18 May 2018 Reference No. 1658853-500-L-Rev0

Laura Beckett, Municipal Planner, MURP, MCIP, RPP
Municipal Planner, Deputy Approving Officer
District of Highlands
1980 Millstream Road
Victoria, BC, V9B 6H1

RESULTS OF 2016 GROUNDWATER LEVEL MONITORING PROGRAM, DISTRICT OF HIGHLANDS, BC

Dear Ms. Beckett,

As requested by the District of Highlands (the District), Golder Associates Ltd. (Golder) conducted a groundwater level monitoring program in the District of Highlands, BC (the Highlands) for 2016. Golder conducted the work in accordance with our proposal titled "Work Plan and Cost Estimate for 2016 Groundwater Level Monitoring Program, District of Highlands, BC" (Golder Reference No. P1658853-001-WP-Rev1) and dated 30 June 2016.

Our letter should be interpreted and used in accordance with the limitations and considerations set out in Golder Associate Ltd.'s *Study Limitations*, provided at the end of this letter.

1.0 BACKGROUND AND OBJECTIVE

The Highlands is one of 13-member municipalities of the Capital Regional District (CRD), encompassing approximately 37 square km and located northwest of Victoria, BC. The majority of the residential population of approximately 2,120 obtains potable water from private, individual water wells. Commercial groundwater use is limited to the southern portion of the Highlands. The Hanington Estates subdivision, located along the southern portion of the Highlands, obtains water from a water system ("Hanington Estates Water System") that is supplied by two communal supply wells. Irrigation water for the Bear Mountain Golf Course (Bear Mountain) is sourced from groundwater wells located within the Highlands. Some businesses within the Millstream Industrial Park, located in the Highlands and Langford, also use groundwater for commercial purposes.

1.1 Aquifer Description

Groundwater supplies within the Highlands are derived primarily from drilled wells completed in the Wark-Colquitz Aquifer. This bedrock aquifer is identified as Aquifer No. 680 by the BC Ministry of Environment and Climate Change Strategy (ENV) and is categorized as class IIB under the BC Aquifer Classification System, indicating moderate demand relative to aquifer productivity and moderate vulnerability of the aquifer to contamination from surface sources.

Sewage servicing within the Highlands is primarily by individual septic systems.

1.2 Highlands Monitoring Program

On behalf of the District, Golder initiated a groundwater level monitoring program in the Highlands in 2009 in support of the District's Groundwater Protection Study. The water-level information was used to assess seasonal groundwater-level variations and, in 2012, to refine the numerical groundwater model that Golder developed and calibrated. The refined numerical model was then used to develop groundwater conservation and protection measures. At the completion of the Groundwater Protection Study, Golder recommended that the District continue to monitor groundwater conditions at select locations in the Highlands to assess long term trends. If trends were to be observed, the results would provide the basis for guiding implementation of management strategies including conservation and groundwater protection measures, and public education efforts. Further details are provided in Golder's report titled "Phase 3: Groundwater Protection Study District of Highlands, District of Highlands Victoria, BC" (Golder Report No. 0714140014-501-R-Rev2-3000) and dated 18 December 2012.

The groundwater monitoring program has been continued since 2009 through 2016. At present, electronic data loggers (i.e., pressure transducers) are deployed in six monitoring wells located across the Highlands to collect continuous water-level data at strategic locations, and one additional pressure transducer (a "barologger") is present to monitor changes in barometric (i.e., atmospheric) pressure. The locations of monitoring wells DOH-01, DOH-02A, DOH-03, DOH-04B, DOH-07B and DOH-09A are presented on attached Figure 1.

Monitoring wells DOH-02A, DOH-07B and DOH-09A are unused wells that are not equipped with pumps (i.e., are not in operation). Therefore, the water levels in these wells are generally considered to be representative of static groundwater levels in the aquifer in the vicinity of the wells. DOH-03 and DOH-04B are equipped with pumps and operated as supply wells for non-potable uses (i.e., not for drinking water). Although DOH-01 is an unused well, the water level in this well is influenced by pumping in an adjacent well. Water levels in DOH-01, DOH-03 and DOH-4B are not representative of the water levels in the surrounding aquifer during periods of pumping; however, the high water-levels that represent static (i.e., non-pumping) periods provide a basis to assess groundwater conditions in the areas of these wells.

1.3 Objective

The objective of the 2016 groundwater level monitoring program was to compile and analyse data from the Highlands and stakeholder monitoring programs to assess regional groundwater conditions and potential long-term trends.

2.0 METHODS

2.1 Groundwater Level Monitoring

The transducers that are installed in the Highlands monitoring wells, including the barologger that is deployed at monitoring location DOH-01A, are programmed to collect data every twelve hours. Golder downloaded pressure transducer data and collected a manual depth-to-water measurement at each monitoring location in the Highlands on 6 June, 30 August and 21 December 2016.

2.2 Data Compilation and Analysis

In addition to the District's monitoring program, Golder also obtained data from other stakeholder monitoring programs in the Highlands including:

- ENV Observation Well Network: water-level data available on-line from the ENV for Observation Well No. 372, located in the western portion of the Highlands
- Hanington Estates Water System: flow data available from Island Flow Control Water Solutions Ltd. (IFCWS) for the Hanington Estates Water System, in the southern portion of the Highlands
- Bear Mountain Monitoring Program: water-level and flow data available from Ecoasis Developments LLP for the Bear Mountain Golf and Country Club in the southern portion of the Highlands
- University of Victoria (UVic) School-Based Weather Station Network: data available on-line for UVic weather stations, located at various areas of the Highlands, as described below

The locations of the monitoring wells and weather stations from the various stakeholder monitoring programs are also presented on attached Figure 1.

Golder compiled the raw pressure data from the Highlands monitoring wells and corrected the data for variations in barometric pressure, as recorded by the barologger, to calculate groundwater levels for each Highlands monitoring well. Golder also compiled data available from ENV Observation Well No. 372. Golder compiled data from the UVic weather stations that have been analysed during previous years; however, limited precipitation data were available for some of the weather stations. Therefore, data were compiled from alternate, nearby weather stations as follows:

- Southern Highlands: In 2016 data for the District of Highlands Office weather station were not available from 15-25 February and from 4 October to the end of the year. Therefore, data from the Millstream Elementary School weather station for the period of 1 February – 31 December 2016 were compiled and compared to the water level data for DOH-01 and DOH-03. The Millstream Elementary School station is located approximately 1,400 m to the south of, and at an elevation 24 m lower than, the District of Highlands Office station (Figure 1).

- Eastern Highlands: Date were not available for the East Highlands District Firehall weather station after 31 May 2014. A UVic weather station is located at Prospect Lake Elementary School, approximately 3 km northeast from the East Highlands District Firehall station; however, only intermittent data were available for the Prospect Lake Elementary station. Therefore, data from the Calle Revelle Nature Sanctuary Weather Station, located approximately 3.9 km northwest from the East Highlands District Firehall, were compared to water-level data from DOH-09A.

Data from the Highlands and stakeholder monitoring programs were plotted and the results analysed to assess seasonal and long-term trends.

Golder also reviewed flow data for the Hanington Estates Water System, as provided by IFCWS, and the results from the Bear Mountain Monitoring Program presented in the report prepared by Western Water Associates Ltd. (WWAL) titled “Bear Mountain 2015-2016 Annual Groundwater Monitoring Report” (WWAL File No. 16-092-01) and dated 19 October 2017. Golder did not conduct a detailed review of the data presented in WWAL’s report. Rather, Golder assessed the results from the Bear Mountain Monitoring Program in the context of the regional groundwater system.

