AtkinsRéalis

City of Nelson
80 Lakeside Drive
Nelson, BC V1L 6B9

OUR REFERENCE:
700667

Attention: Sam Ellison
Email: sellison@nelson.ca

Subject: Nelson Curling Rink – Geotechnical Investigation

July 15, 2024

As requested, AtkinsRéalis Canada Inc. (AtkinsRéalis) is pleased to provide the City of Nelson (the City) this geotechnical letter report in support of potential remediation options of the Nelson Curling Rink building (Curling Rink).

1. Project and Site Information

AtkinsRéalis
#3-520 Lake Street
Nelson, BC V1L 4C6
Canada
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The Curling Rink is located at 302 Cedar Street in Nelson, BC (hereinafter referred to as the 'Site'), as shown in Figure 1 below. It is understood that the masonry block structure was constructed in the 1970s and has undergone deformation causing cracking of the masonry block and concrete foundation. Based on discussions with the City, cracking of the Curling Rink has been observed and worsened for approximately 20 years.

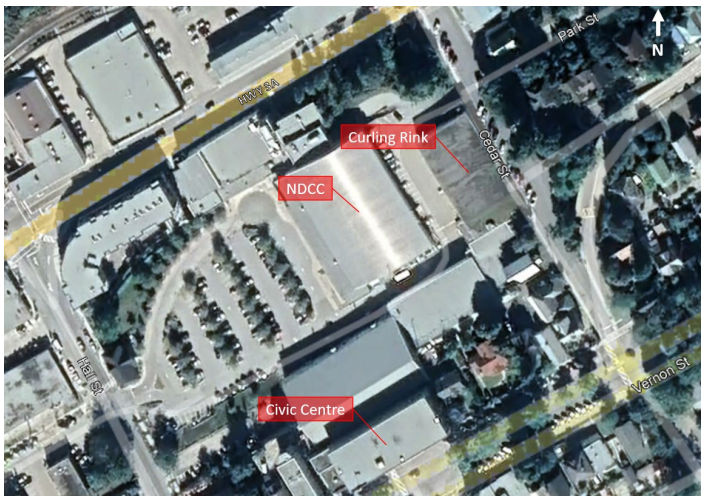


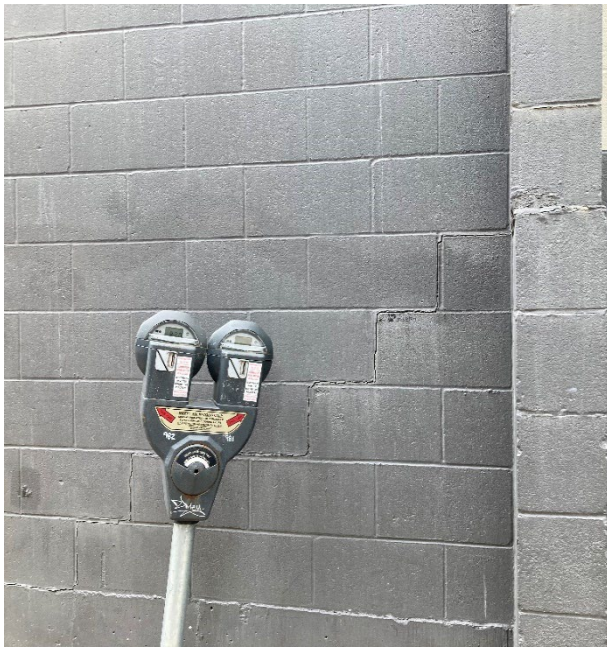
Figure 1: Site Location (north is up)

2. Methodology

2.1 Preliminary Site Visit

AtkinsRéalis attended the Site on April 8, 2024, to conduct a preliminary Site visit to observe the current condition of the Curling Rink alongside Sam Ellison (the City) and Carmen DiPasquale of SNT Engineering Ltd. (SNT).

During the preliminary Site visit, cracking of the Curling Rink was observed primarily along the north and east walls, with more prominent cracks visible towards the northeast corner of the building. Cracking was observed in the mortar between masonry blocks and in the concrete foundation and was visible from both the exterior (Photograph 1) and interior of the Curling Rink. Cracking was also observed from inside the Equipment Refrigeration Room along its south wall (Photograph 2). Figure 2 in the following subsection (Section 2.2) provides a general representation of the walls where cracking was observed.



Photograph 1: Cracking of Mortar Between Masonry Blocks on East Curling Rink Wall – Facing West

Photograph 2: Cracking Inside Refrigeration Equipment Room (South Wall) – Facing South

2.2 Geotechnical Assessment

Prior to conducting the geotechnical investigation, AtkinsRéalis, attended the Site on May 21, 2024 to locate and prepare test hole locations. Test hole locations were selected based on Site access, cracking observed during the preliminary Site visit (Section 2.1), underground utility locations (identified through visual inspection, a BC One Call ticket, and on-Site utility locating performed by City representatives). Following confirmation of test hole locations, AtkinsRéalis prepared test holes using 100 mm diameter

diamond core drill equipment sourced from Andex Rentals & Sales Ltd. (Andex) in Nelson, BC, to bore through existing concrete and asphalt surfaces at the Site. These core holes were to allow for advancement of the testing equipment into the underlying soils; cores extracted during test hole preparation were replaced temporarily to reduce risk to the public between coring and testing.

AtkinsRéalis conducted a geotechnical investigation spanning a three-day period from May 29 to May 31, 2024, inclusive. The geotechnical investigation included driving a manually operated Dynamic Cone Penetrometer (DCP) tool at seven locations along the north, east, and west sides of the Curling Rink; one DCP test hole was advanced within the Refrigeration Equipment Room. Approximate test hole locations are shown in Figure 2 below and test hole advancement details are presented in Table 1, below.

