



July 19, 2017

Reference No. 078410

Ms. Maria Topalovic
CRH Canada Group Inc.
2300 Steeles Ave W, 4th Floor
Concord, Ontario
L4K 5X6

Dear Ms. Topalovic:

**Re: Trigger Mechanism and Contingency Plan
Condition 4.7 – PTTW No. 5826-ALCNNN
Dufferin Aggregates Paris Pit, County of Brant, Ontario**

1. Introduction

This Trigger Mechanism and Contingency Plan (TMC Plan) has been prepared by GHD Limited (GHD) on behalf of Dufferin Aggregates, A division of CRH Canada Group Inc. (Dufferin). The TMC Plan has been prepared as required by the Ministry of the Environment and Climate Change (MOECC) pursuant to Condition 4.7 of Permit to Take Water 5826-ALCNNN (PTTW), issued to CRH Canada Group Inc. on April 27, 2017 for the Dufferin Aggregates Paris Pit.

The PTTW provides the approval necessary for Dufferin to take water from the source water pond which will be excavated below the water table in the area shown on Figure 1. The water taking is for the purpose of aggregate washing and dust control and will be used to fill and top-up the settling and recirculation cells of the settling pond.

The hydrologic and hydrogeologic assessment completed by GHD to support the issuance of the PTTW concluded that the proposed water taking is not anticipated to have any appreciable or unacceptable effect on the Paris North municipal water supply system, private water supply wells or surface water features. The assessment also included an evaluation of the potential drawdown due to operation of the source water pond.

The purpose of the TMC Plan is to have an assessment and evaluation procedure in place to review water levels during the time when Dufferin is taking water from the source water pond and an action plan to respond if key groundwater or surface water levels drop below predicted levels evaluated as part of the PTTW assessment. The TMC Plan is a precautionary addition to the monitoring and other requirements of the PTTW.

2. Groundwater TMC Plan

There is a long history of groundwater monitoring at the Paris Pit, prior to any water taking. The natural range of groundwater levels since 1988 is well established by measurements at monitoring wells BH88-1,



BH88-2, BH88-3, BH88-4, BH88-5, and BH88-6 as well as other County of Brant monitoring wells in the area (refer to Figure 1). This knowledge of historical groundwater levels and the predicted drawdown from the water taking assessment provide the basis to establish appropriate trigger levels for groundwater levels at the three key trigger monitoring well locations identified in the PTTW (Condition 4.2): BH88-5, MW1-12, and MW3-16 (or suitable alternate locations as described in Condition 4.2a).

The TMC Plan for the groundwater level monitoring is based on setting a Trigger Level as well as a precautionary Early-Warning Threshold Level for each of the three specified monitoring locations. The Early-Warning Threshold Level will alert Dufferin to a change in groundwater levels and to increase the frequency of collecting and reviewing monitoring data. The Trigger Level will require Dufferin to reduce and/or cease the taking of water.

2.1 Early-Warning Threshold Levels

The Early-Warning Threshold is defined as the historical seasonal (monthly) low groundwater level plus 10 percent (of the monthly range) based on analysis of historical monitoring data as defined in Table 1.

The historical seasonal low groundwater level will be used to prevent the taking of water at the maximum Table A water taking rate (14,000 litres per minute [L/min]) during dry climatic conditions. Specifically, Dufferin will not take water at a rate higher than the Condition 3.4a rate (1,400 L/min) when the groundwater level is below the historical low groundwater level.

Monitoring Location	Early-Warning Threshold Level	Required Action When Water Level is Below Early-Warning Threshold
BH88-5 MW1-12 MW3-16	Refer to Table 1 for monthly values specific to each monitoring location	<ol style="list-style-type: none"> 1. Increase frequency of manual water level measurements and data logger downloads to weekly for monitoring wells BH88-5, MW1-12, and MW3-16 as well as for surface water location SW1 as identified in Section 3 (below). 2. Review monitoring data weekly to ensure water levels have not dropped below Trigger Levels. 3. When water levels increase to be above the Early-Warning Threshold for a period of one month, normal monitoring frequency can resume.

2.2 Groundwater Trigger Levels

The Trigger Level is defined by subtracting the predicted drawdown in groundwater levels from the historical low groundwater levels as presented in Section 2.1 (above) and Table 1. The predicted drawdown values are the maximum predicted drawdown scenarios from the hydrologic and hydrogeologic impact assessment for the PTTW (CRA, March 2013).