3.0 RESULTS AND DISCUSSION

3.1 District of Highlands Monitoring Program

Detailed water-level data for monitoring wells DOH-01, DOH-02A, DOH-03, DOH-04B, DOH-07B and DOH-09A for the six-year period from 1 January 2011 through 21 December 2016, together with daily precipitation data from nearby weather stations are presented on Figures 2 through 7. The precipitation data are provided to illustrate the relationship between precipitation and groundwater levels. As discussed in Section 2.2, data from the District of Highlands Office and East Highlands District Firehall weather stations, which had been used during previous years to assess precipitation in the southern and eastern portions of the Highlands, respectively, were supplemented with precipitation data from nearby stations within the UVic School-Based Weather Station Network. Although it is expected that there is some variability in precipitation patterns across the Highlands, the precipitation data presented on Figures 2 through 7 are considered suitable for the purposes of assessing general groundwater level patterns. Furthermore, groundwater recharge into the bedrock aquifer is interpreted to be controlled by the properties of the bedrock and not necessarily the intensity of precipitation. Therefore, it is anticipated that minor changes in precipitation in different areas of the Highlands would not necessarily be reflected in water-level data.

In 2016, the water-levels recorded in the majority of the Highlands monitoring wells were consistent with the seasonal trend observed in previous years, with groundwater elevations highest in the wet winter months of December to April, declining to a seasonal low during the summer months of May to September, and increasing in response to precipitation in October and November. Consistent with previous years, the seasonal responses observed in 2016 were greatest in monitoring wells located at higher elevations, in areas of inferred groundwater recharge. Seasonal responses in 2016 ranged from approximately 16 m in DOH-02A, located in an upland area at an elevation of over 260 m above sea level (asl), to approximately 3.5 m and 5 m in DOH-03 and DOH-09A, respectively. These wells are located at lower elevations in inferred groundwater discharge areas adjacent to wetlands.

Similar to previous years, the groundwater levels that were observed in the Highlands monitoring wells at the end of the dry season of 2016 were consistent with precipitation patterns and generally within the range of those observed during previous years. The total precipitation recorded for the West Highlands District Firehall weather station from 1 May through 30 September 2016 was 75.5 mm, generally consistent with previous years in the Highlands Monitoring Program. With the exception of 2013, precipitation recorded at the West Highlands District Firehall weather station during the May through September period has ranged from 45.9 mm in 2012 to 166.7 mm in 2009. In 2013, relatively higher precipitation was recorded in May and September, resulting in a total of 303 mm of precipitation being recorded for the May through September period. The seasonal low water levels observed in the Highlands monitoring wells were generally lower in years when precipitation was lower during the summer months.

In August 2016, the seasonal low water level in DOH-02A, located in an upland area, was reported to be approximately 30.0 m below top of (well) casing (btoc). Although the seasonal low water levels recorded in DOH-02A exhibit a downward trend from 2013 to 2016, the seasonal low water level observed for this well in 2016 was similar to the level of 29.9 mbtoc that was reported in 2012. The seasonal low water levels reported for DOH-04B (8.4 mbtoc) and DOH-09A (5.0 mbtoc) were generally in the higher portion (i.e., less drawdown) of previous readings that have ranged from 8.0 to 9.5 mbtoc and 5.0 to 5.2 mbtoc for these wells, respectively, during previous years.

The water levels in DOH-01, DOH-03 and DOH-07B were also generally consistent with previous years and continued to be influenced by pumping of the well (DOH-03) or nearby well(s) (DOH-01 and DOH-07B). The lowest isolated (i.e., pumping induced) water level of 25.9 mbtoc for DOH-01 was observed in 2016 and previously in 2012. The static water level in DOH-01 is inferred to have been in the range of 11 mbtoc during the dry season of 2016, similar to previous monitoring years. With the exception of a few data points that reflect periods of pumping, the low water level of 7.5 mbtoc that was observed in DOH-03 in 2016 was also consistent with previous years.

Similar to previous years, the lowest water level in DOH-07B (12.2 mbtoc) is inferred to represent a period of pumping in a nearby well late in the summer period. Following recovery of the water level, the static water level in DOH-07B is interpreted to have declined to a seasonal low water level of 11.7 mbtoc in September 2016. The seasonal static low water levels observed in DOH-07B appear to have declined at a rate of approximately 0.4 m/year from 9.6 mbtoc in 2011 to 11.7 mbtoc in 2016. These seasonal low water levels, which may reflect relatively less precipitation during the dry season in recent years, a change in land use or increased pumping from one or more nearby wells, are still much higher than the reported depth of the well (152.4 m below ground surface; bgs).

Similar to previous years, water levels in the Highlands monitoring wells responded rapidly to precipitation following the onset of the wet season, increasing from late September of 2016. The isolated periods of rapid water level increases observed in monitoring wells are consistent with groundwater recharge during periods of greater precipitation. The seasonal high water levels observed in December 2016 were consistent with previous years for most Highlands monitoring wells. Similar to the seasonal low water levels observed in DOH-07B, the seasonal high water levels in this well have generally exhibited a declining trend from 5.3 mbtoc in 2011 to 5.7 mbtoc in early 2016. As discussed above, this pattern may reflect changes in land use that impacted local groundwater recharge or increased groundwater extraction.

3.2 BC Ministry of Environment & Climate Change Strategy Observation Well

Water-level data for ENV Observation Well No. 372 (ENV Well No. 372) are plotted with precipitation data from nearby West Highlands District Firehall weather station on Figure 8.

The water level patterns observed in ENV Well No. 372 were generally consistent with those observed in the Highlands monitoring wells; however, the seasonal low water level of 61.1 mbtoc that was reported for the dry seasons of 2015 and 2016 may reflect periods when the water level dropped below the pressure transducer that was deployed in the well. Therefore, it is inferred that the seasonal low water level in ENV Well No. 372 was lower than 61.1 mbtoc in 2015 and 60.1 mbtoc in 2016.

Although the high water level of 53.3 mbtoc that was observed in December 2016 is lower than the seasonal high water levels observed in this well between 2013 and 2016, it is consistent with the high water level of 53.4 mbtoc that was observed in early 2011.

3.3 Hanington Estates Water System

Water supply for the Hanington Estates Water System is sourced from two groundwater supply wells. Well 409 (Well Tag No. 85183) is operated as the primary water supply for the Hanington System and Well 500 (Well Tag No. 85184) is operated periodically as a backup supply. The total flows from wells 409 and 500 were reported to be 23,079 cubic metres (m^3) and 6,774 m^3, respectively, for a combined flow of 29,853 m^3 for the period 4 December 2015 to 22 December 2016.

The average groundwater use for the Hanington Estates Water System during this period was 77.7 m^3/day and anticipated to be higher during the drier, hotter summer season. This 2016 estimate is within the range of values that have been reported since annual well flow data were provided in 2013. In addition to the flow data wells 409 and 500, IFCWS also provided flow monitoring data for the overall water system. Although considered to be less accurate than the flow data for the individual wells, the data for the water system suggest that approximately 60% of the annual use in 2016 occurred between May and September, with the demand in the summer months more than double the demand in the winter months. These results are inferred to reflect higher irrigation and other outdoor water use during the hotter, drier summer months.

Based on an estimated population of 190 residents in the Hanington Estates subdivision in 2016[1], the average water use at Hanington Estates is calculated to be approximately 409 litres per person per day (L/p/d) for the period December 2015 to December of 2016. This value is lower than previous years that have shown a general decrease in per capita water use in Hanington Estates from the value of 473 L/p/d that was estimated for the period February 2013 to March 2014. As indicated above, it is anticipated that the per capita demand would be higher during the dry summer months.

Water level data were not provided for Well 409 and Well 500 for 2016.

[1] Population information, as provided by the District of Highlands in file "Estd Pop_Hanington Creek Estates_2013-2016.docx",that is based on Occupancy Permits, Stats Canada 2011 Census data and Building Official's observations.

3.4 Bear Mountain Monitoring Program

For the 2015-2016 Bear Mountain Groundwater Monitoring Program, continuous water level data were collected with dedicated pressure transducers that were deployed in irrigation (i.e., pumping) wells 405, 407 and 411, and monitoring wells 413 and 414. Irrigation wells 405, 407 and 411 are each equipped with a flow meter to measure flow rates.

