

TABLE 1  
WELL CONSTRUCTION DETAILS

MOE WWR No.	Location			Coordinates			Elevation			Stick-up (m AGS)	Borehole Depth (m BGS)	Well Diameter (mm)	Screened Interval				Screened Material	
	Well ID	Installation Date	Status	Eastings	Northing	Source	Ground Surface m AMSL	Top of Casing m AMSL	Source				Top of Well Screen		Bottom of Well Screen		Screened Unit	Hydraulic Conductivity (m/s)
												(m BGS)	(m AMSL)	(m BGS)	(m AMSL)			
<b>Monitoring Wells</b>																		
-	MW1-13S	Dec-13	Monitoring Well	673222	4872738	Hydro One (Sept 2014)	262.52	263.39	Hydro One (Sept 2014)	0.87	6.1	51	3.05	259.47	6.10	256.42	Silty Sand Till	9.E-08
-	MW1-13D	Dec-13	Monitoring Well	673222	4872738	Hydro One (Sept 2014)	262.52	263.42	Hydro One (Sept 2014)	0.90	15.2	51	12.19	250.33	15.24	247.28	Silty Sand Till	9.E-06
-	MW2-13S	Dec-13	Monitoring Well	672910	4872716	Hydro One (Sept 2014)	250.42	251.27	Hydro One (Sept 2014)	0.85	4.6	51	1.52	248.90	4.57	245.85	Silty Sand Till	2.E-07
-	MW2-13D	Dec-13	Monitoring Well	672906	4872714	Hydro One (Sept 2014)	250.40	251.26	Hydro One (Sept 2014)	0.86	15.2	51	12.19	238.21	15.24	235.16	Silty Sand Till	1.E-07
-	MW3-13S	Dec-13	Monitoring Well	672702	4872499	Hydro One (Sept 2014)	243.87	244.80	Hydro One (Sept 2014)	0.93	6.7	51	3.66	240.21	6.71	237.16	Silty Sand Till	7.E-09
-	MW3-13D	Dec-13	Monitoring Well	672703	4872495	Hydro One (Sept 2014)	244.03	244.97	Hydro One (Sept 2014)	0.94	15.2	51	12.19	231.84	15.24	228.79	Silty Sand Till	na
-	MW4-13S	Dec-13	Monitoring Well	673051	4872242	Hydro One (Sept 2014)	238.86	239.78	Hydro One (Sept 2014)	0.92	4.6	51	1.52	237.34	4.57	234.29	Sand Silty Sand Till	1.3.E-05
-	MW4-13D	Dec-13	Monitoring Well	673050	4872238	Hydro One (Sept 2014)	238.72	239.55	Hydro One (Sept 2014)	0.83	15.2	51	12.19	226.53	15.24	223.48	Silty Sand Till	na
-	MW4-15D	Jan-15	Monitoring Well	673050	4872238	Approximated from MW4-13D	238.72	239.47	Approximated from MW4-13D	0.75	25.1	51	19.89	218.83	22.94	215.78	Silty Sand Till	2.8.E-10
-	MW5-14S	Oct-14	Monitoring Well	672901	4872453	Field GPS (2014)	252.60	253.51	Hydro One Topography (0.25 m contours)	0.91	6.1	51	3.10	249.50	6.10	246.50	Sandy Silt Till Silty Sand Till	1.6.E-05
-	MW5-14S (2)	Nov-14	Monitoring Well	672901	4872453	Stantec GIS Mapping (2015)	252.60	253.34	Hydro One Topography (0.25 m contours)	0.74	4.1	51	2.48	250.12	4.00	248.60	Sand	2.8.E-07
-	MW5-14I	Oct-14	Monitoring Well	672901	4872453	Field GPS (2014)	252.60	253.43	Hydro One Topography (0.25 m contours)	0.83	40.1	51	37.10	215.50	40.10	212.50	Silty Sand Till	1.3.E-09
-	MW5-14D	Dec-14	Monitoring Well	672901	4872453	Stantec GIS Mapping (2015)	252.44	253.22	Hydro One Topography (0.25 m contours)	0.78	55.0	51	52.43	200.01	53.95	198.49	Sand	3.3.E-07
-	MW5-14D(2)	Dec-14	Monitoring Well	672901	4872453	Stantec GIS Mapping (2015)	252.44	253.52	Hydro One Topography (0.25 m contours)	1.08	129.5	51	112.01	140.43	113.54	138.90	Sand	-
-	MW6-14	Oct-14	Monitoring Well	673195	4872811	Field GPS (2014)	260.80	261.71	Hydro One Topography (0.25 m contours)	0.91	7.6	51	6.10	254.70	7.60	253.20	Silt Till	4.3.E-07
-	MW7-14	Oct-14	Monitoring Well	673254	4872654	Field GPS (2014)	261.75	262.65	Hydro One Topography (0.25 m contours)	0.90	7.6	51	6.10	255.65	7.60	254.15	Silt Till Sandy Silt Till	8.4.E-07
-	MW8-15	Jan-15	Abandoned	673082	4872565	Approximated from BH7D (EXP, 2012)	254.43	255.25	Approximated from BH7D (EXP, 2012)	0.82	16.9	51	13.72	240.71	15.24	239.19	Silty Sand to Sandy Silt Till	7.4.E-06
<b>Boreholes</b>																		
7191922	BH2-12	Nov-12	Abandoned	673024	4872350	Inspect-Sol (2012)	246.40	247.30	Hydro One Topography (0.25 m contours)	0.90	15.9	na	12.15	234.25	15.20	231.20	Sandy Silt Till	-
-	BH4-12	Nov-12	Abandoned	672719	4872330	Inspect-Sol (2012)	243.20	244.10	Hydro One Topography (0.25 m contours)	0.90	15.5	na	12.45	230.75	15.50	227.70	Sandy Silt Till	-
-	BH7A	May-12	Abandoned	672989	4872568	EXP (2012)	253.20	na	Exp borehole log (2012)	na	15.7	na	4.70	248.50	7.75	245.45	Sandy Silt Till	-
-	BH9-15	Mar-15	Abandoned	673015	4872580	Approximated from BH7A (EXP, 2012)	253.60	na	Approximated from BH7A (EXP, 2012)	na	10.1	na	na	na	na	na	na	-
-	BH11-12	Nov-12	Abandoned	673034	4872779	Inspect-Sol (2012)	253.50	254.41	Hydro One Topography (0.25 m contours)	0.91	15.5	51	11.75	241.75	14.80	238.70	Sandy Silt Till Silt and Sand	-

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MOE WWR No.	Location			Coordinates			Elevation			Stick-up (m AGS)	Borehole Depth (m BGS)	Well Diameter (mm)	Screened Interval				Screened Material	
	Well ID	Installation Date	Status	Easting	Northing	Source	Ground Surface m AMSL	Top of Casing m AMSL	Source				Top of Well Screen		Bottom of Well Screen		Screened Unit	Hydraulic Conductivity (m/s)
												(m BGS)	(m AMSL)	(m BGS)	(m AMSL)			
<b>Drivepoint Piezometers</b>																		
na	DP4-13 (MP4)	Dec-13	Piezometer	673055	4872236	Hydro One (Sept 2014)	238.41	239.09	Hydro One (Sept 2014)	0.68	1.57	25	1.15	237.26	1.57	236.84	na	-
na	DP2-13 (MP2, SW2)	Dec-13	Abandoned	672900	4872725	Adjacent to DP2-14	250.10	251.14	Adjacent to DP2-14	1.04	1.21	25	0.79	249.31	1.21	248.89	na	-
na	DP2-14 (MP2, SW2)	May-14	Piezometer	672900	4872725	Hydro One (Sept 2014)	250.10	251.62	Hydro One (Sept 2014)	1.52	1.34	25	0.92	249.18	1.34	248.76	na	-
na	DP3-14 (MP3, SW3)	May-14	Piezometer	672684	4872500	Field GPS (2014)	240.00	241.69	Hydro One Topography (0.25 m contours)	1.69	0.87	25	0.45	239.55	0.87	239.13	na	-
<b>Test Pits</b>																		
na	TP1-14	Oct-14	Abandoned	673189	4872613	Field GPS (2014)	256.40	na	Hydro One Topography (0.25 m contours)	na	4.88	na	na	na	na	na	Silty Sand Till	-
na	TP2-14	Oct-14	Abandoned	673151	4872714	Field GPS (2014)	258.20	na	Hydro One Topography (0.25 m contours)	na	4.57	na	na	na	na	na	Silty Sand Till	-
na	TP3-14	Oct-14	Abandoned	673129	4872784	Field GPS (2014)	257.10	na	Hydro One Topography (0.25 m contours)	na	3.96	na	na	na	na	na	Silty Sand Till	-

**Notes:**

Northing and Easting Coordinates presented as UTM NAD 83 Zone 17

na: not applicable

m AGS: metres above ground surface

m BGS: metres below ground surface

m AMSL: metres above mean sea level

A Following development / sampling, the well was slow to recover and static conditions were not achieved. The level is an approximation of static levels.

B Water level reading from October 8, 2014

# Monitoring Well: MW4-15D

**Project:** Clarington TS Natural Heritage  
**Client:** Hydro One Networks Inc  
**Location:** Clarington, ON  
**Number:** 160900764  
**Field investigator:** N.Spina/ R.Dong  
**Contractor:** Aardvark Drilling Inc.

**Drilling method:** Track Mount CME 75 108 mm ID HSA/ PQ  
**Date started/completed:** 09-Jan-2015 / 14-Jan-2015  
**Ground surface elevation:** 238.72 m AMSL  
**Top of casing elevation:** 239.47 m AMSL  
**Easting:** 673050  
**Northing:** 4872242

SUBSURFACE PROFILE				SAMPLE DETAILS			INSTALLATION DETAILS			
Depth	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram	Description		
0	0	Ground Surface	238.72					Above Ground Casing Stick-Up: 0.75 m AGS		
		TOPSOIL (SILTY SAND) compact (frozen), dark brown (7.5Y 3/2), fine grained sand, little organics (rootlets), trace coarse grained sand, moist	0.00 238.39	1	CC	54.5" 87%			210 mm Diameter Borehole 0 to 2.2 m	
		SAND loose, dark brown (7.5Y 3/2), fine grained sand, some silt, trace coarse sand, moist	0.33 237.60							
5	2	SANDY SILT soft, dark brown (7.5Y 3/2), fine grained sand, trace coarse grained sand, trace clay, trace fine grained gravel, moist trace rusty oxidation staining at 1.60 m BGS	1.12 236.59	2	CC	32" 82%				
		SAND loose, brown (10 YR 5/3), fine grained sand, little silt, trace fine and coarse grained subrounded gravel broken cobble at 2.6 m BGS	2.13 236.13	3	PQ	20" 100%				
10	4	SANDY SILT to SILTY SAND (DIAMICTON) very dense, brown (10YR 5/3), fine grained sand, little medium and coarse grained sand, little fine and coarse grained gravel, trace cobbles, moist colour transition to greyish brown (10YR 5/2) at 2.90 m BGS	2.59 235.62	4	PQ	60" 100%				
		SAND loose, brown (10 YR 5/3), fine grained sand, little silt, trace fine and coarse grained subrounded gravel broken cobble at 2.6 m BGS	3.10	5	PQ	48" 87%				
15	6	SANDY SILT to SILTY SAND (DIAMICTON) very dense, brown (10YR 5/3), fine grained sand, little medium and coarse grained sand, little fine and coarse grained gravel, trace cobbles, moist colour transition to greyish brown (10YR 5/2) at 2.90 m BGS		6	PQ	10" 14%				
		SAND loose, brown (10 YR 5/3), fine grained sand, little silt, trace fine and coarse grained subrounded gravel broken cobble at 2.6 m BGS		7	PQ	60" 100%				
20	8	SANDY SILT to SILTY SAND (DIAMICTON) very dense, brown (10YR 5/3), fine grained sand, little medium and coarse grained sand, little fine and coarse grained gravel, trace cobbles, moist colour transition to greyish brown (10YR 5/2) at 2.90 m BGS		8	PQ	60" 100%				
		SAND loose, brown (10 YR 5/3), fine grained sand, little silt, trace fine and coarse grained subrounded gravel broken cobble at 2.6 m BGS		9	PQ	59" 101%				
25	10	SANDY SILT to SILTY SAND (DIAMICTON) very dense, brown (10YR 5/3), fine grained sand, little medium and coarse grained sand, little fine and coarse grained gravel, trace cobbles, moist colour transition to greyish brown (10YR 5/2) at 2.90 m BGS		10	PQ	60" 100%				
		SAND loose, brown (10 YR 5/3), fine grained sand, little silt, trace fine and coarse grained subrounded gravel broken cobble at 2.6 m BGS		11	PQ	60" 100%				
30	12	SANDY SILT to SILTY SAND (DIAMICTON) very dense, brown (10YR 5/3), fine grained sand, little medium and coarse grained sand, little fine and coarse grained gravel, trace cobbles, moist colour transition to greyish brown (10YR 5/2) at 2.90 m BGS		12	PQ	60" 100%				
		SAND loose, brown (10 YR 5/3), fine grained sand, little silt, trace fine and coarse grained subrounded gravel broken cobble at 2.6 m BGS								
35	14	SANDY SILT to SILTY SAND (DIAMICTON) very dense, brown (10YR 5/3), fine grained sand, little medium and coarse grained sand, little fine and coarse grained gravel, trace cobbles, moist colour transition to greyish brown (10YR 5/2) at 2.90 m BGS					Bentonite Chips 0 to 19.6 m			
		SAND loose, brown (10 YR 5/3), fine grained sand, little silt, trace fine and coarse grained subrounded gravel broken cobble at 2.6 m BGS								
40	16	SANDY SILT to SILTY SAND (DIAMICTON) very dense, brown (10YR 5/3), fine grained sand, little medium and coarse grained sand, little fine and coarse grained gravel, trace cobbles, moist colour transition to greyish brown (10YR 5/2) at 2.90 m BGS								
		SAND loose, brown (10 YR 5/3), fine grained sand, little silt, trace fine and coarse grained subrounded gravel broken cobble at 2.6 m BGS								
45	18	SANDY SILT to SILTY SAND (DIAMICTON) very dense, brown (10YR 5/3), fine grained sand, little medium and coarse grained sand, little fine and coarse grained gravel, trace cobbles, moist colour transition to greyish brown (10YR 5/2) at 2.90 m BGS								
		SAND loose, brown (10 YR 5/3), fine grained sand, little silt, trace fine and coarse grained subrounded gravel broken cobble at 2.6 m BGS								
50	20	SANDY SILT to SILTY SAND (DIAMICTON) very dense, brown (10YR 5/3), fine grained sand, little medium and coarse grained sand, little fine and coarse grained gravel, trace cobbles, moist colour transition to greyish brown (10YR 5/2) at 2.90 m BGS								
		SAND loose, brown (10 YR 5/3), fine grained sand, little silt, trace fine and coarse grained subrounded gravel broken cobble at 2.6 m BGS								
55	22	SANDY SILT to SILTY SAND (DIAMICTON) very dense, brown (10YR 5/3), fine grained sand, little medium and coarse grained sand, little fine and coarse grained gravel, trace cobbles, moist colour transition to greyish brown (10YR 5/2) at 2.90 m BGS								
		SAND loose, brown (10 YR 5/3), fine grained sand, little silt, trace fine and coarse grained subrounded gravel broken cobble at 2.6 m BGS								
		no cobbles from 10.72 m to 12.24 m BGS								
		transition to little cobbles from 16.82 m to 21.38 m BGS								

