

November 22, 2020

Mayne Island Housing Society
Mayne Island BC

Attention: Deborah Goldman

Re: Assessment of Pumping Test on Well WID 43943 for Proposed Affordable Housing Project, Mayne Island

Further to the desktop assessment completed in September 2020 by Hy-Geo Consulting (Kohut, 2020), Red Williams Well Drilling & Pump Installations Ltd., constructed bedrock well WID 43943 on the property to provide the water supply for your proposed affordable housing project along Village Bay Road on Mayne Island. This report summarizes the results of pump testing the well and monitoring potential effects on neighbouring wells and surface water supplies. Previous information on the hydrogeological setting of the property is provided in the September desktop report (Kohut, 2020).

WELL WID 43943

WELL WID 43943 was constructed on September 29, 2020 to a depth of 140 feet (42.67 m) at a location approximately 50 m from the western boundary of the subject property (Figure 1). A copy of the well record for the well is provided in Appendix A. The well was completed in fractured brown to grey sandstone encountering a major water-bearing fracture zone from 106 to 111 feet (32.32 to 33.83m) below ground yielding 20+ USgpm as reported by the driller. The well was subsequently lined with 4 inch diameter slotted PVC casing from 6 to 106 feet (1.83 to 32.31m) as chunks of rock were reported coming from the major fracture zone. Lithology of the drilling record indicates the well was drilled into the Geoffrey Formation comprised mainly of sandstone (Muller and Jeletzky, 1970).

NEIGHBOURING WELLS and SPRINGS

Figure 1 shows the location of reported water wells and springs in and within the vicinity of the property. Wells currently within the Ministry of Environment's WELLS database (Province of British Columbia, 2020a and 2020b) are identified with a Ministry well tag number (WTN) that is a unique computer generated identification number. In recent years, the Ministry has also provided well identification plate (WID) numbers to well drillers for attaching to the casing of new wells for identification in the field.

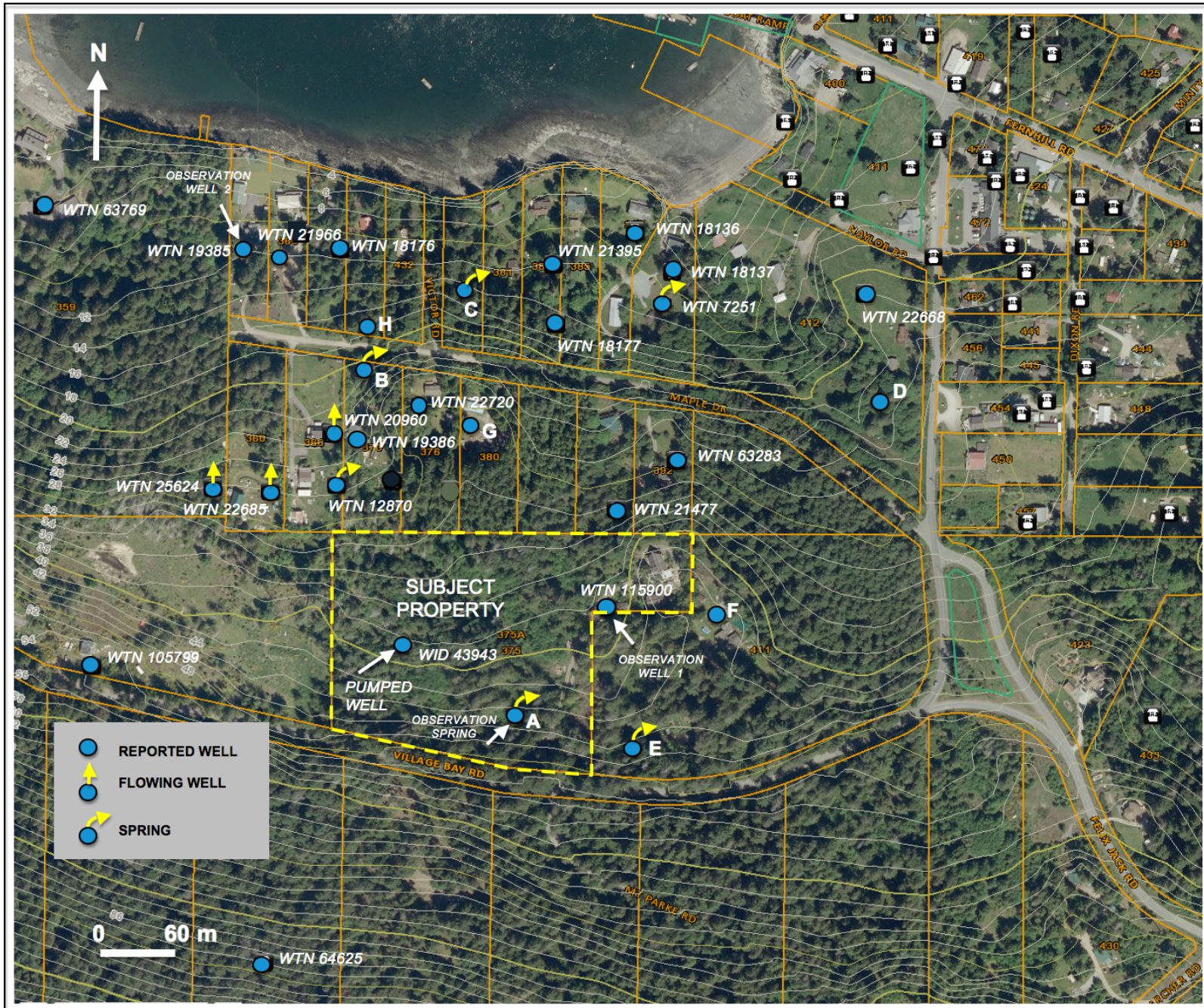


Figure 1. Location of reported wells and springs in and within the vicinity of the subject property. Basemap from CRD (2020).

On October 4, 2020 a field survey was carried out to verify the locations of reported wells and identify any unmapped wells in the region surrounding well WID 43943. Table 1 provides an updated listing and locations of the closest wells and springs to the property. Since historic reporting of water wells to the province was voluntary prior to 2016, it is possible that additional wells may be situated in the region. As access to all properties was not possible during the field survey the listing in Table 1 is not considered entirely complete.

REGIONAL WATER LEVEL FLUCTUATIONS

From historic observation well data in the Gulf Islands, groundwater levels in bedrock wells generally rise and fall with the seasons, in response to available precipitation, becoming highest during the late fall and winter months. Water levels then normally decline during the dry summer months reaching seasonal lows in the late fall months (Kohut *et al.*, 1984).

Figure 2 shows the historic range of annual water level fluctuations for provincial Observation Well 125 on Mayne Island and the water level trend in the fall of 2020 just prior to the pumping test of well WID 43943. At the end of September 2020 groundwater levels in the observation well were declining after spiking in September due to major rain events and were just above the median levels for this time of year. The variation in water level for this particular well, however has been less than 1 m over the past 49 years. As well WID 43943 is situated in a regional groundwater discharge area, the natural seasonal water level fluctuations are not anticipated to be large.

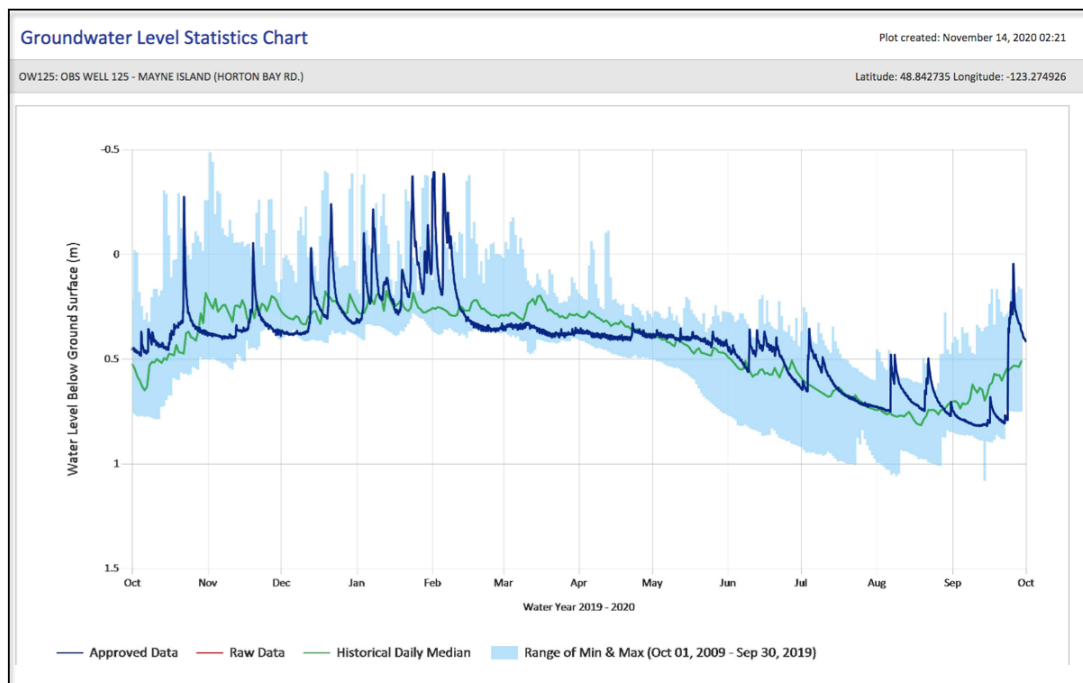


Figure 2. Groundwater level trend in 2019 - 2020 compared to historic maximum, minimum and median data for Observation Well 125, Mayne Island. Adapted from Province of British Columbia (2020c).

Table 1. Summary of reported wells and springs in and within the vicinity of the subject property.

Well Tag Number or Site	Well ID Plate	Finished Well Depth (ft)	Finished Well Depth (m)	Diameter (in)	Water Depth (ft)	Water Depth (m)	Bedrock Depth (ft)	Bedrock Depth (m)	Well Yield (Usgpm)	Well Yield (L/m)	Comments
A											licensed spring, field location verified
B											licensed spring, field location verified
C											licensed spring, field location verified
D											reported well
E											reported spring by landowner
F											reported well by landowner and field location verified
G											well Oct. 4/20 field location verified
H											well Oct. 4/20 field location verified
7251		10	3.0		7	2.1					spring, sandstone
12870		4	1.2		Flows	Flows			0.35	1.32	spring
18136		50	15.2		6	1.8	10	3.0	1.5	5.68	shale and sandstone
18137		50	15.2		8.5	2.6	8	2.4	1	3.79	shale and sandstone
18176		90	27.4		26	7.9	8	2.4	1	3.79	sandstone and shale
18177		50	15.2		8	2.4	8	2.4	1	3.79	sandstone and shale
19385		75	22.9		19	5.8	9	2.7	1.5	5.68	hard grey sandstone, field location verified
19386		73	22.2		19.5	5.9	3	0.9	10	37.85	sandstone and shale, field location verified
20960		88	26.8		Flows	Flows	26	7.9	2	7.57	hard grey sandstone
21395		120	36.6		26	7.9	3	0.9	5	18.93	sandstone and shale
21477		110	33.5		28	8.5	0	0.0	2	7.57	shaley sandstone
21966		93	28.3		14	4.3	8	2.4	5	18.93	shale and sandstone, field location verified
22668		60	18.3				23	7.0	15	56.78	sandstone
22685		85	25.9		4	1.2	17	5.2	5.5	20.82	basalt? reported to flow
22720		70	21.3		24	7.3	0	0.0	12	45.42	shaley sandstone, field location verified
25624		100	30.5		4	1.2	22	6.7	6	22.71	basalt? reported to flow
63283		180	54.9				10	3.0	25	94.64	sandstone
63769		200	61.0				8	2.4	1	3.79	blue shale
64625		300	91.4				1	0.3	10	37.85	hard sandstone
105799	32143	320	97.5	6.63			0	0.0	1.25	4.73	sandstone
115900	47026	140	42.7	6	26	7.9	25	7.6	15	56.78	field location verified
	43943	140	42.7	6	25	7.6	24	7.3	20+	75.70+	sandstone, fracture 55-57 ft (5 gpm), 106-111 ft (20+ gpm)

Data from Province of British Columbia (2020a and 2020b), reports of landowners Sept. 14, 2020 and field survey October 4, 2020.

