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January 21, 2008

Mr. Tom Kintzinger, M.D.
Vice President, Secretary, and Website Administrator, Round Lake Property Owners Association
PO Box 67
Hayward, WI 54843

Re: Review of Hydraulic Design Feasibility Analysis, Little Round Lake Dam

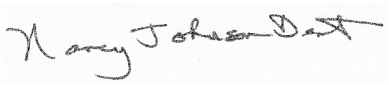
Dear Mr. Kintzinger:

This letter summarizes our review of the *Hydraulic Design Feasibility Analysis (Report), Little Round Lake Dam, SEH, November 2007.* The review was conducted on behalf of the Round Lake Property Owners Association (RLPOA) to define the potential impacts of the proposed structure on the Round Lake water levels. The following pages summarize general comments on the Report and list questions that need to be clarified to finalize the determination of impacts.

In general, the 13xx elevations presented in this summary of our review were obtained from the Report and were assumed to be accurate. Where references are made to local datum, the transfer was made based on information described in *County Highway NN and Round Lake Flood Analysis, January 4,2005,* and *A Study of the Cause of Shoreline Loss at Hausman Property on Round Lake During 2002/2003, January 4, 2005.*

We appreciate the opportunity to work for the RLPOA. Please contact me if you have any questions. I can be reached by phone at 218-529-8224 or by email at ndent@barr.com.

Sincerely yours,



Nancy Johnson Dent, P.E.
Vice President

General comments:

1. The proposed outlet structure raises the low water control higher than the existing control and widens the weir structure by moving it upstream of the bridge. The Report notes that "*Both changes consider the requirement of not raising the previously determined Regional Flood Elevation in Round, Little Round and Osprey Lakes*." The Report also notes in Section 5.1 that "*The proposed design increases the Round Lake elevations as compare to the current condition without boards;…",* and later states "*…12 days of a higher Round and Little Round Lake elevations."* These statements seem to indicate that Round Lake water levels will increase and stay higher for a longer duration during storm events, which is not consistent with other information in the Report.

   The Report focuses on the impacts to the 100-year water levels, but does not address flooding elevations and durations during more frequent events. The Report does not provide information on the peak lake levels under events such as the annual peak, 2-year, 5-year, 10-year, or 25-year peaks. These flood events occur more frequently and could have more long-term impacts to lakeshore owners. A peak water level frequency graph comparing existing and proposed conditions should be provided to show the predicted water levels under various frequency precipitation events. This graph would provide information on the water levels during various frequency events, an indication of how frequently the lake would be high compared to existing water levels.

   The Report also does not provide information on the duration of the 100-year peak flood level under both existing and proposed conditions. A duration frequency graph for the 100-year RFE and other more frequent events (annual peak, 2-year, 5-year, 10-year, or 25-year peaks) should be provided to compare existing and proposed flooding durations.

   Increased duration and/or frequency of flooding can be a concern for vegetation and erosion around the lake. Increased frequency and/or duration of flooding may also be a concern to lakeshore owners due to loss of shoreline property and it could be considered a taking of land (however this is a legal issue and is outside of my area of expertise).

   The Report notes in Section 1.1 that "*…the County has been able to place boards in the dam very infrequently."* Therefore, the requested comparisons should base the existing conditions on current operations (i.e. without boards in the dam) and under various beaver dam configurations since they are not reliable (as noted in Section 1.1 of the Report "*…if the current beaver dams are leaking, fail, or were removed*").

2. The Report provides a summary of the analyses completed to define the impacts of both lowering the CTH NN culverts and replacing the Little Round Lake dam. The lowering of the CTH NN culverts is a separate issue from the replacement of the dam. As noted in the Report *"…the State of Wisconsin administrative rules require that the County Road NN culverts either be lowered…Alternatively, the culverts could be permitted as a dam…"* Therefore, the RFE for comparison of impacts for the proposed structure should be based on the levels after the CTH NN culverts are lowered. As noted in number 4 of the specific comments pages, the impact of the proposed CTH NN culvert replacement is not consistent in the Report and should be revised to clarify.

