

May 11, 2018

Corey Walker  
Platform Ventures  
4220 Shawnee Mission Pkwy, Suite 200B  
Fairway, KS 66205

Re: Old Longview Lake - Dam and Spillway Observations and Preliminary  
Recommendations Letter  
Lee's Summit, MO  
Olsson Project No. 017-0305

Dear Mr. Walker,

An Olsson Associates (**Olsson**) Geotechnical Engineer visited the site on April 30<sup>th</sup>, 2018 to observe the existing dam and spillway. This letter discusses our observations and includes recommendations for temporary remediation to the dam and spillway. This letter does not address the future design or construction plans for the lake. Recommendations and opinions on future design and construction plans will be presented under a separate cover.

**Site Description**

The existing 18-acre private lake with earthen dam and concrete spillway is located on the old Longview Estate, just south of the existing Longview Community College. The site location is shown in Figure 1.



Figure 1: Site Location

We understand the lake was constructed in 1914 and includes an approximately 20 feet high by 630 feet long earthen dam that has a downstream slope between 3H:1V to 5H:1V. Currently, a reinforced double box concrete spillway is located on the east side of the dam. The lake survey indicates a maximum water depth of around 9 feet, however several areas are significantly shallower as siltation has occurred across the majority of the lake. The survey depicting the dam, spillway and southern portion of the lake is shown in Figure 2.

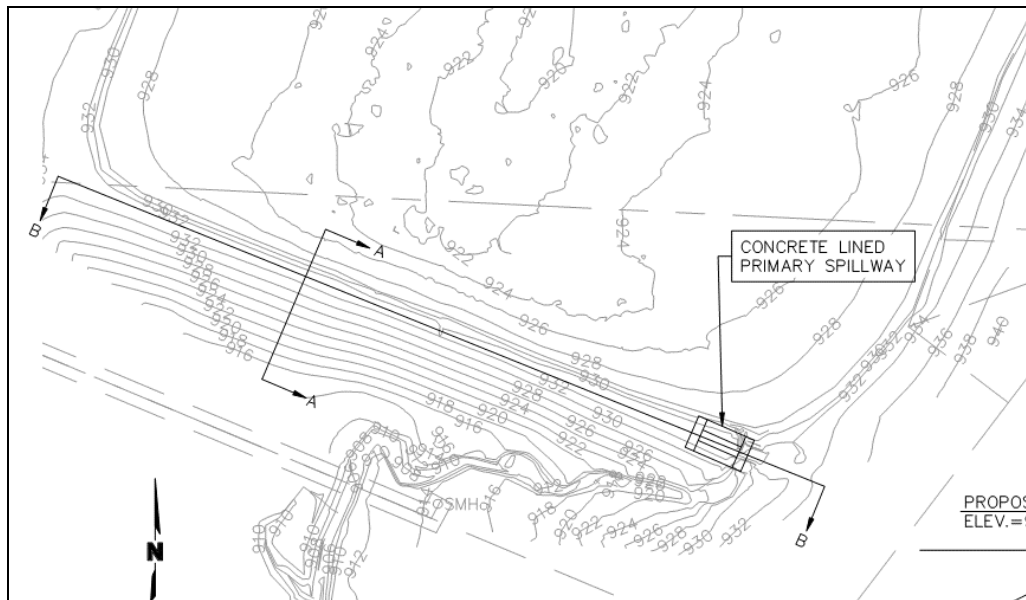


Figure 2: Dam, Spillway and Lake Survey

Several residential homes with maintained yards are located on the east side of the lake. The homes are bounded by the lake and the adjacent properties. On the west side of the lake, clearing has begun for a new development. A wood chip berm, from removal of the nearby vegetation, ran along the west bank of the lake. The berm is around 10 feet wide and 5 feet high. A historic pergola structure is located on the north bank of the lake. Several areas of the pergola have been undermined by the lake. An existing wetland is located to the north of the pergola.

#### Earthen Dam Observations

Portions of the upstream face of the dam are lightly armored with 4 to 8-inch diameter rip-rap. The rip-rap extends about 2 to 3 feet below the crest of the dam. Above the rip-rap, some minor erosion of the dam crest was observed, although it was difficult to see this area due to the vegetation that had recently established.

The west half of the downstream face of the dam slopes at an estimated 5H:1V and contains shallow rooted shrubs on the crest of the dam and shallow rooted grasses on the face of the slope. A photograph of the west portion of the dam is shown in Figure 3.



Figure 3: Photograph of West Portion of the Downstream Face of Dam

The center of the downstream face of the dam contains shallow rooted vegetation and two large mature trees on the crest of the dam (Figure 4). Smaller, less mature trees cover the remainder of the slope (Figure 5). The large trees appear to be around 24 inches in diameter and have canopies around 50 feet in diameter. The smaller trees are generally 6 inches in diameter or less. Additional vegetation, including shrubs and grasses, were observed in this area.



Figure 4: Photograph of Large Mature Tree on Crest of Dam





Figure 5: Smaller Trees on Slope of Downstream Side of Dam

Seepage was observed at the toe of the slope in the central portion of the dam. In our opinion, the amount of seepage observed was relatively minor as erosion from the seepage or flowing water out of the toe was not observed. In addition, seepage was only encountered at the toe and not found along the slope. The pooling of seepage water at the toe of the slope is shown in Figure 6.



Figure 6: Photograph of Seepage at Toe of Dam

The east portion of the dam contains two large trees near the crest of the dam, similar to the center of the dam. The vegetation downslope is slightly more mature and larger in diameter than the center portion.