PUMPING TEST OF WID 43943

A minimum 72 hour pumping test is the recommended standard for assessing bedrock wells for community water systems due to uncertainties associated with bedrock aquifers (Ministry of Environment, 2010). The project well WID 43943 was subsequently pump tested by Red Williams Well Drilling & Pump Installations Ltd., at a constant rate of 11.84 L/min (3.13 USgpm) for just over 72 hours from October 3 to October 6, 2020. The potential residential water demand at the proposed facility is estimated to be 7360 L/day, or equivalent to a continuous pumping rate of 5.11 L/min (1.35 US gals/minute) as estimated by Kohut (2020).

Pumped water was discharged 60 m down slope away from the wellhead towards the west. Manual water level readings were taken in the project well during the test at prescribed intervals (Ministry of Environment, 2010) and a Heron Instruments Inc., *dipperLog* transducer set in the well also recorded water levels at one minute intervals. A Heron Instruments Inc., *barLog* barometric logger was also employed on site during the test.

Water levels in the neighbouring well WTN 115900 and Spring A on the property were also monitored during the pumping test with *dipperLog* transducers. A second observation well WTN 19385 north of Maple Road was also monitored with a *dipperLog* transducer during the test. Photos of the monitoring sites are shown in Appendix B. Upon pump shutdown, recovery water levels in well WID 43943 were manually taken at prescribed intervals for 3.8 hours and for a further 19.5 hours with the installed transducer.

Water samples were taken from the project well near the end of the test and delivered within 20 hours of sampling with ice packs to the Bureau Veritas laboratory in Esquimalt for analysis of chemical and bacteriological parameters. One of the samples was also field filtered by A. Kohut for determination of dissolved metals. All samples were unadulterated and taken from the project well and delivered to the laboratory by A. Kohut.

Precipitation in 2020 as observed at climate station 1015638 on North Pender Island during the months prior to the pumping test was slightly above normal as shown in Table 2. During the ten day period prior to the test, 50.4 mm of rain was recorded at the North Pender Island climate station and during the days of the test 0 mm of rain was recorded. As previously discussed, regional groundwater levels as recorded in Observation Well 125 showed a spike in September 2020.

Table 2. Monthly 2020 precipitation data for North Pender climate station (Climate ID.1015638) compared to 1981-2010 normals for Mayne Island.

Month	Precipitation in 2020 (mm)	Monthly Precipitation Normal (mm)	Percent of Normal	Cumulative Percent of Normal
January	191.6	129.9	147.5	147.5
February	74.6	87.7	85.1	122.3
March	38.6	75.4	51.2	104.0
April	29.2	55.3	52.8	95.9
May	50.4	44	114.5	98.0
June	37.8	36.9	102.4	107.6
July	20.3	21.2	95.8	98.2
August	21.2	23.8	89.1	97.8
September	66.2	28	236.4	105.5
October	80.4	79.9	100.6	108.4

Data from Government of Canada (2020a and 2020b).

PUMP TESTING RESULTS

Well test data, drawdown and recovery plots for the project well are provided in Appendix C. Appendix D contains a copy of the water quality analytical laboratory report from Bureau Veritas.

The pumping test was started at 9:00 am on October 3 and ended at 9:09 am on October 6. Figure 3 shows the drawdown in the project well during pumping. Flow was measured manually using a 5.16 US gallon jug and with a flow meter. The pumping rate was held at a median rate of 11.84 L/min (3.13 USgpm) for the duration of the test varying less than 1 percent at any one measurement time.

Drawdown at the end of the test reached 1.152 m below the initial non-pumping water level of 4.621 m below ground. Only 4.2% of the available drawdown (27.688 m) to the major water bearing fracture at a depth of 32.309 m (106 feet) in the well was utilized during the test. Water level recovery was 96 percent complete 1400 minutes after pump shutdown (Figure B2, Appendix B). Extrapolation of the drawdown in the well to 100 days pumping at 11.84 L/min indicates the water level would reach 2.30 m indicating a relatively high specific capacity of 5.148 L/min/m of drawdown at 100 days. Only 8.4% of the available drawdown in the well would be utilized at that time, providing a large safety factor in the well. Utilization of the well at the estimated demand rate of 5.11 L/min (1.35 US gals/minute) would provide an even higher degree of drawdown safety. Based on these results the minimum long term sustainable yield of the well is the maximum rate at which it was pumped, that is, 11.84 L/min (3.13 USgpm). The well is more than capable of meeting the estimated residential water demand of the housing project with a very large degree of safety. In addition, pumping water levels would not be drawn down below sea level precluding the possibility of sea water intrusion.

No discernible interference was observed in the two observation wells and the spring monitored during the test. (see Figures 4, 5 and 6). A brief discussion on the monitoring results for each of the monitoring sites is provided below. Locations of the monitoring sites are shown in Figure 1. Photos of the monitoring sites are provided in Appendix B,

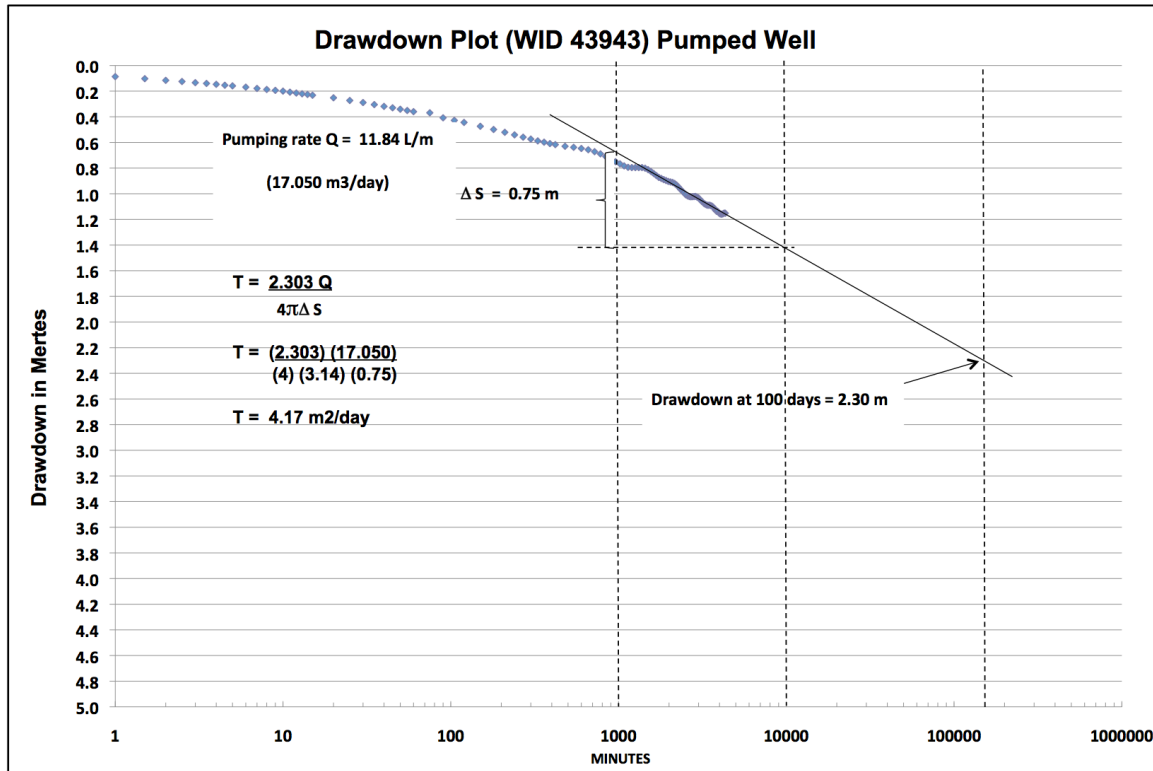


Figure 3. Semi-logarithmic drawdown plot for project well during 72 hour test.

Observation Well 1 (WTN 115900)

Well WTN 115900 is a 140 foot (42.7m) bedrock well situated approximately 150 m northeast of the pumped well WID 43943. A large portable water supply tank was made available to the well owner during the test and the well was not being used. Prior to the test the well was used to fill the water tank. Water level in the monitoring well rose steadily 23.7 cm during the test and continued a rising trend following the test (Figure 4). No discernible water level interference was observed from the pumping well WID 43943.

Observation Well 2 (WTN 19385)

Well WTN 19385 is a 75 foot (22.9) bedrock well completed in hard grey sandstone and situated approximately 350 m northwest of the pumped well WID 43943. Well WTN 19385 continued to operate during the test and shows intermittent drawdown and recovery effects of well WTN 19385 pumping and slight interference effects from neighbouring wells pumping (Figure 5). No discernible water level interference is evident from the test pumping of well WID 43943 during or after the test period.

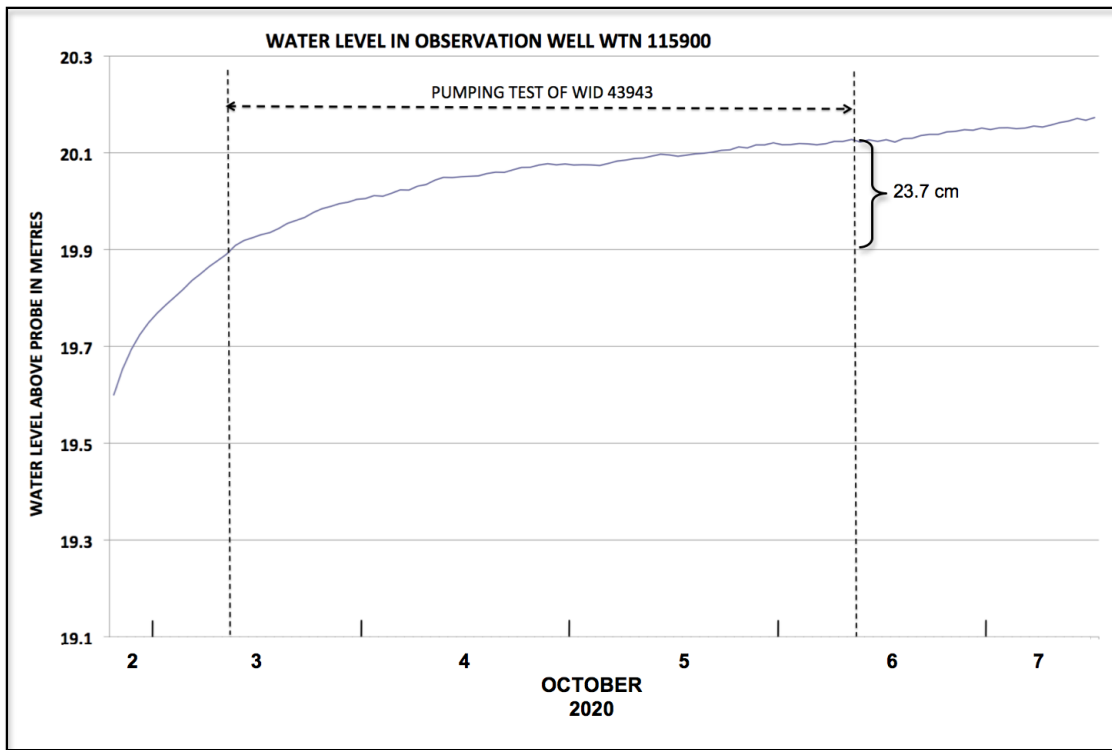


Figure 4. Water levels in observation well (1) WTN 115900 during 72 hour pumping test of project well WID 43943.

