



# San Jacinto River Authority

ADMINISTRATIVE OFFICE  
P.O. Box 329 • Conroe, Texas 77305  
(T) 936.588.3111 • (F) 936.588.3043

April 16, 2018

The Honorable Lyle Larson  
Chairman, House Committee on Natural Resources  
PO Box 2910  
Austin, TX 78768

Dear Chairman Larson,

In a letter dated December 18, 2017, you asked the San Jacinto River Authority (SJRA) to provide the Texas House of Representatives Committee on Natural Resources with an analysis of how dredging may be accomplished in a flood control context. I understand that, at the moment, the U.S. Army Corps of Engineers is considering a significant dredging effort to remove sand deposits and restore channel capacity in the West Fork of the San Jacinto River immediately upstream of Lake Houston. This is a project that is supported by the SJRA because, in areas such as this where the natural channel is shallow (relative to adjoining development) or has been choked with deposits, dredging the channel may allow it carry a given amount of flow at a lower water surface elevation. For its part, the SJRA is in the process of working with other governmental entities to conduct a regional flood study with grant funds from the Texas Division of Emergency Management and/or the Texas Water Development Board. The SJRA is advocating that the study consider whether additional dredging of the West Fork of the San Jacinto River (beyond the dredging expected to be performed immediately upstream of Lake Houston) would provide flood control benefits and what additional dredging may cost the participating governmental entities compared to other possible strategies. We will, of course, keep the Committee apprised of the status of the study and its results.

In the above-referenced letter you also asked me to provide the Texas House of Representatives Committee on Natural Resources with information regarding the potential positive and negative impacts of creating temporary or permanent flood capacity in Lake Conroe. In response to your request, SJRA commissioned two technical memoranda addressing the specific questions you asked in your letter. The results are summarized in this letter below. The technical memoranda are enclosed for the Committee's further review and reference.

***Question 1: What would be the flood control capacity gained by lowering the lake level annually during hurricane season (August and September) by one, two, or three feet?***

Under normal operating conditions, the conservation pool elevation of Lake Conroe is 201 feet above mean sea level (ft-msl). The table below shows the volume in acre-feet (ac-ft) of flood control capacity gained by lowering the normal pool elevation of the reservoir by one, two, or three feet.

	Lake Elevation, ft-msl	Supply Pool Volume, ac-ft	Flood Capacity Volume, ac-ft
Current	201.00	411,022	0
Lowered 1 foot	200.00	392,078	18,944
Lowered 2 feet	199.00	373,635	37,387
Lowered 3 feet	198.00	355,653	55,369

LAKE CONROE DIVISION  
P.O. Box 329  
Conroe, Texas 77305  
(T) 936.588.1111  
(F) 936.588.1114

GRP DIVISION  
P.O. Box 329  
Conroe, Texas 77305  
(T) 936.588.1662  
(F) 936.588.7182

WOODLANDS DIVISION  
P.O. Box 7537  
The Woodlands, Texas 77387  
(T) 281.367.9511  
(F) 281.362.4385

HIGHLANDS DIVISION  
P.O. Box 861  
Highlands, Texas 77562  
(T) 281.843.3300  
(F) 281.426.2877

Knowing the volume of flood capacity created in Lake Conroe is of limited value in understanding the overall flood control benefit created by this capacity, as well as the limitations on using Lake Conroe to control flood flows. To better evaluate the flood control benefits and limitations that may result from lowering Lake Conroe's conservation pool, analyses were performed to estimate the peak discharge from Lake Conroe and the flood stage elevations downstream of Lake Conroe during 100-year and 500-year storm events.

- 100-Year Event -

Under normal operating conditions and at the current conservation pool elevation of 201 ft-msl, the maximum discharge from Lake Conroe during a 100-year storm event would be 22,664 cubic feet per second (cfs). Lowering the conservation pool elevation by two feet (199 ft-msl) and three feet (198 ft-msl) would reduce the peak discharges from Lake Conroe to 16,837 cfs and 16,733 cfs, respectively. This reflects a reduction of approximately 26% from the normal condition at conservation pool elevation of 201 ft-msl.

For the 100-year storm event, the reduction in downstream flooding on the West Fork San Jacinto River is less than one foot (0.74 feet) at the IH-45 bridge assuming a two-foot lowering of the water level in Lake Conroe. By comparison, a three-foot lowering of the water level during a 100-year event results in a 1.25-foot reduction in flood elevations downstream at the same IH-45 bridge location. It is important to note, however, that these reductions are relative to flows that are on average eight feet above the channel banks in a 100-year event. The analysis of elevation reductions did not extend beyond the IH-45 bridge location because of time constraints and the complexity of taking into account (i) uncontrolled flows from other tributaries entering the West Fork, such as Spring Creek and Cypress Creek, and (ii) the need for updated channel models due to significant sedimentation that has changed the channel profile along the lower West Fork.

