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Strada Shelburne Pit/Quarry

MAXIMUM PREDICTED WATER TABLE REPORT

Strada Aggregates Inc.

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1 Introduction

Tatham Engineering Limited (Tatham) was retained by Strada Aggregates Inc. (Strada) to prepare this Maximum Predicted Water Table report in support of a Class A aggregate license for the proposed Strada Pit/Quarry.

The site is located at 437159 4th Line, in Shelburne and currently operates as an above water pit comprised of three ARA licences (#626199, #625155 and #129167). The site is bound by County Road 17 on the south, 4th Line on the west, the Bonnefield agricultural property and Sideroad 15 to the north and the CBM property and 13th Line to the east. Strada is proposing to combine the three existing licences to allow the pit operations to continue and permit below water quarry extraction within the northern 2/3rds of the site (existing licences #626199 and #129167).

The purpose of this report is to identify the maximum predicted water table elevation, in metres above sea level (m asl), relative to the proposed depth of excavation at the site.

This letter outlines the field program conducted at the site used to determine the maximum predicted water table elevation. Additional details and results from the field monitoring program are summarized in the Strada Pit/Quarry Level 1 and 2 Hydrogeological Assessment (Tatham and Earthfx, 2024).



2 Proposed Site Development

At the time quarry operations commence, it is expected the available sand and gravel resource will have been extracted from all portions of the site except for the northern portion of existing License #626199. The proposed phasing sequence is shown on Figure 1 through 7.

Quarry operations will commence in Phase 1A which is located in the southern portion of existing License #129167 and will operate concurrently with pit operations in Phase 2C which is located in the northern portion of existing License #626199.

The quarry floor elevation is expected to vary between 438 m asl and 442 m asl based upon the geological formations. The quarry is anticipated to be extracted in three lifts with lifts varying in height as each follows the geological formations across the site. Lift 1 is approximately 11 to 24 m deep, lift 2 is approximately 11 to 17 m deep, and lift 3 is approximately 14 to 23 m deep.

Quarry extraction will occur in a phased manner divided between four phases with each phase containing multiple sub-phases. Quarry operations will occur sequentially. Phases 1A, 1B, 2A, 2B, and 2C will extract lift 1 and 2. Phase 3A includes extraction of lift 3. Phase 3B, 4A and 4B include extraction of lifts 1, 2 and 3.

All material will be processed by portable plants within close proximity to the active pit and quarry working faces. A portion of the material will also be transported to the wash plant within existing License #626155 where it will be washed.

The new license is proposed to ship a maximum of 2 million tonnes per annum and will utilize both of the existing pit entrance/exits until Phase 3B is extracted. After which only the south entrance/exit will be used.

2.1 WATER CONTROL FEATURES

2.1.1 Benches

Three benches will be used to reach the full extraction depth of the proposed quarry extraction area. The first bench coincides with the Guelph formation; the second bench with the Ancaster/Niagara Falls formation, and the third bench with the Gasport formation. Gravel extraction in the remaining northern pit area will be extracted in conjunction with Phase 1 quarry development, along with simultaneous extraction of Bench 1 and 2.

2.1.2 Water Control Barriers

Groundwater inflow control barriers will be constructed along the overburden and bedrock benches as pit/quarry development progresses, thus restricting groundwater inflow to a limited



active extraction face. Barriers will be constructed on Bench 1 (Guelph) and Bench 3 (Gasport), while no barriers are needed in the Ancaster/Niagara Falls bench because permeability and pump testing indicate it is a significant aquitard.

The design of the barriers will meet all standards for site closure, grading and rehabilitation. Geotechnical analysis indicates the on-site Tavistock till may be suitable for water control barriers if confirmed to be sufficiently impermeable by a geotechnical consultant prior to construction of the barriers. If the on-site Tavistock Till is not considered to be sufficiently impermeable, off-site soil may need to be imported for the construction of the barriers.

A limited portion of the final deep Gasport bench face will be left open to allow long-term drainage of the quarry lake into the Gasport aquifer. The Rehabilitation scenario, presented below, demonstrates this will ensure the lake elevation never rises high enough to result in off-site overland discharge.

2.1.3 Injection Wells

Four injection wells will be constructed along the eastern property boundary prior to Phase 1. Two of the injection wells will be installed in the Guelph Formation and the remaining two will be installed in the Gasport unit. The combined capacity of the injection wells is assumed to be at least 12 L/s. Water captured from the buried tile drain constructed along the western property limit will be diverted directly to the injection wells ensuring water being infiltrated via the injection wells is non-contact water collected upgradient of the on-going aggregate activities.

2.1.4 On-Site Infiltration Systems

Groundwater and surface water (including stormwater and precipitation) will be captured and infiltrated on-site. Three on-site infiltration systems will be constructed, including two infiltration ponds in the south portion of the site and a two-part infiltration trench along the northeast portion of the site. The infiltration systems will be constructed in peripheral areas of sand and gravel materials, thus locally recharging the overburden aquifers with no off-site overland surface water flow.

A buried tile drain will be constructed along the western property boundary to collect groundwater and reduce groundwater mounding to the west of the property. The clean water from the drains will be injected directly into two Guelph and two Gasport injection wells along the eastern property boundary.

The combination of bench barriers (to restrict inflow), and on-site re-infiltration ensures no offsite surface water discharge will occur, and groundwater drawdowns will be minimal.

The proposed infiltration systems are shown on Figure 8.



2.2 PHASE ONE

Phase 1 represents the final extraction of sand and gravel from the north portion of the pit, (in the area labeled Phase 2C/Phase 3A in Figure 1, which refers to later phases of bedrock removal); and extraction of bedrock from Bench 1 and 2 in the central portion of the site, labeled as Phase 1A and Phase 1B. The open extraction faces are shown as dotted lines in Figure 1. A cross section showing the extraction conditions is shown in Figure 2.

The start of bedrock extraction will be a sinking cut located in the Phase 1A area. Groundwater levels in the Phase 1A area are near the lowest recorded on site, and extraction from this initial location will have the minimal impact on the overburden water table.

Overburden water control barriers have been constructed on three sides of the overburden (green line). Progressive barriers have been constructed along the south and east face of Bench 1 (dark blue line), and an open face exists in Bench 1 and 2 along the west and northern faces (dashed red lines).

Quarry floor drains have been constructed to distribute inflow to both the infiltration trenches in the northeast portion of the site and the southern infiltration galleries.

2.3 PHASE TWO

Phase 2 represents the complete extraction of aggregate from Bench 1 and 2 under Phases 1 and 2 and the ongoing extraction of Phase 2C. The open extraction face is shown as dotted lines in Figure 3. A cross section showing the extraction conditions is shown in Figure 4.

Overburden water control barriers have been constructed on four sides of the overburden (green line). Progressive barriers have been constructed along three sides of Bench 1 (dark blue line), and an open face exists in Bench 1 and 2 along the northern face (dashed red line).

Quarry floor drains are constructed to distribute inflow to both the infiltration trenches in the northeast portion of the site and the southern infiltration galleries.

During this phase a buried tile drain constructed along the north western property boundary will collect groundwater so as to reduce groundwater mounding to the west of the property. This water is collected and directly injected into the Guelph and Gasport injection wells along the eastern property boundary. Any excess is added to the eastern infiltration system trenches. The combined injection capacity of these wells is 12 L/s, and a minimum length of 570 m of drain is estimated to generate this flow.

2.4 PHASE THREE

Phase 3 represents the continued extraction of Bench 2 and initial extraction of Bench 3. Phase 3 only includes a partial removal of Bench 3 with the remaining portion of Bench 3 to be removed



in Phase 4. The analysis and presentation of potential impacts were limited to Phase 4 (discussed below) which is considered to be a "worst case scenario" when comparing Phase 3 and Phase 4 conditions.

2.5 PHASE FOUR

Phase 4A represents extraction of bedrock from the second to final Phase 4A cell (Figure 5). In this scenario Benches 1, 2 and 3 are all open along the active face in the south east portion of the excavation. The location of the open extraction faces is shown as a dotted red line in Figure 5. A cross section showing the extraction conditions is shown in Figure 6.

Overburden water control barriers have been constructed on four sides of the overburden (green line). Barriers have been constructed along the majority of Bench 1, with the exception of the south face (dark blue line). As noted, an open face exists in Bench 1, 2 and 3 in the Phase 4A cell (dashed red line). Quarry floor drains are constructed to distribute inflow to both the infiltration trenches at the northeast portion of the site and the southern infiltration ponds.

During this phase a buried tile drain constructed along the north western property boundary will collect groundwater so as to reduce groundwater mounding to the west of the property. This water is collected and conveyed to the Guelph and Gasport injection wells along the eastern property boundary and any excess is added to the eastern infiltration trenches. The combined injection rate is 12 L/s. The drain is subdivided into three segments to provide flexibility in diverting and controlling flow, as needed. In the model representation, the north and central segment divert 12 L/s directly to the injection wells (with any seasonal excess going to the northern infiltration trench), and the southern segment discharges into the central infiltration site.

2.6 REHABILITATION

The Rehabilitation scenario represents conditions after final rehabilitation and closure of the pit and quarry.

At this time, all on-site water control and infiltration systems will be modified and/or removed so as to allow groundwater and surface water conditions to return to near baseline conditions without any active long-term water management.

Water control barriers constructed on all four sides of the pit/quarry in the overburden and Bench 1 will remain in place for the purpose of slope rehabilitation (Figure 7). The exception to this is a 365-m portion of the eastern overburden barrier will be opened to allow lateral seepage into the shallow groundwater system east of the property. The area of barrier opening is shown as a thick orange line in Figure 7. Seepage from this opening will eliminate drawdowns and support streamflow in the tributary flowing into NAT-18.



The barriers constructed on Bench 3 will remain in place; however, a small portion of the Gasport formation along the western face of Phase 4 will remain open to the quarry lake to ensure the lake does not overtop and discharge as surface water.

Water from the western tile drain will no longer be infiltrated into the bedrock injection wells. The wells will be sealed and decommissioned. The northern segment of the tile drain will be opened to freely drain into the quarry lake. This will prevent long-term groundwater mounding west of the quarry.

All the infiltration ponds and trenches will be re-graded and converted into appropriate future land uses, as outlined on the closure site plans. The southern portion of the site, west of the constructed wetland and Wetland NAT-19, will be re-graded so runoff and interflow can enter and support the constructed wetland. Any excess water in the constructed wetlands will be allowed to overflow into Wetland NAT-18.

In summary, the site will be returned to a condition restoring local and regional surface and groundwater conditions, with no need for any form of active water management.



3 Field Program

3.1 DRILLING AND MONITORING WELL INSTALLATION

The development of the Shelburne property has evolved since the licensing of the North Pit in 2001. Several groundwater monitoring well drilling and coring programs have been conducted since 2001. The drilling programs were designed to allow for a detailed characterization of the groundwater regimes and to enhance the understanding of the water level responses in the overburden and bedrock aquifer and aquitard systems to rainfall and snowmelt events as well as to overburden removal and pumping. The network has been upgraded and expanded to specifically support the ARA pit/quarry license application.

There is an extensive network of drilling and monitoring wells at the site, including monitor nests, core holes and pumping wells which are summarized in Table 1. The monitoring network is shown in Figure 9. Due to extraction activities, several of these wells are not active at the current time (either destroyed, pulled/decommissioned, or no longer accessible). There are currently 22 active groundwater well nest locations monitoring 30 discrete aquifer/aquitard intervals in the overburden and bedrock aquifers at the property.

In general, monitors labelled with an "A" suffix are screened at the base of the sand and gravel unit (water table aquifer). Monitors labelled with a "B" suffix are screened at the base of the Tavistock Till (just above the bedrock contact). Monitors labelled with a "C" suffix are constructed within the bedrock aquifer. Borehole logs for all the monitoring wells are included in Appendix A.

Key well data (Well ID, depth, screen setting, etc.) are presented in Table 1.

3.2 WATER LEVEL MEASUREMENTS

Groundwater monitoring on-site began in 2002. Over the course of the monitoring period, each monitoring well has been equipped with an automatic pressure transducer datalogger and is monitored continuously. The pressure transducer data is calibrated using manual groundwater measurements and corrected for barometric pressure.

A summary of the water levels for the A, B and C series monitoring wells are provided in Figures 10 to 12, and individual hydrographs are provided in Appendix B.

In general, the groundwater monitoring history shows a strong degree of seasonal response but a few monitors show a very muted response. The response is likely affected by changes in storage properties (i.e. specific yield) when the water table is mainly within the overlying till (as it is on the western boundary), within the weathered bedrock (center of the site), or deeper within the



bedrock (eastern boundary). Water levels and the local response to recharge events are also affected to some extent by soil stripping and gravel extraction operations

The groundwater levels in the A and B series wells are very similar with respect to measured water levels and trends. The groundwater levels in the C series wells tend to be about 0 to 4.0 m higher than those measured in the A and B series wells, with the exception of several monitors along the western site limit where the groundwater levels in the C series wells were about 3 to 15 m lower than those measured in the A and B series wells.



