Volumetric and Sedimentation Survey of LAKE TRAVIS

July – November 2019

Texas Water Development Board

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Prepared for:

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Executive summary

In September 2018, the Texas Water Development Board (TWDB) entered into an agreement with the Lower Colorado River Authority to perform a volumetric and sedimentation survey of Lake Travis (Travis and Burnet counties, Texas). Surveying was performed using a multi-frequency (208 kHz, 50 kHz, and 12 kHz), sub-bottom profiling depth sounder. Sediment core samples were collected and correlated with sub-bottom acoustic profiles to estimate sediment accumulation thicknesses and sedimentation rates.

Mansfield Dam, impounding Lake Travis, is located on the Colorado River in Travis County, 13 miles northwest of Austin, Texas. The conservation pool elevation of Lake Travis is 681.0 feet above mean sea level. The TWDB collected bathymetric data for Lake Travis between July 18 and November 13, 2019, while daily average water surface elevations measured between 671.40 and 680.18 feet above mean sea level. The TWDB collected bathymetric data for the remainder of the lake in the Pedernales River southwest of State Highway 71 on June 5, 2020, while daily average water surface elevations measured 672.94 feet above mean sea level.

The 2019 TWDB volumetric survey indicates Lake Travis has a total reservoir capacity of 1,115,076 acre-feet and encompasses 19,044 acres at conservation pool elevation (681.0 feet above mean sea level). The 2019 TWDB volumetric survey measured 17,032 acre-feet of capacity below elevation 535.75 feet above mean sea level, or dead pool elevation. Dead pool refers to the water that cannot be drained by gravity through a dam's outlet works. The useable conservation pool storage, total reservoir capacity minus dead pool capacity, of Lake Travis is 1,098,044 acre-feet. The accuracy of the TWDB survey was assessed using the root mean square error (RMSE) method. Between the axial profile points and the model surface, the RMSE equals 2.75 feet. The value 2.75 feet was added to and subtracted from the survey data and interpolated data points to find the range of uncertainty for the volumetric survey. Results at conservation pool elevation suggest the total reservoir capacity estimate is accurate to within ± 4.20 percent (± 46,690 acre-feet).

Previous capacity estimates at elevation 681.0 feet include an original design estimate of 1,170,752 acre-feet, a 1995 Lower Colorado River Authority estimate of 1,132,172 acre-feet, and a 2008 TWDB estimate of 1,134,863 acre-feet. Because of differences in past and present survey methodologies, direct comparison of volumetric surveys to others to estimate loss of area and capacity can be unreliable. Information from past surveys are presented here for informational purposes only.

The 2019 TWDB sedimentation survey measured 40,992 acre-feet of sediment.

Comparison of the 2019 sedimentation survey results with historical records suggest the TWDB sedimentation survey results are likely an underestimate of the total sediment volume in Lake Travis. The sedimentation survey indicates sediment accumulation is greatest in the river channels. The TWDB recommends that a similar methodology be used to resurvey Lake Travis in 10 years or after a major high flow event.

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Note: References to brand names throughout this report do not imply endorsement by the Texas Water Development Board

Introduction

The Hydrographic Survey Program of the Texas Water Development Board (TWDB) was authorized by the 72nd Texas State Legislature in 1991. Texas Water Code Section 15.804 authorizes the TWDB to perform surveys to determine reservoir storage capacity, sedimentation levels, rates of sedimentation, and projected water supply availability.

In September 2018, the TWDB entered into an agreement with the Lower Colorado River Authority (LCRA), to perform a volumetric and sedimentation survey of Lake Travis (Texas Water Development Board, 2018). This report provides an overview of the survey methods, analysis techniques, and associated results. Also included are the following contract deliverables: (1) an elevation-area-capacity table of the reservoir acceptable to the Texas Commission on Environmental Quality (Appendices A and B), (2) a bottom contour map (Figure 6), (3) a shaded relief plot of the reservoir bottom (Figure 4), and (4) an estimate of sediment accumulation and location (Figure 10).

Lake Travis general information

Mansfield Dam, impounding Lake Travis, is located on the Colorado River in Travis County, 13 miles northwest of Austin, Texas (Figure 1). Lake Travis is owned and operated by the LCRA. Construction of the dam began on February 19, 1937, and the dam was completed in May 1942. Deliberate impoundment of water began on September 9, 1940 (Texas Water Development Board, 1971). The reservoir was built primarily for flood management, water supply and hydroelectric power (McCune, 2000; Lower Colorado River Authority, 2020a). Additional pertinent data about Mansfield Dam and Lake Travis can be found in Table 1.

