



May 8, 2024
File No. 2024-060

Mr. Bob Wolfe
98 South Street
Concord, New Hampshire 03301

Re: Limited Hydrologic Evaluation
4 Old Boyce Road
Canterbury, New Hampshire

Dear Mr. Wolfe:

Aries Engineering, LLC (Aries) has prepared this letter summarizing the results of a hydrologic evaluation conducted at 4 Old Boyce Road in Canterbury, New Hampshire (site). This addendum has been prepared in general accordance with our April 15, 2024 scope of work and cost estimate (reference 2024-060).

BACKGROUND

The site is located in Canterbury, New Hampshire just north and paralleling US Route 4. The site primarily consists of approximately 3.5 acres of undeveloped field space with some vegetation generally around the perimeter. An approximately 1,000 square-foot residential structure is located on the property with frontage on Old Boyce Road. The building has been vacant for several years and is inhabitable. The Merrimack River abuts the site to the west.

A test pit investigation was conducted at the site in 1992 to evaluate subsurface conditions and the feasibility of managing wastewater on site (private septic system). We understand from our discussions with you that Fuss & O'Neil evaluated the information collected in 1992 and made an inference to an estimated seasonal high water table depth of approximately two feet below grade based on redoximorphic features observed in the test pits. There is question as to if the redoximorphic features observed in the 1992 test pits are representative of current seasonal high groundwater indicators, or if those features observed are the result of other events such as ancient river flooding or movement of minerals from surface soils to subsurface soil horizons through precipitation infiltration. Groundwater was not observed in the 1992 test pits, which were excavated to depths up to five feet below grade.

OBJECTIVE

Aries completed a limited hydrologic evaluation for the site in April 2024 with the objective of evaluating site overburden groundwater elevations with consideration for potential

redevelopment. Deeper test pits were excavated and piezometers were installed to better evaluate the depth to groundwater at the site.

TEST PIT EXPLORATIONS

Aries oversaw the excavation of six test pit explorations (designated TP-1 through TP-6) at the site on April 25, 2004. The approximate test pit exploration locations are shown on attached Figure 1. The test pits and piezometers were located using a handheld GPS device.

The test pits were excavated by Merrill Construction (Merrill) of Pembroke, New Hampshire, using a track-mounted CAT 312E excavator. Upon completion of the test pits, the excavations were backfilled with the excavated soil flush to the surrounding grades.

Aries installed piezometers identified as PZ-1 and PZ-2 in test pits TP-6 and TP-3, respectively. The piezometers were constructed of slotted 2-inch PVC pipe. The piezometers were installed in the open test pits and backfilled in place with the native soils. A solid PVC standpipe was left extending between 1 to 2 feet above the ground surface and caps were installed at each piezometer location.

An Aries engineer monitored the excavation of the test pits, collected soil samples, prepared field test pit logs, and measured depths groundwater. Soil samples were visually classified in general accordance with visual manual procedures (ASTM D 2488) and described using modified Burmister Soil Classification System descriptors. Test pit logs are included in the attachments.

HYDROLOGIC EVALUATION

Test pits were advanced to depths ranging from approximately 10 to 11.5 feet below existing grades. The test pits generally encountered a thick layer of topsoil, underlain by sand and a silt and clay unit at depth. The general characteristics of the subsurface layers are described below.

Subsurface Soils

Dark brown silt and fine sand (topsoil) was encountered at the ground surface of each test pit. The topsoil was observed to be approximately 1 to 2 feet thick.

A sand unit was encountered beneath the topsoil in each of the test pits. The sand unit typically consisted of two horizons, with the shallower horizon extending to depths ranging from 2.5 to 4.5 feet below grade and described as medium to coarse sand with little gravel. Iron staining was observed in the upper sand horizon at most test pit locations. The easternmost test pits, TP-1 and TP-2, encountered a shallow horizon of white to light gray fine sand. The lower sand horizon was observed to extend to depths ranging from approximately 7 to 11 feet below grade. The lower sand horizon is described as generally consisting of brown to tan medium to coarse sand.

A unit of gray silt with varying amounts of clay and fine sand was observed directly under the sand unit. This unit was observed to be wet. The test pits were terminated in this unit at depths ranging from 10 to 11.5 feet below grade.

