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July 6, 2021 213-8451

Mr. Bryon Keene, P.Eng.
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Peer Review of a Hydrogeological Assessment for a Proposed Development on Part of Lots 64 and 65, 1041 County Road 7, Concession Bayside, Prince Edward County Ontario Prince Edward County

Dear Bryon,

As requested, Greer Galloway has reviewed the report titled: Hydrogeological Assessment Proposed Development Part of Lots 64 and 65, 1041 County Road 7, Concession Bayside, Prince Edward County Ontario. This report was completed on February 4, 2020 by BluMetric Environmental Inc. of Kingston, Ontario in support of a proposed development consisting of eight lots on approximately 12.53 hectares of land fronting on the Bay of Quinte and accessed from County Road 7 to the south.

The scope of the assessment was based on Ministry of Environment Conservation and Parks guidelines D-5-4 (Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment) and D-5-5 (Technical Guideline for Private Wells: Water Supply Assessment). The work included the construction of eight wells (with four of these used for testing) and 16 shallow test pits to assess soil conditions.

Water availability was assessed through pumping tests on five wells (three dug and two drilled). The testing was for a duration of 6-hours for each tested well except for the dug well TW-5 for which the test was terminated after 3-hours due to excessive drawdown and turbidity. Based on the results of the testing, the Consultant determined that four of the test wells (two dug and two drilled) provided adequate quantities of water, while one dug well (TW5) did not. Another four drilled wells were attempted with three of these failing due to flowing sand conditions and the fourth because of saline waters encountered at approximately 25 m depth.

Water quality was assessed through sampling of each of the test wells for commonly tested chemical, physical, and bacteriological parameters as per Guideline D-5-5. No E. coli bacteria were detected in any of the samples, but levels of total coliform bacteria were detected in several of the samples including 19 cfu in TW-2. Following re-chlorination and retesting, a non-detect result was obtained for this location. Elevated turbidity was encountered in TW-1 while elevated levels of iron, manganese, hardness and DOC were also present. The Consultant concluded that the water quality (after re-testing of TW-2) was acceptable with respect to microbiological quality while the parameters exceeding aesthetic criteria are treatable. Treatment systems for the disinfection of raw water were also recommended by the Consultant who noted that the dug wells are

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acting as shore wells and will likely be vulnerable to bacteriological contamination.

The Consultant detected a small drawdown in observation wells that could be attributed to pumping in the test wells but concluded that the magnitude was small and that well interference was unlikely to occur due to the large lot sizes and low overall development density.

The suitability of the site for private septic systems was assessed through the results of the test pitting and three grain size distribution analyses along with nitrate loading calculations performed in general accordance with Guideline D-5-4. The Consultant concluded that the soils are suitable for the construction of conventional in-ground Class 4 systems and that the lots are sufficiently large to meet Ontario Building Code setbacks and to attenuate nitrate in groundwater to below 10 mg/L at the property boundary.

Finally, the Consultant noted that municipal services are not currently available in the area and that given the low development density in the area municipal services will not be available for the foreseeable future. For these reasons the Consultant concludes that servicing on individual wells and septic systems is a viable option for the property.

A peer review must consider the following:

1. the purpose of the study/document being reviewed;
2. whether the scope of the work was consistent with the County's requirements and adequate to fulfill its purpose; and,
3. whether the analyses and conclusions are consistent with sound engineering judgement.