Water rights for Lake Travis have been appropriated to the LCRA through Certificate of Adjudication No. 14-5482 and Amendments to Certificate of Adjudication Nos. 14-5482A, 14-5482B, and 14-5482C (Texas Commission on Environmental Quality, 2021). The complete permits are on file at the Texas Commission on Environmental Quality.

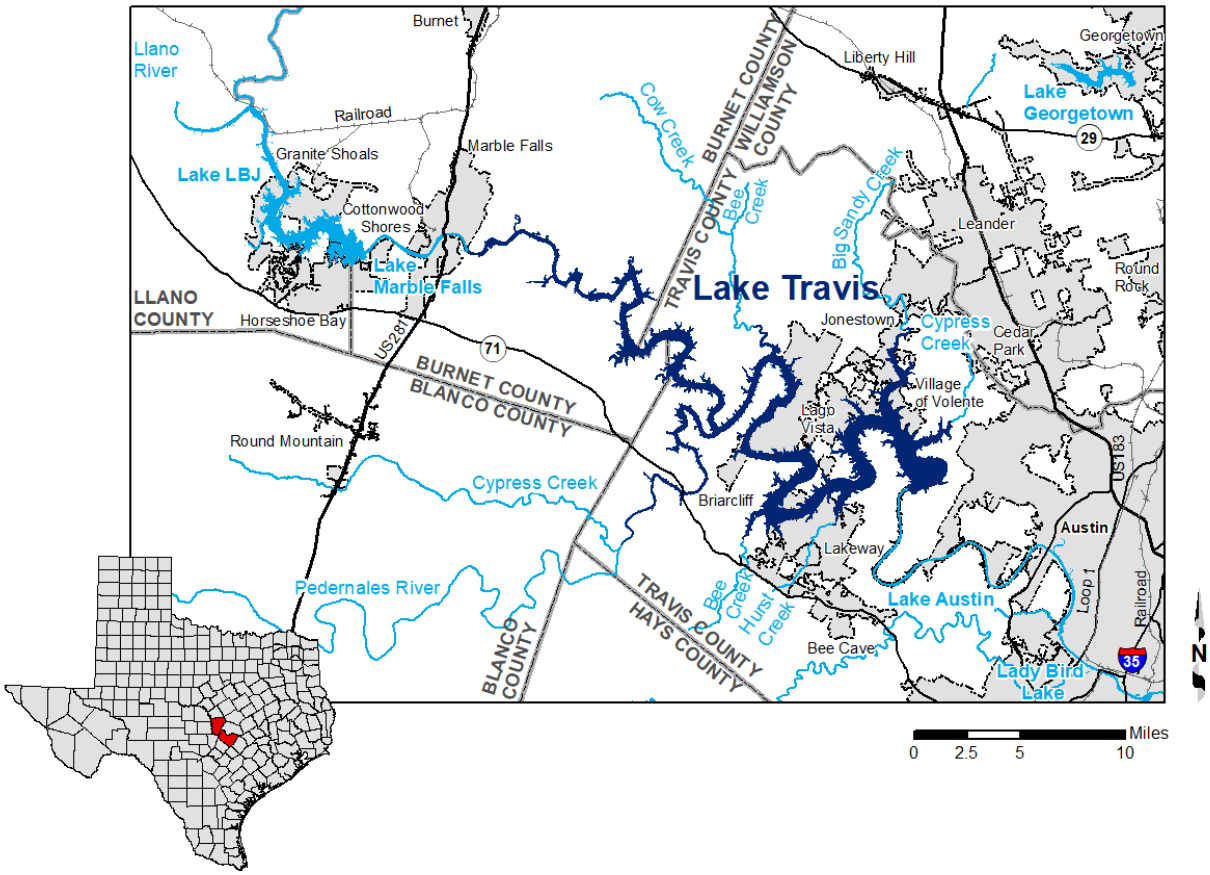

Figure 1. Location map.