Monitoring Location	Trigger Level	Required Action When Water Level is Below Trigger Level
BH88-5 MW1-12 MW1-16	Refer to Table 1 for monthly values specific to each monitoring location	<ol style="list-style-type: none"> 1. Continue weekly manual water level measurements and downloading of data loggers for BH88-5, MW1-12, and MW3-16 (per Section 2.1) as well as surface water monitoring location SW1 as identified in Section 3 (below). 2. Continue weekly review of monitoring data. 3. Within 1 business day of measuring/ downloading a water level that is below the Trigger Level (allowing time for data verification), reduce daily water taking for washing operations by 25 percent by reducing the rate and/or duration of pumping (i.e., reduce maximum daily water taking for washing to 756,000 litres). 4. Notify the MOECC⁽¹⁾ within 2 business days of measuring/downloading a water level that is below a Trigger Level and provide weekly notifications to MOECC⁽¹⁾ regarding the status of water levels and water taking conditions. Notifications may be by email, phone, or other method agreeable to MOECC⁽¹⁾. 5. If water level remains below Trigger Level after 7 calendar days of reduced water taking (item 3 above), reduce daily water taking for washing by 50 percent (i.e., reduce maximum daily water taking for washing to 504,000 litres). 6. If water level remains below Trigger Level after a total of 14 calendar days of reduced water taking (item 3 and 4, above), cease water taking for washing. 7. Water taking for dust control may continue at all times in accordance with PTTW, as warranted by Site conditions. 8. When the water levels in all the affected monitoring wells return to levels that are above the Trigger Levels for a period of 7 calendar days, water takings for washing can resume for a period of 7 calendar days at a rate of up to 50 percent of the daily limit. If the water levels remain above the Trigger Levels for those 7 calendar days, water takings for washing can resume for a period of 7 calendar days at a rate of up to 75 percent of the daily limit. If water levels remain above the Trigger

⁽¹⁾ MOECC refers to the Ontario Water Resources Act (OWRA) Section 34.1 Signing Director.



Monitoring Location	Trigger Level	Required Action When Water Level is Below Trigger Level
		<p>Levels for those 7 calendar days, the application of normal daily water taking limits will resume.</p> <p>9. When the water level increases to be above the historical low groundwater level, the water taking may revert to the amount and rate as described under the Permit to Take Water.</p> <p>10. When the water level increases to be above the historical low groundwater level for a period of one month, normal monitoring frequency can resume.</p>

3. Surface Water TMC Plan

The Surface Water TMC Plan is based on the surface water level in the existing on-Site pond. There is approximately 4 years of monitoring data available for the pond based on the SW1 monitoring location as shown on Figure 1.

The TMC Plan for the on-Site pond is based on setting a Trigger Level as well as a precautionary Early-Warning Threshold Level for the SW1 location (as measured at SW1, SW1A, and SW1B locations over time) similar to the groundwater TMC Plan. The Early-Warning Threshold Level will alert Dufferin to a change in surface water levels and to increase the frequency of collecting and reviewing monitoring data. The Trigger Level will require Dufferin to reduce and/or cease the taking of water.

3.1 Early-Warning Threshold Level

The Early-Warning Threshold is based on the historical seasonal (monthly) low surface water level plus 10 percent (of the monthly range) based on analysis of the historical monitoring data as defined in Table 2. It is noted that the historical monitoring period is limited to approximately 4 years and is therefore expected to overestimate the elevation of the historical low levels experienced by the pond. Therefore the historical low water level and Early-Warning Threshold Levels should be recognized as conservatively high levels.

The historical low water level will also be used to prevent the taking of water at the maximum Table A water taking rate (14,000 L/min during dry climatic conditions. Specifically, Dufferin will not take water at a rate higher than the Condition 3.4a rate (1,400 L/min) when the SW1 surface water level is below the historical low water level.



Monitoring Location	Early-Warning Threshold Level	Required Action When Water Level is Below Early-Warning Threshold
SW1	Refer to Table 2 for monthly values	<ol style="list-style-type: none"> 1. Increase frequency of manual water level measurements and data logger downloads to weekly for SW1 and associated multi-level piezometer as well as for the three groundwater monitoring wells identified in Section 2 (above). 2. Review monitoring data weekly to ensure water level has not dropped below Trigger Level. 3. When water level increase to be above the Early-Warning Threshold for a period of one month, normal monitoring frequency can resume.

3.2 Surface Water Trigger Level

The Trigger Level is defined by subtracting the predicted drawdown in the on-Site pond water level from the historical low surface water level as presented in Section 3.1 (above) and Table 2. The predicted drawdown values are the maximum predicted drawdown scenarios from the hydrologic and hydrogeologic impact assessment for the PTTW (CRA, March 2013).