- 500-Year Event -

Under normal operating conditions and at the current conservation pool elevation of 201 ft-msl, the maximum discharge from Lake Conroe during a 500-year storm event would be 54,532 cfs. Lowering the conservation pool elevation by two feet (199 ft-msl) and three feet (198 ft-msl) would reduce the peak discharges from Lake Conroe to 43,349 cfs and 39,918 cfs, respectively. This reflects a reduction of approximately 21% to 27% from the normal condition at conservation pool elevation of 201 ft-msl.

For the 500-year storm event, the reduction in downstream flooding on the West Fork San Jacinto River is also less than one foot (0.80 feet) at the IH-45 bridge assuming a two-foot lowering of the water level in Lake Conroe. By comparison, a three-foot lowering of the water level during a 500-year event results in a 1.06 foot reduction in flood elevations downstream at the same IH-45 location. It is important to note, however, that these elevation reductions are relative to flows that are on average 12 feet above the channel banks in a 500-year event. The analysis of elevation reductions did not extend beyond the IH-45 bridge location because of time constraints and the complexity of taking into account (i) uncontrolled flows from other tributaries entering the West Fork, such as Spring Creek and Cypress Creek, and (ii) the need for updated channel models due to significant sedimentation that has changed the channel profile along the lower West Fork.



- Summary -

The analysis shows reductions in normal pool elevation do provide some benefit to areas immediately downstream as the peak outflow is slightly reduced relative to existing conditions, and there is also some benefit for those upstream of Lake Conroe during flood events. The benefit for those downstream is offset, however, by the fact that in a 100-year or 500-year event, the average flows will already be above channel banks by 8 to 12 feet, respectively.

For storm events larger than a 500-year event, it is anticipated that the addition of extra flood capacity will likely yield no additional benefit upstream and could potentially increase the flood hazard downstream of the dam if the peak release is delayed such that it occurs at the same time as other tributaries contribute their own flows to the West Fork San Jacinto River.

In closing, we would stress that gate operators must have flexibility to operate the gates in accordance with their mission to ensure safe, dependable reservoir operations, so that when dam safety issues arise, the lake level can be controlled safely without additional deleterious effects. The addition of flood capacity below the current normal pool elevation of 201 ft-msl will likely require a change to the current gate operations policy. Prior to undertaking a change in gate operations for the Lake Conroe Dam, a thorough study of the impact of the revised policy on lake levels and flows for multiple storm events would be required as well as significant initial and ongoing investments to develop additional gauging stations upstream of Lake Conroe to more accurately quantify inflow into the lake.

***Question 2: If the SJRA were to drop the level of Lake Conroe by one to three feet, what would the impact be on permits that are already issued for water in the basin based on historic use during hurricane season (August and September) over the last two decades?***

Texas Commission on Environmental Quality (TCEQ) Certificate of Adjudication (CoA) 10-4963 authorizes the impoundment of up to 430,260 acre-feet of water in Lake Conroe, with a priority date of January 12, 1959, for the impoundment of 380,430 ac-ft of water and a priority date of June 28, 1965, for the impoundment of the remaining 49,830 ac-ft of water. The diversion and use of 100,000 ac-ft of water per year from Lake Conroe is also authorized under CoA 10-4963 with a priority date of January 12, 1959. This water right is held jointly by the City of Houston (COH) and SJRA.

- Analysis -

A modeling analysis<sup>1</sup> was performed to evaluate the potential impacts of lowering the Lake Conroe conservation pool elevation on lake storage and elevation, available diversions from the lake (average and firm), and downstream junior water rights.<sup>2</sup> The results may be summarized as follows:

---

<sup>1</sup> The analysis was performed using the TCEQ-approved Water Availability Model (WAM) for the San Jacinto River Basin simulating water rights in a prior appropriation framework for a period of historical hydrology for 1940 through 1996. The analysis also included a spreadsheet model of Lake Conroe simulating 1940 through 2016 hydrology on a monthly timestep based on data from the TCEQ WAM for the San Jacinto River Basin, records for the post-1996 period, and estimates of year 2010 sediment and storage conditions. The spreadsheet model was developed to incorporate extended hydrology beyond 1996 (end of period for TCEQ WAM) to 2016 and to include the more recent 2011 drought period.