Table 1. Pertinent Data for Mansfield Dam and Lake Travis

Owner	
Lower Colorado River Authority (LCRA)	
Engineer (Design)	
U.S. Bureau of Reclamation (BOR)	Flood Control and conservation features
Lower Colorado River Authority (LCRA)	Power generation features
Drainage Area	
Total Drainage Area	38,755 square miles
Contributing Area	27,352 square miles
Non-contributing Area	11,403 square miles
Runoff (1-inch)	1,458,773 acre-feet
Dam	
Type	Concrete gravity, earth and rock fill
Length	7,336 feet
Maximum Height	278 feet
Top Width	28 to 35 feet
Spillway	
Type	Concrete Ogee, uncontrolled
Total Length	700 feet
Number of Overflow Bays	5, each bay is 140 feet in length
Crest Elevation	714.0 feet above mean sea level
Outlet Works	
Number and Type	24 double-gated conduits
Diameter	8.5 feet
Invert Elevation	535.75 feet above mean sea level
Discharge Control	
Service gates	Paradox type
Emergency gates	Ring-follower type
Power Features	
Number of Turbines	3
Number of Generators	3
Number of Penstocks/floodgates	3
Gate Type	Hoist operated Broom, slide gates
Diameter	16 feet
Total Production Capacity	116,000 kilowatts
Invert Elevation	552.0 feet above mean sea level

Reservoir Data (Based on 2019 TWDB survey)

Feature	Elevation (feet above MSL[a])	Capacity (acre-feet)	Area (acres)
Top of dam	750.0	N/A	N/A
Maximum design water surface	745.0	N/A	N/A
Spillway Crest	714.0	1,891,138	28,832
Top of joint use (flood control and hydropower) pool	691.0	1,318,224	21,528
Top of Conservation Pool	681.0	1,115,076	19,044
Bottom of Power Pool	618.0	321,338	7,511
Invert/dead pool elevation	535.75	17,032	1,100
Conservation storage capacity[b]	—	1,098,044	—

Sources: Lower Colorado River Authority, 2020a; Texas Water Development Board, 1971; U.S. Army Corps of Engineers, 2013a

[a] Mean Sea Level (MSL) indicates a reference to the LCRA Legacy Datum for Mansfield Dam and Lake Travis. National Geodetic Vertical Datum 1929 (NGVD29) equals LCRA Legacy Datum plus 0.40 feet. North American Vertical Datum 1988 (NAVD88) equals LCRA Legacy Datum plus 0.60 feet.

[b] Usable conservation storage equals total capacity at conservation pool elevation minus dead pool capacity. Dead pool refers to water that cannot be drained by gravity through a dam's outlet works.

Volumetric and sedimentation survey of Lake Travis

Datum

The vertical datum used during this survey is feet above mean sea level. This is the legacy datum used by the LCRA. The legacy datum is based on elevation benchmarks set for construction of the dams forming the Highland Lakes that have not been adjusted to a standard datum (Lower Colorado River Authority, 2020b). To convert to standard datum National Geodetic Vertical Datum 1929 (NGVD29), add 0.40 to LCRA Legacy Datum. To convert to standard datum North American Vertical Datum 1988 (NAVD88), add 0.60 to LCRA Legacy Datum. Water surface elevation data were downloaded from the United States Geological Survey (USGS) for the reservoir elevation gage *TX071 08154500 LCRA Lk Travis nr Austin, TX.* For the survey period, the reservoir elevation data provided by the USGS came directly from the LCRA Hydromet: https://hydromet.lcra.org/ (U.S. Geological Survey, 2020). Elevations herein are reported in feet relative to the legacy datum. Volume and area calculations in this report are referenced to water levels provided by the USGS as obtained from the LCRA. The horizontal datum used for this report is North American Datum 1983 (NAD83), and the horizontal coordinate system is State Plane Texas Central Zone (feet).

TWDB bathymetric and sedimentation data collection

The TWDB collected bathymetric data for Lake Travis between July 18 and November 13, 2019, while daily average water surface elevations measured between 671.40 and 680.18 feet above mean sea level. The TWDB collected bathymetric data for the remainder of the lake in the Pedernales River southwest of State Highway 71 on June 5, 2020, while daily average water surface elevations measured 672.94 feet above mean sea level. For data collection, the TWDB used a Specialty Devices, Inc. (SDI), single-beam, multi-frequency (208 kHz, 50 kHz, and 12 kHz) sub-bottom profiling depth sounder integrated with differential global positioning system (DGPS) equipment. Data were collected along pre-planned survey lines oriented perpendicular to the assumed location of the original river channels and spaced approximately 500 feet apart. Many of the same survey lines also were used by the TWDB for the *Volumetric and Sedimentation Survey of Lake Travis, April-July 2008 Survey* (Texas Water Development Board, 2009), therefore, data coverage in 2019 and 2008 are very similar. The depth sounder was calibrated daily using a velocity profiler to measure the speed of sound in the water column and a weighted

tape or stadia rod for depth reading verification. Each speed of sound profile, or velocity cast, is saved for further data processing. Figure 2 shows the data collection locations for the 2019 TWDB survey.