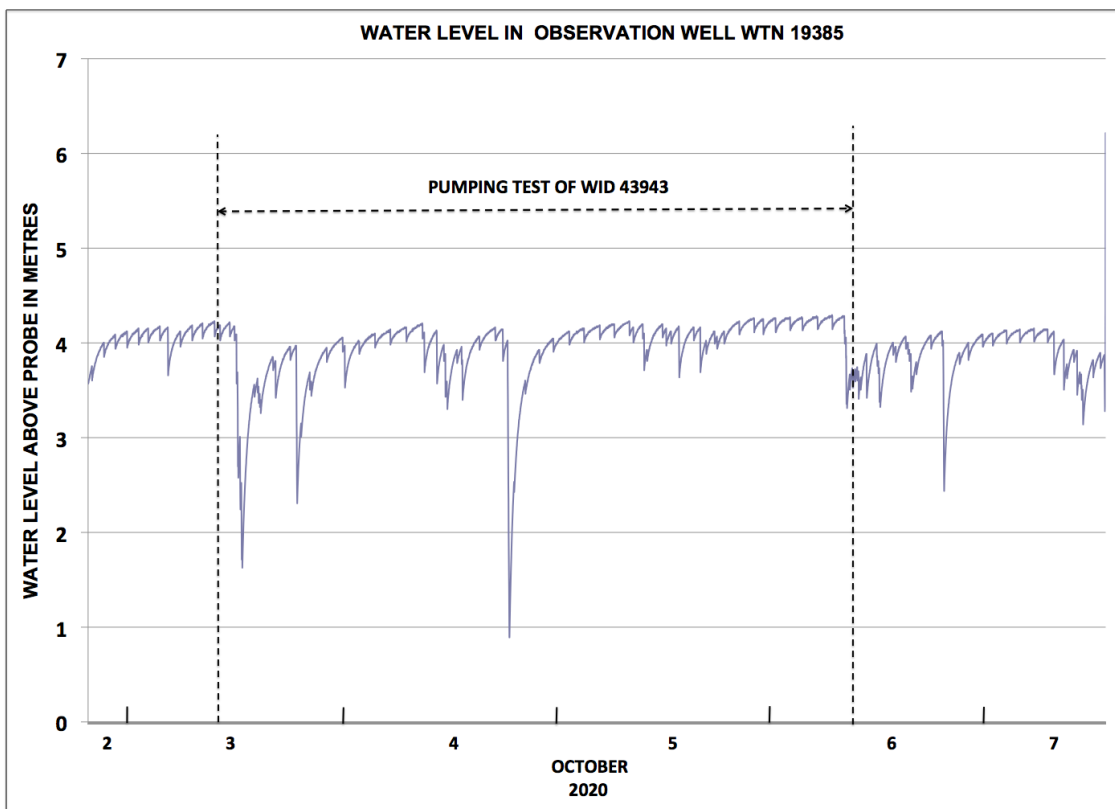


Figure 5. Water level in observation well (2) WTN 19485 during 72 hour pumping test of project well WID 43943.

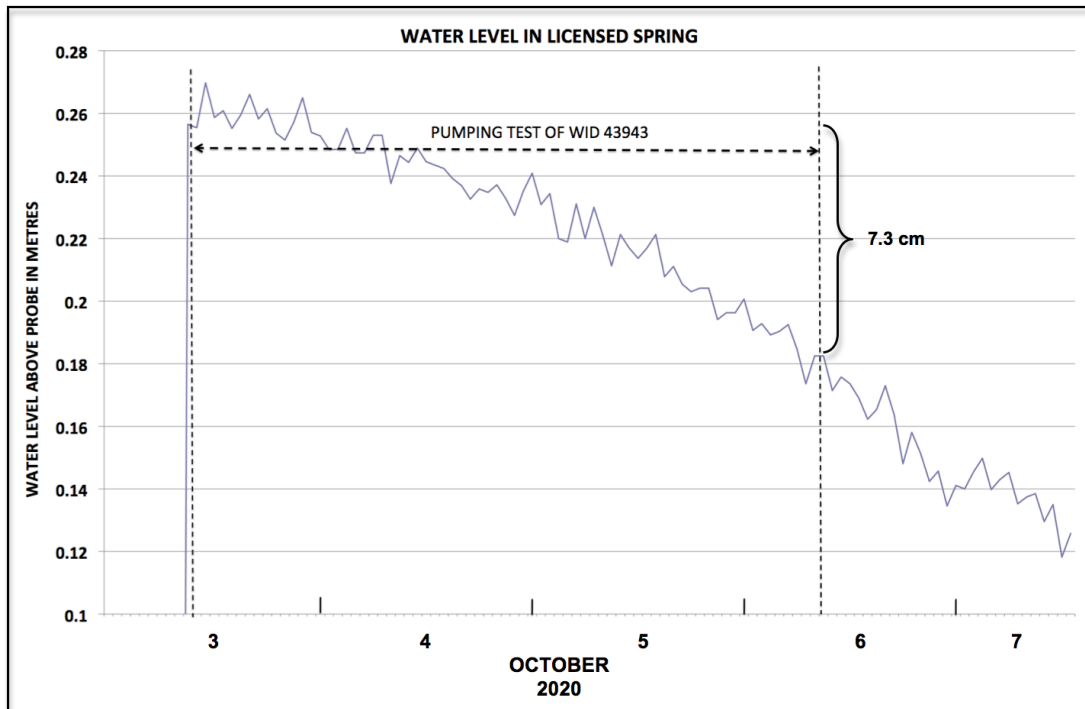


Figure 6. Water level in licensed spring Site A on the property during 72 hour pumping test of project well WID 43943.

Observation Spring Site A

Spring Site A is a concrete lined sump licensed as Dundas Spring (C052832) for 2.273 cubic metres/day. During the pumping test the water level showed an overall decline of 7.3 cm, continuing to decline after the test stopped. This decline is likely due to continued seasonal lowering of shallow groundwater conditions in the unconsolidated deposits and possible interference effects of the neighbouring unlicensed spring Site E to the east (Figure 1). The spring at Site A shows no direct interference from the pumping of WID 43943.

CONCEPTUAL AQUIFER MODEL

Figure 7 essentially represents the conceptual model of a portion of the bedrock Aquifer 619 in the region described previously by Kohut (2020) with recharge taking place on the upland region of Mount Parke with groundwater moving north easterly and discharging at the toe of the slope near an elevation of 50 metres. Groundwater likely moves primarily through a series of interconnected fractures; including faults, joints and bedding plane contacts. The potentiometric (water level) in the aquifer likely mirrors the topography having a similar gradient of about 0.4 .

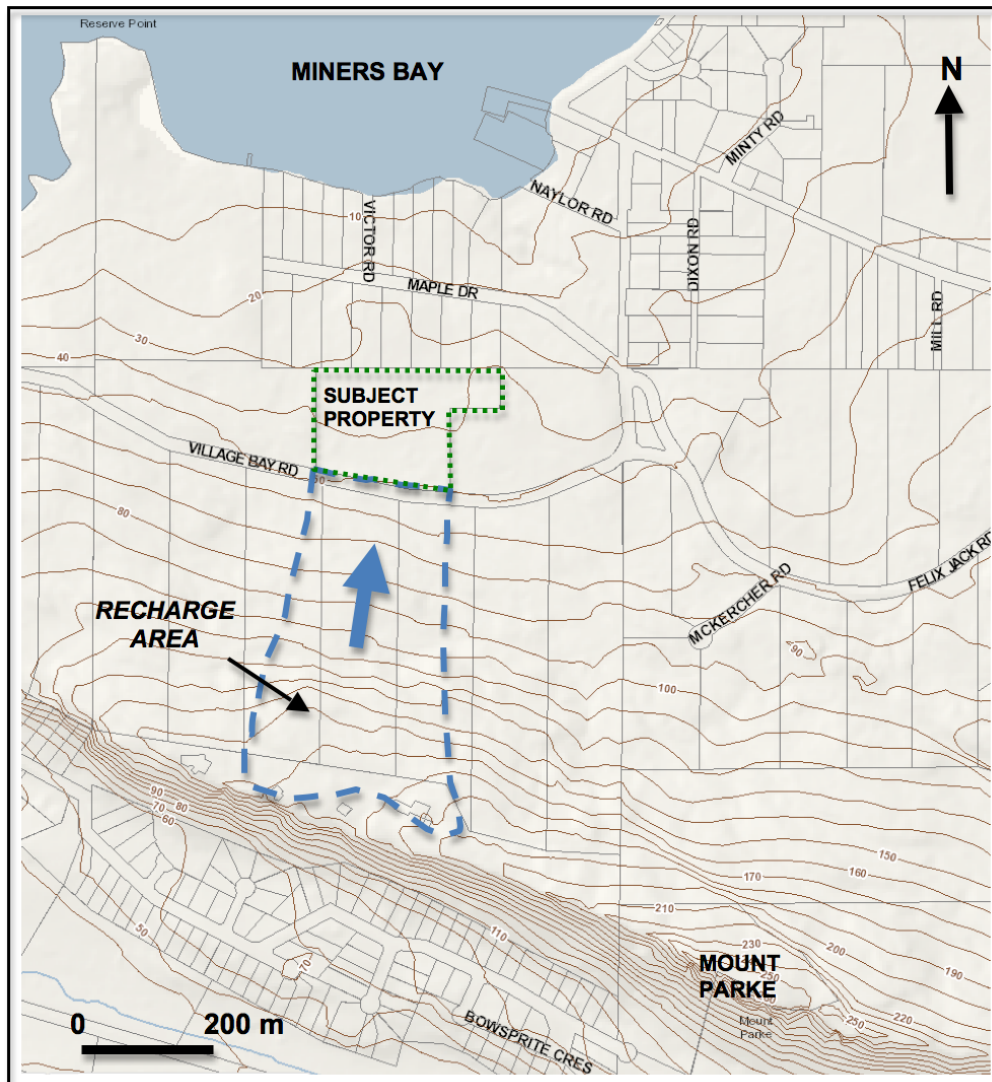


Figure 7. Potential groundwater recharge area in a portion of bedrock Aquifer 619 up gradient of the subject property. Blue arrow indicates inferred direction of groundwater flow. Basemap from Islands Trust (2020); contour interval = 10 m.

Potential Recharge

The potential recharge area situated directly up gradient of the subject property covers an area of approximately 0.123 Km² as determined from the area measurement tool at the Islands Trust *MapIt* website (Islands Trust, 2020). The area lies within the Center1_West Groundwater Region delineated by GW Solutions Inc., (2020). Recharge potential mapping carried out by GW Solutions Inc., (2020) indicates this region has good recharge potential with recharge estimated at 9.4 % of annual (1981-2010) normal precipitation. Based on a groundwater recharge rate of 9.4 % of the annual precipitation of 842 mm, the estimated annual water demands of the project of 5.11 L/min, would potentially utilize 28% % of the annual normal recharge and possibly 30% during a dry year for example such as 2014 with only 788 mm. The dry year figure is based on the Pender Island climate station 1015638 (Government of Canada, 2020b).

Groundwater Flow Estimate

Based on the aquifer transmissivity determined from the pumping test of well WID 43943 an estimate of natural groundwater flow through the subject property can be made using Darcy's Law in the form:

$$Q = T \times I \times L$$

where Q = ground water flow in m³/day,

T = transmissivity in m²/day,

I = hydraulic gradient, and

L = length (aquifer width in m) through which the flow takes place.

In this case, the natural *flow through the aquifer underlying the site area* where L = 200 m, and I = 0.4, and T = 4.17 m²/day would be 333.6 m³/day (61.2 USgpm).

Based on the estimated water demands for the project at 5.11 L/min (1.35 USgpm) only 2.2 % of the groundwater flow through the subject property would be intercepted by pumping of the project well.

There are some 22 other land parcels directly down gradient and above the subject property that potentially may use groundwater for domestic purposes. Assuming a domestic demand of 4000 L/day for two residences per parcel, amounts to a potential future annual demand of 32120 m³/year. With the proposed potential annual use of the project well at 5.11 L/min (2685 m³/year), future demand could approach a total of 34850 m³/year or 17.52 USgpm. This would be equivalent to 28.6 % of the natural flow through the aquifer underlying the site area.