Bear Mountain pumped a total groundwater volume of approximately 344,500 cubic metres (m^3) from 4 May to 27 September 2016 at pumping rates of approximately 1.9 litres per second (L/s) from well 405, 8.8 L/s from well 407 and 10.7 L/s from well 411. The total volume extracted in 2016 was greater than the 238,050 m^3 that was reported to have been pumped from these irrigation wells from 12 May to 5 October 2015, but within the range of values reported in previous years. Data from digital flow meters that are located in the water distribution system indicated that approximately 204,500 m^3 of the total groundwater from the irrigation wells in 2016 was pumped into the Osborne Pond (the primary reservoir for the Valley Golf Course) and 140,000 m^3 was pumped into the Mountain Pond. WWAL also noted that a water balance that had been conducted by Colquitz Engineering Ltd. indicated that due to leakage from the Osborne Pond, approximately 74% of the groundwater that is pumped into the pond recharges the aquifer. Based on this information, WWAL estimated the net groundwater extraction from the irrigation wells for the Valley Golf Course to be approximately 52,000 m^3 in 2016. Golder did not review the water balance study that was conducted by Colquitz Engineering Ltd.

During the pumping period in 2016, maximum drawdown in the irrigation wells was reported to be approximately 50 m, 43 m and 82 m in wells 405, 407 and 411, respectively. Relatively greater drawdown was reported for the irrigation wells in 2016 when compared to 2015, but within the range of values reported in previous years. WWAL reported that in the fall of 2016, the water levels in the irrigation wells recovered to 100% of the pre-pumping groundwater levels within approximately 4 weeks compared to recovery periods of approximately 6 weeks in 2014 to 10 days in 2013. WWAL attributed the variation in recovery periods to the lengths of the dry seasons in these years.

In 2016, the static water levels in observation wells 413 and 414 were reported to be similar to those observed in previous years, exhibiting a seasonal fluctuation of approximately 3 to 5 m. WWAL interpreted these results as indicating that the observation wells are hydraulically separate from the lineament (i.e., fault/fracture zone) in which the irrigation wells are completed. WWAL noted that there are currently no monitoring wells upgradient (north) from the irrigation wells and, therefore, the extent of the drawdown from operation of the irrigation wells is not known. In October 2016, WWAL removed the data logger from well 413 and placed it in well 412, and in July 2017 removed the data logger from well 414 and placed a new logger in well 400.

WWAL noted that Ecoasis submitted an application to the Province of British Columbia for an Existing Use Groundwater License for an annual diversion of 375,000 m^3 of groundwater from its three irrigation wells (wells 405, 407 and 411). WWAL did not indicate whether the license had been approved.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

The results from the 2016 groundwater monitoring program were generally consistent with the seasonal patterns reported for previous years. Water levels in the Highlands monitoring wells during the dry season of 2016 were within the range of those observed in previously monitored years (i.e., since 2010); however, the seasonal high and low water levels observed in monitoring well DOH-07B have generally exhibited a declining pattern between 2011 and 2016. The water level in DOH-07B, which is interpreted to have typically been influenced by pumping of an adjacent well late in the dry season, may reflect a change in land use or increased pumping from one or more nearby wells. Further monitoring is required to determine if this represents a long term decline in dry and wet season water levels at this location. It should be noted that the lowest water level of 12.2 mbtoc that has been observed in DOH-07B is over 140 m higher than the reported depth of the well (152.4 mbgs).

The average water use at Hanington Estates was estimated to be approximately 77.7 m^3/day for the period December 2015 to December of 2016, within the range of values that have been reported since annual well flow data were provided in 2013. When the population of the Hanington Estates subdivision, which has been increasing in recent years, is considered, the per capita water use for the Hanington Estates water system is estimated to have decreased from 473 L/p/d in 2013 to 409 L/p/d in 2016. It is anticipated that total water use, which includes irrigation and outdoor water use, during the dry summer months was more than double that in the winter months.

A total volume of 344,500 cubic metres (m^3) of groundwater was reported to have been pumped from Bear Mountain irrigation wells 405, 407 and 411 during the dry season of 2016. This value is greater than the volume of 238,050 m^3 that was extracted in 2015 but within the range volumes reported in previous years. The pumping-induced drawdown levels that were observed in the irrigation wells in 2016 were also within the range levels that have been reported in previous monitoring years. In 2016, the water levels in the irrigation wells recovered to 100% of the pre-pumping levels within approximately 4 weeks, compared to the range of 10 days to 6 weeks that were observed in 2013 and 2014, respectively.

4.2 Recommendations

Golder recommends that the groundwater monitoring program continue in 2017 to document water levels and provide the basis to assess seasonal patterns and long term trends in groundwater levels across the Highlands. The results of stakeholder programs should also continue to be reviewed on an annual basis to monitor groundwater conditions in the southern portion of the Highlands where production wells are operated.

We also recommend that the water balance study that was prepared by Colquitz Engineering for Bear Mountain be reviewed to understand groundwater extraction and water use at the golf course.

5.0 CLOSURE

We trust the above information meets your current needs. If you have any questions or require additional information, please do not hesitate to contact the undersigned.

Yours truly,

Golder Associates Ltd.

Mark Bolton, MSc, PGeo
Associate, Senior Hydrogeologist

Jillian Sacré, MSc, PGeo
Principal, Senior Hydrogeologist

MAB/nnv

Attachments:
- Figure 1: Monitoring Locations District of Highlands
- Figure 2: Depth to Groundwater Monitoring Well DOH-01 and Precipitation in Southern Highlands
- Figure 3: Depth to Groundwater Monitoring Well DOH-02A and Precipitation in Western Highlands
- Figure 4: Depth to Groundwater Monitoring Well DOH-03 and Precipitation in Southern Highlands
- Figure 5: Depth to Groundwater Monitoring Well DOH-04B and Precipitation in Western Highlands
- Figure 6: Depth to Groundwater Monitoring Well DOH-07B and Precipitation in Northern Highlands
- Figure 7: Depth to Groundwater Monitoring Well DOH-09A and Precipitation in Eastern Highlands
- Figure 8: Depth to Groundwater Monitoring Well MoE Observation Well 372 and Precipitation in Western Highlands

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6.0 STUDY LIMITATIONS

Golder Associates Ltd. (Golder) has prepared this letter in a manner consistent with that level of care and skill ordinarily exercised by members of the landfill engineering and science professions currently practicing in British Columbia, subject to the time limits and physical constraints applicable to this letter. No other warranty, express or implied is made.

The letter is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other letters prepared by Golder for the Client relative to the specific site described in the letter. In order to properly understand the suggestions, recommendations and opinions expressed in this letter, reference must be made to the whole of the letter. Golder cannot be responsible for use by any party of portions of the letter without reference to the entire letter and other relevant communications between Golder and the Client.

In preparing this letter, Golder has relied in good faith on information provided by the individuals and agencies noted in this letter. We accept no responsibility for any deficiency or inaccuracy contained in this letter as a result of errors, omissions, misinterpretations or fraudulent acts of the persons or agencies contacted.

The information, recommendations and opinions expressed in this letter are for the sole benefit of the Client. No other party may use or rely on this letter or any portion thereof without Golder's express written consent. The letter, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client to make copies of the letter, and only in such quantities as are reasonably necessary for the use of the letter by those parties. The Client may not give, lend, sell, or otherwise make available the letter or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client cannot rely upon the electronic media versions of Golder's letter or other work products.

If new information is discovered in the future, Golder Associates Ltd. should be requested to re-evaluate the content of this letter and provide amendments as required prior to any reliance upon the information presented herein.