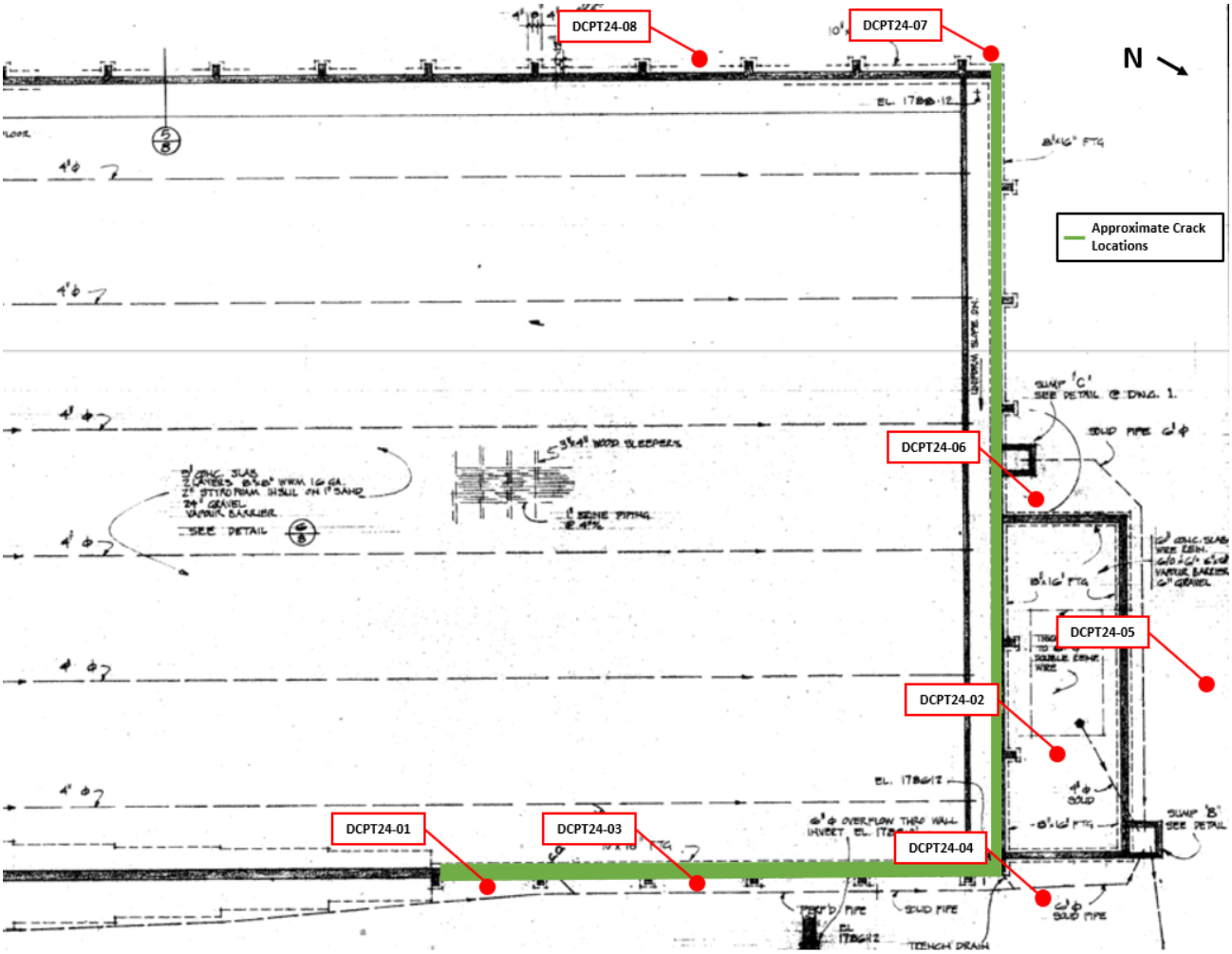


Figure 2: Approximate DCP Test Hole and Crack Locations (excerpt from DWG 2 – Foundation Plan & Details)

Table 1: DCPT Test Hole Details

DCP ID	Surface Finish Thickness (mm)	Termination Depth* (m)	UTM Zone	Approximate Northing** (m)	Approximate Easting** (m)	Approximate Elevation** (masl)
DCPT24-01	165	4.0	11U	5482619	478987	546
DCPT24-02	135	5.7	11U	5482634	478973	543
DCPT24-03	175	1.1	11U	5482626	478983	545
DCPT24-04	75	4.5	11U	5482636	478978	543
DCPT24-05	60	4.0	11U	5482637	478968	542
DCPT24-06	50	0.1	11U	5482629	478965	542
DCPT24-07	80	0.2	11U	5482619	478952	542
DCPT24-08	50	2.2	11U	5482610	478957	542

*Termination depth measured from the underside of the existing surface finish (either concrete or asphalt)
**DCP Test hole locations are estimates based on Google Earth mapping

AtkinsRéalis geotechnical staff logged the number of hammer blows required to advance the DCP tool in 100 mm increments for the full depth of each test hole. Further discussion on the results of the geotechnical investigation is presented in Section 3. The equipment selected to conduct this investigation did not allow for visual examination of subsurface soils or collection of soil samples. Therefore, no laboratory testing was conducted as part of this investigation.