Screen Interval: 19.89 - 22.94 m BGS  
 Sand Pack Interval: 19.61 - 22.94 m BGS  
 Well Seal Interval: 0.00 - 19.61 m BGS

**Notes:**  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 CC - continuous core sample  
 PQ - wireline continuous core sample  
 n/a - not available

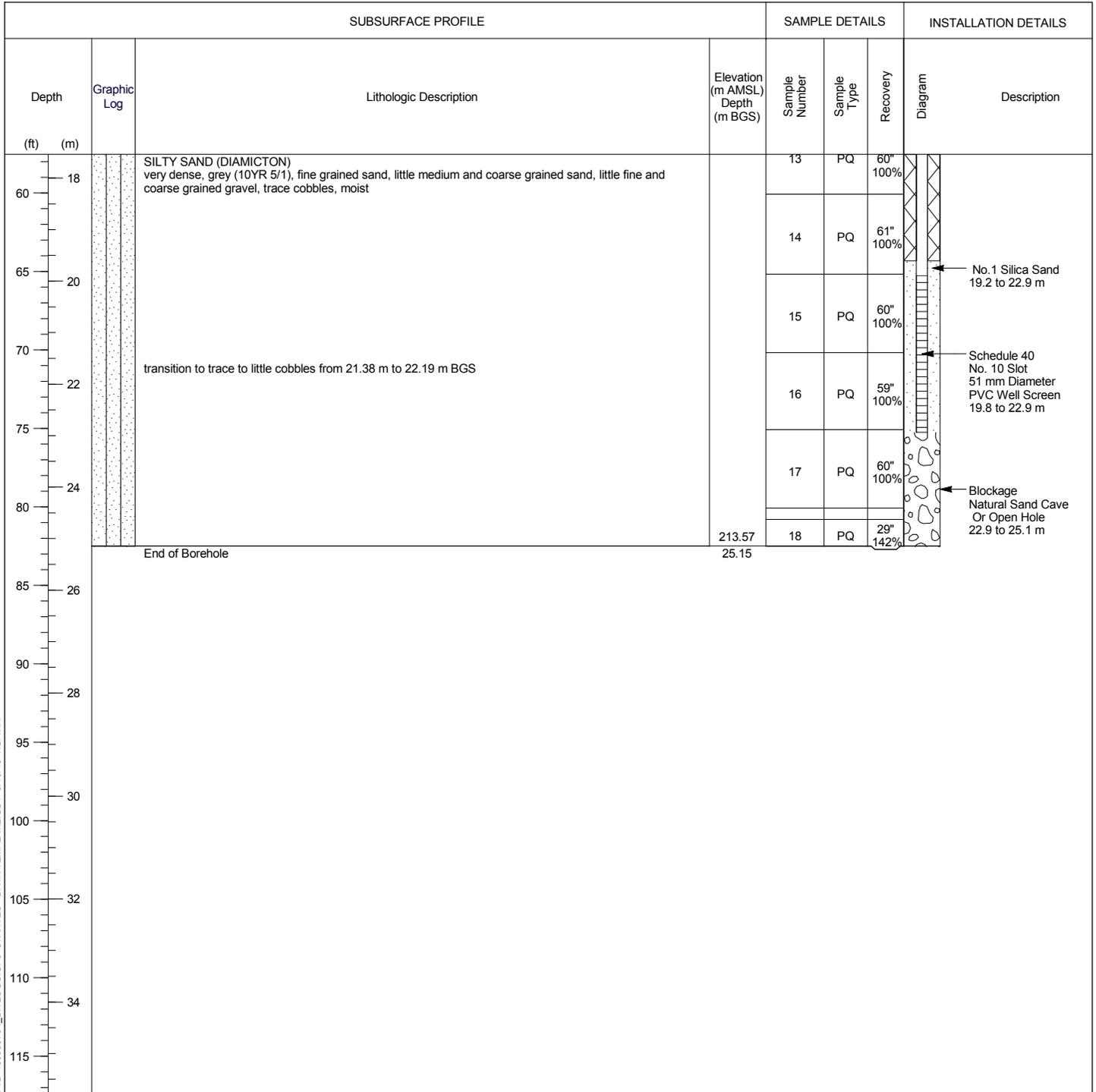
Groundsurface elevation obtained from MW4-13D  
 Static groundwater level not reported due to slow recovery



# Monitoring Well: MW4-15D

**Project:** Clarington TS Natural Heritage  
**Client:** Hydro One Networks Inc  
**Location:** Clarington, ON  
**Number:** 160900764  
**Field investigator:** N.Spina/ R.Dong  
**Contractor:** Aardvark Drilling Inc.

**Drilling method:** Track Mount CME 75 108 mm ID HSA/ PQ  
**Date started/completed:** 09-Jan-2015 / 14-Jan-2015  
**Ground surface elevation:** 238.72 m AMSL  
**Top of casing elevation:** 239.47 m AMSL  
**Easting:** 673050  
**Northing:** 4872242



Screen Interval: 19.89 - 22.94 m BGS  
 Sand Pack Interval: 19.61 - 22.94 m BGS  
 Well Seal Interval: 0.00 - 19.61 m BGS

**Notes:**  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 CC - continuous core sample  
 PQ - wireline continuous core sample  
 n/a - not available

Groundsurface elevation obtained from MW4-13D  
 Static groundwater level not reported due to slow recovery



# Monitoring Well: MW5-14S (2)

**Project:** Clarington TS Natural Heritage  
**Client:** Hydro One Networks Inc  
**Location:** Clarington, ON  
**Number:** 160900764  
**Field investigator:** N. Spina  
**Contractor:** Aardvark Drilling Inc

**Drilling method:** Track Mount CME 75 108 mm ID HSA  
**Date started/completed:** 24-Nov-2014  
**Ground surface elevation:** 252.60 m AMSL  
**Top of casing elevation:** 253.51 m AMSL  
**Easting:** 672901  
**Northing:** 4872453

SUBSURFACE PROFILE				SAMPLE DETAILS			INSTALLATION DETAILS	
Depth (ft) (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram	Description
-2			253.34					
0		Ground Surface	252.60					Above Ground Casing Stick-Up: 0.74 m
0		TOPSOIL (SAND) loose, dark brown (10 YR 3/2), fine grained sand, some silt, trace organics (rootlet, woody debris), moist	0.00					
2		SANDY CLAYEY SILT (DIAMICTON) soft, dark brown (10 YR 3/3), fine grained sand, trace coarse grained sand, trace organics (rootlets), moist deposit (0.05 m) of coarse grained sand at 0.46 m	252.32 0.27					210 mm Diameter Borehole
1		SAND loose, brown (10YR 5/3), fine and medium grained sand, trace coarse grained gravel, trace fine grained gravel, reverse grading (coarsening upwards), moist colour transition to light olive brown (2.5Y 5/4) at 1.02 m	251.84 0.76	1	CC	52" 90%		Schedule 40 PVC Riser Bentonite Chips 0 to 2.2 m
2		deposit (0.55 m) of greyish brown (10YR 5/2 to 2.5Y 5/2), fine grained sand, little silt, horizontal black laminations at 1.47 m becoming compact to dense at 1.69 m						
3		SAND to SILTY SAND dense, light brownish grey (2.5Y 6/2), fine grained sand, little to some fine to coarse grained subrounded gravel, wet transition to very dense, little silt, with horizontal laminations (2-3 mm) of clayey silt at 3.23 m	249.68 2.92	2	CC	54.5" 96%		No. 2 Silica Sand 2.2 to 4.1 m
4		deposit (0.15 m) of well sorted coarse grained sand at 3.71 m						
3		SAND to SILTY SAND dense, light brownish grey (2.5Y 6/2), fine grained sand, little to some fine to coarse grained subrounded gravel, wet transition to very dense, little silt, with horizontal laminations (2-3 mm) of clayey silt at 3.23 m	249.68 2.92	3	CC	48" 100%		No. 10 Slot Schedule 40 51 mm Diameter PVC Well Screen 2.5 to 4.0 m
4		SILTY SAND (DIAMICTON) very dense, greyish brown (2.5Y 5/2), fine grained sand, little to some fine and coarse grained gravel, moist	248.67 3.93 248.46					
4		End of Borehole	4.14					

Screen Interval: 2.48 - 4.01 m BGS  
 Sand Pack Interval: 2.18 - 4.14 m BGS  
 Well Seal Interval: 0.00 - 2.18 m BGS

**Notes:**  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 CC - continuous core sample  
 n/a - not available

Groundsurface elevation approximated from Hydro One  
 Topography (25 m contours)  
 Lithologic descriptions were confirmed and updated based  
 on grain size analysis results from surficial samples at  
 MW5-14D