WATER QUALITY RESULTS

Laboratory results of the October 6, 2020 sampling as shown in Table 3, indicate that the water quality of the project well met or exceeded the *Guidelines for Canadian Drinking Water* (Health Canada, 2019) for all parameters except for dissolved manganese at 349 µg/L. The water is low in overall mineralization (TDS = 190 mg/L), with low total sodium (42.1 mg/L), low chloride (7.8 mg/L) and no detectable coliform or E.coli bacteria. Elevated manganese at or above 20 µg/L can cause staining of laundry and bathroom fixtures. Elevated levels of manganese are also a health concern when levels exceed the Maximum Acceptable Concentration (MAC) of 120 µg/L as this effects neurological development and behaviour and found to cause deficits in memory, attention, and motor skills. Formula-fed infants (where water containing manganese at levels above the MAC is used to prepare formula) may be especially at risk (Health Canada, 2019). Levels of the elevated constituents can be treated with an appropriately designed and maintained point-of-entry (POE) water treatment system.

Table 3. Summary of water quality analyses.

Parameters/Site and Sampling Date	WELL WID 43943 Mayne Housing Oct 6/20		WELL WID 43943 Mayne Housing Oct 6/20	Canadian DWGuideline 2019	Units
PHYSICAL TESTS					
True Colour	<5.0			< or =15	TCU
Conductivity	760				µS/cm
Total Hardness (CaCO ₃)	95.7	Dissolved Hardness	97.9		mg/L
pH	7.87			7.0-10.5	pH units
Total Dissolved solids (TDS)	190			< or = 500	mg/L
Turbidity	0.13			<1.0	NTU
ANIONS					
Alkalinity (Total as CaCO ₃)	170				mg/L
Alkalinity (PP as CaCO ₃)	<1.0				mg/L
Bicarbonate	210				mg/L
Carbonate	<1.0				mg/L
Hydroxide	<1.0				mg/L
Chloride	7.8			< or = 250	mg/L
Fluoride	0.093			1.5	mg/L
Nitrate (N)	<0.020			10	mg/L
Nitrite (N)	<0.0050			1	mg/L
Total Organic Nitrogen (N)	0.038				mg/L
Total Ammonia (N)	0.029				mg/L
Nitrate plus Nitrite (N)	<0.020				mg/L
Total Nitrogen (N)	0.067				mg/L
Total Organic Carbon (C)	0.61				mg/L
Total Phosphorus (P)					mg/L
Total Sulphide	<0.0018			0.05	mg/L
Sulphide (as H ₂ S)	<0.0020			0.05	mg/L
Sulphate	12			< or =500	mg/L
TOTAL METALS		DISSOLVED METALS			
Aluminum	<3.0		<3.0		µg/L
Antimony	0.59		0.56	6	µg/L
Arsenic	0.44		0.43	10	µg/L
Barium	1.1		1.2	1000	µg/L
Beryllium	<0.10		<0.10		µg/L
Boron	<50		<50	5000	µg/L
Cadmium	<0.010		<0.010	5	µg/L
Chromium	<1.0		<1.0	50	µg/L
Cobalt	<0.20		<0.20		µg/L
Copper	0.99		0.93	< or =1000	µg/L
Iron	24.9		22.1	< or = 300	µg/L
Lead	<0.20		<0.20	10	µg/L
Manganese	344		349	< or = 20	µg/L
Mercury	<0.0019			1	µg/L
Molybdenum	<1.0		<1.0		µg/L
Nickel	<1.0		<1.0		µg/L
Selenium	0.36		0.38	50	µg/L
Silicon	9650		9640		µg/L
Silver	<0.020		<0.020		µg/L
Strontium	158		154		µg/L
Thallium	<0.010		<0.010		µg/L
Tin	<5.0		<5.0		µg/L
Titanium	<5.0		<5.0		µg/L
Uranium	0.23		0.23		µg/L
Vanadium	<5.0		<5.0		µg/L
Zinc	<5.0		<5.0	< or = 5000	µg/L
Zirconium	<0.10		<0.10		µg/L
Calcium	26.2		26		mg/L
Magnesium	7.35		7.99		mg/L
Potassium	0.227		0.239		mg/L
Sodium	42.1		46.0	< or = 200	mg/L
Sulphur	3.7		3.8		mg/L
MICROBIOLOGICAL					
Total coliforms	0			ND	CFU/100mL
Escherichia coli (E. coli)	0			ND	CFU/100mL

* Turbidity guideline applies to a surface water source or a groundwater source under the direct influence of surface water.

Red font indicates exceedances.

ND means none detectable.

CONCLUSIONS

The following conclusions on the available water quantity and water quality of well WID 43943 that was constructed for the proposed affordable housing project on Mayne can be made:

1. The new Well WID 43943 was drilled on the subject property by Red Williams on September 29, 2020 and completed to a depth of 140 feet (42.67 m) in fractured sandstone. The drilling encountered a major water-bearing fracture zone at a depth of 106 to 111 feet (32.31 to 33.83 m) that produced 20 USgpm (75.7 L/min) on preliminary testing.
2. The well was pump tested for 72 hours between October 3 and October 6, 2020 by Red Williams Well Drilling Ltd., at a constant rate of 11.84 L/min (3.13 USgpm) and water level monitoring was carried out on the nearest neighbouring bedrock well, a licensed spring on the property and on a private bedrock well off Maple Road.
3. Drawdown in the pumped well at the end of the test was only 1.152 m (3.78 feet) below the non pumping water level of 4.621 m (15.16 feet) below ground. Only 4.2 percent of the available drawdown in the well was utilized during the test at the pumping rate of 11.84 L/min (3.13 USgpm). The well is obviously more than capable of supplying the estimated demand of the project at 5.11 L/min (1.35 USgpm) with a very large safety factor. Pumping water levels would not be drawn down below sea level precluding the possibility of sea water intrusion.
4. None of the neighbouring wells or the spring monitored during the test showed any signs of water level interference from the pumped well.
5. Although capable of being pumped at rates far in excess of 11.84 L/min (3.13 USgpm) the safe well yield is determined to be 11.84 L/min (3.13 USgpm) at this time.
6. Water samples collected at the end of the pumping test and submitted for laboratory testing indicate the water is low in overall mineralization (TDS = 190 mg/L), with low total sodium (42.1 mg/L), low chloride (7.8 mg/L) and no detectable coliform or E.coli bacteria. Dissolved manganese was reported at 349 parts per billion (ppb) exceeding the *Canadian Drinking Water Guideline* of 20 and 120 ppb. Manganese is ubiquitous in the groundwater of the Gulf Islands and can be treated with appropriate water treatment equipment.

RECOMMENDATIONS

1. As a precautionary measure against any future potential sources of coliform bacteria, water from the well should be treated with an appropriately designed and maintained ultraviolet irradiation (UV) treatment system.


2. Elevated levels of manganese may be treated with an appropriately designed and maintained point-of-entry (POE) water treatment system including aeration.
3. Further examination of the potential water treatment options for the well water should be considered. Hy-Geo Consulting does not design or install water treatment systems.
4. Consideration should be given to equipping the discharge line from the well with a totalizing water flow meter to monitor and record the well use with time and having a water level sounding tube installed for taking periodic water level measurements in the well.

CLOSURE

This report was prepared in accordance with generally accepted engineering, hydrogeological and consulting practices. It is intended for the prime use of Mayne Island Housing Society in connection with its purpose as outlined under the scope of work for this project. This report is based on data and information available to the author from various sources at the time of its preparation and the findings of this report may therefore be subject to revision. Data and information supplied by others has not been independently confirmed or verified to be correct or accurate in all cases. Any errors, omissions or issues requiring clarification should be brought to the attention of the author. The author retains full copyright of the material contained in the report. The author and Hy-Geo Consulting accepts no responsibility for damages suffered by any third party as a result of any unauthorized use of this report.

Respectfully submitted,

A. P. Kohut
Nov 22/20

A circular professional seal for Alan P. Kohut, a Professional Engineer in the Province of British Columbia. The seal contains the text: "PROFESSIONAL PROVINCE OF BRITISH COLUMBIA ENGINEER" around the perimeter, and "A. P. KOHUT #10194" in the center.

Alan P. Kohut PEng.
Principal and Senior Hydrogeologist

HY-GEO CONSULTING

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APPENDIX A

Well Record WID 43943



Ministry of Environment

RED WILLIAMS WELL DRILLING LTD. 43943
Well Construction Report 980 PRATT RD
Well Closure Report QUALIKOR BEACH BC
Well Alteration Report V913 IWS
(25) 210-5552

Red lettering indicates minimum mandatory information. See reverse for notes & definitions of abbreviations.

Owner name: MAYNE ISLAND HOUSING SOCIETY
Mailing address: 518 DALTON DRIVE Town MAYNE ISLAND Prov. B.C. Postal Code V0N 2J2
Well Location (see note 2): Address: Street no. 3715 Street name VILLAGE BAY ROAD Town MAYNE ISLAND
Legal description: Lot B Plan Vp27091 D.L. Block Sec. 7 Twp. Rg. Land District 16
PID: 002-552-256 and Description of well location (attach sketch, if nec.): WITHIN PROPERTY BOUNDARIES
PORTION MAYNE ISLAND
NAD 83: Zone: 10 UTM Easting: 477677.3 m Latitude (see note 4):
UTM Northing: 5410551 m Longitude:
Method of drilling: Air rotary
Orientation of well: Vertical
Class of well: WATER SUPPLY Sub-class of well: DOMESTIC
Water supply wells: indicate intended water use: Private domestic

Lithologic description (see notes 8-13) or closure description (see notes 14 and 15)

Table with columns: From ft (bgl), To ft (bgl), Surficial Material, Bedrock Material, Colour, Hardness, Water Content, Observations. Includes handwritten data for depths 0-106 ft and observations like 'BROKEN UP', 'FRACTURE/CHUNKS', 'FRACTURE'.

Casing details

Table with columns: From ft (bgl), To ft (bgl), Dia in, Casing Material/Open Hole, Wall Thickness in, Drive Shoe. Includes handwritten data for 0-6 ft STEEL and 6-106 ft PVC.

Screen details

Table with columns: From ft (bgl), To ft (bgl), Dia in, Type, Slot Size. Includes handwritten data for 0-6 ft STEEL and 6-106 ft PVC.

Surface seal: Type: BENTONITE Depth: 17' ft
Method of installation: Poured Thickness: 2" in
Backfill: Type: Depth: ft
Liner: PVC Other (specify):
Diameter: in Thickness: in
From: ft (bgl) To: ft (bgl) Perforated: From: ft (bgl) To: ft (bgl)

Intake: Screen Open bottom Uncased hole
Screen type: Telescope Pipe size
Screen material: Stainless steel Plastic Other (specify):
Screen opening: Continuous slot Slotted Perforated pipe
Screen bottom: Ball Plug Plate Other (specify):
Filter pack: From: ft To: ft Thickness: in
Type and size of material:

Developed by:

Air lifting Surging Jetting Pumping Bailing
Other (specify): Total duration: 3 hrs
Notes:

Well yield estimated by:

Pumping Air lifting Bailing Other (specify):
Rate: 20 USgpm Duration: 3 hrs
SWL before test: 25' ft (btoc) Pumping water level: ft (btoc)

Obvious water quality characteristics:

Fresh Salty Clear Cloudy Sediment Gas
Colour/odour: Water sample collected:

Well driller (print clearly):

Name (first, last) (see note 19): TRAVIS JOHNSON
Registration no. (see note 20): WD 06041901
Consultant (if applicable, name and company):

Final well completion data:

Total depth drilled: 140' ft Finished well depth: 140' ft (bgl)
Final stick up: 31.2' in Depth to bedrock: 24' ft (bgl)
SWL: 25' ft (btoc) Estimated well yield: 20 USgpm
Artesian flow: USgpm, or Artesian pressure: ft
Type of well cap: VERMIN PROOF Well disinfected: Yes No
Where well ID plate is attached: STRAPPED TO CASING

Well closure information:

Reason for closure:
Method of closure: Poured Pumped
Sealant material: Backfill material:
Details of closure (see note 16):

Date of work (YYYY/MM/DD):

Started: 2020/09/29 Completed: 2020/09/29
Comments:

DECLARATION: Well construction, well alteration or well closure, as the case may be, has been done in accordance with the requirements in the Water Act and the Ground Water Protection Regulation.