Following the investigation, a 19 mm diameter monitoring well (MW) with a 300 mm screen length set between 4.7 m below ground surface (bgs) to 5.0 mbgs was installed in DCPT24-02 (inside the Refrigeration Equipment Room) and capped at the surface with a 100 mm diameter ABS plastic hatch cover. All other test holes were backfilled using sand and gravel materials to the underside of the pre-existing concrete or asphalt and capped with pre-mix concrete or cold patch asphalt to match the existing surface finish at each test hole location.

3. Geotechnical Investigation Results

AtkinsRéalis used a WILDCAT DCP developed by Triggs Technologies Inc. (Triggs) to assess the relative density of subsurface soils at the Site. At each DCP test hole location (Figure 2), the number of hammer blows required to advance the DCP tool in 100 mm increments was recorded for the full depth of each test hole. Following the investigation, DCP hammer blows were converted to equivalent Standard Penetration Test (SPT) N values based on correlations developed by Triggs. For the purposes of this letter report, equivalent SPT N values are used to infer relative strength of the subsurface soils at the Site.

To assess strength of foundation soils below the base of the existing Curling Rink footings, the depth to the base of the footing was estimated by reviewing Site drawings provided to AtkinsRéalis by SNT. The approximate footing depths and DCP test depths below the base of adjacent footings are presented below in Table 2; DCPT24-03, DCPT24-06, and DCPT24-07 have been excluded from the table and discussion below as testing could not be completed beyond the base of the adjacent footings. Results

of the geotechnical investigation for all test holes are provided following the text as Attachment 1; a visual representation of the depths presented in Table 2 is provided in Attachment 1.

Table 2: Approximate DCP Test Hole Depths Relative to Base of Footings

DCP ID	Termination Depth[+] (m)	Approximate Depth to Base of Footing[++] (m)	Approximate DCP Test Depth Below Base of Footing (m)
DCPT24-01	4.0	2.1	1.9
DCPT24-02	5.7	1.2	4.5
DCPT24-04	4.5	1.1	3.4
DCPT24-05	4.0	1.2	2.8
DCPT24-08	2.2	1.6	0.6

[+]Termination depth measured from the underside of the existing surface finish (either concrete or asphalt)
[++]Measured from underside of the existing surface finish (inferred from DWG 5 – Elevations)

Based on a 2023 drilling investigation completed by AtkinsRéalis nearby the Site, it is inferred that the subsurface soils at the Site contain a high percentage of fine-grained (cohesive) soils. As such, SPT N values below the base of the footing in DCPT24-01 generally ranged from 12 to 16 which corresponds to a relative consistency classification of stiff to very stiff.

In DCPT24-02, an approximately 200 mm void was encountered, and its presence confirmed by City representatives using a small diameter downhole camera, directly above the estimated footing depth. A screenshot of the void taken from the downhole camera video recording is shown in Figure 3, below; the depth shown in Figure 3 is inconsistent (variance of 0.5 m) with the depth the void was encountered during DCP testing. Below the assumed footing depth, SPT N values ranged between 0 and 6 (very soft to firm) for approximately 2.2 m. The final approximately 2.2 m of DCPT24-02 was observed to be stiff to very stiff. AtkinsRéalis returned to the Site on June 14, 2024, to take a water level reading in the installed MW, which was observed to be dry at the time of the reading.

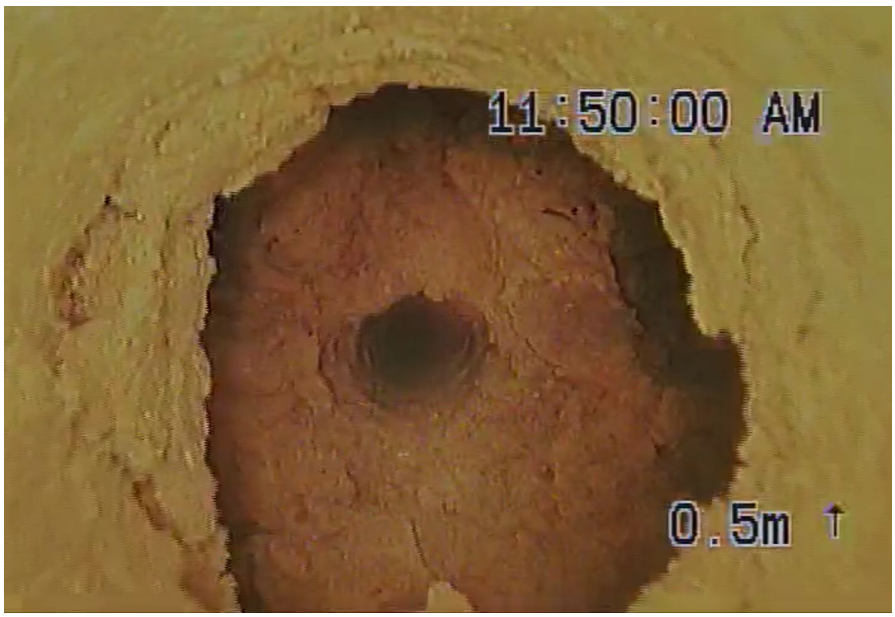


Figure 3: Screenshot of DCPT24-02 Void Taken from Downhole Camera Video Recording

Soils below the assumed footing depths in DCPT24-04 and DCPT24-05 were generally observed to be soft to firm to depths beyond the footing base of approximately 1.7 m and 2.3 m, respectively. Beyond these depths, to termination, both DCPT24-04 and DCPT24-05 were observed to be stiff to very stiff.

DCPT24-08 was generally observed to be firm for 0.6 m below the assumed base of the adjacent footing before becoming hard for the final tested interval.