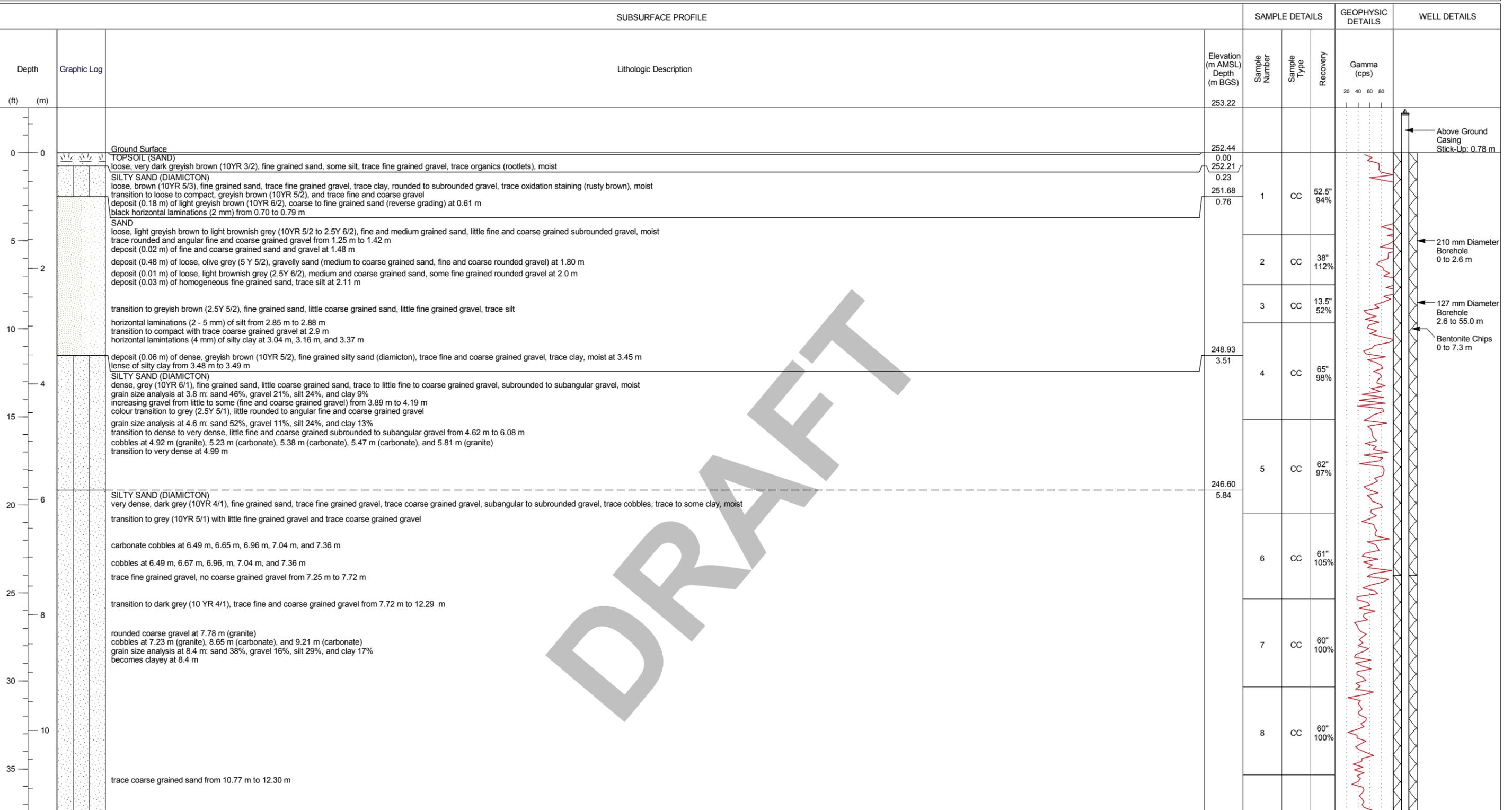


# Monitoring Well: MW5-14D

**Project:** Clarington TS Natural Heritage  
**Client:** Hydro One Networks Inc  
**Location:** Clarington, ON  
**Number:** 160900764

**Field Investigator:** N. Spina  
**Contractor:** Aardvark Drilling Inc  
**Drilling method:** Track Mount CME 75 108 mm ID Hollow Stem Auger / PQ  
**Date started/completed:** 25-Nov-2014 / 01-Dec-2014

**Ground surface elevation:** 252.44 m AMSL  
**Top of casing elevation:** 253.43 m AMSL  
**Easting:** 672901  
**Northing:** 4872453



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Screen Interval: 52.43 - 53.95 m BGS  
 Sand Pack Interval: 51.51 - 54.99 m BGS  
 Well Seal Interval: 0.00 - 51.66 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 CC - continuous core sample

MW5-14D installed on 01-Dec-2014  
 Geophysics completed by Lotowater Technical Services Inc. on 08-Dec-2014  
 Ground surface elevation obtained from Hydro One Topography (25 m contours)  
 Lithologic descriptions were confirmed and updated based on grain size analysis results

n/a - not available/applicable

Drawn By/Checked By: NS/JBG



# Monitoring Well: MW5-14D

**Project:** Clarington TS Natural Heritage  
**Client:** Hydro One Networks Inc  
**Location:** Clarington, ON  
**Number:** 160900764

**Field Investigator:** N. Spina  
**Contractor:** Aardvark Drilling Inc  
**Drilling method:** Track Mount CME 75 108 mm ID Hollow Stem Auger / PQ  
**Date started/completed:** 25-Nov-2014 / 01-Dec-2014

**Ground surface elevation:** 252.44 m AMSL  
**Top of casing elevation:** 253.43 m AMSL  
**Easting:** 672901  
**Northing:** 4872453

SUBSURFACE PROFILE				SAMPLE DETAILS			GEOPHYSIC DETAILS	WELL DETAILS
Depth (ft) (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Gamma (cps)	
12		carbonate cobbles at 11.06 m, 11.50 m, 11.58 m, 12.20 m SILTY SAND (DIAMICTON) very dense, dark grey (10YR 4/1), fine grained sand, trace fine grained gravel, trace coarse grained gravel, subangular to subrounded gravel, trace cobbles, trace to some clay, moist		9	CC	60" 100%		
40		trace fine grained gravel, no coarse grained gravel from 12.29 m to 13.82 m						
45		carbonate cobbles at 12.83 m and 13.11 m grain size analysis at 13.4 m: sand 39%, gravel 12%, silt 28%, and clay 21%		10	CC	60" 100%		
14		no cobbles, trace to some clay from 13.82 m to 15.34 m						
50				11	CC	58.5" 98%		
16		carbonate cobbles at 15.71 m, 16.19 m, 16.44 m, and 10.49 m						
55				12	CC	58.5" 98%		
18		carbonate cobbles at 17.10 m, 17.23 m, 16.44 m, 17.38 m, 17.56 m, 18.03m, and 18.30 m						
60				13	CC	60" 100%		
65		cobbles at 18.46 m (granite), 18.91 m (granite), 19.12 m (carbonate), 19.20 m (carbonate), 19.76 m (carbonate)						
20		trace clay from 19.91 m to 21.44 m						
70		coarse grained carbonate gravel at 19.96 m carbonate cobbles at 20.15 m, 20.72 m, and 20.78 m						
22		trace medium and coarse grained sand from 21.44 m to 44.30 m trace clay from 21.44 to 22.96 m						
75				15	CC	59.5" 99%		
				16	CC	60" 100%		

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STANTEC BOREHOLE AND WELL - MASTER TX11 - 160900764\_BH LOGS.GPJ STANTEC - DATA TEMPLATE.GDT 8/19/15 NSPINA

Screen Interval: 52.43 - 53.95 m BGS  
 Sand Pack Interval: 51.51 - 54.99 m BGS  
 Well Seal Interval: 0.00 - 51.66 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 CC - continuous core sample

MW5-14D installed on 01-Dec-2014  
 Geophysics completed by Lotowater Technical Services Inc. on 08-Dec-2014  
 Ground surface elevation obtained from Hydro One Topography (25 m contours)  
 Lithologic descriptions were confirmed and updated based on grain size analysis results

n/a - not available/applicable



# Monitoring Well: MW5-14D

**Project:** Clarington TS Natural Heritage  
**Client:** Hydro One Networks Inc  
**Location:** Clarington, ON  
**Number:** 160900764

**Field Investigator:** N. Spina  
**Contractor:** Aardvark Drilling Inc  
**Drilling method:** Track Mount CME 75 108 mm ID Hollow Stem Auger / PQ  
**Date started/completed:** 25-Nov-2014 / 01-Dec-2014

**Ground surface elevation:** 252.44 m AMSL  
**Top of casing elevation:** 253.43 m AMSL  
**Easting:** 672901  
**Northing:** 4872453

SUBSURFACE PROFILE				SAMPLE DETAILS			GEOPHYSIC DETAILS		WELL DETAILS
Depth (ft) (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Gamma (cps)		
							20	40 60 80	
24		cobble at 24.13 m BGS (carbonate) SILTY SAND (DIAMICTON) very dense, dark grey (10YR 4/1), fine grained sand, trace fine grained gravel, trace coarse grained gravel, subangular to subrounded gravel, trace cobbles, trace to some clay, moist		17	CC	60" 100%			
80									
26		some clay at 25.0 m grain size analysis at 25.0 m: sand 37%, gravel 18%, silt 28%, and clay 17% carbonate cobbles at 24.77 m, 24.85 m, and 25.33 m		18	CC	58" 97%			
85									
28		coarse grained carbonate gravel at 28.04 m, 28.15 m, 28.39 m		19	CC	59.5" 99%			
90									
28				20	CC	59" 98%			
95									
30		cobbles at 29.30 m (granite), 30.31 m (conglomerate), 30.49 m (carbonate) coarse grained carbonate gravel at 30.57 m		21	CC	61" 102%			
100									
32		carbonate cobbles at 33.06 m, and 33.26 m		22	CC	60" 100%			
105									
34		trace clay from 33.63 m to 36.68 m		23	CC	60" 100%			
110									
34		granite boulder at 34.02 m (0.26 m) coarse grained carbonate gravel at 35.03 m carbonate cobble at 35.08 m		24	CC	61" 102%			
115									

DRAFT

Bentonite Grout  
7.3 to 48.5 m

STANTEC BOREHOLE AND WELL - MASTER TX11 - 160900764\_BH LOGS.GPJ STANTEC - DATA TEMPLATE.GDT 8/19/15 NSPINA

Screen Interval: 52.43 - 53.95 m BGS  
 Sand Pack Interval: 51.51 - 54.99 m BGS  
 Well Seal Interval: 0.00 - 51.66 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 CC - continuous core sample

MW5-14D installed on 01-Dec-2014  
 Geophysics completed by Lotowater Technical Services Inc. on 08-Dec-2014  
 Ground surface elevation obtained from Hydro One Topography (25 m contours)  
 Lithologic descriptions were confirmed and updated based on grain size analysis results

n/a - not available/applicable

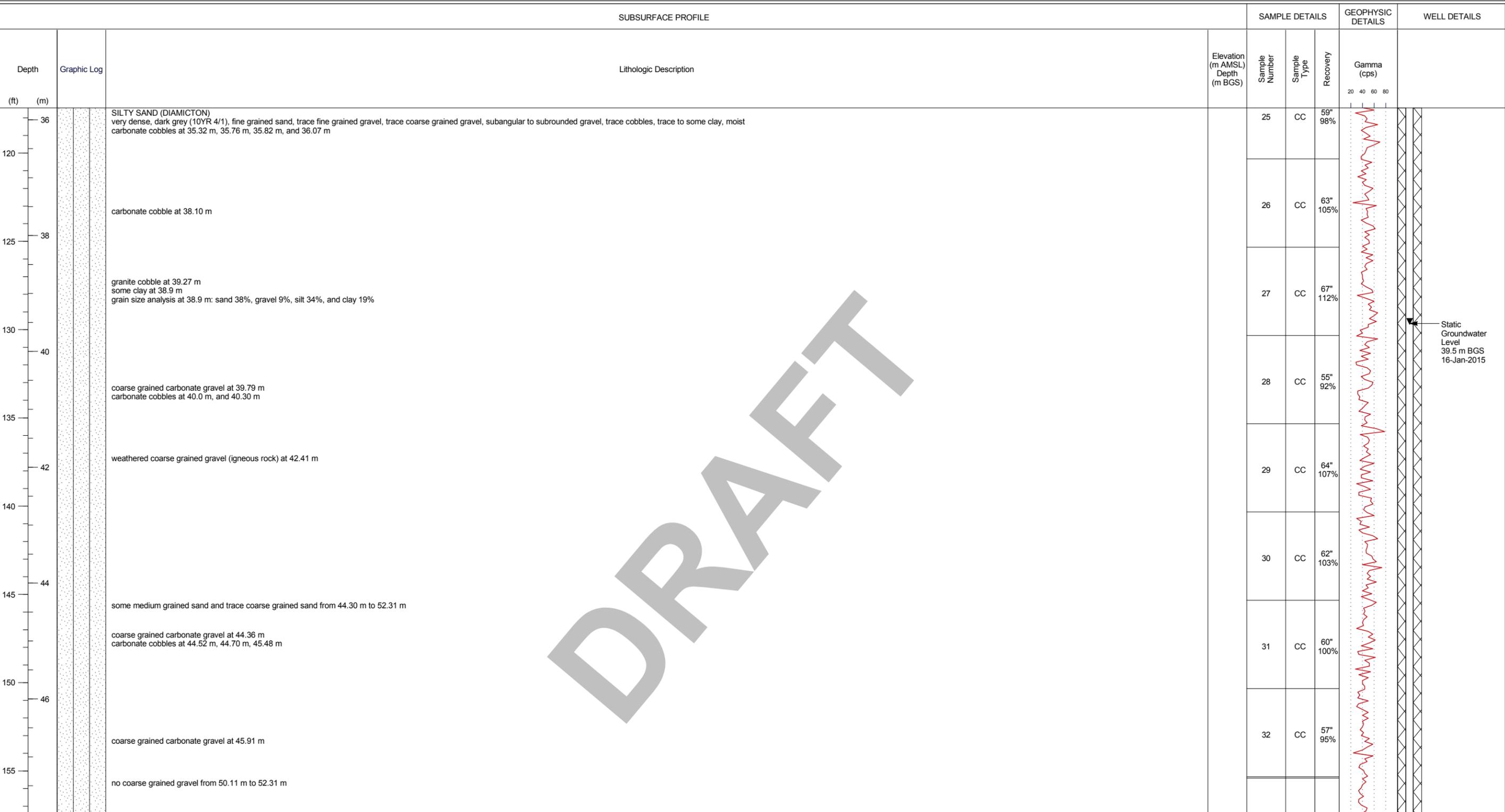


# Monitoring Well: MW5-14D

**Project:** Clarington TS Natural Heritage  
**Client:** Hydro One Networks Inc  
**Location:** Clarington, ON  
**Number:** 160900764