Signature of Driller Responsible PER TRAVIS JOHNSON

PLEASE NOTE: The information recorded in this well report describes the works and hydrogeologic conditions at the time of construction, alteration or closure, as the case may be. Well yield, well performance and water quality are not guaranteed as they are influenced by a number of factors, including natural variability, human activities and condition of the works, which may change over time.

white: Customer copy
canary: Driller copy
pink: Ministry copy
Sheet 1 of 2



Ministry of Environment

RED WILLIAMS WELL DRILLING LTD.

Well Construction Report 980 PRATT ROAD QUALICORP BEACH B.C. V9K 1W5 (250) 248-5552

Ministry Well ID Plate Number: 43943
Ministry Well Tag Number:
Confirmation/alternative specs. attached
Original well construction report attached

Red lettering indicates minimum mandatory information. See reverse for notes & definitions of abbreviations.

Owner name: MAYNE ISLAND HOUSING SOCIETY
Mailing address: 518 DALTON DRIVE Town MAYNE ISLAND Prov. B.C. Postal Code V0N 2J2
Well Location (see note 2): Address: Street no. 375 Street name VILLAGE BAY RD. Town MAYNE ISLAND
Legal description: Lot B Plan V1P27091 D.L. Block Sec. 7 Twp. Rg. Land District 16
PID: 002-552-256 and Description of well location (attach sketch, if nec.): WITHIN PROPERTY BOUNDARIES PORTION MAYNE ISLAND
NAD 83: Zone: 10 UTM Easting: 477677.3 m Latitude (see note 4):
UTM Northing: 5410551 m Longitude:
Method of drilling: Air rotary
Orientation of well: Vertical
Class of well: WATER SUPPLY Sub-class of well: DOMESTIC
Water supply wells: indicate intended water use: Private domestic

Lithologic description (see notes 8-13) or closure description (see notes 14 and 15)

Table with columns: From ft (bgl), To ft (bgl), Surficial Material, Bedrock Material, Colour, Hardness, Water Content, Observations. Includes handwritten data for depths 106-111 and 111-140.

Casing details

Table with columns: From ft (bgl), To ft (bgl), Dia in, Casing Material/Open Hole, Wall Thickness in, Drive Shoe. Includes handwritten data for 0-6' and 6-106'.

Screen details

Table with columns: From ft (bgl), To ft (bgl), Dia in, Type, Slot Size. Includes handwritten data for 0-140'.

Surface seal: Type: BENTONITE Depth: 17' ft
Method of installation: X Poured Thickness: 2" in
Backfill: Type: Depth: ft
Liner: PVC
Diameter: in Thickness: in
From: ft (bgl) To: ft (bgl) Perforated: From: ft (bgl) To: ft (bgl)

Intake: Screen Open bottom Uncased hole
Screen type: Telescope Pipe size
Screen material: Stainless steel Plastic Other (specify):
Screen opening: Continuous slot Slotted Perforated pipe
Screen bottom: Bail Plug Plate Other (specify):
Filter pack: From: ft To: ft Thickness: in
Type and size of material:

Developed by:

Air lifting Surging Jetting Pumping Bailing
Other (specify): Total duration: 3 hrs
Notes:

Final well completion data:

Total depth drilled: 140' ft Finished well depth: 140' ft (bgl)
Final stick up: 31.2" in Depth to bedrock: 24' ft (bgl)
SWL: 25' ft (btoc) Estimated well yield: 20+ USgpm
Artesian flow: VERMIN PROOF USgpm, or Artesian pressure: ft
Type of well cap: VERMIN PROOF Well disinfected: X Yes No
Where well ID plate is attached: STRAPPED TO CASING

Well yield estimated by:

Pumping Air lifting Bailing Other (specify):
Rate: 20+ USgpm Duration: 3 hrs
SWL before test: 25' ft (btoc) Pumping water level: ft (btoc)

Obvious water quality characteristics:

Fresh Salty Clear Cloudy Sediment Gas
Colour/odour: Water sample collected:

Well driller (print clearly):

Name (first, last) (see note 19): TRAVIS JOHNSON
Registration no. (see note 20): WD 0604 1901
Consultant (if applicable; name and company):

Well closure information:

Reason for closure:
Method of closure: Poured Pumped
Sealant material: Backfill material:
Details of closure (see note 16):

DECLARATION: Well construction, well alteration or well closure, as the case may be, has been done in accordance with the requirements in the Water Act and the Ground Water Protection Regulation.

Signature of Driller Responsible PER TRAVIS JOHNSON

Date of work (YYYY/MM/DD):

Started: 2020/09/29 Completed: 2020/09/29
Comments:

PLEASE NOTE: The information recorded in this well report describes the works and hydrogeologic conditions at the time of construction, alteration or closure, as the case may be. Well yield, well performance and water quality are not guaranteed as they are influenced by a number of factors, including natural variability, human activities and condition of the works, which may change over time.

white: Customer copy
canary: Driller copy
pink: Ministry copy
Sheet 2 of 2

APPENDIX B



Photo 1, Appendix B. Observation Well 1 (WTN 115900) on subject property.



Photo 2, Appendix B. Observation Well 2 (WTN 19385).

APPENDIX B



Photo 3, Appendix B. Spring A on subject property.



Photo 4, Appendix B. Access cover to Spring A on subject property.

APPENDIX C

Pumping Test Data for Well WID 43943

Project: Mayne Island Housing Society
Client: Mayne Island Housing Society
Location: Mayne Island

Start Date of Test: 03-Oct-20
Test Conducted by: Red Williams
Pumped Well: WID 43943
Pumping Rate: 11.84 L/min 3.13 USgpm
Static Water Level: 5.621 m
Pump Setting: 36.576 m

Reference: all readings from top of sounding tube

Stick up: 1.0 m
Observation Wells: WTN 115900
 WTN 19385
 Spring A
Pump Start Time: 9:00 AM Oct. 3/20
Pump End Time: 9:09 AM Oct. 6/20
Analysis by: A. Kohut, P.Eng.

Drawdown Data:

Recovery Data:

Time (minutes)	Water Level (m)	Drawdown (m)	Time t (minutes)	Time t' (minutes)	Water Level (m)	t/t'	Residual Drawdown (m)
0.5	5.684	0.063	4330.5	1.5	6.730	2887.0	1.109
1	5.708	0.087	4331	2	6.701	2165.5	1.080
1.5	5.724	0.103	4331.5	2.5	6.682	1732.6	1.061
2	5.737	0.116	4332	3	6.669	1444.0	1.048
2.5	5.746	0.125	4332.5	3.5	6.658	1237.9	1.037
3	5.755	0.134	4333	4	6.649	1083.3	1.028
3.5	5.761	0.140	4333.5	4.5	6.641	963.0	1.020
4	5.768	0.147	4334	5	6.635	866.8	1.014
4.5	5.775	0.154	4334.5	5.5	6.629	788.1	1.008
5	5.780	0.159	4335	6	6.623	722.5	1.002
6	5.790	0.169	4336	7	6.613	619.4	0.992
7	5.800	0.179	4337	8	6.604	542.1	0.983
8	5.808	0.187	4338	9	6.596	482.0	0.975
9	5.815	0.194	4339	10	6.590	433.9	0.969
10	5.821	0.200	4340	11	6.582	394.5	0.961
11	5.829	0.208	4341	12	6.576	361.8	0.955
12	5.836	0.215	4342	13	6.570	334.0	0.949
13	5.842	0.221	4343	14	6.565	310.2	0.944
14	5.847	0.226	4344	15	6.560	289.6	0.939
15	5.853	0.232	4345	16	6.555	271.6	0.934
20	5.873	0.252	4350	21	6.533	207.1	0.912
25	5.894	0.273	4355	26	6.512	167.5	0.891
30	5.910	0.289	4360	31	6.500	140.6	0.879
35	5.926	0.305	4365	36	6.486	121.3	0.865
40	5.940	0.319	4370	41	6.473	106.6	0.852
45	5.951	0.330	4375	46	6.462	95.1	0.841
50	5.962	0.341	4380	51	6.452	85.9	0.831
55	5.972	0.351	4385	56	6.442	78.3	0.821
60	5.981	0.360	4390	61	6.434	72.0	0.813
75	5.990	0.369	4396	67	6.423	65.6	0.802
90	6.029	0.408	4411	81	6.396	54.5	0.775
105	6.049	0.428	4426	96	6.383	46.1	0.762
120	6.065	0.444	4441	111	6.370	40.0	0.749
150	6.095	0.474	4466	126	6.353	35.4	0.732
180	6.120	0.499	4481	141	6.343	31.8	0.722
210	6.142	0.521	4496	156	6.328	28.8	0.707
240	6.162	0.541	4511	171	6.322	26.4	0.701
270	6.180	0.559	4526	186	6.312	24.3	0.691
300	6.195	0.574	4616	231	6.280	20.0	0.659
330	6.209	0.588	4826	441	5.988	10.9	0.367
360	6.219	0.598	4886	501	5.975	9.8	0.354
390	6.230	0.609	4946	561	5.957	8.8	0.336
420	6.238	0.617	5006	621	5.944	8.1	0.323
480	6.251	0.630	5066	681	5.931	7.4	0.310
540	6.259	0.638	5126	741	5.923	6.9	0.302
600	6.268	0.647	5186	801	5.917	6.5	0.296
660	6.278	0.657	5246	861	5.917	6.1	0.296
720	6.293	0.672	5306	921	5.919	5.8	0.298

Time (minutes)	Water Level (m)	Drawdown (m)	Time t (minutes)	Time t' (minutes)	Water Level (m)	t/t'	Residual Drawdown (m)
780	6.310	0.689	5366	981	5.921	5.5	0.300
840	6.331	0.710	5426	1041	5.921	5.2	0.300
900	6.353	0.732	5486	1101	5.921	5.0	0.300
960	6.371	0.750	5546	1161	5.915	4.8	0.294
1020	6.388	0.767	5606	1221	5.908	4.6	0.287
1080	6.404	0.783	5666	1281	5.898	4.4	0.277
1140	6.415	0.794	5726	1341	5.883	4.3	0.262
1200	6.417	0.796	5786	1401	5.871	4.1	0.250
1260	6.417	0.796					
1320	6.417	0.796					
1380	6.417	0.796		Data from transducer			
1440	6.422	0.801					
1500	6.433	0.812					
1560	6.447	0.826					
1620	6.463	0.842					
1680	6.479	0.858					
1740	6.494	0.873					
1800	6.502	0.881					
1860	6.511	0.890					
1920	6.518	0.897					
1980	6.525	0.904					
2040	6.529	0.908					
2100	6.533	0.912					
2160	6.541	0.920					
2220	6.553	0.932					
2280	6.569	0.948					
2340	6.586	0.965					
2400	6.601	0.980					
2460	6.615	0.994					
2520	6.630	1.009					
2580	6.638	1.017					
2640	6.643	1.022					
2700	6.645	1.024					
2760	6.644	1.023					
2820	6.643	1.022					
2880	6.642	1.021					
2940	6.648	1.027					
3000	6.654	1.033					
3060	6.665	1.044					
3120	6.678	1.057					
3180	6.688	1.067					
3240	6.698	1.077					
3300	6.704	1.083					
3360	6.709	1.088					
3420	6.711	1.090					
3480	6.710	1.089					
3540	6.713	1.092					
3600	6.717	1.096					
3660	6.724	1.103					
3720	6.735	1.114					
3780	6.749	1.128					
3840	6.758	1.137					
3900	6.758	1.137					
3960	6.770	1.149					
4020	6.777	1.156					
4080	6.780	1.159					
4140	6.780	1.159					
4200	6.777	1.156					
4260	6.772	1.151					
4320	6.772	1.151					
4329	6.773	1.152					