Monitoring Location	Trigger Level	Required Action When Water Level is Below Trigger Level
SW1	Refer to Table 2 for monthly values	<ol style="list-style-type: none"> 1. Continue weekly manual water level measurements and downloading of data loggers for SW1 and associated multi-level piezometer (per Section 3.1) and for the three groundwater monitoring wells identified in Section 2 (above). 2. Continue weekly review of monitoring data. 3. If the groundwater level in either of the groundwater wells MW1-12 or MW3-16 (or their alternate locations to the south or east of the Source Pond) are below their respective historical low water level, follow items 5 to 12 (below). 4. If the groundwater level in groundwater wells MW1-12 and MW3-16 remain above their respective historical low water levels, follow item 6 and item 12 (below) in addition to submitting to MOECC⁽²⁾ an assessment of the relationship between the water taking, surface water level, groundwater levels, climatic conditions and other potential influences and a proposed plan for any actions that are warranted based on the assessment.

⁽²⁾ MOECC refers to the Ontario Water Resources Act (OWRA) Section 34.1 Signing Director.



Monitoring Location	Trigger Level	Required Action When Water Level is Below Trigger Level
		<ol style="list-style-type: none"> 5. Within 1 business day of measuring/ downloading a water level that is below the Trigger Level (allowing time for data verification), reduce daily water taking for washing operations by 25 percent by reducing the rate and/or duration of pumping (i.e., reduce maximum daily water taking for washing to 756,000 litres). 6. Notify the MOECC⁽³⁾ within 2 business days of measuring/downloading a water level that is below the Trigger Level and provide weekly notifications to MOECC⁽³⁾ regarding the status of water levels and water taking conditions. Notifications may be by email, phone, or method agreeable to MOECC⁽³⁾. 7. If water level remains below Trigger Level after 7 calendar days of reduced water taking (item 3 above), reduce daily water taking for washing by 50 percent (i.e., reduce maximum daily water taking for washing to 504,000 litres). 8. If water level remains below Trigger Level after a total of 14 calendar days of reduced water taking (item 3 and 4, above), cease water taking for washing. 9. Water taking for dust control may continue at all times in accordance with PTTW, as warranted by Site conditions. 10. When the SW1 water level returns to a level that is above the Trigger Level for a period of 7 calendar days, water takings for washing can resume for a period of 7 calendar days at a rate of up to 50 percent of the daily limit. If the water level remains above the Trigger Level for those 7 calendar days, water takings for washing can resume for a period of 7 calendar days at a rate of up to 75 percent of the daily limit. If water levels remain above the Trigger Levels for those 7 calendar days, the application of normal daily water taking limits will resume. 11. When the SW1 water level increases to be above the historical low water level, the water taking may revert to the amount and rate as described in the Permit to Take Water.

⁽³⁾ MOECC refers to the Ontario Water Resources Act (OWRA) Section 34.1 Signing Director.



Monitoring Location	Trigger Level	Required Action When Water Level is Below Trigger Level
		12. When the SW1 water level increases to be above the historical low water level for a period of one month, normal monitoring frequency can resume.

4. Reporting

The Combined Annual Monitoring Report that is a requirement of the PTTW will include documentation of the monitoring results and any notifications, response/contingency actions associated with this TMC Plan.

The variable nature of groundwater flow conditions under the influence of multiple water takings and climate effects is recognized. For example, despite, the long history of water level monitoring data, there might be future climatic conditions which have not been encountered within the Site monitoring period of 1988 to present (2016). If necessary this TMC Plan may be modified in the future subject to consultation with and approval by MOECC⁽⁴⁾.

Should you have any questions on the above, please do not hesitate to contact us.

Sincerely,

GHD

Michael R. Tomka, P. Eng.



Gary I. Lagos, M.Sc., P.Geo.