### Drawdown Structure Observations

What appears to be a drawdown structure with a set of valves is located within the lake approximately 50 feet north of the dam. We did not investigate the structure as access to the structure is only available by boat. However, it appears that this structure is no longer serviceable as we could not locate an outlet pipe downstream and the valves did not appear operable from our vantage point. In addition, the concrete foundation for the valve structure is in very poor condition. The structure is shown in Figure 7. We do not anticipate this structure will be reused.



Figure 7: Drawdown Structure

### Concrete Spillway Observations

The primary spillway for the lake is located on the far east side of the dam. The spillway consists of a reinforced concrete double box with wingwalls downstream. The concrete is in very poor condition. Weathering has resulted in the exposure of the reinforcing elements. At the time of our site visit, the top portion of the box had punctured the concrete apron below (Figure 8).



Figure 8: Photograph of Spillway Puncture



The puncture appears to be due to loss of support from erosion below the bottom of the apron (Figure 9). In addition, the wingwalls appear to have been pushed into the channel from the growth of large vegetation (Figure 10).



Figure 9: Photograph of Erosion Below Concrete Apron



Figure 10: Photograph of Failed Concrete Wingwalls

In addition to erosion below the spillway, we also observed erosion around the west side of the spillway (Figure 11). Erosion around the west side was around 3 to 4 feet deep and around 3 feet wide. At the time of our observations, the majority of water loss from the lake is directed through this area of erosion, however, the water level of the lake during our site visit did not reach the height of the spillway apron. It appears that during high water events, water would be directed over the spillway as normal. The areas downstream of the spillway appear consistent with most streams in the area. Some erosion is present, but erosion is limited by the thick vegetation and shallow rock elevation.



Figure 11: Photograph of Erosion Around West Side of Spillway

### Opinions and Recommendations

We have provided the following opinions and recommendations for the dam and spillway. All opinions and recommendations provided herein are for temporary protection of the dam and spillway and should be implemented within 30 days. These opinions and recommendations are not intended for future site improvements. Final recommendations can be provided once future construction plans are known.

- Principal Recommendation

In our opinion, despite the seepage observed, the earthen dam is in relatively good condition. This is likely because the slopes of the dam are flatter than what new construction usually dictates. As such, remediation should begin with the construction of a pathway to the spillway. This will include removal of small vegetation 6 inches in diameter or less and any brush or weeds in the pathway. For trees greater than 6 inches in diameter, the path should be rerouted around the larger trees as the excavation to remove the entire root ball could be large and leaving the root ball in place could result in additional seepage paths developing in the dam.

Removal of the large trees should be delayed until final construction plans are developed and the lake can be drawn down to a level that does not destabilize the dam during excavations. Repair of the toe seepage can also be delayed until final construction.

We recommend the top portion of the double box spillway that has punctured the apron be removed to provide improved drainage along the spillway. From our observations, this portion of the spillway appears to only have been constructed to level the dam crest. Once the upper portion is removed, we recommend the holes in the concrete apron of the spillway be filled with non-shrink cement grout, flowable fill or Portland cement concrete. Any other noticeable seepage paths should also be grouted, including the erosion around the west side of the spillway. Once all the seepage paths are grouted, a minimum of 3 feet of rip-rap should be placed in front of the spillway extending 10 feet to either side of the spillway to help protect the spillway from additional erosion. The rip-rap should appropriately sized. Rip-rap should also be placed on the downstream side of the spillway to prevent any movement that could occur during high water events.

- Construction Observation for Principal Recommendations

We recommend that all temporary remediation construction be monitored by a representative of **Olsson**, including site clearing, placement of all grout or concrete and rip-rap. The purpose of these services would be to provide **Olsson** the opportunity to observe the conditions encountered after the removal of vegetation and the spillway after the top portion is removed, evaluate the applicability of the recommendations presented in this report to the conditions encountered, and recommend appropriate changes in construction procedures if conditions differ from those described herein.

- Visual Inspections for Principal Recommendations

We recommend the dam and spillway be monitored by an Olsson engineer on a weekly basis until the temporary recommendations presented in this report are accomplished. After the temporary recommendations have been completed, monitoring can be prolonged to once a month and after a 2-inch or greater rain event. Monthly monitoring should continue until final construction or rehabilitation of the dam is complete.

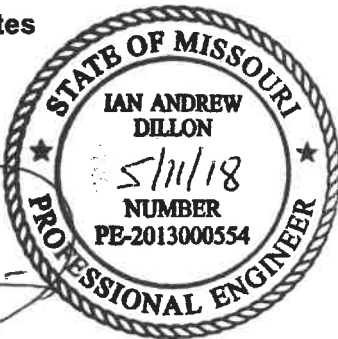

- Secondary Recommendation

We understand there may some delay in accessing the spillway due to environmental concerns and not being able to remove trees in the area. If tree removal cannot be completed at this time and access to the spillway is limited to individuals only, we recommend, at a very minimum, that the dam and spillway be monitored for movement, seepage and continued erosion on a weekly basis until the primary recommendation above can be implemented or final construction for the dam and spillway begin. The owner should be aware that if movement or excessive erosion is observed by **Olsson** personnel, emergency action will need to be taken. An Emergency Action Plan has been developed by **Olsson** and has been submitted to the city and developer.


Closing

We appreciate the opportunity to be of service to you on this project. This letter has been prepared for the exclusive use of Platform Ventures for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, express or implied, are intended or made. If you have any questions regarding this letter, please contact us.

Sincerely,  
**Olsson Associates**



Ian Dillon, PE  
Geotechnical Engineer



James Landrum, PE  
Senior Engineer