TECHNICAL MEMORANDUM

DATE June 7, 2023 **Project No.** 21453907

TO Lafarge Canada Inc.
6509 Airport Road, Mississauga ON L4N 1S7

CC Caitlin Port (MHBC)

FROM Sean McFarland, Hayley Wallace **EMAIL** **Sean.Mcfarland@wsp.com**

LAFARGE GOODWOOD PIT EXTENSION: MAXIMUM PREDICTED WATER TABLE ELEVATION

1.0 INTRODUCTION

WSP Canada Inc. ("WSP") is pleased to provide Lafarge Canada Inc. (Lafarge) with this technical memo outlining the "maximum predicted water table" in support of a Class A Pit Below Water aggregate licensing application for the proposed Goodwood Pit Extension (the Site). The Site is located at 4900 4th Concession Road in the Township of Uxbridge, Regional Municipality of Durham (Figure 1). The Site is located immediately north of the existing Lafarge Goodwood Pit and is intended to be an extension of that active operation.

The following sections outline the groundwater field monitoring program conducted at the Site, as it relates to the identification of the maximum predicted water table elevation. Additional details and results from the field monitoring program are summarized in *Water Report Level 1 and 2: Lafarge Goodwood Pit Extension* (Golder, 2023).

2.0 FIELD PROGRAM

A Site field program was initiated in 2018 with the objectives of characterizing hydrogeologic conditions at the Site, including: geologic units, groundwater levels, hydraulic conductivity, and water quality. The following subsections describe the methodology and results of the field program in detail.

2.1 Borehole Drilling and Monitoring Well Installation

The Site monitoring network includes three monitoring wells (MW18-01, MW18-02, and MW18-03) as shown on Figure 1. Note that the on-Site domestic well cannot be readily monitored as the well is shut-in with live electrical. A monitoring well summary is provided in Table 1 below. The following is noted:

Well Location. The monitoring wells are strategically placed near the Site corners to establish Site-wide water level patterns. The well locations and elevations were surveyed by a professional land surveyor.

Construction. The wells were constructed in April 2018. Boreholes were advanced by Choice Sonic Drilling using a SDC 550 track mounted Sonic drill rig. Core barrel dimensions were 165 mm outer diameter / 114 mm inner diameter. Borehole depths ranged from 36.9 metres below ground surface (mbgs) to 38.1 mbgs. The boreholes were completed as monitoring wells using 50.8 mm diameter Schedule 40 PVC pipe with approximately 6.1 m lengths of 10-slot screens positioned within the ORAC / saturated target resource. The

pipe stick ups were enclosed within a protective steel casing cemented into the ground and locked. The wells were developed upon installation.

Geology and Hydrostratigraphy. A cross-section illustrating Site geology is provided in Figure 2. In general, the subsurface conditions from hole to hole primarily consists of sand to sand and gravel with the exception of shallow (<3 mbgs) topsoil samples, some of which are observed to contain silty or clayey components. The borehole logs support the conceptual hydrostratigraphy of an unconfined sand and gravel aquifer (Oak Ridges Aquifer complex or 'ORAC').

2.2 Water Level Measurements

Groundwater level monitoring at the Site began in May 2018 with monthly monitoring events occurring thereafter. All water level monitoring is conducted manually using a water level probe. Water levels are listed in Table 1 whereas groundwater hydrographs are illustrated on Figure 3. The following observations are noted:

- Depth to water ranges from 23.65 mbgs to 26.77 mbgs depending on the well and the time of year. (Table 1). Correspondingly, groundwater elevations range from 319.96 masl to 322.25 masl with a Site-wide average of approximately 321 masl.
- Groundwater levels at each well fluctuate between approximately +/- 0.4 m during the period of record (Figure 3). Water levels remain fairly stable during May 2018 to March 2019 whereupon they somewhat steadily rise into the summer of 2020 with the highest recorded water levels occurring in July – August 2020. Thereafter water levels being to decline for the remainder of 2020 and into 2021 and 2022.