In general, DCPT24-01 and DCPT24-08, which were located the furthest south of the tests completed exhibited the greatest strength (DCPT24-01) and shallowest depth to very stiff subgrade conditions (0.6 m at DCPT24-08). Conversely the three tests located at the east end of the north wall were noted to be soft to very firm to depths ranging between 1.7 m and 2.3 m below the estimated depth to footing.

4. Geotechnical Comments and Recommendations

The subsections below provided geotechnical comments and recommendations related to potential remediation of the Curling Rink based on results of this geotechnical investigation.

4.1 Potential Causes

Based on the results of the geotechnical investigation (Section 3) two potential causes of the cracking observed at the Curling Rink have been identified and are detailed in the following subsections.

4.1.1 Poor Soil Conditions

Based on the DCP test results (Attachment 1) and the assumption that primarily fine-grained soils are present at the Site, the existing Curling Rink structure is founded on poor, low strength soils. These subgrade soils are likely to have undergone, and may potentially still be undergoing, settlement due to loading of the structure in potential combination with seasonal or variable groundwater levels. The strength of these soils is expected to be inversely correlated to their moisture content with decreased strength at increased moisture levels.

The June 14, 2024, MW reading in DCPT24-02 indicated no groundwater present to a depth of at least 5.0 mbgs, however, rainfall events, seasonal variations, and/or melting of the Curling Rink ice surface may cause groundwater levels at the Site to rise cyclically. Elevated groundwater at the Site would result in further strength reduction of the subsurface soils leading to additional and/or more rapid settlement of the structure foundation.

4.1.2 Piping Failure

The void observed below the Refrigeration Equipment Room in DCPT24-02 indicates that potential piping failures may be occurring below the floor slab. Piping failures occur when groundwater seepage through preferential pathways cause internal erosion by washing away fine-grained soil particles, which has a compounding effect over time. Piping failures leave behind voids in soils along the pathways created by the water flow. This can lead to additional deformations as soils settle into the voids, which may then be

further washed away by flowing water or may cause damming and further saturation of the surrounding soils.

4.2 Future Concerns

Should the Curling Rink structure remain in its current condition, it may be at risk of further deterioration over time. Additional deformation of the existing structure related to either cyclic wetting and softening of the subsurface soils (Section 4.1.1) or piping failures (Section 4.1.2) may occur.

Based on discussions with the City, it is understood that equipment upgrades to support future use of the Curling Rink may be completed. Replacement of existing equipment at the Site with larger units would result in increased foundation loading which may compound existing deformations. Increased foundation loading may also be experienced due to climate change effects (e.g., increased snowfall and/or rainfall).

At the time of this investigation, no cracking of the Refrigeration Equipment Room floor slab was observed. Should future deformations caused by factors outlined in the above paragraphs occur, the existing floor slab may experience cracking. Cracking and settlement of the floor slab may cause equipment to shift and place unwanted strain on the equipment and its piping. Catastrophic failure of equipment piping caused by unwanted movements may lead to fluid and/or gas release.

4.3 Recommendations

AtkinsRéalis provides the following geotechnical recommendations, which may be implemented at the Site as part of remedial activities to assess, slow, stop or reverse deformation of the Curling Rink:

- **More Camera Investigation:** A camera could be used to further investigate the void discovered in DCPT24-02. Should the void be the cause of a piping failure (Section 4.1.2), a camera may assist in determining the source location of water;
  - In order to examine the void with a camera, the existing MW in DCPT24-02 would have to be removed. Following the camera work, the MW could be replaced, however, achieving the same screen depth may not be possible.
- **More Groundwater Information:** It is recommended that MW readings be taken following large rainfall events, melting of the Curling Rink ice surface, and/or other times where elevated groundwater levels may be expected. An electronic datalogger could also be installed at the Site to record data at regular intervals (i.e., daily);
- **Ground Penetrating Radar Assessment:** Although only one void was discovered during the investigation detailed in this letter report, it is possible that others may exist at the Site. A ground penetrating radar (GPR) scan within the Refrigeration Equipment Room may assist in determining the extent or orientation of the identified void, or if additional voids are present below the concrete slab;
- **Survey and Crack Monitoring:** Survey monuments may be installed at select locations around and/or on the Curling Rink structure to allow for accurate measurement of potential displacements and displacement rates at the Site. Crack monitors may be installed at known cracks in the building walls to quantifiably assess direction and rate of movement;
- **More Information on Subsurface Conditions:** Additional investigation activities (i.e., drilling investigation) may be conducted to further assess the subsurface conditions at the Site. A drilling investigation would allow for additional data collection at the Site as well as soil sample collection

for laboratory testing, which was not possible during the investigation detailed in this letter report. Additional investigation activities, although generally useful, may not provide a significant increase in understanding of subsurface conditions at the Site for the cost required to implement;

- **Structural Assessment:** A structural assessment could be undertaken to assess the limits of serviceability of the building if no further actions are taken to remediate the deformation and the displacement of the foundation continues;
- **Pressure Grouting:** Pressure grouting may be implemented at the Site in an attempt to fill the void discovered in DCPT24-02 and add some additional strength to the subsurface soils. However, during pressure grouting it can be difficult to control where the grout ends up as it will choose the path of least resistance in the soil. Grout may enter existing perimeter drainage (if present) and large volumes of grout may be required; and
- **Underpinning:** Footings could be excavated and underpinned in place or raised to re-establish the original building structure elevations. This is expected to be costly and would require a multi-disciplinary team to design as well as specialized contractors to install underpinning connected to helical piles or micropiles.