460000

SAANICH INLET
FINLAYSON ARM
Pease Creek
Pease Lake
Durrance Lake
Hazlitt Creek
PEASE CREEK WATERSHED
DOH-07A
DOH-07B
Cal Revelle Nature Sanctuary
Third Lake
DOH-06
DOH-05
Second Lake
Fork Lake
Killarney Lake
Mill Stm.
Mitchell Lake
MOE 372
West Highlands District Firehall
DOH-04A
DOH-04B
Highlands Weather Station
East Highlands District Firehall
DOH-09B
DOH-09A
Fizzle Lake
Eagles Lake
DOH-02B
DOH-02A
CRAIGFLOWER CREEK WATERSHED
MILL STREAM CREEK WATERSHED
Mary Lake
DOH-01
413
414
Teanook Lake
Pike Lake
411
Matson Lake
District of Highlands Office
DOH-03
407
499
500
McKenzie Lake
INSET
Millstream Elementary School
0 3,000 6,000
1:300,000 METRES

5370000

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LEGEND

- District of Highlands Monitoring Well Location
- Hanington Creek Estates Well
- Bear Mountain Monitoring Well
- Ministry of Environment Observation Well No. 372
- Environment Canada Weather Station
- University of Victoria Weather Station
- Contour (20m Interval)
- Watercourse
- Waterbody
- Cadastre Information
- Major Watershed Boundary
- Municipality Boundary

Elevation - metres above sea level (masl)

- 0 - 100
- 101 - 200
- 201 - 300
- 301 - 400
- 401 - 500

0 500 1,000
1:30,000 METRES

REFERENCES

1. DATA PROVIDED BY THE DISTRICT OF HIGHLAND AND BC ILMB.
2. BASE DATA CONTAIN INFORMATION LICENCED UNDER THE OPEN GOVERNMENT LICENCE – BRITISH COLUMBIA/CANADA.
3. WEATHER STATIONS OBTAINED FROM ENVIRONMENT CANADA AND THE UNIVERSITY OF VICTORIA SCHOOL-BASED WEATHER STATION NETWORK.
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COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
DISTRICT OF HIGHLANDS

PROJECT
GROUNDWATER PROTECTION STUDY
HIGHLANDS, B.C.

TITLE
MONITORING LOCATIONS

CONSULTANT
GOLDER

YYYY-MM-DD	2018-05-14
DESIGNED	MB
PREPARED	DSC/AD
REVIEWED	JPS
APPROVED	MAB

PROJECT NO.	CONTROL	REV.	FIGURE
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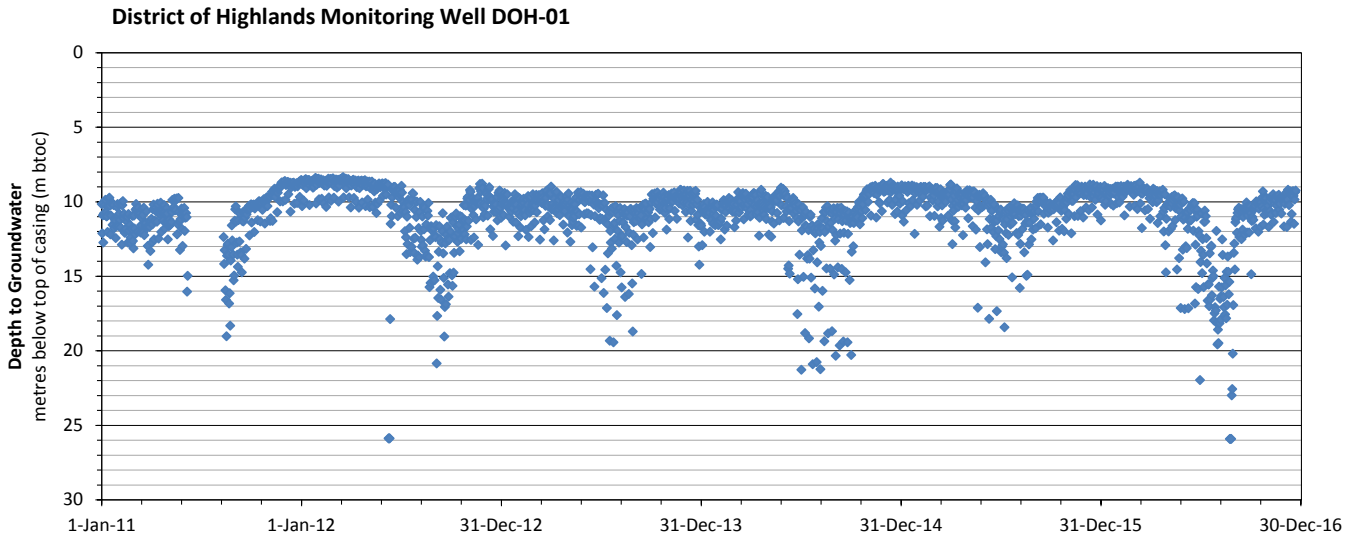

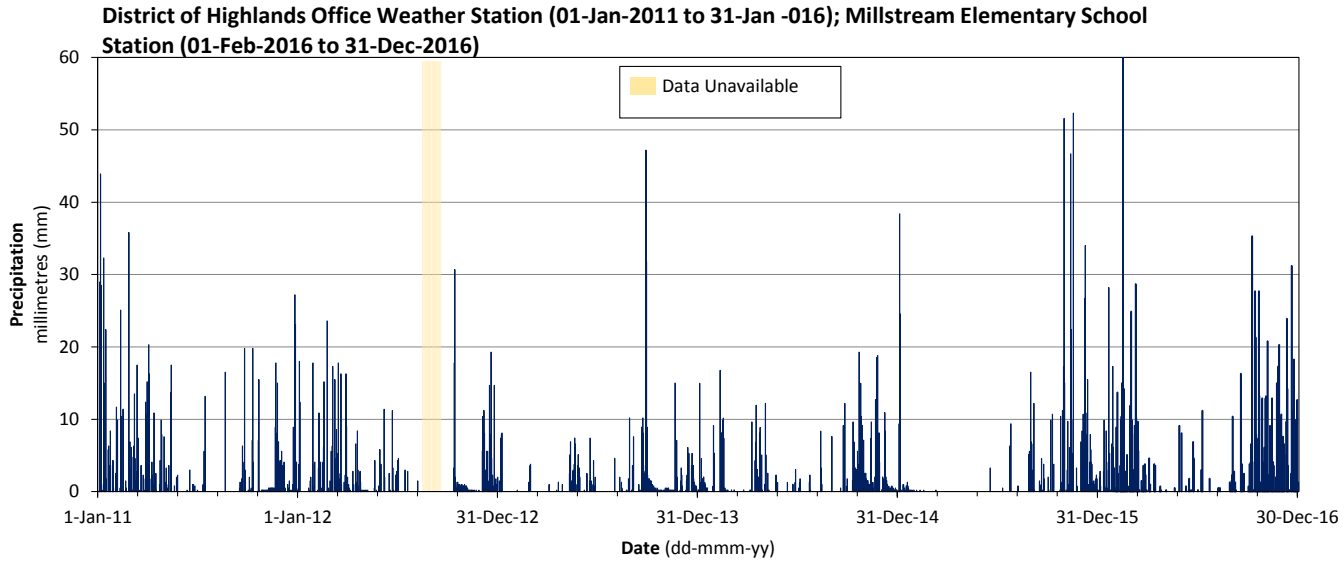

Notes

Water level data collected under the District of Highlands Groundwater Monitoring Program.

Precipitation data obtained online from the University of Victoria School-Based Weather Station Network.
http://www.victoriaweather.ca/