Groundwater Depths

Water-bearing soils were encountered in the test pits at depths ranging from approximately 7 to 11 feet below grade. The presence of wet soils is indicative of groundwater. Aries returned to the site on April 26, 2024 to measure the depth to groundwater in the piezometers. Aries measured the depth to groundwater in the piezometers using an electronic water level indicator. The measurements were made from the top of the PVC standpipes. Ground surface elevations at the test pits are approximately 263 feet at PZ-1 and 265 feet at PZ-2 based on LiDAR data. Groundwater was measured at a depth of approximately 6.16 feet below grade at PZ-1 and approximately 6.43 feet below grade in PZ-2, corresponding to elevations of 256.84 feet and 258.57 feet, respectively. These measurements are believed to be representative of the stabilized groundwater elevations at the piezometer locations at the time that the measurements were made. The groundwater measurements and reference elevations are provided in the attached Table 1.

Local Hydrologic Trends

Groundwater levels in central New Hampshire fluctuate seasonally and are typically highest in the spring. Aries reviewed historic river flow and stage data for the Merrimack River at Franklin Junction, NH stream gage station (USGS 01081500), which is located approximately 10 miles upstream of the site (nearest available USGS-maintained stream gage on the Merrimack River). The USGS has collected data from this station since 1957. The history of data from the Franklin Junction station indicates the highest median stream stage on April 24th. Given the proximity of the Merrimack River to the site, we consider this information valid for evaluating seasonal fluctuations of groundwater levels at the site. This information suggests that seasonal high groundwater conditions at the site likely occur near late April. Aries has additional site visits planned to measure the depth to groundwater over time to further evaluate seasonal fluctuations. The USGS stream gage data can be viewed at <https://nwis.waterdata.usgs.gov/nwis>, Merrimack River at Franklin Junction, NH.

SEASONAL HIGH WATER LEVEL OPINION

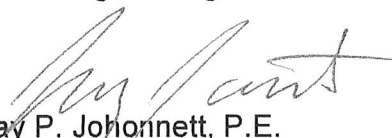
A 1992 investigation made an inference to an estimated seasonal high water table depth of approximately two feet below grade based on redoximorphic features observed in site test pits. The test pits excavated in 1992 were shallow, extending to depths up to approximately five feet below grade. Water-saturated soils were observed in the test pits conducted as part of this evaluation in April 2024 at depths ranging from approximately 7 to 11 feet below grade. Groundwater was measured in the piezometers installed for this evaluation at depths ranging from 6.16 to 6.43 feet below grade on April 26, 2024.


It's our opinion that the redoximorphic features observed (iron staining) in the 1992 test pit soils at a depth of approximately two feet below grade are likely attributed to precipitation

infiltration and not indicative of a seasonal high water table elevation. We believe the results of the test pit investigation and piezometer measurements, as well as local stream gage information support a seasonal high water table depth at the site of approximately 6 to 7 feet below grade. Aries will make additional measurements of the depth to groundwater in the site piezometers and amend this letter report with the results and updated opinion if the results suggest otherwise.

Aries appreciates the opportunity to provide you with engineering assistance on this project. If you have any questions or need additional information, please contact Jay Johonnett at 603 228-0008 or via email at jjhonnett@aries-eng.com.

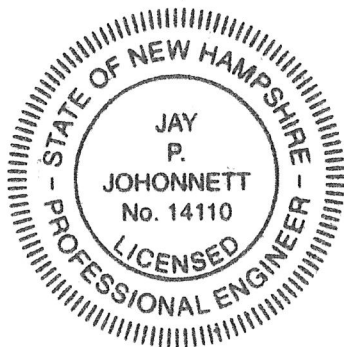
Sincerely,
Aries Engineering, LLC


Jay P. Johonnett, P.E.
Principal Geotechnical Engineer


George C. Holt, P.G.
Principal Hydrogeologist

JPJ:pj

- Attachments: Limitations
Figure 1 – Subsurface Exploration Plan
Test Pit Logs
Table 1 - Water Level Measurements



LIMITATIONS

Aries prepared this report on behalf of and for the exclusive use of Mr. Bob Wolfe (Client) solely for use at the 4 Old Boyce Road, Canterbury, New Hampshire property. This report shall not be transmitted to any other party, or relied upon by any other party, without Aries' written consent.

