GH1-1 - Rock PROJECT No. : TZ16018 DRILLING LOCATION : Geophysical (N5101369, E316355)																						A
CL NA	-IEM	١T	: Canadian Nuclear Laborator : Multidisciplinary Subsurface			on fc	or N	SDF	[:] - Cł	nalk		DRILL DRILL INCLI AZIMU	.INC	G DAT	E (Deg.)		: Geophysical (N5 : 12 Oct 16 - 13 O : Vertical : Vertical			89, E3≦	1635	55)	amec foster wheeler DATUM: Geodetic
DEPTH SCALE (metres)		חמורנומס מבנטמח	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)	FLUSH COLOUR % RETURN		COVE		R.Q.D.	GEC			and OC ngle	descriptions refer to K DESCRIPTION TERMINOLOG DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	GY Jr	Ja	RECK STRENGTH RES ROCK STRENGTH RES INDEX	WI WEATHERING		NOTES WATER LEVELS INSTRUMENTATION
-			GNEISS BEDROCK RC 12: Classification based on RQD: Good			RC 12									•		JN, PL, RO, Ca/Ch JN, PL, RO, Ca/Ch JN, UN, RO, Ca/Ch JN, PL, RO, Ch		0.75 0.75 0.75				
-12			RC 13: Classification based on RQD: Excellent			RC 13									•		JN, PL, SR, Ch/Ca JN, PL, RO, Ch/Ca JN, PL, RO, Ch JN, PL, SR, Ch JN, PL, SR, Ch		1.5 1 1 1				
- - 14 - - -			RC 14: Classification based on RQD: Excellent			RC 14									•		JN, PL, RO, Ch JN, PL, RO, Ca/Ch JN, PL, RO, Ch		0.75 1.5 1				-
- - - -16	12/10/2016	А	RC 15: Classification based on RQD: Excellent			RC 15									•		JN, PL, RO, Ch JN, PL, RO, Ch		0.75				
- 18			RC 16: Classification based on RQD: Excellent			RC 16									•		JN, PL, RO, Bi		0.75				
			RC 17: Classification based on RQD: Excellent		142.06	RC 17									•		JN, PL, SR, Ch CON, PL, SR, Ch		1				
-18			MAFIC INTRUSIVE BEDROCK RC 18: Classification based on RQD: Excellent		19.42	RC 18 RC									•		JN, PL, SR, Ca/Ch JN, UN, RO, Ca/Ch JN, UN, RO, Ca/Ch JN, PL, RO, Ca/Ch		1.5 1.5 1 1				
			GROUNDWATER ELEN														LOGGED : CHECKED :		BC SC/N		HEET	Τ2	of 4

F	R	EC	ORD OF BOREHOL	E	No.	G	iΗ	1-'	1 -	R	ос	k												
C N	:LIE IAN	DJECT ENT IE / ATIO	^r No. : TZ16018 : Canadian Nuclear Laborato : Multidisciplinary Subsurface N River, ON			n fo	or NS	SDF	⁼ - Cł	nalk			LLIN	NG E ATIC	DATI	E Deg		: Geophysical (N5 : 12 Oct 16 - 13 C : Vertical : Vertical			69, E31	63	55)	amec foster wheeler DATUM: Geodetic
DEPTH SCALE (metres)	_	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH	SAMPLE No.	PENETRATION RATE (m/min)	FLUSH COLOUR % RETURN					abbre ND G	viatior	ns, syr CHN	NO	s and ROC	i descriptions refer to K DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE			ROCK STRENGTH INDEX	WEATHERING	INDEX	NOTES WATER LEVELS INSTRUMENTATION
	╀	н	MAFIC INTRUSIVE BEDROCK	s V//	(m)	19	PEN	Γ	248		<u> </u>		80	;92	1 1 1 1 1		88	DESCRIPTION	Jr	Ja	LL 8222228	5887	***	
-22			RC 19: Classification based on RQD: Excellent			RC 19											•	JN, UN, RO, Ca/Ch JN, PL, RO, Ch		1.5				
-			RC 20: Classification based on RQD: Excellent			RC 20											•	JN, PL, RO, Ch/Ca JN, UN, RO, Ch JN, PL, SR, Ch JN, PL, RO, Ch		2 0.75 1				-
-24 - - - -			RC 21: Classification based on RQD: Excellent			RC 21											•	JN, UN, RO, Ch JN, PL, RO, Ch JN, PL, SR, Ch		1.5 1 1.5				-
-26 -	10/0016	HQ	RC 22: Classification based on RQD: Good			RC 22										0	•	JN, PL, SR, Ch JN, PL, RO, Ch JN, PL, RO, Ch JN, PL, RO, Ch JN, PL, SR, Ch		1.5 1 1.5 2 1.5				-
			RC 23: Classification based on RQD: Excellent			RC 23											•	JN, PL, SM, Ch JN, PL, SR, Ch JN, PL, SR, Ch JN, IR, SR, Ch/Ca		0.75 0.75 1				-
			RC 24: Classification based on RQD: Excellent			RC 24											•	JN, PL, SR, Ca/Ch JN, UN, SR, Ca/Ch JN, IR, RO, Ch		1				-
K TZ16018 NSDF			RC 25: Classification based on RQD: Excellent			RC 25											•	JN, PL, SR, Ca/Ch JN, UN, RO, Ch/Bi JN, CU, SR, Ch JN, PL, RO, Ch/Ca		1 1 1 1 1				
AMECFW RUC.			GROUNDWATER ELE IN OPEN BOREHOLE ON WATER LEVEL (date)			ON												LOGGED :		BC SC/I		HEE	ET 3	of 4

F	RE	С	ORD OF BOREHOL	_E	No.	G	iH	<u>1-</u>	1.	• F	Ro)C	<u>:k</u>													2
	ROJ		No. : TZ16018 : Canadian Nuclear Laborato	rioe I	td											LOC DAT				Geophysical (N 12 Oct 16 - 13 (9, E3	16355)	amec foster	
	ME		: Multidisciplinary Subsurface			on fo	or N	SDF	= _ (Cha	ılk							eg.)		Vertical	<i>J</i> CI	10			wheeler	
LC	CA		N River, ON													(Deg				Vertical					DATUM:	Geodeti
DEPTH SCALE (metres)		חמורבומט מבכטמט	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN	TOT COR	ECO TAL E %	VER SO COF	Y DL I D RE 9		Q.D.	FRA IN PE	CTUR IDEX R 1 m	NIC	ha ano	D	riptions refer to SCRIPTION TERMINOLO ISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr	Ja	ROCK STRENGTH INDEX	WEATHERING INDEX	NOT WATER I INSTRUME	EVELS
		Ť	MAFIC INTRUSIVE BEDROCK			RC			24		24	.00	50 8	F 60 80	÷2	50 50		888	5		┢		8 F 2 S 8 S 8	W1 W2 W3 W3 W4		
- - -32 -	12/10/2016	Н	RC 26: Classification based on RQD: Excellent			25 RC 26												•	JN, F	PL, RO, SR, Ch/Ca		0.5				-
ŀ			End of Rock Coring		128.56 32.92					Π																
- - - -34 - -																										-
- 36																										-
-38																										
- - - - - - - -																										-
	•	!	GROUNDWATER ELE					-										. 1			<u> </u>		S	HEET 4	of 4	
			✓ IN OPEN BOREHOLE ON WATER LEVEL (date)	CON	NPLET	ION																BC SC/I	NR.			
L																				UNEONED	•	50/1				

R	RE	C	ORD OF BOREHOL	E	No.	G	iΗ	1-2	2 -	R		ck	<u>(</u>											
CL NA	.IEN	т /	No. : TZ16018 : Canadian Nuclear Laborator : Multidisciplinary Subsurface			on fo	or N	SDF	- C	hal	k	C	DRILL DRILL NCLII	INC	DA1	Е		: Geophysical (N : 13 Oct 16 - 14 (: Vertical			′3, E	31	6380)	amec foster wheeler
LC			N River, ON				ш	17				Α	ZIMU	JTH	(Deg			: Vertical				_		DATUM: Geodetic
DEPTH SCALE (metres)	DRILLING RECORD		DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATI (m/min)	FLUSH COLOUR		ECOV		GICA		GEO FR	ACTUR	ymbo NICAL		d descriptions refer to CK DESCRIPTION TERMINOLO DISCONTINUITY DATA I TYPE AND SURFACE DESCRIPTION	Jr	Ja	ROCK STRENGTH	INULV	WEATHERING INDEX	NOTES WATER LEVELS INSTRUMENTATION
-		5	For overburden details, see "RECORD OF BOREHOLE GH1-2 - Overburden" For core details, see "TABLE FOR ROCK				PE	Ē	20	38	6662	80	6968	2	20	00	886				8 F 5 5 5	22	W1 W2 W3 W3 W4 W4 W4 W4 W4 W4 W4 W4 W4 W4 W4 W4 W4	
•			CORE LOG - GH1-2" Rock Coring Started on 13 October 2016																					•
-2 - -			QUARTZFELDSPATHIC GNEISS BEDROCK RC 4: Classification based on RQD: Fair		<u>161.94</u> 2.16	RC 4																		- - - -
- - - - - - 4 - - - - - - - - - - - - -			RC 5: Classification based on RQD: Excellent			RC 5																		- - - - - - - - - - - - - - - - - - -
- - - - - -			RC 6: Classification based on RQD: Excellent			RC 6											• •.	JN, UN, SR, Ch JN, PL, RO, Bi JN, PL, RO, Ch/Bi		0.75 0.75 0.75				- - - - - -
	13/10/2016	Η	RC 7: Classification based on RQD: Excellent			RC 7										:	•	JN, PL, SR, Ch JN, UN, SR, Io/Ch JN, , JN, PL, RO, Ca/Ch		0.75 1 1.5				- - - - - - - - - - - - - - - - - - -
			RC 8: Classification based on RQD: Excellent			RC 8																		- - - - - - - - -
			RC 9: Classification based on RQD: Excellent			RC 9											•	JN, PL, RO, Ca JN, PL, SR, Ch		0.75				
				K		RC 10												,,						
																		LOGGED	:	BC		SF	IEET 1	of 4
			WATER LEVEL (date)															CHECKED	:	SC/N	NR			

F	REC	CORD OF BOREHO	_E	No.	G	iΗ	1- 2	2 -	R	oc	:k												
		CT No. : TZ16018													ЛС	: Geophysical (N			73, E31	163	80)	amec	
	LIENT				n fc	or N	SDF	⁻ - Ch	nalk			RILLII CLIN			.)	: 13 Oct 16 - 14 0 : Vertical	JCt	16				foster wheeler	
	CAT			0								IMU		 		: Vertical						DATUM:	Geodeti
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)	FLUSH COLOUR % RETURN	REC TOTAL CORE 9 8 9 9 8	COVE		R.		FRAC		s and ROC angle g.)	I descriptions refer to IX DESCRIPTION TERMINOLC DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr	Ja	ROCK STRENGTH	W WEATHERING		NOTE WATER LE INSTRUMEN	EVELS
		QUARTZFELDSPATHIC GNEISS BEDROCK																					
- 12		RC 10: Classification based on RQD: Excellent			RC 10									•		JN, PL, RO, Ch/Ca JN, PL, RO, Ch		1					
														•		JN, PL, RO, Ch/Ca JN, PL, RO, Ca/Ch		1.5 1					
-		RC 11: Classification based on RQD: Excellent			RC 11									•		JN, PL, RO, Ca/Ch JN, PL, RO, Ch		0.75					
																JN, PL, SM, Ch		1 1.5					
-14 - - -		RC 12: Classification based on RQD: Excellent			RC 12									•		JN, PL, SM, Ch		1.5					-
-16	13/10/2016 HO	RC 13: Classification based on RQD: Excellent			RC 13									•		JN, PL, SR, Ch/Ca		1					-
		RC 14: Classification based on RQD: Excellent			RC 14									•		JN, PL, SM, Ch JN, PL, RO, Ca JN, PL, SR, Ch/Ca		1.5 0.75 1.5					
		RC 15: Classification based on RQD: Excellent			RC 15									•		JN, PL, SR, Ca JN, PL, RO, Ca JN, PL, SR, Ch		0.75 0.75 1					
		RC 16: Classification based on RQD: Excellent			RC 16									•		JN, PL, SR, Ch/Ca		1					-
KUCK														 					S	HEE	ET 2	of 4	
VECTV		✓ IN OPEN BOREHOLE ON WATER LEVEL (date)	I COI	MPLET	ON											LOGGED CHECKED		BC SC/N	NR				
ž																							

F	R	EC	ORD OF BOREHOL	E	No.	G	iΗ'	1-2	2 -	F	lo	C	k												
С	LI	ENT	T No. : TZ16018 : Canadian Nuclear Laborator			n fo	r NI			'ho	IL.		DRI	LLIN	NG E	ΟΑΤΙ	Е		: Geophysical (N : 13 Oct 16 - 14 C			73, E3 ⁻	163	380)	amec foster wheeler
		/IE / CATIO	: Multidisciplinary Subsurface N River, ON	Inve	sugatio		or ing	סטר	· - C	па	IK		INC AZIN					g.)	: Vertical : Vertical						DATUM: Geodetic
DEPTH SCALE (metres)	(00 B011)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	는 굳	FLUSH COLOUR % RETURN	TOT, CORE	ECO AL E %	/ERY SOL CORE	. I D E %	R.Q	.D.	FRAC IND PER	CHN TURE EX 1 m	mbol ICAL	angle	J descriptions refer to CK DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	DGY Jr	Ja	ROCK STRENGTH INDEX	WFATHERING	INDEX	NOTES WATER LEVELS INSTRUMENTATION
	╉		QUARTZFELDSPATHIC GNEISS BEDROCK				đ	ш.	400	38	40		543	38 28	1 ₂	50		88	JN, PL, RO, Ch JN, PL, SR, Ch	┢	0.75 1	222228			
- -22			RC 17: Classification based on RQD: Excellent			RC 17											e		JN, PL, SR, Ca/Su		0.75				-
- - - -			RC 18: Classification based on RQD: Excellent			RC 18											•	•	JN, PL, SR, Ch/Bi JN, PL, SM, Ch/Ca/Su JN, UN, SM, Ca/Ch JN, PL, SM, Ca/Ch		1.5 1.5 1 1.5				
-24 - - - -			RC 19: Classification based on RQD: Good			RC 19											•		JN, PL, SM, Ch JN, PL, RO, Ch JN, PL, RO, Ch/Ca JN, PL, RO, Ca JN, PL, SM, Ca JN, UN, SR, Ca JN, PL, SK, Ca		1.5 1.5 0.75 0.75 0.75 0.75				-
-26		13/10/2016 HQ	RC 20: Classification based on RQD: Good			RC 20											4	•	JN, PL, SR, Ch JN, PL, RO, Ch		1.5				-
- M KOCK 2016 GUT 31/10/16			RC 21: Classification based on RQD: Excellent			RC 21												•	JN, PL, SR, Ch JN, PL, SR, Ch/Ca		1				
			RC 22: Classification based on RQD: Excellent			RC 22											•		JN, PL, RO, Ca JN, PL, RO, Ch/Su		0.75				
012 - 30						RC 23											•		JN, PL, RO, Ch/Ca JN, PL, RO, Ch/Ca		1.5				-
AMECFW ROC			GROUNDWATER ELEN			ON													LOGGED CHECKED		BC SC/I		HE	ET 3	3 of 4

	R	EC	CORD OF BOREHO	LE	No.	G	iΗ	1-:	2 -	R	lo	С	k														
			CT No. : TZ16018		4.4														N	: Geophysical (N			73,	E37	1638	80)	amec
		ENT ME /				on fo	or N	SDF	: - C	hal	k		DRI INC)	: 13 Oct 16 - 14 C : Vertica l	Jct	16					foster wheeler
		CATI			e ligatio				-				AZI					cg.)	,	: Vertical							DATUM: Geodetic
DEPTH SCALE	(sallall)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)	FLUSH COLOUR % RETURN	TOT/ CORE	ECO\ AL E %	/ERY SOL COR	/ _ID E %	R.C	ND G	FRA IN PE	CTUF	symi INIC. RE	AL R ha an (deg.)	and CC	descriptions refer to K DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION)GY Jr	Ja	ROCK STRFNGTH	INDEX	WEATHERING		NOTES WATER LEVELS INSTRUMENTATION
\vdash	╉		QUARTZFELDSPATHIC GNEISS			RC 23	8	ш	848	38	248	88	55	88	÷ ی	392 5		88	8		┢		822	2228	M M M M M	88	
- - - 32 - -	2	13/10/2016 HO	RC 24: Classification based on RQD: Excellent		131.41	23 RC 24												•		JN, PL, RO, Ca/Ch		1					- - - - - - - - - - - - - - - - - - -
- - - - - - - - - - - - - - - -	•		End of Rock Coring		32.69																						- - - - - - - - - - - - - - - - - - -
	6																										- - - - - - - - - - - - - - - - - - -
	3																										- - - - - - - - - - - - - - - - - - -
DCK TZ16018 NSDF BEDROCK)		GROUNDWATER ELE		IONS																						- - - - - - - - - - - - - - - - - - -
W RC			$\overline{\mathcal{Y}}$ IN OPEN BOREHOLE ON																	LOGGED	:	вс		S	HEET	14	ot 4
AMEC			WATER LEVEL (date)																	CHECKED		SC/N	١R				

PF CL NA		/ : Multidisciplinary Subsurface	ries l	_td.							[[DRIL DRIL	.LIN .IN/	IG LC IG DA ATION H (De	V (C	: Deg.)	N : Geophysical (N : 4 Oct 16 - 4 Oct : Vertical : Vertical		149	96, E3	16738)	amec foster wheeler DATUM: Geodetic
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)	FLUSH COLOUR % RETURN	RI TOT, CORE 0249	ECO\ AL E %	IOLO /ERY SOLI CORE	D %		D GE		syn HNIC RE		ad descriptions refer to CK DESCRIPTION TERMINOLO DISCONTINUITY DATA Ide TYPE AND SURFACE DESCRIPTION	DGY Jr	Ja	ROCK STRENGTH INDEX	WEATHERING	NOTES WATER LEVELS INSTRUMENTATION
- - - -		 For overburden details, see "RECORD OF BOREHOLE GH14 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - GH1-4" Rock Coring Started on 4 October 2016 		185.87			_	42	0.00	0.40	0	0.4.6	0		7		>					
- - - - - - -		DIORITE BEDROCK		3.20	RC 5											• • • • •	JN, PL, RO, Sa/lo JN, PL, RO, Sa/lo JN, PL, VR, Sa/lo JN, PL, RO, Io/Ch JN, PL, RO, Io/Ch JN, PL, RO, Io/Ch JN, PL, RO, Io/Ch JN, PL, RO, Io/Ch		1 1 1 1 1 1 1 5 1 1			-
- - - - - -					RC 6										>	·} •• ••	JN, PL, RO, Io JN, PL, RO, Io/Ch JN, PL, RO, Io/Ch JN, UN, RO, Io JN, PL, RO, Io/Ch JN, UN, RO, Io/Sa JN, UN, RO, Io/Ch		1.5 1.5 1 1 1			
- - - -	04/10/2016 LO	RC 7: Classification based on RQD: Poor			RC 7										>	•	JN, UN, RO, Io/Ch JN, PL, SR, Io/Ch SH, IR, RO, Io/Ch JN, IR, RO, Io/Ch JN, PL, RO, Io/Ch JN, PL, SR, Ch/Ca		1 1.5 1 1.5 1.5			
8	04/10	RC 8: Classification based on RQD: Fair			RC 8											•	JN, PL, RO, Ch JN, PL, SR, Ch		1			-
		RC 9: Classification based on RQD: Fair			RC 9											•	JN, IR, SR, Ch/Su JN, PL, SR, Ch/Su JN, PL, SR, Ch JN, PL, RO, Ch		1.5 1 1			-
		RC 10: Classification based on RQD: Poor			RC 10											8 8 8 8	JN, PL, SR, Ch JN, UN, RO, Ch JN, PL, RO, Ch JN, PL, RO, Ch JN, UN, RO, Ch JN, PL, RO, Ch		1.5 1.5 1.5 1.5 1			
		GROUNDWATER ELE															LOGGED CHECKED		BC SC/I		HEET 1	of 3

		ORD OF BOREHOL	.Е	No.	<u>G</u>	H	<u>1-</u>	4 -	R	<u>0C</u>		LL	NGI	_00	САТ	ION	। : Geophysical (N	510	149	96, E3	16738)	amec
NA	IENT ME / CATIC	: Canadian Nuclear Laborator : Multidisciplinary Subsurface N River, ON			n fc	or N	SDF	= - Cł	nalk		INC	ILLII CLIN IMU ⁻	IATI	ЛС	(De	eg.)	: 4 Oct 16 - 4 Oct : Vertical : Vertical	. 16				foster wheeler DATUM: Geodetic
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN	TOTA CORE	COVE	DLOGIC	For CAL A	abbre	FRAC	ins, s	Nica Nica		DESCRIPTION	Jr	Ja	RE ROCK STRENGTH RE ROCK STRENGTH RE INDEX	WEATHERING	NOTES WATER LEVELS INSTRUMENTATION
-		DIORITE BEDROCK					F										JN, PL, K, Ch/Ca					
-		RC 11: Classification based on RQD: Fair			RC 11											•	JN, PL, RO, Io/Ch JN, PL, RO, Io/Ch JN, IR, RO, Ch JN, PL, RO, Io/Ch		1.5 1 1.5 1			
- - 14 - - -		RC 12: Classification based on RQD: Good			RC 12									_	•	•	JN, PL, RO, Ca/lo/Ch JN, PL, RO, Ca/lo/Ch JN, PL, SR, Ch JN, IR, SR, Ch		1.5 1.5 1			-
- - - 16 -		RC 13: Classification based on RQD: Excellent			RC 13											•	JN, PL, SR, Ch JN, PL, RO, Ch/Ca JN, PL, RO, Ch JN, PL, RO, Ch/Ca		1.5 1.5 1			-
- - - -	04/10/2016 HQ	RC 14: Classification based on RQD: Good			RC 14										•		JN, PL, K, Ch/IO JN, ST, SM, Ch/Ca JN, PL, SR, Ca/lo/Ch JN, PL, SR, Ch JN, PL, RO, Ch		1.5 1.5 1.5			
		RC 15: Classification based on RQD: Good			RC 15												JN, PL, RO, Ch/IO SH, PL, RO, Ca/Io/Ch		1.5			-
		RC 16: Classification based on RQD: Excellent			RC 16											•	JN, PL, RO, Ch/Ca JN, PL, RO, Ca/lo/Ch JN, PL, RO, Io/Ch JN, PL, RO, Ch JN, UN, RO, Ch/Ca		1.5 1 1.5 1.5			-
		RC 17: Classification based on RQD: Good			RC 17											•	JN, UN, RO, Ch JN, PL, RO, Ch		1			
		GROUNDWATER ELE IN OPEN BOREHOLE ON WATER LEVEL (date)															LOGGED CHECKED		BC SC/I		HEET 2	2 of 3

F	RE	C	ORD OF BOREHOL	E N	No.	G	H1	-4	- F	Ro	C	k																
СІ	LIEN	١T	No. : TZ16018 : Canadian Nuclear Laborato									DR	LLI	NG E	ОАТ	Έ		: 4	Oct	hysical (16 - 4 C			96,	E3	167:	38)	amec foster wheeler	
	ame DCA	: / .TIOI	: Multidisciplinary Subsurface N River, ON	Inves	tigatio	n fo	or NSE)F -	Cha	ılk				atic Th ([g.)		ertic ertic								DATUM: (Geodetic
DEPTH SCALE (metres)		חאורבוואפ אביטאט	DESCRIPTION Continued from non-cored borehole See Overburden log report.		ELEV. DEPTH	SAMPLE No.	PENETRATION RATE (m/min) FLUSH COLOUR	SH % RETURN	RECO	VER)	Y		ND G			mbo ICAL		DIS TYI		ON TERMINO			OCK STDENGTU	INDEX	WEATHERING	INDEX	NOTES WATER LE INSTRUMEN	VELS
 	1	5	DIORITE BEDROCK	s N	(m)	_	PEN FL(\$2	2 88			29	88	92	²⁰		888	JN, PL			Jr	+	828	c 78288 1911	1888 I	S 8		
-			RC 18: Classification based on RQD: Excellent			RC 17 RC 18										•	-	JN, PL JN, UN JN, PL	, RO, C	Ch		1.5 1.5 1.5 1.5						-
- -24 - - - -			RC 19: Classification based on RQD: Excellent			RC 19											•	JN, PL	, RO, C	ch, SR, K		1.5						-
- - -26 - -	04/10/2016	А	RC 20: Classification based on RQD: Excellent			RC 20											•	JN, PL				1.0						
			RC 21: Classification based on RQD: Excellent			RC 21											•	JN, PL				0.75						- - - - - - -
			RC 22: Classification based on RQD: Excellent		159.10	RC 22																						-
					29.97																							
			GROUNDWATER ELET $\[equation]{\label{eq:static}{2}}$ In open borehole on			ЛС														LOGGED	;	BC		S	HEE	Т3	of 3	
			WATER LEVEL (date)																	CHECKE		SC/	NR					

F	RE	С	ORD OF BOREHOL	E	No.	G	iΗ΄	1-5	5 -	R	00	:k												
CL NA	ROJ LIEN AME DCA	IT :/	r No. : TZ16018 : Canadian Nuclear Laborator : Multidisciplinary Subsurface N River, ON			on fo	or NS	SDF	- C	hall	¢	D II	RILLI RILLI NCLIN ZIMU	NG E IATIC	TAC NC	E (De		: Geophysical (N5 : 30 Sep 16 - 30 S : Vertical : Vertical				31	677	4) amec foster wheeler DATUM: Geode
DEPTH SCALE (metres)			DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)	FLUSH COLOUR RETURN						EOTE	TURE DEX	ymbc IICAI Alpha (d		descriptions refer to INTERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr	Ja	ROCK STRENGTH		WEATHERING	NOTES WATER LEVELS INSTRUMENTATION
			For overburden details, see "RECORD OF BOREHOLE GH1-5 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - GH1-5"															JN, PL, ST, SM, Ch/Ca, RO		1.0				
ŀ			Rock Coring Started on 30 September 2016																					
ŀ			QUARTZFELDSPATHIC GNEISS BEDROCK		187.51 1.01			1		ľ							•	JN, UN, RO, Bi		0.75				
- 2 -			RC 3: Classification based on RQD: Excellent			RC 3												JN, PL, RO, lo JN, PL, SR, lo/Su JN, UN, RO, Bi		0.75 0.75 1				-
- - - - - - - 4			RC 4: Classification based on RQD: Excellent			RC 4												JN, UN, RO, Bi/Mu JN, UN, SR, Bi/Io JN, UN, SR, Io JN, PL, SR, Bi JN, PL, SR, Io		1 1 1 0.75				
-	30/09/2016	HQ	RC 5: Classification based on RQD: Excellent			RC 5											• • • •	JN, UN, RO, Io JN, PL, SR, Io JN, UN, RO, Ca		0.75 0.75 1 0.75 1 1				
	e		RC 6: Classification based on RQD: Excellent			RC 6											• •	JN, UN, SR, Io/Su JN, UN, RO, Io/Su JN, PL, PL, Io		1.5 1.5 0.75				
			RC 7: Classification based on RQD: Excellent			RC 7											•	JN, UN, RO, Ca/Ch JN, PL, SR, Bi JN, UN, SR, Io JN, UN, SR, Bi		0.75 1.5 0.75 1				-
			RC 8: Classification based on RQD: Excellent			RC 8											••	JN, UN, SR, Bi JN, PL, SR, Mu/lo JN, PL, SR, Io JN, Cu, SR, Ch/Ca		1 1 1				
			GROUNDWATER ELEN															LOGGED CHECKED		BC SC/N	NR	Sł	HEET	1 of 4

