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October 29, 2021

Shekhar Dalal
Blue Meadows Inc.
125 Arthur St W,
Thornbury, ON N0H 2P0

Dear Shekhar:

Re: Supplemental Hydrogeological Investigation to Support SWM Pond Design 125 Arthur Street W, Thornbury, ON

Palmer Environmental Consulting Group Inc. (Palmer) is pleased to present the results of our Supplemental Hydrogeological Investigation conducted Oct 27, 2021, at 125 Arthur St. W, Thornbury (the "site").

1. Hydrogeological Field Investigation Summary

1.1 Test Pit Summary

Palmer personnel met on site Oct 27, 2021, with Marcus Philipp, the excavation contractor, George Cooper of Crozier & Associates Inc., and Montgomery Philip King Architect Inc. Five (5) test pits were excavated using a Yanmar 5.5-ton Mini excavator, with the goal of characterizing the shallow soil and groundwater conditions present on site. The test pit locations are shown in **Figure 1**. The results of the test pitting program are presented in **Tables 1 – 5**, below. A photograph log of the test pits is provided in **Appendix A**.

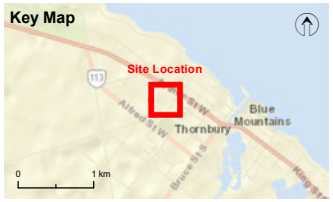
The observed soil and groundwater conditions were fairly consistent across the site. In each test pit topsoil and a sandy silt layer were encountered to depths between 0.1 to 0.7 meters below ground surface (mbgs). This was followed by a layer of saturated soils consisting of a silty sand that was very loose and rapidly began filling the test pits with perched groundwater. The saturated layer was encountered at depths of ranging from 0.2 to 0.85 mbgs in TP-1 to TP- 4. The silty sand unit was not encountered in TP-5; however, the saturated conditions were present in the upper topsoil layer.

Below the saturated conditions, a layer of silty clay to clayey silt was encountered in all test pits at depths ranging from 0.1-0.85 mbgs. This layer was compact and dense, acting as an aquitard due to its low hydraulic conductivity. The silty clay layer was observed in two (2) of the test pits to become grey at a depth of 1.5 mbgs (TP-2 and TP-5). The change in colour from brown to grey is an indicator of permanently saturated conditions in the soils.

Standing water was also encountered on site at surface in multiple locations. This is expected to have been caused by the recent heavy rainfall and low permeability soils near surface. A plastic weeping tile was encountered in the vicinity of TP-3 in the northwestern field at a depth of 0.1 mbgs.

LEGEND

- Borehole
- Monitoring Well
- Test Pit
- Watercourse
- Subject Site (Approximate)



0 25 50 75 100
METRE SCALE

North American Datum 1983
Universal Transverse Mercator Projection Zone 17

DRAFT

Scale: 1:2,000
Page Size: Letter (8.5 x 11 inches)

Drawn: BE
Checked: AM
Date: Oct 28, 2021

NORTH

Source Notes:
Imagery (Maxar, 2019) provided by Esri basemap service. Watercourses provided by Ontario MNRF (Ontatio Hydro Network).

CLIENT
Blue Meadows Inc.

PROJECT
125 Arthur St W and
123 Louisa St W Thornbury

TITLE
Site Map and Monitoring Well Locations

Palmer

REF. NO. 2105901-1-2

Figure 1

Document Path: G:\Shared drives\Projects 2021\21059 - Blue Meadows Inc\2105901 - 125 Arthur St W and 123 Louisa St W Thornbury\GIS\1_Workspace\Task 1 - Figures\2105901-1-1 Borehole Locations.mxd

Table 1. TP-1 Stratigraphy

Depth (mbgs)	Stratigraphy	Description
0.0-0.5	Topsoil	Sandy Silt, Organics, Dark Brown, moist to wet
0.5-0.6	Silty Sand	Fine grained, brown, wet to saturated, loose flowing sand
0.6-0.85	Silty Clay	brown, moist to wet, hard
Groundwater encountered at 0.5 mbgs		

Table 2. TP-2 Stratigraphy

Depth (mbgs)	Stratigraphy	Description
0.0-0.3	Topsoil	Sandy Silt, Organics, Dark Brown, moist to wet
0.3-0.7	Sandy Silt	Fine grained, Brown, wet
0.7-0.85	Silty Sand	Fine grained, brown, wet to saturated, loose flowing sand
0.85-1.5	Silty Clay	Mottled Grey-brown, moist to wet, hard
1.5	Silty Clay	Grey below 1.5m
Groundwater encountered at 0.7 mbgs		

Table 3. TP-3 Stratigraphy

Depth (mbgs)	Stratigraphy	Description
0.0-0.2	Topsoil	Sandy Silt, Organics, Dark Brown, moist to wet
0.2-0.5	Silty Sand	Fine grained, brown, wet to saturated, loose flowing sand
0.5-0.1.1	Silty Clay	Mottled Grey-brown, moist to wet, hard
Groundwater encountered at 0.2 mbgs		

