

FROG POND LAKE AND DAM

SYNOPSIS OF INSPECTION REPORTS BY TEXAS STATE AGENCIES

FOR THE YEARS 1972 TO 2017

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This document provides the findings by the author from review of the various inspection reports and documents issued by State of Texas agencies for the years above pertaining to the maintenance and repair of the Dam and Spillway for Frog Pond Lake.

This document is organized into a Timeline by listing the dates of the various State inspection dates including a brief/partial list of problems found at each inspection, and the dates of known repairs performed on the Dam and Spillway.

The objective of this review is to identify long-term and reoccurring problems with the Dam and Spillway and current condition of the Dam and Spillway.

TIMELINE OF INSPECTIONS AND REPAIRS

Frog Pond Lake was formed by construction of the earthen Dam and concrete Spillway by J. G. Haralson in 1957. The Dam is classified as a “small” dam and has been assigned a Low Downstream Hazard Dam (risk level of 3). The Dam has been assigned the inventory number of TX03775 in the State list. The Dam and Spillway are owned by the Frog Pond Property Owners Association.

There apparently was an inspection of the Dam on November 29, 1972. The defects listed in 1972 were shown on the 1974 inspection, and the 1974 report noted that none of the deficiencies had been repaired.

The Texas Water Rights Commission performed an inspection on February 4, 1974 where findings included: major erosion on the upstream slope of the Dam and on the downstream slope behind the right (south) spillway chute; general seepage at the toe of the Dam; brush growth at the Spillway and in the discharge channel below the Spillway; animal burrows; the Spillway slab had settled 0.66 foot at south end since the 1972 inspection and the undermining (cavity) of the Spillway had not been addressed. The Dam Owners were advised to investigate the problem and perform remedial repairs.

A public hearing was held by the Texas Water Rights Commission on April 24, 1975 where the Commission directed the Dam Owners to prepare plans to upgrade the Dam and Spillway to pass the 100 year flood and to submit them to the Commission for approval.

The Commission was informed in a letter dated August 6, 1975 that the original Dam Owner, Mr. Haralson, had passed away.

An inspection was performed by the Texas Water Rights Commission on November 14, 1975 which identified that an area 110 feet long had been cleared of brush (not the entire 950 foot long Dam) and that all other prior deficiencies remained as before. Additional items were identified including further deterioration of the Spillway with significant flow from under the slab, with two and three foot holes found below the slab. A 25 foot long cavity on the right (south) side of the Spillway was found, along with major erosion (8 feet deep) behind the Spillway right wall along with a gully forming on the right bank. The right edge of Spillway had settled further since 1974.

Extensive tree and brush growth in the downstream channel was found on the left (north) side of the stilling basin, causing concentrated flows down the right (south) side of the channel, which contributed to erosion problems in the downstream channel.

The Commission called the Dam Owners on November 19, 1975 and the owners confirmed they were planning to hire an engineer, but the first engineer they had contacted had subsequently died. The Dam Owners then hired Everett Griffith Jr. and Associates of Lufkin.

An engineering report by the Owner's consulting engineer Everett Griffith Jr. and Associates was submitted in December 1976 to the Agency containing proposed modifications the Spillway, consisting of:

- eliminating the erosion behind the Spillway right retaining wall;
- construction of a concrete toe wall at downstream end of Spillway (to eliminate undermining and erosion);
- fill voids under the Spillway slabs with pneumatic mortar by pumping;
- remove vegetative growth in Spillway cracks and seal the slab joints;
- raise the dam to elevation 207.8 feet;
- flatten the downstream slope of the Dam to 3:1 (to reduce seepage);
- construct rock toe drain at base of downstream slope;
- remove tree and brush growth from both slopes of dam (OK to leave large trees).

State Permit No 3390 (A-3347) was issued on January 6, 1977 to the Dam Owners authorizing an existing structure (Frog Pond Dam) and the impoundment of 410 acre-feet of State water for recreational purposes.

Time limitations were set out in the permit that required repairs and modifications to the Dam structure per the submitted plans, to start within one year of the permit, and be completed in January 1979, within two years from the permit date of January 6, 1977.

The December 1976 engineering study was reviewed by Agency staff and was found to be generally acceptable and the Owner's representative was informed by letter on March 1, 1977 of the finding. The Agency requested that specifications for the Work be

provided. (The specifications were never received by the Agency, based on a statement in the December 1980 inspection.)

A letter dated December 30, 1977 was sent by the Dam Owners to the Agency which informed the Agency that modification work had begun on the Dam (as well as Amanda Dam), and requested an extension of time to complete the work. The Agency responded that an extension was not necessary if the work was finished by January 6, 1979 (within the two years allowed by the permit for repairs to be completed).