F	REC	ORD OF BOREHOL	_E I	No. 🤉	Gł	-11-	-5 -	R	loc	ck	ı										
CI	ROJEC [.] LIENT AME /	T No. : TZ16018 : Canadian Nuclear Laborato : Multidisciplinary Subsurface			for	NSD	•F - C	hal	k	DI	RILLI RILLI ICLIN	NG [DATI	E		: Geophysical (N : 30 Sep 16 - 30 \$: Vertical				16774)	amec foster wheeler
LC		N River, ON								AZ	ZIMU'	TH (I	Deg.	.)		: Vertical					DATUM: Geodetic
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.		ELEV. DEPTH (m)	ENETRATRATION RATE		RE TOTA CORE	ECOV AL E % (/ERY SOLIC CORE	D F	AND G	FRAC IND PER	TURE DEX	ICAL R	and ROC	descriptions refer to K DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr	Ja	ROCK STRENGTH INDEX	WEATHERING INDEX	NOTES WATER LEVELS INSTRUMENTATION
		QUARTZFELDSPATHIC GNEISS BEDROCK		R			248	38	248	8 8	488	92	20	-%8 	38		⊢		8195555	W1 W2 W2 W2 W2 W2 W2 W2 W2 W2 W2 W2 W2 W2	
-		RC 9: Classification based on RQD: Good		R	C									•	•	JN, PL, SR, Io JN, PL, RO, io JN, PL, SR, Io JN, PL, SR, Ch/Ca JN, UN, SR, Io/Sa JN, UN, RO, Io/Sa JN, UN, SR, Io		1 0.75 1 1 0.75 1			- - - - - - - - - - - - - - - - - - -
-12 - - - -		MAFIC INTRUSIVE BEDROCK RC 10: Classification based on RQD: Poor		176.49 12.03	C 0									•	•	JN, PL, SR, Io CON, PL, SR, Io JN, UN, SM, Ch JN, PL, SR, Ch/Ca/Io JN, PL, SR, Ch/Io JN, PL, SK, Ch/Io JN, PL, SM, Ch/Io JN, PL, SM, Ch/Io		1 1 1 1 1 1			
14	30/09/2016 HQ	RC 11: Classification based on RQD: Fair		F 1	C 1									•	•	JN, PL, SR, Ch/lo JN, PL, SR, Ch/lo JN, PL, RO, Ch JN, PL, RO, Ch JN, PL, RO, Ch/Ca/lo		1.5 1 1 1			- - - - - - - - - - - - - - - - - - -
- - - - - 16	30/0£	RC 12: Classification based on RQD: Good			C 2									•	•	JN, PL, RO, Ch JN, PL, RO, Ch/Ca JN, PL, RO, Ch/Ca JN, PL, RO, Ch JN, UN, RO, Ch		1.5 1 1 1.5			
PL AMECFW ROCK 2016.GDT		RC 13: Classification based on RQD: Fair			C 3									• •	•	JN, PL, RO, Ch JN, UN, RO, Ch JN, PL, SR, Ch JN, UN, SR, Ch JN, UN, SR, Ch/ JN, PL, SR, Ch/Ca JN, CU, RO, Ch JN, PL, RO, Ch JN, PL, SM, Ch		1.5 1.5 1.5 1 1 1.5 1 1 1 1			- - - - - - - - - - - - - - - - - - - -
1216018 NSDF BEDROCK 240CT2016.GPJ AMECFW ROCK 2016.GDT 31/10/16		RC 14: Classification based on RQD: Fair			C 4									•	•	JN, PL, SR, Ch JN, UN, RO, Ch JN, PL, SR, Ch JN, PL, SR, Ch JN, PL, SR, Ch JN, PL, SR, Ch JN, PL, RO, Ch		1 1.5 1.5 1.5 1 1 1 1.5			- - - - - - - - - - - - - - -
		RC 15: Classification based on RQD: Excellent		1	C 5									•		JN, PL, K, Ch		1.5			-
AMECFW ROCK		GROUNDWATER ELE			N											LOGGED CHECKED		BC SC/I		HEET 2	2 of 4

F	REC	ORD OF BOREHOL	_E	No. <u>(</u>	Gł	<u>-11-</u>	<u>5 -</u>	R	00	ck											
		T No. : TZ16018													ON	: Geophysical (N				16774	annee
	LIENT	: Canadian Nuclear Laborato : Multidisciplinary Subsurface			for	NSD	= <u>-</u> C	hall	<			NG E IATIC			r)	: 30 Sep 16 - 30 S : Vertical	Sep) 16			foster wheeler
				ouguton		1021		nan	•			TH (E			J-)	: Vertical					DATUM: Geodetic
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV.	PENETRATION RATE	(m/min) FLUSH COLOUR % RETURN	RE TOTA CORE	COV							s and ROC	I descriptions refer to CK DESCRIPTION TERMINOLC DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	DGY	Ja	ROCK STRENGTH INDEX	WEATHERING INDEX	NOTES WATER LEVELS INSTRUMENTATION
<u> </u>	Ľ	MAFIC INTRUSIVE BEDROCK		(11)	Ē		248				488	°5Å	28	<u>ی</u>	88 80				555555	W1 W2 W8 W8 W8 W9	
-				R(1:	0.0											JN, PL, SR, Ch JN, PL, SR, Ch		1 1.5			- - - -
- - 22		RC 16: Classification based on RQD: Fair		Ri 11											•	JN, PL, RO, Ch		1			- - - - -
-		RC 17: Classification based on RQD: Good		Rt 1	07											JN, PL, UN, SR, Ch, RO		1			- - - - - - - - - - - - - - - - - - -
-24 - - - -	30/09/2016 HQ	RC 18: Classification based on RQD: Fair		Ri 1i	3											JN, PL, UN, SR, Ch/lo, RO		1			-
91/01/16 		RC 19: Classification based on RQD: Excellent		R												JN, PL, VR, SR, RO		1			
		RC 20: Classification based on RQD: Excellent		Rt 21	0											JN, PL, SR, K, Ch/lo, RO		1.5			-
1/10/16 NSUF_BEDROCK 240/012/010-04 AMECHW ROCK 2010:001 31/10/16		RC 21: Classification based on RQD: Excellent		Rt 2 7	1											JN, PL, SM, Ch/lo, RO		1.0			
YOCK		GROUNDWATER ELE																	S	HEET	3 of 4
			CON	/IPLETIO	N											LOGGED		BC			
AME		WATER LEVEL (date)														CHECKED	:	SC/N	NR		

		CORD OF BOREHO	LE	No.	G	H	1-(5 -	F	<u>So</u>																
	OJE	CT No. : TZ16018 F : Canadian Nuclear Laborato	ries	td											G LO		T I OI	N : Geop	ohysical ep 16 - 3				8, E3	316	774	amec foster
	ME	: Multidisciplinary Subsurface			on fo	or N	SDF	- C	ha	lk							eg.)) : Verti	cal	000	сþ	10				wheeler
LC	CAT											AZ	ZIMU	JTH	(De	g.)		: Verti	cal					_		DATUM: Geodetic
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN	TOT/ CORE	ECO AL E %	VER SO COR	Y L I D RE %		AND R.Q.D.	GEO FR/ II PE	ACTUF NDEX ER 1 m	symt INIC/ RE n Alp	ha ang	DISCON	TINUITY DAT	Ά Ξ		Ja	ROCK STRENGTH INDEX		WEALHERING	NOTES WATER LEVELS INSTRUMENTATION
		MAFIC INTRUSIVE BEDROCK				<u>۵</u>	<u> </u>	648	5 8 8	<u>84</u>		30	488	<u>م</u> ک	222 222		888			-	+	┪	9122525	85 W1	222 202 202 202 202 202 202 202 202 202	
- - - -	30/09/2016	gr RC 22: Classification based on RQD: Fair		157.22	RC 22													JN, PL, UN, RO	SR, VR, Ch/I	о,		1.5				- - - - -
ŀ		End of Rock Coring		31.30									Π	Π	TII											
- 32 - 32 																										- - - - - - - - - - - - - - - - - - -
-34																										-
-																										- - - - - - - - - - - - -
-36 - - - -																										- - - - - - - - - - - - - - - - - - -
- -38 - - - - - - - -																										-
		GROUNDWATER ELE													<u> </u>	_				1			;	SHE	EET 4	l of 4
		$\stackrel{[]}{ op}$ IN OPEN BOREHOLE ON WATER LEVEL (date)		MPLET	ION														LOGGEI			BC BC/N				

R	REC	CORD OF BOREHOI	E	No.	S	H-	1	- F	Ro	oc	k												
CL NA	ROJEC IENT ME / DCATIO	: Multidisciplinary Subsurface			n fo	r NS	SDF	- C	Chal	lk		DRIL DRIL INCL AZIN	.LIN	NG E ATIC	DAT DN	E (De		 Supporting Stru E8 10:67/16) - 18 (Vertical Vertical 			N5101	743,	amec foster wheeler DATUM: Geodetic
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)	FLUSH COLOUR RETURN	RI TOT CORI 0298	ECO AL E %	IOLO /ERY SOL CORE	, . I D E %		D GI		CHN FURE EX 1 m	ymbol IICAL Alpha (de	. RO	d descriptions refer to CK DESCRIPTION TERMINOLO DISCONTINUITY DATA I TYPE AND SURFACE DESCRIPTION	DGY Jr	Ja	R ROCK STRENGTH	WEATHERING	NOTES WATER LEVELS INSTRUMENTATION
-		For overburden details, see "RECORD OF BOREHOLE BH2-2 - Overburden" - For core details, see "TABLE FOR ROCK CORE LOG - BH 2-2" Rock Coring Started on 17 October 2016																					
- - - -18		QUARTZFELDSPATHIC GNEISS BEDROCK		<u>171.52</u> 17.31												•		JN, PL, RO, Sa		0.75			-
		RC 15: Classification based on RQD: Excellent		-	RC 15											•		JN, PL, RO, Sa		0.75			
- - -20 -		RC 16: Classification based on RQD: Excellent		-	RC 16											•	•	JN, PL, RO, Sa JN, PL, RO, Ca		0.75			-
-	18/10/2016 HQ	RC 17: Classification based on RQD: Excellent			RC 17																		
		RC 18: Classification based on RQD: Excellent		-	RC 18											•		JN, UN, RO, Ca/lo		0.75			
		RC 19: Classification based on RQD: Excellent		-	RC 19											•		JN, PL, SR, Ch/Ca JN, PL, RO, Ch/Ca		0.75			-
		RC 20: Classification based on RQD:			RC 20																		
		GROUNDWATER ELE			NC															MA SC/I		HEET ′	l of 2

F	RE	С	ORD OF BOREHOI	E	No.	S	H·	-1	- R	lo	ck	(- Ale	
CL NA	-IE AM	NT	⁻ No. : TZ16018 : Canadian Nuclear Laborato : Multidisciplinary Subsurface N River, ON			on fo	r N	SDF	= - CI	hal	k	D II	RILL RILL NCLIN ZIMU	ING NAT	DA ION	TE (De	 Supporting Structure E3 10:62710 - 18 Vertical Vertical 			N510	17	43	,	amec foster wheeler DATUM: Geod	letic
DEPTH SCALE (metres)		DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN	RE TOTA CORE 0709	COV	IOLOG (ERY SOLID CORE (GEOT		NICA	ad descriptions refer to DISCONTINUITY DATA INCONTINUITY DATA INCONTINUITY DATA INCONTINUITY DATA DISCONTINUITY DATA DISCONTINUITY DATA	OGY Jr	Ja	ROCK STRENGTH	4 1	WEATHERING		NOTES WATER LEVELS INSTRUMENTATIC	
			Excellent QUARTZFELDSPATHIC GNEISS BEDROCK			RC 20																			
- - - - - - - 28	18/10/2016	ВH	RC 21: Classification based on RQD: Excellent End of Rock Coring		160.79 28.04	RC 21											JN, PL, RO, Ch/Ca		1						
- - - - -			End of Rock Coring		28.04																				-
-30																									-
																									-
			GROUNDWATER ELE $\begin{tabular}{ll} \hline \mathbb{Z} In open Borehole on$									<u> </u>							<u> </u>		S⊦	IEE.	Ш Т 2	of 2	
AMEC			WATER LEVEL (date)		vii LC												LOGGED CHECKED		MA SC/	NR					

F	RE	C	ORD OF BOREHOL	E	No.	S	Н-	2 -	- R	lo	c	<u><</u>								_						Ale
	ROJ		No. : TZ16018 : Canadian Nuclear Laborator	ies I	td								DRIL DRIL					Л	: Supporting Stru : E3 8:6466 - 30 \$				01	790),	amec foster
N/	٩ME	= /	: Multidisciplinary Subsurface			on fo	or NS	SDF	- C	hal	k	l	NCL	INA	TIO	N ([Deg.)	: Vertical	Jop	, 10	,				wheeler
	_		N River, ON				Ë,	тž				A	ZIM	IUTI	H (D	eg.) NOT	·E ·	: Vertical							DATUM: Geodetic
SCALE es)				IC LOG	ELEV.	E No.	ATION RA hin)			LITH	OLOG						nbo l s	and	d descriptions refer to CK DESCRIPTION TERMINOLO)GY		RENGTH	X	ERING	×	NOTES
DEPTH SCALE (metres)		DKILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	DEPTH	SAMPLE No.	PENETRATRATION RA (m/min)	FLUSH -	RE TOTA CORE		ERY SOLI		R.Q.[%	·	RACT INDE PER 1	×k	pha a (deg	ang l e	ITPE AND SURFACE			ROCK STRENGTH	QN	WEATHERING	<u>n</u>	WATER LEVELS
		Ĕ	- For overburden details, see "RECORD OF	S S	(m)		PEA	<u> </u>	<u>8</u> 48				<u>8</u> 48	8	111 292	50	- 88 		DESCRIPTION	Jr	Ja	2223	2228	5883		
ļ			BOREHOLE BH2-2 - Overburden" - For core details, see "TABLE FOR ROCK CORE LOG - BH 2-2"																							
			Rock Coring Started on 29 October 2016																							
ŀ					163.46																					-
-			GNEISS BEDROCK	\bigotimes	23.16					L																•
ŀ			RC 21: Classification based on RQD: Poor	S		RC 21				L																
-24						\vdash		+		╀		H		+	H				JN, PL, RO, Ca							-
ŀ			RC 22: Classification based on RQD: Poor	K		RC 22													JN, PL, RO, Ca JN, PL, RO, Ca		1.5 0.75 0.75					
ŀ								+																		
ŀ			RC 23: Classification based on RQD: Fair			RC 23											•	•	JN, PL, RO, Sa JN, PL, RO, Ca JN, PL, RO, Ca		0.75					-
-								1				t									0.75					
ŀ										L																•
-26				Ø		RC				L									JN, PL, RO, Sa/Ca		0.75					-
	016		RC 24: Classification based on RQD: Fair			24				L																
-	29/09/2016	Å		X						L									JN, PL, RO, Sa		0.75					•
ŀ				S			_	-																		-
-				S													\$		JN, PL, RO, Ca JN, PL, RO, Ca		0.75 0.75					
			RC 25: Classification based on RQD: Fair	K		RC 25																				-
-28																			JN, PL, RO, Di JN, PL, RO, Ca/Sa JN, UN, RO, Ca JN, PL, RO, Br		1 1.5 1 0.75					-
601 3				K								T														
2016.																			JN, UN, RO, Ca JN, PL, SR, Ca		1.5 1					
- CK 2 - 2 2 - 2			RC 26: Classification based on RQD: Fair			RC 26																				-
AMECT						20												•	JN, PL, RO, Ca		1					
				X																						
-30	╞		End of Rock Coring		156.52 30.10				Π			T		۲												-
2400 7400																										
018 0																										•
91.71 Y																										
			GROUNDWATER ELEN $$\Sigma$$ IN OPEN BOREHOLE ON																		D.C		S	HEE	ET 1	of 1
AMECT			WATER LEVEL (date)	501	vii LL []																BC SC/I	NR				

F	REC	ORD OF BOREHOL	E	No.	S	H-	4 •	- R	0	ck	,													A
CI N/	ROJEC ⁻ LIENT AME / DCATIO	r No. : TZ16018 : Canadian Nuclear Laborator : Multidisciplinary Subsurface N River, ON			on fo	r NS	SDF	- CI	nalk		DF IN	RILLI CLIN	NG L NG E IATIC TH (I	DATI	Ξ Deg.		: Supporting Struc : E31088066) - 11 C : Vertical : Vertical			151	01	135,	,	amec foster wheeler DATUM: Geodetic
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	Ëε	Ξľ		COVE		R		FRAC IND PER	TURE EX		and ROC	descriptions refer to K DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	GY Jr	Ja	RE ROCK STRENGTH	INDEX	W WEATHERING		NOTES WATER LEVELS INSTRUMENTATION
-2		 For overburden details, see "RECORD OF BOREHOLE SH-4 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - SH-4" Rock Coring Started 		153.94																				-
-		QUARTZFELDSPATHIC GNEISS BEDROCK RC 5: Classification based on RQD: Fair		2.64	RC 5										•		JN, UN, RO, Ch JN, PL, SR, Ch JN, PL, RO, Ch		1 1 1					-
- - -4 -		RC 6: Classification based on RQD: Excellent			RC 6										•		JN, PL, RO, Ch JN, PL, SR, Ch		1.5					- - - -
-		RC 7: Classification based on RQD: Excellent			RC 7										•		JN, PL, SR, Ch JN, PL, SR, Ch/Ca		1.5 1.5					
-	Н	RC 8: Classification based on RQD: Fair MAFIC INTRUSIVE BEDROCK		<u>149.64</u> 6.94	RC 8										•		JN, PL, SR, Ch JN, IR, SR, Ch JN, PL, SR, Ch JN, PL, SM, Ch JN, PL, SM, Ch JN, PL, SR, Ch		1.5 1.5 1.5 1.5 1.5 1.5					
		RC 10: Classification based on RQD: Fair			RC 9										• • • •	•	JN, PL, SM, Ch/lo JN, PL, RO, Ch/lo JN, PL, SR, Ch JN, UN, RO, Ch JN, PL, RO, Ca/Ch JN, PL, RO, Ca/Ch JN, PL, RO, Ch/lo JN, PL, RO, Ch/lo JN, PL, RO, Ch/lo		1.5 2 1.5 1 1 1 1 1 1 1 1 1 1					- - - - - - - - - - - - - - - -
		SCHIST BEDROCK		<u>147.54</u> 9.04												•	JN, PL, SR, Ch JN, ST, SR, Ch CON, PL, RO, Ch JN, UN, RO, Ch		1.5 1 1.5					-
		RC 11: Classification based on RQD: Excellent End of Rock Coring		146.02	RC 10										•	•	JN, PL, RO, Ch JN, PL, RO, Ch JN, PL, SR, Ch JN, PL, RO, Ch		1.5 1.5 1.5 1.5					- - -
1716018		GNEISS BEDROCK		140.02	RC 11												JN, PL, RO, Ch/Ca JN, PL, RO, Ch		1 1.5					
		GROUNDWATER ELEY ☑ IN OPEN BOREHOLE ON WATER LEVEL (date)				1											LOGGED :		KT/N SC/N		S	HEE	T 1	of 2

R	RE	C	ORD OF BOREHOL	E	No.	<u>S</u>	H·	-4	- F	۲c	C	<u>k</u>															
CL NA	ROJE IEN ⁻ AME DCAT	Г /	No. : TZ16018 : Canadian Nuclear Laborato : Multidisciplinary Subsurface River, ON			on fc	or N	SDF	= - C	Cha	llk		DR	ILLI ILIN	NG ATI	DAT ON	TE (D	FION	Supporti E3106806 Vertical Vertical				N5^	101	13	5,	amec foster wheeler DATUM: Geodetic
DEPTH SCALE (metres)	DRILLING RECORD		DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN	CORE	ECO AL E %	VER) SOI COR	Y L I D RE %	R.C	ND G	FRAG	CTUR DEX R 1 m	symt NICA E Alpi	ha ang	DESCRIPT	TY DATA	GY Jr	Ja		INDEX	WEATHERING	I	NOTES WATER LEVELS INSTRUMENTATION
- - - -			GNEISS BEDROCK RC 12: Classification based on RQD: Excellent			RC 11	<u>a.</u>		20	08	20		20	800	5	20	0	•	JN, PL, SR, Ch/Ca JN, PL, RO, Su/Ch			1.5	81 81 82 82 82 82 82 82 82 82 82 82 82 82 82	25 25 25 25 25 25 25 25 25 25 25 25 25 2	200 200 200	SW SW	
-12 - - - -	:	рн	RC 13: Classification based on RQD: Excellent			RC 12											•	•	JN, PL, SR, Ch/Ca JN, PL, SR, Ch/Ca JN, PL, RO, Ch/Ca	a a a		1 1 1					-
- - - 14 -			End of Rock Coring		<u>143.13</u> 13.45																						- - - - -
-																											-
- 16 																											-
J AMECFW ROCK 2016.GDT 31/1 8 8																											-
AMECEW ROCK TZ16018 NSDF BEDROCK 240CT2016.GP1 31/10/16																											- - - - - - - - - - -
MECFW ROCK TZ16018			GROUNDWATER ELEN ↓ IN OPEN BOREHOLE ON WATER LEVEL (date)																	GGED :		KT/N SC/I		s	HE	Ш ЕТ 2	2 of 2

R	REC	C	ORD OF BOREHOL	E	No.	S	H-	5	- F	20	c	Κ														
CL NA	ROJE .IENT AME / DCAT	Г /	No. : TZ16018 : Canadian Nuclear Laborator : Multidisciplinary Subsurface N River, ON			on fo	or N	SDF	- C	hal	k		ORIL NCL	_LIN	IG LI IG D ATIO IH (C	AT N (E De		: Supporting Stru : E210 31169 - 12 C : Vertical : Vertical			N51	01	337	7,	amec foster wheeler DATUM: Geodetic
DEPTH SCALE (metres)	DRILLING RECORD		DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)			ECOV	/ERY SOL CORE	GICA	R.Q.	D GE		URE EX	mbo ICAL Alpha (di		d descriptions refer to CK DESCRIPTION TERMINOLC DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr	Ja	RE RE RE RE RE RE RE RE RE RE RE RE RE R	RA INDEX	WEATHERING		NOTES WATER LEVELS INSTRUMENTATION
			 For overburden details, see "RECORD OF BOREHOLE SH-5 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - SH-5" Rock Coring Started on 11 October 2016 																							-
- - -6 -			QUARTZFELDSPATHIC GNEISS BEDROCK RC 9: Classification based on RQD: Fair		155.61 5.49	RC 9					>>							•	JN, PL, RO, Io		0.75					- - - -
			RC 10: Classification based on RQD: Fair			RC 10											•	•	JN, PL, RO, Ca/Ch JN, PL, RO, Ca/Ch JN, PL, RO, Io JN, PL, RO, Io/Ch JN, PL, RO, Io/Ch JN, PL, RO, Io/Ch		1.5 1.5 1					-
-8			RC 11: Classification based on RQD: good SCHIST BEDROCK RC 12: Classification based on RQD: Very Poor		<u>152.49</u> 8.61	RC 11 RC 12											•	•	JN, PL, RO, Ch/Ca JN, PL, VR, Io JN, IR, RO, Sa/Ch JN, PL, RO, Sa/Ch JN, PL, VR, Sa/Ch JN, IR, RO, Ch JN, PL, RO, Ch		1.5 1 1.5 1.5 1					-
10	12/10/2016	μ	QUARTZFELDSPATHIC GNEISS BEDROCK RC 13: Classification based on RQD: good RC 14: Classification based on RQD: Very Poor		<u>151.34</u> 9.76												•	•	JN, UN, RO, Sa/Ch JN, PL, RO, Io/Ch JN, PL, RO, Io/Ch JN, UN, RO, Io/Ch/Sa JN, PL, RO, Io/Ch/Sa JN, PL, SR, Ch JN, PL, SR, Ch JN, PL, RO, Ch JN, PL, RO, Ch		1 1.55 1 1 1 1 1.5 1 1 1 1.5					- - - - -
- 12			RC 15: Classification based on RQD: Excellent			RC 15									1		•		JN, PL, RO, Io/Ch JN, PL, RO, Io/Ch JN, PL, RO, Io/Ch/Ca		1.5					-
			RC 16: Classification based on RQD: Excellent			RC 16											•		JN, UN, RO, Io/Ch JN, PL, RO, Io/Ch/Ca JN, IR, RO, Ch JN, PL, RO, Ch JN, PL, RO, Ch/Ca		1 0.75 0.75 0.5					-
			GROUNDWATER ELEN																LOGGED CHECKED		BC SC/h	NR	SI	HE	<u> </u> ≘⊤ ^	I of 2

F	RE	EC	ORD OF BOREHOL	E	No.	S	Η·	-5	- F	Ro	ocl	k													A
С	LIE	JEC1 INT IE /	r No. : TZ16018 : Canadian Nuclear Laborator : Multidisciplinary Subsurface			on fo	or N	SDF	= - C	hal	k		DRILL DRILL INCLI	IN	G DAT	Е		N : Suppor : E21063 : Vertica	1186) - 12 Oc			N5101	337	,	amec foster wheeler
L	_	ATIO	N River, ON										AZIMU	JTF	H (Deg	J.)		: Vertica	1						DATUM: Geodetic
DEPTH SCALE (metres)		DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN		ECOV	IOLO /ERY SOL CORE	D %		GE(ymb NICA Alpi (DISCONTINU	N TERMINOLOG		Ja	ROCK STRENGTH	WEATHERING		NOTES WATER LEVELS INSTRUMENTATION
- - - -	12/10/2016	HQ	QUARTZFELDSPATHIC GNEISS BEDROCK RC 17: Classification based on RQD: Excellent			RC 17																			
			RC 18: Classification based on RQD: Excellent End of Rock Coring		145.56 15.54									ļ			•	JN, UN, RO, Ch JN, PL, RO, Ch JN, PL, SR, Ch			0.75 1.5 1				-
- 																									- - - - - - - - - - - - - - - - - - -
- 																									- - - - - - - - - - - - - - - - - - -
																									-
N KOC			GROUNDWATER ELEV $\overline{\mathbb{Y}}$ IN OPEN BOREHOLE ON																00055	_		S	HEE	T 2	of 2
AMECT			WATER LEVEL (date)	501															LOGGED : CHECKED :		BC SC/N	١R			

F	RE	С	ORD OF BOREHOL	.E	No.	S	H	-6	-	R	C	:k									_					A
CL NA	-IEN Ame	١T	⁻ No. : TZ16018 : Canadian Nuclear Laborato : Multidisciplinary Subsurface N River, ON			n fc	or N	SDF	= _ (Cha	alk		DF IN	rill Cli	.INC	G LO G DA FION I (De	ATE N (C)eg		: Supporting Struc : E2105et299 - 13 C : Vertical : Vertical			N5101	611,	,	amec foster wheeler DATUM: Geodetic
DEPTH SCALE (metres)		חמובוואט מביטמט	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)	FLUSH COLOUR % RETURN	TOT COR	ECC AL E %	OVEF	RE %		AND .Q.D. %	GEC		, sym H NIC IRE (Al		and ROC angle	descriptions refer to IS DESCRIPTION TERMINOLOGI DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION		Ja	ROCK STRENGTH	WEATHERING		NOTES WATER LEVELS INSTRUMENTATION
			For overburden details, see "RECORD OF BOREHOLE SH-6 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - SH-6"																							-
- - 14			Rock Coring Started on 12 October 2016 QUARTZFELDSPATHIC GNEISS BEDROCK		161.23 13.72																					
			RC 15: Classification based on RQD: Poor			RC 15																				-
- - 16			RC 16: Classification based on RQD: Poor			RC 16											>	Λ								- - - - - - - - - - - - - -
- -			RC 17: Classification based on RQD: Excellent			RC 17																				- - - -
-18	12/10/2016	А	RC 18: Classification based on RQD: Excellent			RC 18													•	JN, PL, RO, Ca/Ch		0.75				- - - - -
			RC 19: Classification based on RQD: Excellent			RC 19													•	JN, PL, SR, Ch JN, ST, RO, Ch		1				-
			RC 20: Classification based on RQD: Excellent SCHIST BEDROCK		<u>153.15</u> 21.80	RC 20												•	•	JN, PL, RO, Ca JN, PL, RO, Su/Ca/Ch JN, PL, SR, Su/Ch JN, PL, RO, Ch JN, UN, RO, Ch JN, UN, RO, Ch		1 1 1.5 1.5 1.5				- - - - -
						RC 21												•		JN, PL, RO, Ch		1				
	•	· 1	GROUNDWATER ELE V IN OPEN BOREHOLE ON WATER LEVEL (date)								. 1						í I			LOGGED : CHECKED :		MA SC/I		SHEE	T 1	of 2

F	RE	С	ORD OF BOREHOL	E	No.	S	H-	6	- F	Ro	cł	<u><</u>													
CI N	LIE AM	١T	No. : TZ16018 : Canadian Nuclear Laborato : Multidisciplinary Subsurface N River, ON			on fo	or NS	SDF	- C	hal	k		DRILL DRILL NCLIM	ING VAT	DA ION	TE (De		 Support E2106421 Vertical Vertical 				N5101	61 ⁻	1,	amec foster wheeler DATUM: Geodetic
DEPTH SCALE (metres)		DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)	FLUSH COLOUR % RETURN		ECOV	ERY	GICA		GEOT		symb NICA		DISCONTINUI	TY DATA	Jr	Ja	ROCK STRENGTH	WEATHERING		NOTES WATER LEVELS INSTRUMENTATION
- - -			SCHIST BEDROCK RC 21: Classification based on RQD: Excellent			RC 21												JN, PL, RO, Ch			1.5				
-24 - - - - - -	12/10/2016	AH -	RC 22: Classification based on RQD: Excellent QUARTZFELDSPATHIC GNEISS BEDROCK		<u>150.10</u> 24.85	RC 22											¢	JN, PL, RO, Ch			1				-
- -26 - - -			RC 23: Classification based on RQD: Excellent End of Rock Coring		<u>148.05</u> 26.90	RC 23																			-
- - -28 - - -																									-
																									- - - - - - - - - - - - - - - - - - -
		1	GROUNDWATER ELE IN OPEN BOREHOLE ON WATER LEVEL (date)												<u> í</u>						MA		HE	ET 2	2 of 2
																		Ci	HECKED	:	SC/I	NIX.			