PROJECT
DISTRICT OF HIGHLANDS
2016 GROUNDWATER MONITORING PROGRAM
HIGHLANDS, BC

TITLE
DEPTH TO GROUNDWATER MONITORING WELL DOH-01 AND PRECIPITATION IN SOUTHERN HIGHLANDS

GOLDER

PROJECT No. 1658853			FILE No. ----	
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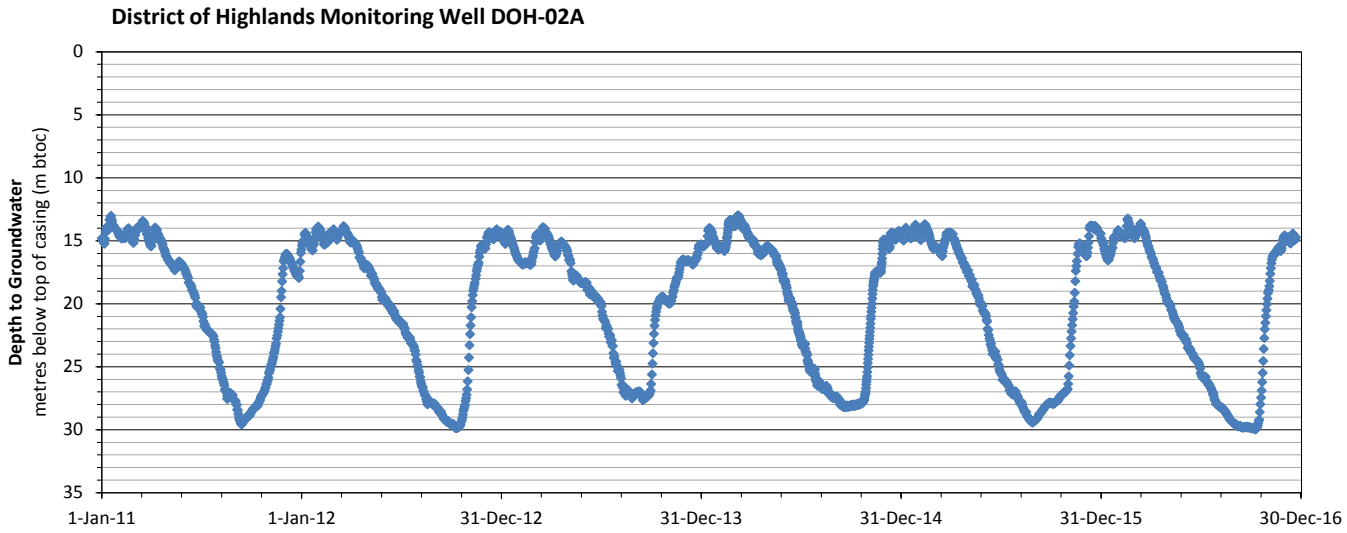

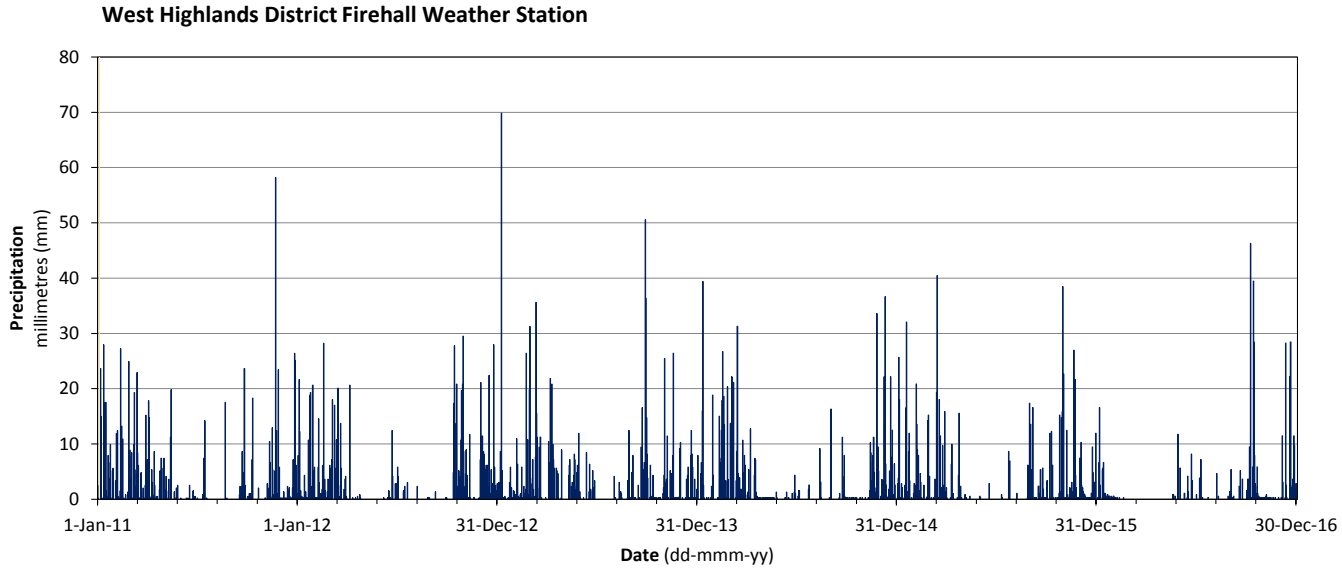

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PROJECT	DISTRICT OF HIGHLANDS 2016 GROUNDWATER MONITORING PROGRAM HIGHLANDS, BC				
TITLE	DEPTH TO GROUNDWATER MONITORING WELL DOH-02A AND PRECIPITATION IN WESTERN HIGHLANDS				
GOLDER	PROJECT No. 1658853			FILE No. ----	
	DESIGN	CB	14NOV06	SCALE NTS	REV.
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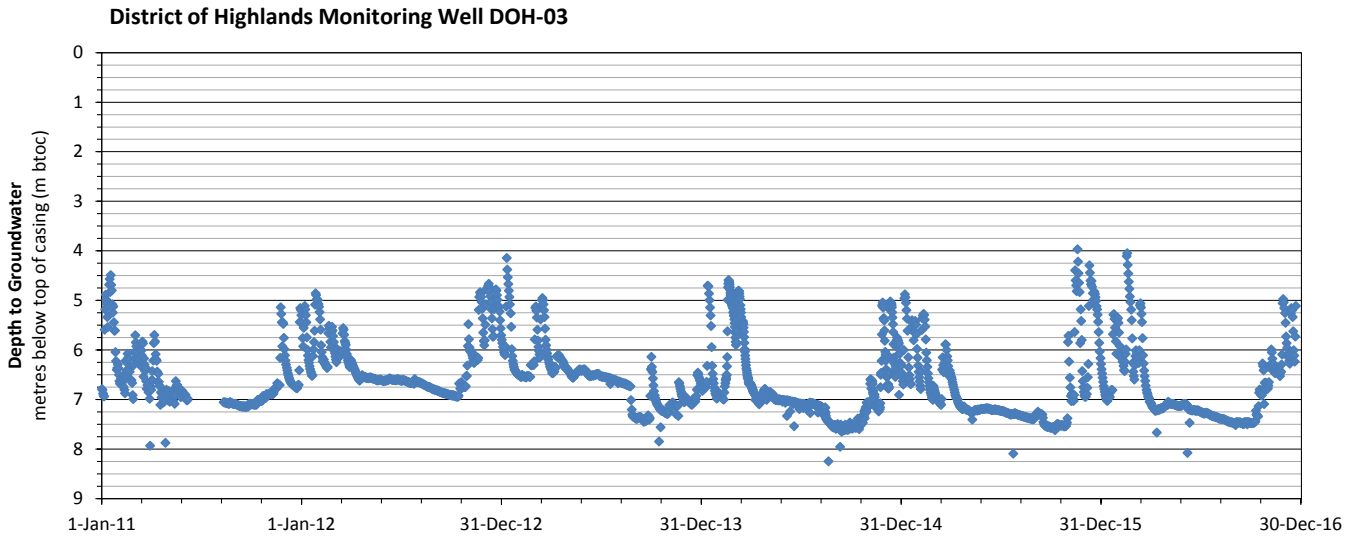