Based on our review, we consider the scope adequate to meet the purpose of the assessment (to determine whether there is a likelihood that the proposed development can be serviced using individual wells and septic systems without causing adverse effects to neighbouring properties) and consistent with published guidance from the Province and County. In general, the conclusions reached by the consultant follow logically from the scope and are consistent with sound engineering judgement. However, there are several areas where the assessment methodology needs clarification and there remain technical questions that should be answered prior to draft plan approval of the proposed development. These are provided below (in no particular order):

1) The reviewer agrees with the Consultants conclusion that the proposed development meets the criteria established in Guideline D-5-4 but the Consultant's nitrate loading mass balance calculation does not conform to guidance in D-5-4 or the MECP Sewage System Design Guidelines (2008). Specifically, the daily sewage flows are considerably higher than recommended in D-5-4 (3,450 vs 1,000) and the nitrate concentration is lower (20 mg/L vs. 40 mg/L). In addition, we are unable to find the source references for these values (referenced as "Assessing the Potential for Groundwater Impact, MOE July 1992"). We also consider the estimated infiltration rate to be on the high side and suggest that the value of 250 mm/a be used unless the site conditions are exceptional enough to warrant deviation.

   It is understood that the nitrate loading mass balance described in D-5-4 is mathematically flawed but the results may be used as a surrogate for more relevant contaminants (such as bacteria from septic system effluent)

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and may serve to flag proposals that require closer examination with respect to groundwater impacts from septic system discharge. The reviewer requests that the consultant provide a revised D-5-4 mass balance calculation consistent with the relevant guidance: Q=1,000 L/day/lot, C=40 mg/L, and R=250 mm/a. The entire lot area may be used.

2) With regard to the variability in transmissivity (e.g., TW-5), the shallowness of the dug wells, and the challenges in finding adequate water at this site and in the County in general, we ask that the Consultant consider and comment on whether wells should be constructed and tested for each lot and reviewed by a Qualified Person following Draft Plan Approval but before final approval is granted.

3) With respect to the proposed location of water supply wells downgradient from the septic systems, the intrinsically greater susceptibility of shallow dug wells to bacterial contamination relative to deeper drilled wells, and the acceptable well yield and water quality obtained for the two drilled wells tested (TW-2 and TW4), we ask that the consultant consider and comment on whether the preferred well construction should be drilled wells located up-gradient from septic systems. This decision involves a trade-off between the greater difficulty and lower yield likely to be obtained from drilled wells vs. the greater safety of the water supply. We acknowledge that the Consultant encountered considerable difficulty in constructing drilled wells at the site but there are drilling techniques that can deal with flowing sands.

4) With respect to the possible location of water supply wells downgradient from the septic systems, we ask that the consultant consider and comment on whether tertiary treatment of septic system effluent should be a requirement for the development. Additionally, the Consultant should consider and comment on whether setback distances should be larger than the minimum setbacks in the Ontario Building Code (e.g., 50 m separation between septic system and dug well vs. 30 m).

5) The Consultant should add a qualifying statement that depending on the specific location of the septic systems, soil and/or groundwater conditions might require the use of raised systems.

6) The hydraulic testing was performed in November and December which is outside the seasonal water table lows typically seen from August to October. As a result, the indicated yield of the tested wells is likely to be lower during the dry summer months than during the test period (although the wells extend below lake level which will limit the magnitude of any seasonal fluctuations in groundwater elevation). We ask that the Consultant consider and comment on the susceptibility of the tested wells to seasonal yield declines and whether confirmatory yield testing should be performed during the summer months.

7) The Consultant recommends that all water supply systems include disinfection and pre-disinfection filtration. The reviewer agrees and would recommend that water treatment equivalent to that required for surface water (e.g., particulate filtration, absolute filtration to less than 1 micron, and ultraviolet sterilization) and be made a requirement for any Building Permits issued for this development.

8) The permission to monitor letters (Appendix A) should be removed from the report or redacted to remove names and emails etc. to comply with privacy guidance. Such written permission may be retained by the consultant but the statement of a professional geoscientist or engineer that permission had been granted (or denied) is sufficient for the technical report.

In summary, the hydrogeological assessment report was adequately scoped and sufficient to support approval of the proposed development (from a water supply and sewage treatment perspective) conditional on the resolution of the points raised in this review.

If you have any questions or points that require clarification, please contact me at your convenience.

Yours very truly,

THE GREER GALLOWAY GROUP
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Charles Mitz, M.Eng., Ph.D., P.Geo.
Senior Project Manager

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