Table 1: Monitoring Well Summary and Groundwater Levels

Well ID	MW18-01		MW18-02		MW18-03	
East83/North83	645,890	4,879,758	645,868	4,879,445	645,315	4,879,385
Ground Elev (masl)	343.74		346.43		346.63	
Pipe Elev (masl)	344.62		347.34		347.47	
Well Depth (mbgs)	36.88		38.10		36.88	
Date	**Water Level (mbgs)**	**Groundwater Elev (masl)**	**Water Level (mbgs)**	**Groundwater Elev (masl)**	**Water Level (mbgs)**	**Groundwater Elev (masl)**
22-May-18	24.44	320.18	25.89	321.45	26.12	321.36
27-Jun-18	24.39	320.23	25.85	321.49	26.10	321.38
17-Jul-18	24.41	320.21	25.86	321.48	26.13	321.34
10-Aug-18	24.42	320.20	25.85	321.49	26.12	321.35
17-Sep-18	24.38	320.24	25.79	321.55	26.07	321.41
22-Oct-18	24.44	320.19	25.84	321.50	26.14	321.33
29-Nov-18	24.48	320.14	25.88	321.46	26.16	321.31
20-Dec-18	24.41	320.22	25.83	321.51	26.07	321.40
07-Feb-19	24.43	320.20	25.84	321.50	26.12	321.36
25-Mar-19	24.40	320.22	25.86	321.48	26.17	321.31
23-Apr-19	24.26	320.36	25.73	321.61	25.99	321.49

Well ID	MW18-01		MW18-02		MW18-03	
14-May-19	24.28	320.34	25.73	321.61	25.98	321.50
10-Jun-19	24.15	320.47	25.61	321.73	25.85	321.62
18-Jul-19	24.14	320.48	25.57	321.77	25.86	321.61
16-Aug-19	24.03	320.59	25.46	321.89	25.76	321.72
13-Sep-19	24.02	320.6	25.43	321.91	25.73	321.74
16-Oct-19	23.95	320.67	25.38	321.96	25.62	321.85
28-Nov-19	24.10	320.524	25.48	321.86	25.78	321.694
23-Dec-19	23.99	320.635	25.39	321.96	25.65	321.82
10-Jan-20	24.02	320.6	25.42	321.92	25.69	321.78
26-Feb-20	23.88	320.74	25.28	322.06	25.58	321.89
17-Mar-20	23.87	320.75	25.26	322.08	25.52	321.95
31-Jul-20	23.65	320.97	25.09	322.25	25.42	322.05
26-Aug-20	23.66	320.96	25.09	322.25	25.42	322.06
29-Sep-20	23.69	320.94	25.12	322.22	25.42	322.05
29-Oct-20	23.75	320.88	25.19	322.15	25.47	322.00
26-Nov-20	23.74	320.88	25.19	322.15	25.45	322.03
23-Dec-20	23.81	320.81	25.24	322.10	25.56	321.91
26-Feb-21	23.94	320.68	25.38	321.97	25.73	321.74
31-Mar-21	23.96	320.66	25.40	321.94	25.68	321.79
30-Apr-21	24.00	320.624	25.45	321.90	25.71	321.757
17-May-21	24.036	320.584	25.53	321.81	25.79	321.68
25-Jun-21	24.09	320.53	25.53	321.81	25.91	321.56
21-Jul-21	24.11	320.51	25.6	321.74	26.03	321.44
31-Aug-21	24.18	320.44	25.63	321.71	26.1	321.37
27-Sep-21	24.2	320.42	25.6	321.74	26.1	321.37
28-Oct-21	24.22	320.4	25.66	321.68	26.16	321.31
29-Nov-21	24.36	320.26	25.795	321.55	26.16	321.31
22-Dec-21	24.25	320.37	25.8	321.54	26.1	321.37
29-Sep-22	24.59	320.03	26.03	321.31	26.77	320.7
26-Oct-22	24.57	320.05	26.05	321.29	26.38	321.09
29-Nov-22	24.67	319.96	26.13	321.22	26.52	320.95
16-Dec-22	24.64	319.98	26.12	321.22	26.45	321.02

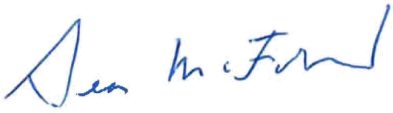
2.3 Maximum Predicted Water Table Elevation

An inferred high-water table map is developed using water levels measured during the July 31, 2020 event (Figure 4), which represents the highest measured groundwater elevation in all three monitoring wells for the period of record. Consistent with other monitoring events, the on-Site flow pattern during this period is from roughly south to north / northeast. The highest water level occurs to the southeast at MW18-02 (322.25 masl) and the lowest water level occurs to the northeast at MW18-01 (320.97 masl). The groundwater elevations are approximately 11 m to 12 m above the proposed final extraction elevation of 310 masl.