The Texas Department of Water Resources set a meeting at the Dam for September 22, 1978 but no one from the Owners attended the meeting. Observations made at that time by the Water Rights Adjudication staff stated that no improvements were obvious since November 1975, with the same deficiencies found, and they noted that the proposed modifications in the December 1976 plans had not been performed.

The Texas Department of Water Resources issued a letter dated October 4, 1978 from the Dam Safety Unit, Permits Division which listed prior deficiencies with the Dam, and also listed the modifications proposed by the Owners' Consultant, which the State was ready to accept (as adequate to improve the deficiencies in the Dam).

The letter was amended on December 8, 1978 to show that the Dam Owner's representative had been informed that the State had set a completion date for construction improvements of January 6, 1979 and of the need to request an extension of time on the project if the Work was not completed by that date.

The Dam Owners provided a letter to the Agency dated January 4, 1979 that some work had been done and that a construction firm had been retained to do the dirt work on Frog Pond (and also on Amanda) and a time extension was requested. The Agency extended the completion date for modifications by 2 additional years to January 6, 1981.

A letter from the Dam Owners to TNRCC dated June 24, 1980 explained that due to the presence of the Gulf States Utilities Co power line paralleling the crest of the dam that no trees had been removed from the downstream dam face, and no dirt work had been undertaken to raise the elevation of the dam crest.

The Texas Department of Water Resources performed an inspection on December 17, 1980, just before the deadline to complete the repairs. (The inspection report contains all of the history and information on the process of permit issuance and the requirement to perform improvements on the Dam and Spillway.) The inspection found evidence of recent concrete work on the Spillway and areas adjacent to the Spillway had been bulldozed of vegetation. The toe wall at the base of the Spillway had not been constructed (was not visible) but dirt had been pushed up to the base of the Spillway. No other work of the approved modifications was done at that time, including the rock toe drain along the base of the downstream dam face. *

The Dam Owners submitted another request for time extension on December 23, 1980 for two additional years to complete the work, and the extension was recommended, so the new completion date became January 6, 1983.

The Texas Department of Water Resources performed an inspection on July 21, 1983 and met a representative from the Dam Owners at the site. The representative stated that concrete had been placed within the Spillway to fill voids below the slab. He also stated that during the flood of June 1981 that the water rose to within 3 inches of the top of the Spillway walls.

The 1983 inspection found trees and brush on both slopes of the Dam with some erosion on the upstream face. Water flowing over the Spillway was entering cracks and exiting below from under the slab. Recommendations included to fill holes and cracks in the Spillway and seal open joints, as well as determine if any voids exist.

No additional documents are known for the 11 year period from 1983 until 1994 when the Texas Natural Resource Conservation Commission (TNRCC) was contacted by a lakeside resident to conduct an investigation. This was done in June 1994 with finding that the bottom of the Spillway apron slab was badly cracked due to the supporting soil having been eroded away. An inspection was scheduled. (Note that the inspection of 1980 that the planned toe wall at the base of the Spillway apron had not be built.)

The Texas Natural Resource Conservation Commission (TNRCC) conducted an inspection on July 13, 1994 and found that "...due to continued neglect since the modifications performed in the early 1980's that the discharge apron (Spillway), the energy dissipator, sidewalls and perhaps the entire Spillway section are beyond the stage that they can be easily stabilized and repaired". A large void had developed under the discharge apron and left (north) sidewall. The assessment was that the performance of the structure was unpredictable.

The Texas Natural Resource Conservation Commission (TNRCC) conducted an inspection on November 16, 1994 to discuss repairs to the Dam with a representative of the Dam Owners and two representatives from their engineer (Everett Griffith Jr & Associates of Lufkin). Flow from the Box Culvert conduit was entering holes and cracks in the Spillway slab. The report states that undermining of the Spillway was more extensive than originally believed. A concept was discussed to remove the lower part of the Spillway to reveal the extent of erosion and perform repairs. However, no work could be done until the dry period in the following summer of 1995.

During 1995, the Dam Owners undertook repairs of the Spillway, including significant modifications to the Spillway concrete downstream apron, and the additions of a toe wall, and modifications to the stilling basin.

The Texas Natural Resource Conservation Commission (TNRCC) conducted an inspection on October 18, 1995. The damaged lower section of the Spillway had been removed and replaced with a new concrete section (toe wall), but the wing walls and

additional riprap below the Spillway had not been installed. Since the lake had not been lowered, seepage problems were encountered during the work requiring installation of gravel/geotextile mat to provide a stable working platform, which could also serve as a drain at the foot of the Spillway. Most of the undermining under the original portion of the Spillway had been corrected by breaking small access holes in the slab and filling with concrete grout. Most of the cracks had been sealed. Trees and brush had NOT been removed from the Dam nor had inspection for animal burrows been performed or repairs performed.