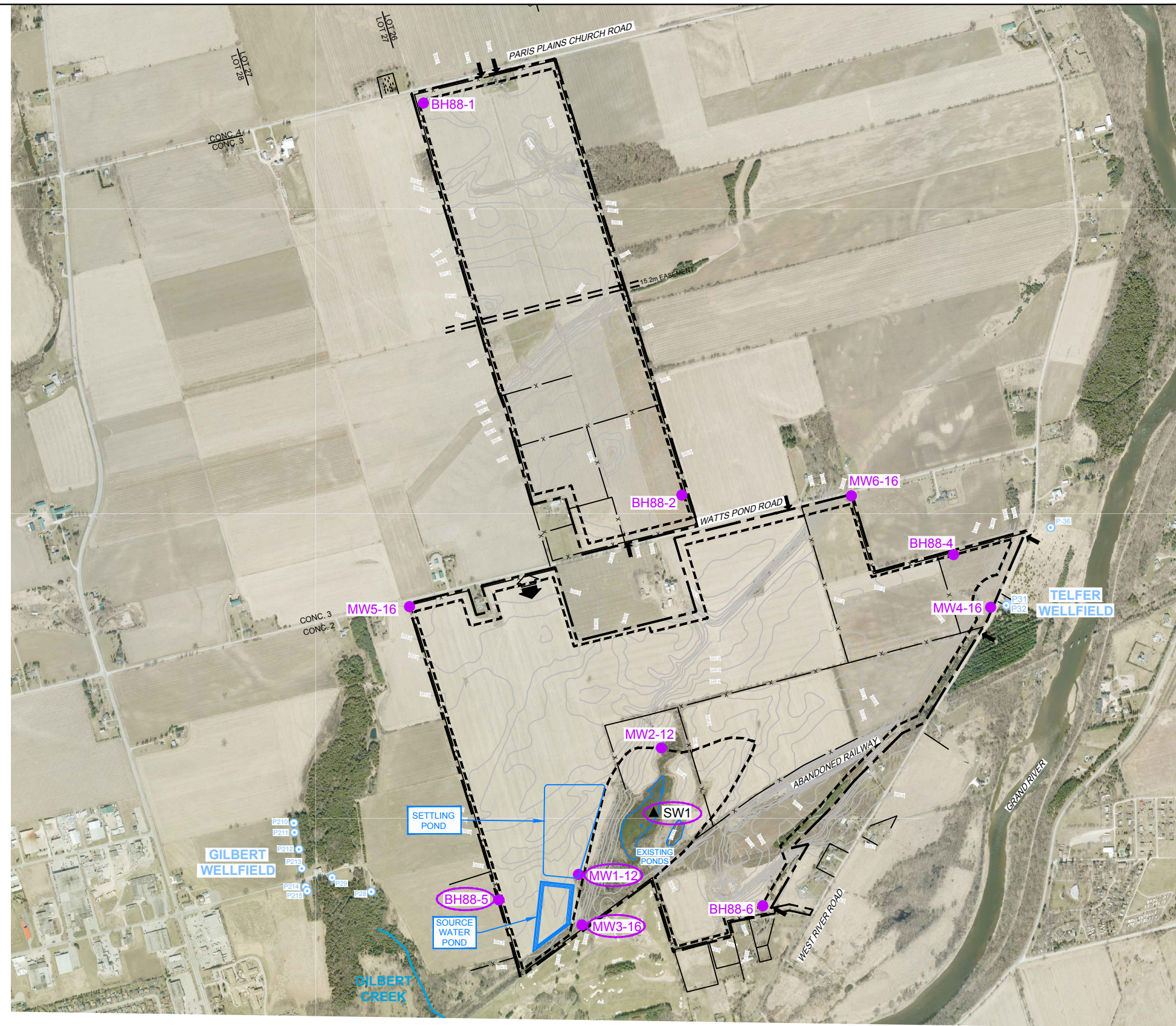
J. Richard Murphy, M.A.Sc., P. Eng.

JRM/kf/4

Encl.

cc: Kevin Mitchell, CRH
Martin Bradley, CRH
Richard Erdmann, CRH

⁽⁴⁾ MOECC refers to the Ontario Water Resources Act (OWRA) Section 34.1 Signing Director.



- LEGEND**
- 253.0 — CONTOUR ELEVATION
 - LICENSED BOUNDARY
 - - - - - LIMIT OF EXTRACTION
 - LICENSED BOUNDARY AND LIMIT OF EXTRACTION BOUNDARY REFLECT JUNE 2015 SITE PLANS.
 - - - - - EASEMENT
 - ◻ PROPOSED ENTRANCE/EXIT
 - ➔ EXISTING FIELD ENTRANCE
 - ⊙ P32 PUBLIC WATER SUPPLY WELL (COUNTY OF BRANT)
 - BH88-3/MW3-16 MONITORING WELL
 - ▲ SW1 STAFF GAUGE
 - MONITORING WELL/STAFF GAUGE INCLUDED IN THE TMC PLAN

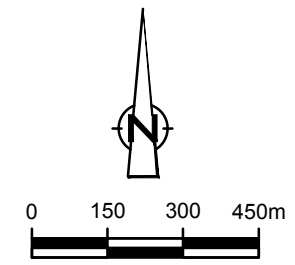


figure 1
 TMC PLAN MONITORING LOCATIONS
 DUFFERIN PARIS PIT
 County of Brant, Ontario