Table 1: Groundwater Monitoring Well Network

Current Well Nest ID	Current Well Monitor ID	2016 Pit Name	Status ²	Well Tag Number	MECP ID	Easting	Northing	Survey Elevation (masl) ¹	Stick up (m)	Top of Casing (masl)	Borehole Depth (m)	Borehole Bottom Elevation (masl)	Top Monitor Depth (m)	Bottom Monitor Depth (m)	Top Monitor Elevation (masl)	Bottom Monitor Elevation (masl)
PW1	PW1	PW1	Inactive	A006812	17-06267	561425	4888246	503.37	0.48	503.85	48.76	454.61	20.11	48.76	483.26	454.61
OW1	OW1	OW1	Inactive	A006830	17-06269	561395	4888238	504.12	0.21	504.33	48.76	455.36	18.28	48.76	485.84	455.36
OW2	OW2A-08		Destroyed	A047161	71-06056	561215	4887224	509.69	0.55	510.24	25.60	484.09	7.05	10.10	502.64	499.59
OW2	OW2B-08		Destroyed	A047161	71-06056	561215	4887224	509.69	0.55	510.24	25.60	484.09	22.55	25.60	487.14	484.09
OW2-07	OW2C-07		Destroyed	A049591	70-43351	561218	4887224	509.48	0.64	510.12	72.24	437.24	26.52	72.24	482.96	437.24
OW3	OW3A-08		Dry	A047166	71-06057	561273	4886844	504.47	1.41	505.88	12.80	491.67	2.44	3.96	502.03	500.51
OW3	OW3B-08		Active	A047166	71-06057	561273	4886844	504.47	1.41	505.88	12.80	491.67	9.75	12.80	494.72	491.67
OW3-C	OW3C-07		Active	A049601	70-45010	561271	4886844	504.04	0.37	504.41	15.54	488.50	12.49	15.54	491.55	488.50
OW4	OW4A-08		Active	A047165	71-06048	561355	4886425	505.52	0.63	506.15	13.72	491.80	5.14	7.92	500.38	497.60
OW4	OW4B-08		Active	A047165	71-06048	561355	4886425	505.52	0.63	506.15	13.72	491.80	10.54	13.72	494.98	491.80
OW4-C	OW4C-07		Active	A049604	70-45013	561359	4886425	505.38	0.56	505.94	17.06	488.32	13.41	16.46	491.97	488.92
OW5	OW5A-08		Active	A047164	71-06047	561738	4886523	493.51	0.65	494.16	10.67	482.84	2.50	5.70	491.01	487.81
OW5	OW5B-08		Active	A047164	71-06047	561738	4886523	493.51	0.65	494.16	10.67	482.84	7.00	10.05	486.51	483.46
OW5-C	OW5-C		Active	A049603	70-45012	561738	4886520	493.61	0.69	494.30	13.10	480.51	10.00	13.10	483.61	480.51
OW6	OW6-A		Active	A146152	72-21960	561663	4886939	494.13	0.62	494.75	7.90	486.23	1.80	7.80	492.33	486.33
OW7-A	OW7-A		Active	A146161	72-21961	561771	4886674	497.18	0.64	497.82	10.15	487.03	2.13	10.05	495.05	487.13
OW7-C	OW7-C		Active	A133144	72-21962	561773	4886668	496.98	0.78	497.76	30.60	466.38	18.00	30.60	478.98	466.38
OW8	OW8-A		Active	A172376	72-39322	561282	4887057	504.93	0.94	505.87	12.60	492.33	4.00	12.00	500.93	492.93
OW9	OW9A-08		Dry	A047160	71-06055	561798	4887451	496.51	0.42	496.93		477.92	3.40	6.40	493.11	490.11
OW9	OW9B-08		Active	A047160	71-06055	561798	4887451	496.51	0.42	496.93	18.59	477.92	15.20	18.20	481.31	478.31
OW10	OW10A-08		Dry	A047162	71-06053	561632	4887297	495.45	0.57	496.02	19.51	475.94	2.00	3.00	493.45	492.45
OW10	OW10B-08		Active	A047162	71-06053	561632	4887297	495.45	0.57	496.02	19.51	475.94	16.00	19.20	479.45	476.25
OW11-A	OW11-A		Destroyed	A133145	72-21963	561574	4886478	494.70	1.20	495.90	16.50	478.20	2.90	8.60	491.80	486.10
OW11-C	OW11-C		Destroyed	A133145	72-21964	561578	4886480	494.80	1.20	496.00	16.50	478.30	13.50	16.50	481.30	478.30
OW12-A	OW12A-08		Active	A047149	71-06054	561882	4887192	495.70	0.87	496.57	7.62	488.08	4.57	7.62	491.13	488.08
OW12-B	OW12B-08		Active	A047149	71-06054	561882	4887190	495.13	0.53	495.66	21.64	473.49	17.98	21.03	477.15	474.10
OW13	OW13-A	MW1A	Active			561140	4887598	506.78	0.75	507.53	19.00	487.78	11.34	14.34	495.44	492.44
OW13	OW13-C	MW1B	Active	-		561140	4887598	506.78	0.75	507.53	19.00	487.78	15.94	18.94	490.84	487.84
OW14	OW14-A	MW2A	Dry	A006815	17-06268	561763	4887841	496.82	1.01	497.83	20.10	476.72	9.60	12.40	487.22	484.42
OW14	OW14-C	MW2B	Active	A006815	17-06268	561763	4887841	496.82	1.01	497.83	20.10	476.72	17.00	20.00	479.82	476.82
OW15	OW15-A	MW5A	Destroyed	A006826	17-06274	561431	4887669	510.48	1.13	511.61	30.80	479.68	18.00	20.50	492.48	489.98
OW15	OW15-C	MW5B	Destroyed	A006826	17-06274	561431	4887669	510.48	1.13	511.61	30.80	479.68	26.87	29.87	483.61	480.61
OW16-A	OW16-A		Active	A115091	71-85600	561726	4887994	497.06	0.56	497.62		485.25	10.29	11.81	486.77	485.25
OW16-C	OW16-C	MW8B	Active	A115091	71-85600	561726	4887993	497.11	0.56	497.67	27.30	469.81	8.00	27.30	489.11	469.81
OW17	OW17-B		Destroyed	A193020	72-79229	561472	4887382	502.61	1.00	503.61	27.50	475.11	20.40	23.60	482.21	479.01
OW17	OW17-C		Destroyed	A193020	72-79229	561472	4887382	502.61	1.00	503.61	27.50	475.11	24.30	27.50	478.31	475.11
OW18	OW18-A		Active	A193021	72-79230	561653	4887685	501.21	0.66	501.87	23.70	477.51	17.00	19.80	484.21	481.41
OW18	OW18-C		Active	A193021	72-79230	561653	4887685	501.21	0.66	501.87	23.70	477.51	20.40	23.70	480.81	477.51
OW19	OW19-A		Active	A218812	72-88078	561036	4888192	510.32	1.12	511.44	35.50	474.82	11.20	14.40	499.12	495.92
OW19	OW19-C		Active	A218813	72-88079	561036	4888192	510.32	1.12	511.44	35.50	474.82	34.00	35.50	476.32	474.82

Current Well Nest ID	Current Well Monitor ID	2016 Pit Name	Status	Well Tag Number	MECP ID	Easting	Northing	Survey Elevation (masl) ¹	Stick up (m)	Top of Casing (masl)	Borehole Depth (m)	Borehole Bottom Elevation (masl)	Top Monitor Depth (m)	Bottom Monitor Depth (m)	Top Monitor Elevation (masl)	Bottom Monitor Elevation (masl)
OW20	OW20-A		Dry	A218820	72-88077	561544	4888333	509.30	1.18	510.48	26.40	482.90	20.12	21.64	489.18	487.66
OW20	OW20-C		Active	A218819		561544	4888333	509.30	1.18	510.48	26.40	482.90	25.00	26.40	484.30	482.90
OW21	OW21-A		Dry	A218822	72-88038	561593	4888680	511.41	0.95	512.36	25.30	486.11	20.80	22.20	490.61	489.21
OW21	OW21-C		Active	A218823	72-88076	561593	4888680	511.41	0.95	512.36	25.30	486.11	23.60	25.30	487.81	486.11
OW22	OW22-A		Dry	A218821	A-218821	561384	4888890	513.66	1.01	514.67	27.50	486.16	22.80	24.30	490.86	489.36
OW22	OW22-C		Active	A218818	A-218818	561384	4888890	513.66	1.01	514.67	27.50	486.16	26.00	27.50	487.66	486.16
OW23	OW23-A		Dry	A218815	72-88037	560938	4888787	510.31	0.75	511.06	29.50	480.81	18.90	20.40	491.41	489.91
OW23	OW23-C		Active	A218816	72-88036	560938	4888787	510.31	0.75	511.06	29.50	480.81	27.90	29.50	482.41	480.81
Core #3	OW24-H		Inactive	A353622	A-353622	560965	4888558	508.90	0.41	509.31	71.02	437.88	25.00	71.02	483.90	437.88
Core #3	OW24-A		Active	A353622	A-353622	560965	4888558	508.90	0.41	509.31	71.02	437.88	27.52	30.57	481.38	478.33
Core #3	OW24-C		Active	A353622	A-353622	560965	4888558	508.90	0.41	509.31	71.02	437.88	63.64	66.69	445.26	442.21
Core #1	OW25-H		Inactive	A266920	17-04295	561648	4888161	490.62	0.68	491.30	50.47	440.15	4.00	50.47	486.62	440.15
Core #1	OW25-A		Active	A266920	17-04295	561648	4888161	490.62	0.68	491.30	50.47	440.15	16.18	19.23	474.44	471.39
Core #1	OW25-C		Active	A266920	17-04295	561648	4888161	490.62	0.68	491.30	50.47	440.15	43.03	46.08	447.59	444.54
Core #2	OW26-H		Inactive	A353621	A-353621	561231	4887427	499.22	0.40	499.62	62.41	436.81	25.00	62.41	474.22	436.81
Core #2	OW26-A		Active	A353621	A-353621	561231	4887427	499.22	0.40	499.62	62.41	436.81	27.36	30.41	471.86	468.81
Core #2	OW26-C		Active	A353621	A-353621	561231	4887427	499.22	0.40	499.62	62.41	436.81	51.83	54.88	447.39	444.34
OW27-C	OW27-C		Active	A391976	A-391976	560927	4888785	510.26	0.61	510.87	71.88	438.38	68.83	71.88	441.43	438.38
OW28-A	OW28-A		Active	A391975	A-391975	561602	4888675	511.51	1.05	512.56	37.18	474.33	34.13	37.18	477.38	474.33
OW28-C	OW28-C		Active	A391972	A-391972	561602	4888678	510.98	0.35	511.33	67.59	443.39	64.54	67.59	446.44	443.39
OW29-A	OW29-A		Active	A391974	A-391974	561413	4886532	499.80	0.98	500.78	25.96	473.84	22.91	25.96	476.89	473.84
OW29-C	OW29-C		Active	A391973	A-391973	561412	4886533	499.90	0.93	500.83	62.76	437.14	59.71	62.76	440.19	437.14
OW30	OW30-C		Active	A374686	A-374686	561634	4886901	494.35	0.60	494.95	56.62	437.73	53.57	56.62	440.78	437.73
Legacy wells in	cluded in comp	liance reports a	lating back to	2007. Ground	d elevation do	es not corresp	ond to LiDAR	nor to the m	ost current	survey but t	o elevations	taken from c	ompliance r	eports.		
MW3	MW3A-04	MW3A	Dry	A006796	17-06273	561740	4887987	508.33	0.70	509.03	22.86	485.47	23.39	26.43	484.94	481.90
MW3	MW3B-04	MW3B	Dry	A006796	17-06273	561740	4887987	508.33	0.70	509.03	22.86	485.47	29.18	32.23	479.15	476.10
MW4	MW4A-04	MW4A	Destroyed	A006827	17-06272	561230	4888243	510.28	0.91	511.19	24.07	486.21	13.64	16.40	496.64	493.88
MW4	MW4B-04	MW4B	Dry	A006827	17-06272	561230	4888243	510.28	0.91	511.19	24.07	486.21	18.53	21.58	491.75	488.70
MW7	MW7A-07		Destroyed	A047147	71-06065	561284	4887645	507.00			18.28		4.20	7.25	502.80	499.75
MW7	MW7B-07		Destroyed	A047147	71-06065	561284	4887645	507.00			18.28		14.26	17.31	492.74	489.69
MW9	MW9-A	MW9A	Destroyed	A115096	71-85598	561634	4887857	498.35			8.23		1.46	4.51	496.89	493.84
MW9	MW9-B	MW9B	Destroyed	A115096	71-85598	561634	4887857	498.35			8.23		4.81	7.86	493.54	490.49
MW10	MW10-A	MW10A	Destroyed	A115117	71-78110	561271	4887681	500.63	0.80	501.43	10.80	489.83	4.13	6.13	496.50	494.50
MW10	MW10-B	MW10B	Destroyed	A115117	71-78110	561271	4887681	500.63	0.80	501.43	10.80	489.83	7.63	10.43	493.00	490.20
Domestic wells	currently invol	ved in the Targe	-	on Area (TPA) f	or long-term r	nonitoring. E	levation obta	ined from Pro	vincial LiD	AR coverag	е.					
DW1	DW1		Active	A000438	17-06362	562951	4886286	479.67			11.60				-	
DW2	DW2		Active	A104771	71-99024	562704	4888248	482.36			44.80				-	
DW3	DW3		Active			562373	4887677	493.92								
DW4	DW4		Active	A051672	71-22047	562197	4890008	486.02			24.40					
DW5	DW5		Active			559538	4889095	517.26								

Notes: 1 Originally surveyed on the vertical datum CGVD28, then converted to CGVD13 using the Canada Geoid Model HT2_2010v70 (CGVD28), and the NAD83 Canada Molodensky Transformation.

² The ground elevations of destroyed monitoring locations were assumed to be in the CGVD28 datum and a gross conversion factor of (0.37m) was applied to the original elevations.

³ (-H) Suffix refers to initial open hole condition at the borehole. A water level timeseries was measured during this period and labeled -H as well.

4 Maximum Predicted Water Table Elevation

A Predicted Maximum Groundwater Level map was prepared utilizing the highest groundwater elevations measured on-site to date. The highest groundwater elevations are shown on Figure 13.

The high groundwater in both the A/B and C Series wells range from 500.0 m asl towards the western limits of the property to 483.0 m asl towards the eastern limits of the property.

The quarry floor will be graded in a generally westerly direction with a maximum elevation 441.5 m asl to the west and 437.9 m asl to the east.