3.0 CLOSURE

We trust that this memo meets the current requirements of this peer review. Should you have any further questions please do not hesitate to contact the undersigned.

WSP Canada Inc.



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Hydrogeologist, Senior Principal/Fellow

HW/SM/rk

Distribution: e Copy- Lafarge Canada Inc.
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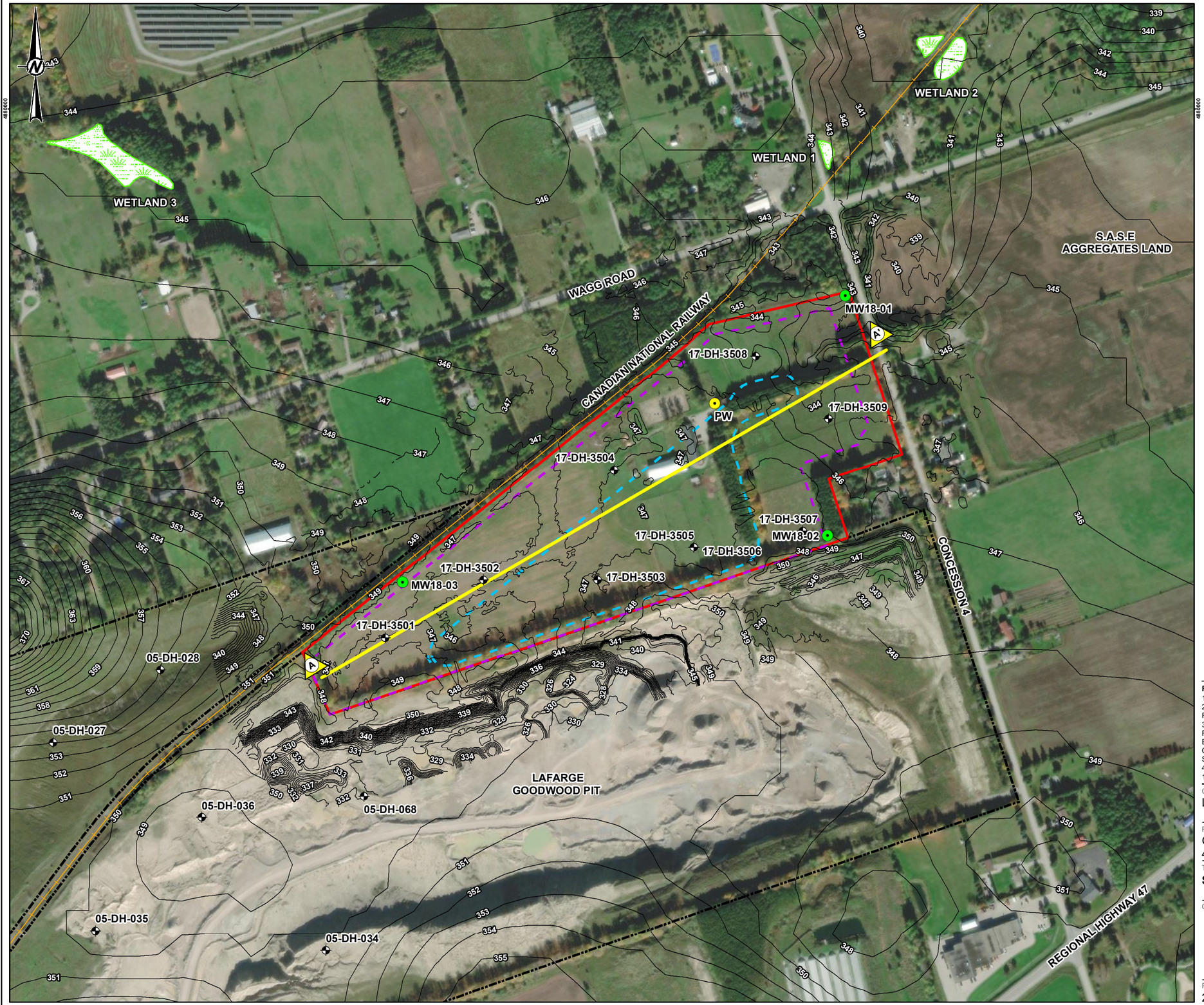
e Copy- WSP Canada Inc.

Attachments Figure 1: Site Detail
Figure 2: Section A-A'
Figure 3: Groundwater Hydrographs
Figure 4: Maximum Predicted Water Table

4.0 REFERENCES

Golder Associates Ltd., 2021. *Water Report Level 2 Lafarge Goodwood Pit Extension.* Submitted to Lafarge Canada Inc. 21453907. July 2021.

