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DEPARTMENT OF
WATER RESOURCES

July 1, 2009

Mr. Jeff Peppersack
Idaho Department of Water Resources
322 East Front Street
P.O. Box 83720
Boise, ID 83720-0098

Re: Water Right Permit 37-8205

Dear Mr. Peppersack:

Thank you for letter of June 24, 2009 regarding the contemplated beneficial uses of geothermal water right permit 37-8205. Your guidance was very helpful and the owner is proceeding with the development substantially as proposed. I reviewed the technical memorandum prepared by Michele Edl and have several comments and clarifications regarding that document.

Snow Melting Use

Snow melting heat load and water requirements were based chiefly on guidance provided in the Geo-Heat Center's design guidance document (Reference 1). This document outlines general design criteria and provides equations to estimate heat loss and water requirements for a hydronic snow melting system. The water requirements are heavily dependent upon the selection of design levels of snowfall rate and temperature, which requires engineering judgment. Certainly, both parameters should be selected such that adequate melting can be achieved with a reasonably high probability, but should not be so extreme that excessive water requirements result. In engineering design, exceedance levels of 80%, 90%, 95%, and 99% are the most common values adopted, varying based on an assessment of the risk of the parameter exceeding these levels. Since the risk in this case is low, a 95% or 99% level is not warranted. I selected a 90% exceedance level for 24-hour snowfall depth and 80% exceedance level for minimum daily temperature. Ms. Edl states that most snowfall does not occur at the coldest air temperatures. This is likely a true statement, but statistical evaluation of the statement would require a complex joint-probability analysis of short-duration temperature and snowfall data. It is doubtful whether such an analysis would be warranted for this engineering design.

The resulting heat load requirement for snow melting is 214.5 Btu/hr/ft². Based on typical values provided in Reference 1 for certain cities, this value is

in line with Class II system heat output in cold-climate locations, but higher than Class I output. The reference attached to Ms. Edl's memo regarding the feasibility study for the City of Ketchum indicates that 146 Btu/hr/ft² is required to keep an area snow-free 99% of the time, and 62 Btu/hr/ft² is necessary to "melt snow after a certain period of time after accumulating," based on Boise, Idaho weather data. I do not believe it is appropriate to apply Boise weather data to Ketchum or to the Clarendon site. For example, the average minimum temperature in January is 22°F at Boise versus 8°F at Hailey and 5°F at Ketchum, and the average January snowfall is 6.4 inches at Boise versus 24.0 inches at Hailey and 27.8 inches at Ketchum (data from NWS stations, compiled by WRCC). One factor at Clarendon which will increase the heat load requirement is that the roadways are not hard-surfaced and therefore the radiators must be buried 4" below the gravel surface rather than the recommended 2-3" to prevent exposure of the radiators over time. This fact will likely increase the heat dissipation into the road subbase and reduce the heat output at the roadway surface. In short, the 214.5 Btu/hr/ft² value may be conservative, but does not appear to be unreasonable. I may attempt to evaluate this further in the course of the beneficial use exam.

Regarding the effluent discharge, it is true that the ground surface conditions may preclude complete infiltration of the spent water. If needed to ensure that no consumptive use occurs, the water can be discharged to dry wells.

Recreational Spa Use

The choice of design temperature for the pond heat loss calculations is also a matter of judgment. In previous conversations with Director Tuthill, his opinion was requested as to an appropriate design level. He felt that a minimum daily temperature at some conservative design level was appropriate. However, the argument that an average daily temperature is more appropriate due to the thermal buffering capacity of the pond also has merit. If the average daily temperature is used, the value still should be selected based on a probability analysis to arrive at an 80% exceedance level for average daily temperature. I have not performed this analysis, but the value would likely be about 11°F. The calculation of pond heat loss is relatively insensitive to the temperature. For example, with a pond temperature of 76°F, substituting 11°F for -1.7°F yields a water requirement of 374 gpm instead of 420 gpm, and more than 420 gpm could be justified if the pond temperature was maintained only 3°F higher.

A floating pool cover has never been contemplated for the proposed recreational spa facility. The "cover thickness" parameter in the calculations

was set to zero, so the value of "k" is irrelevant and the suggested revisions by Ms. Edl do not apply.

I am not familiar with the swimming pool heating calculator on engineeringtoolbox.com referenced by Ms. Edl. The Geo-Heat Center's calculation tool is readily available, is applicable to pond heating with direct-use geothermal water, and appears to be based on sound thermodynamic principles.

Based on the above information, I do not believe that any revision to the engineering report is warranted.

It does not appear that permit 37-8205 requires *a priori* justification of the non-consumptive nature of the uses. Condition No. 3 on the permit states, "Use of water under this right shall be non-consumptive. If use is found to be consumptive in the future, the consumption must be replaced or the user of the water must cease diversion until a plan of replacement is implemented." The burden is on the applicant to develop the water in accordance with this condition, and the condition is clear that a determination of consumptiveness would only be made after the use begins to occur (otherwise, how could the user "cease diversion"?). Any consumptive use that the Department deems to occur in the future with this water use will require a mitigation plan of some sort, but it does not appear that a mitigation plan is required to be submitted prior to this determination.

I would request that the Department continue to process the permit amendment application and make a decision whether to approve or deny the amendment.

Cordially,



Charles G. Brockway, P.E.

Cc: Donna Kelsey
Allen Merritt, IDWR-Southern
Hal Anderson, IDWR