

June 13, 2022

WWAL Project: 17-049-02

Nodding Hill Developments Ltd.
c/o Mr. Josh Galloway
7601 McLennan Road
Vernon, BC
V1B 3S7

**Re: Update on Long-Term Water Level Monitoring - Nodding Hill Residential Development
Phase 2 Groundwater Assessment, Regional District of North Okanagan, near Vernon, B.C**

This letter is to provide a supplemental update to the long-term groundwater level monitoring program at the Nodding Hill Development site.

In 2017 Western Water Associates Ltd. (WWAL) completed a preliminary hydrogeological assessment of the proposed Nodding Hill residential development, located in Electoral Area “C” of the Regional District of North Okanagan (WWAL 2017). Our work in 2017 included the testing of three wells on the property, analysis of the data collected and water quality sampling.

In 2020, we conducted an expanded and more extensive hydrogeological assessment at the property, as reported on in our October 2021 report (WWAL 2021). The work included installation of five water level transducers in wells at the site to monitor groundwater levels, completion of five 72-hour constant rate tests with monitoring of onsite and offsite wells, and water quality sampling. Our 2021 report included water level monitoring data up to September 2021. Since that time, water levels have continued to be monitored.

WATER LEVEL MONITORING RESULTS

Figure 1 (attached) presents the long-term hydrographs for the five wells on the property outfitted with transducers, for the observation period of September 2020 when the transducers were installed to May 2022 when data was most recently retrieved. This graph is an extension of the data provided in Figures 5 and 5a in WWAL (2021). The data show that as of May 2022, water levels in all five wells have recovered to beyond the initial water levels in September 2020 when monitoring began. Water level increases ranging between 3 to 6 metres are evident in the past year of monitoring.

It is worth noting that the groundwater level observation period to date has been conducted during a period where annual precipitation has been substantially below the most recently published climate normal for the Vernon area (Vernon North Climate Station 1981 to 2010; Environment Canada 2022). Late June-early July 2021 was marked by the “heat dome” weather event in BC, and the summer of 2021 was considered an extreme drought by both Provincial and Federal agencies. Figure 2 (attached) shows actual monthly precipitation measured at the Vernon Auto climate station (Climate Station ID 1128582) and monthly climate normal data from the Vernon North climate station (Climate Station ID 1128583). Also illustrated on Figure 2 is the cumulative deviation from

climate normal precipitation (i.e. a running sum of the difference between the climate normal and actual precipitation received) beginning in January 2019 through April 2022. The data indicate that there has been a significant precipitation deficit in the Vernon area over this 40 month period totaling 368.8 mm. To put that in context, the 1981 – 2010 annual climate normal average annual precipitation at the Vernon North station is 487 mm.

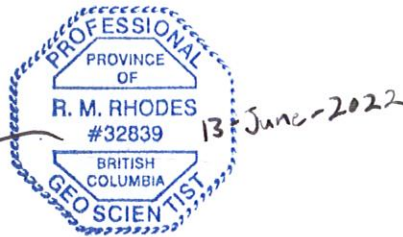
Observed recovery during a period of such a significant precipitation deficit demonstrates that Aquifer 351 beneath the Nodding Hill Site is capable of receiving recharge in spite of prolonged drought conditions and is a positive sign as it relates to aquifer recharge and groundwater availability for the proposed project.

CLOSURE

The ongoing water level monitoring at Nodding Hill supports the conclusions of our October 2021 report. Well testing at that time confirmed wells at the property meet the RDNO Subdivision Servicing Bylaw requirements for quantity and quality. Ongoing monitoring demonstrates that the local aquifer receives recharge even during a period of abnormally dry weather (2021) and longer-term below average precipitation. It continues to be our opinion that sufficient groundwater resources exist to support rezoning of the property. We continue to recommend a phased approach to development, beginning with 10 lots in the northern part of the property. A decision to proceed with additional phases of development would be based on the results of continued groundwater level monitoring.

WESTERN WATER ASSOCIATES LTD.


Ryan Rhodes, P. Geo
Hydrogeologist



Attachments:

Figures 1, 2 and 4

REFERENCES

Environment Canada, 2021. Climate Normals 1981-2010. Available online at

http://climate.weather.gc.ca/climate_normals/index_e.html#1981

Western Water Associates Ltd. (WWAL) 2017. Groundwater Assessment in Support of Rezoning Application, Nodding Hill Development, McLennan Road, near Vernon, B.C. September 27, 2017.