Table 3 below provides an assessment of each of the remedial activities listed above based on their likely effect on deformation classified as: assess (provides further assessment of subsurface conditions); slow (reduction in rate of movement); stop (halt movement); and reverse (revert building to pre-existing condition). A cost rating for low ($) to high ($$$) and potential pre-requisite remedial activities required are also provided.

Table 3: Remedial Activity Assessment

No.	Remedial Activity	Likely Effect on Deformation	Cost Rating	Potential Pre-Requisite
1	More Camera Investigation	Assess	$	-
2	More Groundwater Information	Assess	$	-
3	Ground Penetrating Radar Assessment	Assess	$	-
4	Survey and Crack Monitoring	Assess	$	-
5	More Information of Subsurface Conditions	Assess	$$	-
6	Structural Assessment	Assess	$$	1, 3, 4
7	Pressure Grouting	Slow/Stop	$$$	1, 2, 3, 5
8	Underpinning	Stop/Reverse	$$$	1, 2, 3, 5

5. Closure

We trust this geotechnical letter report provides you with the information required at this time. Please contact the undersigned with any questions or if further clarification is required.

Brandon Ross, EIT
Geotechnical Engineer-in-Training

Geotechnical Practice
Engineering Services Canada

Stacey Charlton, P.Eng., PMP
Senior Geotechnical Engineer

Geotechnical Practice
Engineering Services Canada

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ATTACHMENT 1

DCP Results

WILDCAT DYNAMIC CONE LOG

AtkinsRealis Canada Inc.
#3-520 Lake Street
Nelson, BC V1L 4C6

PROJECT NUMBER: 700667
DATE STARTED: 05-29-2024
DATE COMPLETED: 05-29-2024

HOLE #: DCPT24-01
CREW: Brandon Ross/Alaeddine Saab
PROJECT: Curling Rink Assessment
ADDRESS: 302 Cedar Street
LOCATION: Nelson, BC

SURFACE ELEVATION:
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

Underside of surface finish

Approximate footing base

Termination depth

DEPTH*	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	COHESIVE
-	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
-	9	40.0	••••••••••••	11	MEDIUM DENSE	STIFF
- 1 ft	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
-	11	48.8	••••••••••••••	13	MEDIUM DENSE	STIFF
-	9	40.0	••••••••••••	11	MEDIUM DENSE	STIFF
- 2 ft	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
-	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
-	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
- 3 ft	4	15.4	••••	4	VERY LOOSE	SOFT
- 1 m	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
-	4	15.4	••••	4	VERY LOOSE	SOFT
- 4 ft	3	11.6	•••	3	VERY LOOSE	SOFT
-	3	11.6	•••	3	VERY LOOSE	SOFT
-	4	15.4	••••	4	VERY LOOSE	SOFT
- 5 ft	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
-	4	15.4	••••	4	VERY LOOSE	SOFT
-	4	15.4	••••	4	VERY LOOSE	SOFT
- 6 ft	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
-	8	27.4	•••••••	7	LOOSE	MEDIUM STIFF
- 2 m	13	44.5	••••••••••••	12	MEDIUM DENSE	STIFF
- 7 ft	20	68.4	••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
-	17	58.1	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
-	36	123.1	••••••••••••••••••••••••••••••••••	25+	DENSE	HARD
- 8 ft	43	147.1	••	25+	DENSE	HARD
-	27	92.3	••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
-	20	68.4	••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
- 9 ft	18	61.6	•••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
-	15	51.3	••••••••••••••	14	MEDIUM DENSE	STIFF
-	14	42.8	••••••••••••	12	MEDIUM DENSE	STIFF
- 3 m 10 ft	15	45.9	••••••••••••	13	MEDIUM DENSE	STIFF
-	14	42.8	••••••••••••	12	MEDIUM DENSE	STIFF
-	14	42.8	••••••••••••	12	MEDIUM DENSE	STIFF
-	14	42.8	••••••••••••	12	MEDIUM DENSE	STIFF
- 11 ft	17	52.0	••••••••••••••	14	MEDIUM DENSE	STIFF
-	17	52.0	••••••••••••••	14	MEDIUM DENSE	STIFF
-	18	55.1	••••••••••••••	15	MEDIUM DENSE	STIFF
- 12 ft	22	67.3	••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
-	21	64.3	•••••••••••••••••	18	MEDIUM DENSE	VERY STIFF
-	22	60.9	•••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
- 4 m 13 ft	22	60.9	•••••••••••••••••	17	MEDIUM DENSE	VERY STIFF

*Depth measured from the underside of existing surface finish (either concrete or asphalt)

WILDCAT DYNAMIC CONE LOG

AtkinsRealis Canada Inc.
#3-520 Lake Street
Nelson, BC V1L 4C6

PROJECT NUMBER: 700667
DATE STARTED: 05-29-2024
DATE COMPLETED: 05-30-2024

HOLE #: DCPT24-02
CREW: Brandon Ross/Alaeddine Saab
PROJECT: Curling Rink Assessment
ADDRESS: 302 Cedar Street
LOCATION: Nelson, BC