3. In several places the Report notes that the beaver dams currently control the upstream water levels at elevation 1345 (or about elevation 77 local datum). However, the Report also seems to indicate that the proposed structure is needed at elevation 1345 in case the beaver dams fail.

The Report notes in Section 1.1 that "*The SEH study suggested a structural low flow control would be more reliable than the beaver dam…",* indicating that the Report and study attempts to keep the low water levels up to the elevation of 1345 rather than at the sill of the existing dam (1343.7). In Section 8 the Report states that "*Water surface elevations within the range of 1344.5 feet to 1345.25 on Round and Little Round Lake are generally not of concern as documented by the lack of measurement made at these elevations. Outside of this range the level of concern goes up… The 1941 PSC order indicates a range of 1344.75 to 1345 is desirable. On July 25, the Round Lake Property Owners Association made a formal proposal requesting the County consider an operation range of 1344.15 feet to 1345.65 feet for Round and Little Round Lakes*." The proposed weir structure is 0.25 feet above the State Designated Maximum water level noted in the PSC order of 76.75 for Round Lake. Since the desired water levels extend from 1344.15 to 1345.65, the proposed structure seems to be to keeping the water levels higher than desired by the Round Lake Property Owners during low water conditions. The higher structure elevation may also result in higher flood levels during more frequent events (as noted above).

4. Section 1.1 of the Report states "*It was determined that the boards currently used controlled the water surface on Round Lake for all flows when they are in place at 1345. However, since base flow is required to be passed, the boards must be removed from the current structure when the Little Round Lake elevation is below 1345 feet and the boards prevent base flow in Osprey Creek from being passed...Round Lakes must reach an elevation of over 1345 before boards can be placed.)"* This paragraph seems to indicate that removing the boards from the dam allows base flows out of the system. This is consistent with photos and site visits indicating flows thru the CTH NN culverts and flows through the Round Lake Dam when the boards are removed. However, the Report notes that the downstream beaver dams have a crest of 1345 and Figures 4, 6, 7, and 8 indicate that there is zero flow below 1345. Therefore, the Report does not seem to accurately depict base flows below 1345 with the boards removed.

   The line showing the "Current Conditions at Sill" in Figures 4, 6, 7, and 8 indicate a flow of zero at elevation 1345. The report says the sill is at 1343.7, so the gold line would extend down to 1343.7 at 0 cfs unless there is a downstream control. These figures indicate that the beaver dams are the low water control, allowing zero flow below 1345. Assuming this to be true, the weir and the new structure are not necessary. The beaver dam already controls the lake at 1345 and the new weir structure at elevation 1345 is redundant. This is confirmed in Section 8: "*The board configuration plays a minor role in the lake elevation at these low flows because beaver dams are controlling. However, the boards provide a control if the beaver dams fail, leak, or are removed*." Since the beaver dams would likely not fail during low flows, any potential failure during high flow conditions would be a natural occurrence and would relieve flooding during high water levels on Round Lake.

   Section 8 states "*The proposed change of a notch in the weir to provide base flow is significant because it allows the board to remain in place at all low flows….If necessary, the full weir could be opened to increase capacity*." Since the beaver dams are controlling the elevation at 1345 and all model and flood levels assume this minimum elevation, there is no base flow in Osprey Creek below 1345 under any conditions. Therefore this paragraph is not consistent with other portions of the Report.

5. The analysis of 100-year flood levels (RFE) assumes starting water surface elevation of 1346.13 prior to the start of the storm event. The high starting water surface elevation skews the results of the impacts of the proposed structure on the 100-year flood level, as described further in

number 5 of the specific comments pages. This assumption that the lake starts at 1.15 feet above the top of the boards and 2.45 feet above the sill elevation prior to the start of the storm event is extreme since it is at the highest recent recorded flood level.

6. The Report lists elevations that are referenced to mean sea level (13xx). However they do not state how the elevations were determined. If a GPS (Global Positioning System) or total station survey was conducted in the area, the survey should be provided and reviewed to define the accuracy of the unit and the licensed surveyor should be identified. If a survey was not conducted, the method used to transfer the old local datum (7x) into the new datum (13xx) should be reviewed. This transfer method is critical to the analysis and conclusions that are drawn because there is more than one local datum that was developed and used in this area.