<sup>2</sup> There are also two non-saline perpetual water rights junior to CoA 10-4963 located downstream of Lake Conroe. CoA 10-5807, held by the COH and SJRA, is located at Lake Houston and authorizes the use of 28,200 ac-ft/yr of the unappropriated firm yield of Lake Houston for municipal and industrial uses at a priority date of June 19, 2003. The right is subject to special conditions, including conditions related to instream use. CoA 10-5808, held by the COH and SJRA, authorizes the diversion and use of up to

- Under normal conditions, Lake Conroe has a modeled firm water availability (yield) of 80,200 ac-ft/yr.
- The yield of Lake Conroe was not impacted by a temporary lowering of the conservation pool by one foot during the fall.
- The yield of Lake Conroe was reduced for all scenarios where the conservation pool was lowered by more than one foot, whether temporary or permanent.
  - The yield of Lake Conroe was reduced by 2,300 ac-ft (2.9 percent of baseline firm diversion) for permanent lowering of one foot (200 ft-msl).
  - The permanent lowering of Lake Conroe by one foot (200 ft-msl) results in lake levels below elevation 197 ft-msl for 60 more months (approximately 1.2 times more often) than under normal conditions. 197 ft-msl is the level at which mandatory drought response measures are initiated.
  - The yield of Lake Conroe was reduced by 6,600 ac-ft (8.2 percent of baseline firm diversion) for permanent lowering of three feet (198 ft-msl).
  - The permanent lowering of Lake Conroe by three feet (198 ft-msl) results in lake levels below elevation 197 ft-msl for 231 more months (approximately 1.6 times more often) than under normal conditions. 197 ft-msl is the level at which mandatory drought response measures are initiated.
- Lowering the Lake Conroe conservation pool does not result in impacts to the diversion reliability of downstream junior water rights.

The above analysis assumes that the release of water to lower Lake Conroe is not charged against SJRA and COH annual water rights under CoA 10-4963. This is a significant issue for consideration by the Committee and by the TCEQ, as CoA 10-4963 currently provides that all releases from Lake Conroe are charged against SJRA and COH annual water rights under that permit. If the TCEQ takes the position that the release of water to lower Lake Conroe must be charged against SJRA and COH annual water rights under CoA 10-4963, then every gallon of water that is released from Lake Conroe to create flood capacity is a gallon of water that cannot be diverted for municipal, industrial, or other beneficial uses.

It should also be noted that the above impacts on the yield of Lake Conroe do not include the potential additional impacts to both SJRA and City of Houston permits if the conservation pool of Lake Houston were lowered. Lowering the conservation pool of Lake Houston will result in additional annual reductions to water supply in the San Jacinto Basin beyond those stated here.

- Other Considerations -

Existing water supplies in the San Jacinto River Basin are either currently being used or will be used in the near term to meet existing and projected demands for the region.<sup>3</sup> Therefore, any reduction in water supply capacity -- whether resulting from lowering the conservation pool of Lake Conroe, or from a regulatory requirement to charge the release of water to create flood capacity in Lake Conroe against SJRA and COH annual water rights -- will need to be replaced through the development of major project infrastructure with associated costs dependent on project-specific infrastructure, source, yield, and timing. A preliminary, conceptual-level unit cost analysis was performed to estimate the cost of replacing this raw water availability. Costs were based on potential future water management strategies associated with SJRA

---

80,000 ac-ft/yr of run-of-river water from Lake Houston for municipal and industrial uses at a priority date of June 19, 2003. The right is subject to special conditions, including conditions related to instream use.

<sup>3</sup> See the 2016 Regional Water Plan (RWP) for the Region H Water Planning Area (Region H).



in the 2016 RWP for Region H. Based on this analysis, the costs to replace SJRA's lost yield could exceed \$21 million, assuming a permanent three-foot lowering of the conservation pool of Lake Conroe.

\* \* \*

I hope this information is helpful to you and to the Committee in analyzing potential flood mitigation strategies and the impacts they may have on the State's water supplies. Please do not hesitate to call on me if you have any questions regarding this letter or the enclosed memoranda.

Respectfully,



Jace A. Houston  
General Manager

cc: House Natural Resources Committee Members  
San Jacinto River Authority Board of Directors  
The Honorable Dan Huberty, State Representative, District 127  
Russ Poppe, Executive Director, Harris County Flood Control District  
Stephen Costello, Chief Resiliency Officer, City of Houston  
Carol Haddock, Director of Public Works and Engineering, City of Houston  
Jeff Walker, Executive Administrator, Texas Water Development Board  
Dr. Michael Sterling, U.S. Army Corps of Engineers, Southwestern Division