All sounding data were collected and reviewed before sediment core sampling sites were selected. Sediment core samples are collected throughout the reservoir to assist with interpretation of the sub-bottom acoustic profiles. After analyzing the sounding data, the TWDB selected 18 locations to collect sediment core samples, however, sediment cores were unattainable from two locations (Figure 2). Sediment cores were collected on January 27 – 30, 2020, with a custom-coring boat and an SDI VibeCore system.

Sediment cores are collected in 3-inch diameter aluminum tubes. A sediment core extends from the current reservoir-bottom surface, through the accumulated sediment, and into the pre-impoundment surface. After the sample is retrieved, the core tube is cut to the level of the sediment core. The tube is capped, labeled, and transported to TWDB headquarters for further analysis.

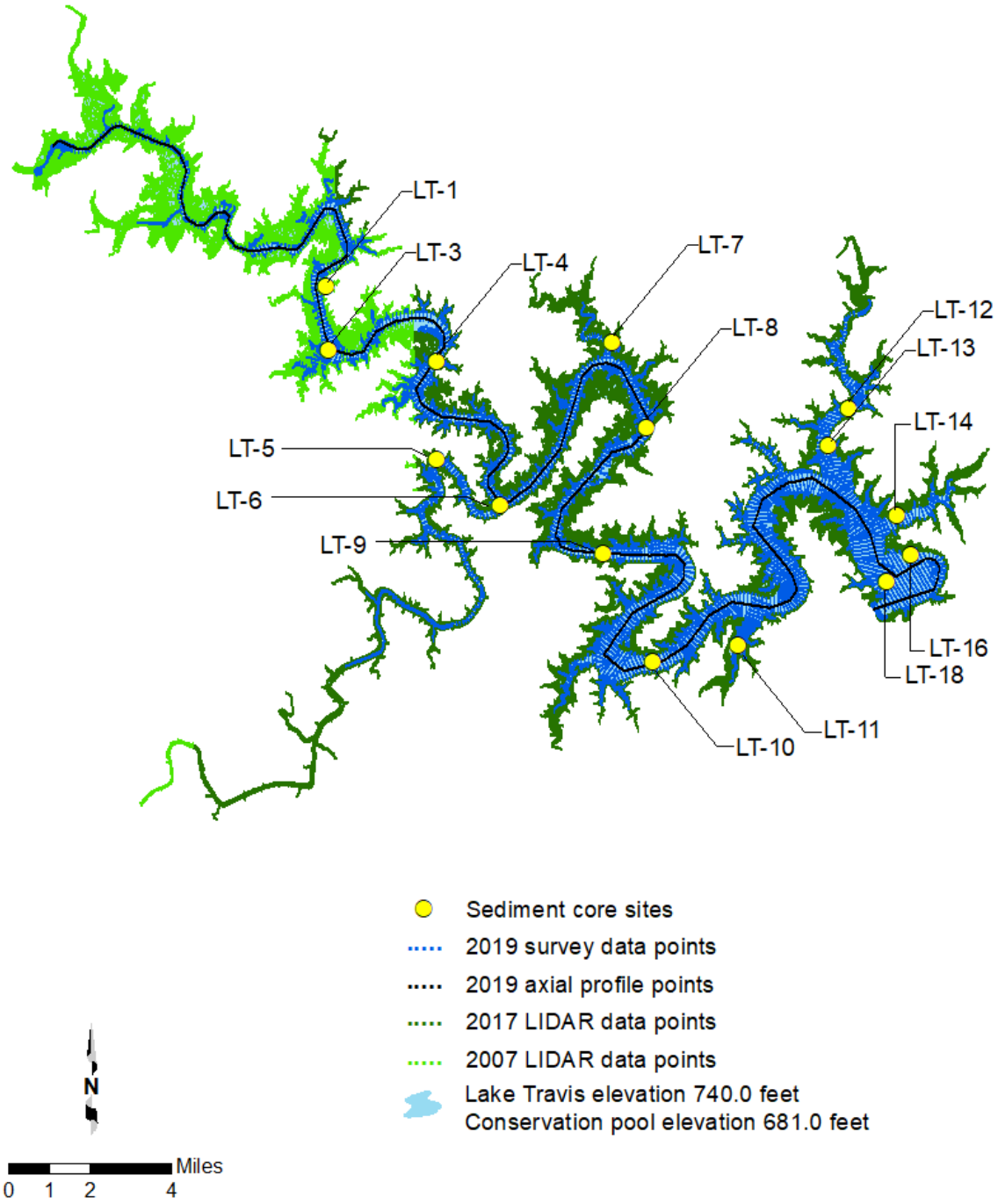

Figure 2. 2019 TWDB sounding data (*blue dots*), sediment coring locations (*yellow circles*), 2007 LIDAR data (*light green dots*), and 2017 LIDAR data (dark *green dots*).

Data processing

Model boundary

The reservoir's model boundary was generated with Light Detection and Ranging (LIDAR) Data available from the Texas Natural Resource Information System (TNRIS). LIDAR data acquired between January 28, 2017, and March 27, 2017, while the daily average water surface elevation of the reservoir measured between 681.48 feet and 682.99 feet, respectively, were available for the reservoir downstream of the area known as Muleshoe Bend, and are identified as the dark green points in Figure 2. LIDAR data collected on January 7, 2007 (Texas Water Development Board, 2009), while the daily average water surface elevation of the reservoir measured 644.50 feet, were used for the remaining area of the reservoir (light green points, Figure 2). The 2008 TWDB survey of Lake Travis used the 2007 LIDAR data for topographic modeling, however, it was reprocessed for 2019 modeling and analysis. As a result, there are minor differences between 2008 and 2019 area estimates at conservation pool elevation. Because the 2017 LIDAR was collected while the water surface elevation of the reservoir was above conservation pool elevation, the area in between the LIDAR and survey data is modeled while the 2008 model used 2007 LIDAR data that extended below conservation pool elevation. Both the 2007 and 2017 LIDAR data files were imported into an Environmental Systems Research Institute's ArcGIS file geodatabase. A topographical model of the data was generated and converted to a raster