BREM 152-01.14.2015

GeoHydroCycle, Inc.

Hazardous Waste
Water Supply

Assessment
Remediation
Analyses
Permitting
Modeling
Software

January 14, 2015

Mr. Steven Ventresca, P.E.
Nitsch Engineering
2 Center Plaza, Suite 430
Boston, MA 02108

re: Comments and Recommendations for The Birches
100 Long Ridge Road
Carlisle, MA
GHC #14015

Dear Mr. Ventresca:

GeoHydroCycle, Inc. (GHC) provides the following recommendations and comments for the proposed The Birches (Birches) development located at 100 Long Ridge Road (the Site).

My comments and recommendations are based on a review of documents outlined in previous GHC comment letters and the recent Deschenes & Farrell, P.C. (D&F) letter dated January 9, 2015.

GHC's Comments and Recommendations

Because wastewater is discharged to the surficial aquifer (overburden soils) and drinking water is obtained from the bedrock aquifer, a detailed understanding of both aquifers is required to produce any predictions of future groundwater conditions that would be used to design groundwater protection options.

The following table presents a comparison of Exhibit A from the D&F letter with GHC's 12/30/14 comments and recommendations.

EXHIBIT A	Meeting GHC 12/30/14 Comments & Recommendations
I. Data Generation and Testing:	
• Well Drilling: Install a series of groundwater monitoring wells using a hollow stem auger drilling rig. Soil samples will be taken every 5 feet.	Helps meet recommendations for overburden aquifer. Provides data for groundwater hydraulic parameters, flow direction, and basis for seasonal high groundwater in the overburden.
• Water Level Gauging: Install a series of wooden stakes in the nearby wetlands on subject property to act as water gauges.	Helps meet recommendations for overburden aquifer. Provides information on how the overburden aquifer interacts with surface waters.
• Surface Contours: Use GIS mapping and other mapping with site information	Helps meet recommendations for overburden aquifer. Establishes

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Newton, Massachusetts
02458

(617) 527-8074 (v)
(617) 527-8668 (f)

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EXHIBIT A	Meeting GHC 12/30/14 Comments & Recommendations
to develop a surface contour map and locate existing wells within 500 feet of septic systems.	groundwater flow direction and rate in the overburden aquifer.
• Soils: Obtain and analyze past soil testing on site for septic systems and for sampling for this study done by NGI in November, 2014. Amend the soils information with the soil sampling done above.	Helps meet recommendation to evaluate soils for Title 5.
• Pump Testing: Perform a pump test on each monitoring well pair by pumping water in one well and measuring the water level drawdown in the adjacent well or perform a rising head/falling head permeability and/or hydraulic loading test.	Helps meet recommendations for overburden aquifer. Provides values of hydraulic properties for the overburden aquifer.
II. Modeling and Analysis:	
• Develop a pre and post development groundwater contour map.	Helps meet recommendations for overburden aquifer. Provides flow direction and rate in overburden. Post development mapping should be based on digital model results.
• Determine groundwater flow direction and hydraulic gradients across the site and surrounding areas.	Unclear - is this item a repeat of the pre and post development of groundwater contour mapping or does it refer to bedrock contours?
• Determine saturated thickness at the site.	Unclear - part of the Pump Testing item or is this bedrock testing?
• Determine aquifer permeability.	Unclear - part of the Pump Testing item or is this bedrock testing?
• Perform a mass-balance nitrogen loading model to estimate the post development nitrogen concentration in the groundwater with Title 5 determined loading rates for various scenarios.	Helps meet recommendations for determining site nitrate loading.
• Develop an analytical solute transport model to estimate nitrate plume extent and magnitude.	Does not include effects of natural groundwater flow, well pumping or wastewater discharge. GHC recommends using a single digital model to evaluate impacts. A single model could take into account natural groundwater flow, the effects of well pumping, and the effects of wastewater discharge.
• Determine the groundwater mound	Helps meet recommendations for

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under each of three septic systems using Title 5 determined loading rates and in-situ data developed per above and assuming pressure distributed flow to the leaching area.	overburden aquifer. Wastewater discharge from abutters should also be included in the modeling.

Based on the proposed hydrogeologic work for The Birches (Exhibit A), assessment and analysis of the bedrock aquifer was not included. Three of GHC's 12/30/14 recommendations were not met:

1. Conduct a 48-hour pump test of the proposed Birches wells,
2. Based on the results of the surficial aquifer investigation, the pump test and the abutter well testing, a groundwater impact model should be developed to predict how the proposed Birches wells will impact each other and abutter's wells. The model should include: drawdowns from the Birches and abutter wells; groundwater mounding from the proposed three leach fields and abutter leach fields; and a groundwater plume analysis to show how nitrate plumes will develop downgradient of the three proposed leach fields.
3. Based on the results of the groundwater modeling showing the predicted shape of the water table under build-out of the Birches, a 5-year groundwater monitoring plan should be developed showing the location of monitoring wells and the types and frequency of analyses of well water samples.

In addition, no mention of the testing of the abutters wells was included. This testing was previously proposed by Joel Frisch, Mr. Brem's hydrogeologist.

A complete understanding of the overburden and bedrock aquifers is necessary to be able to predict whether adverse impacts from the proposed pumping and wastewater discharge will occur to the Birches or abutter wells.

If you have any questions, please call me.

Sincerely,
GeoHydroCycle, Inc.

Stephen W. Smith, P.E., P.HGW.

GHC Comments 1-13-15.lwp

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