

Sherwood Lake Club

Condition of Dam

March 31, 2019

History – The Lake Sherwood dam construction was completed in October, 1964. Since its construction, other than adding rock facing to the dam, very little maintenance has been required or undertaken. The dam is now 55 years old and as is very common in lakes like ours, the dam is starting to show its age.

Governing authority in Kansas – In Kansas, the Division of Water Resources (KDWR), a division of the Department of Agriculture, is responsible for dam safety. While KDWR is the governing body for tracking dam safety, the engineering studies are engaged and paid for by each lake. Sherwood Lake Club (SLC) has, for many years, used Cook, Flatt & Strobel Engineering (CFSE) and prior to that SLC used King Engineering, which was purchased by CFSE approximately 4 years ago. CFSE evaluates our dam every other year, or as needed basis, and their reports must be sent to KDWR. KDWR has reviewed our engineering reports and they are demanding we address three very costly items. We have relied heavily on CFSE to propose resolution ideas and plans that would address KDWR's concerns, in fact fix the issues, but be as cost effective as possible. At the end of the day, we must make KDWR's required repairs or risk having our dam decertified.

US Army Corps of Engineers & Shunganunga Watershed – The U.S. Army Corps of Engineers is responsible for the oversight and management of the Shunganunga Watershed. While Lake Sherwood is part of the watershed and the Corps can comment on the condition of our dam, the guiding authority is the KDWR. Lake Sherwood does have a significant responsibility as it relates to the watershed; should our dam fail to perform adequately; many downstream individuals and their property would be in jeopardy.

Condition of the Dam – KDWR has reviewed our dam inspection report (the full report to KDWR is available on the SLC website) and demand three issues be dealt with:

1. KDWR would like us to either raise the height of our dam by twenty-two inches; or, lower our spillway by twelve to eighteen inches,
2. They would like us to correct and/or replace the dam's toe drain system and modify our main drain outflow.
3. New standards for design of dams calls for the face slope, front and back, to be no less than a three-to-one slope. The front side of our dam already approximates the required slope, but the back side of the dam is far steeper than the new guidelines. KDWR has not been as emphatic about making this change to the back side of our dam, but they could require us to meet this standard as well. We have not commenced the necessary engineering for this work and do not have an estimate for the cost of this work.

Insurance – Sherwood Lake Club (SLC) has always carried liability insurance for the activities of the lake, which includes the potential failure of the dam. Because of an increasing number of dam failures nationwide, insurance companies are now requesting copies of the dam inspection

reports coming from the governing authority. Based on KDWR's report, our insurance company will not provide SLC insurance for the dam. Operating without insurance for our dam is not a viable long-term option.

Engineering – CFSE has served for many years as our consultants for lake engineering matters. CFSE has a broad base of knowledge on lake dams and design. They have been evaluating the three issues raised by KDWR, above. Most of the planning is complete to address item # 1 related to dam height or lowering of our spillway. The preliminary evaluation of item # 2 is in its early stages, but a basic understanding of the problem and potential remedies is available. No engineering has been undertaken on the matter of addressing the slope gradient on the dam. CFSE has been good to work with, but we may choose to bid out the required engineering fees for this project in an effort to assure Members that every effort is being made to control costs of the work-related professional fees.

KDWR Issue # 1 – Raise the dam height or lower the spillway

To raise the height of a dam is not as simple as pouring dirt on the top of it. To raise a dam's height, you must widen the base of the dam and build up on all sides. For us, that would mean removing our dam face rock and adding tons of dirt prior to reinstalling the rock. This alternative is virtually cost prohibitive.

CFSE proposed an alternative to raising the dam height to KDWR. They were not accepting the idea at first, but now have warmed to the idea of permitting us to lower our spillway. This alternative will cost about 10% of the cost to raise our dam, will be significantly faster, will not change the water level of the lake, and will not increase the likelihood of downstream flooding. The engineering plans for this remedy will be ready for KDWR's review and approval in the near future. This work has not yet been bid out to qualified excavation contractors, but estimates range from \$80,000 to \$120,000.

KDWR Issue # 2 – Correct/replace dam toe drain and main drain

This matter is very technical and has to do with how the dam was built 55 years ago and how the drainage pipes within the dam are functioning today. A rudimentary explanation – when dams are constructed, there is a horizontal section within the base of the dam that consists of sand. The purpose of the sand is to capture the water seeping through the dam and funnel it into pipes (toe drains) that are buried within the sand that carry the water out the back side of the dam. When our dam was built, the toe drains were tied into our main overflow tube, not the acceptable design. In flood events the main overflow tube fills with water and causes water to back up into the toe drains, which can lead to backside erosion of the base of the dam and potential dam failure. To complicate matters, none of the blueprints from the original design and construction of our dam are available; if you have them or know where they are, please raise your hand.

CFSE is mapping the toe drain & main drain systems. They plan to inspect the inside of the pipes and surrounding materials. They will then prepare a scope of work for the correction & repair of those systems. Those plans will then have to be reviewed and accepted by KDWR, then we will bid the work with qualified excavation contractors, and perform the work.

Estimating the cost of this work in advance of having the completed engineering studies, is not an exact science. For budgeting purposes, we have been told to expect approximately \$500,000 for this work.

KDWR Issue # 3 – Slope gradient of the dam

If KDWR sticks to their guns on this issue, our overall cost will increase significantly. We do not have an estimate of the yards of dirt, clay, it would take to reduce the backside slope of our dam to a three-to-one slope. Needless to say, it would be a very large undertaking. We hope that CFSE efforts to dissuade KDWE from this requirement will be successful.

Is the Dam safe? – CFSE does not believe the dam is in imminent danger. SLC must address these deferred maintenance issues before they do represent a potential failure threat or suffer KDWR decertification of the dam.

How will SLC afford this cost? – We don't have the answer to that question, we would like your thoughts on that matter, but the most likely source will be an assessment to our membership. SLC has enjoyed the lake for 55 years, but we will have to invest in the dam to protect the next 55 years of the Lake. All work related to this project will need to be bid and the bidders' qualifications to perform the work will have to be vetted.

What is the timeline for doing this work on the dam? – Once again, we don't have all the information we need to develop a timeline that will include design, KDWR approval, permitting, bidding, and construction. The work can not be completed in 2019 due to the necessary design and approval process, but we would like to bid the work not later than January of 2020, or earlier, and perform the work next spring and summer.

Will this work impact our use of the Lake? – The work to be done should not impact Members' use of the Lake.

Will lowering the spillway take any homes out of the flood plain? – While we will know the finished elevation of the spillway, we do not know the elevation of the homes around the lake. It stands to reason that some homes could come out of the FEMA flood plain determination, but the Board can not represent this to be the case. A game plan for addressing this matter will have to be developed with the participation of FEMA and homeowners currently in the flood plain.

Who do I talk to if I have questions? – Steve Brewster is the best person to contact with any questions related to this matter or other lake operation issues. We will keep a list of all questions and attempt to address those with the full membership, so please help us respond and communicate with everyone on this very important matter. We plan to hold a meeting of the full Membership discuss this matter once we have additional information about project costs and alternatives for funding the project.