Figures



LEGEND

- ON-SITE DOMESTIC WELL LOCATION
- MONITORING WELL LOCATION
- RESOURCE EVALUATION BOREHOLE
- CONTOUR (1m INTERVAL)
- CROSS SECTION LINE
- RAILWAY
- EXISTING GOODWOOD PIT SITE BOUNDARY
- SITE BOUNDARY
- LIMIT OF EXTRACTION
- APPROXIMATE BELOW WATER (PIT POND) EXTENTS
- UNEVALUATED WETLAND

0 100 200 300

1:5,000 METRES

REFERENCE(S)

1. BASEDATA: MNRF LIO OBTAINED APRIL 2019
2. CONTOURS SUPPLIED BY MHBC, FILE NAME "EXISTING FEATURES", DRAWING NO. 1 OF 3, FILE NO. 9526HC, DATED MAY 2019.
3. IMAGERY: 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), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
   SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
4. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
LAFARGE CANADA INC.

PROJECT
GOODWOOD PIT EXTENSION
4900 CONCESSION ROAD 4, TOWNSHIP OF UXBRIDGE

TITLE
SITE DETAIL

CONSULTANT

wsp

YYYY-MM-DD	2023-05-19
DESIGNED	SO
PREPARED	SO/JT (HW 2023/06)
REVIEWED	DH
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
21453907	0002	1	1

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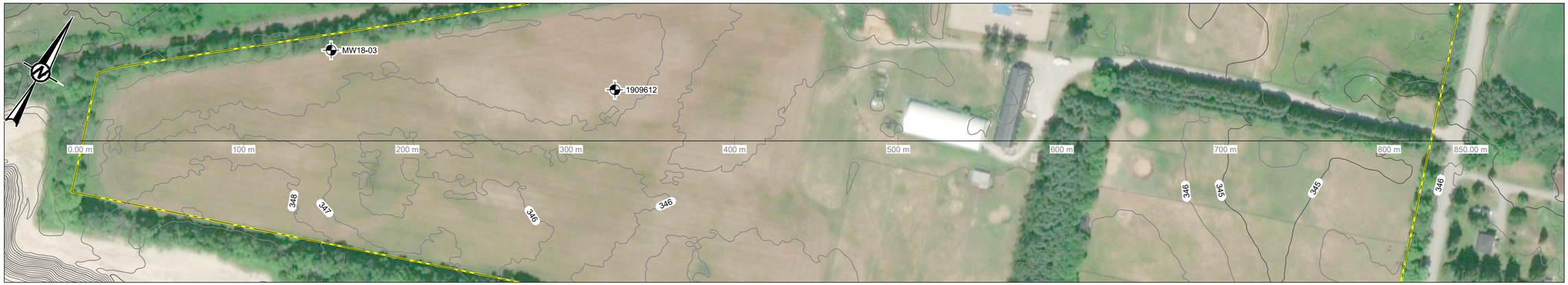
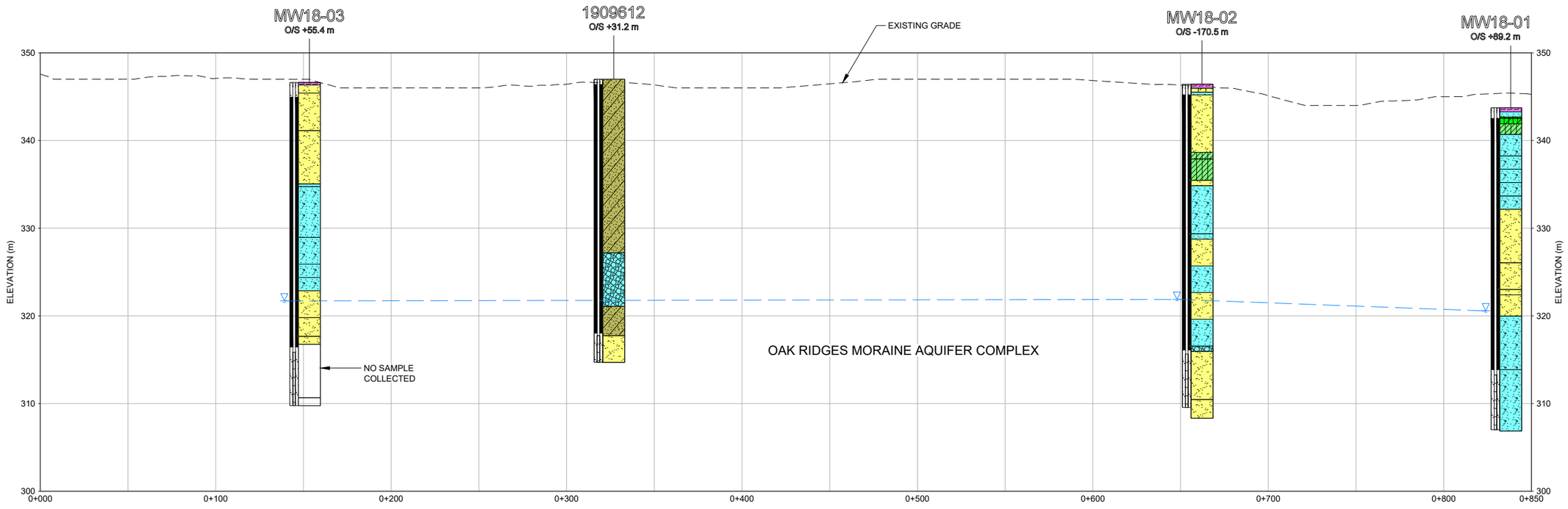
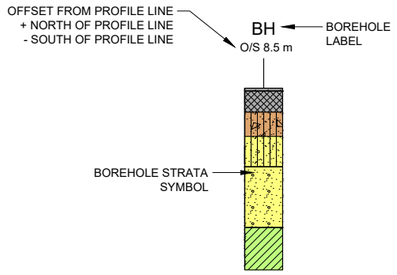