Aries made the reported observations under the conditions stated herein. Aries based the report conclusions solely on the services described herein, and not on scientific tasks or procedures beyond the scope of described services. This report was written to communicate the interpretation of site conditions as well as design and construction recommendations to the Client. This report may also contain recommendations presented for consideration by the Client.

Aries' conclusions are based solely on the results of the investigation activities described in this report. If variations or other latent conditions later appear evident, Aries may need to re-evaluate and may change the report conclusions and/or recommendations. This report summarizes subsurface conditions based on explorations conducted at widely spaced points. Variation of subsurface conditions between explorations may and should be expected to occur.

Aries conducted this report in general accordance with accepted consulting practices. Aries makes no warranty, either expressed or implied.



104 PLEASANT STREET
CONCORD, NH 03301
(603) 228-0008
www.aries-eng.com

PROJECT: Old Boyce Road

TEST PIT NO. TP-1

LOCATION: Canterbury, NH

SHEET 1 of 1

EXCAVATION CO. Merrill Construction

Groundwater Observations

FILE NO. 2024-060

FOREMAN Donny

DATE	TIME	DEPTH	REFERENCE	STAB T.
4/25/2024	10:00	8.5 ft.	Grade	

GROUND ELEVATION: NM

ARIES REP. J. Johonnett

DATUM: NA

DATE 4/25/2024

DEPTH (feet bgs)	SAMPLE NO.	EXCAVATION EFFORT	SAMPLE INTERVAL (feet below grade)	PID HEADSPACE (PPMV)	SOIL DESCRIPTION	STRATA CHANGE	NOTES	NO EQUIPMENT INSTALLED
1		Easy	0.0 - 1.3	NM	Dk. bn., f. SAND and SILT, TOPSOIL	TOPSOIL		
2		Easy	1.3 - 2.5	NM	White/lt. gray, f. SAND	SAND		
3		Easy	2.5 - 8.5	NM	Bn./dk. bn., interbedded f. SAND and m./c. SAND	SAND		
4								
5								
6								
7								
8								
9		Easy	8.5 - 10.0	NM	Bn., m./c. SAND, wet	SAND	Wet	
10								
11					End of test pit 10 feet below grade.			
12								
13								
14								

R
E
M
A
R
K
S

Notes:
 1. The test pit excavations were excavated by Merrill Construction using a CAT 312E excavator.
 2. The test pit excavations were backfilled upon completion using the excavated soils.

NE = Not Encountered
 NA = Not Applicable
 NM = Not Measured



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PROJECT: Old Boyce Road

LOCATION: Canterbury, NH

TEST PIT NO. TP-2

SHEET 1 of 1

EXCAVATION CO. Merrill Construction

Groundwater Observations

FILE NO. 2024-060

FOREMAN Donny

DATE 4/25/2024 TIME 9:35 DEPTH 11.0 ft. REFERENCE Grade STAB T.

GROUND ELEVATION: NM

ARIES REP. J. Johonnett

DATE 4/25/2024

DATUM: NA

DEPTH (feet bgs)	SAMPLE NO.	EXCAVATION EFFORT	SAMPLE INTERVAL (feet below grade)	PID HEADSPACE (PPMV)	SOIL DESCRIPTION	STRATA CHANGE	NOTES	NO EQUIPMENT INSTALLED
1		Easy	0.0 - 1.8	NM	Dk. bn., f. SAND and SILT, TOPSOIL Orange stain at 1.8'	TOPSOIL		
2								
3		Easy	1.8 - 4.0	NM	Light gray, f. SAND	SAND		
4								
5								
6		Easy	4.0 - 11.0	NM	Bn. to dark bn., m. SAND	SAND		
7								
8								
9								
10								
11								
		Easy	11.0 - 1.5	NM	Gray, SILT and CLAY, so. f. Sand, wet	SILT & CLAY	Wet	
12					End of test pit 11.5 feet below grade.			
13								
14								

REMARKS

Notes:
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PROJECT: Old Boyce Road

TEST PIT NO. TP-3 / PZ-2

LOCATION: Canterbury, NH

SHEET 1 of 1

EXCAVATION CO. Merrill Construction

Groundwater Observations

FILE NO. 2024-060

FOREMAN Donny

DATE TIME DEPTH REFERENCE STAB T.