Specific Comments on Hydraulic Design Feasibility Analysis, Little Round Lake Dam:

1. Section 2.0 and Table 1 note that the WDNR approved Regional Flood Elevation (RFE) for Round Lake is listed at Elevation 1346.98. The materials submitted to the WDNR in December 2006 were not reviewed. This RFE elevation is equivalent to a local datum of about 79. This water level is about one foot higher than the maximum water level recorded since 1942 - prior to construction of the Little Round Lake dam in the late 1940's.

2. Table 2 presents the results from the second study by SEH, which was not reviewed. The information in the table and the results of the second study are not clear from Table 2.

3. Section 3.0 notes that the models used for the evaluation were modified from those used for the Regional Flood Elevation, but does not list how the models were changed. It is assumed that the modifications were related to the proposed structures, but that was not clear.

4. The text in Section 4.1 notes that by lowering the existing 2 culverts at Highway NN, "*the HEC-RAS model showed the culverts and embankments are not part of the control for flow below 100.5 cfs – the 100-year flow at this reach."* However, the illustrations on Figure 2 indicate that the proposed lower culverts do not have any impact on the flood level. Figure 2 shows an elevation at about Elevation 1346.3 at station 26300 under Current Conditions, which is nearly identical to the elevation shown on Figure 2 under the CTH NN Culvert Lowered. Figure 2 shows the elevation at the upstream end (about station 26300) to be just under 1346 with CTH NN Culverts Removed (about 0.3 feet lower than the other 2 figures). Figure 2 would appear to indicate that lowering the 2 culverts does not reduce the flood level in the upstream channel back to natural flow conditions and continues to have some control on the 100-year flood level.

5. Tables 3 and 4 note a starting water surface elevation for RFE determination of Round Lake at elevation 1346.15 (or about elevation 78.15 local datum). This seems to indicate that the RFE evaluation assumed that the lake was 1.15 feet above the top of the boards and 2.45 feet above the sill elevation prior to the start of the storm event. This is 1.4 feet above the State Designated Maximum elevation of 76.75 for Round Lake prior to the storm event. And according to Section 8 was at the recent Historical High Watermark for Round Lake.

   This assumption should be justified since it is higher than all of the historic recorded levels presented in Appendix B since the dam was first built in the late 1940's, and it is at the Spring 2002 level listed in Appendix C that occurred during the peak of a snowmelt event. Typically the starting water surface elevation for a snowmelt event would be close to the outlet elevation in cases where the boards are removed during the winter months to prevent Spring flooding. Typical starting water surface elevations for rain storm events would be based on the board elevation or typical summer levels, not a peak spring snowmelt elevation. The type of precipitation event that was analyzed for the 100-year RFE was not described in this Report. The resulting 100-year flood levels would likely be significantly lower if the starting water surface elevation were established at a more typical level, especially for the cases with the boards removed. The assumed high 100-year starting water surface elevation also minimizes the impact of the various proposed structures. If a lower starting water surface elevation were used to evaluate water level impacts of the proposed structures, the impacts with the new structure would likely become greater.

6. Table 3 lists the "*USGS Topo Map "Normal" Water Surface Elevation*" for Round Lake at 1346. The USGS topographic maps list the elevation of water bodies at the time that the map was flown and does not attempt to represent a "Normal" water level. When you compare the USGS level with the recorded levels in Appendices B and C, it shows that the lake has only been at or above 1346 once since the dam was constructed. As noted in Section 9.0 "*Water surface elevations within the range of 1344.5 feet to 1345.25 on Round and Little Round Lake are generally not of concern as documented by the lack of measurement made at these elevations*." So the "Normal" water surface elevation would be much lower than 1346.

7. Table 3 notes a 100-year flood level on Osprey Lake with the CTH NN Culverts Removed as 1346.49. This does not agree with the level that is shown on Figure 2 for the CTH NN Culverts Removed that is less than 1346. This discrepancy of more than 0.5 feet should be corrected. This may also impact the upstream flood levels on Little Round Lake and Round Lake.