Revised plans for the Work were submitted to the Agency by the Dam Owners engineer (Everett Griffith Jr & Associates of Lufkin) on December 7, 1995. The Agency concluded that there were "...no visible signs of distress at that time, and that the spillway structure appeared to be adequate as constructed". Any additional modifications will need to be designed by a registered engineer and submitted to the Agency for approval. Another call for filling of animal burrows on both slopes of the Dam was contained in the letter.

A letter dated December 22, 1995 was issued by the Texas Natural Resource Conservation Commission (TNRCC) on findings from review of the Dam and complaints received from homeowners on the Lake. Among the details was the approval to close the ramps at the ends of the Spillway using railroad ties and concrete, which would stop any further vehicle traffic over the Spillway.

The original Owners deeded the Dam and Lake to the FPPOA in 1996, with an additional special warranty deed issued in 2002 that clarified that the Lake was owned by the FPPOA.

The Texas Natural Resource Conservation Commission (TNRCC) conducted an inspection on October 23, 2001 where they reported the Dam to be in fair condition. Most of the items noted during the inspection were maintenance, including the animal burrows that were not repaired as previously recommended by the Agency. Joints in the Spillway slab needed to be resealed (last done in 1995). Wave benching on the upstream slope was observed (a repair recommendation was included consisting of placement of successive clay soil layers followed by placement of protective rip rap). Removal of trees on the Dam, and filling holes in the Dam was needed. Removal of brush and trees at seeps needed to be done.

The Texas Commission on Environmental Quality (TCEQ) conducted an inspection on July 5, 2006 where they reported the upstream slope was overgrown with trees and brush and beaver holes were still evident. There were trees and brush behind all the Spillway walls and in the stilling basin. There was vegetative growth in the slab joints and cracks since the joint sealant material was deteriorating and some joints were open. All of the joints needed to be resealed. Due to lack of maintenance, the drains installed in 1995 were no longer operating and seepage from the concrete was evident.

The FPPOA requested a proposal in 1996 for improvements from MOBILE Enterprises (Beaumont office). The scope of work covered the typical repairs listed in the previous inspection reports such as filling holes below the Spillway slab and sealing the joints. No action by the POA was taken on this proposal.

The Texas Commission on Environmental Quality (TCEQ) conducted an inspection on July 16, 2014 where the Dam was found to be in fair condition with main deficiencies being benching and erosion gullies on the upstream slope of the Dam, trees and brush on the downstream slope, cracks and seepage in the Spillway channel and concrete deterioration in the stilling basin. Soil had been placed on the upstream face to fill animal burrows, and small trees and brush had been removed. The downstream channel was in fair condition but overgrown with trees and brush with vegetation encroaching on the stilling basin.

FPPOA hired Russell and Sons in the latter part of 2015 to restore wash outs behind the spillway wingwalls and put new concrete over the old railroad ties. The concrete side and back wall were extended 18" below the ground to prevent future wash outs. The cost was \$2,812.

On May 27, 2016, a storm moving from west to east across Texas dropped between 14" to 18" of rain on Frog Pond and Amanda lakes in a 24 hour time period, which could be defined as a catastrophic rain event. This resulted in heavy flows through the Frog Pond Spillway, but the Dam was not overtopped. It only took about 6 hours of rain to cause the Lake level to rise to the crest of the Dam, and FM 3065 was flooded.

Frog Pond Spillway was damaged by erosion to the right (south) side behind the Spillway sidewall, but no major concrete damage was identified.

Unfortunately, insufficient flow was released from Amanda Lake and their Dam was overtopped, resulting in a breach and failure of Amanda Dam and the water in the lake was lost. The resulting damage included a wide gap in the dam.

Amanda POA decided to form a Water Control & Improvement District (WCID) to have the ability to obtain a permitted design to restore their dam and also the ability to award a bid for reconstruction of their Dam, including the ability to obtain a loan and have dedicated annual taxes on the lake homeowners to pay for the loan.

Frog Pond property owners began in 2016 to work toward establishing a WCID for Frog Pond for the specific purpose of maintaining the Lake and Dam.

An annual maintenance review by the FPPOA was performed on November 11, 2016. The current conditions of the Dam and Spillway were compared to the July 2014 TCEQ inspection.

The FPPOA again hired Russell & Sons of Woodville in November 2016 to repair the Spillway: cleaning and sealing cracks in the concrete pavement (\$3,248); and filling several voids* below the concrete slab with 7 CY of concrete (\$6,908).

(* The voids were filled with 4000psi fiber-reinforced concrete with the concrete cost alone priced at \$115/CY.)