LEGEND

- MONITORING WELL LOCATION
- INFERRED WATER TABLE
- SITE BOUNDARY

SOIL PATTERN AND GENERIC SHADING



- ORGANICS / TOPSOIL
- GRAVEL
- SAND AND GRAVEL
- SAND
- SILTY SAND
- SILTY CLAY
- CLAYEY SILT
- CLAYEY SAND

0 50 100
1:2,500 HORIZONTAL METRES

0 10 20
1:500 VERTICAL METRES

REFERENCE(S)

1. TOPOGRAPHIC INFORMATION COMPILED BY GEOOPTIC (A DIVISION OF AEON EGMOND LTD.) PRODUCED FROM AERIAL PHOTOGRAPHY FLOWN JULY 19, 2018. MAPPING IS PRODUCED IN REAL WORLD SCALE AND COORDINATES (NAD83 UTM ZONE 17N). CONTOUR INTERVAL IS 1M. ALL ELEVATIONS ARE GEODETIC.
2. BASE MAP - © 2018 MICROSOFT CORPORATION © 2018 DIGITALGLOBE ©CNES (2018) DISTRIBUTION AIRBUS DS
3. PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2018
4. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17

CLIENT
LAFARGE CANADA INC.

CONSULTANT
wsp

YYYY-MM-DD	2022-05-12
DESIGNED	
PREPARED	STB (Rev HW 2023/06)
REVIEWED	DH/ SM
APPROVED	

PROJECT
GOODWOOD PIT EXTENSION

TITLE
SITE CROSS SECTION A - A'