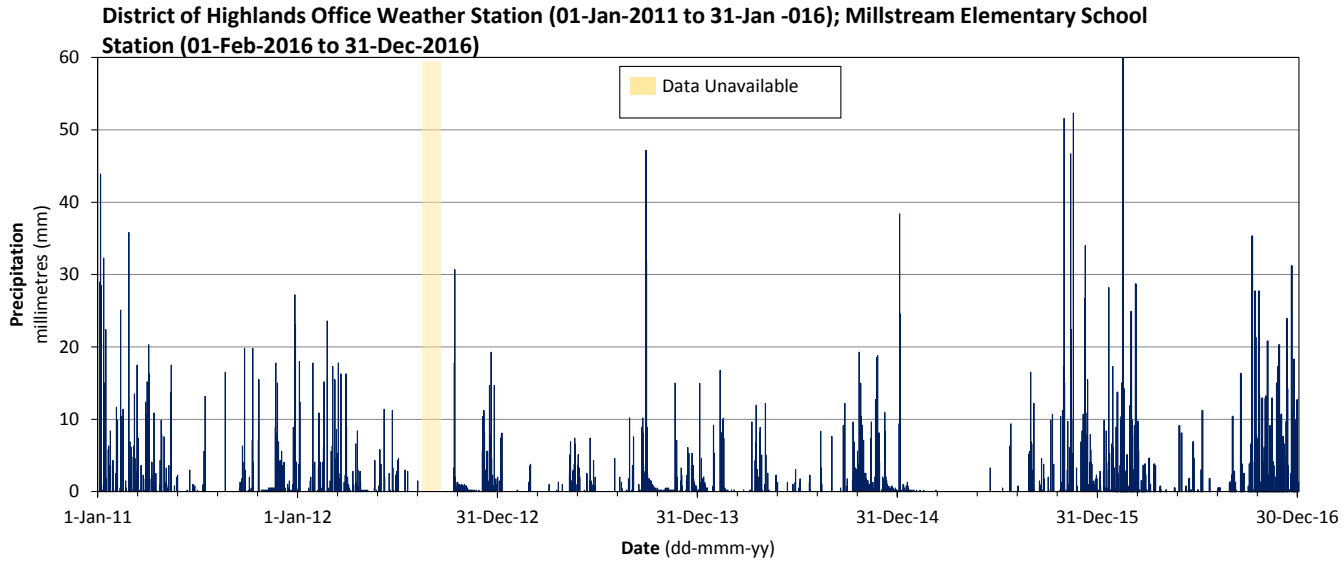

Notes

Water level data collected under the District of Highlands Groundwater Monitoring Program.

Precipitation data obtained online from the University of Victoria School-Based Weather Station Network.
http://www.victoriaweather.ca/

PROJECT
DISTRICT OF HIGHLANDS
2016 GROUNDWATER MONITORING PROGRAM
HIGHLANDS, BC

TITLE
DEPTH TO GROUNDWATER MONITORING WELL DOH-03 AND PRECIPITATION IN SOUTHERN HIGHLANDS

GOLDER

PROJECT No. 1658853			FILE No. ----	
DESIGN	CB	14NOV06	SCALE NTS	REV.
CADD	CB	15JAN16	**FIGURE 4**	
CHECK	MAB	23APR18		
REVIEW	JPS	23APR18		

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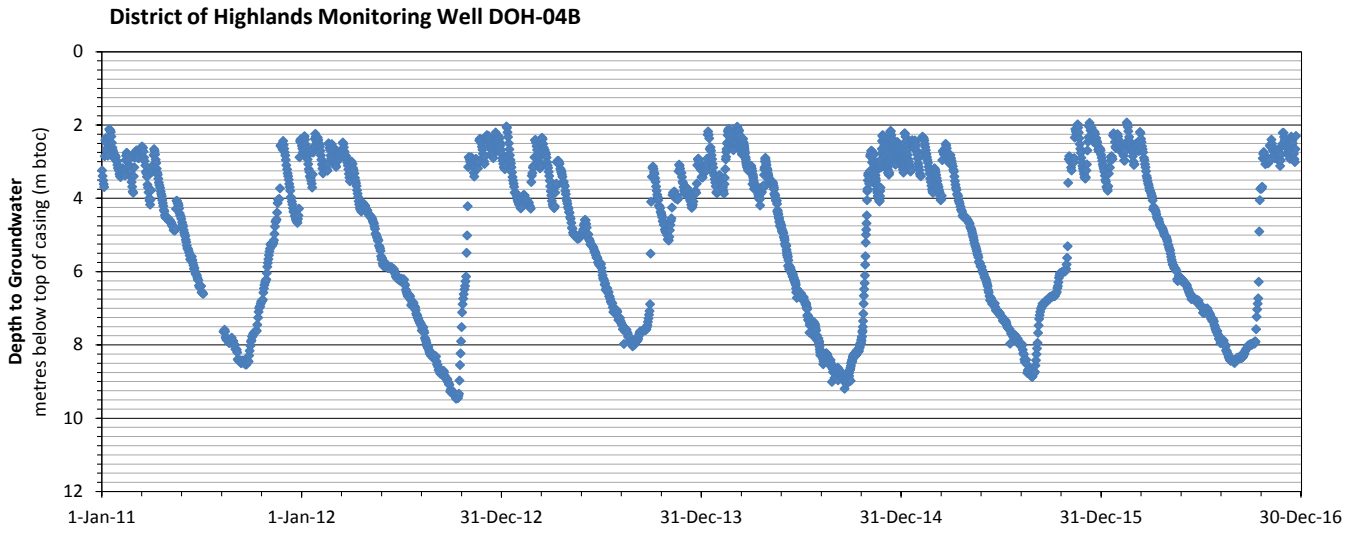

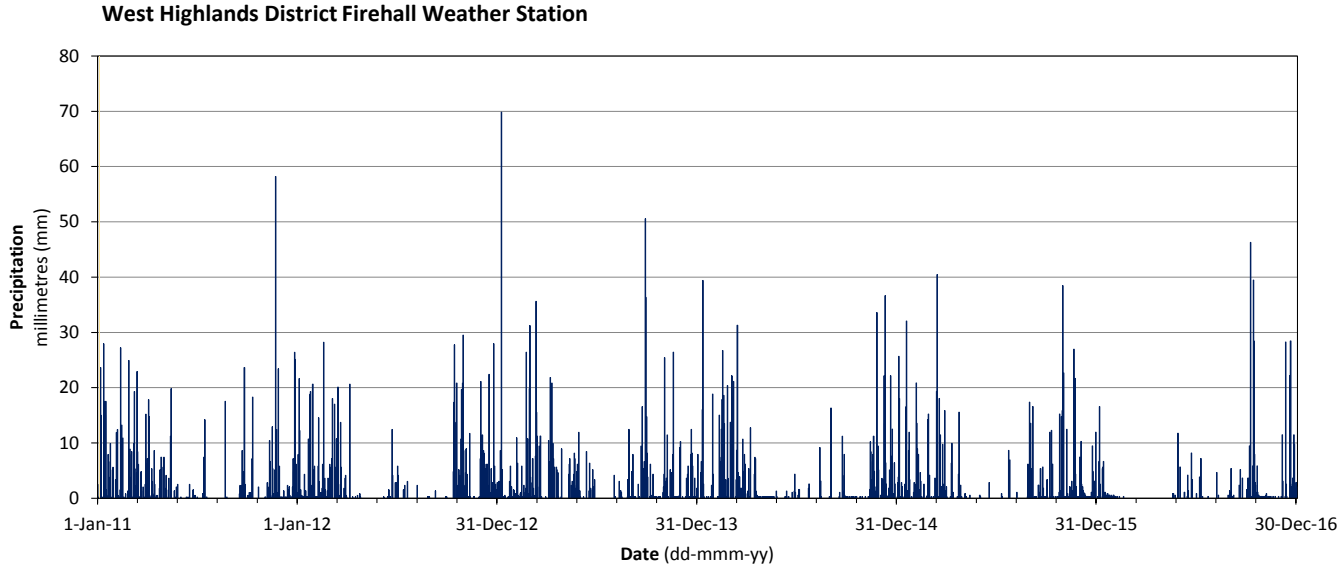

Notes

Water level data collected under the District of Highlands Groundwater Monitoring Program.