8. Section 5.1 notes that "*The bottom of the notch will be set at the current sill elevation while the top is set at the normal elevation of the top of the present boards when in place (1345 feet)."* This proposed structure appears to replace the existing boards with a structure that has removable boards located in front of the dam and at the same elevation. The added notch would allow for some flow out of the dam with the boards in place and would potentially decrease the placement and removal of the boards. However, it is critical to ensure that the operation of the boards prior to winter freezing would not change from existing operations to ensure that the lake is lowered to the sill elevation in anticipation of high spring snowmelt conditions. Although the notch provides flow below the elevation of the boards, the notch has much less capacity than the current dam with the boards removed and it would take a long time to draw down such a large lake with the boards remaining in place.

9. Section 5.1 states that "*the elevation that the low water control can then be raised was determined*." The low water control elevation at the dam is critical to the duration of water levels above the typical normal level. The sill of the dam and the low sill at the removable boards needs to be specified. A higher sill elevation could increase the duration of high water levels and should be defined.

10. Section 5.1 states that "*Overall the new control structure is 16 feet long with 12 feet of weir. Three feet, or 25 percent of the weir is comprised of a vee notch weir…"* Therefore, the width of the removable boards on the new structure is 1 foot less than the current board width (75% of a 12 foot weir = 9 feet, compared to the existing 10 foot boards). Although the vee notch weir allows for additional capacity when the water level is high, at elevations close to the sill elevation the capacity may be reduced below the current capacity. The lower capacity at lower elevations may increase the duration of high water levels, which should be defined and provided.

11. Section 5.1 states that "*The proposed structure is a 6 x 10 foot concrete box, giving the opening additional flow capacity compared to the old wooden box with twin five foot openings."* Since both openings are 10 feet wide, the additional capacity with the new structure is minimal. The Figure 6 line that represents data with boards removed indicates that the added capacity is about 10 percent of the total capacity for flows above about 80 cfs. The Report should describe the proposed bottom for the box structure and how the structure will reduce the roughness to achieve the additional 10 percent increase in flows.

12. Section 6 appears to present a different structure that would be used if the CTH NN culverts are not lowered. The concerns noted for Section 5 remain applicable for Section 6, and will not be repeated.

13. Section 1.1 notes that "*The elevation difference between the beaver dam control and the boards is only 0.6 inches. A structural low water control would be needed at the dam to maintain the Round Lake elevations near the 1345 foot elevation only if the current beaver dams are leaking, fail, or were removed*." Figure 2 shows the upstream beaver dam at about elevation 1345 (or about elevation 77 local datum). Section 8 indicates the beaver dam crest was surveyed at 1344.95. The survey documents and modeling completed by Carthel Engineering under contract with Sawyer County indicates the beaver dam crest at 1343.5 in 2004. If the beaver dam crest has been raised 1.5 feet since 2004 and is at 1345, further raises to the dams could result in similar increases.

    Based on the water levels on the gage in the top photo on page A-2 from November 2006, the water level was much lower than 1345 (it appears to be just above the sill of the dam, or about 1-1.5 feet below 1345). The beaver dam crest during my site visits and from the Carthell survey never held the water level within 0.6 inches of the top of the boards in the dam. This could either indicate some incorrect data on the beaver dam crest elevation or that the beavers have raised the dam and the upstream lake levels.

    Doing modeling that is dependent on beaver dams and setting flood levels that depend on beaver dams is typically not standard practice. If the County plans to let the beavers regulate the flood levels, the ultimate flood level could be at much higher levels. It may be worthwhile to investigate other lakes with outlet channels that have beaver problems to define the County's standard practice for dealing with beavers. A question for the County would be at what water level would they try to control the beavers?

14. Section 8 states "*It was again several inches below the dam sill (1346.7) in the summer of 2007*." This sill elevation is not consistent with other references at 1343.7, and may be a typographical error.

15. Section 8 states "*If the County Road NN culverts can not be lowered, the board configuration on the box structure should be modified to provide a vee notch weir for low water control*." This statement is confusing, since the proposed structure shown in Figure 5 already shows a vee notch weir. The statement should be revised, removed, or the text clarified.

16. There is no information on how the beaver dams were input to the model. This should be evaluated to ensure that it is representative of the actual conditions.