GROUND ELEVATION: 265 FEET

ARIES REP. J. Johonnett

4/25/2024

9:15

9 ft.

Grade

DATUM: NAVD 88

DATE 4/25/2024

4/26/2024

10:00

7.43 ft.

PVC Riser

DEPTH (feet bgs)	SAMPLE NO.	EXCAVATION EFFORT	SAMPLE INTERVAL (feet below grade)	PID HEADSPACE (PPMV)	SOIL DESCRIPTION	STRATA CHANGE	NOTES
1		Easy	0.0 - 1.7	NM	Dk. bn., f. SAND and SILT, TOPSOIL	TOPSOIL	<p>PIEZOMETER INSTALLED (DRAWING NOT-TO-SCALE)</p> <p>2" PVC RISER 1' ABOVE GRADE</p> <p>GRADE</p> <p>TOP OF SLOTTED 2" PVC 2' BELOW GRADE</p> <p>BOTTOM OF SLOTTED 2" PVC 9' BELOW GRADE</p>
2		Easy	1.7 - 3.0	NM	Dark bn., m./c. SAND, li. gravel, maroon staining	SAND	
3							
4		Easy	3.0 - 9.0	NM	Bn., m./c. SAND	SAND	
5							
6							
7							
8							
9							
10		Easy	9.0 - 11.0	NM	Gray, SILT, so. f. Sand, wet	SILT	
11					End of test pit 11 feet below grade.		Wet
12							
13							
14							

R Notes:
E 1. The test pit excavations were excavated by Merrill Construction using a CAT 312E excavator.
M 2. The test pit excavations were backfilled upon completion using the excavated soils.
A
R NE = Not Encountered
K NA = Not Applicable
S NM = Not Measured



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PROJECT: Old Boyce Road

TEST PIT NO. TP-4

LOCATION: Canterbury, NH

SHEET 1 of 1

EXCAVATION CO. Merrill Construction

Groundwater Observations

FILE NO. 2024-060

FOREMAN Donny

DATE	TIME	DEPTH	REFERENCE	STAB T.
4/25/2024	8:35	8.5 ft.	Grade	

GROUND ELEVATION: NM

ARIES REP. J. Johonnett

DATE 4/25/2024

DATUM: NA

DEPTH (feet bgs)	SAMPLE NO.	EXCAVATION EFFORT	SAMPLE INTERVAL (feet below grade)	PID HEADSPACE (PPMV)	SOIL DESCRIPTION	STRATA CHANGE	NOTES	NO EQUIPMENT INSTALLED
1		Easy	0.0 - 1.3	NM	Dk. bn., f. SAND and SILT, TOPSOIL	TOPSOIL		
2		Easy	1.3 - 3.0	NM	Bn., m./c. SAND, li. gravel	SAND		
3								
4								
5		Easy	3.0 - 8.5	NM	Tan/bn., m. SAND	SAND		
6								
7								
8								
9		Easy	8.5 - 10.0	NM	Gray, SILT and CLAY, so. f. Sand, wet	SILT & CLAY	Wet	
10					End of test pit 10 feet below grade.			
11								
12								
13								
14								

R Notes:
E 1. The test pit excavations were excavated by Merrill Construction using a CAT 312E excavator.
M 2. The test pit excavations were backfilled upon completion using the excavated soils.
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K NA = Not Applicable
S NM = Not Measured



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PROJECT: Old Boyce Road

LOCATION: Canterbury, NH

TEST PIT NO. TP-5

SHEET 1 of 1

EXCAVATION CO. Merrill Construction

FOREMAN Donny

ARIES REP. J. Johonnett

DATE 4/25/2024

Groundwater Observations

DATE TIME DEPTH REFERENCE STAB T.