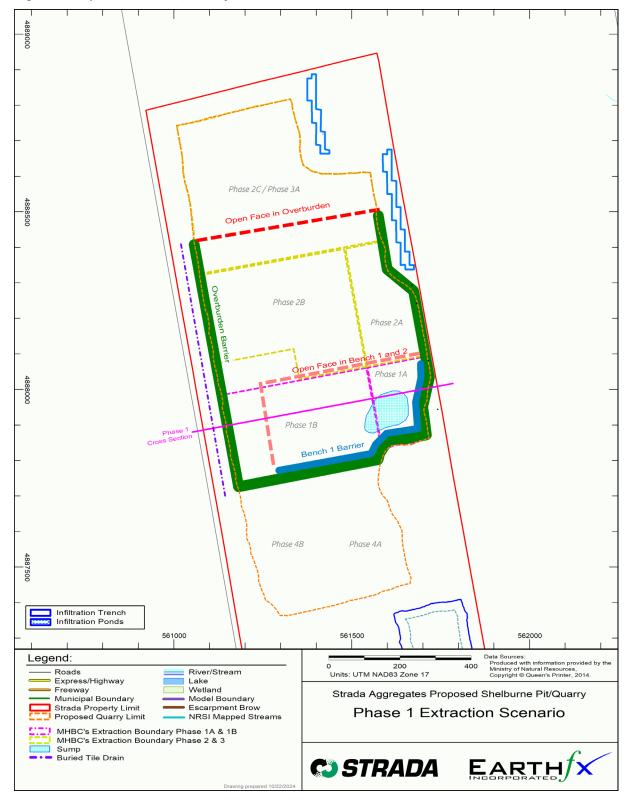


Figure 1: Proposed Strad Pit/Quarry Phase 1 Extraction Scenario



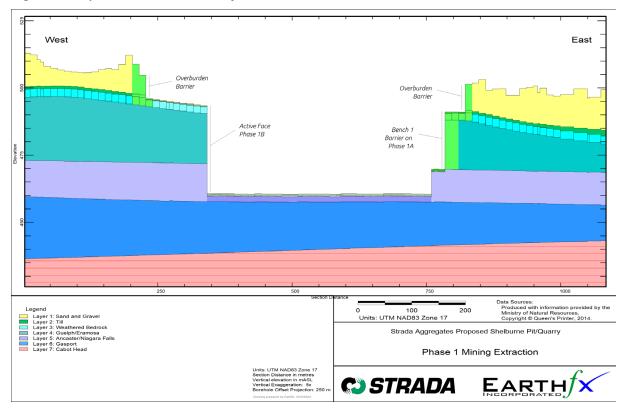


Figure 2: Proposed Strada Pit/Quarry Phase 1 Extraction Scenar-W Section



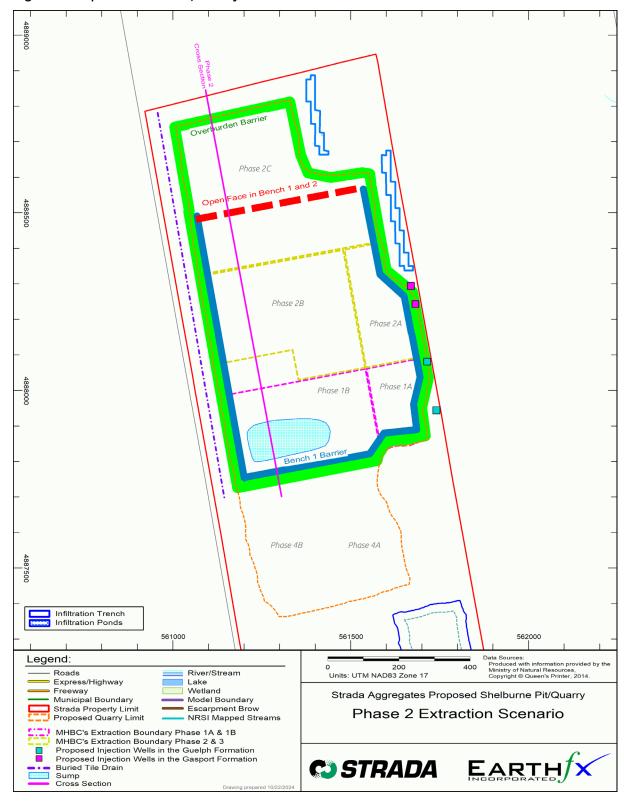


Figure 3: Proposed Strada Pit/Quarry Phase 2C Extraction Scenario



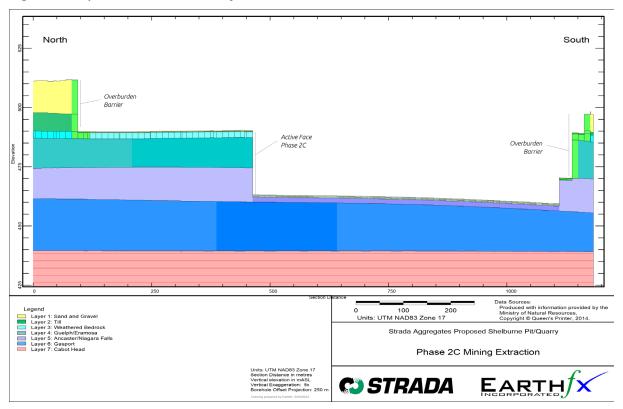


Figure 4: Proposed Strada Pit/Quarry Phase 2C Extraction Scenario N-S Section



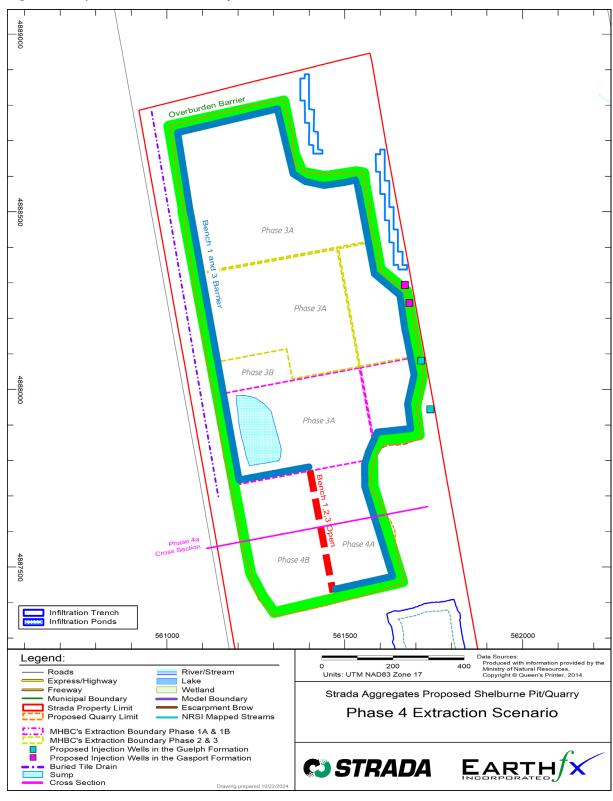


Figure 5: Proposed Strada Pit/Quarry Phase 4A Extraction Scenario



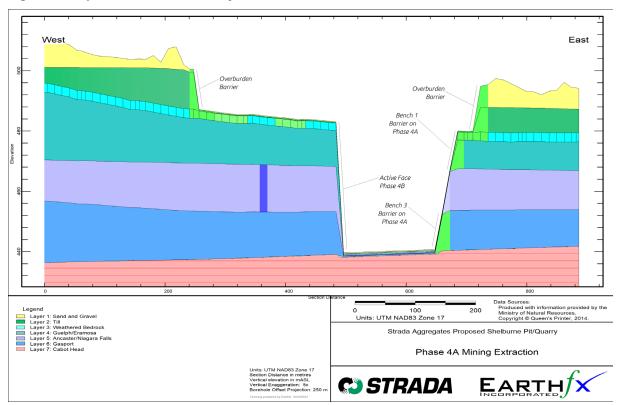


Figure 6: Proposed Strada Pit/Quarry Phase 4A Extraction Scenario N-S Section



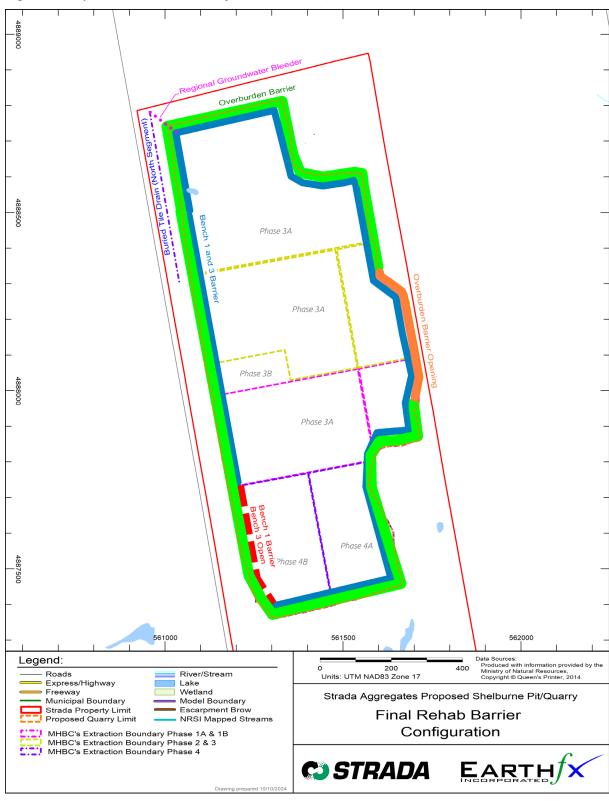


Figure 7: Proposed Strada Pit/Quarry Rehabilitation (Rehab) Scenario



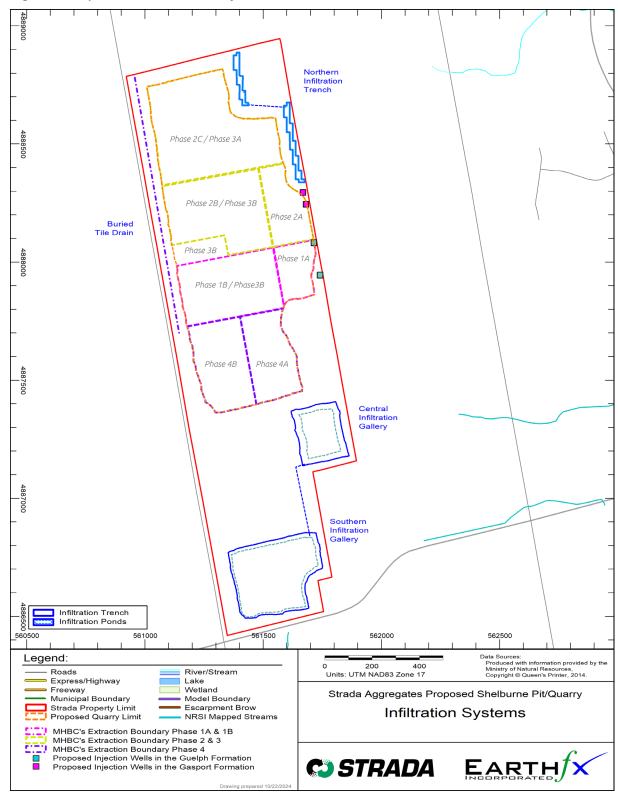


Figure 8: Proposed Strada Pit/Quarry Infiltration Features



OW23 OW24 OW25 OW14 OW18 OW26 OW17 OW9 OW10 COUNTY RD 17 Legend: 0 200 400 Units: UTM NAD83 Zone 17 600 Roads Express/Highway Freeway Municipal Boundary Strada Property Limit River/Stream Lake Wetland Model Boundary Escarpment Brow Strada Aggregates Proposed Shelburne Pit/Quarry Proposed Strada Site Monitors Proposed Strada Site Monitors STRADA EARTH X

Figure 9: On-Site Groundwater Monitoring Wells



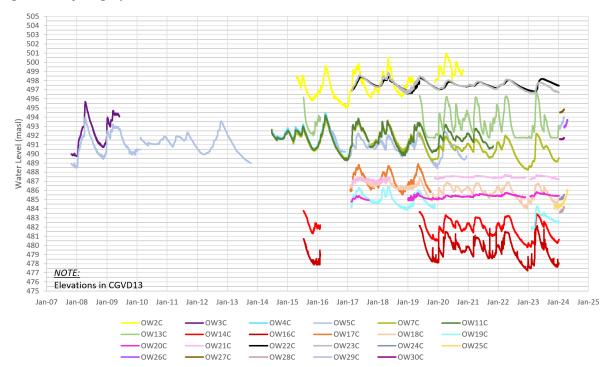


Figure 10: Hydrograph of Bedrock Water Levels (C Series) Across the Site



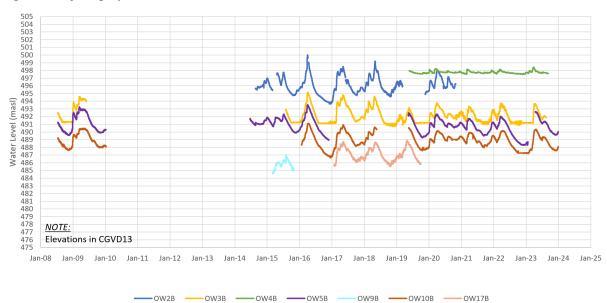


Figure 11: Hydrograph of Intermediate Series "B" Wells Across the Site



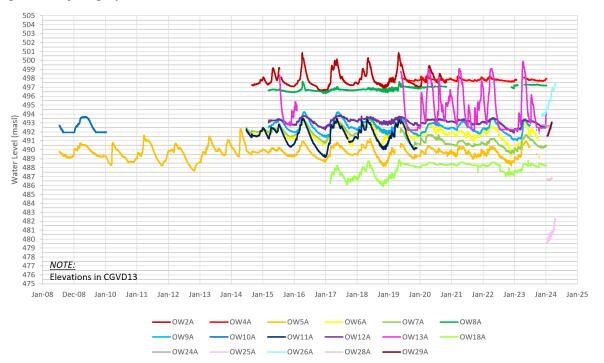


Figure 12: Hydrograph of Intermediate Series "A" Wells Across the Site





OW27 OW23 OW21 **OW28** PRINCE PROPERTY OW19 OW14 BONNEFIELD PROPERTY OW12 MELANCTHON OW29 DWG. No.