Precipitation data obtained online from the University of Victoria School-Based Weather Station Network.
http://www.victoriaweather.ca/

PROJECT
DISTRICT OF HIGHLANDS
2016 GROUNDWATER MONITORING PROGRAM
HIGHLANDS, BC

TITLE
DEPTH TO GROUNDWATER MONITORING WELL DOH-04B AND PRECIPITATION IN WESTERN HIGHLANDS

GOLDER

PROJECT No. 1658853			FILE No. ----	
DESIGN	CB	14NOV06	SCALE NTS	REV.
CADD	CB	15JAN16	**FIGURE 5**	
CHECK	MAB	23APR18		
REVIEW	JPS	23APR18		

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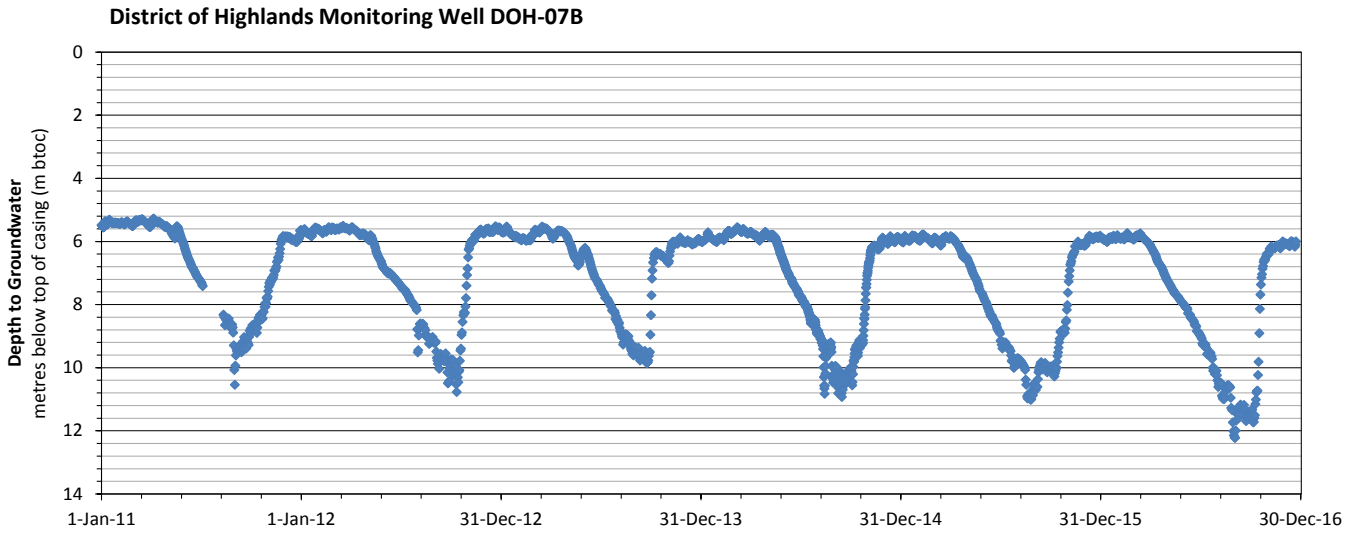

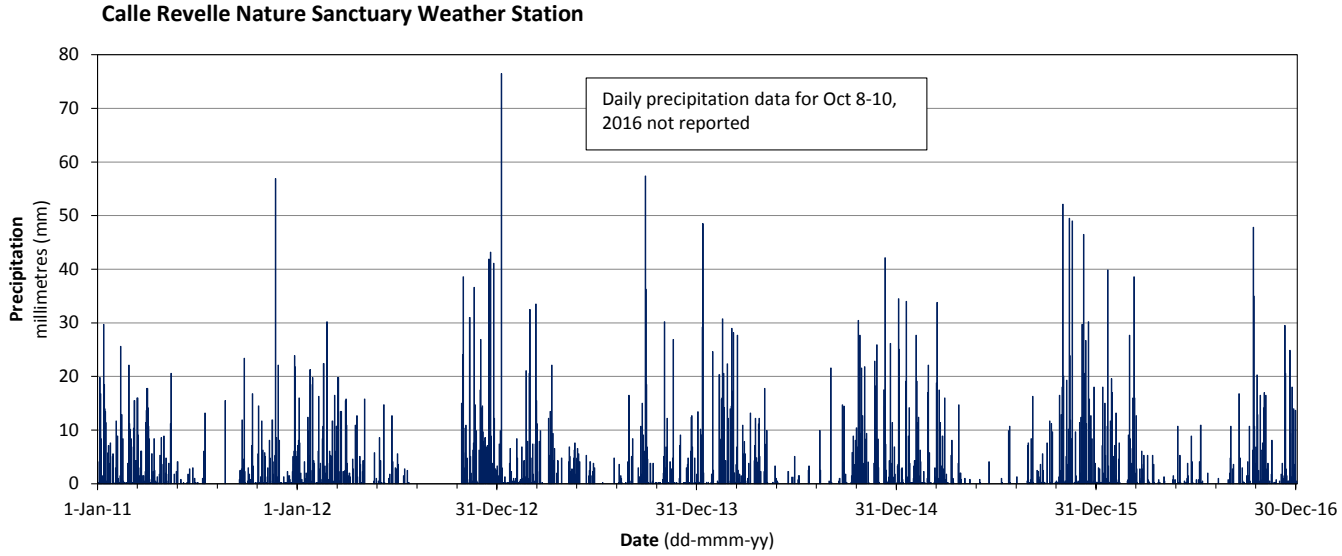

Notes

Water level data collected under the District of Highlands Groundwater Monitoring Program.

Precipitation data obtained online from the University of Victoria School-Based Weather Station Network.
http://www.victoriaweather.ca/

PROJECT
DISTRICT OF HIGHLANDS
2016 GROUNDWATER MONITORING PROGRAM
HIGHLANDS, BC

TITLE
DEPTH TO GROUNDWATER MONITORING WELL DOH-07B AND PRECIPITATION IN NORTHERN HIGHLANDS

GOLDER

PROJECT No. 1658853			FILE No. ----	
DESIGN	CB	14NOV06	SCALE NTS	REV.
CADD	CB	15JAN16		
CHECK	MAB	23APR18	**FIGURE 6**	
REVIEW	JPS	23APR18		

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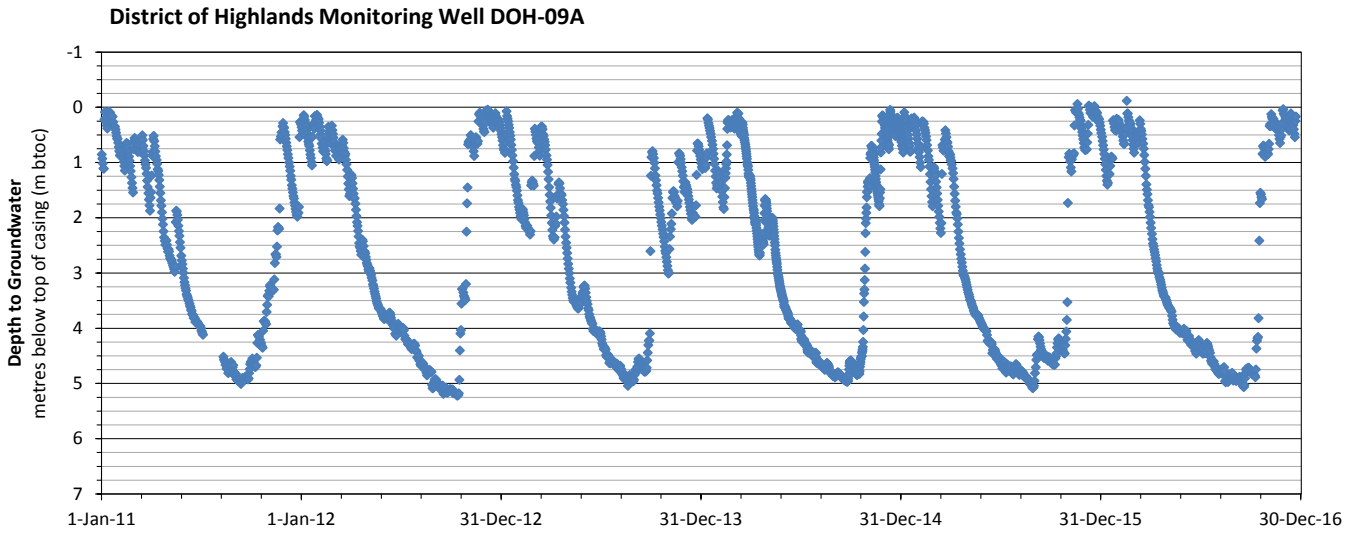