Table 1

**Groundwater Threshold and Trigger Levels
Dufferin Paris Pit
County of Brant, Ontario**

Monitoring Well Location	Month ⁽¹⁾	Historical Seasonal Low Groundwater Level⁽²⁾ (m AMSL)	Early-Warning Threshold Levels ⁽²⁾ (m AMSL)	Groundwater Trigger Level ⁽³⁾ (m AMSL)
BH88-5-I predicted drawdown: 0.6 m	January	not applicable	not applicable	not applicable
	February	243.83	243.94	243.23
	March	243.93	244.04	243.33
	April	244.04	244.14	243.44
	May	244.14	244.22	243.54
	June	244.07	244.16	243.47
	July	243.91	244.02	243.31
	August	243.81	243.92	243.21
	September	243.76	243.87	243.16
	October	243.71	243.82	243.11
	November	243.67	243.78	243.07
	December	243.65	243.76	243.05
MW1-12 predicted drawdown: 1.0 m	January	not applicable	not applicable	not applicable
	February	243.80	243.88	242.80
	March	243.88	243.96	242.88
	April	243.96	244.04	242.96
	May	244.04	244.10	243.04
	June	243.98	244.06	242.98
	July	243.86	243.95	242.86
	August	243.79	243.87	242.79
	September	243.75	243.84	242.75
	October	243.72	243.80	242.72
	November	243.68	243.76	242.68
	December	243.67	243.75	242.67
MW3-16 predicted drawdown: 0.75 m	January	not applicable	not applicable	not applicable
	February	243.75	243.83	243.00
	March	243.83	243.91	243.08
	April	243.91	243.98	243.16
	May	243.98	244.04	243.23
	June	243.93	244.00	243.18
	July	243.81	243.89	243.06
	August	243.74	243.82	242.99
	September	243.71	243.79	242.96
	October	243.67	243.75	242.92
	November	243.64	243.72	242.89
	December	243.63	243.70	242.88

Notes:

- (1) Threshold and Trigger Levels apply during period of required PTTW monitoring or from February 15 to December 15 each year.
- (2) Early-Warning Threshold Level is equal to the historical minimum monthly water level plus ten percent of the range observed within a given month based on analysis of monitoring data (1988 to August 2016). This analysis includes linear interpolation between physical measurements and statistical correlation analysis to calculate surrogate water levels for MW1-12 and MW3-16 to represent historic ground water level conditions at these monitoring well locations prior to actual well installation and measurement. The MW3-16 location presently has a limited data history and will be reviewed (and revised if necessary and approved by The Ontario Water Resources Act (OWRA) Section 34.1 Signing Director as more data is collected. The level was rounded to two decimal places after the calculation was complete.
- (3) Trigger Levels are based on using the Historical Seasonal Low Groundwater Level minus the maximum predicted drawdown at the monitoring well location.

Table 2

**Surface Water Threshold and Trigger Levels
 Dufferin Paris Pit
 County of Brant, Ontario**

Monitoring Location	Month ⁽²⁾	Historical Seasonal Low Surface Water Level ⁽³⁾ (m AMSL)	Early-Warning Threshold Level ⁽⁴⁾ (m AMSL)	Surface Water Trigger Level ⁽⁵⁾ (m AMSL)
Existing Pond ⁽¹⁾	January	not applicable	not applicable	not applicable
	February	243.57	243.60	243.27
	March	243.70	243.76	243.40
	April	243.91	243.91	243.61
	May	243.82	243.84	243.52
	June	243.84	243.84	243.54
	July	243.72	243.75	243.42
	August	243.58	243.62	243.28
	September	243.56	243.60	243.26
	October	243.53	243.57	243.23
	November	243.61	243.64	243.31
	December	243.51	243.55	243.21

Notes:

- (1) Existing pond water elevation measured at SW1/SW1B or suitable alternate location in on-Site pond
- (2) Threshold and Trigger Levels apply during period of required PTTW monitoring or from February 15 to December 15 each year
- (3) Historical Seasonal Low Surface Water level is equal to the historical minimum measured monthly water level (August 2012 to August 2016)
- (4) Early-Warning Threshold Level is equal to the historical minimum measured monthly water level plus ten percent of the range observed within a given month. The level was rounded to two decimal places after the calculation was complete. (August 2012 to August 2016)
- (5) Trigger Level is equal to the Historical Seasonal Low Surface Water Level minus the maximum predicted drawdown in the on-Site pond surface water level (i.e., 0.3 metres)