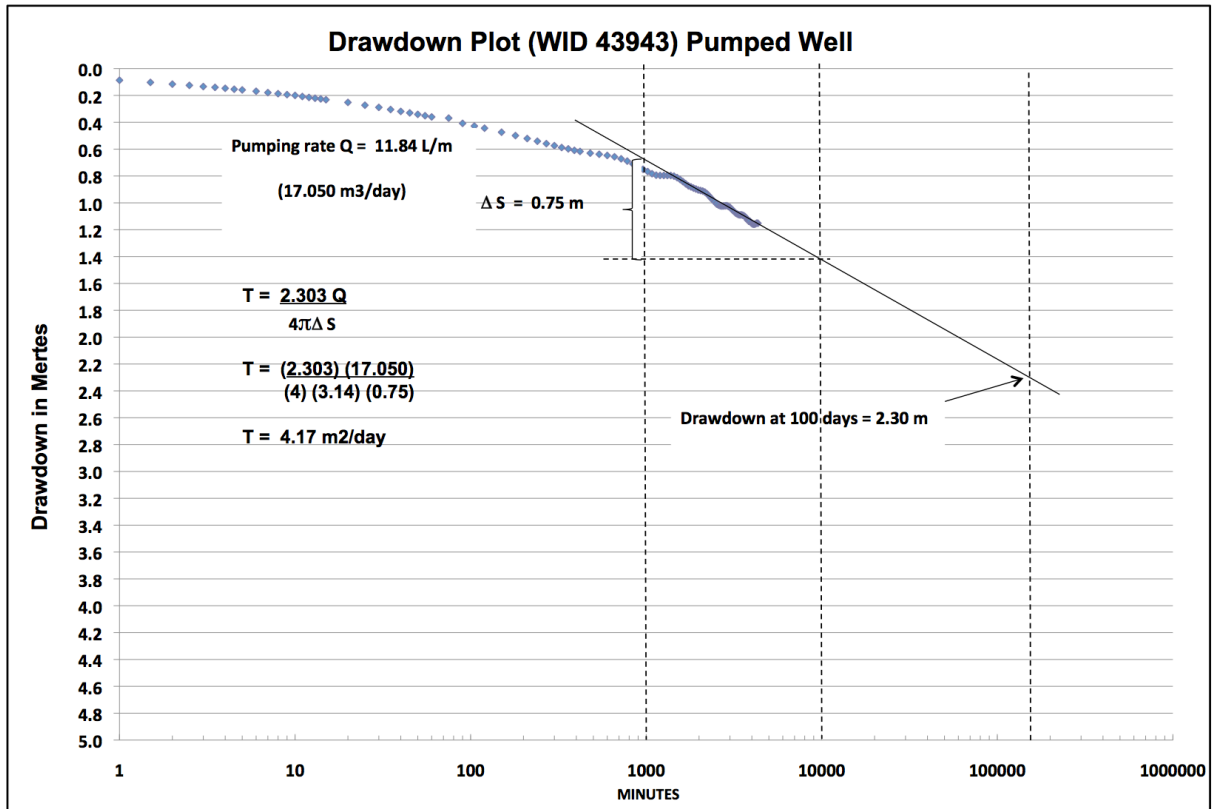


Figure 1, Appendix C. Semi-logarithmic drawdown plot for project well during 72 hour test.

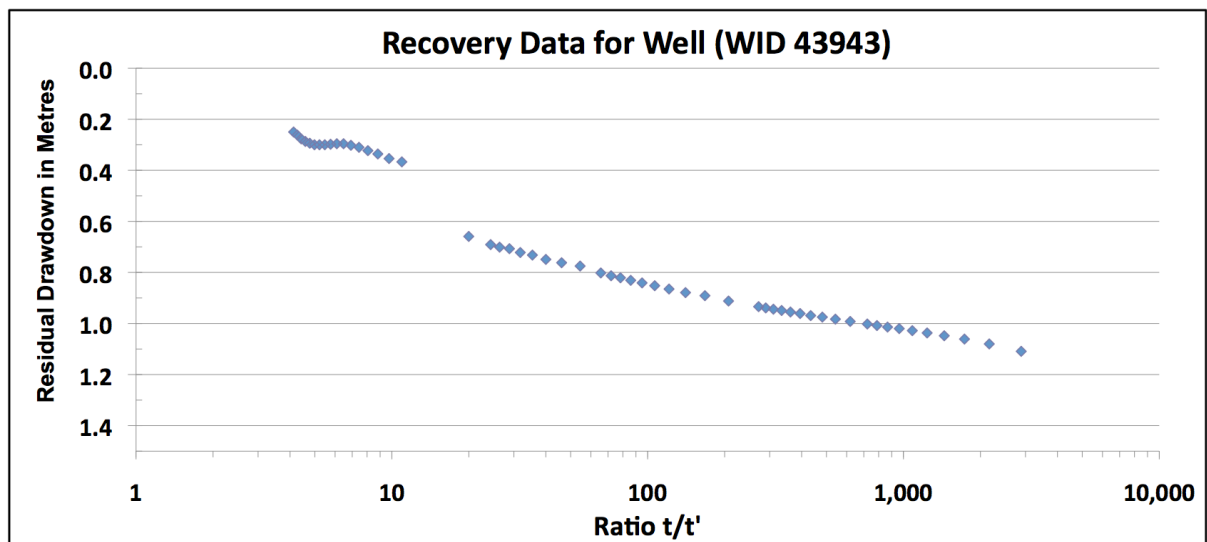


Figure 2, Appendix C. Semi-logarithmic recovery plot for project well.

APPENDIX D

Laboratory Water Quality Analyses

WID 43943



Your Project #: MAYNE HOUSING
Your C.O.C. #: WI023249

Attention: AL KOHUT

HY-GEO CONSULTING
CLIENT #5948 - inactive
1041 LABURNUM RD
VICTORIA, BC
Canada V8Z 2M9

Report Date: 2020/10/21
Report #: R2945545
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C072986

Received: 2020/10/06, 13:45

Sample Matrix: Drinking Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	1	N/A	2020/10/08	BBY6SOP-00026	SM 23 2320 B m
Chloride/Sulphate by Auto Colourimetry	1	N/A	2020/10/08	BBY6SOP-00011 / BBY6SOP-00017	SM23-4500-Cl/SO4-E m
Colour (True) by Kone Lab	1	N/A	2020/10/08	BBY6SOP-00057	SM 23 2120 C m
Conductivity @25C	1	N/A	2020/10/08	BBY6SOP-00026	SM 23 2510 B m
Fluoride	1	N/A	2020/10/08	BBY6SOP-00048	SM 23 4500-F C m
Sulphide (as H2S) (1)	1	N/A	2020/10/13		Auto Calc
Hardness Total (calculated as CaCO3) (3)	1	N/A	2020/10/09	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2020/10/09	BBY WI-00033	Auto Calc
Mercury (Total) by CV	1	2020/10/07	2020/10/08	AB SOP-00084	BCMOE BCLM Oct2013 m
Heterotropic Plate Count (MF) in Water	1	N/A	2020/10/07	BBY4SOP-00003	SM 23 9215
Iron Related Bacteria (4)	1	N/A	2020/10/07	BBY4SOP-00004	BI BART User Manual
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	1	N/A	2020/10/09	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	1	N/A	2020/10/08	BBY7SOP-00002	EPA 6020b R2 m
Na, K, Ca, Mg, S by CRC ICPMS (total)	1	N/A	2020/10/09	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (total)	1	N/A	2020/10/09	BBY7SOP-00003 / BBY7SOP-00002	EPA 6020b R2 m
Nitrogen (Total)	1	N/A	2020/10/21	BBY6SOP-00016	SM 23 4500-N C m
Ammonia-N (Total)	1	N/A	2020/10/09	BBY6SOP-00009	EPA 350.1 m
Nitrate + Nitrite (N)	1	N/A	2020/10/20	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrite (N) by CFA	1	N/A	2020/10/07	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrogen - Nitrate (as N)	1	N/A	2020/10/08	BBY WI-00033	Auto Calc
Nitrogen (Tot. Organic) Calculation	1	N/A	2020/10/10	BBY WI-00033	Auto Calc
Filter and HNO3 Preserve for Metals	1	N/A	2020/10/06	BBY7 WI-00004	SM 23 3030B m
pH @25°C (5)	1	N/A	2020/10/08	BBY6SOP-00026	SM 23 4500-H+ B m
Sat. pH and Langelier Index (@ 4.4C)	1	N/A	2020/10/09	BBY WI-00033	Auto Calc
Sat. pH and Langelier Index (@ 60C)	1	N/A	2020/10/09	BBY WI-00033	Auto Calc
Total Sulphide (1)	1	N/A	2020/10/13	AB SOP-00080	SM 23 4500 S2-A D Fm
Sulphate Reducing Bacteria (4)	1	N/A	2020/10/07	BBY4SOP-00004	BI BART User Manual
Total Dissolved Solids (Filt. Residue)	1	2020/10/13	2020/10/14	BBY6SOP-00033	SM 23 2540 C m
Total Coliform & E.Coli by MF-Chromocult	1	N/A	2020/10/07	BBY4SOP-00143	Merck KGaA Version 1



Your Project #: MAYNE HOUSING
 Your C.O.C. #: WI023249

Attention: AL KOHUT
 HY-GEO CONSULTING
 CLIENT #5948 - inactive
 1041 LABURNUM RD
 VICTORIA, BC
 Canada V8Z 2M9

Report Date: 2020/10/21
 Report #: R2945545
 Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C072986
Received: 2020/10/06, 13:45

Sample Matrix: Drinking Water
 # Samples Received: 1

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Carbon (Total Organic) (1, 6)	1	N/A	2020/10/19	AB SOP-00087	MMCW 119 1996 m
Turbidity	1	N/A	2020/10/08	BBY6SOP-00027	SM 23 2130 B m
UV Transmittance (2)	1	2020/10/13	2020/10/13	CAM SOP-00459	SM 23 5910 m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

- (1) This test was performed by BV Labs Calgary Environmental
- (2) This test was performed by BV Labs Ontario (From Burnaby)
- (3) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).
- (4) Presence/Absence Method. Number is an estimate.
- (5) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas Laboratories endeavours to analyze samples as soon as possible after receipt.
- (6) TOC present in the sample should be considered as non-purgeable TOC.