using a cell size of 1.0 meters by 1.0 meters. The horizontal datum of the LIDAR data is North American Datum 1983 (NAD83; meters) and the projection is Universal Transverse Mercator (UTM) Zone 14. The vertical datum is North American Vertical Datum 1988 (NAVD88; meters). Therefore, a contour of 225.735 meters NAVD88, equivalent to 740.6 feet NAVD88, was extracted from the raster. The vertical datum transformation offset of 0.60 feet, provided by the LCRA, was used to convert from feet NAVD88 to feet above mean sea level, resulting in a model boundary at conservation pool elevation of 740.0 feet above mean sea level. Additional editing of the 740.0-foot contour was necessary to remove artifacts and close the contour across the dam. Horizontal coordinate transformations to NAD83 State Plane Texas Central Zone (feet) coordinates were done using the ArcGIS Project tool.

LIDAR data points

To utilize the LIDAR data in the reservoir model, points were extracted from the topographical model of the reservoir. The topographical model, or terrain, was created using the z-tolerance pyramid type. The points were extracted at the smallest pyramid resolution of 0.5 meters to reduce computational burden without significantly affecting the modeled topography of the coverage area. New attribute fields were added to convert the elevations from meters to feet NAVD88 and then to feet above mean sea level for compatibility with the bathymetric survey data. LIDAR data with elevations not consistent with the TWDB survey data in areas of overlap were deleted and the shapefile projected to NAD83 State Plane Texas Central Zone (feet). No further interpolation of the data in the areas with only LIDAR coverage was necessary.

Triangulated Irregular Network model

Following completion of data collection, the raw data files collected by the TWDB were edited to remove data anomalies. The current bottom surface of the reservoir is automatically determined by the data acquisition software. Hydropick software, developed by TWDB staff, was used to display, interpret, and edit the multi-frequency data by manually removing data anomalies in the current bottom surface and to manually edit the pre-impoundment surfaces. The speed of sound profiles, also known as velocity casts, were used to further refine the measured depths. For each location velocity casts are collected, the harmonic mean sound speed of all the casts are calculated. From this, depths collected using one average speed of sound are corrected with an overall optimum speed of sound for each specific depth (Specialty Devices, Inc., 2018).