**Field Investigator:** N. Spina  
**Contractor:** Aardvark Drilling Inc  
**Drilling method:** Track Mount CME 75 108 mm ID Hollow Stem Auger / PQ  
**Date started/completed:** 25-Nov-2014 / 01-Dec-2014

**Ground surface elevation:** 252.44 m AMSL  
**Top of casing elevation:** 253.43 m AMSL  
**Easting:** 672901  
**Northing:** 4872453



DRAFT

Screen Interval: 52.43 - 53.95 m BGS  
 Sand Pack Interval: 51.51 - 54.99 m BGS  
 Well Seal Interval: 0.00 - 51.66 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 CC - continuous core sample

MW5-14D installed on 01-Dec-2014  
 Geophysics completed by Lotowater Technical Services Inc. on 08-Dec-2014  
 Ground surface elevation obtained from Hydro One Topography (25 m contours)  
 Lithologic descriptions were confirmed and updated based on grain size analysis results f

n/a - not available/applicable



# Monitoring Well: MW5-14D

**Project:** Clarington TS Natural Heritage  
**Client:** Hydro One Networks Inc  
**Location:** Clarington, ON  
**Number:** 160900764

**Field Investigator:** N. Spina  
**Contractor:** Aardvark Drilling Inc  
**Drilling method:** Track Mount CME 75 108 mm ID Hollow Stem Auger / PQ  
**Date started/completed:** 25-Nov-2014 / 01-Dec-2014

**Ground surface elevation:** 252.44 m AMSL  
**Top of casing elevation:** 253.43 m AMSL  
**Easting:** 672901  
**Northing:** 4872453

SUBSURFACE PROFILE				SAMPLE DETAILS			GEOPHYSIC DETAILS		WELL DETAILS	
Depth (ft) (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Gamma (cps)			
							20	40 60 80		
160		SILTY SAND (DIAMICTON) very dense, dark grey (10YR 4/1), fine grained sand, trace fine grained gravel, trace coarse grained gravel, subangular to subrounded gravel, trace cobbles, trace to some clay, moist  trace to some clay at 49.6 m grain size analysis at 49.6 m: sand 60%, gravel 1%, silt 23%, and clay 16%	200.13	33	CC	65" 107%				
165				34	CC	53" 88%				
170				35	CC	60" 100%				
175		SAND to SILTY SAND compact, grey (10 YR 5/1), medium grained sand, some fine sand, trace silt, homogeneous, wet, to compact, grey (10 YR 5/1), fine to medium grained silty sand, homogeneous, wet grain size analysis at 52.6 m: sand 63%, gravel 0%, silt 22%, and clay 15%  deposit (0.01 m) of coarse grained sand at 52.98 m deposit (0.09 m) of fine grained silty sand at 53.11 m black horizontal laminations (~2 mm) and deposits of coarse sand (0.01 m) from 53.11 m to 53.20 m	52.31	36	CC	61" 102%				
180				37	CC	58.5" 98%				
185		SILTY SAND very dense, grey (10 YR 5/1), fine grained sand, clay laminations, moist clay laminations at 54.05 m (10 mm), 54.11 m (10 mm), and 54.14 m (8 mm) deposit (0.23 m) of very dense, fine grained silty sand (diamict), trace fine grained gravel, trace coarse grained gravel, angular gravel, trace coarse grained sand, moist from 54.22 m to 54.45 m thin grey (10 YR 4/1) sandy silt lamination at 54.36 m BGS slightly angled deposit of interbedded medium sand and clay layers (0.05m) from 54.45 m to 54.99 m	53.98							
190				End of Borehole		54.99				
195										
60										

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STANTEC BOREHOLE AND WELL - MASTER TX11 - 160900764\_BH LOGS.GPJ STANTEC - DATA TEMPLATE.GDT 8/19/15 NSPINA

Screen Interval: 52.43 - 53.95 m BGS  
 Sand Pack Interval: 51.51 - 54.99 m BGS  
 Well Seal Interval: 0.00 - 51.66 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 CC - continuous core sample

n/a - not available/applicable

MW5-14D installed on 01-Dec-2014  
 Geophysics completed by Lotowater Technical Services Inc. on 08-Dec-2014  
 Ground surface elevation obtained from Hydro One Topography (25 m contours)  
 Lithologic descriptions were confirmed and updated based on grain size analysis results



# Monitoring Well: MW5-14D (2)

Project: Clarington TS Natural Heritage  
 Client: Hydro One Networks Inc  
 Location: Clarington, ON  
 Number: 160900764

Field Investigator: N. Spina  
 Contractor: Aardvark Drilling Inc  
 Drilling method: Track Mount CME 75 101.6 mm ID PQ  
 Date started/completed: 02-Dec-2014 / 18-Dec-2014

Ground surface elevation: 252.44 m AMSL  
 Top of casing elevation: 253.52 m AMSL  
 Easting: 672901  
 Northing: 4872453

SUBSURFACE PROFILE			SAMPLE DETAILS						GEOPHYSIC DETAILS		WELL DETAILS	
Depth (ft)	Depth (m)	Lithologic Description	Elevation (m AMSL)	Sample Number	Sample Type	Recovery	SCR	RQD	Fractures per 1.52m	Gamma (cps)	Resistivity (Ohm.m)	
			252.75									
0	0	Ground Surface	252.44									← Above Ground Casing Stick-Up = 1.08 m
		TOPSOIL (SAND) loose, very dark greyish brown (10YR 3/2), fine grained sand, some silt, trace fine grained gravel, trace organics (rootlets), moist	0.00									
		SILTY SAND (DIAMICTON) loose, brown (10YR 5/3), fine grained sand, trace fine grained gravel, trace clay, rounded to subrounded gravel, trace oxidation staining (rusty brown), moist	252.21									
		transition to loose to compact, greyish brown (10YR 5/2), and trace fine and coarse gravel	0.23									
		deposit (0.18 m) of light greyish brown (10YR 6/2), coarse to fine grained sand (reverse grading) at 0.61 m	251.68									
		black horizontal laminations (2 mm) from 0.70 to 0.79 m	0.76									
		SAND loose, light greyish brown to light brownish grey (10YR 5/2 to 2.5Y 6/2), fine and medium grained sand, little fine and coarse grained subrounded gravel, moist										
		trace rounded and angular fine and coarse grained gravel from 1.25 m to 1.42 m										
		deposit (0.02 m) of fine and coarse grained sand and gravel at 1.48 m										
		deposit (0.48 m) of loose, olive grey (5 Y 5/2), gravelly sand (medium to coarse grained sand, fine and coarse rounded gravel) at 1.80 m										
		deposit (0.01 m) of loose, light brownish grey (2.5Y 6/2), medium and coarse grained sand, some fine grained rounded gravel at 2.0 m										
		deposit (0.03 m) of homogeneous fine grained sand, trace silt at 2.11 m										
		transition to greyish brown (2.5Y 5/2), fine grained sand, little coarse grained sand, little fine grained gravel, trace silt										
		horizontal laminations (2 - 5 mm) of silt from 2.85 m to 2.88 m										
		transition to compact with trace coarse grained gravel at 2.9 m										
		horizontal laminations (4 mm) of silty clay at 3.04 m, 3.16 m, and 3.37 m										
		deposit (0.06 m) of dense, greyish brown (10YR 5/2), fine grained silty sand (diamicton), trace fine and coarse grained gravel, trace clay, moist at 3.45 m	248.93									
		lense of silty clay from 3.48 m to 3.49 m	3.51									
		SILTY SAND (DIAMICTON) dense, grey (10YR 6/1), fine grained sand, little coarse grained sand, trace to little fine to coarse grained gravel, subrounded to subangular gravel, moist										
		increasing gravel from little to some (fine and coarse grained gravel) from 3.89 m to 4.19 m										
		colour transition to grey (2.5Y 5/1), little rounded to angular fine and coarse grained gravel										
		transition to dense to very dense, little fine and coarse grained subrounded to subangular gravel from 4.62 m to 6.08 m										
		cobbles at 4.92 m (granite), 5.23 m (carbonate), 5.38 m (carbonate), 5.47 m (carbonate), and 5.81 m (granite)										
		transition to very dense at 4.99 m										
		SILTY SAND (DIAMICTON) very dense, dark grey (10YR 4/1), fine grained sand, trace fine grained gravel, trace coarse grained gravel, subangular to subrounded gravel, trace cobbles, trace to some clay, moist	246.60									
		transition to grey (10YR 5/1) with little fine grained gravel and trace coarse grained gravel	5.84									
		carbonate cobbles at 6.49 m, 6.65 m, 6.96 m, 7.04 m, and 7.36 m										
		cobbles at 6.49 m, 6.67 m, 6.96 m, 7.04 m, and 7.36 m										
		trace fine grained gravel, no coarse grained gravel from 7.25 m to 7.72 m										
		transition to dark grey (10 YR 4/1), trace fine and coarse grained gravel from 7.72 m to 12.29 m										
		rounded coarse gravel at 7.78 m (granite)										
		cobbles at 7.23 m (granite), 8.65 m (carbonate), and 9.21 m (carbonate)										
		becomes clayey at 8.4 m										
		trace coarse grained sand from 10.77 m to 12.30 m										
		carbonate cobbles at 11.06 m, 11.50 m, 11.58 m, 12.20 m										

DRAFT

Screen Interval: 112.01 - 113.54 m BGS  
 Sand Pack Interval: 111.25 - 115.37 m BGS  
 Well Seal Interval: 0.00 - 111.25 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 CC - continuous core sample  
 n/a - not available/applicable

MW5-14D(2) well installed from 19-Dec-2014 to 23-Dec-2014  
 Overburden stratigraphy from 0 m to 49.7 m BGS obtained from MW5-14D  
 Lithologic descriptions were confirmed and updated based on grain size analysis results

Ground surface elevation obtained from Hydro One Topography (25 m contours)  
 Geophysics completed by Lotowater Technical Services Inc. on 08-Dec-2014

Stantec

Drawn By/Checked By: NS/JBG

Sheet 1 of 11

# Monitoring Well: MW5-14D (2)

**Project:** Clarington TS Natural Heritage  
**Client:** Hydro One Networks Inc  
**Location:** Clarington, ON  
**Number:** 160900764

**Field Investigator:** N. Spina  
**Contractor:** Aardvark Drilling Inc  
**Drilling method:** Track Mount CME 75 101.6 mm ID PQ  
**Date started/completed:** 02-Dec-2014 / 18-Dec-2014

**Ground surface elevation:** 252.44 m AMSL  
**Top of casing elevation:** 253.52 m AMSL  
**Easting:** 672901  
**Northing:** 4872453

SUBSURFACE PROFILE			SAMPLE DETAILS						GEOPHYSIC DETAILS		WELL DETAILS								
Depth (ft) (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	SCR	ROD	Fractures per 1.52m	Gamma (cps)			Resistivity (Ohm.m)						
										20	40	60	80	600	1200	1800	2400		
12		SILTY SAND (DIAMICTON) very dense, dark grey (10YR 4/1), fine grained sand, trace fine grained gravel, trace coarse grained gravel, subangular to subrounded gravel, trace cobbles, trace to some clay, moist																	
40		trace fine grained gravel, no coarse grained gravel from 12.29 m to 13.82 m																	
		carbonate cobbles at 12.83 m and 13.11 m																	
45		no cobbles, trace to some clay from 13.82 m to 15.34 m																	
14																			
50																			
16		carbonate cobbles at 15.71 m, 16.19 m, 16.44 m, and 10.49 m																	
55																			
18		carbonate cobbles at 17.10 m, 17.23 m, 16.44 m, 17.38 m, 17.56 m, 18.03m, and 18.30 m																	
60																			
18																			
65		cobbles at 18.46 m (granite), 18.91 m (granite), 19.12 m (carbonate), 19.20 m (carbonate), 19.76 m (carbonate)																	
20		trace clay from 19.91 m to 21.44 m																	
70		coarse grained carbonate gravel at 19.96 m carbonate cobbles at 20.15 m, 20.72 m, and 20.78 m																	
22		trace medium and coarse grained sand from 21.44 m to 44.30 m trace clay from 21.44 to 22.96 m																	
75																			
24		cobble at 24.13 m BGS (carbonate)																	