PROJECT NO.	CONTROL	REV.	FIGURE
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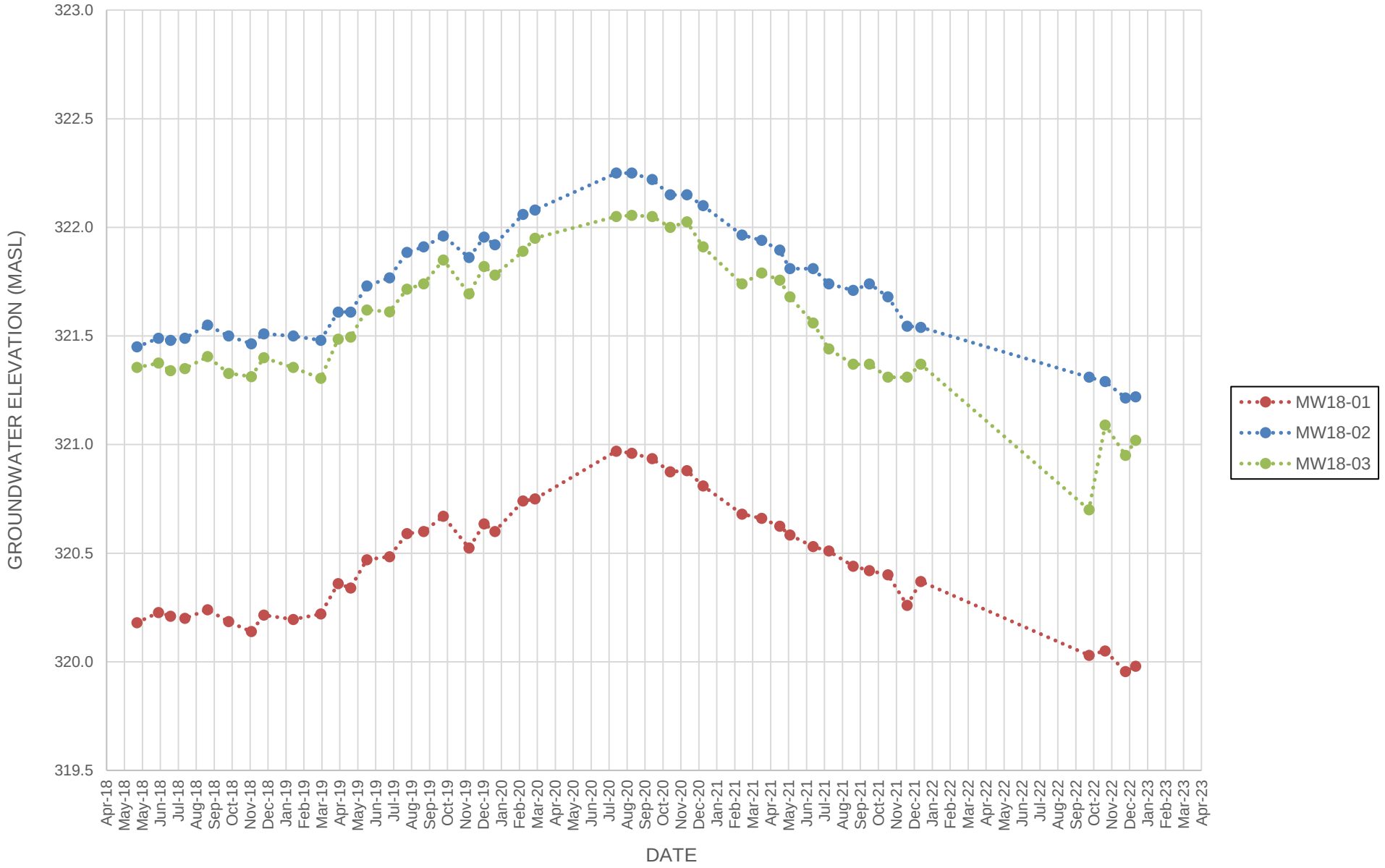

NOTES

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LAFARGE CANADA INC.

WSP Canada Inc.
BARRIE, ONTARIO, CANADA

GROUNDWATER HYDROGRAPHS

MAY 2023	PROJECT: 21453907	FIGURE: 3

LEGEND

- MECP WATER WELL LOCATION
- On-Site Domestic Well Location
- Monitoring Well Location
- Resource Evaluation Borehole
- Groundwater Contour (0.2 masl interval)
- DH — Measured Groundwater Elevation
- RAILWAY
- EXISTING GOODWOOD PIT SITE BOUNDARY
- SITE BOUNDARY
- LIMIT OF EXTRACTION
- APPROXIMATE BELOW WATER (PIT POND) EXTENTS
- UNEVALUATED WETLAND

0 100 200 300

1:5,000 METRES

NOTE(S)

1. SITE GROUNDWATER ELEVATIONS REFLECT OBSERVED HIGH WATER TABLE AS MEASURED DURING JULY 31, 202.
2. INDIVIDUAL MECP WELL RECORD STATIC WATER LEVELS SPAN TIME PERIOD OF 1958 TO 2017 AND MAY NOT BE REFLECTIVE OF CURRENT CONDITIONS. WATER LEVELS ARE THUS POSTED FOR ILLUSTRATION PURPOSES ONLY.

REFERENCE(S)

1. BASEDATA: MNRF LIO OBTAINED APRIL 2019
2. IMAGERY: 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), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
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TITLE
MAXIMUM PREDICTED WATER TABLE

CONSULTANT

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YYYY-MM-DD	2023-05-19
DESIGNED	SO
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APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
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