1,000

500

STRADA AGGREGATES PROPOSED SHELBURNE PIT/QUARRY
PREDICTED MAXIMUM GROUNDWATER LEVEL

DRAWN: AO

DATE: JAN. 2025

SCALE: 1:12,000

FIG-13

JOB NO. 123016

LEGEND

SITE

MONITORING WELLS

PREDICTED GROUNDWATER COMBINED

NOTES:

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N 2.CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE -ONTARIO.

Appendix A: Borehole Logs



Well ID: OW2

Depth (m)	Elevation (masl)	Lithology	Lithology Description	W	lell Construction Diagram
-4	508			1	
0 =	=	· 6:- : : 6:-	TOP SOIL		
4 =	504	0.00	SILTY SAND: Brown, occassional stone, loose, dry		
8 =	500	0.00	SAND AND GRAVEL: Brown, angular to		
12 =	496	V. 57.	subangular gravel, loose, dry to wet		
16	492	. N			
=	488		TAVISTOCK TILL: Grey, clay with stones, dense to soft, damp		
20 =	484	Δ. []	dense to soit, damp		
24 =	=	.D \Q			
28 -	480				A A
32 =	476				
36 —	472				
40 =	468	//			
44	464	/			
=	460		GUELPH FORMATION: Dolostone, buff to		lole
48 =	<u> </u>		white, fossiliferous		Open Hole
52 —	456				ō
56	452				
60 =	448				
64	444	/			
68	440				
	436		CABOT HEAD SHALE: Green, soft, damp	-	
72 - 76 -	432	,,	- , , _T	_	В

Drilling Date: March 2007 / April 2008 Drilling Company: Keith Lang Drilling



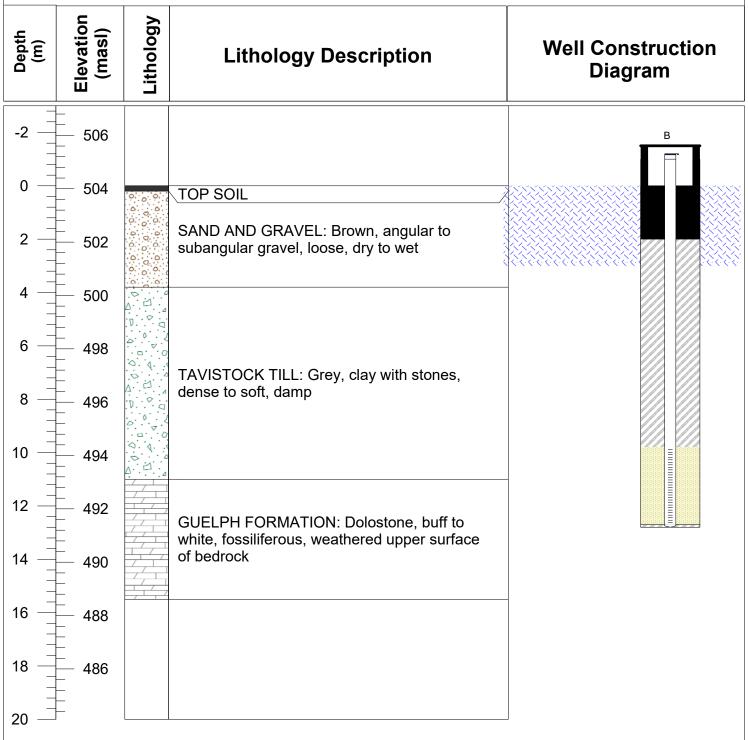
Location: Township of Melancthon

Easting: 561,689 Northing: 4,887,097

Page 1 of 1



Well ID: OW3



Drilling Date: March 2007 / April 2008 Drilling Company: Keith Lang Drilling

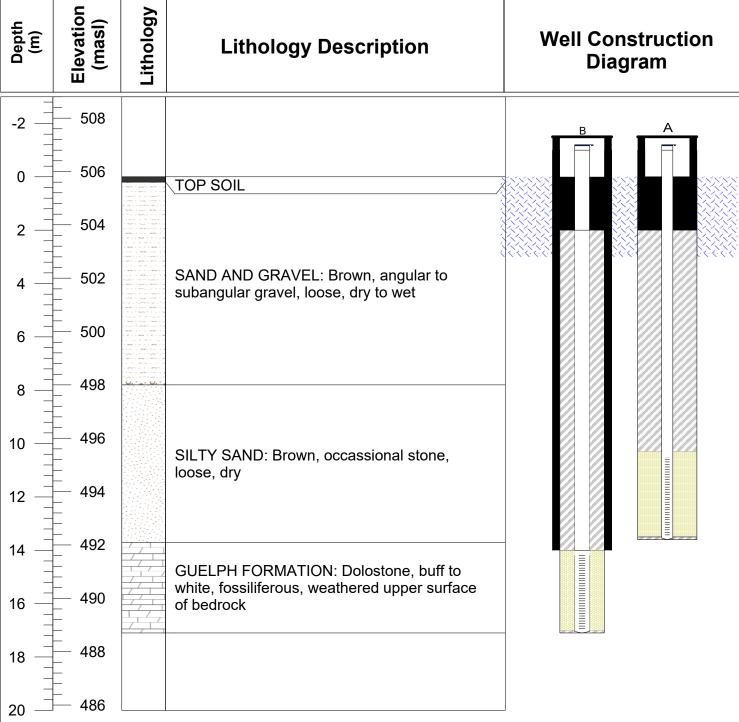
Location: Township of Melancthon

Easting: 561,272 Northing: 4,886,849





Well ID: OW4

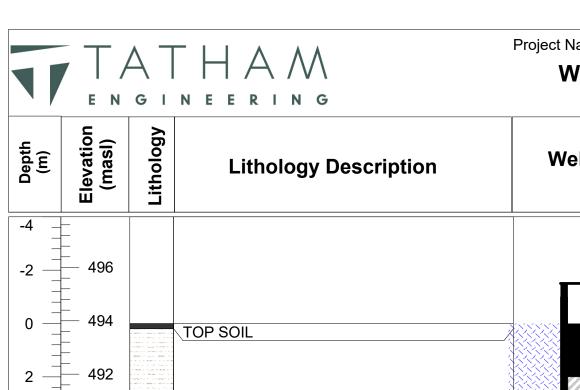


Drilling Date: March 2007 / April 2008 Drilling Company: Keith Lang Drilling



Location: Township of Melancthon

Easting: 561,313 Northing: 4,886,400



Well ID: OW5

Well Construction Diagram SAND AND GRAVEL: Brown, angular to subangular gravel, loose, dry to wet 490 488 TAVISTOCK TILL: Grey, clay with stones, 486 dense to soft, damp 484 GUELPH FORMATION: Dolostone, buff to white, fossiliferous, weathered upper surface 482 of bedrock 480 478 476 18 20 474

Drilling Date: March 2007 / April 2008 Drilling Company: Keith Lang Drilling



Location: Township of Melancthon

Easting: 561,742 Northing: 4,886,523



Well ID: OW6

Depth (m)	Elevation (masl)	Lithology	Lithology Description	Well Construction Diagram
-2	497			A
-1	_ 496 			
0	495 495		SILTY SAND: Brown, occassional stone,	
1 -	 494		loose, dry	
2 —	 493 			
3	492			
4	 491 		SAND AND GRAVEL: Brown, angular to	
5	490		subangular gravel, loose, dry to wet	
6	 489 			
7	 488 			
8 —	487 			
9 —	 486 			
10	 485 			
11	484			
12	483			

Drilling Date: Jun-15

Drilling Company: Keith Lang Drilling



Location: Township of Melancthon

Easting: 561,660 Northing: 4,886,939



Well ID: OW7

Depth (m)	Elevation (masl)	Lithology	Lithology Description	V		enstruction agram
-2 <u> </u>	498					
0 —	496		SILTY SAND: Brown, occassional stone, loose, dry			
4 =		0.000		_		
6 —	492 490	0 0 0	SAND AND GRAVEL: Brown, angular to			
8 =	488	0 0 0	subangular gravel, loose, dry to wet			
10	486	V. 17		_		
12 =	484		TAVISTOCK TILL: Grey, clay with stones,			A
14 =	482	V D D	dense to soft, damp			
16 =	480	D. 0. 7				
18 —	478	// /				
20 _	476					
22	474		GUELPH FORMATION: Dolostone, buff to			
24 =	472	////	white, fossiliferous, weathered upper surface of bedrock		in Hole	
26	470				Open H	
28 —	468					
30 =	466	7/1		_	-	
32 =					С	

Drilling Date: Jun-15

Drilling Company: Keith Lang Drilling



Location: Township of Melancthon

Easting:

Northing:



Well ID: OW8

Depth (m)	Elevation (masl)	Lithology	Lithology Description	Well Construction Diagram
-2				A
-1	497			I Fill
0	496			
1 —	 495		SILTY SAND: Brown, occassional stone, loose, dry	
2 —	 494			
3 =	493 493			
4	492 			
5 -	491 			
6	490 		SAND AND GRAVEL: Brown, angular to	
7	489 		subangular gravel, loose, dry to wet	
8 =	488 			
9 -	487 			
10	486 			
11 =	485 			
11 -	484 			
	483 			
14	482			

Drilling Date: Jun-15

Drilling Company: Lantech Drilling Services



Location: Township of Melancthon

Easting: 561,881 Northing: 4,887,192



Well ID: OW9

Depth (m)	(masl) Lithology Description		Lithology Description	Well Construction Diagram				
-2	498			A				
0 =	496 496							
2 -	 494 		SAND AND GRAVEL: Brown, angular to subangular gravel, loose, dry to wet					
4 -	492 		Subangular graver, 100se, dry to wet					
6 =	490 	,						
8 -	 488							
10	486 	V V V						
12	484 	0.00	TAVISTOCK TILL: Grey, clay with stones, dense to soft, damp					
14	482 482	A. D. O. V.						
16	480 480	0.00						
18 —	478 478	7	GUELPH FORMATION: Dolostone, buff to					
20	 476		white, fossiliferous, weathered upper surface of bedrock					
22								

Drilling Date: March 2007 / April 2008 Drilling Company: Keith Lang Drilling



Location: Township of Melancthon

Easting: 561,806 Northing: 4,887,468



Well ID: OW10

Depth (m)	Elevation (masl)	Lithology	Lithology Description	Well Construction Diagram				
-2 _	496							
2 —	494	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	SAND AND GRAVEL: Brown, angular to subangular gravel, loose, dry to wet					
4 —	492	8 - 6	SILTY CLAY: Brown, compact, moist					
8 —	488		SILTY SAND: Brown, occassional stone, loose, dry					
10	484							
14 —	482		TAVISTOCK TILL: Grey, clay with stones, dense to soft, damp					
18 —	478							
20	474	/ , 1	GUELPH FORMATION: Dolostone, buff to white, fossiliferous, weathered upper surface of bedrock					

Drilling Date: March 2007 / April 2008
Drilling Company: Keith Lang Drilling



Location: Township of Melancthon

Easting: 561,628 Northing: 4,887,239



Well ID: OW11

Depth (m)	Elevation (masl)	Lithology Description	W	Well Construction Diagram				
498	498				В	A		
496	496							
494 —	494		SILTY SAND: Brown, occassional stone, loose, dry					
492 —	492							
490 —	490		SAND AND GRAVEL: Brown, angular to subangular gravel, loose, dry to wet					
488	488	. D . A						
486 —	486		TAVISTOCK TILL: Grey, clay with stones, dense to soft, damp					
484	484	A. [1]		_				
482 —	482		GUELPH FORMATION: Dolostone, buff to white, fossiliferous, weathered upper surface of bedrock		Open Hole			
480 _	480	////				2		
478 —	478							
476	476							

Drilling Date: Jun-15

Drilling Company: Keith Lang Drilling

Location: Township of Melancthon

Easting: 561,571 Northing: 488,477





Well ID: OW12

Depth (m)	Elevation (masl)	Lithology	Lithology Description	Well Construction Diagram
-2				A
-1	507			
0	506			
1 -	505		SILTY SAND: Brown, occassional stone, loose, dry	
2 —	 504 			
3	503 			
4	 502			
5	 501 			
6	500 		SAND AND CDAVEL: Proven angular to	
7	499 		SAND AND GRAVEL: Brown, angular to subangular gravel, loose, dry to wet	
8	498 			
9 =	497			
10	496 			
11	495 			
12	494 494			
13	493			