DRAFT

← 127 mm Diameter Borehole 50.0 to 129.5 m

← Schedule 80 PVC Riser

STANTEC BOREHOLE AND WELL - MASTER TX11 - 160900764 - BH LOGS.GPJ STANTEC - DATA TEMPLATE.GDT\_8/19/15 NSPINA

Screen Interval: 112.01 - 113.54 m BGS  
 Sand Pack Interval: 111.25 - 115.37 m BGS  
 Well Seal Interval: 0.00 - 111.25 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 CC - continuous core sample

n/a - not available/applicable

MW5-14D(2) well installed from 19-Dec-2014 to 23-Dec-2014  
 Overburden stratigraphy from 0 m to 49.7 m BGS obtained from MW5-14D  
 Lithologic descriptions were confirmed and updated based on grain size analysis results

Ground surface elevation obtained from Hydro One Topography (25 m contours)  
 Geophysics completed by Lotwater Technical Services Inc. on 08-Dec-2014



# Monitoring Well: MW5-14D (2)

**Project:** Clarington TS Natural Heritage  
**Client:** Hydro One Networks Inc  
**Location:** Clarington, ON  
**Number:** 160900764

**Field Investigator:** N. Spina  
**Contractor:** Aardvark Drilling Inc  
**Drilling method:** Track Mount CME 75 101.6 mm ID PQ  
**Date started/completed:** 02-Dec-2014 / 18-Dec-2014

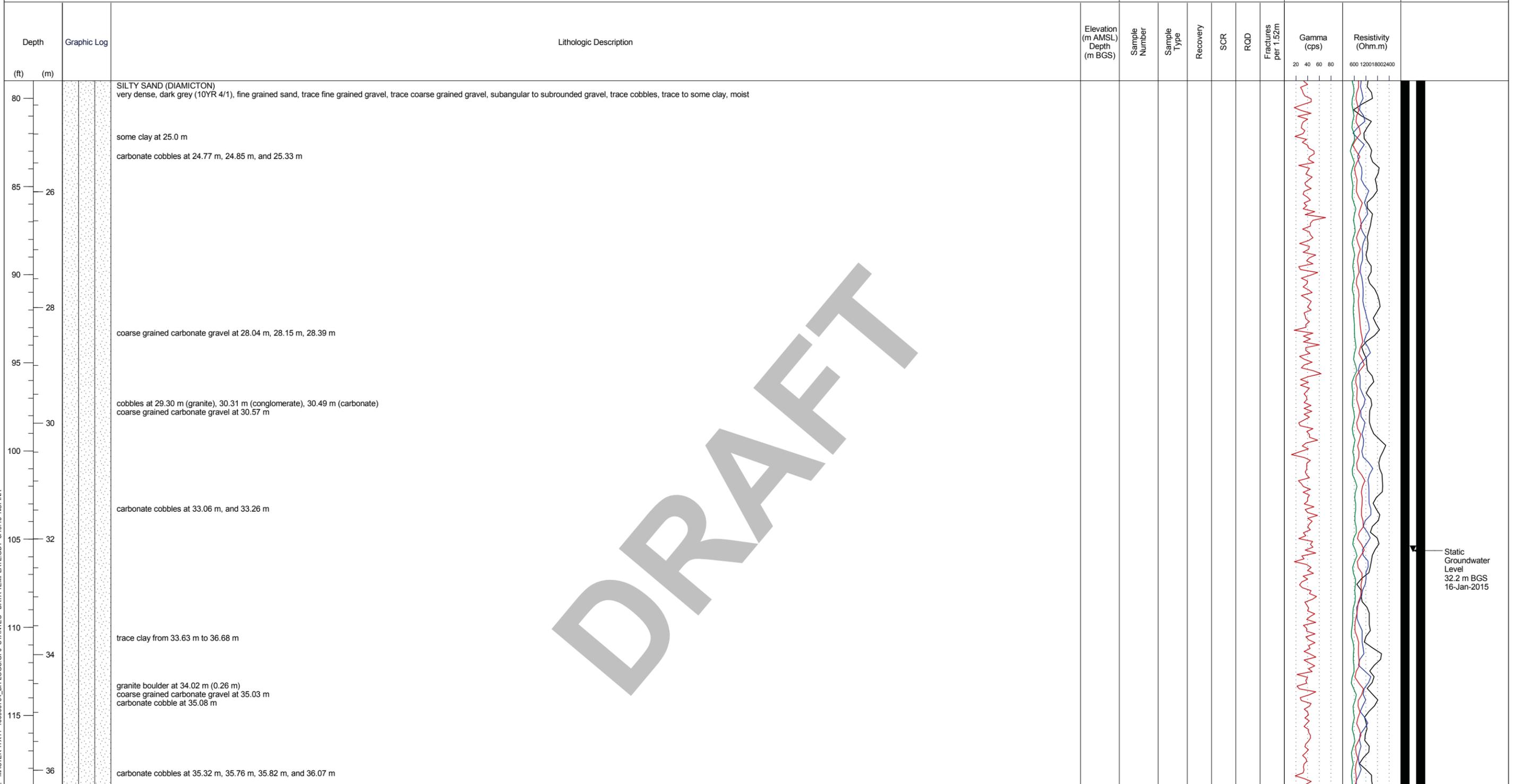
**Ground surface elevation:** 252.44 m AMSL  
**Top of casing elevation:** 253.52 m AMSL  
**Easting:** 672901  
**Northing:** 4872453

## SUBSURFACE PROFILE

## SAMPLE DETAILS

## GEOPHYSIC DETAILS

## WELL DETAILS



DRAFT

Static Groundwater Level  
32.2 m BGS  
16-Jan-2015

Screen Interval: 112.01 - 113.54 m BGS  
 Sand Pack Interval: 111.25 - 115.37 m BGS  
 Well Seal Interval: 0.00 - 111.25 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 CC - continuous core sample

MW5-14D(2) well installed from 19-Dec-2014 to 23-Dec-2014  
 Overburden stratigraphy from 0 m to 49.7 m BGS obtained from MW5-14D  
 Lithologic descriptions were confirmed and updated based on grain size analysis results

Ground surface elevation obtained from Hydro One Topography (25 m contours)  
 Geophysics completed by Lotowater Technical Services Inc. on 08-Dec-2014

n/a - not available/applicable

Drawn By/Checked By: NS/JBG



# Monitoring Well: MW5-14D (2)

**Project:** Clarington TS Natural Heritage  
**Client:** Hydro One Networks Inc  
**Location:** Clarington, ON  
**Number:** 160900764

**Field Investigator:** N. Spina  
**Contractor:** Aardvark Drilling Inc  
**Drilling method:** Track Mount CME 75 101.6 mm ID PQ  
**Date started/completed:** 02-Dec-2014 / 18-Dec-2014

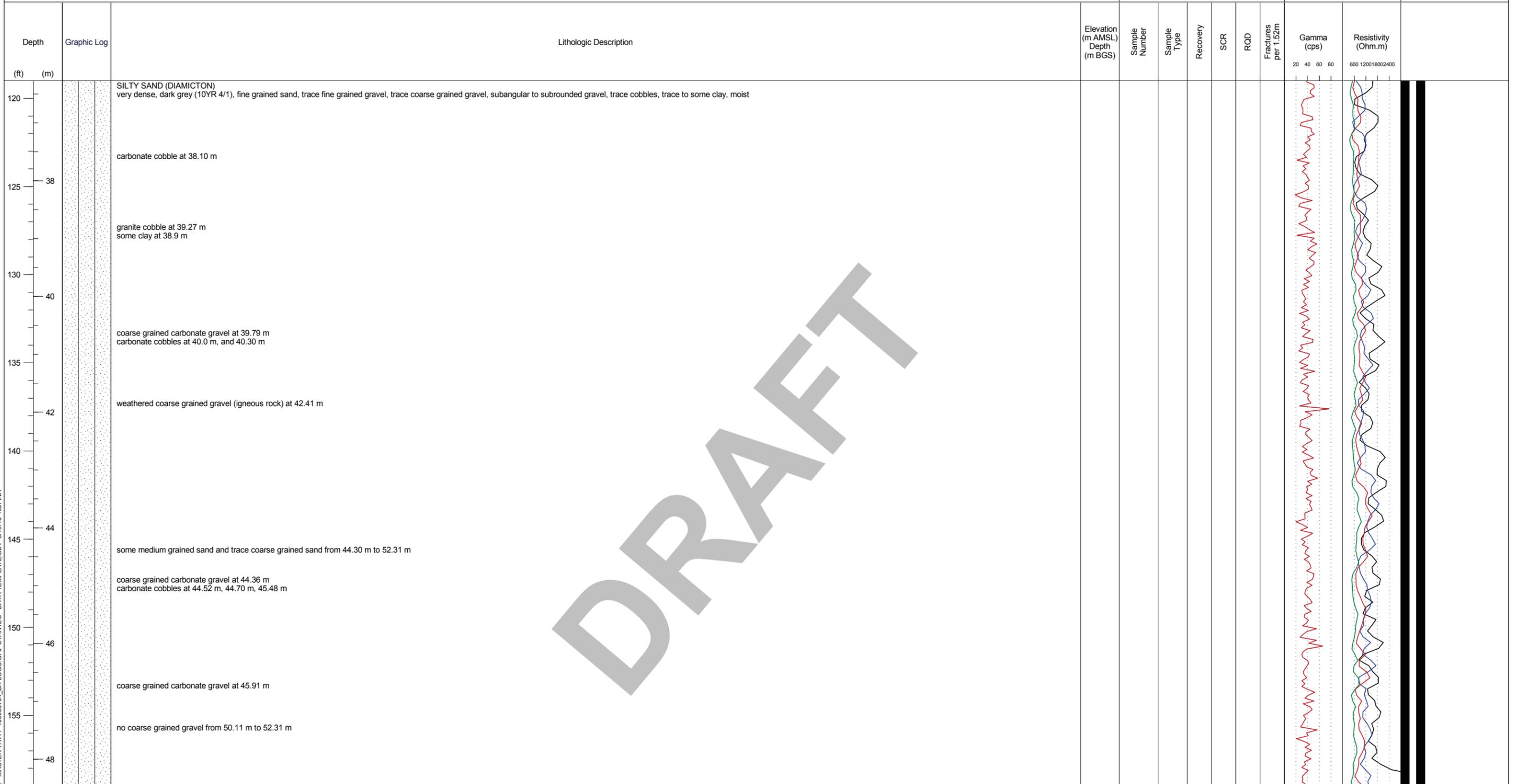
**Ground surface elevation:** 252.44 m AMSL  
**Top of casing elevation:** 253.52 m AMSL  
**Easting:** 672901  
**Northing:** 4872453

## SUBSURFACE PROFILE

## SAMPLE DETAILS

## GEOPHYSIC DETAILS

## WELL DETAILS



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Screen Interval: 112.01 - 113.54 m BGS  
 Sand Pack Interval: 111.25 - 115.37 m BGS  
 Well Seal Interval: 0.00 - 111.25 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 CC - continuous core sample

MW5-14D(2) well installed from 19-Dec-2014 to 23-Dec-2014  
 Overburden stratigraphy from 0 m to 49.7 m BGS obtained from MW5-14D  
 Lithologic descriptions were confirmed and updated based on grain size analysis results

Ground surface elevation obtained from Hydro One Topography (25 m contours)  
 Geophysics completed by Lotowater Technical Services Inc. on 08-Dec-2014

n/a - not available/applicable

Drawn By/Checked By: NS/JBG



# Monitoring Well: MW5-14D (2)

**Project:** Clarington TS Natural Heritage  
**Client:** Hydro One Networks Inc  
**Location:** Clarington, ON  
**Number:** 160900764

**Field Investigator:** N. Spina  
**Contractor:** Aardvark Drilling Inc  
**Drilling method:** Track Mount CME 75 101.6 mm ID PQ  
**Date started/completed:** 02-Dec-2014 / 18-Dec-2014

**Ground surface elevation:** 252.44 m AMSL  
**Top of casing elevation:** 253.52 m AMSL  
**Easting:** 672901  
**Northing:** 4872453