In August, 2017 Hurricane Harvey caused incredible rainfall amounts from west of Houston into Louisiana. Fortunately, the Spillway was able to pass the flow generated by the daily rain amounts at Frog Pond Lake from Hurricane Harvey, and the Dam was not overtopped. Measurements show that 27 inches of rain fell at Frog Pond Lake over 5 days: Saturday August 26 1.44"; Sunday 8/27 6.04"; Monday 8/28 6.57"; Tuesday 8/29 5.09"; and Wednesday 8/30 8.24". (These rain totals did not exceed the daily (24 hour) rain totals from the May 2016 event.)

At the end of Sunday's rain, it was reported that the Lake had risen 4 to 5 feet, but after a 2 hour break in the rainfall, the Lake level had receded about one foot. By the end of the entire event on Wednesday (the heaviest day of rain when Hurricane Harvey was moving overhead), the Lake level again came up by 4 to 5 feet. Photos taken at that time showed the water level was very close to the crest of the Dam, but the discharge through the Spillway remained within the sidewalls of the Spillway.

Initial inspections of the Dam and Spillway after the Hurricane, and again on September 9, 2017 revealed the following damage:

- damage at the end of the Spillway sidewall on the left (north) side where the action of the water caused further erosion to the bank;
- erosion at the end of the right (south) Spillway sidewall washed out about 2 feet of soil material (where there has always been a pair of springs);
- multiple cracks at the lower end of the Spillway concrete apron (the sloped paving on backside of the Spillway), where the apron transitions to the 1995 vertical toe wall, with some showing flow out of them, indicating voids below the slab with flow.

Planning is underway for the newly approved WCID to address the storm damage, and to obtain a condition inspection report on the Dam and Spillway.

The FPPOA lowered the lake surface in November 2017 for the purpose of inspecting the Dam and Spillway, and to seal cracks on the Spillway (work on November 25 and December 2).

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FACTS on the Lake and Dam

- The lake is an impoundment on Wolf Creek, which arises to the West within Tyler County, and which flows downstream to the East to the B. A. Steinhagen Lake on the Neches River.
- The surface area of the lake is about 100 acres, and it contains approximately 410 acre-feet at normal pool elevation of 199.0 to 200.0 feet (all elevations measured from sea level).
- The maximum impoundment of 867 acre-feet is when the lake surface reaches the crest of the dam (about 8 feet above normal lake elevation).
- The Dam and original Spillway were constructed in 1957. The Dam is earthen, and appears to consist of sand, silt and some clay.
- The crest of the Dam is about 950 feet long, and has an elevation about 207.45 feet.
- The Dam has a height of 19 feet from the crest to the downstream toe of the dam (which would be an elevation about 188.45 feet).
- The upstream face of the Dam generally has a slope of 3 horizontal to 1 vertical (3:1).
- The downstream face of the Dam generally has a slope of 3 to 1, but near the low flow outlet (pipe and valve) the slope is steeper at about 2 horizontal to 1 vertical.
- The concrete Spillway is 80 feet wide. The bottom of the Spillway is about 6'-3" feet below the crest of the Dam, so the Spillway slab may have an elevation about 201.2 feet. The Spillway has a short front apron slab on the lake side, a 14.3 feet wide horizontal (flat) slab, and a long downstream apron, leading to the creek below.
- The normal elevation of the Lake is controlled by removable stop logs installed across the opening to the Box Culvert conduit in the Spillway.
- The Box Culvert conduit within the Spillway is to allow lowering of the lake by about 3 to 4 feet. The culvert measures 3.4 feet by 10 feet wide, with a 7" slab for a roof.
- A drain pipe was installed in the Dam in the 60's with a gate valve which when opened can lower the lake surface another couple of feet below the Box Culvert.
- The backside apron of the Spillway appears to be 1:4 slope, ending at a vertical toe wall, and there is a stilling basin beyond that reduces the energy of the discharge flowing down the apron before the discharge enters the downstream creek channel.
- Per the 1995 Hydrologic and Hydraulic calculations of the State agencies, the Spillway is able to pass sufficient flow to meet the State Requirement to pass at least 25% of the Possible Maximum Flood (PMF).
- The Spillway cross-section area is about 6'-3" feet height to top of dam by 80 feet length which is about 500 square feet, which would be the size the State used to determine what flow can be passed safely. If the stop logs across the Box Culvert conduit are removed, there is an additional cross sectional area of 34 SF.
- Repairs to the Spillway were done in late 1980 (25 years after initial construction);
- Major repairs to the Spillway were made during 1995 (15 years after 1980 repairs);
- In late 2015, and in late 2016, maintenance and repairs were performed at the Spillway (20 years after 1995 repairs). Further repairs are underway in late 2017.

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