Drilling Date: Jun-15

Drilling Company: Lantech Drilling Services

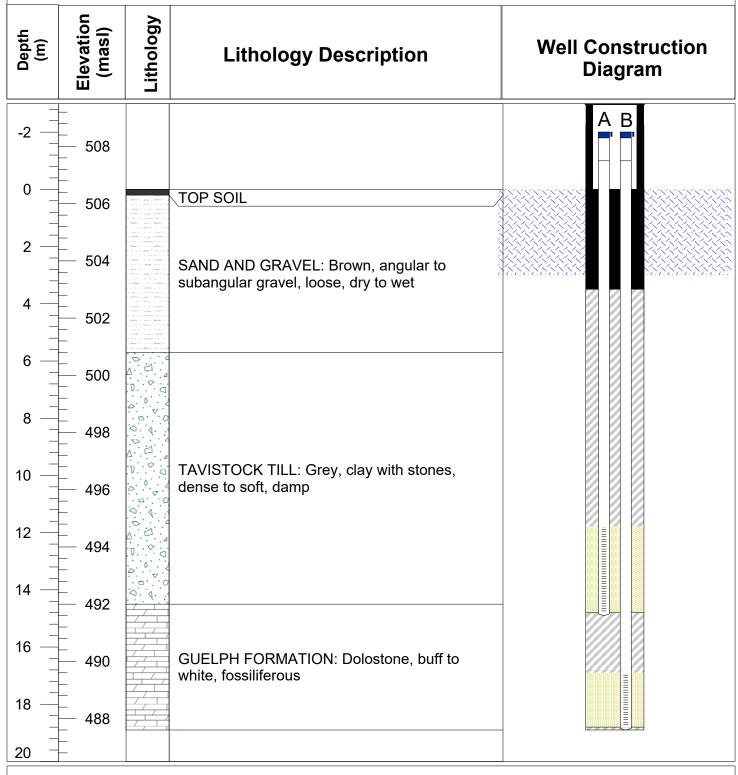


Location: Township of Melancthon

Easting: 561,282 Northing: 4,887,057



Well ID: OW13



Drilling Date: Dec-01

Drilling Company: Keith Lang Drilling

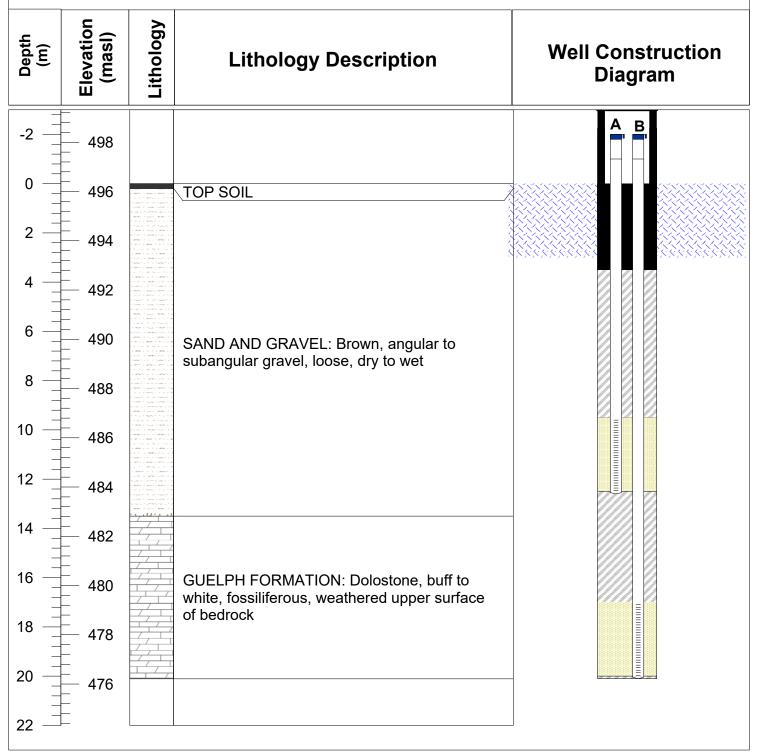
Location: Township of Melancthon

Easting: 561,145 Northing: 4,887,604





Well ID: OW14



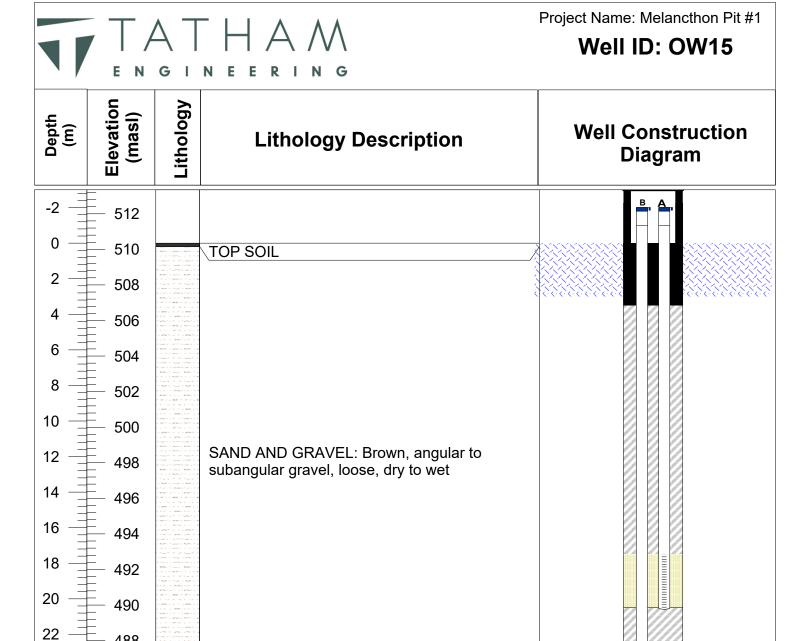
Drilling Date: Aug-04

Drilling Company: Keith Lang Drilling

Location: Township of Melancthon

Easting: 561,769 Northing: 4,887,847





GUELPH FORMATION: Dolostone, buff to white, fossiliferous, weathered upper surface

Drilling Date: Aug-04

488

486

484

482

26

28

Drilling Company: Keith Lang Drilling

of bedrock



Location: Township of Melancthon

Easting: 561,431 Northing: 4,887,669



Well ID: OW16

Depth (m)	Elevation (masl)	Lithology	Lithology Description	Well Construction Diagram			
-4	500			В			
-2	 498						
0 —	496						
2 =	494 494		SAND AND GRAVEL: Brown, angular to subangular gravel, loose, dry to wet				
4 —	492 		, , ,				
6 -	490	/					
10	488 						
12 —	486						
14	484 						
16	482 		GUELPH FORMATION: Dolostone, buff to				
18	480 		white, fossiliferous, weathered upper surface of bedrock				
20 —	478 						
22 —	476	// /					
24	474						
26	472						
28	470 	1 /					

Drilling Date: Jun-12

Drilling Company: Keith Lang Drilling



Location: Township of Melancthon

Easting:

Northing:



Project Name: Bonnefiel Pit #3

Well ID: OW17

Depth (m)	Elevation (masl)	Lithology	Lithology Description	Well Construction Diagram		
-4	506					
-2	 504			A B		
0 =	502		TOP SOIL			
2 -	500					
4 -	 498					
6 -	496		SAND AND GRAVEL: Brown, angular to subangular gravel, loose, dry to wet			
8 =	 494					
10	 492					
12 -	490	V. []				
14 =	488					
16	486	V. 7				
18	484	D 0 7	TAVISTOCK TILL: Grey, clay with stones, dense to soft, damp			
20 —	482	0.0.0				
22 —	480	D. O. Y				
24 =	 478	, , , , ,	GUELPH FORMATION: Dolostone, buff to			
26 — 28 —	476		white, fossiliferous			

Drilling Date: 28-Sep

Drilling Company: Keith Lang Drilling



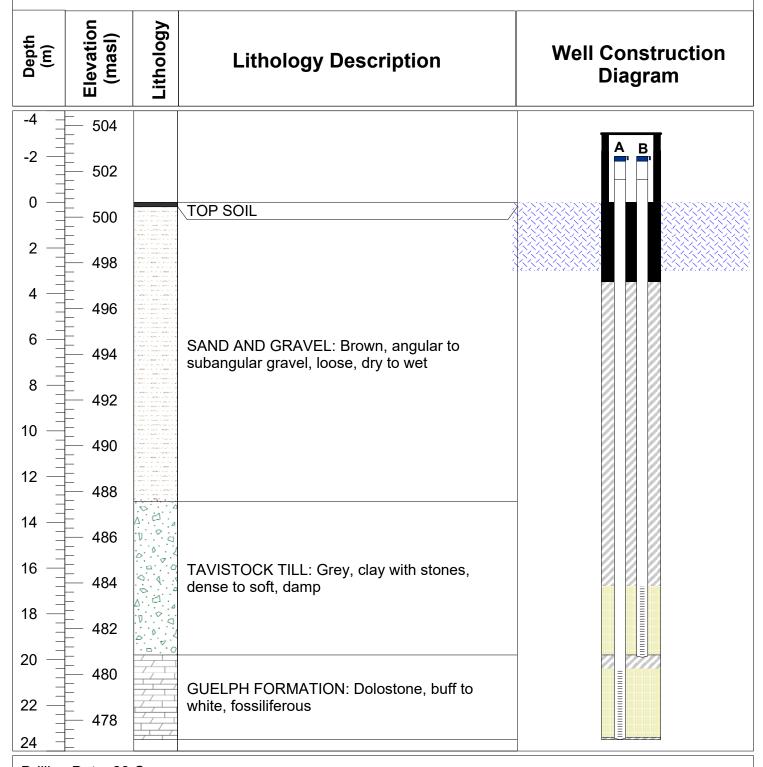
Location: Township of Melancthon

Easting: 561,472 Northing: 4,887,382



Project Name: Bonnefiel Pit #3

Well ID: OW18



Drilling Date: 28-Sep

Drilling Company: Keith Lang Drilling

Location: Township of Melancthon

Easting: 561,653 Northing: 4,887,686





Well ID: OW19

Depth (m)	Elevation (masl)	Lithology	Lithology Description	Well Construction Diagram
-4 -2	512			B A
0 =	510		TOP SOIL	
2 =	508			
4 =	506		SAND AND GRAVEL: Brown, angular to	
6	504		subangular gravel, loose, dry to wet	
8 =	502	0		
10 =	500	.D ♦	TAVISTOCK TILL: Crow alove and ailt with	
12 —	498	○ · · · · · · · · · · · · · · · · · · ·	TAVISTOCK TILL: Grey, clay and silt with stones, dense to soft, damp	
14 =	496	V		
16	494			
18	492			
20 =	490			
22 —	488			
24 —	486		GUELPH FORMATION: Dolostone, buff to	
26	484		white, fossiliferous	
28	482			
30 =	480			
32 —	478	// 1		
34	476			
36	474			

Drilling Date: Feb-17

Drilling Company: Highland Water Well Drilling



Location: Township of Melancthon

Easting: 561,035 Northing: 4,888,193



Well ID: OW20

Depth (m)	Elevation (masl)	Lithology	Lithology Description	Well Construction Diagram
-4	512			
-2	 510			B A
0 =	 508		TOP SOIL	
2	506			
4	 504			
6	502			
8 -	500			
10	498		SAND AND GRAVEL: Brown, angular to	
12	496		subangular gravel, loose, dry to wet	
14	494			
16	492			
18	490			
20	 488			
22	486			
24	484		GUELPH FORMATION: Dolostone, buff to white, fossiliferous	
26	 482			
28				

Drilling Date: Feb-17

Drilling Company: Highland Water Well Drilling

Location: Township of Melancthon

Easting: 561,544 Northing: 4,888,334





Well ID: OW21

Depth (m)	Elevation (masl)	Lithology	Lithology Description	Well Construction Diagram				
-4	514							
-2 -				A B				
0 =	510		TOP SOIL					
2 —	508							
4 -	506							
6 =	504							
8 -	502							
10 —	500		SAND AND GRAVEL: Brown, angular to					
12 —	498		subangular gravel, loose, dry to wet, some silt					
14 —	496							
16 —	494							
18 —	492							
20 —	490							
22	488	7	CHELDH FORMATION: Delegation of heading					
24 —	 486	//	GUELPH FORMATION: Dolostone, buff to white, fossiliferous					
26								

Drilling Date: Feb-17

Drilling Company: Highland Water Well Drilling



Location: Township of Melancthon

Easting: 561,593 Northing: 4,888,681



Well ID: OW22

Depth (m)	Elevation (masl)	Lithology	Lithology Description	Well Construction Diagram
-4	516			
-2	 514			
0			TOP SOIL	
2 —	 510			
4	 508			
6 —	506			
8	 504		SAND AND GRAVEL: Brown, angular to subangular gravel, loose, dry to wet, some silt	
10	 502			
12	500			
14	 498			
16	496 	V		
18	 494	D. O. S.	TAVISTOCK TILL: Grey, clay and silt with	
20	492 492	V. C. V.	stones, dense to soft, damp, silt and gravel layer at base	
22	490	D		
24	488 488	-00	GUELPH FORMATION: Dolostone, buff to	
26 - 28 -	486 486		white, fossiliferous	

Drilling Date: Feb-17

Drilling Company: Highland Water Well Drilling



Location: Township of Melancthon

Easting: 561,384 Northing: 4,888,891



Well ID: OW23

Depth (m)	Elevation (masl)	Lithology	Lithology Description	Well Construction Diagram
-4 -2	 512 			B A
0	510		TOP SOIL	
2 =	508 		TOI GOIL	
4	506			
6	504 		SAND AND GRAVEL: Brown, angular to subangular gravel, loose, dry to wet, some silt	
8 =	502 			
10	<u>500</u>			
12	498 	Δ· Δ· Δ		
14	496 	0.4.		
16	494 	.∆	TAVISTOCK TILL: Grey, clay and silt with stones, dense to soft, damp,	
18	492 	D . 0		
20	490 	Δ		
22	488	/		
24	486		GUELPH FORMATION: Dolostone, buff to	
26	484		white, fossiliferous	
28	482 	7,1		
30	480			<u> </u>

Drilling Date: Feb-17

Drilling Company: Highland Water Well Drilling



Location: Township of Melancthon

Easting: 560,938 Northing: 4,888,788



Location ID: -2147483403 Master ID: -2147483403 Original Name/ID: Alt Name: Core #3 Location: E: 560965.02 N: 4888558.315 QA: 1

Lot: Con: Rgn/Cnty: Muni. Gnd Elev: 508.9 masl Elev. QA Code: Depth: 71.02 m Drill Date:

Pump test rate: Test Start: to Recommended Rate: at Depth m Purpose: , BH Diameter: Drill Method:

Metres		Pic	ks	MC	DE Material 1	M	DE Material 2	2E Material	Sc	reens	Ge	eo Description
500					TILL		SAND SILT	**				OVERBURDEN (TILL): mix of sand, silt, boulders, gravel (detailed lognot obtained)
490	490.24 477.31 477.81		Top of Bedrock - Guelph		DOLOSTONE		CRYSTALLINE	Ö		SCREEN OW24-A		Guelph: Dolostone, white to greyish pink on drill surface on broken surface white, fine crystalline and sucrosic, medium to thick bedded, porous quickly soaking up wate drop, small vugs 1-2 mm and occasional large vugs to 30 mm, sometimes filled with poorly cemented dolomite xals, and sometimes empty. Absence of natural breaks that have a black styloilitic shale surface64'-65' and 72'-74' many large vugs incipient reef/ bioharmal? 2'-74' many large vugs incipient reef/ bioharmal? -82'-92'-6" and 100' breccia/collapseBottom contact marked by start of styloilitic leafs and gradational colour change.
470	476.81 466.27		Eramosa Goat Island - Ancaster		DOLOSTONE DOLOSTONE		CHERT					Eramosa Goat Island, Ancaster Member. (chert beds): Dolostone, light grey on drill surface and light brownish grey on broken surface becoming light grey lower in section on broken surface, fine crystalline, medium to thick bedded, natural breaks have black stylolitic shale surface, less porous than overlying Guelph based on rate of water absorption. Frequent vugs to 30 mm filled either with chert or soft weakly cemented dolomite and at 105' 10' 3 inch vug filled with coarse crystalline calcite. Faint bituminous smell on freshly broken surfaces.
460	461.5		Goat Island - Niagara Falls Lions Head		DOLOSTONE		CRYSTALLINE			SCREEN OW24-H (Orig- inal open hole)		Gost Island. Niagara Falls Member: Dolostone, very light grey on drill surface and pinkish grey on broken surface with medium bluish grey coloured bands, fine crystalline but finer than Ancaster, thick to massive bedded, low porosity and general absence of vugs. Gasport: Dolostone, very light grey on drill surface and pinkish grey on broken surface with medium bluish grey coloured bands wider but less defined than in overlying Niagara, fine crystalline, thick to massive bedded, porous, vugs 1-3 mm. 155°5 to 168°3° (approximate) possible incipient reef / bioherm, large vugs with partial dolomite filling or containing well formed calcite crystals to 5-10 mm. Below this typical Gasport encrinite texture. Note: Gasport section in hole 3 is thicker than in hole 2 due to possible reef formation.
450	442.01		Irondequoit		DOLOSTONE		POROUS			SCREEN OW24-C		IRM:Dolostone, Pinkish grey with medium bluish grey on wet broken surface, fine crystalline, thick bedded, occ irregular stylolitic seams, porous and vugs. Contact is defined by marked increase in bluish grey banding o



Location ID: -2147483405 Master ID: -2147483405 Original Name/ID: Alt Name: Core #1 Location: E: 561647.683 N: 4888161.257 QA: 1

Lot: Con: Rgn/Cnty:

Muni. Gnd Elev: 490.62 masl Elev. QA Code: Depth: 50.47 m Drill Date:

Pump test rate: Test Start: to Recommended Rate: at Depth m Purpose: , BH Diameter: Drill Method:

Metres		Picks		MOE Material 1		MOE Material 2		Screens		creens	G	eo Description
490 <u> </u>				×	OVERBURDEN							Overburden (no recovery)
480	486.61		Top of Bedrock - Guelph		DOLOSTONE		CRYSTALLINE					Guelph Formation: Dolostone, light brown grey to pinkish grey, fine crystalline, vuggy-(due to fossils), strong, porous with water easily soaking into surface, thick to medium bedded.
-	472.28		Eramaca							SCREEN OW25-A		
	470.93		Eramosa Goat Island - Ancaster		DOLOSTONE	\perp	CRYSTALLINE	L	H			Eramosa Formation: Dolostone, light brownish grey to greyish orange pink, fine- crystalline, vuggy (due to fossils), strong, less porous
470 - - - - -	462.93		30000		DOLOSTONE		BEDDED			SCREEN		than above, thick to medium bedded. Gradational change to underlying Eramosa with decreased porosity and increased stylolites on going deeper, Good RQD. Goat Island Formation Chert Beds: Dolostone as above. Colour change to pale yellowish brown and oilsmell when freshly broken. Bedding planes have soft black surfaces. Upper Goat Island? Lower porosity below here based on water absorption on drill core surface. It is an encrinite ite. composed largely of crinoid debris that has recrystallized.
460	455.92		Goat Island - Niagara Falls		DOLOSTONE					OW25-H (Orig- inal open hole)		Niagara Falls
450			Gasport		DOLOSTONE		CRYSTALLINE					Gasport Formation: Dolostone, light brownish grey to light grey with medium grey mottling (on drill surface this looks like a blue grey colour but on broken surface is medium grey), fine crystalline (not as sugary texture as Guelph), thick bedded, occ. styloilitis. Pale brown in upper 1 ft. Mottling due to bioturbation (trace fossils). Stronger than overlying beds and less porous. Excellent RQD. Encrinite with >50% crinoid fossil debris. Same rock as Duntroon, Acton and Milton Qry's. Highly bioturbated.
-										SCREEN OW25-C		
-	444.63		Irondequoit		LIMESTONE	十		F	Г			Irondequoit Formation: Strong mottling (photo)or biotur- bation
_	441.62				DOLOSTONE	\perp						Fossil Hill Formation: Dolostone, finer grained calcisiltite (Rockway Member?)
440	441.02		Cabot Head		SHALE							Cabot Head Formation: Shale, fissile leafs, reddish at top becoming grey with depth. Trace micro pyrite
-												



Location ID: -2147483404 Location ID: -2147483404 Master ID: -2147483404 Original Name/ID: Alt Name: Core #2 Location: E: 561230.697 N: 4887427.22 QA: 1

Lot: Con: Rgn/Cnty:

Muni. Gnd Elev: 499.22 masl Elev. QA Code: Depth: 62.41 m Drill Date:

Pump test rate: Test Start: to

Recommended Rate: at Depth m Purpose: , BH Diameter: Drill Method:

Metres	Picks			MOE Material 1		MOE Material 2		Material 3		Screens		Geo Description	
490					SAND		SAND SILT	*** 0000000000000000000000000000000000				OVERBURDEN: mix of sand, silt, boulders, gravel (deta- iled log notobtained)	
480	481.4 469.65		Top of Bedrock Guelph		DOLOSTONE		CRYSTALLINE		=	SCREEN OW26-A		Guelph, Upper Member: Dolostone, white to greyish pink on drill surface on broken surface white, fine crystalline and sucrosic, medium to thick bedded, porous quickly soaking up water drop, small vugs 1-2 mm and occasional large vugs to 30 mm, sometimes filled with poorly cemented dolomite xtals, and sometimes empty. Originally a bioturbated mud. Recrystallization has destroyed most fossils but mold of gastropod found at 61°. Absence of natural breaks that have a black stylolitic shale surface. Lower member, reefal in nature is missing. Bottom contact marked by start of stylolitic leafs and	
460	468.35 456.14		Eramosa Goat Island - Ancaster		DOLOSTONE		CHERT			UW26-A		aradational colour change Eramosa Goat Island, Ancaster Member. (chert beds): Contact at 101' 6" at start of first significant stylolite leafs. Dolostone, light grey on drill surface and light brownish grey on broken surface becoming light grey lower in section on broken surface, fine crystalline, medium to thick bedded, natural breaks have black stylolitic shale surface, less porous than overlying Guelph based on rate of water absorption. Frequent vugs to 30 mm filled either with chert or soft weakly cemented dolomite. Faint bituminous smell on freshly broken surfaces.	
450	451.6 442.53		Goat Island - Niagara Falls Gasport		DOLOSTONE		CRYSTALLINE			SCREEN OW26-H (Orig- inal open hole) SCREEN OW26-C		Goat Island, Niagara Falls Member: Dolostone, very light grey on drill surface and pinkish grey on broken surface with medium bluish grey coloured bands, fine crystalline but finer than overlying Ancaster, thick to massive bedded, low porosity and general absence of vugs. Gasport: Dolostone, very light grey on drill surface and pinkish grey on broken surface with medium bluish grey coloured bands wider but less defined than in overlying Niagara, fine crystalline, thick to massive bedded, porous, vugs 1-3 mm, some discrete areas high concentration of vugs resulting in weak, porous and brittle rock. A grain stone. Extensive bioturbation giving a mottled fabric.	
440_	437.38 _		Irondequoit Cabot Head		DOLOSTONE SHALE		CRYSTALLINE					IRM: Contact with Irondequoit Formation. Dolostone, Pinkish grey with medium bluish grey on wet broken surface, fine crystalline, thick bedded, occ irregular stylo- litic seams, porous and vugs. Upper contact is defined by marked increase in bluish grey banding going downwards. At 191° contact with Rockway Formation. At 199° 11° contact with Merriton Formation (aka Fossil Hill). 203° 2° 1 inch shale. Note shale seams in IRM are rip up clasts of underlying Cabot Head shale. Cabot Head: Shale, dark grey, soft, aphanitic, fissile and	
430												soft	



Location Name: OW27-C

Location ID: -902854379 Master ID: -902854379 Original Name/ID:
Alt Name: A391976
Location: E: 560927.286 N: 4888784.544 QA:

Lot: Con: Rgn/Cnty:

Muni. Gnd Elev: 510.26 masl Elev. QA Code: Depth: 71.88 m Drill Date:

Pump test rate: Test Start: to

Recommended Rate: at Depth m

Purpose: , BH Diameter: Drill Method:

Metres	res Picks		MOE Material 1		MOE Material 2		OE Materi	Sc	reens	Geo Description		
510					OVERBURDEN			ov .				Overburden
490	487.59		Top of Bedrock - Guelph		DOLOSTONE	<u> </u>						Guelph Formation: Dolostone, white to light grey. Finely crystalline to sucrosic, medium to thick bedded. Porous, quickly soaking up water on surface.
480	482.87		Eramosa		DOLOSTONE							Small vugs 1-2 mm and occasional large vugs to 30 mm, sometimes filled with poorly cemented dolomite crystals. Complete absence of natural breaks that exhibit black stylolitic shale surface. Eramosa Formation: Dolostone. light to medium brown- ish grey, fine crystalline, vuggy (due to fossils), strong, thick to medium bedded. Unlike the verlying Guelph, stylolites are common, and the colour is more
470	464.86		Goat Island - Ancaster		DOLOSTONE							brown-grey. Less porous than above, with a clear reflective sheen when wet, unlike the Guleph, which readily absorbs applied water. Good RQD. Goat Island, Ancaster Member. Dolostone, finely crystalline, medium to dark ash grey, thin to medium bedded. Occasional vugs to 40 mm filled either with chert or weakly cemented dolomite. Faint bituminous smell on freshly broken surfaces. Zones with numerous dark stylolites. Tight, with very low porosity — water applied to surface is not absorbed and remains
460	464.85 464.15		Niagara Falls Lions Head Gasport		\DOLOSTONE							as a sheen. Goat Island, Niagara Falls Member: Dolostone, very light bluish grey on drill surface and pinkish grey on broken surface. Medium bluish grey, thin, wavy bands that give a distinctive pin-striped appearance, with occasional bluish specks. Very fine crystalline. Thick to massive bedded, very low porosity and absence of vugs. Very tight – water applied to surface is not absorbed and remains as a sheen. Gasport: Dolostone, thick to massive-bedded, fine-
450					DOLOSTONE							to coarse-grained, blue-grey to white in a frequently banded pattern. Vugs, 1 to 4 mm in size are common. More porous than the overlying Niagara Falls, but water applied to surface still remains as a sheen. Lighter in color and less mottled than the underlying IRM.
440	442.24 438.57		Irondequoit Cabot Head		DOLOSTONE SHALE				‡	SCREEN OW27-C		IRM: Dolostone, pinkish grey with medium bluish grey on wet broken surface, fine crystalline, thick bedded, occasional irregular stylolitic seams. Porous with vugs up to 4mm. Darker, less banded and more mottled than the overlying Gasport. Becoming brownish coloured with depth. Cabot Head: Shale, dark grey, soft, aphanitic, fissile.



Location Name: OW28-C

Location ID: 1602548740 Master ID: 1602548740 Original Name/ID:

Alt Name: Location: E: 561602 N: 4888678 QA: 1

Lot: Con: Rgn/Cnty: Muni. Gnd Elev: 510.98 masl Elev. QA Code: Depth: 67.59 m Drill Date:

Pump test rate: Test Start: to

Recommended Rate: at Depth m Purpose: , BH Diameter: Drill Method:

Metres		Picks			MOE Material 1		MOE Material 2		Screens		Geo Description	
510				OVER	BURDEN			MOE				Overburden
490	484.47		\Top of Bedrock Eramosa	DOLO	STONE	,						Eramosa Formation: Dolostone, light to medium brownish grey, fine crystalline, vuggy (due to fossils), strong, thick to medium bedded. Unlike the overlying Guelph, stylolles are common, and the colour is more brown-grey. Less porous than above, with a clear reflective sheen when wet, unlike the Guelph, which readily absorbs applied water. Good RQD.
470	472.84		Goat Island - Ancaster	DOLO	STONE							Goat Island, Ancaster Member. Dolostone, finely crystalline, medium to dark ash grey, thin to medium bedded. Occasional vugs to 40 mm filled either with chert or weakly cemented dolomite. Faint bituminous smell on freshly broken surfaces. Zones with numerous dark stylolites. Tight, with very low porosity — water applied to surface is not absorbed and remains as a sheen.
460	462.09	<u>~</u>	Niagara Falls Lions Head Gasport		STONE							Goat Island, Niagara Falls Member: Dolostone, very light bluish grey on drill surface and pinkish grey on broken surface. Medium bluish grey, thin, wavy bands that give a distinctive pin-striped appearance, with occasional bluish specks. Very fine crystalline. Thick to massive bedded, very low porosity and labsence of vugs. Very tight — water applied to surface is not absorbed and remains as a sheen. Gasport: Dolostone, thick- to massive-bedded, fine-to coarse-grained, blue-grey to white in a frequently banded pattern. Vugs, 1 to 4 mm in size are common. More porous than the overlying Niagara Falls, but water applied to surface still remains as a sheen. Lighter in color and less mottled than the underlying IRM.
440	444.72		Irondequoit Cabot Head	DOLO	STONE					SCREEN OW28-C		IRM: Dolostone, pinkish grey with medium bluish grey on wet broken surface, fine crystalline, thick bedded, occasional irregular stylolitic seams. Porous with vugs up to 4mm. Darker, less banded and more mottled than the overlying Gasport. Becoming brownish coloured with depth. Cabot Head: Shale, dark grey, soft, aphanitic, fissile.