Your Project #: MAYNE HOUSING
Your C.O.C. #: WI023249

Attention: AL KOHUT
HY-GEO CONSULTING
CLIENT #5948 - inactive
1041 LABURNUM RD
VICTORIA, BC
Canada V8Z 2M9

Report Date: 2020/10/21
Report #: R2945545
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C072986
Received: 2020/10/06, 13:45

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Customer Solutions, Western Canada Customer Experience Team
Email: customersolutionswest@bvlabs.com
Phone# (604) 734 7276

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BV Labs Job #: C072986

Report Date: 2020/10/21

HY-GEO CONSULTING

Client Project #: MAYNE HOUSING

RESULTS OF CHEMICAL ANALYSES OF DRINKING WATER

BV Labs ID		YP1509	
Sampling Date		2020/10/06 08:15	
COC Number		WI023249	
	UNITS	MAYNE HOUSING WELL	QC Batch
Calculated Parameters			
Filter and HNO3 Preservation	N/A	FIELD	ONSITE



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VERITAS

BV Labs Job #: C072986
Report Date: 2020/10/21

HY-GEO CONSULTING
Client Project #: MAYNE HOUSING

VIHA PKG, WELLS/SPRINGS - BURNABY (DRINKING WATER)

BV Labs ID					YP1509		
Sampling Date					2020/10/06 08:15		
COC Number					WI023249		
	UNITS	MAC	AO	OG	MAYNE HOUSING WELL	RDL	QC Batch
ANIONS							
Nitrite (N)	mg/L	1	-	-	<0.0050	0.0050	A037484
Calculated Parameters							
Total Hardness (CaCO3)	mg/L	-	-	-	95.7	0.50	A033569
Nitrate (N)	mg/L	10	-	-	<0.020	0.020	A034240
Total Organic Nitrogen (N)	mg/L	-	-	-	0.038	0.020	A035387
Sulphide (as H2S)	mg/L	-	0.05	-	<0.0020	0.0020	A034996
Misc. Inorganics							
Conductivity	uS/cm	-	-	-	760	2.0	A037336
pH	pH	-	-	7.0:10.5	7.87	N/A	A037325
Total Organic Carbon (C)	mg/L	-	-	-	0.61	0.50	A053827
Total Dissolved Solids	mg/L	-	-	-	190	10	A044840
Anions							
Alkalinity (PP as CaCO3)	mg/L	-	-	-	<1.0	1.0	A037334
Alkalinity (Total as CaCO3)	mg/L	-	-	-	170	1.0	A037334
Bicarbonate (HCO3)	mg/L	-	-	-	210	1.0	A037334
Carbonate (CO3)	mg/L	-	-	-	<1.0	1.0	A037334
Dissolved Fluoride (F)	mg/L	1.5	-	-	0.093	0.050	A038894
Hydroxide (OH)	mg/L	-	-	-	<1.0	1.0	A037334
Total Sulphide	mg/L	-	0.05	-	<0.0018	0.0018	A044460
Dissolved Chloride (Cl)	mg/L	-	250	-	7.8	1.0	A038584
Dissolved Sulphate (SO4)	mg/L	-	500	-	12	1.0	A038584
MISCELLANEOUS							
True Colour	Col. Unit	-	15	-	<5.0	5.0	A039946
Transmittance at 254nm	%T/cm	-	-	-	97	N/A	A044956
Nutrients							
Total Ammonia (N)	mg/L	-	-	-	0.029	0.015	A042255
Nitrate plus Nitrite (N)	mg/L	-	-	-	<0.020	0.020	A056389
Total Nitrogen (N)	mg/L	-	-	-	0.067	0.020	A054864
Physical Properties							
Turbidity	NTU	see remark	see remark	see remark	0.13	0.10	A039683
No Fill	No Exceedance						
Grey	Exceeds 1 criteria policy/level						
Black	Exceeds both criteria/levels						
RDL = Reportable Detection Limit							
N/A = Not Applicable							



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BV Labs Job #: C072986
Report Date: 2020/10/21

HY-GEO CONSULTING
Client Project #: MAYNE HOUSING

VIHA PKG, WELLS/SPRINGS - BURNABY (DRINKING WATER)

BV Labs ID					YP1509		
Sampling Date					2020/10/06 08:15		
COC Number					WI023249		
	UNITS	MAC	AO	OG	MAYNE HOUSING WELL	RDL	QC Batch
Elements							
Total Mercury (Hg)	ug/L	1	-	-	<0.0019	0.0019	A037114
Total Metals by ICPMS							
Total Aluminum (Al)	ug/L	-	-	100	<3.0	3.0	A039393
Total Antimony (Sb)	ug/L	6	-	-	0.59	0.50	A039393
Total Arsenic (As)	ug/L	10	-	-	0.44	0.10	A039393
Total Barium (Ba)	ug/L	2000	-	-	1.1	1.0	A039393
Total Beryllium (Be)	ug/L	-	-	-	<0.10	0.10	A039393
Total Bismuth (Bi)	ug/L	-	-	-	<1.0	1.0	A039393
Total Boron (B)	ug/L	5000	-	-	<50	50	A039393
Total Cadmium (Cd)	ug/L	7	-	-	<0.010	0.010	A039393
Total Chromium (Cr)	ug/L	50	-	-	<1.0	1.0	A039393
Total Cobalt (Co)	ug/L	-	-	-	<0.20	0.20	A039393
Total Copper (Cu)	ug/L	2000	1000	-	0.99	0.20	A039393
Total Iron (Fe)	ug/L	-	300	-	24.9	5.0	A039393
Total Lead (Pb)	ug/L	5	-	-	<0.20	0.20	A039393
Total Manganese (Mn)	ug/L	120	20	-	344	1.0	A039393
Total Molybdenum (Mo)	ug/L	-	-	-	<1.0	1.0	A039393
Total Nickel (Ni)	ug/L	-	-	-	<1.0	1.0	A039393
Total Selenium (Se)	ug/L	50	-	-	0.36	0.10	A039393
Total Silicon (Si)	ug/L	-	-	-	9650	100	A039393
Total Silver (Ag)	ug/L	-	-	-	<0.020	0.020	A039393
Total Strontium (Sr)	ug/L	7000	-	-	158	1.0	A039393
Total Thallium (Tl)	ug/L	-	-	-	<0.010	0.010	A039393
Total Tin (Sn)	ug/L	-	-	-	<5.0	5.0	A039393
Total Titanium (Ti)	ug/L	-	-	-	<5.0	5.0	A039393
Total Uranium (U)	ug/L	20	-	-	0.23	0.10	A039393
Total Vanadium (V)	ug/L	-	-	-	<5.0	5.0	A039393
Total Zinc (Zn)	ug/L	-	5000	-	<5.0	5.0	A039393
Total Zirconium (Zr)	ug/L	-	-	-	<0.10	0.10	A039393
Total Calcium (Ca)	mg/L	-	-	-	26.2	0.050	A034254
Total Magnesium (Mg)	mg/L	-	-	-	7.35	0.050	A034254
Total Potassium (K)	mg/L	-	-	-	0.227	0.050	A034254
Total Sodium (Na)	mg/L	-	200	-	42.1	0.050	A034254
No Fill	No Exceedance						
Grey	Exceeds 1 criteria policy/level						
Black	Exceeds both criteria/levels						
RDL = Reportable Detection Limit							



VIHA PKG, WELLS/SPRINGS - BURNABY (DRINKING WATER)

BV Labs ID					YP1509		
Sampling Date					2020/10/06 08:15		
COC Number					WI023249		
	UNITS	MAC	AO	OG	MAYNE HOUSING WELL	RDL	QC Batch
Total Sulphur (S)	mg/L	-	-	-	3.7	3.0	A034254
Microbiological Param.							
Heterotrophic Plate Count	CFU/mL	-	-	-	18	1	A037327
Iron Bacteria	CFU/mL	-	-	-	150	25	A037324
Sulphate reducing bacteria	CFU/mL	-	-	-	<75	75	A037326
Total Coliforms	CFU/100mL	0	-	-	0	N/A	A037315
E. coli	CFU/100mL	0	-	-	0	N/A	A037315
Calculated Parameters							
Langelier Index (@ 4.4C)	N/A	-	-	-	-0.404	N/A	A035390
Langelier Index (@ 60C)	N/A	-	-	-	0.637	N/A	A035392
Saturation pH (@ 4.4C)	N/A	-	-	-	8.27	N/A	A035390
Saturation pH (@ 60C)	N/A	-	-	-	7.23	N/A	A035392
No Fill	No Exceedance						
Grey	Exceeds 1 criteria policy/level						
Black	Exceeds both criteria/levels						
RDL = Reportable Detection Limit							
N/A = Not Applicable							



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BV Labs Job #: C072986
Report Date: 2020/10/21

HY-GEO CONSULTING
Client Project #: MAYNE HOUSING

CSR DISSOLVED METALS (NO CV-HG) IN WATER

BV Labs ID					YP1509		
Sampling Date					2020/10/06 08:15		
COC Number					WI023249		
	UNITS	MAC	AO	OG	MAYNE HOUSING WELL	RDL	QC Batch
Calculated Parameters							
Dissolved Hardness (CaCO3)	mg/L	-	-	-	97.9	0.50	A034641
Dissolved Metals by ICPMS							
Dissolved Aluminum (Al)	ug/L	-	-	100	<3.0	3.0	A037100
Dissolved Antimony (Sb)	ug/L	6	-	-	0.56	0.50	A037100
Dissolved Arsenic (As)	ug/L	10	-	-	0.43	0.10	A037100
Dissolved Barium (Ba)	ug/L	2000	-	-	1.2	1.0	A037100
Dissolved Beryllium (Be)	ug/L	-	-	-	<0.10	0.10	A037100
Dissolved Bismuth (Bi)	ug/L	-	-	-	<1.0	1.0	A037100
Dissolved Boron (B)	ug/L	5000	-	-	<50	50	A037100
Dissolved Cadmium (Cd)	ug/L	7	-	-	<0.010	0.010	A037100
Dissolved Chromium (Cr)	ug/L	50	-	-	<1.0	1.0	A037100
Dissolved Cobalt (Co)	ug/L	-	-	-	<0.20	0.20	A037100
Dissolved Copper (Cu)	ug/L	2000	1000	-	0.93	0.20	A037100
Dissolved Iron (Fe)	ug/L	-	300	-	22.1	5.0	A037100
Dissolved Lead (Pb)	ug/L	5	-	-	<0.20	0.20	A037100
Dissolved Lithium (Li)	ug/L	-	-	-	8.9	2.0	A037100
Dissolved Manganese (Mn)	ug/L	120	20	-	349	1.0	A037100
Dissolved Molybdenum (Mo)	ug/L	-	-	-	<1.0	1.0	A037100
Dissolved Nickel (Ni)	ug/L	-	-	-	<1.0	1.0	A037100
Dissolved Selenium (Se)	ug/L	50	-	-	0.38	0.10	A037100
Dissolved Silicon (Si)	ug/L	-	-	-	9640	100	A037100
Dissolved Silver (Ag)	ug/L	-	-	-	<0.020	0.020	A037100
Dissolved Strontium (Sr)	ug/L	7000	-	-	154	1.0	A037100
Dissolved Thallium (Tl)	ug/L	-	-	-	<0.010	0.010	A037100
Dissolved Tin (Sn)	ug/L	-	-	-	<5.0	5.0	A037100
Dissolved Titanium (Ti)	ug/L	-	-	-	<5.0	5.0	A037100
Dissolved Uranium (U)	ug/L	20	-	-	0.23	0.10	A037100
Dissolved Vanadium (V)	ug/L	-	-	-	<5.0	5.0	A037100
Dissolved Zinc (Zn)	ug/L	-	5000	-	<5.0	5.0	A037100
Dissolved Zirconium (Zr)	ug/L	-	-	-	<0.10	0.10	A037100
Dissolved Calcium (Ca)	mg/L	-	-	-	26.0	0.050	A034643
Dissolved Magnesium (Mg)	mg/L	-	-	-	7.99	0.050	A034643
No Fill	No Exceedance						
Grey	Exceeds 1 criteria policy/level						
Black	Exceeds both criteria/levels						
RDL = Reportable Detection Limit							



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VERITAS

BV Labs Job #: C072986
Report Date: 2020/10/21

HY-GEO CONSULTING
Client Project #: MAYNE HOUSING

CSR DISSOLVED METALS (NO CV-HG) IN WATER

BV Labs ID					YP1509		
Sampling Date					2020/10/06 08:15		
COC Number					WI023249		
	UNITS	MAC	AO	OG	MAYNE HOUSING WELL	RDL	QC Batch
Dissolved Potassium (K)	mg/L	-	-	-	0.239	0.050	A034643
Dissolved Sodium (Na)	mg/L	-	200	-	46.0	0.050	A034643
Dissolved Sulphur (S)	mg/L	-	-	-	3.8	3.0	A034643
No Fill	No Exceedance						
Grey	Exceeds 1 criteria policy/level						
Black	Exceeds both criteria/levels						
RDL = Reportable Detection Limit							



GENERAL COMMENTS

Sample YP1509 [MAYNE HOUSING WELL] : Sample was analyzed past recommended hold time for Heterotropic Plate Count (MF) in Water. Sample was analyzed past recommended hold time for Iron Related Bacteria. Sample was analyzed past recommended hold time for Sulphate Reducing Bacteria. Sample was analyzed past method specific hold time for Total Coliform & E.Coli by MF-Chromocult. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

MAC,AO,OG: The guidelines that have been included in this report have been taken from the Canadian Drinking Water Quality Summary Table, September 2020.