	RE	C	ORD OF BOREHOL	E	No.	Α	W	15	5-6) -	· N	Λ	or	nit	to	ori	n	g '	W	<u>/ell</u>											
			No. : TZ16018	ine l	4.4														ION	I : (N	1510	148	2, E3	316	599)				amec	
	LIEN IAME		: Canadian Nuclear Laborator : Multicidisciplinary Subsurfac			tion	for I	NSE)F -							IG E ATIC			a.)	: - : V	ertic	al								foster wheeler	
L	OCA	TIOI			_											Ή (Ε				: V	ertic	al								DATUM:	Geodeti
DEPTH SCALE		ורדואפ אברטאח	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR RETURN	RI TOT. CORI	ECC	VEF	۲Y) GE			mbol ICAL		e tyf			DATA	Т			ROCK STRENGTH INDEX	WEATHERING	INDEX	NOT WATER L INSTRUME	EVELS
				ۍ ا	(m)		PEN	Ĩ	248 248					11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	8	19 19	20 20		39./ 388		DESCI	RIPTIO	N	J	r Ja		C 222221 11111	2 5 3 9			
			- For overburden details, see "RECORD OF BOREHOLE G-BH15-6"		<u>168.10</u> 6.50																										
		[I;		 ,				<u> </u>			<u> </u>	<u> </u>				1					_1		ـــــــــــــــــــــــــــــــــــــ	SHEE	ET 1	of 1	
			✓ SHALLOW/SINGLE INSTA WATER LEVEL (date)	LLA	TION			- D WAT							AL			DN 201	16			LOG CHE	GED CKED	:	KG	G/NF	र				

F	RE	C	ORD OF BOREHOL	E	No.	B	H	2-2	2 -	N	10	n	ito	ori	in	q	V	Ve	<u> </u>								No.
CI N/	LIEM Ame	١T	⁻ No. : TZ16018 : Canadian Nuclear Laborato : Multicidisciplinary Subsurfac N Chalk River, ON			tion	for	NS)F -				DRI DRI INC AZII	LLIN	NG ATI	DA ⁻ ON	TE (De			: ECM (N510136 : 11 Oct 16 - 11 C : Vertical : Vertical			646	8)			amec foster wheeler DATUM: Geodetic
DEPTH SCALE (metres)		DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN		L NL	HOLO VERY SOL CORE	, .ID E %	R.Q	ND G	FRAG		symb NICA		nd de DCK	escriptions refer to DESCRIPTION TERMINOLC DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr	Ja	RI RI ROCK STRENGTH	INDEX		I	NOTES WATER LEVELS INSTRUMENTATION
		-	About 80 mm TOPSOIL brown (Disturbed) SILTY SAND trace gravel moist brown		162.96																						
-			SILTY SAND trace to some gravel moist End of Overburden Drilling Due to Auger		<u>162.64</u> 1.01	RC 3					>>																
-2		-	Refusal Rock Coring Started on 11 October 2016 QUARTZOFELDSPATHICGNEISS BEDROCK RC 3: Classification based on RQD: Excellent																								
			RC 4: Classification based on RQD: Fair			RC 4																					
- - - - - 4 - -			RC 5: Classification based on RQD: Good			RC 5					>>																
- - 6	11/10/2016	А	RC 6: Classification based on RQD: Excellent			RC 6					>>																
			RC 7: Classification based on RQD: Excellent			RC 7																					
-8			RC 8: Classification based on RQD: Excellent			RC 8																					
			RC 9: Classification based on RQD: Excellent			RC 9																					
			GROUNDWATER ELE SHALLOW/SINGLE INSTA WATER LEVEL (date) 20/10/	ALLA	TION	;			DEEI					TA		∆⊤I 0/10				LOGGED CHECKED		BC KG/	NR	S	HEE	ET 1	1 of 2

R	EC	ORD OF BOREHOL	.E	No.	B	H	2-2	2 -	•	N	0	ni	ito	or	in	g		Ne	el	<u> </u>							A	
PR	OJECT	ГNo. : TZ16018										0	DRI	LLI	NG	LO	CA	TIC	ΟN	: ECM (N510136			646	68)			amec	
	IENT	: Canadian Nuclear Laborator						_							NG					: 11 Oct 16 - 11 (Cct	16					foster wheeler	9
	ME /	: Multicidisciplinary Subsurfac	e Inv	vestigat	tion	for I	VSE)F -	•									Deg.	.)	: Vertical								
	CATIO	N Chalk River, ON				<u></u> 1						-	4211	MU	TH	(De	eg.)			: Vertical			_				DATUM: Ge	eodetic
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)		R TOT 208	ECC	OVE S CC	RY OL I E DRE		R.C	ND G	FRA IN PE	CTUR IDEX R 1 r	sym INIC RE	NOTI bols CAL R pha au (deg.	and o ROCI	descriptions refer to K DESCRIPTION TERMINOL DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr	Ja		INDEX	WEATHERING		NOTES WATER LEVI INSTRUMENTA	ELS
	말		\boxtimes				-	040		Ñ	40	ō	04		- CD -		ŭ d		50		┢	\vdash	8.8	1 2 2 2 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	W1 W2 W3			
	Η	End of Rock Coring		10.16																								
																												- - - - - - - -
		GROUNDWATER ELE			5																			S	HEE	ET 2	of 2	
		✓ SHALLOW/SINGLE INSTA WATER LEVEL (date) 20/10/2					- C WAT							ТА				N :016	6	LOGGED CHECKED		BC KG/	′NR					

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		CT No. : TZ16018															: ECM (N51012			659	5)		amec	
	.IENT AME /		Nuclear Laborator iplinary Subsurfac			ion [.]	for NS	SDE	-						E (Deg.)		: 7 Oct 16 - 7 O : Vertical	ct 16	Ċ,				foster wheeler	
	CAT				rooligai	1011										/	: Vertical						DATUM: Geod	detic
DEPTH SCALE (metres)	DRILLING RECORD	DESCR Continued from n See Overburg	RIPTION on-cored borehole den log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min) FI I I CHOUR		RECO DTAL RE %	SOL CORE	ID ND	R.Q.D	GEOT FRA PE	CTURE DEX R 1 m	ICAL R Alpha ar (deg.)	and d OCK	escriptions refer to DESCRIPTION TERMINO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr		ROCK STRENGTH	INDEX	WEATHERING INDEX	NOTES WATER LEVELS	
		brown (Disturbed) SAN some grave	to grey ND /SILTY SAND el, some clay oist					- 64	1.0 00	0.40	000	<u>8852</u>	- 01 G	20	0000	0				858	22.22	200 200 200 200 200 200 200 200 200 200	8	
		brow SILTY trace	wn to 'SAND gravel oist																				⊻	
		Refu Rock Coring Started			156.05 1.45																			
		GNEISS E	BEDROCK																					
-2		RC 4: Classification	based on RQD: Fair			RC 4																		
- -4.		RC 5: Classification	based on RQD: Poor			RC 5																		
- - - - -	07/10/2016		based on RQD: Very oor			RC 6																		- - - - -
		RC 7: Classification Pc	based on RQD: Very bor			RC 7																		
- - - - - - - - - - - - - - - - - - -		RC 8: Classification Po	based on RQD: Very cor			RC 8																		- - - - - -
		Exce	on based on RQD: ellent			RC 9																		
			WATER ELE				_														SF	IEET	1 of 2	
		SHALLON WATER LEVE	W/SINGLE INSTA L (date)	ALLA	TION			DEI ATEF							DN 2016		LOGGED CHECKEI	: D :	MA KG/	NR				

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			No. : TZ16018															ION	: ECM (659	95)			amec	
	LIEN		: Canadian Nuclear Laborato : Multicidisciplinary Subsurfac			lian	for						DRIL					,	: 7 Oct [.] : Vertica	16 - 7 Oc	t 16						foster wheeler	
					vestiya	lion	101	NOL)r =				INCL AZIN					g.)	: Vertica								DATUM:	
DEPTH SCALE (metres)			DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR <u> % RETURN</u>		ECOV	HOLO VERY SOL	o gi c <i>i</i>	For a	bbrev D GE	viatio	ns, sy CHN TURE	NC /mbc		e TYPE AND	N TERMINOLO			ROCK STRENGTH	INDEX	WEATHERING	INUEX	NOT WATER L INSTRUME	EVELS
			GNEISS BEDROCK	io XZZ	(m)		PEN	FL	%4%		248		299 940	38	192	15		-9./ 888	DESCR	RIPTION	Jr	Ja		2228	588 A			_
			GNEISS BEDROCK			RC 9																						
- - - - - - - - - - - - - - - - - - -	07/10/2016	ЮН	RC 10: Classification based on RQD: Fair		145.30	RC 10																						-
Ì.			End of Rock Coring		12.20																					\parallel		
- - - - - - - - - - - - - - - - - - -																												- - - - - - - - - - - - - - - - - - -
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			GROUNDWATER ELE SHALLOW/SINGLE INSTA WATER LEVEL (date)))EEF				NS1 te)	TAL		T IC /10/						MA KG/I	NR	SI	HEE	Τ2	of 2	

R	RE	C	ord of Borehol	_E	No.	E	<u>BH</u>	2-6	<u>- (</u>	• 1	<u>//c</u>	<u>)n</u>	it	0	<u>'ir</u>	١g		N	e										
			No. : TZ16018																ON	ECM						895)		amec
	.IEN		: Canadian Nuclear Laborato : Multicidisciplinary Subsurfac			tion	for	NGL											~ \	: 29 Se : Vertie		5 - 29	9 S	ep 1	6				foster wheeler
					vestiga	lion	101	NUL	- 10							ION De]-)	: Verti									DATUM: Geodeti
DEPTH SCALE (metres)			DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)	FLUSH COLOUR <u> <u> <u> </u> /u></u>	R TOT COR	ECO AL E %	VER SC COF	Y DL I D RE %		AND .Q.D. %	GEO FR P		RE (A	nbol CAL Ipha (de	ROC	DISCONT	ION TE	DATA ACE		Y Jr J	a	ROCK STRENGTH INDFX		WEATHERING	NOTES WATER LEVELS INSTRUMENTATION
-			brown (Disturbed) SILTY SAND trace gravel, with organics moist brown COBBLES/BOULDERS with rock fragments End of Overburden Drilling Due to Auger Refusal Rock Coring Started on 29 September 2016 DIORITE BEDROCK		190.91 0.69 190.66 0.94										_														
-2																									-				
- - - -4 -						RC 3									_										_				
- - - -	29/09/2016	На				RC 4																			-				
			RC 5: Classification based on RQD: Fair			RC 5																			_				
			RC 6: Classification based on RQD: Good			RC 6																			_				
8 			RC 7: Classification based on RQD: Fair			RC 7																							
						ò			_							• -											SH	EET	1 of 2
			✓ SHALLOW/SINGLE INSTA WATER LEVEL (date)	ALLA	ATION			WAT								.AT 20/1			6		LOG CHE	GED CKEE	:) :	BC	C G/N	R			

F	RE	С	ORD OF BOREHOL	E	No.	B	H	2-(6 •	- 1	N	or	ni	to	ori	n	g	V	Ve		<u>l</u>							
	RO. LIEI		T No. : TZ16018 : Canadian Nuclear Laborato	ries l	Ltd.									DRIL DRIL					ION		: ECM (N510145 : 29 Sep 16 - 29				95)			amec foster
N	AM	Ε/	: Multicidisciplinary Subsurfac			tion	for	NS	٦F	-			I	NCL	_IN/	4TI	ЛС	(De	eg.)		: Vertical	r		-				wheeler
⊢	_		N Chalk River, ON	<u> </u>			빈	~12					A	ZIN	101	Н (Deg				: Vertical			Г		Т		DATUM: Geode
DEPTH SCALE (metres)		DRILLING RECORD		SYMBOLIC LOG	ELEV.	No.	TION RAT	COLOUR % RETURN		LIT	тно	LOG						ymb		nd d	descriptions refer to	JGY					X NG	NOTES
EPTH S (metre		LING F	DESCRIPTION Continued from non-cored borehole	MBOL	DEPTH	SAMPLE No.	PENETRATRATION RA (m/min)		F TO COF	RECO		RY OLID	,	R.Q. %	υ. Ι	IN	TURI DEX R 1 m	Alph	na ang	le	DISCONTINUITY DATA	_			INDE		WEATHERING INDEX	WATER LEVELS
ä		DRIL	See Overburden log report.	Š	(m)	^o	PENE	FLUSH		RE %		RE 9		248			50 203		deg.) RBB	3	DESCRIPTION	Jr	Ja		2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		>	
ŀ			DIORITE BEDROCK			RC 7					L																	
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ŀ	29/09/2016	НQ									L																	
ļ.	29/09	Т	RC 8: Classification based on RQD: Good			RC 8					L																	
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ļ.					179.69						L																	
-12			End of Rock Coring		11.91					Π	T				Τ													
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				ALLA	TION										ΓAL							:	вс					
			WATER LEVEL (date)					WA.	ιER	ιĿΕ	vE	∟ (C	Jate	e)		20)/10	/20	16		CHECKED	:	KG	/NR				

F	RE	С	ORD OF BOREHOL	E	No.	B	H2	2-7	' -	N	10	n	ito	or	in	g	N	le										
CL N/	LIEN AME	IT	No. : TZ16018 : Canadian Nuclear Laborato : Multicidisciplinary Subsurfac N Chalk River, ON			tion ⁻	for N	ISD	F -				DRI INC	LLI	NG L NG E IATIC TH (I	DAT ON	TE (De		:	: ECM (N510 : 6 Oct 16 - 6 : Vertical : Vertical			316	3753 <u>)</u>)		amec foster wheeler DATUM:	Geodetic
DEPTH SCALE (metres)			DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	ΈÈ	Ξļ	RE TOT/ CORE	ECOV		, .ID E %	R.C	ND G	FRAC IND PER	TURE	ymbc NICAI			Scriptions refer to DESCRIPTION TERM DISCONTINUITY DA TYPE AND SURFA(DESCRIPTION	ATA	GY Jr	Ja	ROCK STRENGTH		WEATHERING	NOTE WATER LI INSTRUMEN	EVELS
- - - - - -		-	light brown (Disturbed) SILTY SAND trace gravel moist Iight grey SILTY SAND trace gravel very dense moist rock fragments at tip of spoon		<u>191.10</u> 0.69																							
-2 - - - -			cobbles/boulders																									
-4			End of Overburden Drilling Due to Auger Refusal																									-
ŀ	\vdash		Rock Coring Started on 6 October 2016 QUARTZOFELDSPATHICGNEISS		187.29 4.50		_																		++			
- - - - -			BEDROCK RC 7: Classification based on RQD: Excellent			RC 7																					Ţ	
	06/10/2016	НА	RC 8: Classification based on RQD: Fair			RC 8																						
-8			RC 9: Classification based on RQD: Poor			RC 9									F													
 			RC 10: Classification based on RQD: Good			RC 10																						
			GROUNDWATER ELE			5		- D WAT						ТА	LLA 20		ОN /20 [/]	16		LOGGE			MA		SHI	EET 1	of 2	
			WATER LEVEL (Uale)				V	/VA1	ΞĀ			(ua	110)		20	, 10,	120	10		CHECK	KED :		KG/N	١K				

	R	EC	ORD OF BOREHOL	E	No.	B	H	2-7	7 -	Μ	0	ni	tor	ir	ŋd	V	Ve	; 								
	IAN	DJEC [.] ENT //E / CATIC	T No. : TZ16018 : Canadian Nuclear Laborato : Multicidisciplinary Subsurfac N Chalk River, ON			tion	for	NSE	DF -				DRILLI DRILLI NCLIN AZIMU	ING IAT	DA	TE (De			: ECM (N5101650 : 6 Oct 16 - 6 Oct : Vertical : Vertical		31	675	53)			amec foster wheeler DATUM: Geodetic
DEPTH SCALE	(20 BOIL)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN		ECOV		GICA	For abbr L AND (R.Q.D. %	FRA IN PE	ions, TECH ACTUF NDEX ER 1 n	NICA	OTE: ols ar L RC na ang deg.)	nd de DCK	escriptions refer to DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	GY Jr	Ja					NOTES WATER LEVELS INSTRUMENTATION
			QUARTZOFELDSPATHICGNEISS BEDROCK			RC 10																				
- - 12		0	RC 11: Classification based on RQD: Excellent			RC 11																				
		06/10/2016 HQ	RC 12: Classification based on RQD: Excellent			RC 12																				-
14			RC 13: Classification based on RQD: Good		<u>177.03</u> 14.76	RC 13																				
			End of Rock Coring		14.76																					
			GROUNDWATER ELE ♀ SHALLOW/SINGLE INSTA			;																	<u>اااا</u> د	SHE	 ET :	2 of 2
			WATER LEVEL (date)	1LLA					TER						ATI 20/10				LOGGED : CHECKED :		MA KG/	NR				

F	RE	EC	ORD OF BOREHOL	E	No.	S	H	-4	- [Mo	on	it	0	rir	<u>10</u>	V	N	el									
С	RO. LIEI IAMI	NT	No. : TZ16018 : Canadian Nuclear Laborator : Multicidisciplinary Subsurfac			tion	for	NSE)F -				DR DR INC	ILLI	ING		ΤE			: Supporting Stru : E 3106&066)- 11 C : Vertical			N51	101	135,	,	amec foster wheeler
			N Chalk River, ON										ΑZ							: Vertical							DATUM: Geodetic
DEPTH SCALE (metres)	()	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN	20 101 101 101 101	ECO TAL E %		∕ LID E%			FRA IN PE		symt INIC/		and de OCK	escriptions refer to DESCRIPTION TERMINOLC DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr	Ja	ROCK STRENGTH	INDEX	WEATHERING		NOTES WATER LEVELS INSTRUMENTATION
			light brown (Disturbed) SILTY SAND trace gravel, with organics moist		155.89																						▼ -
-			light grey / grey SAND / SILTY SAND trace gravel compact wet		0.69																						
-2			End of Overburden Drilling Due to Auger Refusal Rock Coring Started																								
			some gravel QUARTZOFELDSPATHICGNEISS BEDROCK RC5 : Classification based on RQD: Poor		<u>153.94</u> 2.64	RC 5																					
- - - -4 -			RC6 : Classification based on RQD: Good			RC 6																					
-			RC7 : Classification based on RQD: Excellent			RC 7																					- - - - - - - - - -
AMECEW KOCK 2016 GDI 31/10/16		Å	RC8 : Classification based on RQD: Poor MAFIC INTRUSIVE BEDROCK		<u>149.64</u> 6.94	RC 8																					- - - - - - - - - - - - -
1210018 NSUF WELL 24UCI 2016 6PJ AMECEN			RC9 : Classification based on RQD: Poor		147 54	RC 9																					- - - - - - - - - - - - -
≚ - ≚			SCHIST BEDROCK	R	<u>147.54</u> 9.04	1																					-
			RC10 : Classification based on RQD: Excellent			RC 10																					
KOCK						;	_																	SI	HEE	T 1	of 2
			✓ SHALLOW/SINGLE INSTA WATER LEVEL (date)	\LLA	TION			- C WAT						STA		AT I :0/10				LOGGED CHECKED		KT/N KG/I					

	RE	CORD OF BOREHOL	-E	No.	<u>S</u>	H-	4	- 1	<u>//c</u>	n	it	ori	in	g	V	Ve) 									
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	IEN ME				tion	for N	NSE)F -				ORIL INCL					ea.)		: E310620166)- 11 C : Vertical	JCL	10					foster wheeler
LC	CAT											٩ZIN					5,		: Vertical							DATUM: Geodetic
DEPTH SCALE (metres)	DRILLING RECORD		SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN		ECOV		ID E %		D GE	FRAC		ymbo NICA		nd de DCK	escriptions refer to DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	GY Jr	Ja	RI RI DOCTORING	R ROCK SIKENGIH			NOTES WATER LEVELS INSTRUMENTATION
		SCHIST BEDROCK End of Rock Coring			RC 10																	\prod				-
ŀ				146.02																		╟		Щ		
		GNEISS BEDROCK		10.56																						-
-		RC11 : Classification based on RQD: Good			RC 11																					-
-12		RC12 : Classification based on RQD: Excellent			RC 12																					
}		End of Rock Coring	×	143.13 13.45																						
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			ALLA	TION				EEF					ΓAL						LOGGED		KT/I					
		WATER LEVEL (date)					٧٧A	ER I	LEV	EL	(dat	le)		20)/10	/20	10		CHECKED	:	KG/	'NR		_		

PR CL NA	OJI IEN	ECT IT	No. : TZ16018 : Canadian Nuclear Laborator : Multicidisciplinary Subsurface Chalk River, ON	ries I	Ltd.						<u>on</u>			ILLI ILLI CLIN	NG NG NATI	LO(DA ⁻ ION	CA ⁻ TE (De	TION	۷	: Supporting Str : E210 21169 - 12 : Vertical : Vertical			(N5 ⁻	101	337	7,	amec foster wheeler DATUM: Geod
DEPTH SCALE (metres)	DRILLING RECORD		DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN	F TO COF	RECO FAL RE %	HOLC VERY SOL CORI	/ _ID E %	R.C	ND (Q.D. %	FRA IN PE		symb NICA		nd de DCK	ascriptions refer to DESCRIPTION TERMINO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	T	, r Ja		INDEX	WEATHERING	- I	NOTES WATER LEVELS INSTRUMENTATIO
-2			About 100 mm TOPSOIL brown (Disturbed) SILTY SAND trace gravel moist grey/brown SILTY SAND trace gravel firm to very dense moist		160.41				044								0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						2.2.2.9	" " " " " " " " " " " " " " " " " " " "		
-4 - - -			End of Overburden Drilling Due to Auger Refusal Rock Coring Started on 12 October 2016 cobbles/boulders QUARTZFELDSPATHIC GNEISS BEDROCK		155.61																						
-6	/2016	a	RC 9: Classification based on RQD: Poor			RC 10					>>> 				_												
	12/10/2016	НA	RC 11: Classification based on RQD: Fair SCHIST BEDROCK		152.49 8.61 151.34 9.76	RC 12 RC 13									-												
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	ROJ LIEN		No. : TZ16018 : Canadian Nuclear Laborato	riae I	td								ig lo Ig d/			N	: Supporting Struct : E21063:1166) - 12 C		V51	013	337,		amec foster	
	AME		: Multicidisciplinary Subsurfac			tion	for NSE)F -)	: Vertical	0					wheeler	
L			N Chalk River, ON								AZI	MUT	Ή (D	eg.)			: Vertical	 					DATUM: 0	Geodeti
DEPTH SCALE (metres)		DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min) FLUSH COLOUR % RETURN	RE TOTA CORE 02 9 99	ECOV	ERY SOLI	GICAL A	ND GE		S, SYN CHNIC URE X A		and d OCK	descriptions refer to C DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Ja	RE RE ROCK STRENGTH		WEATHERING	-	NOTE: WATER LE NSTRUMEN	VELS
-			RC 13: Classification based on RQD: Fair QUARTZFELDSPATHIC GNEISS BEDROCK			RC 13 RC 14 RC																		
- - - - - - 12			RC 15: Classification based on RQD: Excellent			14 RC 15																		
-	12/10/2016	Н	RC 16: Classification based on RQD: Good			RC 16																		
- 14 - - -			RC 17: Classification based on RQD: Excellent			RC 17																		-
			RC 18: Classification based on RQD: Excellent End of Rock Coring		145.56 15.54																			
- - 16 - - - - - - - - - - - - - - - - - - -																								-
- 18 - - - - - - - - -			GROUNDWATER ELE ♀ SHALLOW/SINGLE INST/				¥ D										100055			SI	HEET	2 0	of 2	
			WATER LEVEL (date)								(date)	. / \L	20/				LOGGED :	3C KG/N	١R					

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	IENT ME /	: Canadian Nuclear Laborato : Multicidisciplinary Subsurfac			on f	or N	SDF	:_					NG D IATIC		⊢ Deg.)		: E2106ct296) - 13 C : Vertical	JCI	16				foster wheeler	U
	CATIO												TH (C				: Vertical						DATUM:	Geodetic
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENEIRAIRAI JON RAIE (m/min) F11101 COLOUR	-LUSH %RETURN 0 R⊣	REC OTAL DRE %		RY OL I D DRE %	R.C	ND G	FRACT INDE PER	CHN TURE EX 1 m	ICAL RO	and de OCK	escriptions refer to DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION)GY Jr	Ja	ROCK STRENGTH INDEX		WEATHERING	NOT WATER L INSTRUME	EVELS
		reddish brown (Disturbed) SILTY SAND trace gravel moist		<u>174.26</u> 0.69				40 80		1000	20		5 10	202	0880	00				8 H 2 H 2 H 2 H 2 H 2 H 2 H 2 H 2 H 2 H	28.8	201 201 201 201 201 201 201 201 201 201		
-		SAND / SILTY SAND trace gravel, cobbles / boulders compact very dense moist to wet																						-
-2																								
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						•															SH	EET '	1 of 3	
		SHALLOW/SINGLE INSTA	ALLA ⁻	TION			DE /ATE					δTA			DN 2016		LOGGED CHECKED		MA KG/N	١R				

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			No. : TZ16018 : Canadian Nuclear Laborator	tion I	td													ON	: Supporting Struct : E21064296) - 13 C			N51	101	311	,	amec	
) IAN		: Multicidisciplinary Subsurfac			tion	for I	NSE)F -				DRIL NCL					.)	: Vertical	JCL	10					foster wheeler	
L	_		N Chalk River, ON									A	ZIM	UTŀ	H (D	eg.)		: Vertical							DATUM: (Geodetic
DEPTH SCALE (metres)	(2000)	DRILLING RECORD	DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN	TOT/ CORE	ECOV AL E % C	ERY SOLI	GICA	R.Q.I	D GE	RACTU INDE PER 1	JRE X A m	CAL F Ipha a (deg	and o ROCK	descriptions refer to K DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr	Ja	ROCK STRENGTH	INDEX	WEATHERING	- I	NOTES WATER LE	VELS
· · · · · · · · · · · · · · · · · · ·		DRILL	See Overburden log report. grey / light grey SAND / SILTY SAND trace gravel, cobbles / boulders compact to very dense moist to wet End of Overburden Drilling Due to Auger Refusal Rock Coring Started on 12 October 2016 GUARTZOFELDSPATHICGNEISS BEDROCK		(m) 161.23 13.72		PENET	FLUS	CORE R92		3951		22	· ا	PER 1 1	m		J.)		Jr	Ja				- I		
- - - - - - - - - - - - - - - - - - -			RC15 : Classification based on RQD: Very Poor RC16 : Classification based on RQD: Very Poor			RC 15																					
18	10/01/01/01	QH	RC17 : Classification based on RQD: Excellent			RC 17																					
			RC18 : Classification based on RQD: Good			RC 18																				- - - - - - - - - - - - - - - - - - -	
						RC 19																					
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			☑ SHALLOW/SINGLE INSTA WATER LEVEL (date)	LLA	TION				DEEI						LA7 20/*			6	LOGGED CHECKED		MA KG/I	١R					