## SUBSURFACE PROFILE

## SAMPLE DETAILS

## GEOPHYSIC DETAILS

## WELL DETAILS

Depth (ft) (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	SCR	ROD	Fractures per 1.52m	GEOPHYSIC DETAILS		WELL DETAILS
										Gamma (cps)	Resistivity (Ohm.m)	
160		SILTY SAND (DIAMICTON) very dense, dark grey (10YR 4/1), fine grained sand, trace fine grained gravel, trace coarse grained gravel, subangular to subrounded gravel, trace cobbles, trace to some clay, moist										
		trace to some clay at 49.6 m	202.66									
165		SILTY SAND (DIAMICTON) very dense, grey (10YR 5/1), fine and medium grained sand, trace fine gravel, subrounded gravel, moist	49.78	1	CC	27" 135%	n/a	n/a	n/a			
				2	CC	60" 100%	n/a	n/a	n/a			
170		transition to dense at 52.30 m slightly angular laminations (4 mm) of silt from 52.58 m to 52.61 m deposit (0.88 m thick) of compact, (10 YR 4/1), medium grained sand, little to trace silt, wet at 52.46 m grain size analysis at 52.6 m: sand 63%, gravel 0%, silt 22%, and clay 15%										
			199.10									
175		SAND (DIAMICTON) dense, dark grey (10 YR 4/1), fine grained sand, some silt, trace medium grained sand, trace fine grained gravel, trace clay, moist cobbles at 53.48 m (carbonate) and 53.67 m (granite) horizontal lamination (3 mm) of silt at 53.58 m horizontal layer (0.04 m) of very dense, brown (10YR 5/3), silty clay, little fine grained gravel, moist at 53.88 m deposit (0.37 m) of very dense, fine grained sand, some silt, moist at 53.88 m horizontal layers (10 mm) of clay at 54.10 m and 54.20 m trace coarse grained, subrounded gravel from 53.67 m to 54.86 m trace coarse grained, subrounded gravel from 54.26 m to 55.21 m	53.34	4	CC	13" 103%	n/a	n/a	n/a			
				5	CC	44" 93%	n/a	n/a	n/a			
180		deposit (0.35 m) of very dense, dark grey (10 YR 4/1), fine and medium grained sand, some silt, trace fine grained gravel, moist at 55.21 m horizontal layers (26 mm) of clay with interbedded fine grained sand at 55.21 m, 55.28 m, 55.30 m, 55.41 m, and 55.59 m transition to very dense at 55.60 m										
				6	CC	56.5" 94%	n/a	n/a	n/a			
185		deposit (0.31 m) of loose to compact, dark grey (10YR 4/1), fine, medium, and coarse grained sand, well graded, little silt, trace fine gravel, wet at 57.20 m										
				7	CC	52" 87%	n/a	n/a	n/a			
190		colour transition to grey (10 YR 5/1) at 57.91 m										
				8	CC	61" 102%	n/a	n/a	n/a			
195												
				9	CC	60" 100%	n/a	n/a	n/a			
60		cobble (metamorphic rock) at 60.44 m										

DRAFT

Bentonite Grout  
21.9 to 95.1 m

Screen Interval: 112.01 - 113.54 m BGS  
 Sand Pack Interval: 111.25 - 115.37 m BGS  
 Well Seal Interval: 0.00 - 111.25 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 CC - continuous core sample

MW5-14D(2) well installed from 19-Dec-2014 to 23-Dec-2014  
 Overburden stratigraphy from 0 m to 49.7 m BGS obtained from MW5-14D  
 Lithologic descriptions were confirmed and updated based on grain size analysis results

Ground surface elevation obtained from Hydro One Topography (25 m contours)  
 Geophysics completed by Lotwater Technical Services Inc. on 08-Dec-2014

n/a - not available/applicable



STANTEC BOREHOLE AND WELL - MASTER TX11 - 160900764 - BH LOGS.GPJ STANTEC - DATA TEMPLATE.GDT 8/19/15 NSPINA

# Monitoring Well: MW5-14D (2)

Project: Clarington TS Natural Heritage  
 Client: Hydro One Networks Inc  
 Location: Clarington, ON  
 Number: 160900764

Field Investigator: N. Spina  
 Contractor: Aardvark Drilling Inc  
 Drilling method: Track Mount CME 75 101.6 mm ID PQ  
 Date started/completed: 02-Dec-2014 / 18-Dec-2014

Ground surface elevation: 252.44 m AMSL  
 Top of casing elevation: 253.52 m AMSL  
 Easting: 672901  
 Northing: 4872453

SUBSURFACE PROFILE				SAMPLE DETAILS						GEOPHYSIC DETAILS		WELL DETAILS			
Depth (ft) (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	SCR	ROD	Fractures per 1.52m	Gamma (cps)			Resistivity (Ohm.m)		
										20	40	60	80	600	1200
200		SAND (DIAMICTON) dense, dark grey (10 YR 4/1), fine grained sand, some silt, trace medium grained sand, trace fine grained gravel, trace clay, moist													
62		grain size analysis at 62.0 m : sand 60%, Gravel 1%, silt 30%, and clay 9%	190.44	10	CC	56" 93%	n/a	n/a	n/a						
205		SILTY SAND (DIAMICTON) loose to compact, grey (10 YR 5/1), fine grained sand, trace fine grained gravel, trace clay, wet, sulphurous odour trace coarse grained gravel from 62.48 m to 62.96 m horizontal laminations (5 mm) of clay with interbedded fine grained sand from 62.48 m to 62.56 m and 62.69 m to 62.70 m	62.00												
210		SAND (DIAMICTON) very dense, grey (10 YR 5/1), fine and medium grained sand, some silt, trace fine grained gravel, moist, sulphurous odour slightly angled layers of clay at 64.10 m (8 mm) and 64.25 m (35 mm) horizontal laminations (4 mm) of clay at 64.11 m and 64.39 m angled layer (40 mm) of clay at 64.63 m BGS deposit (0.24 m) of dense, grey (10 YR 5/1), fine grained sand, some silt, wet, sulphurous odour at 64.71 m becoming fine grained sand diamict (no medium grained sand) at 64.95 m horizontal layers (13 mm) of clay at 65.00 m, 65.06 m, 65.08 m, 65.16 m, 65.19 m, and 65.23 m	188.78	11	CC	54.5" 91%	n/a	n/a	n/a						
215		deposit (0.09 m) of silty sand, trace fine gravel with horizontal laminations (3 mm) of clay from 66.20 m to 66.29 m	63.66												
220		SILTY SAND dense, dark grey (10 YR 4/1), fine to medium grained sand, wet horizontal layer (0.09 m) of clay with interbedded fine grained sand deposit from 66.59 m to 66.68 m BGS	185.98	12	CC	53" 88%	n/a	n/a	n/a						
225		SAND very dense, dark grey (10 YR 4/1), fine and medium grained sand, normal and reverse grading sequences (0.09 m to 0.27 m thick), little silt, trace fine grained gravel, moist to wet, sulphurous odour, trace black horizontal laminations horizontal lense (18 mm) of clay at 68.17 m slightly angled and horizontal layers (14 mm to 23 mm) of clay at 67.21 m, 67.24 m, 67.48 m, 67.67 m, 67.85 m, and 67.91 m becomes grey (10 YR 5/1) at 68.58 m becomes silty sand from 68.92 m to 69.05 m horizontal layer (0.06 m) of greyish brown (10 YR 5/2) sandy silt from 69.05 m to 69.38 m	66.46	13	CC	49" 82%	n/a	n/a	n/a						
230		SAND very dense, dark grey (10 YR 4/1), fine and medium grained sand, normal and reverse grading sequences (0.09 m to 0.27 m thick), little silt, trace fine grained gravel, moist to wet, sulphurous odour, trace black horizontal laminations	185.39	14	CC	48.5" 81%	n/a	n/a	n/a						
235		SILTY SAND to SAND (DIAMICTON) very dense, grey (10 YR 5/1), fine grained sand, trace to little medium grained sand, trace fine grained gravel, trace coarse grained gravel, trace clay, moist to wet, sulphurous odour grain size analysis at 71.1 m : sand 50%, gravel 5%, silty 30%, and clay 15% cobbles at 71.13 m (igneous rock) and 71.57 m (carbonate) trace clay from 71.63 m to 72.44 m deposit (0.31 m) of dense, greyish brown (10 YR 5/2), medium grained sand, trace coarse grained sand, trace fine grained gravel, moist, sulphurous odour at 72.75 m	67.06	15	CC	57" 95%	n/a	n/a	n/a						
70			183.06	16	CC	59" 98%	n/a	n/a	n/a						
72			69.38	17	CC	56.5" 94%	n/a	n/a	n/a						

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Screen Interval: 112.01 - 113.54 m BGS  
 Sand Pack Interval: 111.25 - 115.37 m BGS  
 Well Seal Interval: 0.00 - 111.25 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 CC - continuous core sample  
 n/a - not available/applicable

MW5-14D(2) well installed from 19-Dec-2014 to 23-Dec-2014  
 Overburden stratigraphy from 0 m to 49.7 m BGS obtained from MW5-14D  
 Lithologic descriptions were confirmed and updated based on grain size analysis results

Ground surface elevation obtained from Hydro One Topography (25 m contours)  
 Geophysics completed by Lotwater Technical Services Inc. on 08-Dec-2014



# Monitoring Well: MW5-14D (2)

Project: Clarington TS Natural Heritage  
 Client: Hydro One Networks Inc  
 Location: Clarington, ON  
 Number: 160900764

Field Investigator: N. Spina  
 Contractor: Aardvark Drilling Inc  
 Drilling method: Track Mount CME 75 101.6 mm ID PQ  
 Date started/completed: 02-Dec-2014 / 18-Dec-2014

Ground surface elevation: 252.44 m AMSL  
 Top of casing elevation: 253.52 m AMSL  
 Easting: 672901  
 Northing: 4872453

## SUBSURFACE PROFILE

Depth (ft) (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	SAMPLE DETAILS						GEOPHYSIC DETAILS		WELL DETAILS
				Sample Number	Sample Type	Recovery	SCR	RQD	Fractures per 1.52m	Gamma (cps)	Resistivity (Ohm.m)	
240		SILTY SAND to SAND (DIAMICTON) very dense, grey (10 YR 5/1), fine grained sand, trace to little medium grained sand, trace fine grained gravel, trace coarse grained gravel, trace clay, moist to wet, sulphurous odour deposit (0.19 m) of well sorted, dark greyish brown (10YR 4/2), fine grained sand at 73.19 m										
74				18	CC	56" 93%	n/a	n/a	n/a			
245		deposit (0.28 m) of well graded, dark greyish brown (10YR 4/2), fine to medium to coarse grained sand at 74.68 m										
76		deposit (0.13 m) of well graded (reverse grading), dark greyish brown (10 YR 4/2), coarse to medium grained sand, little silt, interbed at 75.59 m carbonate boulder at 75.72 m		19	CC	49" 82%	n/a	n/a	n/a			
250		deposit (0.17 m) of well graded, fine to coarse grained sand, trace fine gravel, with silty clay laminations at 76.38 m	175.75									
255		SAND compact to dense, greyish brown (10 YR 5/2), coarse grained sand, trace to little fine grained gravel, moist, sulphurous odour	76.69	20	CC	34.5" 58%	n/a	n/a	n/a			
78		SAND compact to dense, greyish brown (10 YR 5/2), fine and medium grained sand, black horizontal laminations (1 - 2 mm), wet, sulphurous odour horizontal layer (0.50 m) of silt, little clay at 77.72 m grain size analysis at 78.0 m : sand 6%, gravel 0%, silt 81%, and clay 13%	174.72									
260		deposit (0.04 m) of coarse sand at 79.45 m	77.72	21	CC	48.5" 81%	n/a	n/a	n/a			
80				22	CC	54.5" 91%	n/a	n/a	n/a			
265		deposit (0.19 m) of coarse grained sand at 80.88 m										
82		horizontal layer (0.03 m) of grey (10 YR 5/1), clayey silt at 81.52 m		23	CC	48" 80%	n/a	n/a	n/a			
270												
84		grain size analysis at 83.1 m : sand 83%, gravel 0%, silt 14%, and clay 3%		24	CC	60" 100%	n/a	n/a	n/a			
275		deposit (0.13 m) of coarse sand at 85.56 m transition to dense at 83.82 m transition to medium and coarse grained sand from 81.10 m to 84.18 m										
280		transition to fine, medium, and coarse grained sand from 84.85 m to 285.34 m		25	CC	48" 80%	n/a	n/a	n/a			

DRAFT

Screen Interval: 112.01 - 113.54 m BGS  
 Sand Pack Interval: 111.25 - 115.37 m BGS  
 Well Seal Interval: 0.00 - 111.25 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 CC - continuous core sample  
 n/a - not available/applicable

MW5-14D(2) well installed from 19-Dec-2014 to 23-Dec-2014  
 Overburden stratigraphy from 0 m to 49.7 m BGS obtained from MW5-14D  
 Ground surface elevation obtained from Hydro One Topography (25 m contours)  
 Geophysics completed by Lotwater Technical Services Inc. on December 8, 2014

Drawn By/Checked By: NS/JBG



# Monitoring Well: MW5-14D (2)

Project: Clarington TS Natural Heritage  
 Client: Hydro One Networks Inc  
 Location: Clarington, ON  
 Number: 160900764

Field Investigator: N. Spina  
 Contractor: Aardvark Drilling Inc  
 Drilling method: Track Mount CME 75 101.6 mm ID PQ  
 Date started/completed: 02-Dec-2014 / 18-Dec-2014

Ground surface elevation: 252.44 m AMSL  
 Top of casing elevation: 253.52 m AMSL  
 Easting: 672901  
 Northing: 4872453