All data were exported into a single file, including the current reservoir bottom surface, pre-impoundment surface, and sediment thickness at each sounding location. The water surface elevation at the time of each sounding was used to convert each sounding depth to a corresponding reservoir-bottom elevation. This survey point dataset was then preconditioned by inserting a uniform grid of artificial survey points between the actual survey lines. Bathymetric elevations at these artificial points were determined using an anisotropic spatial interpolation algorithm described in the next section. This technique creates a high resolution, uniform grid of interpolated bathymetric elevation points throughout a majority of the reservoir (McEwen *et al.* 2011a). The resulting point file was used in conjunction with sounding and boundary data to create volumetric and sediment

Triangulated Irregular Network (TIN) models utilizing the 3D Analyst Extension of ArcGIS. The 3D Analyst algorithm uses Delaunay's criteria for triangulation to create a grid composed of triangles from non-uniformly spaced points, including the boundary vertices (Environmental Systems Research Institute, 1995).

Spatial interpolation of reservoir bathymetry

Isotropic spatial interpolation techniques such as the Delaunay triangulation used by the 3D Analyst extension of ArcGIS are, in many instances, unable to suitably interpolate bathymetry between survey lines common to reservoir surveys. Reservoirs and stream channels are anisotropic morphological features where bathymetry at any particular location is more similar to upstream and downstream locations than to transverse locations. Interpolation schemes that do not consider this anisotropy lead to the creation of several types of artifacts in the final representation of the reservoir bottom surface and hence to errors in volume. These artifacts may include artificially curved contour lines extending into the reservoir where the reservoir walls are steep or the reservoir is relatively narrow, intermittent representation of submerged stream channel connectivity, and oscillations of contour lines in between survey lines. These artifacts reduce the accuracy of the resulting volumetric and sediment TIN models in areas between actual survey data.

To improve the accuracy of bathymetric representation between survey lines, the TWDB developed various anisotropic spatial interpolation techniques. Generally, the directionality of interpolation at different locations of a reservoir can be determined from external data sources. A basic assumption is that the reservoir profile in the vicinity of a particular location has upstream and downstream similarity. In addition, the sinuosity and directionality of submerged stream channels can be determined by directly examining the survey data, or more robustly by examining scanned USGS 7.5-minute quadrangle maps (DRGs), hypsography files (the vector format of USGS 7.5-minute quadrangle map contours), and historical aerial photographs, when available. Using the survey data, polygons are created to partition the reservoir into segments with centerlines defining the directionality of interpolation within each segment. Using the interpolation definition files and survey data, the current reservoir-bottom elevation, pre-impoundment elevation, and sediment thickness are calculated for each point in the high-resolution uniform grid of artificial survey points. The reservoir boundary, artificial survey points grid, and survey data points are used to create volumetric and sediment TIN models representing reservoir

bathymetry and sediment accumulation throughout the reservoir. Specific details of this interpolation technique can be found in the HydroTools manual (McEwen and others, 2011a) and in McEwen and others (2011b).

In areas inaccessible to survey data collection, such as small coves and shallow upstream areas of the reservoir, linear interpolation is used for volumetric and sediment accumulation estimations (McEwen and others, 2011a). Although LIDAR was utilized, linear interpolation was necessary to accurately model features in the areas between survey data and LIDAR data. Linear interpolation results in improved elevation-capacity and elevation-area calculations.

Figure 3 illustrates typical results from application of the anisotropic interpolation as applied to Lake Travis. In Figure 3A, deeper channels and steep slopes indicated by surveyed cross-sections are not continuously represented in areas between survey cross-sections. This is an artifact of the TIN generation routine rather than an accurate representation of the physical bathymetric surface. Inclusion of interpolation points in creation of the volumetric TIN model, represented in Figure 3B, directs Delaunay triangulation to better represent the reservoir bathymetry between survey cross-sections. The bathymetry shown in Figure 3C was used in computing reservoir elevation-capacity (Appendix A) and elevation-area (Appendix B) tables.