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DEPTH SCALE (metres)			DESCRIPTION Continued from non-cored borehole See Overburden log report.	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min) FLUSH COLOUR	TI CC	REC DTAL DRE 9	CO\ L % (/ER SC) GE		TURI EX	symt NIC/ E Alpi		and ROC	DISCON TYPE 4	TION T	Y DAT	A	i GY Jr	Ja			R6 W1	W WEATHERING	90		NOTE TER L UMEI	EVEL	
-			RC19 : Classification based on RQD; Excellent QUARTZOFELDSPATHCGNEISS BEDROCK			RC 19																												
- - - -22 -			RC20 : Classification based on RQD; Excellent SCHIST BEDROCK		<u>153.15</u> 21.80																													
-	12/10/2016	HQ	RC21 : Classification based on RQD: Excellent			RC 21																												
-24 - - - -			RC22 : Classification based on RQD: Excellent QUARTZOFELDSPATHICGNEISS BEDROCK		<u>150.10</u> 24.85																													
-26			RC23 : Classification based on RQD: Excellent End of Rock Coring		148.05 26.90																													
-28																																		- - - - - - - - - - - - - - - - - - -
			GROUNDWATER ELE			3	V A							AL		/10			1	<u>.</u>		GGEI			MA KG/I	NR		SH	EET	-3	of 3			

R	EC	ORD OF BOREHOL	.E No. <u>V</u>	<u>N-1/</u>	<u>A -</u>	-5 M a	omi	tor	ing	We	<u>əll</u>						
		TNo. : TZ16018- Phase II										: E316738.3, N510		6.32		amec	
		: Canadian Nuclear Laborator : Multidisciplinary Subsurface		for NOI	DE	Chal	k	DRILL				: Dec 1, 16 - Dec : Vertical	1, 16			foster wheeler	
	AME / DCATIO		Investigation	01 1131	JF -	Gilai	ĸ	AZIM		DN (Deg Deg.)		: Vertical				DATUM: n	nasl
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG (m) SAMPLE No.	PENETRATION RATE (m/min) ELLISH COLOUR	% RETURN			For abl	breviatior GEOTE	NO ns, symbol: CHNICAL	TE: Is and d	escriptions refer to DESCRIPTION TERMINOLOG	ΞY	ROCK STRENGTH INDEX	WEATHERING INDEX	NOTES WATER LEY	3
DEPTI (m	DRILLING	Ground Surface Elev: 188.86	OBMPC (m)	PENETRAT (m			SOLID CORE %		PER	EX Alpha 1 m (de	≥g.)	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr Ja	ROCK	1 1	INSTRUMENT	TATION
	NW Casing DRI	Ground Surface Elev: 188.86 Augering to 31.2 m Without Sampling (former GH1-4)								(DESCRIPTION	Jr Ja		R 注於指述者, 2 注於非, 2 注於1 注於1 注於1 注於1 注於1 注於1 注於1 注於1 注於1 注於1	Σ	
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		GROUNDWATER ELE	VATIONS											ـــــــــــــــــــــــــــــــــــــ	SHEET 1	of 4	<u></u>
		$\overline{\underline{\bigtriangledown}}$ in open borehole on	COMPLETION	٧								LOGGED :	BC	,			
		WATER LEVEL (date) 12/01/2										CHECKED :	NR/	KG			

F	REC	ORD OF BOREHO	LE No.	W -	1A	-5	Ma)	itc	<u>pri</u>	nc	<u>I V</u>	Ve	<u> II</u>							
PF	ROJEC	No. : TZ16018- Phase II							DF	RILLI	NG	LOC	ATI	ON	: E316738.3, N510	0149	96.	32			amec
CL	IENT	: Canadian Nuclear Laborat							DF	RILLI	NG	DAT	Έ		: Dec 1, 16 - Dec 1	1, 16	3				foster
	AME /	: Multidisciplinary Subsurfac	e Investigation	for N	ISDF	= - C	hall	<	ING	CLIN	IATI	ON (Deg	g.)	: Vertical						wheeler
LC	CATIO	N River, ON							AZ	IMU	TH (Deg	.)		: Vertical						DATUM: masl
DEPTH SCALE (metres)	- DRILLING RECORD	DESCRIPTION	DEPTH (m)	PENETRATION RATE	FLUSH COLOUR 6 RETURN	TOT/ CORE	LITH ECOVI AL E % C 88 8	ERY SOLID	R.	Q.D.	FRAC			angle	descriptions refer to K DESCRIPTION TERMINOLOC DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION		Ja	ROCK STRENGTH			NOTES WATER LEVELS INSTRUMENTATION
AMECFW ROCK TZ16018_NSDF_ALLINONE_PHASE II_DEC2016.GPJ_AMECFW ROCK 2016.GDT_16/01/17	NW Casing	Augering to 31.2 m Without Sampling (former GH1-4)																			
Ś		GROUNDWATER ELE																:	SHE	ET 2	2 of 4
Ч М		$\overline{\mathbb{Y}}$ in open borehole of	N COMPLETIO	N											LOGGED :	в	с				
AMEC			1/2016												CHECKED :		R/K	G			

R	REC	ORD OF BOREHO	LE No. <u>\</u>	<u>N-</u>	<u>1A</u>	-5	M	DII	it (ori	n	g١	N	el									
PF	ROJEC	۲ No. : TZ16018- Phase II							DF	RILL	ING	LO(САТ	ION	N : E316	6738.3, N5	101	496	6.32	2			amec
CL	IENT	: Canadian Nuclear Laborate							DF	RILL	ING	DA	ΤE		: Dec	1, 16 - Dec	; 1, 1	16					foster
	AME /	: Multidisciplinary Subsurfac	e Investigation	for N	ISD	= - C	Chal	k				ION		eg.)									wheeler
LC	CATIO	N River, ON							AZ	ZIMU	JTH	(De	g.)		: Verti	cal						_	DATUM: masl
DEPTH SCALE (metres)	- DRILLING RECORD	DESCRIPTION	SAMBOLIC LOG SAMBOLIC LOG (m)	PENETRATION RATE	FLUSH COLOUR % RETURN	TOT. CORI	ECOV		F		GEO FR		NICA		nd descriptions DCK DESCRIP DISCON gle TYPE A DES	refer to FION TERMINOL TINUITY DATA ND SURFACE CRIPTION	DGY Jr	Ja	R ROCK STRENGTH	INDEX			NOTES WATER LEVELS INSTRUMENTATION
	NW Casing	Augering to 31.2 m Without Sampling (former GH1-4)																					
KOC																				S	HEE	Т3	of 4
≷		${\overline{ar{ abla}}}$ in open borehole of	I COMPLETIO	N												LOGGED	:	вс					
AME			/2016													CHECKED	:	NR/	KG				

F	REC	ORD OF BOREHO		No.	W	<u>-1/</u>	<u> - A</u>	5	0	Ω	to	ri	nç	I V	Ne	ell	<u> </u>							
		No. : TZ16018- Phase II															: E316738.3, N51			5.32	2			amec
	IENT	: Canadian Nuclear Laborato									DRI						: Dec 1, 16 - Dec	1, 1	16					foster wheeler
	AME /	: Multidisciplinary Subsurface	e Inves	stigation	n foi	NS	DF -	Cha	alk		INC					g.)	: Vertical							
		N River, ON									AZII	MU	ΓΗ (Deg	.)		: Vertical			_		—		DATUM: masl
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION		ELEV. DEPTH (m)	SAMPLE No.	EILICH COLOUR		LI RECO OTAL DRE % 9 8 8	OVER SO COF	Y ILID RE %	R.C	ND G	FRAC INE PEF		/mbol IICAL Alpha (de		DESCRIPTION	Jr	Ja		INDEX	WEATHERING		NOTES WATER LEVELS INSTRUMENTATION
- - - -	NW Casing	Augering to 31.2 m Without Sampling (former GH1-4)		157.67			3	4.0.0																
-32 -32 - - - - - - - - - 34		End of Augering Well Installation Details: 0 - 6.1 m Bentonite 6.1 - 6.9 m Sand 6.9 - 9.9 m Screen 9.9 - 10.4 m Sand 10.4 - 31.2 m Grout		31.19																				-
ECFW ROCK 2016.GDT 16/01/17																								
AMECFW ROCK TZ16018_NSF_ALLINONE_PHASE II_DEC2016.6PJ AMECFW ROCK 2016.6DT 16.01/1																								-
Х С С С С С		GROUNDWATER ELE	VATI	ONS		- 1			• • •						(<u> </u>			S	HE	ET 4	l of 4
ЧЧ		${\underline{\bigtriangledown}}$ in open borehole on		PLETIC	NC												LOGGED	:	BC					
AMEC			/2016														CHECKED		NR/I	KG				

F	RE	C	ord of Borehol	E No.	<u>N-</u>	-1B	-5	M	OH	it	ori	n	g \	Ne	ell	_							
P	ROJ	ECT	No. : TZ16018- Phase II							D	RILL	ING	LOC	CATI	ION	: E316773.6, N51			.13	\$		amec	
	LIEN		: Canadian Nuclear Laborator					. .			RILL					: Dec 1, 16 - Dec	1, 1	16				foster wheeler	
			: Multidisciplinary Subsurface River, ON	Investigation	for	NSDI	(Cha	lk						g.)	: Vertical : Vertical							maal
			River, ON		ш	1-	_			A	ZIMU	ЛН	(Deg	J.)				_	_			DATUM: n	nasi
ЧГШ				90	PENETRATRATION RATE	(min) COLOUR % RETURN								ymbol		descriptions refer to			GTH		Q	NOTES	2
DEPTH SCALE (metres)			DESCRIPTION	ELEV. DEPTH S. (m)	RATIO	CO CO RE				SICAL	AND				ROC	CK DESCRIPTION TERMINOLC	GY		TREN	INDEX	WEATHERING INDEX	WATER LEV	
EPTH				DEPTH	TRAT	UHS (U			VERY SOLIE CORE) C	R.Q.D. %	IN	CTUR IDEX R 1 m	Alpha	angle	DISCONTINUITY DATA TYPE AND SURFACE			OCK S	Z	WEAT	INSTRUMENT	
			Ground Surface Elev: 188.28	ගි (m)	PENE	FLUSH			248 CORE		1408		15	000	eg.) 800	DESCRIPTION	Jr	Ja		2222	w1 w2 w6 w6		
			Augering to 31.1 m Without Sampling (former GH1-4)	$ \mathcal{Y} $																			
ŀ			(former GH1-4)																				
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- 1-6																						$\overline{\Delta}$	
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	-	<u> </u>	GROUNDWATER ELE	VATIONS	_												<u> </u>		<u>uu</u>	S.	HEET	1 of 4	
			${\underline{\bigtriangledown}}$ in open borehole on	COMPLETIO	N											LOGGED	:	BC		21			
			WATER LEVEL (date) 12/01/2													CHECKED		NR/ł	٢G				

		ORD OF BOREHO	LE No. <u>W</u>	/-1B	- 5	on		-									
	ROJECT I	No. : TZ16018- Phase II : Canadian Nuclear Laborato	ories Ltd.					ING LO ING DA			316773.6, N5 ec 1, 16 - Dec			3		amec foster	
N/	AME /	: Multidisciplinary Subsurface		r NSDF	- Cha	alk	INCLI	NATION	I (Deg.)) : Ve	ertical	,	-			wheeler	
		River, ON	<u> </u>	ш І-			AZIMU	JTH (De			ertical		_		,	DATUM: m	nasl
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG SAMPLE No.	PENETRATION RATE (m/min) FLUSH COLOUR % RETURN	LIT RECO TOTAL CORE %	OVERY			INICAL R	DISC	CONTINUITY DATA			ROCK STRENGTH INDEX	WEATHERING INDEX	NOTES WATER LEV	VELS
	DRI		ගි (m)	ELU PEN	%468			120			DESCRIPTION	Jr J			W1 W2 W3 W3 W3 W3 W3	_	
-12	NW Casing	Augering to 31.1 m Without Sampling (former GH1-4)															
																	
		GROUNDWATER ELE $\[\begin{subarray}{c} \hline \mathbb{Y} in open Borehole on \end{subarray}$											_	S	HEET 2	2 of 4	
		WATER LEVEL (date) 12/01									LOGGED CHECKED	: B(: N	C R/KG	6			

R	EC	ORD OF BOREHO	LE No. <u>V</u>	<u>V-1</u>	<u>B</u> -	-5 M	on	<u>site</u>	<u>ori</u>	nc	<u>1</u> V	<u>Ne</u>							
		۲No. : TZ16018- Phase II												: E316773.6, N510	01498	3.13	\$		amec
	IENT	: Canadian Nuclear Laborat				~.	_		RILLI					: Dec 1, 16 - Dec 1	, 16				foster wheeler
	AME / DCATIO	: Multidisciplinary Subsurfac N River, ON	e Investigation for	or NS	DF -	Cha	lk		ICLIN ZIMU				.)	: Vertical : Vertical					DATUM: masl
			<u> </u>	ш	17			A.			Deg.	-				Τ		,	DATOM. Masi
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG EFTEA (W) (M) SAMPLE No.	부글		RECO OTAL ORE %	VERY SOLII CORE	D	. AND 0 R.Q.D.	FRAC INE PER	TURE DEX	ICAL F Alpha a (deg	and d ROCK	descriptions refer to CDESCRIPTION TERMINOLOG DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Y Jr Ja		INDEX	WEATHERING INDEX	NOTES WATER LEVELS INSTRUMENTATION
	NW Casing	Augering to 31.1 m Without Sampling (former GH1-4)				100 100 100 100 100 100 100 100 100 100	20	80.	1988		15								
Т Р																	S	HEET 3	of 4
		IN OPEN BOREHOLE OI WATER LEVEL (date) 12/01	N COMPLETION	1										LOGGED : CHECKED :	BC NR/				

R	ECC	ord of Borehol	E No.	V	V- 1	IB	-5	M	or	sit	Oľ	in	Ig	V	Ve	<u>) </u>							
		No. : TZ16018- Phase II														ON	: E316773.6, N510			13			amec
	.IENT ME /	: Canadian Nuclear Laborato : Multidisciplinary Subsurface		n f	or N	e D E		`ho			DRIL						: Dec 1, 16 - Dec 1 : Vertical	1, 16	6				foster wheeler
			investigatio	, , , , ,		501	- C	na	IK		NCL AZIM					.)	: Vertical						DATUM: masl
	Ъ		U		ATE	RN N									NOT	E:			Т	т	Т		
DEPTH SCALE (metres)	DRILLING RECORD		90 ULEV. DEPTH S (m)	No.	PENETRATION RATE (m/min)	COLOL		LITH	HOLO					s, syn	nbols	and	descriptions refer to K DESCRIPTION TERMINOLOG	iΥ		ROCK STRENGTH	~	WEATHERING INDEX	NOTES
PTH S (metre	NG F	DESCRIPTION	DEPTH	SAMPLE No.	RATRA (m/mi	- ∼	R		/ERY		R.Q.[D. FF	RACTI				DISCONTINUITY DATA			K STR		ATHE	
DEF	DRILL		× (m)	SA	PENETE	=LUSI	COR		SOLI CORE ରବ୍ଦତ୍ତି		% 640 %		INDE PER 1	- I	lpha a (deg ං සි ම	3.)	TYPE AND SURFACE DESCRIPTION	Jr Ja	· •				INSTRUMENTATION
		Augering to 31.1 m Without Sampling			-	-	040	200	040		110				000			+	8	2252	28	002 002 003 003 003 003 003	
	ging	Augering to 31.1 m Without Sampling (former GH1-4)																					
ŀ	NW Casing																						
ŀ	ź		KI																				
F		End of Augering	157.19																				
		Well Installation Details:																					
ŀ		0 - 27.4 m Bentonite 27.4 - 28.1 m Sand																					
		28.1 - 31.1 m Screen																					
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		WATER LEVEL (date) 12/01/															CHECKED :		, К(G			

	REC	ORD OF BO	OREHOL	E No	. <u>v</u>	V-2	2D	- 5	lon	ito	rir	<u>ng l</u>	Nel	<u>I</u>									2	
		TNo. : TZ16018- Pha													316670.							amec		
	CLIENT		clear Laboratori ary Subsurface		tion f	or N	SDF	- Ch	alk			G DAT	E (Deg.)		ov 25, 1 ertical	ซ - No	v 26	, 16)			foster wheeler		
	OCATIO		,			-	-		-			H (Deg			ertical							DATUM:	mas	\$I
DEPTH SCALE	DRILLING RECORD	DESCRIP Ground Surface Ele		SYMBOLIC LOG DED (m)	SAMPL	ENETRATION RATE (m/min)		REC TOTAL CORE %	OVERY SOLIE	R.Q.	D.	RACTURE INDEX PER 1 m	Alpha ang (deg.)	d description CK DESC DISC	ONS REFER TO RIPTION TE CONTINUITY E AND SUR DESCRIPTIC	DATA FACE		Ja	ROCK STRENGTH INDEX	WEATHERING	INUEA	NOTE WATER L INSTRUMEN	EVEL	
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	NW Casing																					∑		
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		✓ IN OPEN BO WATER LEVEL (c			IUN	4										GED CKED		ЛА NR/K	G					

R	EC	ORD OF BOREHOL	E No.	V	/-2	D	-5	/lo	IJ	ito	ri	ng	V	Ve									
		TNo. : TZ16018- Phase II														: E316670.78, N				1		amec	
	IENT	: Canadian Nuclear Laborato : Multidisciplinary Subsurface		on fc	or NS	DF	- Cł	nalk				NG D ATIC				: Nov 25, 16 - No : Vertical	v 26	6, 1	6			foster wheeler	
	CATIO		0									TH (C			,	: Vertical						DATUM: ma	asl
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION	SAWBOLIC LOG DEDLH SYMBOLIC LOG DEDLH (m)	SAMPLE No.	는 글				RY	R.C	ND G				and d ROCK	descriptions refer to C DESCRIPTION TERMINOLC DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr	Ja	ROCK STRENGTH	INDEX	WEATHERING	NOTES WATER LEVE INSTRUMENTA	
	NW Casing	Augering to 30.0 m Without Sampling (former SH-1)																				2 of 4	
		$\overline{\mathbb{V}}$ in open borehole on														LOGGED		MA		51	IIII	∠ UI 4	ſ
		WATER LEVEL (date) 11/26/														CHECKED		NR/ł	٢G				

		ORD OF BOREHO	LE NO. <u>V</u>	V- 2	2D	-6	VIO			_	-								
	ROJEC LIENT	T No. : TZ16018- Phase II : Canadian Nuclear Laborate	ories I td						DRILL DRILL				N : E316670.78, : Nov 25, 16 -						amec foster
	AME /	: Multidisciplinary Subsurface		or N	ISDI	F - Cł	nalk		INCLI					INUV 2	_0, I	0			wheeler
LC	CATIC								AZIMU				: Vertical						DATUM: masl
ALE A	CORD		00 0	N RATE	-OUR								nd descriptions refer to			GTH	U		NOTES
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG FFFA MPLE No.	PENETRATRATION RA		DE	COVER		AL AND	GEOTE	ECHNI		DISCONTINUITY DAT			ROCK STRENGTH	THERIN	INDEX	WATER LEVELS
DEPT (m	SILLIN		WHR (m)	NETRAT	FLUSH	TOTA			R.Q.D. %	INE	CTURE DEX R 1 m	Alpha ang (deg.)			Ja	SOCK	WEA	-	INSTRUMENTATION
	L L			H		868	8 89	88	2488	9.2	50 12	-888				82288		***	
ŀ		Augering to 30.0 m Without Sampling (former SH-1)																	
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PHASE																			
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7160																			
	1	GROUNDWATER ELE	VATIONS															ШШ FT ?	3 of 4
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AMEC		WATER LEVEL (date) 11/26	6/2016										CHECKE	D :	NR/	KG			

F	REC	ORD OF BOREHOL	E	No.	W	-2	D	- 6	M	0	ßİ	tc	ori	n	g '	W	le									
P	ROJEC	TNo. : TZ16018- Phase II										DR	RILL	ING	LO	CA	TIO	N	: E316670.78, N				21		amec	
		: Canadian Nuclear Laborator			n for	NIC	ירר		\ ha					ING					: Nov 25, 16 - No	v 26	6, 1	6			foste whee	
	IAME / OCATIO	: Multidisciplinary Subsurface	inve	stigatio	n tor	INS.	DF	- C	-na	IIK				ITAV			eg.))	: Vertical : Vertical							M: masl
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DEPTH SCALE (metres)	ECOF		SYMBOLIC LOG		No.	(m/min)	RETUR		LIT	HOL	ogic					symb	ools a	and d	descriptions refer to CDESCRIPTION TERMINOLO	JGY		NGTH		DNN C	N	OTES
TH SC metre	NG RI	DESCRIPTION	30LIG	ELEV. DEPTH	SAMPLE No.	(m/min	ر ار		ECC	VER	Y		Q.D.	FRA	CTUF	78			DISCONTINUITY DATA			STRE	INDE	WEATHERING INDEX		R LEVELS
DEP	DRILLING RECORD		SYME	(m)	SAMPLE No.		η SU	TOT CORI				5	%	PE	IDEX R 1 n	n ["pi	ha an (deg.)	.)	TYPE AND SURFACE DESCRIPTION	Jr	Ja	Ì	INDEX	ŴÊ	INSTRU	MENTATION
-		End of Augering		30.00		-		243		62	88	89	111	÷0	235		88	18		┢	\vdash		22222	W1 W2 W3 W4	2	
ŀ		Well Installation Details:																								
ţ.		0 - 0.3 Concrete 0.3 - 7.6 m Bentonite																								
		7.6 - 16.6 m Grout 16.6 - 17.5 Bentonite																								
ŀ		17.5 - 18.0 Sand 18.0 - 21.0 Screen																								
ŀ		21.0 - 21.3 Sand 21.3 - 23.3 Bentonite																								
Į.		23.3 - 30.0 Grout																								
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С Х Х		$\overline{\Sigma}$ in open borehole on																					S	HEET	4 of 4	
		WATER LEVEL (date) 11/26/2																	LOGGED CHECKED		MA NR/	KG				

			_E No. <u>V</u>	N-2	<u>2S</u>	-6 V			-				0.04		
	ROJECT LIENT	No. : TZ16018- Phase II : Canadian Nuclear Laborate							NG LOC NG DAT		: E316670.78, N5 : Nov 24, 16 - Nov				amec Transformer
	AME / DCATIO	: Multidisciplinary Subsurface N River, ON	Investigation f	or N	SDF	- Cha			IATION TH (Deg		: Vertical : Vertical				wheeler DATUM: masl
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Ground Surface Elev: 188.60	SYMBOLIC LOG (m) (m) SAMPLE No.	PENETRATION RATE (m/min)	-LUSH COLOUR % RETURN	RECO TOTAL CORE %	VERY SOLID CORE %	R.Q.D.	FRACTURI INDEX PER 1 m	NICAL ROCK E Alpha angle (deg.)	lescriptions refer to CDESCRIPTION TERMINOLOG DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	SY Jr Ja	ROCK STRENGTH INDEX	WEATHERING INDEX	NOTES WATER LEVELS INSTRUMENTATION
	HW Casing	GROUNDWATER ELE												 予約124 予約124 	
		$\overline{\mathcal{Y}}$ in open borehole on		1							LOGGED :	MA	5	HEET	1 01 2
		WATER LEVEL (date) 11/25									CHECKED :		KG		

Pf Cl N/		 RD OF BOREHO TZ16018- Phase II Canadian Nuclear Laborato Multidisciplinary Subsurface River, ON 	ories Ltd.			DRILLI DRILLI INCLIN	-	TION eg.)	: E316670.78, N5 : Nov 24, 16 - Nov : Vertical : Vertical				amec foster wheeler DATUM: masl
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG 	12 e 1	LITHOLOG RECOVERY OTAL SOLIE DRE % CORE 988 R98	R.Q.D.	FRACTURE INDEX PER 1 m		lescriptions refer to CESCRIPTION TERMINOLOG DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	GY Jr Ja	ROCK STRENGTH	WI WEATHERING	NOTES WATER LEVELS INSTRUMENTATION
	D	Augering to 14.1 m Without Sampling (beside former SH-1) SILTY SAND cobbles/boulders						988			JEPEREN A		
		GROUNDWATER ELE		۱ ۱					LOGGED : CHECKED :			SHEET	2 of 2

F	REC	ORD OF BOREHOLE No). <u>V</u>	V-:	<u>3 -</u>	M	01	ita	<u>pri</u>	ng	N	<u>/el</u>	<u> </u>							
		No. : TZ16018- Phase II							DRI	LIN	G LO	CAT	ION						amec	
		: Canadian Nuclear Laboratories Ltd.		N	000		المعا				G DA			: Nov 27, 16 - Nov	/ 28, 1	6			foster wheeler	
	AME / DCATIO	: Multidisciplinary Subsurface Investiga N River, ON	tion to	or in	SDF	- 0	nair	(TION H (De		g.)	: Vertical : Vertical					DATUM: ma	asl
				μ	αZ				, m		. (20		DTE:				Т			
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION DESCRIPTION	No.	ON RA	FLUSH COLOUR % RETURN		LITHO	OLOGI				symbo	ols and	descriptions refer to	GY	ROCK STRENGTH INDEX			NOTES	
TH S(metre	NG R	DESCRIPTION DESCRIPTION	년 'S SAMPLE No.	ATRATI (m/min	08		COVE	ERY		- Fi	RACTU	RE		DISCONTINUITY DATA		STRE		INDEX	WATER LEVE	
DEP	SILLIN	Ground Surface Elev: 171.99 (m	SAN	NETR/	HSU.	TOT/ CORE		SOLID ORE %	6 %	·	INDEX PER 1 r	n (d	a angle eg.)	TYPE AND SURFACE DESCRIPTION	Jr Ja	ROCK			INSTRUMENTA	ATION
-	ā	Augering to 12.04 m	+	H.		248	38 8	1488	8 8 9	38 l	111	3 08	388			828221	28 53	S # 8 8		
ŀ		(former SR-2)																	7. 7. 7. 7. 7. 7.	
İ.		SILTY SAND some gravel, cobbles/boulders																		
┢																				-
ŀ		Γ.																		·
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Į.		B																		
-2																				
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ŀ	HW Casing	ſ																		-
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		R																		
1/1.0/																				
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- 6		l l																		·
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AME																				ŀ
- C- C- C- C- C- C- C- C- C- C- C- C- C-																				
<u>–</u> 8		5																		
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L'		KI																		目:
2																				
Z160																				
		GROUNDWATER ELEVATION	1S	I															of 2	
		$\overline{\Sigma}$ in open Borehole on Comple		I										LOGGED :	MA		SHE	.∟।		
AMEC		WATER LEVEL (date) 11/28/2016												CHECKED :		KG				