4/25/2024 8:55 9.0 ft. Grade

FILE NO. 2024-060

GROUND ELEVATION: NM

DATUM: NA

DEPTH (feet bgs)	SAMPLE NO.	EXCAVATION EFFORT	SAMPLE INTERVAL (feet below grade)	PID HEADSPACE (PPMV)	SOIL DESCRIPTION	STRATA CHANGE	NOTES	NO EQUIPMENT INSTALLED
1		Easy	0.0 - 1.2	NM	Dk. bn., f. SAND and SILT, TOPSOIL	TOPSOIL		
2								
3		Easy	1.2 - 4.2	NM	Bn., m./c. SAND, li. gravel, slight orange staining at 1.2 to 2.5' below grade	SAND		
4								
5								
6		Easy	4.2 - 9.0	NM	Tan/bn., m. SAND	SAND		
7								
8								
9								
10		Easy	9.0 - 10.5	NM	Gray, SILT and CLAY, so. f. Sand, wet	SILT & CLAY	Wet	
11					End of test pit 10 feet below grade.			
12								
13								
14								

REMARKS

Notes:
 1. The test pit excavations were excavated by Merrill Construction using a CAT 312E excavator.
 2. The test pit excavations were backfilled upon completion using the excavated soils.

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 NA = Not Applicable
 NM = Not Measured



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PROJECT: Old Boyce Road

TEST PIT NO. TP-6 / PZ-1

LOCATION: Canterbury, NH

SHEET 1 of 1

EXCAVATION CO. Merrill Construction

Groundwater Observations

FILE NO. 2024-060

FOREMAN Donny

DATE 4/25/2024 TIME 8:15 DEPTH 7 ft. REFERENCE Grade STAB T.

GROUND ELEVATION: 263 FEET

ARIES REP. J. Johonnett

DATE 4/26/2024 TIME 10:00 DEPTH 8.16 ft. REFERENCE PVC Riser

DATUM: NAVD 88

DEPTH (feet bgs)	SAMPLE NO.	EXCAVATION EFFORT	SAMPLE INTERVAL (feet below grade)	PID HEADSPACE (PPMV)	SOIL DESCRIPTION	STRATA CHANGE	NOTES
1		Easy	0.0 - 0.8	NM	Dk. bn., f. SAND and SILT, TOPSOIL	TOPSOIL	<p>PIEZOMETER INSTALLED (DRAWING NOT-TO-SCALE)</p> <p>2" PVC RISER 2' ABOVE GRADE</p> <p>GRADE</p> <p>TOP OF SLOTTED 2" PVC 1' BELOW GRADE</p> <p>BOTTOM OF SLOTTED 2" PVC 7' BELOW GRADE</p>
2		Easy	0.8 - 7.0	NM	Bn., m./c. SAND, li. gravel, orange staining at two feet below grade	SAND	
3							
4							
5							
6							
7							
8		Easy	7.0 - 10.0	NM	Gray, SILT and CLAY, so. f. Sand, wet	SILT / CLAY	
9							
10							
11					End of test pit 10 feet below grade.		
12							
13							
14							

Wet

R Notes:
E 1. The test pit excavations were excavated by Merrill Construction using a CAT 312E excavator.
M 2. The test pit excavations were backfilled upon completion using the excavated soils.
A
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K NA = Not Applicable
S NM = Not Measured

TABLE 1

GROUNDWATER LEVEL ELEVATION DATA
 4 OLD BOYCE ROAD
 CANTERBURY, NEW HAMPSHIRE

Relative Elevation of Top of PVC Riser Pipe (feet)		
Measurement Date	PZ-1	PZ-2
04/25/24	265.0	266.0
Relative Elevation of Ground Surface (feet)		
Measurement Date	PZ-1	PZ-2
04/25/24	263.0	265.0
Measured Water Level Below Top of PVC Riser Pipe (feet btc)		
Date	PZ-1	PZ-2
04/26/24	8.16	7.43
06/17/24	dry	dry
07/12/24	dry	dry
Relative Groundwater Elevation (feet)		
Date	PZ-1	PZ-2
04/26/24	256.84	258.57
06/17/24	dry	dry
07/12/24	dry	dry

NOTES:

1. Elevations from May 2022 NH Granit LiDAR digital elevations.
2. Aries measured groundwater levels using a Solinst water level meter.
3. Reported elevations are approximate.
4. "dry" indicates water was not present in the piezometer at the time that the measurement was made.