Table 4. TP-4 Stratigraphy

Depth (mbgs)	Stratigraphy	Description
0.0-0.2	Topsoil	Sandy Silt, Organics, Dark Brown, moist to wet
0.2-0.5	Silty Sand	Fine grained, brown, wet to saturated, loose flowing sand
0.5-0.1.2	Silty Clay	Mottled Grey-brown, moist to wet, hard
Groundwater encountered at 0.2 mbgs		

Table 5. TP-5 Stratigraphy

Depth (mbgs)	Stratigraphy	Description
0.0-0.1	Topsoil	Silty Sand, Organics, Dark Brown, wet to saturated, trace cobbles and boulders
0.1-0.1.5	Silty Clay	Mottled Grey-brown, moist to wet, hard
1.5	Clayey Silt	Grey, wet, hard
Groundwater encountered at 0.1 mbgs		

1.2 Updated Groundwater Conditions

While on site, Palmer staff recorded water levels from the monitoring wells installed onsite during the summer. Water levels were measured using a water level tape and recorded to the nearest centimetre, these are presented in the **Table 6**.

Even with the recent heavy rainfall, the groundwater levels in the monitoring wells are all lower than those measured during August 2021, suggesting that the shallow groundwater levels recorded in the test pits may not represent the seasonal high water level, and that higher water levels in spring should be expected. It is clear that the silty clay layer encountered in each borehole and test pit acts as an aquitard restricting deeper groundwater flow and recharge, and causes the formation of a perched water table in the upper silty sand unit. A perched water table located a <1 mbgs should be expected across the entire site. The true water table is likely found in the silty clay unit at a depth of approximately 1.5 – 2.0 mbgs, which is consistent with the brown to grey soil colour transition and the water levels measured in the shallower groundwater monitoring wells (BH21-2, BH21-5, and BH21-10). Within an open excavation, seepage from within the silty clay unit is expected to be minor; however, significant groundwater contributions from the perched water table in the silty sand unit are expected.

Table 6. Groundwater Levels

MW ID	Depth (mbgs)	Unit	Water Level		
			August 10th, 2021	August 13th, 2021	October 27th, 2021
BH21-1	9.50	mbgs	4.0	4.37	4.94
BH21-2	6.20	mbgs	1.30	1.37	2.05
BH21-5	6.70	mbgs	1.10	1.29	1.73
BH21-6	9.80	mbgs	3.70	3.97	4.45
BH21-10	6.70	mbgs	0.80	0.89	0.96

2. Closure

This report was prepared and reviewed by the undersigned.

Prepared By: [redacted]

Cole Thompson, B.Sc.
Environmental Scientist (Hydrogeology)

Reviewed By: [redacted]

Jason Cole, M.Sc., P.Geo.
VP, Principal Hydrogeologist

General Comments and Limitations of Report

Palmer should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, Palmer will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes and test pits required to determine the localized underground conditions between boreholes and test pits affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole and test pit results, so that they may draw their own conclusions as to how the subsurface conditions may affect them. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to Palmer at the time of preparation. Unless otherwise agreed in writing by Palmer, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Palmer accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

Appendix A – Photo Log

Photograph Log

Palmer

Client Name:	Project No.	Site Location:
Shekhar Dalal Blue Meadows Inc.	2105901	125 Arthur St W, Thornbury, ON

Photo #:	Date.
1	10/27/2021
Direction Photo Taken	SW

Description

TP-1, rapidly filling with perched groundwater form the saturated layer at 0.5 meters below ground surface (mbgs).

Photo #:	Date.
2	10/27/2021
Direction Photo Taken	E

Description

TP-2, soil stratigraphy. The loose saturated layer can be seen falling into the test pit from 0.7mbgs to 0.85 mbgs. Perched groundwater is infiltrating from this layer. Above is the topsoil and sandy silt layer. Bellow is the Silty Clay layer acting as an aquitard. The soil at the bottom of this test pit (1.5 mbgs), is grey indicating permanently saturated conditions.

Photograph Log

Palmer

Client Name:	Project No.	Site Location:
Shekhar Dalal Blue Meadows Inc.	2105901	125 Arthur St W, Thornbury, ON

Photo #:	Date.
3	10/27/2021
Direction Photo Taken	S

Description

TP-3, weeping tile encountered 0.10 mbgs.

Photo #:	Date.
4	10/27/2021
Direction Photo Taken	NW

Description

TP-4, Soil stratigraphy. The 3 main layers can be seen here. The topsoil and sandy silt layer extends from surface to 0.3 mbgs where the perched groundwater and saturated silty sand layer was encountered. In this test pit the saturated layer was found to depth of 0.5 mbgs where the mottled silty clay layer was encountered.

Photograph Log

Palmer

Client Name:	Project No.	Site Location:
Shekhar Dalal Blue Meadows Inc.	2105901	125 Arthur St W, Thornbury, ON

Photo #:	Date.
5	10/27/2021
Direction Photo Taken	N

Description

TP-5, at this location the groundwater was observed to be infiltrating from the topsoil layer at a depth of 0.1 mbgs. The groundwater is perched on a mottled silty clay layer. The silty clay soils become a clayey silt and transition from mottled to grey at a depth of 1.5 mbgs. This is evidence of permanently saturated soil conditions.

Photo #:	Date.
6	10/27/2021
Direction Photo Taken	N

Description

Standing water observed on site.