R	REC	ORD OF BOREHO	_E No.	V	<u>V-3</u>	3 -	M	อา	itte	øri	in	g١	We	ell								
PR CL NA		T No. : TZ16018- Phase II : Canadian Nuclear Laborato : Multidisciplinary Subsurface	ories Ltd.							DR DR	RILLI RILLI CLIN	-	LOC DATI ON (ATIC E Deg	NC	: E316514.12, N5 : Nov 27, 16 - Nov : Vertical : Vertical				1		amec foster wheeler DATUM: masl
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION	ELEV. DEPTH (m)		PENETRATION RATE (m/min)			ECOVE		Fo ICAL / R.	r abbr	FRAC	ons, sy ECHN	NOT	and d ROCK	Iescriptions refer to CDESCRIPTION TERMINOLOG DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	GY Jr	Ja	ROCK STRENGTH	at INDEX	WEATHERING	
- - - - - - - - - - - - - - - - - -	HW Casing	Augering to 12.04 m (former SR-2) SILTY SAND some gravel, cobbles/boulders	159.9	5				X8 C	1400		4 @ @		0		26							
- - - - - - - - - - - - - - - - - - -		Ling of Augering Well Installation Details: 0.6 - 8.6 m Bentonite 8.6 - 9.0 m Sand 9.0 - 12.0 m Screen																				
		GROUNDWATER ELE ♀ IN OPEN BOREHOLE ON WATER LEVEL (date) 11/28	I COMPLET		1											LOGGED : CHECKED :		MA NR/K	G	SF	-IEET	

PR CL NA	ROJ LIEI AME	JECT NT	ORD OF BOREHOL No. : TZ16018- Phase II : Canadian Nuclear Laborato : Multidisciplinary Subsurface N River, ON	ries l	Ltd.			_		66 Cha		35	DF DF IN	RILL RILL CLII ZIMU	.INC	g d Tio	ate N ([E Deg		: E316658.15, N : Nov 29, 16 - No : Vertical : Vertical					3			amec foster wheeler DATUM: masl	
DEPTH SCALE (metres)		DRILLING RECORD	DESCRIPTION Ground Surface Elev: 171.51	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE	FLUSH COLOUR % RETURN	TO COF	LI RECO TAL RE %	OVEF		R		GEC FF		s, syr HNI JRE X m	CAL	s and RO angl eg.)	d descriptions refer to CK DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr	T	la	ROCK STRENGTH		WEATHERING	WE INDEX	NOTES WATER LEVELS INSTRUMENTATIO	
		Rcok Coring (HQ)	Augering to Bedrock Without Soil Sampling SAND some gravel, cobbles pink/white/black GNEISS EDROCK RC 1: Classification based on RQD: Good RC 2: Classification based on RQD: Excellent		<u>169.69</u> 1.82	RC 1								4 0 0			2	3 • •		JN, UN, RO, Sa / Ch JN, UN, RO, Io / Ca JN, UN, RO, Ch / Ca JN, PL, RO, Ch / Ca JN, PL, RO, Io / Ca JN, PL, RO, Io / Ca	2.5 2.5 2.5 1.5	5 1. 5 1.	.5		R. C. C. C. C. C. C. C. C. C. C. C. C. C.				
MECFW ROCK 2016.GDT 16/01/17	4 RC 2: Classification based on RQD: Excellent RC 3: Classification based on RQD: Excellent RC 3: Classification based on RQD: Excellent RC 3: Classification based on RQD:																												
AMECEV ROCK TZ16018_NSDF_ALLINONE_PHASE II_DEC2016.GPJ_AMECEV ROCK 2016.GDT_16/01/17			GROUNDWATER ELE		FIONS																							of 1	
AMECFW RC			✓ IN OPEN BOREHOLE ON WATER LEVEL (date) 11/30/	CO	MPLETI															LOGGED CHECKED	:	BC	C R/K	G	SF	166	: 1	of 1	

RE	C	ORD OF BOREHOL	E	No.	V	V-5	5	67	of 3	57														
	JEC ⁻ NT E /	T No. : TZ16018- Phase II : Canadian Nuclear Laborato : Multidisciplinary Subsurface	ries	Ltd.			-	= - Cha	alk	DF IN	RILLI RILLI ICLIN ZIMU	NG I IATIO	DAT ON	ΓE (De		 E316796.73, N Nov 29, 16 - No Vertical Vertical 				93			amec foster wheeler DATUM:	masl
	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV.	SAMPLE No.	PENETRATRATION RATE (m/min)	COLOUR % RETURN	LIT		GICAL	or abbr AND (eviatio GEOTE	ins, s <u>i</u> E CHN	ymbo NICA		d descriptions refer to CK DESCRIPTION TERMINOLO DISCONTINUITY DATA	DGY		CTDENCTU	INDEX		INDEX	NOTE WATER L	ES
DEP1 (r	DRILLIN	Ground Surface Elev: 165.06	SYMB	(m)	SAN	PENETRA (FLUSH			ID E %	2.Q.D. %	PER	2EX ₹1m £200	(0	na angl deg.) ೫ ೪ ೪ ೪		Jr	Ja		202	5 LINE CON		INSTRUME	NTATION
-		Augering to Bedrock Without Soil Sampling black PEAT				\square									•	BC JN, UN, RO, Sa	2.5	0.75						
		pink/white/black GNEISS BEDROCK															2.0							
-		RC 1: Classification based on RQD: Fair			RC 1									•	•	JN, UN, RO, Sa JN, UN, RO, Sa BC, , ,	2.5 2.5	0.75						
-2 -2 -		RC 2: Classification based on RQD: Fair			RC 2									>>		JN, UN, VR, Io JN, UN, RO, Io	3	0.75					Ā	
- - - - - -	RC RC																							
-	RC 4: Classification based on RQD: Excellent RC 4: Classification based on RQD:																							
- - - -		RC 5: Classification based on RQD: Excellent		157.52											•	JN, UN, RO, Si	2.5	0.75						
- - - - - - - - - - - - - - - - - - -		End of Rock Coring Well Installation Details: 0 - 1.6 m Bentonite 1.6 - 2.0 m Sand 2.0 - 5.0 m Screen 5.0 - 5.1 m Sand 5.1 - 7.5 m Bentonite		7.54																				
		GROUNDWATER ELE [™]	COI	MPLET		ı 1								11		LOGGED CHECKED		BC NR/I	KG	S	SHE	ET /	1 of 1	

AMECFW ROCK TZ16018_NSDF_ALLINONE_PHASE II_DEC2016.GPJ_AMECFW ROCK 2016.GDT_16/01/17

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F	REC	ORD OF BOREHO	DLE No. <u>V</u>	<u>V-6</u>	<u> </u>	M٤	nit	<u>orir</u>	١g	Well							2
		No. : TZ16018- Phase II									: E316619.44, N5					amec	
	LIENT IAME /	: Canadian Nuclear Labora : Multidisciplinary Subsurfa		or N	SDF	- Ch	alk			G DATE TION (Deg.)	: Nov 26, 16 - Nov : Vertical	27, 1	0			foster wheeler	
	OCATIO		Ũ							I (Deg.)	: Vertical					DATUM:	masl
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION Ground Surface Elev: 184.78	SYMBOLIC LOG MBOLIC LOG MPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN	REC TOTAL CORE %	OVERY SOLID	R.Q.I	D GEO	RACTURE INDEX PER 1 m (deg.)	DISCONTINUITY DATA	SY Jr Ja	ROCK STRENGTH INDEX		WEATHERING INDEX	NOTE WATER L INSTRUME!	EVELS
\vdash				8	Ē	86962	8 848	3 248	38 4	86830 5229			8222	28 55			
AMECEW ROCK TZ16018_NSDF_ALLINONE_PHASE II_DEC2016.GPJ_AMECEW ROCK 2016.GDT_16/01/17		Augering to 12.2 m Without Sampling SILTY SAND trace gravel														$\overline{\nabla}$	
TZ1601																	
č Š		GROUNDWATER EL	EVATIONS										<u> </u>	UII SHE	<u>ШШ</u> =FT 1	of 2	<u>1. H. I</u>
CFW R($\overline{\mathbb{V}}$ in open borehole (ON COMPLETION	1							LOGGED :	BC			1	01 2	
AME		WATER LEVEL (date) 11/	27/2016								CHECKED :	NR/	KG				

	PR		I No. : TZ16018- Phase II : Canadian Nuclear Laborato		<u>V-6 - N</u>	Aonita	DRILLI		: E316619.44, N510166 : Nov 26, 16 - Nov 27, 1		amec foster
	NA	IME / CATIO	: Multidisciplinary Subsurface		or NSDF -	Chalk	INCLIN	ATION (Deg.) IH (Deg.)	: Vertical : Vertical		wheeler DATUM: masl
	DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG THAT (m) SAMPLE No.		LITHOLOGIC RECOVERY DTAL SOLID RE % CORE % 2 & 8 & R & 8	R.Q.D.	NOTE: eviations, symbols and EOTECHNICAL ROCI INDEX INDEX PER 1 m (deg.) 0 0 0 0 0 0 0 0 0	descriptions refer to K DESCRIPTION TERMINOLOGY DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION Jr Ja	<u> </u>	NOTES WATER LEVELS INSTRUMENTATION
	-12		Augering to 12.2 m Without Sampling SILTY SAND trace gravel inferred boulders								
	- 14		End of Augering Well Installation Details: 0 - 0.6 m Concrete 0.6 - 3.4 m Bentonite 3.4 - 7.8 m Grout 7.8 - 8.5 m Bentonite 8.5 - 9.1 m Sand 9.1 - 12.2 m Screen	172.59 12.19							
CFW ROCK 2016.GDT 16/01/17	-16										
TZ16018_NSDF_ALLINONE_PHASE II_DEC2016.GPJ_AMEC	-16										
AMECFW ROCK								<u> </u>	LOGGED : BC		ET 2 of 2
AMEC			WATER LEVEL (date) 11/27						CHECKED : NR		

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F	REC	CORD OF BOR	EHOLE	No.	V	V-7		70	of	357	,												
C N	LIENT AME /	: Multidisciplinary S	⁻ Laboratories		on fo	or NS	DF	- Ch	alk		DRILL INCLI	LINC	g dat Tion	E (De		: E316672.93, N : Nov 30, 16 - De : Vertical				1		amec foster wheeler	
		ION River, ON		1	-	<u>۳</u>	Jz				AZIM	JTH	I (Deg			: Vertical						DATUM: m	nasl
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	는 돈	FLUSH CULUUR		OVEF			GEC		ymbo IICAL Alpha		descriptions refer to CK DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jr	Ja	ROCK STRENGTH	INDEX	WEATHERING INDEX	NOTES WATER LEV INSTRUMENT	VELS
-		Ground Surface Elev: 18 Augering to Bedrock Without S SAND and GRAVE	0.00	>	┢	H		2488 848	2 2 2	88	248	8 4	3 ² 2	8	388			00	82223		W1 W2 W1 W2		
		SAND and GRAVE		179.54	L																		
-		pink/white/black GABBRO / DIORITE BEL RC 1: Classification based Excellent	DROCK on RQD:	1.02	RC 1										•	JN, UN, SR, Io JN, UN, SR, Io	2	2				-	-
-2		RC 2: Classification based Excellent	on RQD:		RC 2									-	•	JN, UN, RO, Io JN, ST, RO, Io JN, UN, RO, Io	2.5 3.5 2.5	2 2					
-4	Book Coring (HO)	RC 3: Classification based	on RQD:		RC 3										•	JN, UN, RO, Io JN, PL, RO, Io	2.5 1.5	2					
		RC 4: Classification based on	RQD: Good		RC 4										•	JN, PL, SR, Io / Ca	1.25	2					
		RC 5: Classification based Excellent	on RQD:	173.19	RC 5									-	•	JN, UN, SR, Ch / Ca JN, UN, SR, Ch / Ca JN, UN, SR, Ch / Ca JN, UN, SR, Ch / Ca JN, UN, SR, Ch / Ca JN, ST, SR, Ch / Ca	2 2 2 2 2 3	1 1.5 1 1.5 1					
0.6FJ		End of Rock Corin		7.37								Π											
		Well Installation Deta 0 - 2.5 m Bentonite 2.5 - 2.8 m Sand 2.8 - 5.8 m Screen 5.8 - 6.1 m Sand 6.1 - 7.4 m Bentonit																					-
	_	GROUNDWAT	ER ELEVA	TIONS	} }												1			∐∐ S⊦	<u>IIIII</u> IEET	1 of 1	
		✓ IN OPEN BORE WATER LEVEL (date)	HOLE ON CO 11/30/2016		ION											LOGGED CHECKED		MA NR/ŀ	٢G				

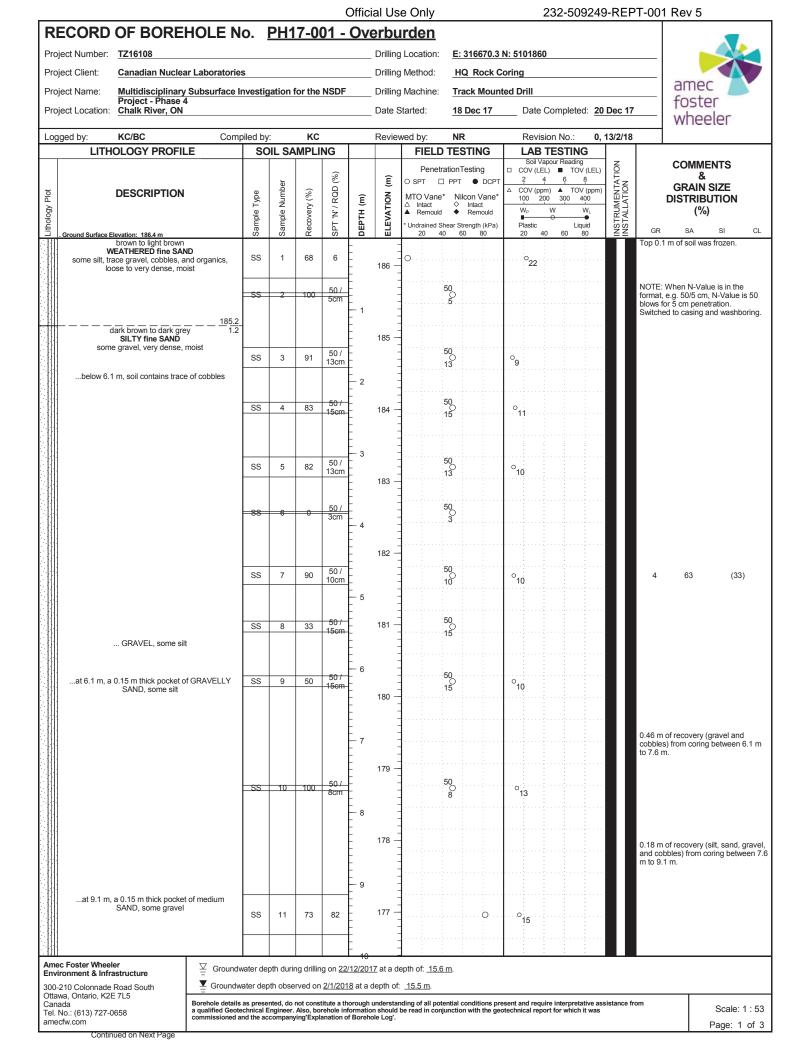
R	RE	C	ORD OF BOREHOL	E	No.	V	8-V	3	7	'1 o	of 3	57											
CL NA	ROJE .IEN AME)CA ⁻	T /	No. : TZ16018- Phase II : Canadian Nuclear Laborator : Multidisciplinary Subsurface N River, ON			on fo	or NS	SDF	= - (Cha	ılk	I	DRILL DRILL NCLI AZIMU	.ING NAT	DA ⁻ TON	TE (De		: E316936.88, N : Nov 30, 16 - De : Vertical : Vertical					amec foster wheeler DATUM: masl
DEPTH SCALE (metres)	DRILING RECORD		DESCRIPTION Ground Surface Elev: 193.16	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN	TOT COR	RECO FAL E %	VER) SOI COR	/ LID E %	R.Q.D.	GEO FR/ PI	ACTUR NDEX ER 1 m	NICAI	a angle eg.)	I descriptions refer to CK DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	DGY Jr	Ja	ROCK STRENGTH INDEX	WEATHERING INDEX	NOTES WATER LEVELS INSTRUMENTATION
- - - - -		1	Augering to Bedrock Without Soil Sampling (former BH2-5)				۵.	<u> </u>	20	800	20	80	0400	2	10	0	388				8-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2		
2			pink/white/black GNEISS BEDROCK RC 1: Classification based on RQD: Poor pink/white/black GNEISS, PEGMATITE and SCHIST BEDROCK		191.79 1.37 191.53 1.63	RC 1												JN, PL, SR, Si / Ca BC JN, IR, VR, Si JN, UN, RO, Ca JN, PL, RO, Mu	1.25 4 2.5	0.75 4 1			
-		Coring (HQ)	RC 2: Classification based on RQD: Good		190.09	RC 2											•	IN, PE, RO, Mu JN, PL, SR, Mu / Si JN, UN, RO, Mu / Si JN, UN, SR, Mu JN, UN, RO, Bi / Ca	1.5 1.5 1.25 2.5 2.5	4 2 2 1			
-4 RC 3: Classification based on RQD: Very Poor RC 3 RC 3: Classification based on RQD: Very Poor RC 3 RC 3: Classification based on RQD: Very Poor RC 3 RC 3: Classification based on RQD: Very Poor RC 4: Classification based on RQD: Very Poor<																							
RC 4: Classification based on RQD: Fair																							
.GPJ_AMECFW_ROCK_2016.GI			pink/white/black MONZONITE BEDROCK with gravel, some gneiss RC 5: Classification based on RQD: Fair		<u>186.86</u> 6.30	RC 5					>>					•	•	JN, UN, SR, Ca / Ch BC JN, UN, SR, Ca / Ch JN, UN, RO, Ca / Ch BC JN, UN, RO, Ca / Io JN, SR, SR, Ca / Io JN, UN, SR, Ca / Io BC, , ,	2 2.5 2.5 3.5 2.5 3.5	2 2 1 0.75			
AMECFW ROCK TZ16018_NSDF_ALLINONE_PHASE II_DEC2016.GPJ_AMECFW ROCK 2016.GDT_1601117			RC 6: Classification based on RQD: Excellent		183.94	RC 6					>>					•	•	JN, UN, RO, Ca JN, UN, RO, Ca / Io JN, PL, SR, Ca / Io JN, UN, RO, Ca / Io / Si JN, PL, SR, Ca / Io JN, PL, SR, Ca / Io JN, UN, SR, Ca / Io	2.5 2.5 1.25 2.5 1.25	2			
TZ16018_NSDF			dark grey/black GABBRO / DIORITE BEDROCK		9.22	RC 7											•	JN, PL, RO, Mu / Si JN, PL, SR, Si JN, IR, RO, Bi / Si JN, UN, RO, Si / Io JN, UN, RO, Ca / Io	1.5 1.25 3.5 2.5	2 2 1 0.75			
AMECFW ROCK			GROUNDWATER ELEN	CON															:	BC/I NR/I	AN	HEET 1	of 2

R	EC	ORD OF BOREHOL	.E	No.	V	V-8	8	72	of 3	357	,													
PRO CLI NAI		T No. : TZ16018- Phase II : Canadian Nuclear Laborator : Multidisciplinary Subsurface	ries	Ltd.			-	⁼ - Ch	alk		DRILI DRILI INCLI AZIMI	_IN NA	g da Tion	NTE N (D			: E316936.88, N : Nov 30, 16 - De : Vertical : Vertical				2			amec foster wheeler DATUM: masl
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATRATION RATE (m/min)	FLUSH COLOUR % RETURN	LI REC TOTAL CORE %	OVER SO	Y LID RE %		GE . F		Symi HNIC		ind d	descriptions refer to X DESCRIPTION TERMINOL DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	.OGY Jr	Ja	ROCK STRENGTH		WEATHERING	I	NOTES WATER LEVELS INSTRUMENTATION
-		RC 7: Classification based on RQD: Good dark grey/black GABBRO / DIORITE BEDROCK			RC 7			0.4.000	0 014		040				•		JN / CON, UN, RO, Ca / Ch BC JN, IR, RO, Ca / Ch JN, PL, SR, Ca / Ch	2.5 2.5 3.5	2		222		***	
- - - - - - 12		RC 8: Classification based on RQD: Good			RC 8				>>						•		JN, IR, VR, Ch JN, PL, RO, Ch JN, PL, SR, Ch / Ca JN, IR, RO, Ch JN, PL, SR, Ch BC JN, PL, SR, Ch JN, UN, RO, Ch JN, UN, SR, Ch	1.25 4 1.5 1.25 1.25 1.25 2.5 2	2					
-		RC 9: Classification based on RQD: Fair			RC 9				>>								JN, PL, SR, Ch BC JN, PL, SR, Ch JN, R, SR, Ch JN, UN, SR, Ch JN, UN, SR, Ch JN, UN, SR, Ch JN, UN, SR, Ch JN, UN, SR, Ch JN, UN, SR, Ch JN, UN, SR, Ch	1.25 1.25 1.25 3 2 2 2 1.5 2.5 3	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2					
-14 - - - - - -		End of Rock Coring Well Installation Details: 0 - 10.1 m Bentonite 10.1 - 10.4 m Sand 10.4 - 13.4 m Screen 13.4 - 13.7 m Sand 13.7 - 14.0 m Bentonite		179.25													JN, UN, SR, Ch / Mu JN, UN, SR, Ch / Mu	2 2	2 2					
- - 16 - - - -																								
- 																								
		GROUNDWATER ELEN Variable IN OPEN BOREHOLE ON WATER LEVEL (date) 11/30/2	со	MPLET		<u> </u>											LOGGED CHECKED	:	BC/		S	HE	⊥111 ET 2	of 2

AMECEW ROCK TZ16018_NSDF_ALLINONE_PHASE II_DEC2016.GPJ_AMECFW ROCK 2016.GDT_16/01/17

232-509249-REPT-001 Rev 5

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	CORD OF BOREHOLE	NO. <u>I</u>								41				
-	t Number: <u>TZ16108</u> t Location: <u>Chalk River, ON</u>		- F	Project	Name:	Multidis	ciplir	nary Subsurface In	vestiga	tion for the	NSDF Projec	t - Pha	se 4	amec foster wheeler
	LITHOLOGY PROFILE	SO	IL SA	MPLI	NG			FIELD TESTI	NG	LAB T	ESTING			
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesti O SPT □ PPT ● MTO Vane* Nilcon △ Intact ◇ Inta ▲ Remould ◆ Re * Undrained Shear Streng 20 40 60	DCPT	COV (LEL) 2 4	ur Reading ■ TOV (LEL) 6 8 ▲ TOV (ppm) 300 400 V W, ↓ Liquid 60 80	INSTRUMENTATION INSTALLATION	GR	COMMENTS & GRAIN SIZE DISTRIBUTION (%) SA SI CI
	dark brown to dark grey SILTY fine SAND					-	-						0.00 m betwee	of recovery from coring n 9.1 m to 10.7 m.
	Some gravel, very dense, mola	SILTY fine SAND me gravel, very dense, moist												
		SS 12 50 507 												
						- 11 - -	-							
						- - 1	175 —						0.20 m	of recovery (gravel and s) from coring between 10.7
						-	-						cobble to 12.2	s) from coring between 10.7 m.
					50 /	- 12 -	-	50						
		SS	13	0	50 / 15cm		74 —	50 15						
						E	-							
						- 13	-						0.00 m betwee	of recovery from coring n 12.2 m to 13.7m.
					50/		-	50						
		SS	14	100	50 / 15cm	- 14	-	50 0 15		⁰ 15				
						-								
						- 1 - -	72 —						0.00 m	of recovery from coring n 13.7 m to 15.2 m.
							-						Delwee	n 13.7 m to 15.2 m.
		SS	15	100	50 /	15 	-	50 8						
				100	8cm		71 —	8				Ţ		
						- 16 -	-						0.00 m betwee	of recovery from coring n 15.2 m to 16.8 m.
						_ _ 1	170 —							
				100	<u>50 /</u>	-	-	50 3						
					3cm	- 17	-	3						
							- - 169 —							
						-	-						0.08 m coring	of recovery (cobbles) from between 16.8 m to 18.3 m.
						- 18	-						Ū	
			17	100	50 / 5cm		-	50 5		0				
					Juli		68 — 	5		14				
						- 19	-							
						- 19	-						0.00 m betwee	of recovery from coring n 18.3 m to 19.8 m.
							167 —							
						-	-							
						20 	-							
							66 —							
						-	-						0.00 m betwee	of recovery from coring n 19.8 m to 21.3 m.
						21	-							

Continued on Next Page

	ECORD OF BOREHOLE N										
-	ect Number: <u>TZ16108</u> ect Location: Chalk River, ON		_ F	Project	Name:	Multid	liscipli	nary Subsurface Investiga	ation for the NSDF Projec	t - Phas	foster
-	LITHOLOGY PROFILE	6		MPLI	NG			FIELD TESTING	LAB TESTING		wheeler
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading COV (LEL) TOV (LEL) 2 4 6 A COV (ppm) TOV (ppm) 100 200 300 400 Wp W Wp Wp Wp Plastic Liquid Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI (
	Isury fine SAND Some gravel, very dense, moist at 21.3 m, a 0.10 m thick pocket of SiLT AND SAND	<u>SS</u> <u>SS</u> <u>SS</u> <u>SS</u>	18	100	50 / 50 / 8cm 50 / 3cm	<u>2</u> 22 23 24 26 26 26 27 26	164 - 163 - 162 - 161 - 160 -	50 80 50 80 50 8 50 50 3 50 50 3 50 50 50 br>50 50 50 50	°11 °20 40 60 80 °11		GR SA SI C 0.18 m of recovery (silty sand, trac gravel and cobbles) from coring between 21.3 m to 22.9m. Casing shoe broke. Driller had to remove casing and core barrel out and redrill. 0.51 m of recovery (sand and grav some silt and cobbles) from coring between 22.9 m to 24.3 m. 0.13 m of recovery (gravel and cobbles) from coring between 24.3 to 25.9 m. 0.15 m of recovery (gravel and cobbles) from coring between 25.5 to 27.4 m. 0.15 m of recovery (gravel and cobbles) from coring between 25.5