Western Water Associates Ltd. (WWAL) 2021. Nodding Hill Residential Development Phase 2 Groundwater Assessment. October 25, 2021.

Figure 1: Nodding Hill Long Term Water Levels (Sept. 2020 through May 2022)

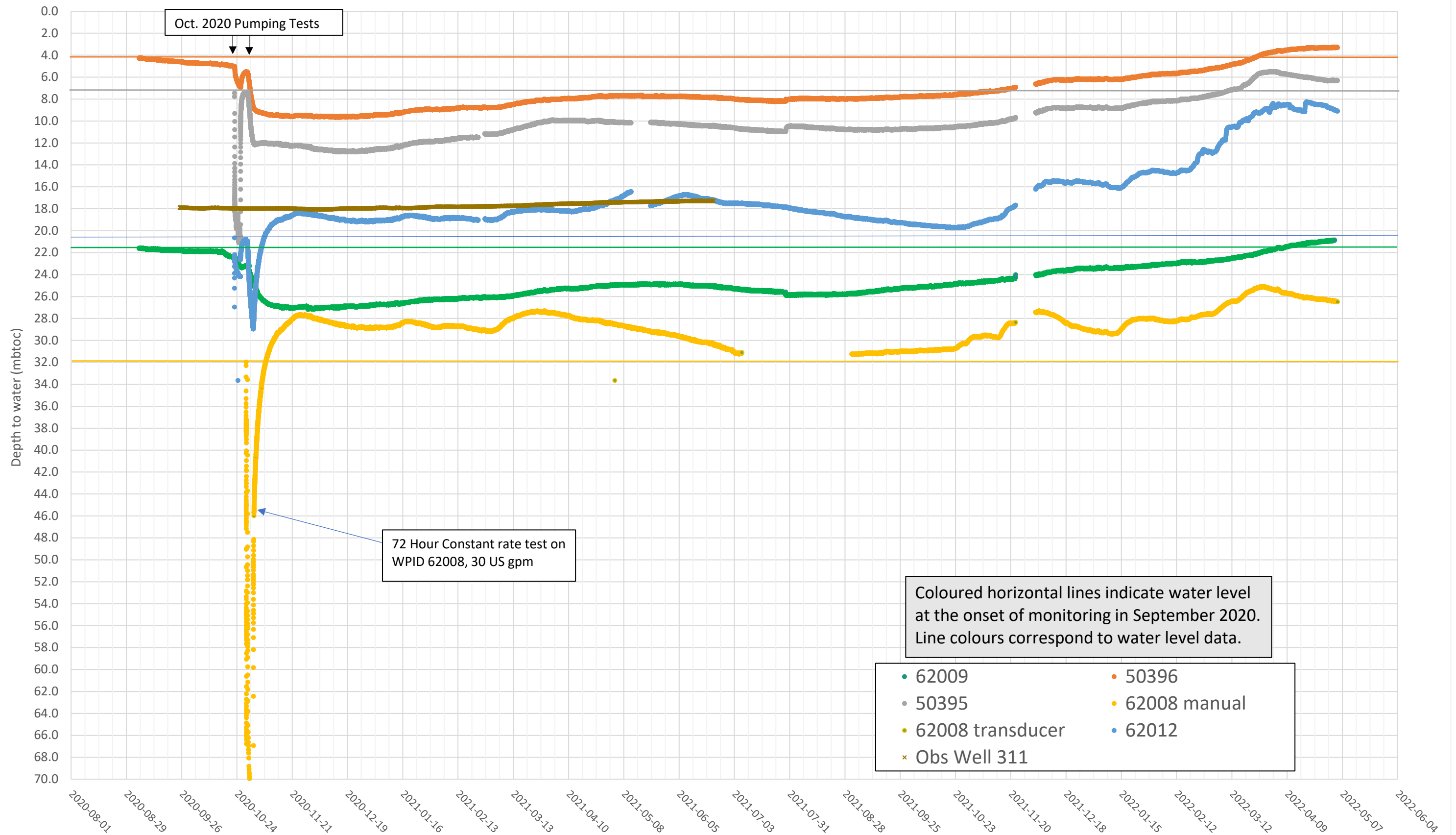
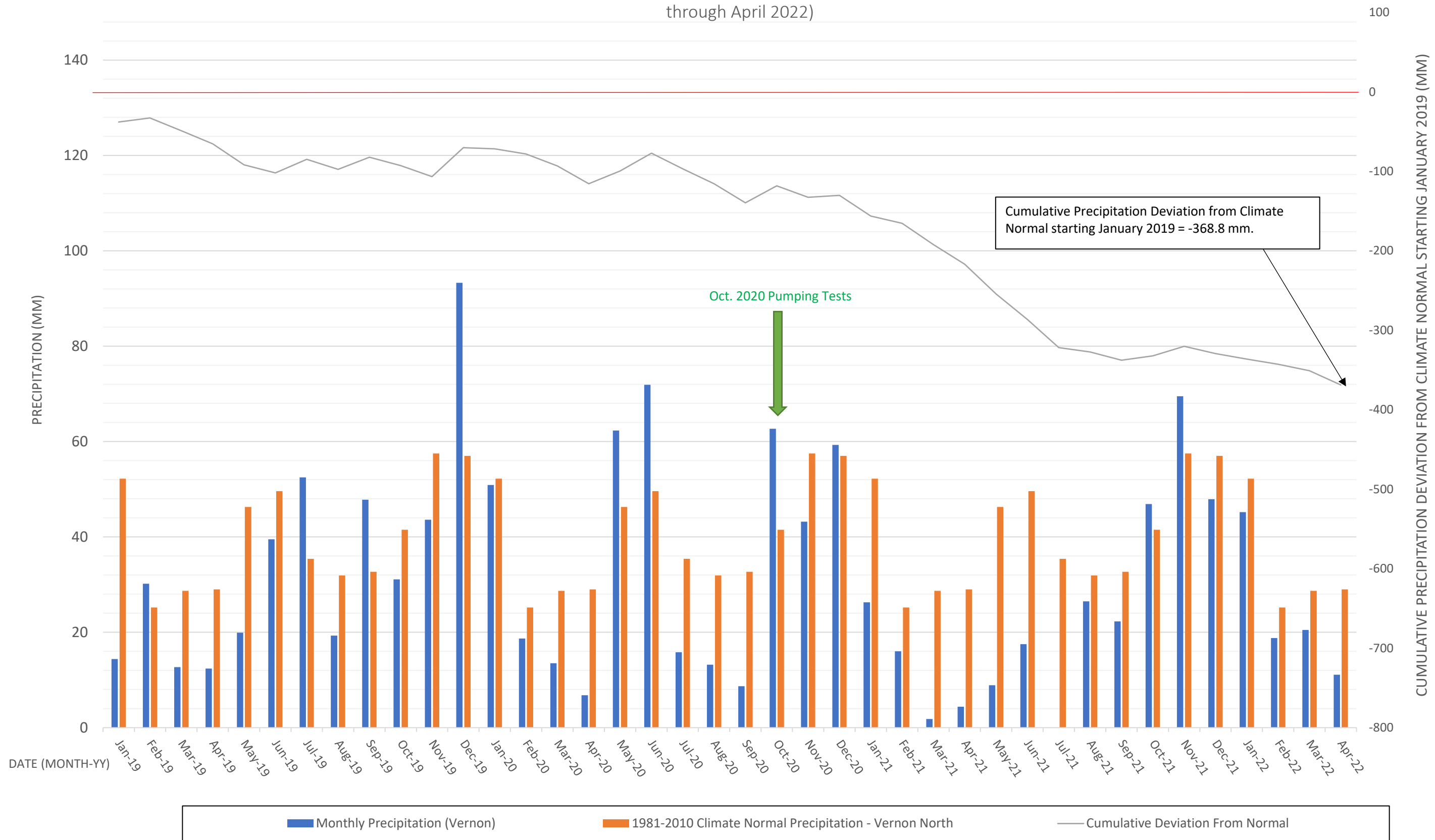
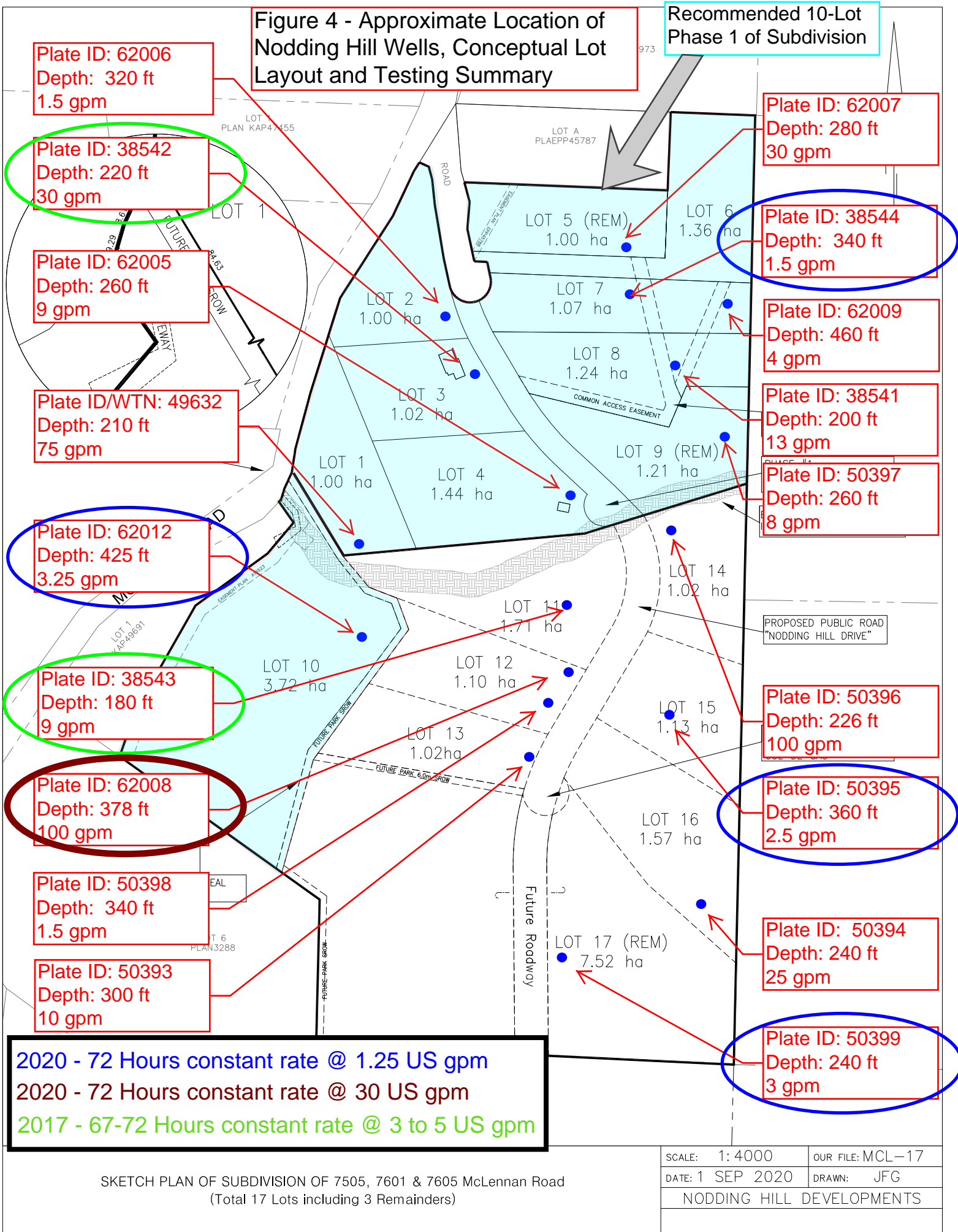


Figure 2: Actual Precipitation in Vernon Compared to 1981 - 2010 Climate Normals and Cumulative Precipitation Deviation from Climate Normal (Jan. 2019 through April 2022)



**Figure 4 - Approximate Location of
Nodding Hill Wells, Conceptual Lot
Layout and Testing Summary**

**Recommended 10-Lot
Phase 1 of Subdivision**



2020 - 72 Hours constant rate @ 1.25 US gpm
2020 - 72 Hours constant rate @ 30 US gpm
2017 - 67-72 Hours constant rate @ 3 to 5 US gpm

SKETCH PLAN OF SUBDIVISION OF 7505, 7601 & 7605 McLennan Road
 (Total 17 Lots including 3 Remainders)

SCALE: 1:4000
 DATE: 1 SEP 2020
 OUR FILE: MCL-17
 DRAWN: JFG
 NODDING HILL DEVELOPMENTS