Location Name: OW29-C

Location ID: 1369143902 Master ID: 1369143902 Original Name/ID:

Alt Name: Location: E: 561411.76 N: 4886532.7 QA: 1

Lot: Con: Rgn/Cnty: Muni. Gnd Elev: 499.9 masl Elev. QA Code: Depth: 62.76 m Drill Date:

Pump test rate: Test Start: to

Recommended Rate: at Depth m

Purpose: , BH Diameter: Drill Method:

Metres	Picks		MOE Material 1	MOE Material 2	MOE Materia	Screens	Ge	o Description
500			OVERBURDEN					Overburden
480	488.34	Top of Bedrock - Guelph	DOLOSTONE				××	Guelph Formation: Dolostone, white to light grey. Finely crystalline to sucrosic, medium to thick bedded. Porous, quickly soaking up water on surface. Small vugs 1-2 mm and occasional large vugs to 30 mm, sometimes filled with poorly cemented dolomite crystals. Complete absence of natural breaks that exhibit black stylolitic shale surface.
470	460.13	Eramosa	DOLOSTONE					Eramosa Formation: Dolostone, light to medium brown- ish grey, fine crystalline, vuggy (due to fossils) strong, thick to medium bedded. Unlike the overlying Guelph, stylolites are common, and the colour is more brown-grey. Less porous than above, with a clear reflective sheen when wet, unlike the Guelph, which readily absorbs applied water. Good RQD.
450	454.3	Goat Island - Ancaster Niagara Falls Lions Head Gasport	DOLOSTONE					Goat Island, Ancaster Member. Dolostone, finely crystalline, medium to dark ash grey, thin to medium bedded. Occasional vugs to 40 mm filled either with chert or weakly cemented dolomite. Faint bituminous smell on freshly broken surfaces. Zones with numerous dark stylolites. Tight, with very low porosity – water applied to surface is not absorbed and remains as a sheen. Goat Island, Niagara Falls Member: Dolostone, very light bluish grey on drill surface and pinkish grey
440	441.33	Irondequoit	DOLOSTONE			CODEEN OWN S		on broken surface. Medium bluish grey, thin, wavy bands that give a distinctive pin-striped appearance, with occasional bluish specks. Very fine crystalline. Thick to massive bedded, very low porosity and absence of vugs. Very tight – water applied to surface is not absorbed and remains as a sheen. Gasport: Dolostone, thick to massive-bedded, fine-to coarse-grained, blue-grey to white in a frequently banded pattern. Vugs, 1 to 4 mm in size are common. More porous than the overlying Niagara Falls, but
430	438.13	Cabot Head	SHALE			SCREEN OW29-C		water applied to surface still remains as a sheen. Lighter in color and less mottled than the underlying IRM. IRM: Dolostone, pinkish grey with medium bluish grey on wet broken surface, fine crystalline, thick bedded, occasional irregular stylolitic seams. Porous with vugs up to 4mm. Darker, less banded and more mottled than the overlying Gasport. Becoming brownish coloured with depth. Cabot Head: Shale, dark grey, soft, aphanitic, fissile.



Location ID: -1130319958 Master ID: -1130319958 Original Name/ID: A374686

Alt Name

Location: E: 561634.341 N: 4886900.777 QA: 1

Lot: Con: Rgn/Cnty: Muni.

Gnd Elev: 494.35 masl Elev. QA Code:

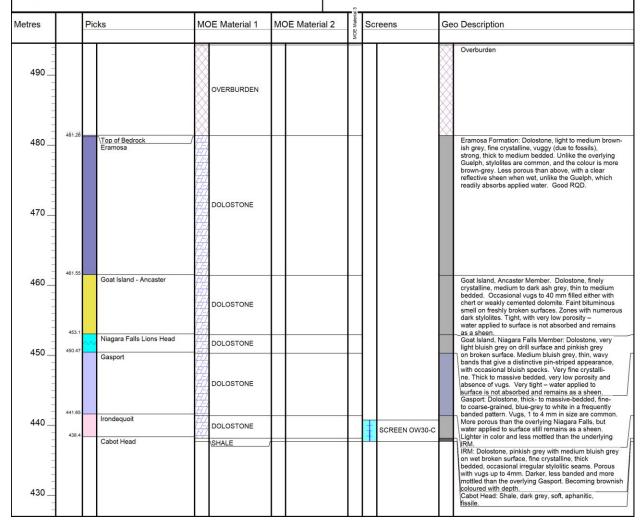
Depth: 56.62 m Drill Date:

Pump test rate: Test Start: to

Recommended Rate: at Depth m

Purpose:

BH Diameter: Drill Method:



Appendix B: Hydrographs



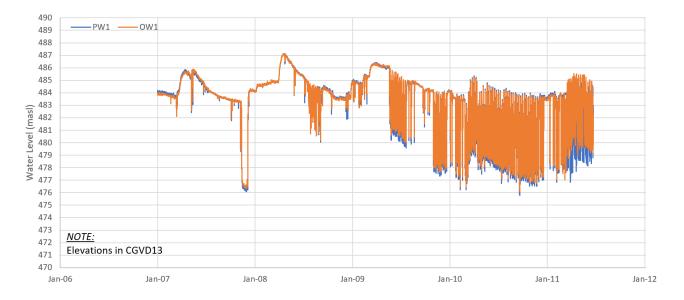


Figure B.1: Hydrograph of water levels at PW1 and OW1, in masl

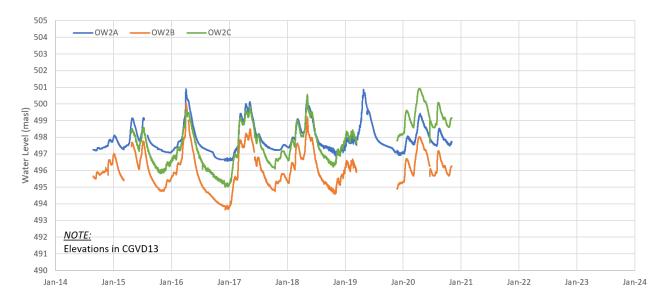


Figure B.2: Hydrograph of water levels at Well Nest OW2, in masl.

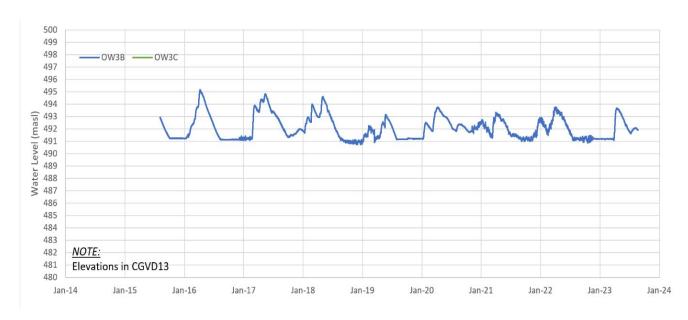


Figure B.3: Hydrograph of water levels at Well Nest OW3, in masl, 2008 to 2009.

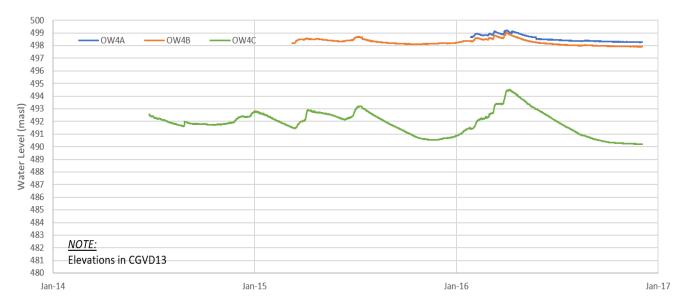


Figure B.4: Hydrograph of water levels at Well Nest OW4, in masl., 2014 to 2016

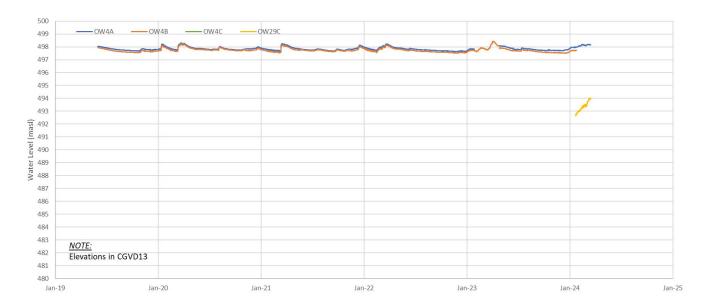


Figure B.5: Hydrograph of water levels at Well Nest OW4 and OW29C, in masl.

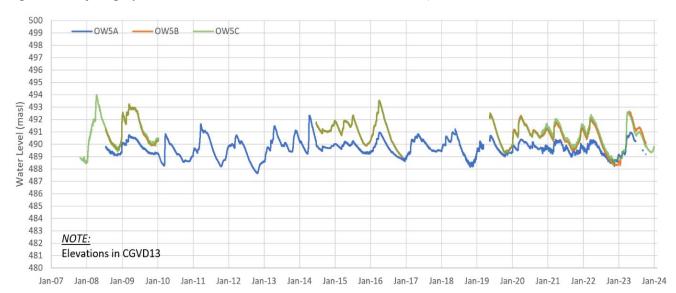


Figure B.6: Hydrograph of water levels at Well Nest OW5, in masl.

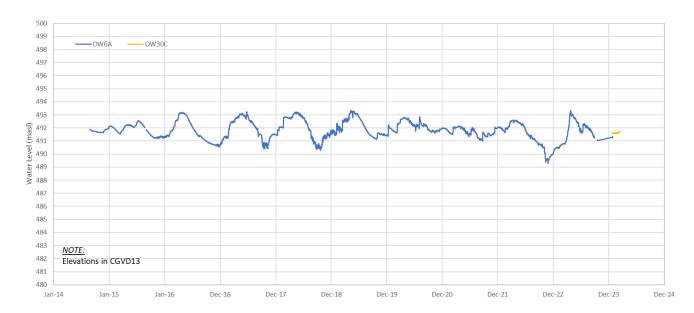


Figure B.7: Hydrograph of water levels at OW6A, in masl, 2014 to 2024.

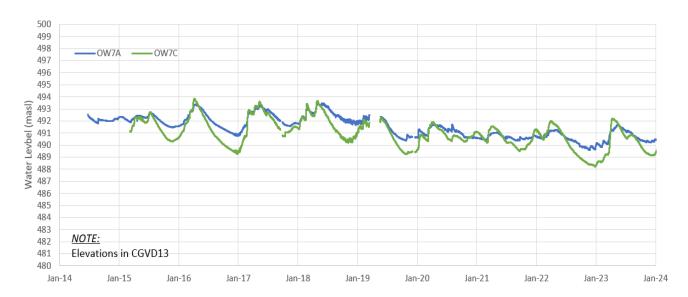


Figure B.8: Hydrograph of water levels at Well Nest OW7, in masl.

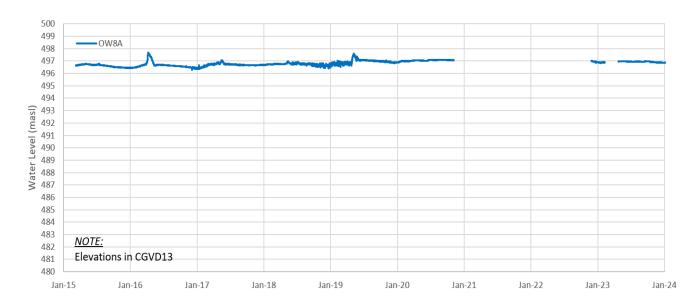


Figure B.9: Hydrograph of water levels at OW8A, in masl.

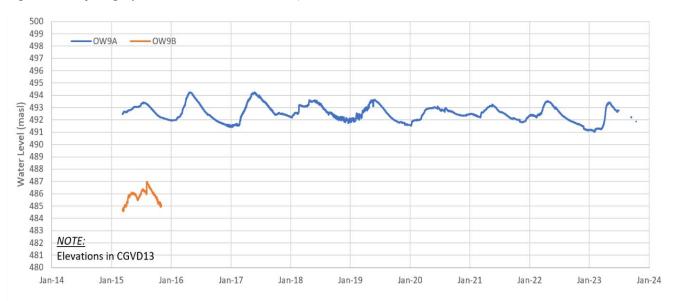


Figure B.10: Hydrograph of water levels at Well Nest OW9, in masl.

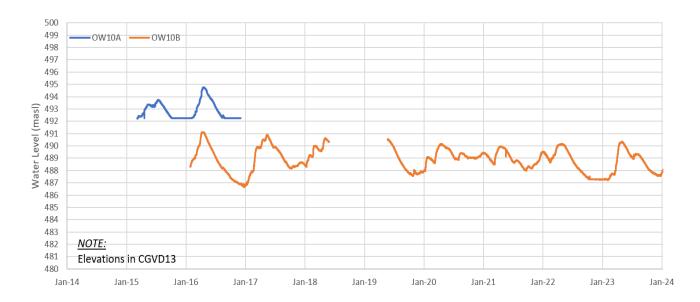


Figure B.11: Hydrograph of water levels at Well Nest OW10, in masl.

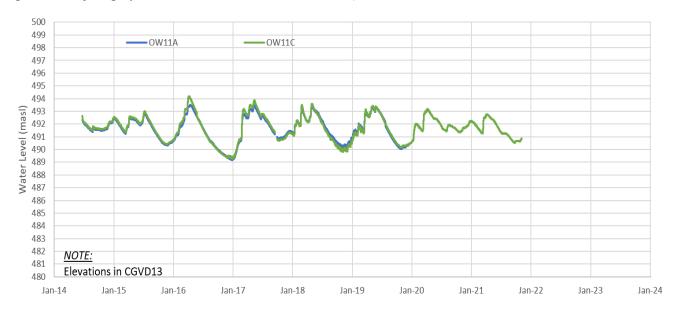


Figure B.12: Hydrograph of water levels at Well Nest OW11, in masl.