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Participa Calculate Autoritation Diring Machine Diri	R	ECORD OF BOREHOLE N	o. !	PH1	7-0	02 -	Ov	<u>erbı</u>	<u>irden</u>				
Project Remark Desk State T Date State		·							, ,	-			
Projecti - Prise 4 Date Statesti 2 Des 17 Date Conjecti 2 Des 17 Date Conjecti 2 Des 17 Date Conjecti 2 Des 17 Longel by RC Complet by RC Complet by RC Revenue by RC Revenue by RC Revenue by RC 10 <td></td> <td></td> <td></td> <td>otion</td> <td>for the</td> <td>NODE</td> <td></td> <td></td> <td>·</td> <td></td> <td></td> <td></td> <td>amec</td>				otion	for the	NODE			·				amec
Light dy: KC Dongled by: KC Newword by: N Review dby: N Last ESTING table table		Project - Phase 4	ivestig	Jation	for the	NSDF			·			1 Dec 17	foster
LITHOLOGY PROFILE SOL SAMPLING FIELD TESTING LAB TESTING agg B		·	la al la c										wheeler
DESCRIPTION B <t< td=""><td>LOĘ</td><td></td><td></td><td></td><td></td><td></td><td></td><td>Revie</td><td></td><td></td><td>LAB TESTING</td><td>, 13/2/18</td><td></td></t<>	LOĘ							Revie			LAB TESTING	, 13/2/18	
Under it if yr trong Under it						(%		(-		0	COV (LEL) TOV (LEL)	TION	
Under it if yr trong Under it	Plot	DESCRIPTION	ype	umber	(%)	RQD (Ê		MTO Vane*	Nilcon Vane*	△ COV (ppm) ▲ TOV (ppm		
Under the for yourse State 1 63 7 </td <td>ology</td> <td></td> <td>nple T</td> <td>nple N</td> <td>povery</td> <td>.N. </td> <td>PTH (</td> <td>EVATI</td> <td>Remould</td> <td> Remould </td> <td></td> <td></td> <td></td>	ology		nple T	nple N	povery	.N.	PTH (EVATI	Remould	 Remould 			
Weathered The skore 18 1 33 7 1 <th1< th=""> 1 1 1</th1<>	Lith		Sar	Sar	Rec	SP	DE						
		WEATHERED fine SAND	SS	1	63	7			0		9		
Income to base model ISS 2 00 1 <th1< th=""> <th1< th=""> 1 1</th1<></th1<>							E						
Americ Total Working Sig 2 90 0 <th0< th=""> 0 0 0</th0<>		Fine SAND						181 -					
The constraint of service of the constructions, most 38 3 83 9 2 100 9 10 64 (2) and genes. Locate to dense, most 38 4 71 38 7 73 6 9 10 64 (2) and genes. Locate to dense, most 38 6 8 17 9 0 9 10 64 (2) and genes. Locate to dense, most 38 6 8 34 77 36 9 10 64 (2) and genes. Locate to dense, most 38 6 8 34 7 7 200 10 64 (2) and genes. Locate to dense. Note: 38 6 8 34 7 7 200 10 64 (2) and genes. Constructed of denses. Note: 38 6 8 17 17 10 10 64 (2) and genes. Constructed of denses. Note: 38 6 17 17			SS	2	50	6	- '		0		°10		
Interesting spreid, base to done, most set of spreid regarded and spreid re		brown to dark grey 1.4											
al 2 4 m. 6 0 30 m Bick podel (GRWELLY S 4 71 5 10 0 9 0 9 0 9 0 9 0 9 0 0 <td></td> <td></td> <td>SS</td> <td>3</td> <td>63</td> <td>8</td> <td>E</td> <td></td> <td>0</td> <td></td> <td>0_10</td> <td></td> <td></td>			SS	3	63	8	E		0		0_10		
SAND, taxo all SS 4 /1 3 179 10 6 7							_ 2	180 -					
SAND, taxo all SS 4 /1 3 179 10 6 7		at 2.4 m, a 0.30 m thick packet CPAVELLY					L	-					
The control of the c		SAND, trace silt	SS	4	71	35	E		0		°.8		
and gravel, trace outbles, very dense, most S8 S S		dark grey to light brown 3.0					- 3	179 —					
Ame: Foster Weeker Environment & Aline fastszuture 300-210 Colomade Rad Stortigen Tel Nocionalizer Stortigen Tel Nocionalize		SILTY fine SAND some gravel, trace cobbles, very dense, moist	SS	5	58	34	_		0		· • • _ · · · · · · · · · · · · · · · ·		
SS 6 71 40 - - - - 10 64 (25) NOTE: Wheeler Environment & Infrastructure 302:210 (Consultance Read Social Tel No. (26) 137 27:068 - </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Ē</td> <td></td> <td></td> <td></td> <td>5</td> <td></td> <td></td>							Ē				5		
SS 6 71 40 - - - - 10 64 (25) NOTE: Wheeler Environment & Infrastructure 302:210 (Consultance Read Social Tel No. (26) 137 27:068 - </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Ē</td> <td>470</td> <td></td> <td></td> <td></td> <td></td> <td></td>							Ē	470					
Amer. Foster Wheeler Environmet & Infrastructure Doubles: Foster Wheeler Environmet & Infrastructure Database Rood South Tel. No: (15) 727.0583			SS	6	71	40	- 4	176 -	0		0 ₁₅	10	64 (26)
Amer. Foster Wheler Environmet & Infrastructure Diagona Colonian, KEZ FJS Canada TE, No. (15) 727.058 S 7 7 7 2000 6 17 1							Ē						
Amer Foster Wheeler Environmet & Infrastructure 200/210 Controls K2E 7/2 Coundwater depth during drilling on 21/12/2018 at a depth of: 11.5.m. 50 9 50 9 5 11 15 9 15 9 15 15 9 15 15 9 15 15 9 15 15 9 15 15 9 15 15 9 15 15 9 15 15 9 15 15 9 15 15 9 15 15 9 15 15 9 15 15 9 15 15 9 15 15 9 15 16 <td></td> <td></td> <td>SS</td> <td>7</td> <td>73</td> <td></td> <td>_</td> <td></td> <td></td> <td>68 0 23</td> <td>°₆</td> <td>forma</td> <td>t, e.g. 68/23 cm, N-Value is 68</td>			SS	7	73		_			68 0 23	° ₆	forma	t, e.g. 68/23 cm, N-Value is 68
Ame: Foster Wheeler Environment & Infrastructure Box/Concade Road South Clanade, Ontario, R2E 715 S 8 92 50/ 15/ 16/ 18 9 173 9 50/ 15/ 15/ 16 9 9 7 175 9 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 11							- 5	177 -				biowa	for 25 cm penetration.
Ame: Foster Wheeler Environment & Infrastructure Box/Concade Road South Clanade, Ontario, R2E 715 S 8 92 50/ 15/ 16/ 18 9 173 9 50/ 15/ 15/ 16 9 9 7 175 9 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 11							_						
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Amer Foster Wheeler Environment & Infrastructure Boo-100 Colonade Road South Clavace, Ontario, KZE 72, Canada Image: 1 conductant on the sector of the s							- 6	176 —					
Amec Foster Wheeler Environment & Infrastructure 300-210 Colonade Road South Otrawa, Ontario, K2E 7L5 Canada Tel. No: (613) 727-0658 amecMuccon Image: Construction of the spreament of the output of the spreament of							_						
Amec Foster Wheeler Environment & Infrastructure 300-210 Colonade Road South Otrawa, Ontario, K2E 7L5 Canada Tel. No: (613) 727-0658 amecMuccon Image: Construction of the spreament of the output of the spreament of							Ē						
Amec Foster Wheeler Environment & Infrastructure 300-210 Colonade Road South Otrawa, Ontario, K2E 7L5 Canada Tel. No: (613) 727-0658 amecMuccon Image: Construction of the spreament of the output of the spreament of								175					
Amec Foster Wheeler Environment & Infrastructure 300-210 Colonnade Road South Ottawa, Ontario, K2E 7L5 Canada Tel. No: (613) 727-0658 amecfw.com Image: Comparison of the accompanying Explanation of Borehole Log. Break and the accompanying Explanation of Borehole Log. Image: Scale: 1:53 Page: 1 of 3							Ē	1/5 -					
Amec Foster Wheeler Environment & Infrastructure 300-210 Colonnade Road South Ottawa, Ontario, K2E 7L5 Canada Tel. No: (613) 727-0658 amecfw.com Image: Comparison of the second of								-					
Amec Foster Wheeler Environment & Infrastructure 300-210 Colonnade Road South Ottawa, Ontario, K2E 7L5 Canada Tel. No: (613) 727-0658 amecfw.com Image: Comparison of the accompanying Explanation of Borehole Log. Break and the accompanying Explanation of Borehole Log. Image: Scale: 1:53 Page: 1 of 3			SS	8	92		ŀ			0 5	° ₅		
Amec Foster Wheeler Environment & Infrastructure Image: Construction of the cons							8	174 -					
Amec Foster Wheeler Environment & Infrastructure Image: Construction of the cons							Ē						
Amec Foster Wheeler Environment & Infrastructure Image: Construction of the cons							F						
Amec Foster Wheeler Image: Construction of the construction							- 9	173 -					
Amec Foster Wheeler Environment & Infrastructure 300-210 Colonnade Road South Ottawa, Ontario, K2E 7L5 Canada Tel. No.: (613) 727-0658 amecfw.com Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying Explanation of Borehole Log'.							-						
Environment & Infrastructure Image: Groundwater depth during drive driving driving dring driving driving driving driving driving							-						
Environment & Infrastructure Image: Groundwater depth during drive driving driving dring driving driving driving driving driving							-	170					
300-210 Colonnade Road South Ottawa, Ontario, K2E 7L5 Canada Tel. No.: (613) 727-0658 amecfw.com Image: Companying Explanation of Borehole Log. Scale: 1:53 Page: 1 of 3		rironment & Infrastructure			-	-				<u>n</u> .			
Canada Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was a meeting a qualified Geotechnical Engineer. Also, borehole Log'. Scale: 1:53 Page: 1 of 3	300	-210 Colonnade Road South awa, Ontario, K2E 7L5											
Page: 1 of 3	Car Tel.	No.: (613) 727-0658 Borehole details a qualified Geote	as prese chnical E nd the ac	nted, do Ingineer. company	not cons Also, bo ying'Expl	titute a th rehole inf anation o	orough formation f Boreh	understa on should ole Log'.	nding of all pote be read in conju	ntial conditions pr nction with the ge	resent and require interpretative a eotechnical report for which it was	ssistance from	
	ame	Continued on Next Page						-					Page: 1 of 3

ject Location: Chalk River, ON											foster wheeler
LITHOLOGY PROFILE	SC	IL SA	MPLI	NG			FIELD TE	STING	LAB TESTING Soil Vapour Reading	7	COMMENTS
DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)		T DCPT Vilcon Vane* Intact Remould	□ COV (LEL) ■ TOV (LEL)	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) R SA SI (
dark grey to light brown SILTY fine SAND some gravel, trace cobbles, very dense, moist					-						
	SS	9	94	89 / 28cm	- - 	171 -		89 28	° ₈	7	65 (28)
					- - - -	Z					
					- 12 	170 -					
					- - - - - 13	169 -				, T	
	SS	10	90	50 / 10cm			50 10		° ₈		
					- 14 - - - -	168 –				Diffici and v	ult to auger. Switched to cas vashboring.
					- - - 15 - - -	167 —					
					- - - - - - - -	166 -					
	SS	11	0	50 / 10cm	- - - - - - 17	165 -	50 10				
					- - - - - - - - - - - - - - - - - - -	164 -					
					- - - -					grave	m of recovery (silty sand, tra el and cobbles) from coring een 16.8 m to 19.8 m.
					- - 19 - - - -	163 -					
	SS	12	100	50 / 10cm	- - - - - - -	162 -	50 0 10		° ₁₂		
					- - - - - 21	161 -					

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RE	ECORD OF BOREHOLE N	o.]	<u>PH1</u>	7-0	02 -	Ove	<u>erbu</u>	<u>irden</u>				
Proj	ect Number: TZ16108		_ F	Project	Name:	Multid	liscipli	nary Subsurfa	ce Investig	ation for the NSDF Projec	t - Phase	
Proj	ect Location: Chalk River, ON											foster wheeler
	LITHOLOGY PROFILE	SC	IL SA	MPLI	NG			FIELD TE	STING	LAB TESTING		
								Penetration		Soil Vapour Reading □ COV (LEL) ■ TOV (LEL)	NOI	COMMENTS
±	DESCRIPTION	۵	lber		ND (%		E I	O SPT 🗆 PP			NTAT ION	& GRAIN SIZE
gy Pld	DESCRIPTION	Typ	Nun	ery (%	'/RC	(m) H	OIL	△ Intact <	lilcon Vane* Intact Remould	100 200 300 400 W _P W W _L	UME	DISTRIBUTION (%)
Lithology Plot		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION	* Undrained Shear	Strength (kPa)	Plastic Liquid	INSTRUMENTATION INSTALLATION	GR SA SI CL
	dark grey to light brown SILTY fine SAND	0)	0	Ľ.	0	_	<u> </u>	20 40	60 80	20 40 60 80		1 40 m of recovery (siilty sand some
	some gravel, trace cobbles, very dense, moist					-						grave, trace cobbles) from coring between 19.8 m to 22.9 m.
		S8 13 0cm 23 159 50 0 12 -24 158 - - - - -										
						-						
						-						
			13		50 /	-		50 0				
		- 30	15		0cm	- 23	159 -	o o		o12		
						_	-					
						_				· · · · · · · · · · · · · · · · · · ·		
						-						
						— 24 _	158 -					
	<u>157.6</u> 24.4											
	End Of Borehole											
	Well Installation Details 0.0 - 20.7 m Bentonite											
	20.8 - 21.3 m Sand 21.3 - 24.4 m Screen											

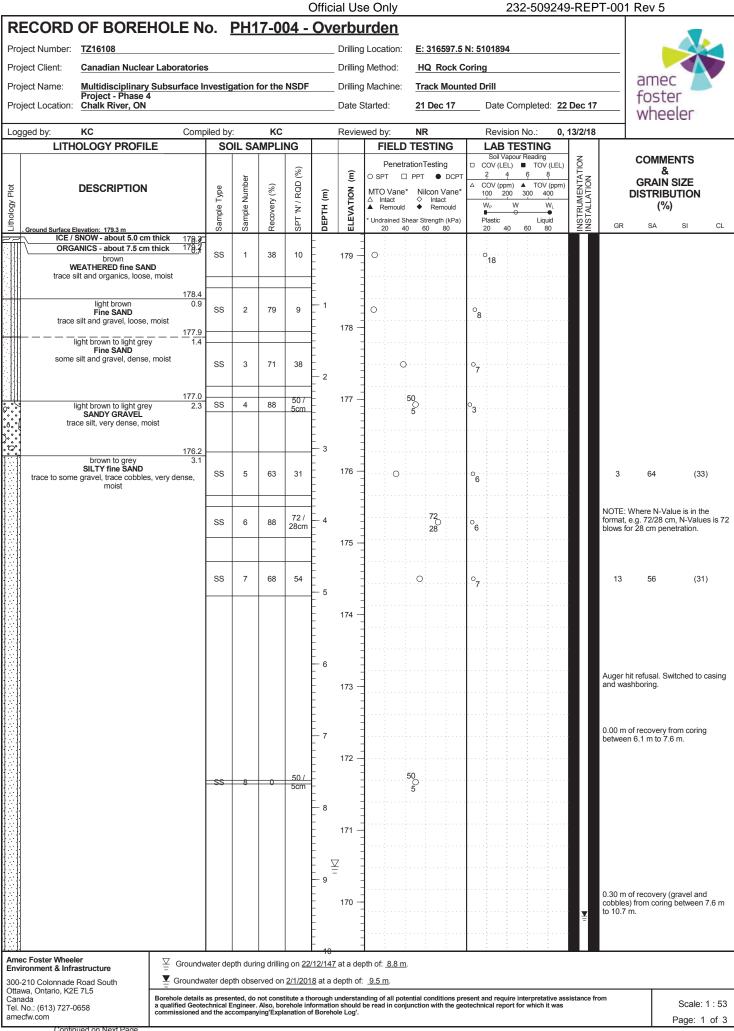
Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying Explanation of Borehole Log.

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R	ECORD	OF BOREHO	LE No.	ļ	PH1	7-00	<u> 03 -</u>	Ov	erbu	<u>ırden</u>									-
	ject Number:			-						Location:	E: 31	6484.3	N: 510 ⁻	1872					
	ject Client:	Canadian Nuclear Lat	ooratories							g Method:		Rock C							
	ject Name:	Multidisciplinary Sub		stia	ation f	or the	NSDF			Machine:		k Mount							amec
		Project - Phase 4 Chalk River, ON		ou.g					- `	Started:		ec 17			omolei	ted: 21	Dec 1	7	foster
110									Duio		<u></u>				mpio			·	wheeler
Log	iged by:	BC	Compileo			KC			Revie	wed by:	NR				n No.:		13/2/18	8	
	LITH	OLOGY PROFILE		so	IL SA	MPLI	NG			FIELD			S	ioil Vapo	ESTII ur Read	ing	z		COMMENTS
					5		(%)		Ê	Penetra O SPT □		DCPT	2	4	6	OV (LEL) ۶	RUMENTATION		&
Plot		DESCRIPTION	0	he	qunp	(%)	'N' / RQD (%)	Ê		MTO Vane*		n Vane*	△ CO 100		▲ T 300	OV (ppm) 400	AENT	C	GRAIN SIZE
Lithology Plot					Sample Number	Recovery (%)	, N.	DEPTH (m)	ELEVATION	 △ Intact ▲ Remould 	♦ R	tact emould	W _P		v >	WL			(%)
Lith	. Ground Surface E	levation: 170.3 m		0	San	Rec	SPT	DEF		* Undrained Sh 20 40		gth (kPa) 80	Plas 20		6 <u>0</u>	iquid. 80	INSTI INSTI	GR	SA SI CL
	COREI	O WITHOUT SOIL SAMPLIN	G					E	170 -									BH-114, v	profile may be referred to which it was drilled at E: I: 5101868, with a surface
								Ē	170 -									elevation	170.2 m.
								E	-										
								- 1											
								Ē	169 -				· · · · · · · · ·						
								È									Ţ		
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Env	ec Foster Whee ironment & Infr	astructure 🗧	Groundwate								<u>1</u> .								
Otta	210 Colonnade wa, Ontario, K2	E7L5	Groundwater																
Can Tel.	ada No.: (613) 727-(Bore a qua	hole details as p alified Geotechni missioned and th	cal E	ngineer. A	Also, boi	rehole ir	formatio	on should	nding of all pote be read in conji	ntial con Inction w	ditions pre ith the geo	sent and technica	require I report	interpre for whic	etative ass ch it was	sistance	from	Scale: 1 : 53
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R	ECORD OF BOREHOLE N	0.	<u>PH1</u>	7-00)3 -	Over	<u>rbu</u>	<u>ırden</u>						
Pro	ject Number: TZ16108		_ F	Project I	Name:	Multidis	cipli	nary Subsurface Investig	ation for the NSDF Projec	t - Phase	4		mec 🍐	
Pro	ject Location: Chalk River, ON										_		vheeler	
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG			FIELD TESTING	LAB TESTING Soil Vapour Reading	-		0.01		
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)		ELEVATION (m)	PenetrationTesting SPT PPT DCPT MTO Vane* Nilcon Vane* A Intact Intact Remould Remould Undrained Shear Strength ((Pa)	COV (LEL) TOV (LEL)	INSTRUMENTATION INSTALLATION	GR	GRA DISTF	MENTS & NIN SIZE RIBUTION (%)	CL
	CORED WITHOUT SOIL SAMPLING	<i>i</i> o	ŭ	Ĕ	S	-	<u> </u>	20 40 60 80	20 40 60 80		GR	54	ι 5i	UL
	159.6					- 1 	60							
	10.7 End Of Borehole													
	End Of Borehole Well Installation Details 0.0 - 7.0 m Sentonite 7.0 - 7.6 m Sand 7.6 - 10.7 m Screen													
	Borehole details a qualified Geote commissioned a	as prese echnical I ind the ad	ented, do Engineer. ccompany	not consti Also, bor ying'Expla	itute a th ehole inf ination o	orough und ormation s f Borehole	lerstan hould I Log'.	nding of all potential conditions problem in conjunction with the get	esent and require interpretative ass otechnical report for which it was	sistance from	1		Scale	: 1 : 53



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R	ECORD OF BOREHOLE N	0.	<u>PH1</u>	7-0	04 -	Ov	erbu	<u>irden</u>					
	ect Number: TZ16108								urface Inve	estigati	tion for the NSDF Project	t - Phas	
Proj	ect Location: Chalk River, ON												foster wheeler
	LITHOLOGY PROFILE	sc	DIL SA	MPLI	NG			FIELD	TESTIN	G	LAB TESTING		
Plot	DESCRIPTION					Ē	(m) NC	Penet O SPT D MTO Vane	rationTesting □ PPT ● [* Nilcon Va) C DCPT ane*	Soil Vapour Reading COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ▲ TOV (ppm) 100 200 300 400	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION
: Lithology Plot	brown to grey	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION		 ◇ Intact ▲ Remo Shear Strength (40 60 80 	ould (kPa)	W _p W W _L ● ● ● Plastic Liquid 20 40 60 80		(%) GR SA SI CL
	SILTY fine SAND trace to some gravel, trace cobbles, very dense, moist				50/	-	169 -		50				
		SS	9	67	8cm			-	50 8				
						- 11 -							
							168 -	-					
						-		-					
						- 12		-					
						-	167 -						0.08 m of recovery (silty sand, some gravel) from coring between 10.7 m to 13.7 m.
						-							to 13.7 m.
								-					
						13		-					
						-	166 -	-					
		SS	10	0	50 / 8cm			-	50 8				
					ociti	- 14]	8				
						F	165 -	1					
						-]					
						-							
•						- 15 -							
							164 -						0.45 m of recovery (gravel, trace cobbles/boulders) from coring between 13.7 m to 16.7 m.
								-					between 13.7 m to 16.7 m.
						- 16		-					
						-	163 -	-					
						-		-					
•						-							Did not performed a SPT as driller noted hard material.
						- 17 -							
							162 -	-					
								-					
						18						E	
						E	161 -	-				E.	0.00 m of recovery from coring
•						E]				I	between 16.7 m to 20.7 m.
						F		1					
						- 19 -]				.∶₿.	
					1	Ē	160 -	1					
-]]								1					
						- 20							
					1	E	159 -	-				:¦₿₽	
	158.6					E		-					
	20.7					Ē							1
	a qualified Geote	echnical I	Enaineer.	. Also, bo	prehole in	formatio	on should	nding of all po be read in cor	tential conditio	ons prese	ent and require interpretative ass echnical report for which it was	istance fr	rom Scale: 1 : 53
	commissioned a	ind the ad	compan	ying'Exp	lanation o	of Boreh	ole Log'.						Page: 2 of 3

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RECORD OF BOREHOLE No. PH17-004 - Overburden Project Number: TZ16108 Project Name: Multidisciplinary Subsurface Investigation for the NSDF Project - Phase 4 amec foster Project Location: Chalk River, ON wheeler LITHOLOGY PROFILE SOIL SAMPLING FIELD TESTING LAB TESTING Soil Vapour Reading COMMENTS INSTRUMENTATION INSTALLATION PenetrationTesting & (%) 2 4 6 8 Ē O SPT D PPT • DCPT **GRAIN SIZE** Sample Number COV (ppm) ▲ TOV (ppm) 100 200 300 400 SPT 'N' / RQD DESCRIPTION -ithology Plot MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould Sample Type Recovery (%) ELEVATION DISTRIBUTION Ē w W_P W_L (%) DEPTH * Undrained Shear Strength (kPa) 20 40 60 80 Plastic 20 40 Liquid 80 GR SA SI CL 60 End Of Borehole Well Installation Details 0.0 - 17.1 m Bentonite 17.1 - 17.7 m Sand 17.7 - 20.7 m Screen Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying Explanation of Borehole Log'. Scale: 1 : 53

RECORD OF BOREHOLE No. PH17-005 - Overburden Project Number T216108 Drilling Location: E: 316787.5 N: 5101720 Project Clent: Canadian Nuclear Laboratories Drilling Mathod: HQ Rock Coring Project Clent: Canadian Nuclear Laboratories Drilling Mathod: HQ Rock Coring arrack Mounted Drill Project Location: Chalk River, ON Date Started: 13 De 17 Date Completed: 15 Dec 17 Logged by: KC Complet by: KC Revision No: 0, 13/2/18 UTHOLOGY PROFILE SOIL SAMPLING FletD TESTING LAB TESTING Completed: 15 Dec 17 DESCRIPTION 0 <	er TS ZE
Project Number: IZI6108 Drilling Location: E: 316787.5 N: 5101720 Project Client: Canadian Nuclear Laboratories Drilling Method: HQ Rock Corring Image: Complex Comp	er TS Ze Ion
Project Client: Canadian Nuclear Laboratories Drilling Method: HQ Rock Coring Project Name: Multidisciplinary Subsurface Investigation for the NSDF Drilling Machine: Track Mounted Drill amech Project Location: Chark River, ON Date Started: 13 Dec 17 Date Completed: 15 Dec 17 Logged by: KC Completed by: KC Reviewed by: NR Revision No.: 0, 13/2/18 LiTHOLOGY PROFILE SOIL SAMPLING Image: Soil Sampling Soil Soil Soil Soil Soil Soil Soil Soil	er TS Ze Ion
Project Name: Multidisciplinary Subsurface Investigation for the NSDF Project Location: Drilling Machine: Tack Mounted Drill Image: Complete: Image:	er TS Ze Ion
Project - Phase 4 Project Location: Chalk River, ON Date Started: 13 Dec 17 Date Completed: 15 Dec 17 Logged by: KC Compled by: KC Reviewed by: NR Revision No:: 0, 13/2/18 LitrHoLOGY PROFILE SOIL SAMPLING FileLD TESTING LAB TESTING Sol (LAB TESTING) Of (LB) TO V(LE) Sol (LAB TESTING) Sol (L	er TS Ze Ion
Logged by: KC Complete by: KC Reviewed by: NR Revision No.: 0, 13/2/18 LITHOLOGY PROFILE SOIL SAMPLING Filled Testing Lab TESTING Lab TESTING COMMENT DESCRIPTION 0	ts Ze Ion
LITHOLOGY PROFILE SOIL SAMPLING FIELD TESTING LAB TESTING COMMENT DESCRIPTION <u> </u>	ZE ION
Image: Description Image: Descri	ZE ION
ORGANICS - about 7.5 cm thick 193.4 brown to light brown WEATHERED fine SAND some silt, trace gravel and organics, very loose to compact, moist SS 1 50 3 193.5 1	ZE ION
ORGANICS - about 7.5 cm thick 193 -	ION
ORGANICS - about 7.5 cm thick 193.4 brown to light brown WEATHERED fine SAND some silt, trace gravel and organics, very loose to compact, moist SS 1 50 3 193.5 1	SI CL
Obvious of the state of the	SI CL
brown to light brown WEATHERED fine SAND some silt, trace silt, orage 1 and registric compact, moist SS 1 50 3 192.5 (a) 102 (b) 102 (c) SS 2 63 29 1 0 0 0 193 100 (c) GRAVELLY SAND (c) SS 2 63 29 1 0 0 0 192.5 (c) 100 (c) GRAVELLY SAND (c) SS 2 63 29 1 0 0 0 192.7 (c) 100 (c) GRAVELLY SAND (c) SS 3 78 507 192 192 50 0 12 192 100 (c) 100 (c) 100 (c) 100 (c) 100 (c) 192 50 0 12 100 (c)	
some silt, trace gravel and organics, very loose to compact, moist 192.5 193 25 iight grey 1.0 SS 2 63 29 1 0 9 iight grey 1.0 SS 2 63 29 1 0 9 iight grey 1.0 SS 2 63 29 1 0 9 iight grey 1.4 SS 3 78 507 192 50 12 Some gravel, trace cobles and boulders, very dense, moist SS 3 78 8cm -2 191 23 SS 4 78 937 28 9 14 59	
192.5 SS 2 63 29 1 Ight grey 1.0 SS 2 63 29 1 Ight preverence 1.0 SS 2 63 29 1 Ight preverence 1.0 SS 2 63 29 1 Ight preverence 1.0 SS 2 63 29 1 Ight preverence 1.4 SS 3 78 507 Some gravel, trace cobbles and boulders, very dense, moist SS 3 78 507 SS 4 78 937 28cm 191 93 28 9 14 59	
light grey 1.0 SS 2 63 29 1 0 9 9 Ight provide stress of the stress	
trace silt, compact, moist 192.0 light brown to light grey 1.4 SLTY fine SAND SS some gravel, trace cobles and boulders, very dense, moist SS SS 4 The second se	
Ight brown to light grey 192.0 Some gravel, trace cobbles and boulders, very dense, moist 18 SS 3 78 507 8 12 192 10 93 12 SS 4 78 937 191 28 93 9 14 59	
blows grade, moist blows in a bolacter, resy dense, moist blows for 8 cm penetration of 8 cm penetration o	
SS 4 78 93/ 28 99 14 59	Value is 50
	washboring.
	(27)
SS 5 73 50/ 13cm	
SS 6 79 $\frac{83}{20cm} - 4$ 30 $\frac{83}{10}$ 10 $\frac{10}{10}$	
SS 7 67 507 8cm - 50 8 12	
33 8 100 8cm - 188 - 188 - 12 12 12 0.40 m of recovery (bou	(35) Iders) from
coring between 5.3 m to	6.1 m.
-6 -50 -6 -50 -6 -50 -6 -50 -6 -50 -6 -50 -6 -50 -6 -50 -6 -6 -6 -6 -6 -6 -6 -6	
SS 9 100 507 15cm	
- 7 - 0.50 m of recovery (cob	bles /
boulders) from coring be	.ween 0.1 f
SS 10 100 507 15cm 105 15 16 16 16 16 16 16 16 16 16 16 16 16 16	
0.20 m of recovery (grav cobles) from coring betw	
9 1 m. SS 11 100 50/ SS 11 100 8cm ⊻ 8 8 8 8 98 9.1 m.	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
Amec Foster Wheeler Groundwater depth during drilling on <u>15/12/2017</u> at a depth of: <u>9.3 m</u> .	
300-210 Colonnade Road South $\mathbf{\Sigma}$ Groundwater depth observed on 2/1/2018 at a depth of: 10.6 m.	
Ottawa, Ontario, K2E 7L5	
Tel. No.: (613) 727-0658 a dualitied Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying/Explanation of Borehole Log'.	Scale: 1 : 5

								e Only	232-509249	9-REPT-00)1 Rev 5
R	ECORD OF BOREHOLE N	0.	<u>PH1</u>	7-0	<u>05 -</u>	Ov	<u>erbı</u>	<u>irden</u>			
Proj	ect Number: TZ16108		_ F	Project	Name:	Multio	discipli	nary Subsurface Investig	ation for the NSDF Projec	t - Phase 4	amec foster
Proj	ect Location: Chalk River, ON										wheeler
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG			FIELD TESTING	LAB TESTING		1
					(%			PenetrationTesting	Soil Vapour Reading COV (LEL) TOV (LEL) 2 4 6 8	INSTRUMENTATION INSTALLATION	COMMENTS &
lot	DESCRIPTION	be	Sample Number	(%)	SPT 'N' / RQD (%)	Ē	(m) N	O SPT □ PPT ● DCPT MTO Vane* Nilcon Vane*	2 4 9 9 △ COV (ppm) ▲ TOV (ppm) 100 200 300 400		GRAIN SIZE
Lithology Plot		Sample Type	le Nu	Recovery (%)	N'/ R	DEPTH (m)	ELEVATION	△ Intact ◇ Intact ▲ Remould ◆ Remould	W _p W W _L	ALLA	DISTRIBUTION (%)
Lithol		Samp	Samp	Reco	SPT	DEP1	ELE	* Undrained Shear Strength (kPa) 20 40 60 80	Plastic Liquid 20 40 60 80		
ĪI	light brown to light grey SILTY fine SAND					-					m of recovery (cobbles) from g between 9.1 m to 10.7 m.
	some gravel, trace cobbles and boulders, very dense, moist					E	183 -				-
		ss	12	100	50 / 5cm	-		50 5	°13	Ŧ	
						- 11		5	10		
						-	182 -			0.00	m of recovery from coring een 10.7 m to 12.2 m.
						F				Detwo	een 10.7 m to 12.2 m.
						- 12		50			
		SS	13	67	50 / 8cm			50 0 8	°13		
						-	181 -				
						-					
						- 13 -				cobb	m of recovery (gravel and es) from coring between 12.2 n
						E	180 -			to 13	./ m.
						F	100			Dida	
						- 14				hard	ot perform SPT as driller notice material
						-					
						-	179 -				
	170.0					-					
	black 14.9 GNEISS TO SCHIST BEDROCK					- 15					
\mathbb{Z}	slightly to highly weathered	RC	14	100	0	-					
X						F	178 -				
	(for rock core details, see "RECORD OF	RC	15	88	66	-					
\square	BOREHOLE No. PH17-005 - ROCK")					— 16					
X						ŀ	177 -				
						-					
						- 17					
X		RC	16	63	30	-				Drille	r noticed a weak layer
						-	176 -				
β						-					
X						18					
						E					
						-	175 -	1			
ÿ		RC	17	79	74	F		1			
X						- 19 -		1			
						E	174 -				
ÿ						F	1/4 -				
X						- 20					
		RC	18	100	100	Ē					
X						F	173 -]			
$\langle\!\langle$]			
4	172.5					- 21					
	Borehole details a qualified Geote commissioned a	echnical E	Engineer.	. Also, bo	rehole in	formatio	on should	nding of all potential conditions problem is a set of the set of t	esent and require interpretative ass otechnical report for which it was	sistance from	Scale: 1 : 53
	commissioned a	ind the at	~ompany	,a ⊂xbi	anauon 0	- Poteu	ore LUg.				Page: 2 of 3