SURFACE ELEVATION:
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

Underside of surface finish

Approximate footing base

DEPTH*	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	COHESIVE
-	11	48.8	••••••••••••••	13	MEDIUM DENSE	STIFF
-	14	62.2	••••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
- 1 ft	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
-	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
-	15	66.6	••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
- 2 ft	13	57.7	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
-	9	40.0	•••••••••••	11	MEDIUM DENSE	STIFF
-	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
- 3 ft	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
- 1 m	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
-	0	0.0		0	VERY LOOSE	VERY SOFT
- 4 ft	0	0.0		0	VERY LOOSE	VERY SOFT
-	3	11.6	•••	3	VERY LOOSE	SOFT
-	3	11.6	•••	3	VERY LOOSE	SOFT
- 5 ft	4	15.4	••••	4	VERY LOOSE	SOFT
-	4	15.4	••••	4	VERY LOOSE	SOFT
-	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
- 6 ft	4	15.4	••••	4	VERY LOOSE	SOFT
-	5	12.1	•••	3	VERY LOOSE	SOFT
- 2 m	5	17.1	••••	4	VERY LOOSE	SOFT
- 7 ft	5	17.1	••••	4	VERY LOOSE	SOFT
-	7	23.9	••••••	6	LOOSE	MEDIUM STIFF
-	6	20.5	•••••	5	LOOSE	MEDIUM STIFF
- 8 ft	3	10.3	••	2	VERY LOOSE	SOFT
-	5	17.1	••••	4	VERY LOOSE	SOFT
-	5	17.1	••••	4	VERY LOOSE	SOFT
- 9 ft	4	13.7	•••	3	VERY LOOSE	SOFT
-	4	13.7	•••	3	VERY LOOSE	SOFT
-	4	12.2	•••	3	VERY LOOSE	SOFT
- 3 m 10 ft	5	15.3	••••	4	VERY LOOSE	SOFT
-	12	36.7	••••••••••	10	LOOSE	STIFF
-	9	27.5	•••••••	7	LOOSE	MEDIUM STIFF
-	3	9.2	••	2	VERY LOOSE	SOFT
- 11 ft	1	3.1		0	VERY LOOSE	VERY SOFT
-	4	12.2	•••	3	VERY LOOSE	SOFT
-	14	42.8	••••••••••••	12	MEDIUM DENSE	STIFF
- 12 ft	20	61.2	••••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
-	13	39.8	••••••••••••	11	MEDIUM DENSE	STIFF
-	18	49.9	••••••••••••••	14	MEDIUM DENSE	STIFF
- 4 m 13 ft	18	49.9	••••••••••••••	14	MEDIUM DENSE	STIFF

*Depth measured from the underside of existing surface finish (either concrete or asphalt)

PROJECT: Curling Rink Assessment PROJECT NUMBER: 700667

DEPTH*	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
-	17	47.1	••••••••••••••	13	MEDIUM DENSE	STIFF
-	18	49.9	••••••••••••••	14	MEDIUM DENSE	STIFF
- 14 ft	18	49.9	••••••••••••••	14	MEDIUM DENSE	STIFF
-	17	47.1	••••••••••••••	13	MEDIUM DENSE	STIFF
-	14	38.8	••••••••••••	11	MEDIUM DENSE	STIFF
- 15 ft	16	44.3	••••••••••••	12	MEDIUM DENSE	STIFF
-	15	41.6	••••••••••••	11	MEDIUM DENSE	STIFF
-	20	55.4	•••••••••••••••	15	MEDIUM DENSE	STIFF
- 16 ft	27	68.6	••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
- 5 m	25	63.5	•••••••••••••••••	18	MEDIUM DENSE	VERY STIFF
-	25	63.5	•••••••••••••••••	18	MEDIUM DENSE	VERY STIFF
- 17 ft	31	78.7	••••••••••••••••••••	22	MEDIUM DENSE	VERY STIFF
-	31	78.7	••••••••••••••••••••	22	MEDIUM DENSE	VERY STIFF
-	38	96.5	•••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
- 18 ft	48	121.9	••••••••••••••••••••••••••••••••••	25+	DENSE	HARD
-	47	119.4	•••••••••••••••••••••••••••••••••	25+	DENSE	HARD
-	40	101.6	••••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
- 19 ft						
-						
- 6 m						
- 20 ft						
-						
-						
- 21 ft						
-						
-						
- 22 ft						
-						
-						
- 7 m 23 ft						
-						
-						
- 24 ft						
-						
-						
- 25 ft						
-						
-						
- 26 ft						
- 8 m						
-						
- 27 ft						
-						
-						
- 28 ft						
-						
-						
- 29 ft						
-						
- 9 m						

Termination depth

*Depth measured from the underside of existing surface finish (either concrete or asphalt)

WILDCAT DYNAMIC CONE LOG

AtkinsRealis Canada Inc.
#3-520 Lake Street
Nelson, BC V1L 4C6

PROJECT NUMBER: 700667
DATE STARTED: 05-30-2024
DATE COMPLETED: 05-30-2024

HOLE #: DCPT24-03
CREW: Brandon Ross/Alaeddine Saab
PROJECT: Curling Rink Assessment
ADDRESS: 302 Cedar Street
LOCATION: Nelson, BC

SURFACE ELEVATION:
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

	BLOWS	RESISTANCE	GRAPH OF CONE RESISTANCE		TESTED CONSISTENCY	
DEPTH*	PER 10 cm	Kg/cm²	0 50 100 150	N'	NON-COHESIVE	COHESIVE
-	12	53.3	•••••••••••••••	15	MEDIUM DENSE	STIFF
-	16	71.0	••••••••••••••••••••	20	MEDIUM DENSE	VERY STIFF
- 1 ft	13	57.7	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
-	14	62.2	•••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
-	13	57.7	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
- 2 ft	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
-	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
-	14	62.2	•••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
- 3 ft	44	169.8	••	25+	DENSE	HARD
- 1 m	13	50.2	••••••••••••••	14	MEDIUM DENSE	STIFF
-	12	46.3	•••••••••••••	13	MEDIUM DENSE	STIFF
- 4 ft						
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