## SUBSURFACE PROFILE

## SAMPLE DETAILS

## GEOPHYSIC DETAILS

## WELL DETAILS

Depth (ft) (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	SCR	ROD	Fractures per 1.52m	Gamma (cps)			Resistivity (Ohm.m)			
										20	40	60	80	600	1200	1800
280		SAND compact to dense, greyish brown (10 YR 5/2), fine and medium grained sand, black horizontal laminations (1 - 2 mm), wet, sulphurous odour transition to compact coarse grained sand, some medium grained sand from 85.34 m to 85.94 m horizontal lenses (6 mm) of clay from 85.53 m to 85.58 m														
86		deposit (0.07 m) of fine grained sand, little silt, with deformed black laminations at 85.94 m	166.33	26	CC	53" 88%	n/a	n/a	n/a							
285		SILT and SAND interbedded sequences (0.24 - 0.76 m) of very dense, grey (5Y 5/1) silt, little to some fine grained sand and very dense, dark grey (2.5 Y 4/1), fine grained sand, some silt, moist, sulphurous odour, trace black horizontal laminations (2 mm) grain size analysis at 86.4 m : sand 13%, gravel 0%, silt 80%, and clay 7%	86.11													
88		becomes fine and medium grained sand from 87.62 m to 87.86 m		27	CC	55" 92%	n/a	n/a	n/a							
290		SAND to SILTY SAND very dense, grey (5Y 5/1), fine grained sand, some silt, moist, sulphurous odour to very dense, grey (5Y 5/1), fine grained silty sand, moist, sulphurous odour deposit (0.23 m) of silty fine grained sand, trace horizontal black laminations (1 mm) at 88.83 m	164.05 88.39	28	CC	61" 102%	n/a	n/a	n/a							
295		horizontal, black laminations (1 - 2 mm) from 89.92 m to 91.44 m grain size analysis at 90.7 m : sand 72%, gravel 0%, silt 26%, and clay 2%		29	CC	58" 97%	n/a	n/a	n/a							
300		deposits (30 mm) of medium grained sand from 92.0 m to 92.10 m	160.30	30	CC	58.5" 98%	n/a	n/a	n/a							
92		SILTY SAND very dense, grey (5Y 5/1), fine grained sand, homogeneous, moist, sulphurous odour, black horizontal laminations (2 mm), horizontal silt laminations (2 mm) transition to dense to compact, medium and coarse grained sand from 92.52 m to 93.67 m becomes very dense at 92.96 m	92.14													
305				31	CC	55" 92%	n/a	n/a	n/a							
94		SANDY SILT to SILT very dense, grey (5Y 5/1), fine grained sand, homogenous, trace clay, moist, sulphurous odour	158.44 94.01													
310		SILTY SAND and SAND interbedded sequences of very dense, grey to dark grey (5Y 5/1 to 5Y 4/1), fine grained silty sand and very dense, dark grey (2.5 Y 4/1), fine grained sand, well sorted, moist, sulphurous odour little medium grained sand from 94.89 m to 95.48 m	157.95 94.49	32	CC	55" 92%	n/a	n/a	n/a							
315		medium to coarse grained sand laminations and thin black horizontal laminations from 96.36 m to 96.70 m grain size analysis at 96.8 m : sand 82%, gravel 0%, silt 16%, and clay 2% transition to medium and coarse grained sand from 96.83 m to 97.11 m	155.33	33	CC	58" 97%	n/a	n/a	n/a							

STANTEC BOREHOLE AND WELL - MASTER TX11 - 160900764\_BH LOGS.GPJ STANTEC - DATA TEMPLATE.GDT - 8/19/15 NSPINA

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Screen Interval: 112.01 - 113.54 m BGS  
 Sand Pack Interval: 111.25 - 115.37 m BGS  
 Well Seal Interval: 0.00 - 111.25 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 CC - continuous core sample  
 n/a - not available/applicable

MW5-14D(2) well installed from 19-Dec-2014 to 23-Dec-2014  
 Overburden stratigraphy from 0 m to 49.7 m BGS obtained from MW5-14D  
 Groundsurface elevation obtained from Hydro One Topography (25 m contours)  
 Geophysics completed by Lotowater Technical Services Inc. on December 8, 2014

Drawn By/Checked By: NS/JBG



# Monitoring Well: MW5-14D (2)

Project: Clarington TS Natural Heritage  
 Client: Hydro One Networks Inc  
 Location: Clarington, ON  
 Number: 160900764

Field Investigator: N. Spina  
 Contractor: Aardvark Drilling Inc  
 Drilling method: Track Mount CME 75 101.6 mm ID PQ  
 Date started/completed: 02-Dec-2014 / 18-Dec-2014

Ground surface elevation: 252.44 m AMSL  
 Top of casing elevation: 253.52 m AMSL  
 Easting: 672901  
 Northing: 4872453

## SUBSURFACE PROFILE

Depth (ft) (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	SAMPLE DETAILS						GEOPHYSIC DETAILS		WELL DETAILS
				Sample Number	Sample Type	Recovery	SCR	RQD	Fractures per 1.52m	Gamma (cps)	Resistivity (Ohm.m)	
320		SILTY CLAY to SILT very stiff, dark grey (2.5 Y 4/1), moist, sulphurous odour	97.11 154.91									
98		SAND very dense, dark grey (2.5 Y 4/1), fine grained sand, well sorted, trace silt, moist, sulphurous odour horizontal layers (0.018 m to 0.090 m) of stiff silt interbedded with fine grained sand from 97.88 m to 97.67 m  grading of silt layer to fine grained sand at 98.68 m	97.54	34	CC	59" 98%	n/a	n/a	n/a			
325		SAND very dense, dark grey (2.5 Y 4/1), fine grained sand, well sorted, some silt, thin horizontal black laminations, moist, sulphurous odour horizontal layer (0.04 m) of silt at 99.22 m  grades to medium sand at 99.66 m to 99.86 m transition to some silt, with deformed thin (1 - 2 mm) black laminations from 99.86 m to 100.58 m  horizontal layers (0.05 m) of silt at 100.17 m and 100.43 m grain size analysis at 100.3 m : sand 1%, gravel 0%, silt 93%, and clay 6%	153.38 99.06	35	CC	59.5" 99%	n/a	n/a	n/a			
330		SILTY SAND and SANDY SILT interbedded sequences (0.43 - 0.84 m) of very dense, grey (2.5 Y 5/1), fine grained silty sand and fine grained sandy silt, moist, sulphurous odour, thin horizontal clay laminations and horizontal black laminations  becomes wet and grey (5 Y 5/1) from 101.01 m to 101.30 m  lenses (2 mm diameter) of clay from 101.57 m to 102.11 m  lenses of clay at 102.33 m (0.09 m diameter) and 102.50 m (0.04 m diameter)	151.86 100.58	36	CC	60" 100%	n/a	n/a	n/a			
335		CLAYEY SILT stiff, grey (5 Y 5/1), blocky, wet, sulphurous odour	149.50 102.95	37	CC	55" 92%	n/a	n/a	n/a			
340		SILTY SAND very dense, dark grey (2.5 Y 4/1), fine grained sand, moist to wet, horizontal clayey silt interbeds (40 - 70 mm), horizontal clay laminations (2 mm), moist, sulphurous odour horizontal layer of clay (0.03 m) at 104.04 m	148.81 103.63									
345		CLAYEY SILT stiff, dark grey (5 Y 4/1) blocky, moist, sulphurous odour thin horizontal clay laminations and horizontal fine grained sand laminations from 104.32 m to 105.16 m  horizontal laminations (2 mm) of sandy silt at 106.54 m slightly angled laminations (3 - 6 mm) of clay from 105.16 m to 105.55 m	148.12 104.32	38	CC	54" 90%	n/a	n/a	n/a			
350		CLAY and SILT very hard, dark grey (5 Y 4/1), clay, homogeneous, dry to moist, sulphurous odour grain size analysis at 105.8 m : sand 0%, gravel 0%, silt 48%, and clay 52%  horizontal layer (0.10 m) of clayey silt at 106.68 m	146.89 105.55	39	CC	57" 95%	n/a	n/a	n/a			
355		SILTY CLAY (DIAMICTON) very hard, (10 YR 4/1), blocky, little fine grained gravel, little clay clasts, trace coarse grained sand, trace fine grained sand, trace coarse grained gravel, angular shale and carbonate gravel, moist, sulphurous odour	145.37 107.08	40	CC	59" 98%	n/a	n/a	n/a			
108				41	CC	69" 115%	n/a	n/a	n/a			

Peltonite Chips  
95.1 to 111.3 m

STANTEC BOREHOLE AND WELL - MASTER TX11 - 160900764\_BH LOGS.GPJ STANTEC - DATA TEMPLATE.GDT 8/19/15 NSPINA

DRAFT

Screen Interval: 112.01 - 113.54 m BGS  
 Sand Pack Interval: 111.25 - 115.37 m BGS  
 Well Seal Interval: 0.00 - 111.25 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 CC - continuous core sample  
 n/a - not available/applicable

MW5-14D(2) well installed from 19-Dec-2014 to 23-Dec-2014  
 Overburden stratigraphy from 0 m to 49.7 m BGS obtained from MW5-14D  
 Groundsurface elevation obtained from Hydro One Topography (25 m contours)  
 Geophysics completed by Lotowater Technical Services Inc. on December 8, 2014



Drawn By/Checked By: NS/JBG

# Monitoring Well: MW5-14D (2)

**Project:** Clarington TS Natural Heritage  
**Client:** Hydro One Networks Inc  
**Location:** Clarington, ON  
**Number:** 160900764

**Field Investigator:** N. Spina  
**Contractor:** Aardvark Drilling Inc  
**Drilling method:** Track Mount CME 75 101.6 mm ID PQ  
**Date started/completed:** 02-Dec-2014 / 18-Dec-2014

**Ground surface elevation:** 252.44 m AMSL  
**Top of casing elevation:** 253.52 m AMSL  
**Easting:** 672901  
**Northing:** 4872453

SUBSURFACE PROFILE			SAMPLE DETAILS						GEOPHYSIC DETAILS		WELL DETAILS					
Depth (ft) (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	SCR	ROD	Fractures per 1.52m	Gamma (cps)			Resistivity (Ohm.m)		Well Details	
										20	40	60	80	600		1200
360		CLAYEY SILT (DIAMICTON) and SANDY SILT interbedded sequences (0.19 - 0.48 m) of very hard, dark grey (10 YR 4/1), clayey silt (diamicton) and very dense, very dark greyish brown (10 YR 3/2), fine grained sandy silt, moist, sulphurous odour	142.71 109.73	42	CC	64" 107%	n/a	n/a	n/a							
365		compact, dark grey (2.5 Y 4/1), medium grained sand, wet, from 111.30 m to 111.34 m	141.10 111.34													
		CLAYEY SILT (DIAMICTON) very dense, dark greyish brown (10 YR 3/2), some fine grained sand, trace to little fine grained gravel, moist deposit (0.16 m) of dense to very dense, silty sand, wet at 111.59 m	140.37 112.07	43	CC	44" 73%	n/a	n/a	n/a							
		grain size analysis at 112.0 m : sand 17%, gravel 3%, silt 52%, and clay 28%														
		SAND loose, (2.5 Y 4/1), fine to medium sand, little coarse grained sand, wet, sulphurous smell	138.90 113.54	44	CC	55.5" 93%	n/a	n/a	n/a							
		grain size analysis at 113.2 m : sand 93%, gravel 0%, silt 5%, and clay 2%														
		SILTY SAND and SANDY SILT interbedded sequences (0.08 - 1.5 m) of compact to dense, dark grey (2.5 Y 4/1) fine grained silty sand, black horizontal laminations, wet, sulphurous odour, and loose to compact, grey (5Y 5/1), fine grained sandy silt, black horizontal laminations														
		grain size analysis at 113.7 m : sand 23%, gravel 0%, silt 75%, and clay 2%														
		horizontal laminations (2 mm) of silt from 121.07 m to 121.24 m														
				45	CC	55" 92%	n/a	n/a	n/a							
				46	CC	58" 97%	n/a	n/a	n/a							
				47	CC	60" 100%	n/a	n/a	n/a							
				48	CC	57" 95%	n/a	n/a	n/a							
				49	CC	64.5" 108%	n/a	n/a	n/a							

DRAFT

No. 1 Silica Sand 111.3 to 115.4 m  
 Schedule 80 No. 10 Slot 51 mm Diameter PVC Well Screen 112.0 to 113.5 m

STANTEC BOREHOLE AND WELL - MASTER TX11 - 160900764\_BH LOGS.GPJ STANTEC - DATA TEMPLATE.GDT 8/19/15 NSPINA

Screen Interval: 112.01 - 113.54 m BGS  
 Sand Pack Interval: 111.25 - 115.37 m BGS  
 Well Seal Interval: 0.00 - 111.25 m BGS