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RECORD OF BOREHOLE No. PH17-005 - Overburden Project Number: TZ16108 Project Name: Multidisciplinary Subsurface Investigation for the NSDF Project - Phase 4 amec foster Project Location: Chalk River, ON wheeler LITHOLOGY PROFILE SOIL SAMPLING FIELD TESTING LAB TESTING Soil Vapour Reading COMMENTS INSTRUMENTATION INSTALLATION PenetrationTesting & (%) 2 4 6 8 Ē O SPT D PPT • DCPT **GRAIN SIZE** Sample Number COV (ppm) ▲ TOV (ppm) 100 200 300 400 SPT 'N' / RQD DESCRIPTION -ithology Plot MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould Sample Type Recovery (%) ELEVATION DISTRIBUTION Ē w W_P W_L (%) DEPTH * Undrained Shear Strength (kPa) 20 40 60 80 Plastic 20 40 Liquid 80 GR SA SI CL 60 End of Borehole Well Installation Details 0.0 - 17.7 m Bentonite 17.7 - 18.0 m Sand 18.0 - 21.0 m Screen

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying Explanation of Borehole Log'.

			ORD OF BOREHOL	-E	No.	<u>P</u>	PH1	7-	-0(<u>05</u>	<u> </u>	F				1.00	<u>.</u> Δ.	τιοι	N	: E: 316787.5 N:	51	017	72(٦ ٦				
CL	.IEM	١T	: Canadian Nuclear Laborato					יסר	Dee		-4		DR	RILLI	NG	DA	TE			: 13 Dec 17 - 15							amec Ster foster wheeler	
	AME DCA		: Multidisciplinary Subsurface N Phase 4 - Chalk River, ON	e inve	estigatio	on to	or NS	SDF	Pro	ojeo	ct -					ION (De		eg.))	: Vertical : Vertical							DATUM: m	AMSL
DEPTH SCALE (metres)		חגוובוואק אבנטאט	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	m/m		RE TOT/ CORE	ECOV	VER SO COR	Y LID RE %	R.	Q.D.	FRA IN PE	CTUR NDEX R 1 m	NIC	ha an deg.)	ind (descriptions refer to K DESCRIPTION TERMINOLO DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	DGY	. Ja	a	ROCK STRENGTH INDEX		WEATHERING INDEX	NOTES WATER LEV INSTRUMENT/	
-14			For overburden details, see "RECORD OF BOREHOLE PH17-005 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - PH17-005" Rock Coring Started on 14 Dec 2017				a	Ľ	20	000	20	800	20	60 80	2	10	0		00				8	22 22 25 25 22 25 25 22 25 25	88.	M3 M3 M5 M5 M5		
-			black GNEISS to SCHIST BEDROCK		178.55 14.94															BC from 14.94 m to 15.39 m BC from 15.39 m to 15.51 m							-	
- 			RC 15: Classification based on RQD: Fair			RC 15												•		JN, PL, SR, Si, Sa JN, PL, SR, Si, Sa JN, PL, SR VN, Si, Sa BC from 16.26 m to 13.61 m JN, PL, SR	1.25 1.25 1.25	5 1						-
			RC 16: Classification based on RQD: Poor			RC 16												•		JN, PL, SR	1.2!	5 0.7	75					
- 	15/12/2017	Rock Coring (HQ)	RC 17: Classification based on RQD: Fair			RC 17											0	•		JN, PL, SR JN, PL, SR JN, PL, SR	1.25 3							
- 20 - 20 			RC 18: Classification based on RQD: Excellent		172.49	RC 18												•		JN, PL, SR JN, PL, SR, Sa	1.25	5 1	75					
-		L	End of Rock Coring		21.00																							<u>,⊟</u> ∵,
-22 - - - - - -																												-
						\$	 	I								<u> </u>	-				-				SH	EET	1 of 1	
			SHALLOW/SINGLE INST WATER LEVEL (date) 15/12/		TION			D NAT						STA		ATI /1/2				LOGGED CHECKED	:	KC NF						

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R	ECORD OF BOREHOLE N	o.]	PH1	7-0	06 -	Ove	erbu	<u>ırden</u>					_
	ject Number: TZ16108							Location:	E: 316749.9	N: 5101578			
	ject Client: Canadian Nuclear Laboratorie	s						g Method:	HQ Rock C				
			ation	for the	NODE			g Machine:	Track Moun				amec
	ject Name: Multidisciplinary Subsurface In Project - Phase 4	ivestig	alion	ior the	NODE			-					foster
Pro	ject Location: Chalk River, ON						Date	Started:	12 Dec 17	Date Co	ompleted: 12	Dec 1/	wheeler
Log	iged by: KC Comp	oiled by	:	кс			Revie	wed by:	NR	Revisio	n No.: 0, 1	13/2/18	
	LITHOLOGY PROFILE	SC	IL SA	MPLI	NG			FIELD	TESTING		ESTING		
								Penetra	ationTesting	COV (LEL)	 TOV (LEL) 	INSTRUMENTATION INSTALLATION	COMMENTS &
¥	DESCRIPTION		lber		(%) Qi		E	O SPT □	PPT • DCPT	2 4 △ COV (ppm)	6 8 ▲ TOV (ppm)	ON	GRAIN SIZE
y Plo	DESCRIPTION	Type	Nun	ر% (%	'N' / RQD	Ē	10 I	MTO Vane* △ Intact	Intact	100 200	300 400	JME LAT	
Lithology Plot		Sample Type	Sample Number	Recovery (%)	.z. ⊢	DEPTH (m)	ELEVATION	Remould * Lindrained Sh	 Remould ear Strength (kPa) 	W _P V Plastic	N W _L ∋ ● Liquid	STRL	(%)
Lith	. Ground Surface Elevation: 190.1 m Therefore ICE / SNOW - about 5 cm thick 198.47		Sa	Re	SPT	ä		20 40		20 40	60 80	<u>z</u> z	GR SA SI CL
ĨĨ	ORGANICS - about 7.5 cm thick 19∯.	SS	1	42	3	-	190 -						
	brown to light brown WEATHERED - fine SAND	33		42	3	E		ľ		°26			
	trace to some gravel, trace silt and cobbles, very loose to very dense, moist					F							
		SS	2	78	57/	È			57 0 30				NOTE: Where N-Value is in the
		33	2	10	30cm	E'	189 -		30	⁰ 12			format, e.g. 57/30 cm, N-Value is 57 blows for 30 cm penetration
\downarrow	188.7 black, green, white 1.4	RC	3	100		ŀ							Switched to casing and washboring.
)))	GNEISS TO SCHIST BEDROCK fresh to moderately weathered												
K						-]					
\gg		RC	4	100	40	2	188 -	1					
\mathbb{K}	(for rock core details, see "RECORD OF					-							
\mathbb{Z}	BOREHOLE No. PH17-006 - ROCK")					ĒŽ	Z						
		<u> </u>				Ł							
						- 3					1 1 		
Ŵ						Ē	187 -					Ţ	
K		RC	5	100	75	E							
\gg						F		· · · · · · · · · · · ·					
K						E,							
						- 4	186 -						
\mathbb{N}						-							
						-							
X		RC	6	100	79	E							
K			-			- 5	185 -						
						F							
\mathbb{K}													
						F				•••••••••••••••••••••••••••••••••••••••			
\bigotimes						6	184 -						
K						-	104						
\triangleright		RC	7	100	01	-							
\mathbb{K}		RC	/	100	81								
						- 7							
\bigotimes						-	183 -						
K//						Ē							
)))						-							
K						-							
\gg		RC	8	100	85	- 8	182 -						
\mathbb{N}						F							
						-							
s)						Ę		· · · · · · · · · · · · · · · · · · ·					
K						- 9	181 -						
\gg						-							
\mathbb{K}			_]			· · · · · · · · · · · · · · · · · · ·		
\mathbb{Z}		RC	9	100	100	F							
Ň						10-		1				· . 🕂 .	
				-	-			epth of: <u>2.5 m</u>	<u>1</u> .				
	210 Colonnade Road South wa, Ontario, K2E 7L5	ater dep	oth obse	erved on	<u>2/1/201</u>	1 <u>8</u> at a c	lepth of	: <u>3.2 m</u> .					
Can	ada Borehole details No.: (613) 727-0658 a qualified Geote	chnical E	ingineer.	Also, bo	rehole in	formatio	n should	nding of all pote be read in conju	ntial conditions pro	esent and require otechnical report	interpretative ass for which it was	istance fr	om Scale: 1 : 53
	cfw.com	na the ac	company	ring Expl	anation o	n Boreho	ne Log'.						Page: 1 of 2

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RECORD OF B	OREHOLE No.	PH17-006 - Overburden	
Project Number: TZ16108	1	Project Name: Multidisciplinary Subsurface Inves	stigation for the NSDF Projec

-	
Project Location:	Chalk River, ON

Lithology Plot

CORD OF BOREHOLE N	0.	PH1	7-0	06 -	Ove	erbu	<u>irden</u>			
t Number: TZ16108		_ F	Project	Name:	Multid	liscipli	nary Subsurface Investig	ation for the NSDF Projec	t - Phase 4	amec foster
t Location: Chalk River, ON										wheeler
LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG			FIELD TESTING	LAB TESTING Soil Vapour Reading	-	0000050170
DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting O SPT PPT DCPT MTO Vane* Nilcon Vane* A Intact Remould * Undrained Shear Strength (kPa) 20 40 60 80	□ COV (LEL) ■ TOV (LEL)	INSTRUMENTATION INSTALLATION B	COMMENTS & GRAIN SIZE DISTRIBUTION (%) SA SI
black, green, white GNEISS TO SCHIST BEDROCK fresh to moderately weathered						180				
178.2	RC	10	100	100	- - - - - - - - - - - - - - - - - - -					
11.9 End Of Borehole										
Well Installation Details 0.0 = 8.1 m Bentonite 8.1 = 8.8 m Sand 8.8 = 11.9 m Screen										

R	REC	ORD OF BOREHOL	.E	No.	<u>P</u>	H1	7-	- <u>00</u>)6	-	R	<u>)C</u>	<u>k</u>											
		T No. : TZ16018														ION	: E: 316749.9 N:						amec	
	.IENT ME /	: Canadian Nuclear Laborator : Multidisciplinary Subsurface		stigatio	n fc	or NS	DF	Pro	iect	_				DAT ON (nu)	: 12 Dec 17 - 12 : Vertical	Dec	C 17				foster wheeler	
	CATIC			Jongano			01	110	Joor					Deg		·y.)	: Vertical						DATUM: n	nAMSL
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH	SAMPLE No.	μË Έ	FLUSH <u>% RETURN</u>		COVE	RY			FRA		/mb		TTFE AND SURFACE			ROCK STRENGTH	INUEX	WEATHERING INDEX	NOTES WATER LEV INSTRUMENT	VELS
Ļ	DR	- For overburden details, see "RECORD OF	Ś	(m)		PEN		<u>111</u> 848				<u>4</u> 88	- 20	512		388 711	DESCRIPTION	Jr	Ja	82255 82555 57	522 i	****		
		 For overburden details, see "REORE FOR ROCK BOREHOLE PH17-006 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - PH17-006" 																						
-		Rock Coring Started on 12 Dec 2017		188.73																				
		black, white, pink, white SCHIST to GNEISS BEDROCK		1.37																				
-2		RC 4: Classification based on RQD: Poor			RC 4											•	BC from 1.94 m to 2.24 m JN, PL, RO JN, IR, RO BC from 2.84 m to 2.91 m	1.5	1				Ţ	-
-		RC 5: Classification based on RQD: Poor			RC 5										•	•	BC from 3.03 m to 5.09 m JN, PL, SR, CI JN, PL, RO, CI JN, PL, RO, CI	20 20	1.25				Ţ	-
-4 - - - - - - - - - - - -	12/2017 Coring (HQ)	RC 6: Classification based on RQD: Good			RC 6											•	JN, PL, SR JN, PL, SR JN, IR, SR, Cl JN, IR, SM JN, IR, SM, Io BC from 5.39 m to 5.59 m	20 1.25 20 1.25 10	1.25				-	
-6	12/- Rock C	RC 7: Classification based on RQD: Good			RC 7											•	JN, IR, SR, CI JN, IR, SR BC from 6.30 m to 6.8 m JN, IR, SR	2 20 20	1 2 2					
-8		RC 8: Classification based on RQD: Excellent			RC 8								_		•	•	JN, IR, SR JN, IR, SR BC from 8.03 to 8.11 m JN, PL, SM BC from 8.53 m to 8.67 m	3	1					
- 10		RC 9: Classification based on RQD: Excellent			RC 9										•	•	JN, PL, SM JN, IR, SR JN, IR, SM	1 3	1 0.75 1.5					
																					SH	IEET	「1 of 2	
		SHALLOW/SINGLE INSTA WATER LEVEL (date) 12/12/		TION				EEF ER L						ATIC 1/20			LOGGED CHECKED		KC NR					

F	RE	CORD OF BOF	REHOLE	No.	Pł	-117	'-00)6	- F	Roc	<u><</u>								
		CT No. : TZ16018											ION	: E: 316749.9 N:					amec
	LIEN ⁻ AME			stigation	for	NSD	F Pro	iect	_	DRILLI INCLIN			, n	: 12 Dec 17 - 12 : Vertical	Dec	c 17			foster wheeler
	CAT				-	_		,		AZIMU			9.7	: Vertical					DATUM: mAMSL
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH	SAMPLE NO.	(m/min) FLUSH COLOUR		COVEI	RY OLID DRE %	R.Q.D.	EOTEC	Symb HNICA		I descriptions refer to CK DESCRIPTION TERMINOL DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	OGY Jr	Ja	ROCK STRENGTH INDEX	WEATHERING INDEX	NOTES WATER LEVELS INSTRUMENTATION
-		black, white, pink, w	nite	(,	8		248	8 23	488	54 <u>6</u> 8	12		888				8222888	M 88	
-	12/12/2017	RC 10: Classification based Excellent			8C 10							•	•	JN, IR, SR JN, IR, SR JN, IR, SR	3 3 3	1			
-12 - - - - - - - - - - - - - - -		End of Rock Corir	g	<u>178.21</u> 11.89															
- - - - - - - - - - - - - - - - - - -																			
-20																			-
52		GROUNDWAT				_			<u></u>								S	HEET	12 of 2
		SHALLOW/SIN WATER LEVEL (date)	GLE INSTALLA ⁻ 12/12/2017	TION			DEEP			INSTA ate)	LLAT 2/1/2			LOGGED CHECKED		KC NR			

						Offici	al Us	e Only		2	32-509249	-REP	T-001 Rev 5
R	ECORD OF BOREHOLE N	o.]	PH1	7-00	07 -	Ove	erbu	<u>irden</u>					_
	ject Number: TZ16108							Location:	E: 316828.1	N· 5101498			
	·							g Method:	HQ Rock C				amec
Pro	ject Name: Multidisciplinary Subsurface II Project - Phase 4	nvestig	ation f	for the	NSDF		Drilling	g Machine:	Track Mount	ed Drill			foster
Pro	ject Location: Chalk River, ON						Date S	Started:	11 Dec 17	Date C	completed: 11	Dec 17	wheeler
Loc	iged by: KC Comp	biled by		кс			Revie	wed by:	NR	Revisio	on No.: 0.1	3/2/18	
	LITHOLOGY PROFILE	,		MPLI	NG			-	TESTING	1	ESTING		
									tionTesting	Soil Vap	our Reading) TOV (LEL)	NO	COMMENTS
			.ec	_	(%) (E)		PPT • DCPT	2 4	6 8	ITATI	& GRAIN SIZE
Plot	DESCRIPTION	Type	Imn	V (%)	'N' / RQD	Ē	NO	MTO Vane* △ Intact	Nilcon Vane* ◇ Intact	100 200		MEN ATIC	DISTRIBUTION
Lithology Plot		Sample Type	Sample Number	Recovery (%)	.Z	DEPTH (m)	ELEVATION	Remould	 Remould 		W WL	INSTRUMENTATION INSTALLATION	(%)
Lith	. Ground Surface Elevation: 189.3 m ICE / SNOW - about 3 cm thick 189.6	Sar	Sar	Rec	SPT	DEI	E E	* Undrained Shi 20 40	ear Strength (kPa) 60 80	Plastic 20 40	Liquid 60 80	SNI	GR SA SI CL
	ICE / SNOW - about 3 cm thick 180, ORGANICS - about 5.0 cm thick 180,					-							
	brown to light brown WEATHERED fine SAND	SS	1	54	4		189 -			°23			
	trace silt, gravel, and organics, loose, moist					ŧ							
	188.4 grey to brown 0.9		2	60	20								
	Fine to medium SAND trace silt and gravel, compact, moist	SS	2	60	30	¢ '		0		°9			
		RC	3	100	0	1	188 -						Switched to casing and washboring.
	white, black, pink 1.6					£							
Ň	GNEISS BEDROCK fresh to slightly weathered					È,							
\mathbb{K}		RC	4	98	76	- 2 -]					
\mathbb{Z}	(for rock core details, see "RECORD OF BOREHOLE No. PH17-007 - ROCK")		-	30	10	-	187 -						
\mathbb{N}						F							
						ŧ							
X						3 7	Z :						
K							186 -					T	
\geq							-						
\mathbb{N}		RC	5	80	65	-							
						- 4	-						
\bigotimes						-	185 —						
K						È							
\bigcirc						F							
\mathbb{N}						- 5							
		RC	6	100	100	-	184 -						
X						-							
\mathbb{K}						£	-						
						- 6							
\bigotimes						E	183 -						
K		RC	7	100	100	-							
\mathbb{N}						E							
						- 7							
K//						E	182 –						
X						-							
\mathbb{K}						Ē		1					
$\langle \rangle \rangle$		RC	8	100	90	- 8							
\mathbb{N}		RC	0	100	90	E	101						
						F	181 -						
\gg						E							
\mathbb{K}						- 9							
)//						F							
Ŵ						E	180 -						
K		RC	9	100	100	F							
Ŵ						F 10							
				-				epth of: <u>3.0 m</u>	ļ.				
	210 Colonnade Road South wa, Ontario, K2E 7L5	ater dep	oth obse	rved on	<u>2/1/20′</u>	<u>18</u> at a c	lepth of	: <u>3.3 m</u> .					
Can	ada Borehole details No.: (613) 727-0658 a qualified Geote	chnical E	ingineer.	Also, bo	rehole in	formatio	n should	nding of all poter be read in conju	ntial conditions pre	esent and requir otechnical repor	e interpretative ass t for which it was	istance fro	m Scale: 1 : 53
	commissioned a	nd the ac	company	/ing'Expla	anation o	of Boreho	ole Log'.						Page: 1 of 2
	Continued on Next Page												

RECORD OF BOREHOLE No. PH17-007 - Overburden Project Name Project Name Multidisciplinary Subsurface Investigation for the NSDF Project - Phase 4 Project Location: Chalk River, ON FIELD TESTING Lab TESTING COVIENT Optimization for the NSDF Project - Phase 4 Description as a grad of the state of the st	er eler NTS SIZE
Image: construction: Chalk River, OM Construction: Chalk River, OM Solid SAMPLING FIELD TESTING LAB TESTING No No No COMME DESCRIPTION a b a b a b a b a b a b a b a b a b a b	er Eler NTS SIZE JTION
Understand Understand Soil SAMPLING FIELD TESTING LAB TESTING DESCRIPTION g b g g g g g g g g g g g g g g g g g g	NTS SIZE ITION
DESCRIPTION and back pink one pink o	SIZE JTION
DESCRIPTION image: bit display bit d	SIZE JTION
GNEISS BEDROCK fresh to slightly weathered Image: state of the state of	
RC 10 100 100 11 RC 10 100 100 11 RC 11 100 100 178 RC 11 100 100 178 RC 11 100 100 112 RC 11 100 100 177 Image: RC 11 100 100 117 Image: RC 110	
RC 11 100 100 177 177 176.4 100	
End Of Borehole Well Installation Details 0.0 - 9.0 m Bentonite 9.0 - 9.9 m Sand	
0.0 - 9.0 m Bentonite 9.0 - 9.9 m Sand	

R	E	CORD OF BOREHOL	.E	No.	<u>P</u>	H1	7-	00)7	-	R	C	k									
CL	OJE IENT ME /	: Multidisciplinary Subsurface		estigatio	on fo	or NS	DF	Pro	ject	t -	DI	RILLI RILLI ICLIN	NG	DAT	E		E: 316828.1 N 11 Dec 17 - 11 Vertical					amec foster wheeler
LO	CATI	ON Phase 4 - Chalk River, ON					<u> </u>				AZ	ZIMU	TH	Deg	.)		: Vertical					DATUM: mAMSL
DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	또 칠	ĭ [°		COVE		F		FRA IN PE		/mbc ICAI Alpha (d		DESCRIPTION	Jr			WEATHERING	
-		For overburden details, see "RECORD OF BOREHOLE PH17-007 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - PH17-007"																T				
-		Rock Coring Started on 11 Dec 2017																				
-		White, black, pink GNEISS BEDROCK		<u>187.71</u> 1.60												•	JN, PL, SR, Sa, Si JN, IR, VR,	1.25				
-2		RC 3: Classification based on RQD: Poor			RC 4										•	•	JN, IR, VR, JN, IR, VR, JN, IR, VR, JN, IR, VR, JN, IR, VR, JN, IR, Sr, Si JN, IR, Sr, Si JN, IR, VR,	4 4 3 3 1	0.75 0.75 0.75 0.75 0.75			 ∑
- - 4 -		RC 4: Classification based on RQD: Fair			RC 5											•	JN, PL, SR, JN, IR, SR, Si	1.25				- <u>-</u>
-	(2/2017 oring (HO)	RC 5: Classification based on RQD: Excellent			RC 6										•	•	JN, IR, SR, JN, PL, SR, Si JN, PL, Sr, Si JN, PL, SR,	0.75	5 0.75 5 0.75			
-6	11/12/2017 Book Coring /L				RC 7										•	•	JN, PL, SR JN, PL, SR, SI JN, PL, SR, Si JN, PL, SR, Si JN, PL, SR, Si	1.24 1.22 1.25	5 0.75 5 1 5 1			
- - - - - - -		RC 7: Classification based on RQD: Excellent			RC 8											•	JN, PL, SR, JN, PL, SR, JN, IR, SR, JN, PL, SM,	1.25 1.25 3.5	5 1			
- - - - - - 10		RC 8: Classification based on RQD: Excellent			RC 9											•	JN, PL, SR, CI JN, IR, SR, CI JN, PL, SR, CI	1.25 3 3	0.75			
		GROUNDWATER ELEN	ALLA		RC 10		DE					STA		ATI(1/20			JN, IR, SR, LOGGED CHECKED		0.75 KC NR	S	HEE	

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F	RE	C	ORD OF BOREHOI	E	No.	P	Ή	17	-00)7	-	R	oc	:k										
P	RO	JECT	No. : TZ16018									D	RILL	INC	G LO	CA	TION	N : E: 316828.1 M						amec
	LIE		: Canadian Nuclear Laborato					000					RILL					: 11 Dec 17 - 1	1 De	c 17	,			foster wheeler
	AMI	E / ATIOI	: Multidisciplinary Subsurface Phase 4 - Chalk River, ON	e inve	estigatio	on to	or in	SDF	- Pro	jec	[-		NCLI ZIMI				eg.)	: Vertical : Vertical						DATUM: mAMSL
				<u> </u>		-	ш	Iz						511								-		
DEPTH SCALE (metres)		DRILLING RECORD		LOG		P	PENETRATRATION RATE (m/min)	COLOUR % RETURN								sym		nd descriptions refer to			ROCK STRENGTH INDEX		Ŋ	NOTES
H SC etres		G R	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH	SAMPLE No.	rRATIC n/min)	S R		COVE		_					AL RC	DISCONTINUITY DATA			STREN DEX		WEATHERING INDEX	WATER LEVELS
(m EPT				YMB(SAM	ETRA1 (n	FLUSH	TOTA		SOLIE	D %	R.Q.D %	•	NDEX ER 1 r	Alt	oha ang (deg.)	gle TYPE AND SURFACE			S X 2		WEA'	INSTRUMENTATION
		R		N N	(m)		PEN	E	848 848		148		0400	2 G	555		886	DESCRIPTION	Jr	Ja	85222 C		w2 W2 W2 W2	
-			White, black, pink GNEISS BEDROCK															JN, PL, SR, CI	1.2	5 1		Ш		
ŀ																		JN, PL, SR, CI JN, IR, SR, CI	0.2			Ш		
ł			RC 9: Classification based on RQD: Excellent			RC 10											•	JN, IR, SR, CI	3			Ш		
ľ	~	Rock Coring (HQ)																JN, PL, SR,				Ш		
	11/12/2017	oring															•	JN, PL, SR,	1.2			Ш		
-12	11/1	С К С				-					╈													
ł		R																JN, IR, SR,	3	1		Ш		
-			RC 10: Classification based on RQD: Excellent			RC 11											•	JN, PL, SR,	1.2			Ш		
ŀ																	•	JN, IR, SR,	3	1		Ш		
Ľ		\square		K	176.36						1											Ш		
			End of Rock Coring		12.95																			
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			GROUNDWATER ELE	 \/ ^ ¬		<u> </u>																		
AMECFW ROCK TZ16018_NSDF_PHASE4_BEDROCK.GPJ_AMECFW ROCK 2016.GDT_13/02/18			∇ SHALLOW/SINGLE INST			,			DEEF	ים/כ	141		ICT		۸ т		N					SHI	EET	2 of 2
ECF			WATER LEVEL (date) 12/12/		NUN				DEEF TER L						_A I 2/1/2			LOGGED CHECKE		KC NR				
AM											('		/		/2	2.1	*	UNEUKE	υ.	NK				