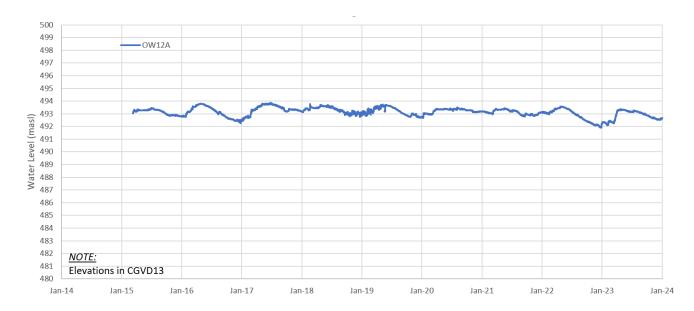


Figure B.13: Hydrograph of water levels at Well OW12A, in masl.

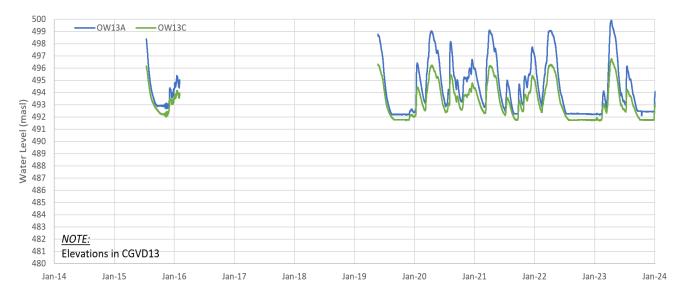


Figure B.14: Hydrograph of water levels at Well Nest OW13, in masl.

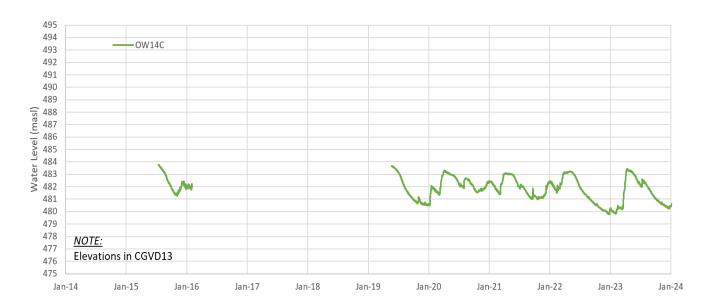


Figure B.15: Hydrograph of water levels at Well OW14C, in masl.

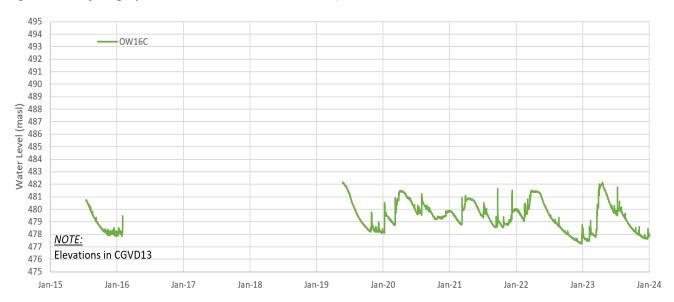


Figure B.16: Hydrograph of water levels at Well OW16C, in masl.

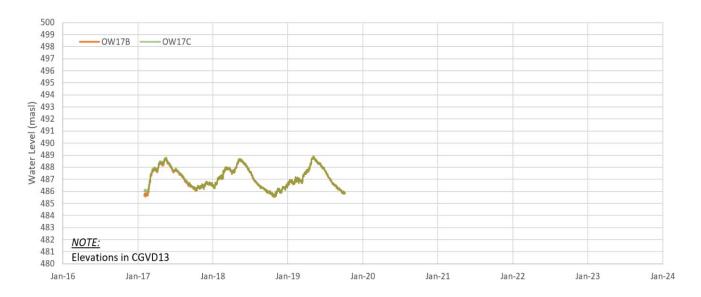


Figure B.17: Hydrograph of water levels at Well Nest OW17, in masl.

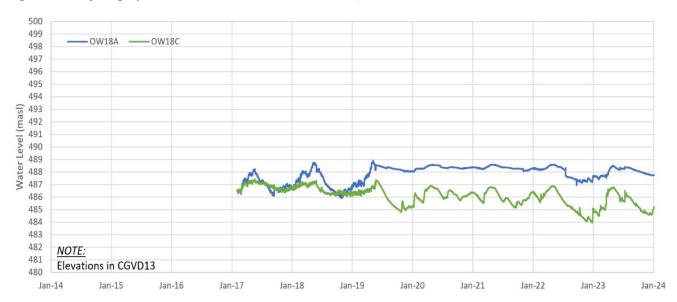


Figure B.18: Hydrograph of water levels at Well Nest OW18, in masl.

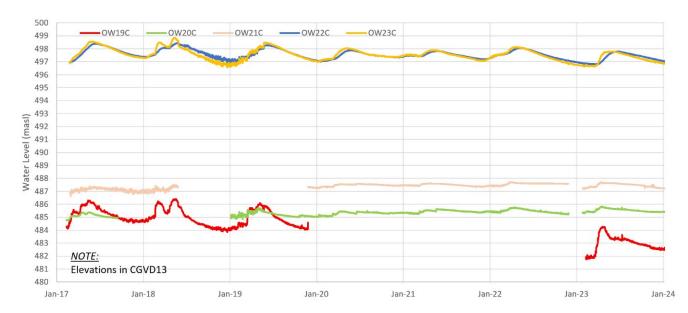


Figure B.19: Hydrograph of water levels at Well Nests OW19, OW20, OW21, OW22, and OW23.

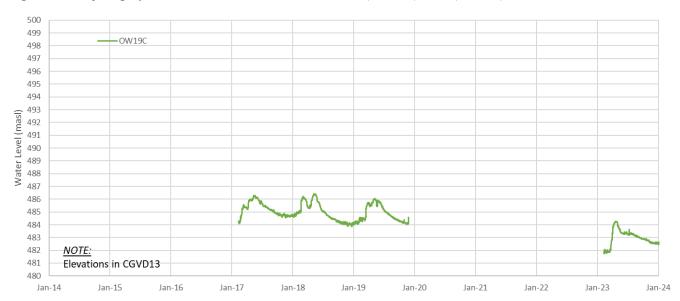


Figure B.20: Hydrograph of water levels at Well Nest OW19C, in masl

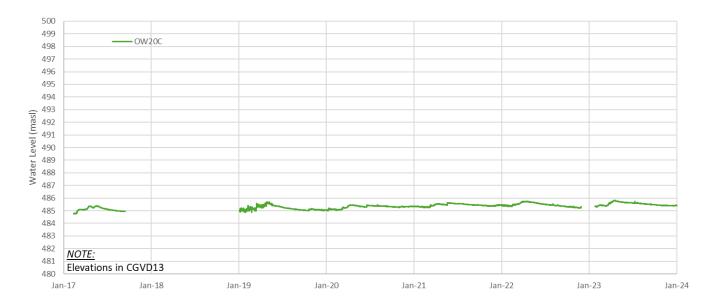


Figure B.21: Hydrograph of water levels at Well Nest OW2OC, in masl.

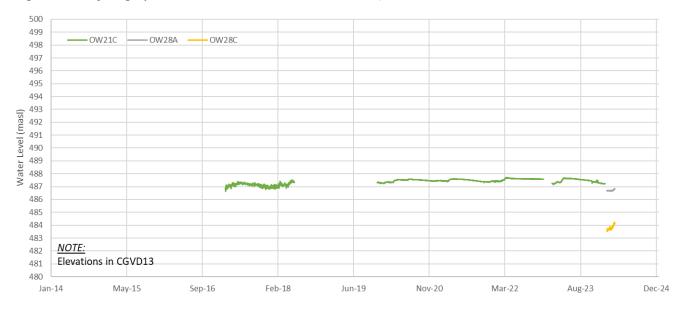


Figure B.22: Hydrograph of water levels at Well Nests OW21 and OW28, in masl.

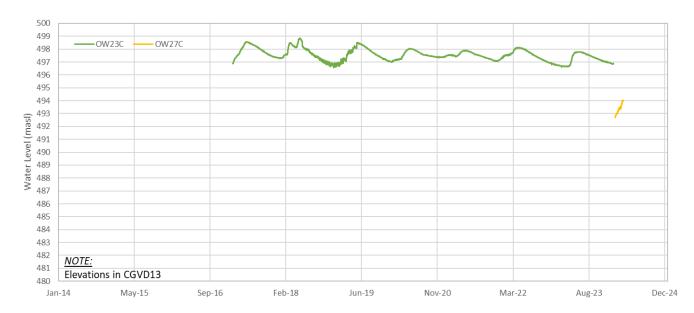


Figure B.23: Hydrograph of water levels at Well Nests OW23 and OW27, in masl.

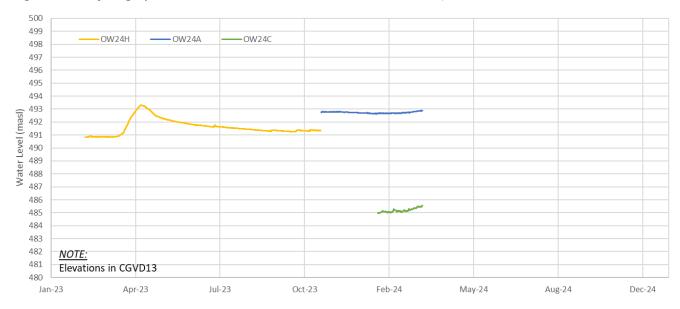


Figure B.24: Hydrograph of water levels at Well Nest OW24, in masl.

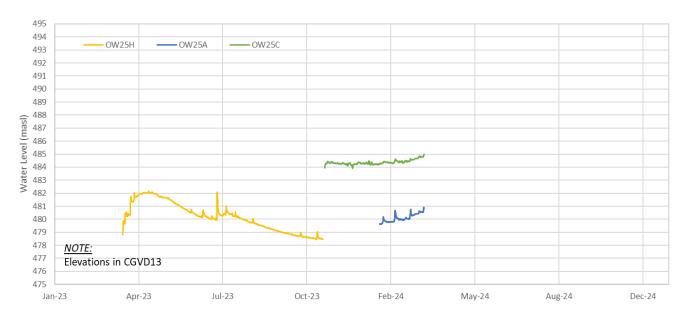


Figure B.25: Hydrograph of water levels at Well Nest OW25, in masl.

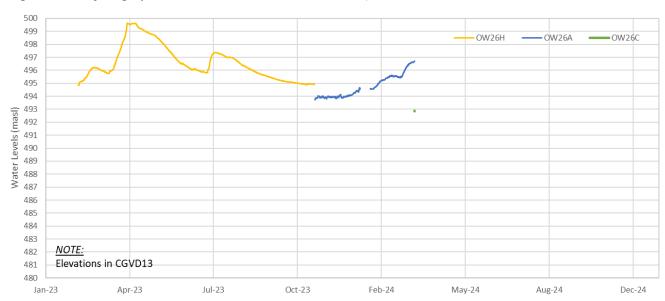


Figure B.26: Hydrograph of water levels at Well Nest OW26, in masl.

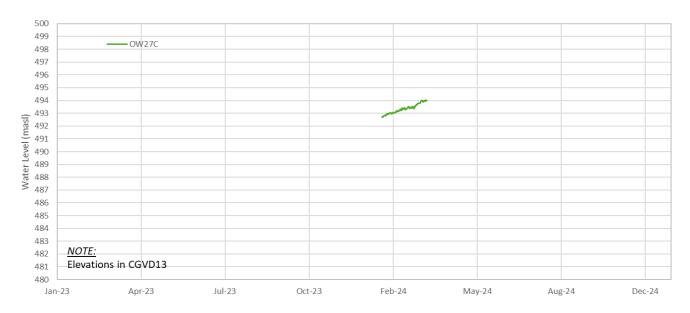


Figure B.27: Hydrograph of water levels at Well Nest OW27, in masl.

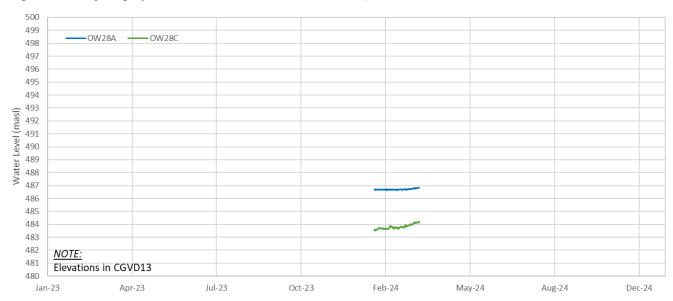


Figure B.28: Hydrograph of water levels at Well Nest OW28, in masl.

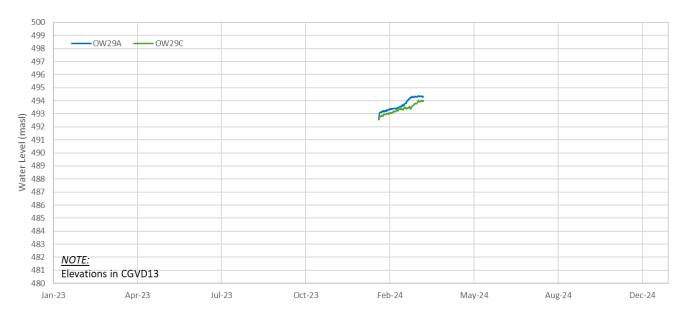


Figure B.29: Hydrograph of water levels at Well Nest OW29, in masl.



Figure B.30: Hydrograph of water levels at Well Nest OW30, in masl.