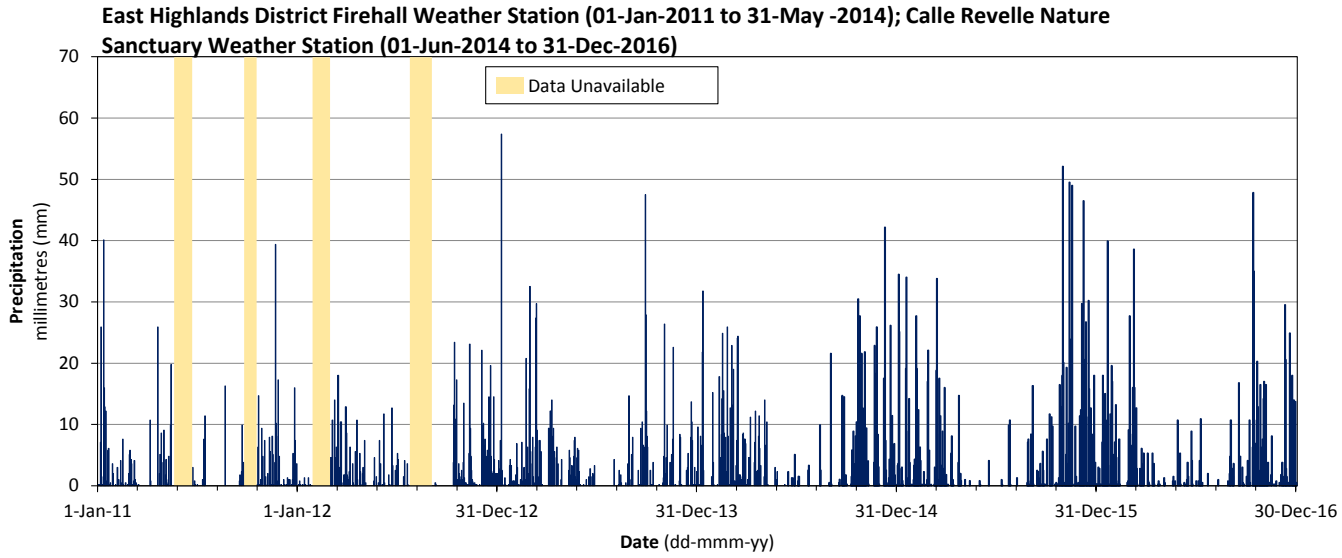

Notes

Water level data collected under the District of Highlands Groundwater Monitoring Program.

Precipitation data obtained online from the University of Victoria School-Based Weather Station Network.
http://www.victoriaweather.ca/

PROJECT
DISTRICT OF HIGHLANDS
2016 GROUNDWATER MONITORING PROGRAM
HIGHLANDS, BC

TITLE
DEPTH TO GROUNDWATER MONITORING WELL DOH-09A AND PRECIPITATION IN EASTERN HIGHLANDS

GOLDER

PROJECT No. 1658853			FILE No. ----	
DESIGN	CB	14NOV06	SCALE NTS	REV.
CADD	CB	15JAN16	**FIGURE 7**	
CHECK	MAB	23APR18		
REVIEW	JPS	23APR18		

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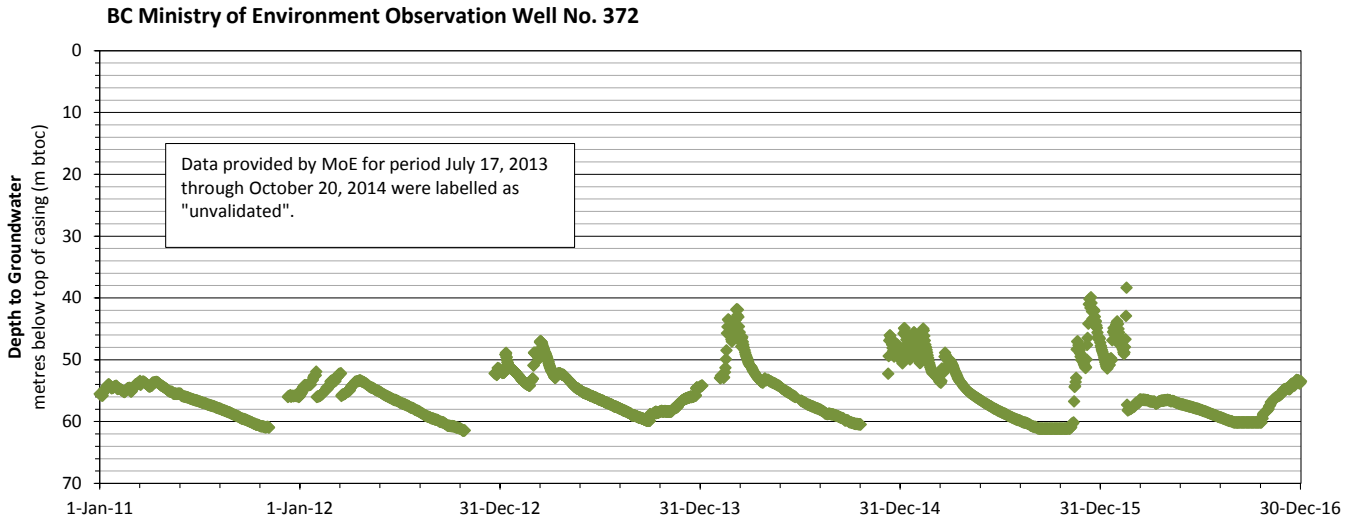

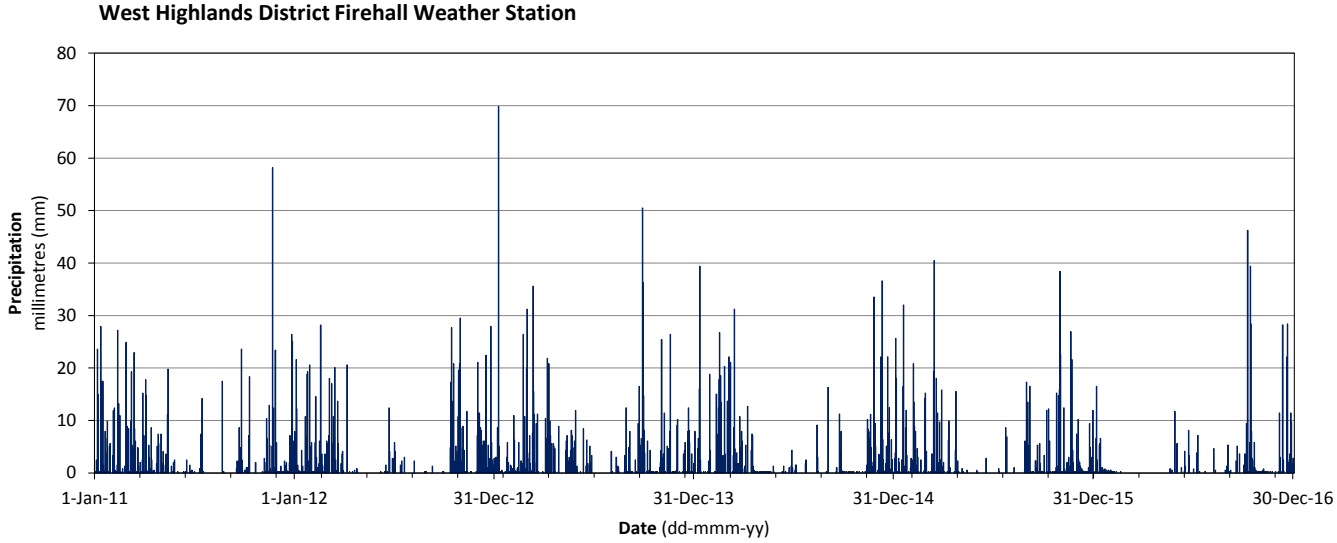

Notes

Water level data obtained online from the Ministry of Environment British Columbia Groundwater Observation Network.
http://www.env.gov.bc.ca/wsd/data_searches/obswell/map/obsWells.html

Precipitation data obtained online from the University of Victoria School-Based Weather Station Network.
http://www.victoriaweather.ca/

PROJECT
DISTRICT OF HIGHLANDS
2016 GROUNDWATER MONITORING PROGRAM
HIGHLANDS, BC

TITLE
DEPTH TO GROUNDWATER
MOE OBSERVATION WELL 372 AND
PRECIPITATION IN WESTERN HIGHLANDS

GOLDER

PROJECT No. 1658853			FILE No. ----	
DESIGN	CB	14NOV06	SCALE NTS	REV.
CADD	CB	15JAN16	**FIGURE 8**	
CHECK	MAB	23APR18		
REVIEW	JPS	23APR18		

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