Notes:  
 m AMSL - metres above mean sea level  
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 m BTOC - metres below top of casing  
 CC - continuous core sample  
 n/a - not available/applicable

MW5-14D(2) well installed from 19-Dec-2014 to 23-Dec-2014  
 Overburden stratigraphy from 0 m to 49.7 m BGS obtained from MW5-14D  
 Groundsurface elevation obtained from Hydro One Topography (25 m contours)  
 Geophysics completed by Lotowater Technical Services Inc. on December 8, 2014



Drawn By/Checked By: NS/JBG

# Monitoring Well: MW5-14D (2)

Project: Clarington TS Natural Heritage  
 Client: Hydro One Networks Inc  
 Location: Clarington, ON  
 Number: 160900764

Field Investigator: N. Spina  
 Contractor: Aardvark Drilling Inc  
 Drilling method: Track Mount CME 75 101.6 mm ID PQ  
 Date started/completed: 02-Dec-2014 / 18-Dec-2014

Ground surface elevation: 252.44 m AMSL  
 Top of casing elevation: 253.52 m AMSL  
 Easting: 672901  
 Northing: 4872453

SUBSURFACE PROFILE			SAMPLE DETAILS						GEOPHYSIC DETAILS		WELL DETAILS					
Depth (ft) (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	SCR	ROD	Fractures per 1.52m	Gamma (cps)			Resistivity (Ohm.m)			Well Details
										20	40	60	80	600	1200	
400	122	SILTY SAND and SANDY SILT interbedded sequences (0.08 - 1.5 m) of compact to dense, dark grey (2.5 Y 4/1) fine grained silty sand, black horizontal laminations, wet, sulphurous odour, and loose to compact, grey (5Y 5/1), fine grained sandy silt, black horizontal laminations horizontal layer (0.22 m) of silt at 121.92 m		50	CC	60" 100%	n/a	n/a	n/a							
		transition to dense at 123.44 m														
405	124			51	CC	59.5" 99%	n/a	n/a	n/a							
410				52	CC	58" 97%	n/a	n/a	n/a							
415	126		125.79													
		SILT and SAND and GRAVEL interbedded sequences of very dense, grey (5 Y 5/1), silt, little fine sand, moist, sulphurous odour, and very dense, very dark grey (2.5 Y 3/1), coarse grained sand and fine to coarse grained gravel, subangular to angular gravel, trace cobbles, moist	126.65	53	CC	61" 102%	n/a	n/a	n/a							
420	128	BEDROCK weak, highly fractured, black (10 YR2/1), shale bedrock silt infilling in fractures trilobite fossils present at 129.5 m	124.68													
			127.76	54	CC	61.5" 103%	27" 45%	24.5" 41%	14							
425		End of Borehole	122.90													
			129.54													
430	130															
435	132															

DRAFT

Peltonite Chips  
115.4 to 129.5 m

STANTEC BOREHOLE AND WELL - MASTER TX11 - 160900764\_BH LOGS.GPJ STANTEC - DATA TEMPLATE.GDT 8/19/15 NSPINA

Screen Interval: 112.01 - 113.54 m BGS  
 Sand Pack Interval: 111.25 - 115.37 m BGS  
 Well Seal Interval: 0.00 - 111.25 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 m BTOC - metres below top of casing  
 CC - continuous core sample  
 n/a - not available/applicable

MW5-14D(2) well installed from 19-Dec-2014 to 23-Dec-2014  
 Overburden stratigraphy from 0 m to 49.7 m BGS obtained from MW5-14D  
 Groundsurface elevation obtained from Hydro One Topography (25 m contours)  
 Geophysics completed by Lotowater Technical Services Inc. on December 8, 2014



Drawn By/Checked By: NS/JBG

# Monitoring Well: MW8-15

**Project:** Clarington TS Natural Heritage  
**Client:** Hydro One Networks Inc  
**Location:** Clarington, ON  
**Number:** 160900764  
**Field investigator:** R.Dong  
**Contractor:** Aardvark Drilling Inc.

**Drilling method:** Track Mount CME 75 108 mm ID HSA/ PQ  
**Date started/completed:** 14-Jan-2015 / 15-Jan-2014  
**Ground surface elevation:** 254.43 m AMSL  
**Top of casing elevation:** 255.25 m AMSL  
**Easting:** 673082  
**Northing:** 4872565

SUBSURFACE PROFILE				SAMPLE DETAILS			INSTALLATION DETAILS	
Depth	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram	Description
0		Ground Surface	254.43					
0		TOPSOIL (SANDY SILT) very dense (frozen), very dark greyish brown (10YR 3/2), fine grained sand	0.00 254.07					Above Ground Casing Stick-Up: 0.82 m AGS
5		SAND loose, very dark greyish brown (10YR 3/2), fine grained sand, trace to little medium and coarse grained sand, little fine grained gravel, moist	0.36 253.92	1	CC	52" 87%		210 mm Diameter Borehole 0 to 2.8 m
2		SANDY SILT to SILTY SAND (TILL) loose, very dark greyish brown (10YR 3/2), fine grained sand, trace medium and coarse grained sand, trace fine and coarse grained gravel, trace cobbles colour grading to brown (10YR 5/3), by 0.74 m BGS	0.51	2	CC	50" 100%		
10		density grading from loose to very dense by 1.22 m BGS transition to little medium and coarse grained sand, little fine and coarse grained gravel from 1.52 m to 8.74 m BGS		3	CC	14" 100%		Groundwater Level 2.79 m BGS (3.61 m BTOC) 3-Feb-2015
4		rusty coloured sediment fractures from 2.80 m to 3.15 m BGS Grain Size Analysis: 52% silt and clay, 44% sand, 6% gravel from 3.71 m to 4.32 m BGS Vertical Hydraulic Conductivity: $K=3.6 \times 10^{-7}$ cm/s from 4.01 m to 4.32 m BGS		4	CC	58" 100%		127 mm Diameter Borehole 2.8 to 16.9 m
15		angular deposit of very dense, dark grey (10YR 3/1), fine grained sand from 4.32 m to 4.40 m BGS boulder at 4.40 m BGS with angular fracture and rusty coloured staining		5	CC	57" 90%		
20		transition to grey (10YR 5/1) at 5.05 m BGS horizontal layer of very hard clayey silt from 5.05 m to 5.12 m BGS transition from moist to wet and loose to compact at 5.64 m BGS decreasing silt content and becoming more sandy at 5.64 m BGS		6	CC	36" 62%		Bentonite Chips 0 to 13.1 m
25				7	CC	60" 100%		
30		Grain Size Analysis: 47% sand, 38% silt and clay, 15% gravel; Vertical Hydraulic Conductivity: $K=1.7 \times 10^{-6}$ m/s from 8.33 m to 8.94 m BGS transition to trace fine and coarse grained gravel at 8.74 m BGS wet seams from 8.81 m to 8.92 m BGS and 9.04 m to 9.17 m BGS	245.21 9.22	8	CC	58" 97%		
35		SILTY SAND (TILL) loose to compact, grey (10YR 5/1), fine grained sand, trace medium and coarse grained sand, trace fine and coarse grained gravel, wet		9	CC	49" 83%		
40				10	CC	47" 81%		
45		cobble at 12.24 m BGS horizontal laminations of silty clay from 12.37 m to 12.60 m BGS drilling washout of fine material from 13.3 m to 14.2 m BGS, possible more permeable lense in this interval		11	CC	30" 46%		No. 1 Silica Sand 13.1 to 15.5 m
50		SILTY SAND to SANDY SILT (TILL) compact to dense, grey (10YR 5/1), fine grained sand, trace medium and coarse grained sand, trace fine and coarse grained gravel, moist	239.90 14.53	12	CC	56" 92%		Schedule 40 No. 10 Slot PVC Well Screen 13.7 to 15.2 m
55		Grain Size Analysis: 45% sand, 43% silt and clay, 12% gravel from 16.29 m to 16.49 m BGS	238.02 16.41					Bentonite Chips 15.5 to 16.9 m
60		SILTY SAND (TILL) very dense, grey (10YR 5/1), fine grained sand, little medium and coarse grained sand, trace fine and coarse grained gravel, trace cobbles, moist End of Borehole	237.51 16.92					

Screen Interval: 13.72 - 15.24 m BGS  
 Sand Pack Interval: 13.11 - 15.54 m BGS  
 Well Seal Interval: 0.00 - 13.11 m BGS

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 CC - continuous core sample  
 n/a - not available

Ground surface elevation obtained from exp log for BH7D.



# Borehole: BH9-15

**Project:** Clarington TS Natural Heritage  
**Client:** Hydro One Networks Inc  
**Location:** Clarington, ON  
**Number:** 160900764  
**Field investigator:** N.Spina  
**Contractor:** Aardvark Drilling Inc (Teracore)

**Drilling method:** Track Mount CME 75 158.8 mm ID HSA  
**Date started/completed:** 25-Mar-2015 / 26-Mar-2015  
**Ground surface elevation:** 253.60 m AMSL  
**Top of casing elevation:** n/a  
**Easting:** 673015  
**Northing:** 4872580

SUBSURFACE PROFILE				SAMPLE DETAILS			INSTALLATION DETAILS	
Depth	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram	Description
		Ground Surface	253.60					
	TOPSOIL and SANDY CLAYEY SILT very dense (frozen), dark brown (10 YR 3/3), fine grained sand, trace fine grained angular gravel, trace coarse grained sand, trace organics (rootlets), moist colour transition to brown (10 YR 4/3) at 0.25 m BGS subangular to angular gravel from 0.25 m to 0.53 m BGS		0.00					
2	SAND (TILL) compact, light olive brown (2.5 Y 5/3), fine grained sand, some silt, trace to little fine and coarse grained subangular gravel, trace subangular to subrounded cobbles, trace coarse grained sand, moist, trace oxidation staining, trace weathered gravel 0.14 m diameter granite cobble at 0.53 m BGS thin (1 - 2 mm diameter) coarse grained sand lense at 0.84 m BGS trace clay from 0.96 m to 2.49 m BGS 0.13 m diameter cobble at 0.96 m BGS		253.07 0.53	1	CC	38" 100%		
4								
6		cobbles from 1.52 m to 2.01 m BGS (maximum diameter is 0.16 m)		2	CC	29" 48%		
2		No recovery from 2.01 m to 2.49 m BGS due to large cobbles blocking continuous core sampler	251.59 2.01					
8			251.11 2.49					
10	SAND to SILTY SAND (TILL) dense, light olive brown (2.5 Y 5/3), fine grained sand, some silt to silty sand, some fine and coarse grained subangular gravel trace coarse sand, moist, oxidation staining around gravel			3	CC	35" 117%		
3		cobble at 3.17 m BGS	250.30 3.30					
12	SILTY SAND (TILL) dense, light olive brown (2.5 Y 5/3), fine grained sand, some coarse and fine grained rounded to subrounded gravel, some clay, moist, oxidation staining, thin horizontal laminations (2 mm diameter) of clay and silt grain size analysis at 3.34 m BGS: sand 34%, silt 33%, gravel 15%, and clay 18% 25 mm diameter fine sand deposit at 3.97 m BGS			4	CC	43.5" 145%		
4		cobble at 3.96 m BGS becomes very dense, greyish brown (2.5 Y 5/2) fine grained sand to silty sand (till) at 3.99 m BGS	249.59 4.01					
14	SILTY SAND (TILL) very dense, greyish brown (2.5 Y 5/2), fine grained sand, little to some fine and coarse grained subrounded gravel, trace cobbles, trace coarse grained sand, moist, trace oxidation staining wet from 4.01 m to 4.09 m BGS cobble at 4.34 m BGS			5	CC	34" 113%		
5		cobble at 5.0 m BGS		6	CC	32" 107%		
16		transition to gravelly from 5.3 m to 6.7 m BGS		7	CC	30" 100%		
18								
6								

← 279.4 mm Diameter Borehole

← Bentonite Chips 0 to 10.1 m

Screen Interval: n/a  
 Sand Pack Interval: n/a  
 Well Seal Interval: n/a

Notes:  
 m AMSL - metres above mean sea level  
 m BGS - metres below ground surface  
 CC - continuous core sample  
 n/a - not available

Drilling reference included 0.56 m gravel pad above ground surface. All depths have been corrected to meters below ground surface.

Approximate ground surface elevation (not including temporary gravel pad) interpolated from Hydro One drawing: Station Geotechnical Landscape Plan and Details (NK296-D0S-1200-0005).

Coordinates estimated from Stantec GIS Mapping (2015).  
 Ground surface elevation approximated from exp log for BH7A.

Open borehole dry upon completion.



Drawn By/Checked By: NSJBG

STANTEC BOREHOLE AND WELL V2 160900764\_BH LOGS.GPJ STANTEC - DATA TEMPLATE.GDT 8/19/15 NSPINA

