Permit Receipt Centre
Natural Resources Wales
Cambria House
29 Newport Road
Cardiff
CF24 0TP

Your Ref: PPN-012047

2nd December 2020

Black Rock Farm – abstraction licence application

Dear Sarah,

Following your letter of November 25th advising of an invalid licence application, please find attached a revised copy of the Hydrogeological Impact Assessment (v4.2). The revised report addresses and incorporates the queries and comments of your letter. For further clarity I have outlined the responses to your points below.

- **Re-injection borehole (RIBH).** The system does indeed need to be pressurised to pump the abstracted water back into the RIBH. I have added an extra chart (Figure 10), that shows the response within the RIBH during the re-injection phase of testing (Test 1). The equivalent water level within the RIBH showed an increase of 38.4 metres, the level stabilising after 36 hours of injection. On cessation of injection, water levels within the borehole recovered to within 5% within 95 minutes.
- **Water Quality.** No water quality samples were taken during the period of investigation. A representative sample was taken from the abstraction borehole after construction in 2018. The analysis is presented in Section 4.2 of the report; parameters tested are all within the UK limit (drinking water standards).
- **Groundwater Temperature.** Groundwater temperature within the RIBH was monitored throughout the investigation, data are presented in Section 5.5. During the injection phase (Test 1), the temperature within the RIBH fluctuated between 10.3 and 10.9°C, with occasional spikes to 12.4°C.
- **Robinwood Borehole.** Since submitting the application, a colleague has provided me with an additional manual dip, taken on June 12th, prior to the start of testing. The dip (27.95 m below datum) is within the range seen during recovery after Test 2; thus, although at the end of Test 2 the water level didn't recover to the that seen immediately prior to the test, recovery levels were within the background range. The borehole is used solely to top up water within a large pond on the site. Whilst the Activity Centre was closed over the monitoring period, the borehole was operational, intermittently pumping small volumes of

water. Please note, on subsequent re-evaluation of the data the drawdown in the Robinwood borehole has been amended to 0.27 m (Test 1) and 0.44 m (Test 2), apologies for any confusion.

- **Abstraction Volumes/Heat Calculations.** The Bavenhill document stating a maximum flow requirement of 50 cubic metres an hour assumes the water flowing through would be chilled by 4.45 degrees to provide the peak output of 360 kW (max from the 6no heat pumps). The pump installed can only achieve 30 cubic metres an hour to sustain the peak of 360 kW. In practice, the system will run at a lower flow rate with a larger temperature difference (delta T). When, for example, the outside temperature is -10 degrees C the heat pumps will chill the water passing through by 7.5 degrees in order to recover the same amount of energy to generate the 360 kW peak. As water temperatures are sufficiently warm coming from the ground the 7.5 degree drop is sustainable and they will not need more water.

I hope this letter and the revised report address the points you raised. If you require any further details or clarification, please contact myself or another member of the team.

Yours sincerely

Jennifer Young

Senior Hydrogeologist