Criteria A = Maximum Acceptable Concentration (MAC) / Criteria B = Aesthetic Objectives (AO) / Criteria C = Operational Guidance Values (OG)
It is recommended to consult these guidelines when interpreting your data since there are non-numerical guidelines that are not included on this report.

Turbidity Guidelines:

1. Chemically assisted filtration: less than or equal to 0.3 NTU in 95% of the measurements or 95% of the time each month. Shall not exceed 1.0 NTU at any time.
2. Slow sand / diatomaceous earth filtration: less than or equal to 1.0 NTU in 95% of the measurements or 95% of the time each month. Shall not exceed 3.0 NTU at any time.
3. Membrane filtration: less than or equal to 0.1 NTU in 99% of the measurements made or at least 99% of the time each calendar month. Shall not exceed 0.3 NTU at any time.
4. To ensure effectiveness of disinfection and for good operation of the distribution system, it is recommended that water entering the distribution system have turbidity levels of 1.0 NTU or less.

Measurement of Uncertainty has not been accounted for when stating conformity to the selected criteria, where applicable.

Results relate only to the items tested.



BUREAU
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BV Labs Job #: C072986

Report Date: 2020/10/21

QUALITY ASSURANCE REPORT

HY-GEO CONSULTING

Client Project #: MAYNE HOUSING

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
A037100	Dissolved Aluminum (Al)	2020/10/08	102	80 - 120	99	80 - 120	<3.0	ug/L	1.1	20
A037100	Dissolved Antimony (Sb)	2020/10/08	104	80 - 120	100	80 - 120	<0.50	ug/L	NC	20
A037100	Dissolved Arsenic (As)	2020/10/08	104	80 - 120	97	80 - 120	<0.10	ug/L	8.0	20
A037100	Dissolved Barium (Ba)	2020/10/08	NC	80 - 120	100	80 - 120	<1.0	ug/L	0.18	20
A037100	Dissolved Beryllium (Be)	2020/10/08	103	80 - 120	101	80 - 120	<0.10	ug/L	NC	20
A037100	Dissolved Bismuth (Bi)	2020/10/08	95	80 - 120	98	80 - 120	<1.0	ug/L	NC	20
A037100	Dissolved Boron (B)	2020/10/08	102	80 - 120	102	80 - 120	<50	ug/L	1.1	20
A037100	Dissolved Cadmium (Cd)	2020/10/08	100	80 - 120	98	80 - 120	<0.010	ug/L	NC	20
A037100	Dissolved Chromium (Cr)	2020/10/08	100	80 - 120	97	80 - 120	<1.0	ug/L	NC	20
A037100	Dissolved Cobalt (Co)	2020/10/08	99	80 - 120	98	80 - 120	<0.20	ug/L	NC	20
A037100	Dissolved Copper (Cu)	2020/10/08	94	80 - 120	96	80 - 120	<0.20	ug/L	3.3	20
A037100	Dissolved Iron (Fe)	2020/10/08	101	80 - 120	98	80 - 120	<5.0	ug/L	3.2	20
A037100	Dissolved Lead (Pb)	2020/10/08	100	80 - 120	99	80 - 120	<0.20	ug/L	NC	20
A037100	Dissolved Lithium (Li)	2020/10/08	95	80 - 120	97	80 - 120	<2.0	ug/L	1.2	20
A037100	Dissolved Manganese (Mn)	2020/10/08	101	80 - 120	98	80 - 120	<1.0	ug/L	0.74	20
A037100	Dissolved Molybdenum (Mo)	2020/10/08	NC	80 - 120	102	80 - 120	<1.0	ug/L	0.65	20
A037100	Dissolved Nickel (Ni)	2020/10/08	96	80 - 120	97	80 - 120	<1.0	ug/L	1.0	20
A037100	Dissolved Selenium (Se)	2020/10/08	105	80 - 120	100	80 - 120	<0.10	ug/L	1.0	20
A037100	Dissolved Silicon (Si)	2020/10/08	103	80 - 120	100	80 - 120	<100	ug/L	0.0031	20
A037100	Dissolved Silver (Ag)	2020/10/08	98	80 - 120	95	80 - 120	<0.020	ug/L	NC	20
A037100	Dissolved Strontium (Sr)	2020/10/08	NC	80 - 120	97	80 - 120	<1.0	ug/L	0.079	20
A037100	Dissolved Thallium (Tl)	2020/10/08	99	80 - 120	99	80 - 120	<0.010	ug/L	NC	20
A037100	Dissolved Tin (Sn)	2020/10/08	100	80 - 120	98	80 - 120	<5.0	ug/L	NC	20
A037100	Dissolved Titanium (Ti)	2020/10/08	105	80 - 120	97	80 - 120	<5.0	ug/L	NC	20
A037100	Dissolved Uranium (U)	2020/10/08	109	80 - 120	104	80 - 120	<0.10	ug/L	0.72	20
A037100	Dissolved Vanadium (V)	2020/10/08	104	80 - 120	98	80 - 120	<5.0	ug/L	NC	20
A037100	Dissolved Zinc (Zn)	2020/10/08	100	80 - 120	100	80 - 120	<5.0	ug/L	NC	20
A037100	Dissolved Zirconium (Zr)	2020/10/08	108	80 - 120	96	80 - 120	<0.10	ug/L	NC	20
A037114	Total Mercury (Hg)	2020/10/08	NC	80 - 120	98	80 - 120	<0.0019	ug/L	NC	20
A037325	pH	2020/10/08			101	97 - 103			0.46	N/A
A037334	Alkalinity (PP as CaCO3)	2020/10/08					<1.0	mg/L	NC	20
A037334	Alkalinity (Total as CaCO3)	2020/10/08	102	80 - 120	96	80 - 120	<1.0	mg/L	2.7	20
A037334	Bicarbonate (HCO3)	2020/10/08					<1.0	mg/L	2.7	20



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BV Labs Job #: C072986

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QUALITY ASSURANCE REPORT(CONT'D)

HY-GEO CONSULTING

Client Project #: MAYNE HOUSING

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
A037334	Carbonate (CO3)	2020/10/08					<1.0	mg/L	NC	20
A037334	Hydroxide (OH)	2020/10/08					<1.0	mg/L	NC	20
A037336	Conductivity	2020/10/08			100	80 - 120	<2.0	uS/cm		
A037484	Nitrite (N)	2020/10/07	104	80 - 120	100	80 - 120	<0.0050	mg/L	6.5	20
A038584	Dissolved Chloride (Cl)	2020/10/08			105	80 - 120	<1.0	mg/L		
A038584	Dissolved Sulphate (SO4)	2020/10/08			102	80 - 120	<1.0	mg/L		
A038894	Dissolved Fluoride (F)	2020/10/08	102	80 - 120	104	80 - 120	<0.050	mg/L	0	20
A039393	Total Aluminum (Al)	2020/10/09	99	80 - 120	101	80 - 120	<3.0	ug/L		
A039393	Total Antimony (Sb)	2020/10/09	100	80 - 120	103	80 - 120	<0.50	ug/L		
A039393	Total Arsenic (As)	2020/10/09	100	80 - 120	102	80 - 120	<0.10	ug/L		
A039393	Total Barium (Ba)	2020/10/09	99	80 - 120	101	80 - 120	<1.0	ug/L		
A039393	Total Beryllium (Be)	2020/10/09	98	80 - 120	99	80 - 120	<0.10	ug/L		
A039393	Total Bismuth (Bi)	2020/10/09	97	80 - 120	99	80 - 120	<1.0	ug/L		
A039393	Total Boron (B)	2020/10/09	109	80 - 120	109	80 - 120	<50	ug/L		
A039393	Total Cadmium (Cd)	2020/10/09	100	80 - 120	102	80 - 120	<0.010	ug/L		
A039393	Total Chromium (Cr)	2020/10/09	98	80 - 120	100	80 - 120	<1.0	ug/L		
A039393	Total Cobalt (Co)	2020/10/09	98	80 - 120	100	80 - 120	<0.20	ug/L		
A039393	Total Copper (Cu)	2020/10/09	NC	80 - 120	97	80 - 120	<0.20	ug/L		
A039393	Total Iron (Fe)	2020/10/09	102	80 - 120	106	80 - 120	<5.0	ug/L		
A039393	Total Lead (Pb)	2020/10/09	101	80 - 120	103	80 - 120	<0.20	ug/L		
A039393	Total Manganese (Mn)	2020/10/09	100	80 - 120	103	80 - 120	<1.0	ug/L		
A039393	Total Molybdenum (Mo)	2020/10/09	103	80 - 120	104	80 - 120	<1.0	ug/L		
A039393	Total Nickel (Ni)	2020/10/09	98	80 - 120	102	80 - 120	<1.0	ug/L		
A039393	Total Selenium (Se)	2020/10/09	102	80 - 120	104	80 - 120	<0.10	ug/L		
A039393	Total Silicon (Si)	2020/10/09	104	80 - 120	105	80 - 120	<100	ug/L		
A039393	Total Silver (Ag)	2020/10/09	97	80 - 120	99	80 - 120	<0.020	ug/L		
A039393	Total Strontium (Sr)	2020/10/09	98	80 - 120	100	80 - 120	<1.0	ug/L		
A039393	Total Thallium (Tl)	2020/10/09	100	80 - 120	101	80 - 120	<0.010	ug/L		
A039393	Total Tin (Sn)	2020/10/09	99	80 - 120	100	80 - 120	<5.0	ug/L		
A039393	Total Titanium (Ti)	2020/10/09	102	80 - 120	103	80 - 120	<5.0	ug/L		
A039393	Total Uranium (U)	2020/10/09	105	80 - 120	107	80 - 120	<0.10	ug/L		
A039393	Total Vanadium (V)	2020/10/09	101	80 - 120	102	80 - 120	<5.0	ug/L		
A039393	Total Zinc (Zn)	2020/10/09	NC	80 - 120	105	80 - 120	<5.0	ug/L		



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VERITAS

BV Labs Job #: C072986

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QUALITY ASSURANCE REPORT(CONT'D)

HY-GEO CONSULTING

Client Project #: MAYNE HOUSING

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
A039393	Total Zirconium (Zr)	2020/10/09	102	80 - 120	104	80 - 120	<0.10	ug/L		
A039683	Turbidity	2020/10/08			104	80 - 120	<0.10	NTU	NC	20
A039946	True Colour	2020/10/08			95	80 - 120	<5.0	Col. Unit	NC	20
A042255	Total Ammonia (N)	2020/10/09	105	80 - 120	98	80 - 120	<0.015	mg/L	0	20
A044460	Total Sulphide	2020/10/13	48 (1)	80 - 120	99	80 - 120	<0.0018	mg/L	13	20
A044840	Total Dissolved Solids	2020/10/14	100	80 - 120	95	80 - 120	<10	mg/L	4.6	20
A044956	Transmittance at 254nm	2020/10/13			100	97 - 103			0.030	25
A053827	Total Organic Carbon (C)	2020/10/19	100	80 - 120	106	80 - 120	<0.50	mg/L	3.5	20
A054864	Total Nitrogen (N)	2020/10/21			97	80 - 120	<0.020	mg/L		
A056389	Nitrate plus Nitrite (N)	2020/10/20	104	80 - 120	107	80 - 120	<0.020	mg/L	0.66	25

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.



VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Brad Newman, Scientific Specialist

David Huang, M.Sc., P.Chem., QP, Scientific Services Manager

Laura Martin, Sample Reception/PMA

Harry (Peng) Liang, Senior Analyst

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