*Depth measured from the underside of existing surface finish (either concrete or asphalt)

WILDCAT DYNAMIC CONE LOG

AtkinsRealis Canada Inc.
#3-520 Lake Street
Nelson, BC V1L 4C6

PROJECT NUMBER: 700667
DATE STARTED: 05-30-2024
DATE COMPLETED: 05-30-2024

HOLE #: DCPT24-04
CREW: Brandon Ross/Alaeddine Saab
PROJECT: Curling Rink Assessment
ADDRESS: 302 Cedar Street
LOCATION: Nelson, BC

SURFACE ELEVATION:
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

Underside of surface finish

Approximate footing base

DEPTH*	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	COHESIVE
-	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
-	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
- 1 ft	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
-	9	40.0	••••••••••••	11	MEDIUM DENSE	STIFF
-	8	35.5	••••••••••	10	LOOSE	STIFF
- 2 ft	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
-	13	57.7	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
-	13	57.7	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
- 3 ft	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
- 1 m	7	27.0	•••••••	7	LOOSE	MEDIUM STIFF
-	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
- 4 ft	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
-	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
-	4	15.4	••••	4	VERY LOOSE	SOFT
- 5 ft	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
-	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
-	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
- 6 ft	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
-	7	27.0	•••••••	7	LOOSE	MEDIUM STIFF
- 2 m	6	20.5	•••••	5	LOOSE	MEDIUM STIFF
- 7 ft	5	17.1	••••	4	VERY LOOSE	SOFT
-	5	17.1	••••	4	VERY LOOSE	SOFT
-	4	13.7	•••	3	VERY LOOSE	SOFT
- 8 ft	4	13.7	•••	3	VERY LOOSE	SOFT
-	7	23.9	••••••	6	LOOSE	MEDIUM STIFF
-	18	61.6	•••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
- 9 ft	22	75.2	••••••••••••••••••••	21	MEDIUM DENSE	VERY STIFF
-	14	47.9	••••••••••••••	13	MEDIUM DENSE	STIFF
-	21	71.8	••••••••••••••••••••	20	MEDIUM DENSE	VERY STIFF
- 3 m 10 ft	18	55.1	••••••••••••••••	15	MEDIUM DENSE	STIFF
-	20	61.2	•••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
-	17	52.0	••••••••••••••••	14	MEDIUM DENSE	STIFF
-	21	64.3	••••••••••••••••••	18	MEDIUM DENSE	VERY STIFF
- 11 ft	18	55.1	••••••••••••••••	15	MEDIUM DENSE	STIFF
-	14	42.8	••••••••••••	12	MEDIUM DENSE	STIFF
-	14	42.8	••••••••••••	12	MEDIUM DENSE	STIFF
- 12 ft	16	49.0	••••••••••••••	13	MEDIUM DENSE	STIFF
-	15	45.9	••••••••••••••	13	MEDIUM DENSE	STIFF
-	17	52.0	••••••••••••••••	14	MEDIUM DENSE	STIFF
- 4 m 13 ft	21	58.2	•••••••••••••••••	16	MEDIUM DENSE	VERY STIFF

*Depth measured from the underside of existing surface finish (either concrete or asphalt)

PROJECT: Curling Rink Assessment PROJECT NUMBER: 700667

DEPTH*	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
	24	66.5	••••••••••••••••••	18	MEDIUM DENSE	VERY STIFF
	23	63.7	•••••••••••••••••	18	MEDIUM DENSE	VERY STIFF
14 ft	23	63.7	•••••••••••••••••	18	MEDIUM DENSE	VERY STIFF
	21	58.2	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
	19	52.6	••••••••••••••	15	MEDIUM DENSE	STIFF
15 ft						
16 ft						
5 m						
17 ft						
18 ft						
19 ft						
6 m						
20 ft						
21 ft						
22 ft						
7 m 23 ft						
24 ft						
25 ft						
26 ft						
8 m						
27 ft						
28 ft						
29 ft						
9 m						

Termination depth

*Depth measured from the underside of existing surface finish (either concrete or asphalt)

WILDCAT DYNAMIC CONE LOG

AtkinsRealis Canada Inc.
#3-520 Lake Street
Nelson, BC V1L 4C6

PROJECT NUMBER: 700667
DATE STARTED: 05-31-2024
DATE COMPLETED: 05-31-2024

HOLE #: DCPT24-05
CREW: Brandon Ross/Alaeddine Saab
PROJECT: Curling Rink Assessment
ADDRESS: 302 Cedar Street
LOCATION: Nelson, BC