								Offic	ial Us	e Only		232-5092	49-REF	PT-001 Rev 5
R	ECORD	OF BOREH	IOLE N	o.	PH1	7-0	<u> 08 -</u>	Ov	<u>erbı</u>	<u>irden</u>				-
Pro	oject Number:	TZ16108							Drilling	Location:	<u>E: 316858.1</u>	N: 5101575		
Pro	oject Client:	Canadian Nuclear	Laboratories	5					Drilling	Method:	HQ Rock C	Coring		
Pro	oject Name:	Multidisciplinary S	Subsurface Ir	nvestig	ation	for the	NSDF		Drilling	Machine:	Track Moun	ted Drill		amec
Pro	oject Location:	Project - Phase 4 Chalk River, ON							Date S	Started:	6 Dec 17	Date Completed:	6 Dec 17	foster wheeler
	gged by:	кс	Comp	iled by	<i>.</i>	кс			Revie	wed by:	NR	Revision No.:	0, 13/2/18	
		OLOGY PROFILE) IL SA						TESTING	LAB TESTING	0, 13/2/10	
										Penetr	ationTesting	Soil Vapour Reading □ COV (LEL) ■ TOV (L		COMMENTS &
t		DESCRIPTION		Ð	nber	(%	(%) DC		E Z		PPT • DCPT	△ COV (ppm) ▲ TOV (p	INSTRUMENTATION	GRAIN SIZE
gy Pl				e Typ	e Nur	ery (%	V'/RO	E (E	ATIO	MTO Vane △ Intact ▲ Remould	Intact	100 200 300 400 W _P W W _L		DISTRIBUTION (%)
Lithology Plot				Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD	DEPTH (m)	ELEVATION	* Undrained S	hear Strength (kPa) 0 60 80	Plastic Liquid 20 40 60 80	NSTF	GR SA SI CL
Ī		Elevation: 195.5 m ANICS - about 7.5 cm ti	hick 195.4	0)	0)			5		20 4	1	20 40 60 80		
		light brown to brown EATHERED fine SAND avel, boulders, and orga		SS	1	52	53 / 23cm	Ē	-		53 23			NOTE: Where N-Value is in the
	i doc ont, gi	dense, moist	anioo, vory					Ē	195 -					format, e.g. 53/23 cm, N-Value is 53 blows for 23 cm penetration Switched to casing and washboring.
								-	-					Switched to casing and washboring.
			194.0					-	194 —					
		End of Borehole	1.5											
	Abandon hole	e as casing and core bar	rrel got stuck											
		inside of a boulder.												
	ec Foster Whee vironment & Infr		$\frac{\nabla}{=}$ No freest	anding g	groundv	vater me	easured	in oper	n boreho	le on comple	tion of drilling.			
300	-210 Colonnade awa, Ontario, K2	Road South												
Car	awa, Ontario, K2 nada No.: (613) 727-	1658	a qualified Geote	chnical E	Engineer.	Also, bo	rehole in	formatic	on should	nding of all pot be read in con	ential conditions pr unction with the ge	resent and require interpretative externation of the second second second second second second second second se	assistance fi	Scale: 1 : 53
	ecfw.com	-	commissioned ar	nd the ac	company	/ing'Exp	anation o	or Boreh	ole Log'.					Page: 1 of 1

								Offic	ial Us	e Only			232-	509249	9-REP	T-001	Rev 5	
R	ECORD	OF BORE	HOLE N	o.	PH1	17-0	<u>08A</u>	- 0	verl	<u>ourden</u>								
Pro	ject Number:	TZ16108							Drillin	g Location:	<u>E: 316856.6</u>	N: 51015	75					
Pro	ject Client:	Canadian Nuclea	ar Laboratorie	s					Drillin	g Method:	HQ Rock C	oring						
Pro	ject Name:	Multidisciplinary Project - Phase 4		nvestig	gation	for the	NSDF		Drillin	g Machine:	Track Moun	ted Drill					amec	1
Pro	ject Location:	Chalk River, ON	•						Date	Started:	7 Dec 17	Dat	e Comp	leted: 8	Dec 17		foster wheeler	
Loc	ged by:	кс	Com	oiled by	<i>r</i> :	кс			Revie	wed by:	NR	Rev	ision N	o.: 0 ,	13/2/18		WINCOLO	
		OLOGY PROFIL		· · · · ·		MPLI					TESTING	LA	B TES	TING				
							(%)		-		tionTesting		Vapour Re LEL) 4 6	TOV (LEL)	TION		COMMENTS &	
lot		DESCRIPTION		be	mber	(%	OD (0	2	(m)	O SPT □ MTO Vane*	PPT • DCPT Nilcon Vane*	△ COV (TOV (ppm)	RUMENTATION ALLATION	r	GRAIN SIZE	
ogy P				Sample Type	ole Nu	Recovery (%)	SPT 'N' / RQD	(m) H	ELEVATION	△ Intact ▲ Remould	 Intact Remould 	W _P	200 30 W	0 400 WL	ALLA		DISTRIBUTION (%)	
Lithology Plot	. Ground Surface E	levation: 195.5 m		Samp	Sample Number	Reco	SPT	DEPTH	ELEV	* Undrained Sh 20 40	ear Strength (kPa) 60 80	Plastic 20	40 60	Liquid) 80	INST INST	GR	SA SI	CL
		ANICS - about 2.5 cm brown to light brown	thick 19 5 ,5					-								Borehole 1.5 m We	was drilled approxima est of PH17-008A	ately
		EATHERED fine SAN ce gravel and organic		SS	1	50	3		195 -			°22						
		moist	194.7					ł	155									
		grey to light grey Fine SAND	0.8															
	trace silt, gra	vel, and cobbles, very	dense, moist	SS	2	75	30			0		°7						
									194 -	· · · · · · · · · · · · · · · · · · ·						Switched	to casing and washbo	oring.
				SS	3	0	78				0							
								- 2			0	°24	4					
\bigotimes	CNE	black, pink, white SS TO SCHIST BEDF	193.3 2.2					}										
	GNEI	slightly weathered	KUCK	RC	4	100	41	-	193 -			· · · · · · · · · · · · · · · · · · ·						
\mathbb{N}								Ł				•••••						
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\mathbb{N}				RC	6	100	88	F ,	7									
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\mathbb{N}								È	188 -	1								
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Ŵ				RC	8	100	100	8										
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	ec Foster Wheel ironment & Infra		-			-	-			lepth of: <u>5.3 m</u>	L.							
Otta	-210 Colonnade wa, Ontario, K2		Groundw												-1-1			
Tel.	ada No.: (613) 727-0	658	Borehole details a qualified Geote commissioned a	chnical E	Engineer	. Also, bo	rehole in	formatic	on should	nding of all pote be read in conju	ntial conditions pr Inction with the ge	esent and re otechnical re	quire inte eport for v	pretative as hich it was	sistance fr	om	Scale: 7	
ame	ecfw.com								-								Page: 1	of 2

ject Lo	cation: Chalk River, ON										foster wheeler
	LITHOLOGY PROFILE	SC	IL SA	MPLI	NG			FIELD TESTING	LAB TESTING Soil Vapour Reading	-	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCP MTO Vane* Nilcon Vane △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	T COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ▲ TOV (ppm) 100 200 300 400 W _p W W _L	INSTRUMENTATION INSTALLATION B	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	black, pink, white GNEISS TO SCHIST BEDROCK slightly weathered					-					
		RC	10	100	100	- - - - - - - - - - - - - -	185 -				
		RC	11	95	65	- - - - - - - -	183 -				
betv	ween 13.5 m and 16.5 m, bedrock contains pyrite					- - - - - - - - -	182 -				
	руне	RC	12	100	100	- - - - - - - - - - -	181 -				
		RC	13	97	86	- 15 	180 -				
		RC	14	100	74	- - - - - - - - - - - - - - - - - - -	179 -				
*	177.6 17.9 End Of Borehole Well Installation Details 0.0 - 13.7 m Bentonite 13.7 - 14.0 m Sand 14.0 - 17.1 m Screen 17.1 - 17.9 m Sand					-					

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying Explanation of Borehole Log.

PF CL	ROJE .IENT	CT No.	CANADIAN CONTRACTOR Canadian Nuclear Laborato	ries								DF DF	RILL RILL	ing Ing	LO(DA ⁻	TE			ec 17 - 8				5			amec foster wheele	
	ME / CAT		: Multidisciplinary Subsurface Phase 4 - Chalk River, ON	e Inve	estigatio	on fo	or N	SDF	- Pro	jec	t -		CLIN				eg.)	: Vert : Vert									n: mAMS
DEPTH SCALE (metres)	DRILLING RECORD		DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)	FLUSH COLOUR % RETURN		COV	ERY	F		FRA IN PE		NICA		DISCON		TA		Ja	ROCK STRENGTH		WEATHERING INDEX	NC WATEF INSTRUM	DTES R LEVELS IENTATION
-2		BC - Fo	overburden details, see "RECORD OF DREHOLE PH17-008A - Overburden" r core details, see "TABLE FOR ROCK CORE LOG - PH17-008A" Rock Coring Started on 07 Dec 2017																							5	
-		RC	black, pink, white GNEISS TO SCHIST BEDROCK 4: Classification based on RQD: Poor		<u>193.29</u> 2.21	RC 4											•	JN, ST, SR JN, IR, SR, JN, IR, RO,			3	0.75 0.75 0.75					
- - - - -4-		RC	5: Classification based on RQD: Poor			RC 5												JN, IR, SR, JN, IR, SR, BC from 3.3 JN, IR, SR, JN, PL, SR	53 to 3.58 m Sa Sa		1.25	.75 .75 .75 0.75 0.75					
- - - -		RC	6: Classification based on RQD: Good			RC 6										•	•	JN, IR, SR, JN, PL, SR JN, IR, SM, JN, PL, SR	Sa		1.25	0.75 0.75 0.75 1				_ ∑	
6 		Kock Coring (Hu)	RC 7: Classification based on RQD: Excellent			RC 7										•		JN, PL, SM JN, IR, RO,				0.75					
- - 		1	RC 8: Classification based on RQD: Excellent			RC 8										•		JN, IR, RO, JN, IR, RO,				0.75					
- - - - -10		F	RC 9: Classification based on RQD: Excellent			RC 9											•	JN, IR, SR,			3.	.75					
-			2C 10: Classification based on RQD:			RC 10											•	JN, IR, SR, JN, IR, SR, JN, IR, SR,			1.25 1.25 1.25	0.75 0.75 0.75					
		Ţ	GROUNDWATER ELE SHALLOW/SINGLE INST/ WATER LEVEL (date) 08/12/	ALLA		5			DEEF TER L						ATI /1/20				LOGGE			KC NR		SH	IEET	1 of 2	

PF CI		JECT NT	ORD OF BOREHOL No. : TZ16018 : Canadian Nuclear Laborator : Multidisciplinary Subsurface	ries									G L(G D/	ATE			: E: 316856.6 N: : 7 Dec 17 - 8 De : Vertical			75				amec foster wheeler	
DEPTH SCALE (metres)	_	DRILLING RECORD	N Phase 4 - Chalk River, ON DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	PENETRATION RATE (m/min)	FLUSH COLOUR % RETURN	RECO		R.Q.D	GE	iations	s, syn HNIC JRE X M	NOTE	and ROC ngle	: Vertical	DGY	Ja	ROCK STRENGTH		WEATHERING		DATUM: mAM NOTES WATER LEVELS	s
	Ī		Excellent black, pink, white GNEISS TO SCHIST BEDROCK			RC 10												Ī							
12			RC 11: Classification based on RQD: Fair			RC 11									•	•	JN, PL, SR, JN, PL, SR, JN, PL, SR, BC from 13.05 m to 13.54 m	1.25	5 0.75						
-14 - -	07/12/2017	Rock Coring (HQ)	RC 12: Classification based on RQD: Excellent			RC 12									•	•	JN, IR, RO, JN, PL, SR,	3.5							
- - - - - 16			RC 13: Classification based on RQD: Good			RC 13																			
- - - -			RC 14: Classification based on RQD: Fair		177.59	RC 14																			
- 18 - 18 18 			End of Rock Coring		17.91																				
		1				;				DUAL	INST	AL	LAT		N		LOGGED	:	кс		SH	IEE ⁻	Τ2	of 2	
			WATER LEVEL (date) 08/12/2	2017				WA	TER LE	/EL (d	ate)		2/1/	201	8		CHECKED	:	NR						

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R	ECORD OF BOREHOLE N	o.	PH1	7-0	09 -	Ove	erbu	<u>urden</u>					_
	ject Number: TZ16108							g Location:	E: 316954.9	N: 51015	34		
	ject Client: Canadian Nuclear Laboratories	•						g Method:	HQ Rock				
								-					amec
	ject Name: Multidisciplinary Subsurface II Project - Phase 4	nvestig	ation	for the	NSDF			g Machine:	Track Mou				foster
Pro	ject Location: Chalk River, ON						Date S	Started:	5 Dec 17	Dat	e Completed: 6	Dec 17	foster wheeler
Loc	ged by: KC Comp	biled by	:	кс			Revie	wed by:	NR	Rev	vision No.: 0,	13/2/18	
	LITHOLOGY PROFILE	,		MPLI	NG				TESTING	1	B TESTING		
								Penetra	tionTesting		Vapour Reading LEL) TOV (LEL)	N	COMMENTS
			Der		(%) (Ē	1	PPT • DCP	2	4 6 8	E E N	& GRAIN SIZE
Plot	DESCRIPTION	Type	Aumt	(%) /	'N' / RQD	Ē	NO	MTO Vane* △ Intact	Nilcon Vane ³	100	ppm) ▲ TOV (ppm) 200 300 400	ATIC	DISTRIBUTION
Lithology Plot		Sample Type	Sample Number	Recovery (%)	N.	DEPTH (m)	ELEVATION	Remould	 Remould 	W _P	W W _L	INSTRUMENTATION INSTALLATION	(%)
Lith	. Ground Surface Elevation: 191.3 m	San	San	Rec	SPT	DEF	ELE	* Undrained She 20 40	ear Strength (kPa) 60 80	Plastic 20	Liquid 40 60 80	INSN IN	GR SA SI CL
ĨĨ	ORGANICS - about 5.0 cm thick 19∂.3 light brown					-							
	WEATHERED fine SAND trace silt, gravel, and organic, very loose to very	SS	1	38	3	Ę Z	Z ¹⁹¹ –	P		24	4		
	dense, moist												NOTE: Where N-Value is in the
		SS	2	91	50 / 13cm	ŀ		5	0 3	°12			format, e.g. 50/13 cm, N-Value is 50 blows for 13 cm penetration
	190.2 black, pink, white 1.1				13011	1 		- 1	3	12			Switched to casing and washboring.
\bigotimes	GNEISS TO SCHIST BEDROCK fresh to slightly weathered					E	190 -						
K	incari to angritay weathered	RC	3	98	69	F							
\gg		RC	3	90	09	Ē							
\mathbb{K}						- 2						Ţ	
		<u> </u>				È.	189 —						
\bigotimes		RC	4	100	85								
						F							
Ŵ						- 3							
K						Ē	188 -						
\mathbb{Y}		RC	5	100	100	F							
\mathbb{N}			-			Ē							
						- 4							
X						F	187 -						
\mathbb{K}						_	107						
\mathbb{Z}						-							
S						- 5							
K		RC	6	100	100	-	100						
\gg							186 -						
\mathbb{K}						-							
						- 6	-						
\bigotimes													
K							185 -						
\geq		RC	7	100	100	F							
\otimes						- 7	-						
						L '							
Ň						F	184 -						
\mathbb{K}						_		···· .			· [· · ·] · · ·] · · · ·		
\mathbb{Z}						-							
\mathbb{N}		RC	8	98	95	- 8							
\langle / \rangle						F	183 -						
\gg													
K						È.							
¥//						- 9		1					
\bowtie						-	182 -						
K		RC	9	100	100								
Amec Foster Wheeler Environment & Infrastructure Groundwater depth during drilling on <u>06/12/2017</u> at a depth of: <u>0.4 m</u> .													
	ronment & Infrastructure = Crountwin 210 Colonnade Road South ¥ Groundwin			-	-								
Otta Can	wa, Ontario, K2E 7L5 Borehole details	as prese	nted. do	not const	titute a th	orouah	understa	nding of all poter	ntial conditions p	resent and re	quire interpretative ass	sistance fr	rom Social 4 - 50
	No.: (613) 727-0658 a qualified Geote commissioned a cfw.com	nd the ac	company	AISO, DO /ing'Expl	anation o	ormatio of Boreho	ole Log'.	ue read în conju	neuon with the g	eotecnnical re	eport for which it was		Scale: 1 : 53 Page: 1 of 2

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		-

CORD OF BOREHOLE	No.	<u>PH1</u>	7-0	<u>09 -</u>	Ove	<u>erbı</u>	<u>ırden</u>						
Project Number: TZ16108 Project - Phase 4													
ect Location: Chalk River, ON										foster wheeler			
LITHOLOGY PROFILE	s		MPLI	NG			FIELD TESTING	LAB TESTING					
							PenetrationTesting	Soil Vapour Reading	NO	COMMENTS			
DECODIDITION		ber		%) O		E)	O SPT D PPT • DCPT	2 4 6 8	ON	& GRAIN SIZE			
DESCRIPTION	Type	Num	ry (%	/ RQ	Ē	NOIL	MTO Vane* Nilcon Vane* △ Intact ◇ Intact	△ COV (ppm) ▲ TOV (ppm) 100 200 300 400 W _P W W _I	TATI	DISTRIBUTION			
	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION	 Remould Remould * Undrained Shear Strength (kPa) 	W _P W W _L ■ → ● ● Plastic Liquid	INSTRUMENTATION INSTALLATION	(%)			
black, pink, white	Sa	Sa	Re	ß	L		20 40 60 80	20 40 60 80		R SA SI			
GNEISS TO SCHIST BEDROCK fresh to slightly weathered					Ł	181 -							
					-								
					-								
	RC	10	96	93	- 11								
					-	180 -							
					-								
					t								
	RC	11	100	100	- 12								
					-	179 -							
	RC	12	100	100									
178	3.4	12	100	100	-								
12 End Of Borehole	2.9												
Well Installation Details													
0.0 - 9.2 m Bentonite 9.2 - 9.8 m Sand													
9.8 - 12.9 m Screen													
	1	1	1	1	1								

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying Explanation of Borehole Log'.

F	RE	C	ORD OF BOREHOL	.E	No.	P	H 1	7-	-0()9	-	R	loc	k												
c	LIE	NT	No. : TZ16018 : Canadian Nuclear Laborato						-			[DRILL	ING	DAT	E		E: 316954.9 N: 5 Dec 17 - 6 De			34				amec foster wheeler	
	IAMI OCA	E / ATIO	: Multidisciplinary Subsurface N Phase 4 - Chalk River, ON	Inve	estigatio	on fo	or NS	SDF	Pro	ojec	:t -		INCLII AZIMU				g.)	: Vertical : Vertical							DATUM: m	nAMSL
DEPTH SCALE (metres)		DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	SAMPLE No.	臣칠	Ξ́ (RE TOTA CORE	ECOV		GICA		GEO FR/ II PE		/mbo IICA Alph (c		DESCRIPTION	OGY Jr	Ja	ROCK STRENGTH	INDEX		WE INDEX	NOTES WATER LEV INSTRUMENT	/ELS
			 For overburden details, see "RECORD OF BOREHOLE PH17-009 - Overburden" For core details, see "TABLE FOR ROCK CORE LOG - PH17-009" 																						Ā	
-			Rock Coring Started on 05 Dec 2017																							
-			Black, pink, white GNEISS to SCHIST		<u>190.17</u> 1.12																					-
ŀ			RC 3: Classification based on RQD: Fair			RC 3				l								JN, PL, RO, JN, PL, SR,	1.5							
-2			RC 4: Classification based on RQD: Good			RC 4										•	•	JN, PL, SR, Sa JN, PL, RO,	1.25	5 1					Ţ	
- - - -4			RC 5: Classification based on RQD: Excellent			RC 5										•	•	JN, PL, SR, JN, PL, SR,	1.25							
-	05/12/2017	Rock Coring (HQ)	RC 6: Classification based on RQD: Excellent			RC 6										•	•	JN, PL, RO, JN, PL, SR, JN, IR, SR, JN, PL, RO,	1.5 1.25 3	5 0.75						
-6 - - - - -		Roc	RC 7: Classification based on RQD: Excellent			RC 7																				- - - -
			RC 8: Classification based on RQD: Excellent			RC 8										•	•	JN, PL, SM, JN, PL, SR, JN, PL, SR,	1 1.2(1.2)	1 5 0.75 5 1						
- - - - - - - - - - - - - - - - - - -			RC 9: Classification based on RQD: Excellent			RC 9										•		JN, PL, SR,	1.75	5 0.75						
			GROUNDWATER ELE	ALLA		5		D WAT					NSTA te)		ATI(/1/20			LOGGED CHECKED	:	KC NR		SI	HEE	T 1	of 2	

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F	RE	C	ORD OF BOREHOL	E	No.	Ρ	Ή	17	-00)9) _	R	lo	cł	<u><</u>												
			No. : TZ16018															101	N : E: 31					4			amec
	LIEI AMI		: Canadian Nuclear Laborator : Multidisciplinary Subsurface		etiantia	n fo	or N	201	Dro	vior	*							- \		c 17 - 6	Dec	17					foster wheeler
		= / ATIOI	· · · ·	iiive	siyaiu			301	FIC	Jec	<i>.</i> -		INCI AZIN					:g.)	: Verti								DATUM: mAMSL
	-			0			ATE	R N										OTE:						т	Т		
DEPTH SCALE (metres)		SECO		SYMBOLIC LOG	ELEV.	No.	LION R	H COLOUR % RETURN		LITH	IOLO	GIC					ymbo	ols an	nd descriptions r		IOLOG	Y		ROCK STRENGTH INDEX		WEATHERING INDEX	NOTES
PTH S (metre		ING F	DESCRIPTION	BOLI	DEPTH	SAMPLE No.	RATRA ⁻ (m/mi	~ %			ERY		R.Q	.D.	FRAC	TURE				FINUITY DAT	A	_		K STR INDE		INDE	
DEI		DRILLING RECORD		SYN	(m)	'S	PENETRATRATION RATE (m/min)	FLUSH	TOTA CORE		SOL CORI		% 800 800 800 800 800 800 800 800 800 80		PER	m1% 502	(d	a ang leg.)	DES	ND SURFACE	•	Jr	Ja			*****	INSTRUMENTATION
-	┢		Black, pink, white GNEISS to SCHIST	\mathbb{K}			-		040		140		040	0.00	<u>۳</u>		•	100	JN, PL, SR,		1	1.25 0	0.75	82888	223		
ł										l															Ш		
Į.				\bigotimes						l															Ш		
ŀ			RC 10: Classification based on RQD:	\mathbb{K}		RC 10				l															Ш		
ł	17	g (HQ	Excellent							l															Ш		
Î.	05/12/2017	Rock Coring (HQ)		$\left \right\rangle$						l															Ш		
-	050	Rock		\mathbb{N}						T															H		
-12			RC 11: Classification based on RQD:	K		RC 11													JN, IR, SR,						Ш		
Î.			Excellent																JN, IR, SR,	Sa		1.25 0	0.75		Щ		
-			RC 12: Classification based on RQD:			RC 12																					
Ł	┢	4	Excellent	K//	178.44 12.85						┼																
•			End of Rock Coring																								
ł																											
İ.																											
-14																											-
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									זברי	רי ר			NO.	τ		\	<u>_</u>								SH	EET	2 of 2
ECFV			SHALLOW/SINGLE INSTA		NUON				DEEF					IA		ATTO 1/20				LOGGED			IR				
A											_	, . .	'		-		-			UNLONE	. י	IN					

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R	ECORD OF BO	REHOLE N	о.	<u>PH1</u>	7-0 ²	<u> 10 -</u>	Ove	erbu	<u>ırden</u>				-
Pro	ject Number: TZ16108							Drilling	Location:	E:316534.8	N: 5101992		
		luclear Laboratorie	5					-	g Method:	HQ Rock C			
		linary Subsurface I		nation	for the	NSDE		-	Machine:	Track Mount			amec
	ject Location: Chalk River	nase 4	1100113	gation					Started:	20 Dec 17	Date Completed	21 Dec 17	foster
		, ON						Date	Started.	20 Dec 17		ZI Dec II	wheeler
Log	ged by: BC		iled by		KC			Revie	wed by:	NR	Revision No.:	0, 13/2/18	
	LITHOLOGY PR		sc	DIL SA	MPLI	NG				TESTING	LAB TESTING Soil Vapour Reading		COMMENTS
						(%)		Ű.	1	tionTesting	□ COV (LEL) ■ TOV 2 4 6 8		&
lot	DESCRIPT	ΓΙΟΝ	be	admu	(%)	SOD	Ê		MTO Vane*	Nilcon Vane*	△ COV (ppm) ▲ TOV 100 200 300 40	ppm) LUN	GRAIN SIZE DISTRIBUTION
ogy F			Sample Type	Sample Number	very	'N' / RQD	DEPTH (m)	ELEVATION	 △ Intact ▲ Remould 	♦ Intact♦ Remould	W _P W V	ALLA	(%)
Lithology Plot	. Ground Surface Elevation: 171.3 m		Samp	Samp	Recovery (%)	SPT	DEPT	ELE	* Undrained Sh 20 40	ear Strength (kPa) 60 80	Plastic Liqu 20 40 60 8		GR SA SI CL
	CORED WITHOUT SO	DIL SAMPLING					2	-					Lithology profile may be referred to BH-110, which it was drilled at E:
							_	171 —					316535 N: 5101992, with a surface elevation of 171.3 m.
							-	-					
							_	-					
							- 1 -	-					
							F	170 -					
							Ē	-					
							F	-					
							- 2 -	-					
							Ē	169 —					
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							- 5	-					
							Ē	166 -					
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							-	-					
							6 	-				···· :=:	
							_	165 —					· ·
							_	-					
		164.3					_	-					· ·
	End Of Bore	7.0					-7-	-		· · ·			-
	Well Installation												
	0.0 - 3.4 m Be 3.4 - 4.0 m S	ntonite											
	4.0 - 7.0 m Se												
	ec Foster Wheeler	∑ Groundw	<i>v</i> ater de	pth duri	ng drillin	g on <u>22</u>	2/12/2017	<u>7</u> at a d	epth of: <u>3.1 m</u>	<u>l</u> .	•		•
300	ironment & Infrastructure 210 Colonnade Road South	-			-								
Otta Can	ttawa, Ontario, K2E 7L5 anada Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from												rom Scale: 1 : 53
	No.: (613) 727-0658 cfw.com	a qualified Geote commissioned a	nd the ac	company	/ing'Expla	anation o	of Borehol	le Log'.	Se redu in conju	incuon with the geo	oteoninical report for which h		Page: 1 of 1

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