SURFACE ELEVATION:
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

Underside of surface finish

Approximate footing base

Termination depth

DEPTH*	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	COHESIVE
-	36	159.8	••	25+	DENSE	HARD
-	34	151.0	••	25+	DENSE	HARD
- 1 ft	23	102.1	••••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
-	23	102.1	••••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
-	17	75.5	••••••••••••••••••••	21	MEDIUM DENSE	VERY STIFF
- 2 ft	12	53.3	••••••••••••••	15	MEDIUM DENSE	STIFF
-	9	40.0	••••••••••••	11	MEDIUM DENSE	STIFF
-	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
- 3 ft	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
- 1 m	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
-	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
- 4 ft	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
-	4	15.4	••••	4	VERY LOOSE	SOFT
-	4	15.4	••••	4	VERY LOOSE	SOFT
- 5 ft	4	15.4	••••	4	VERY LOOSE	SOFT
-	3	11.6	•••	3	VERY LOOSE	SOFT
-	4	15.4	••••	4	VERY LOOSE	SOFT
- 6 ft	3	11.6	•••	3	VERY LOOSE	SOFT
-	3	11.6	•••	3	VERY LOOSE	SOFT
- 2 m	4	13.7	•••	3	VERY LOOSE	SOFT
- 7 ft	4	13.7	•••	3	VERY LOOSE	SOFT
-	3	10.3	••	2	VERY LOOSE	SOFT
-	6	20.5	•••••	5	LOOSE	MEDIUM STIFF
- 8 ft	4	13.7	•••	3	VERY LOOSE	SOFT
-	7	23.9	••••••	6	LOOSE	MEDIUM STIFF
-	7	23.9	••••••	6	LOOSE	MEDIUM STIFF
- 9 ft	6	20.5	•••••	5	LOOSE	MEDIUM STIFF
-	8	27.4	•••••••	7	LOOSE	MEDIUM STIFF
-	7	23.9	••••••	6	LOOSE	MEDIUM STIFF
- 3 m 10 ft	6	18.4	•••••	5	LOOSE	MEDIUM STIFF
-	9	27.5	•••••••	7	LOOSE	MEDIUM STIFF
-	9	27.5	•••••••	7	LOOSE	MEDIUM STIFF
-	10	30.6	••••••••	8	LOOSE	MEDIUM STIFF
- 11 ft	8	24.5	•••••••	6	LOOSE	MEDIUM STIFF
-	9	27.5	•••••••	7	LOOSE	MEDIUM STIFF
-	12	36.7	••••••••••	10	LOOSE	STIFF
- 12 ft	32	97.9	••••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
-	32	97.9	••••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
-	57	174.4	••	25+	DENSE	HARD
- 4 m 13 ft	70	193.9	••	25+	VERY DENSE	HARD

*Depth measured from the underside of existing surface finish (either concrete or asphalt)

WILDCAT DYNAMIC CONE LOG

AtkinsRealis Canada Inc.
#3-520 Lake Street
Nelson, BC V1L 4C6

PROJECT NUMBER: 700667
DATE STARTED: 05-31-2024
DATE COMPLETED: 05-31-2024

HOLE #: DCPT24-06
CREW: Brandon Ross/Alaeddine Saab
PROJECT: Curling Rink Assessment
ADDRESS: 302 Cedar Street
LOCATION: Nelson, BC

SURFACE ELEVATION:
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

Underside of surface finish

Termination depth

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
-	9	40.0	••••••••••	11	MEDIUM DENSE	STIFF
- 1 ft						
- 2 ft						
- 3 ft						
- 1 m						
- 4 ft						
- 5 ft						
- 6 ft						
- 2 m						
- 7 ft						
- 8 ft						
- 9 ft						
- 3 m 10 ft						
- 11 ft						
- 12 ft						
- 4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

AtkinsRealis Canada Inc.
#3-520 Lake Street
Nelson, BC V1L 4C6

PROJECT NUMBER: 700667
DATE STARTED: 05-31-2024
DATE COMPLETED: 05-31-2024

HOLE #: DCPT24-07
CREW: Brandon Ross/Alaeddine Saab
PROJECT: Curling Rink Assessment
ADDRESS: 302 Cedar Street
LOCATION: Nelson, BC

SURFACE ELEVATION:
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

Underside of surface finish

Termination depth

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
1 ft						
2 ft						
3 ft						
1 m						
4 ft						
5 ft						
6 ft						
2 m						
7 ft						
8 ft						
9 ft						
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

AtkinsRealis Canada Inc.
#3-520 Lake Street
Nelson, BC V1L 4C6

PROJECT NUMBER: 700667
DATE STARTED: 05-31-2024
DATE COMPLETED: 05-31-2024

HOLE #: DCPT24-08
CREW: Brandon Ross/Alaeddine Saab
PROJECT: Curling Rink Assessment
ADDRESS: 302 Cedar Street
LOCATION: Nelson, BC

SURFACE ELEVATION:
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

		BLOWS	RESISTANCE	GRAPH OF CONE RESISTANCE		TESTED CONSISTENCY	
	DEPTH*	PER 10 cm	Kg/cm²	0 50 100 150	N'	NON-COHESIVE	COHESIVE
Underside of surface finish	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	- 1 ft	-	-	-	-	-	-
	-	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
	-	15	66.6	•••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
	- 2 ft	12	53.3	•••••••••••••••	15	MEDIUM DENSE	STIFF
	-	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
	-	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
	- 3 ft	3	13.3	•••	3	VERY LOOSE	SOFT
	- 1 m	2	7.7	••	2	VERY LOOSE	SOFT
	-	8	30.9	••••••••	8	LOOSE	MEDIUM STIFF
	- 4 ft	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
	-	9	34.7	••••••••••	9	LOOSE	STIFF
	-	7	27.0	•••••••	7	LOOSE	MEDIUM STIFF
	- 5 ft	9	34.7	••••••••••	9	LOOSE	STIFF
Approximate footing base	-	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
	-	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
	- 6 ft	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
	-	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
	- 2 m	7	23.9	••••••	6	LOOSE	MEDIUM STIFF
	- 7 ft	11	37.6	••••••••••	10	LOOSE	STIFF
Termination depth	-	130	444.6	•••	25+	VERY DENSE	HARD
	-						
	- 8 ft						
	-						
	-						
	- 9 ft						
	-						
	-						
	- 3 m 10 ft						
	-						
	-						
	-						
	- 11 ft						
	-						
	-						
	- 12 ft						
	-						
	-						
	- 4 m 13 ft						

*Depth measured from the underside of existing surface finish (either concrete or asphalt)