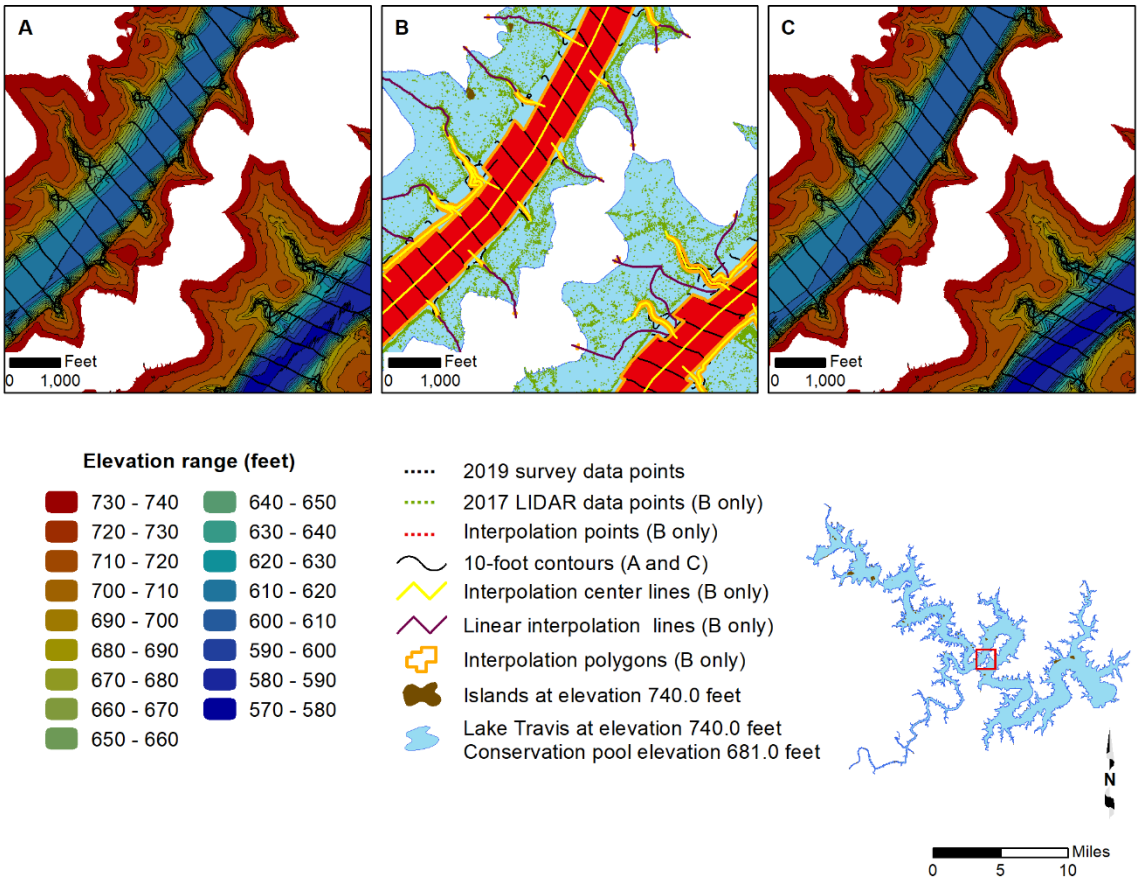

Figure 3. Anisotropic spatial interpolation as applied to Lake Travis sounding data; A) bathymetric contours without interpolated points, B) sounding points (*black*) and interpolated points (*red*), C) bathymetric contours with interpolated points.

Area, volume, and contour calculation

Volumes and areas were computed for the entire reservoir at 0.1-foot intervals, from 504.5 to 730.0 feet above mean sea level. The elevation-capacity table and elevation-area table, based on the 2019 survey and analysis, are presented in Appendices A and B, respectively. The capacity curve is presented in Appendix C, and the area curve is presented in Appendix D.

The volumetric TIN model was converted to a raster representation using a cell size of 2 feet by 2 feet. The raster data then were used to produce three figures: (1) an elevation relief map representing the topography of the reservoir bottom (Figure 4); (2) a depth range map showing depth ranges for Lake Travis (Figure 5); and, (3) a 10-foot contour map (Figure 6).

Figure 4

Lake Travis

Elevation relief map

2,960,000

3,000,000

3,040,000

10,160,000

10,120,000

650

650

600

550

550

Elevation
feet above mean sea level

670 - 681	580 - 590
660 - 670	570 - 580
650 - 660	560 - 570
640 - 650	550 - 560
630 - 640	540 - 550
620 - 630	530 - 540
610 - 620	520 - 530
600 - 610	510 - 520
590 - 600	504.6 - 510

50-foot contours

Projection: NAD83 State Plane
Texas Central Zone (feet)

N

0 0.5 1 2 Miles

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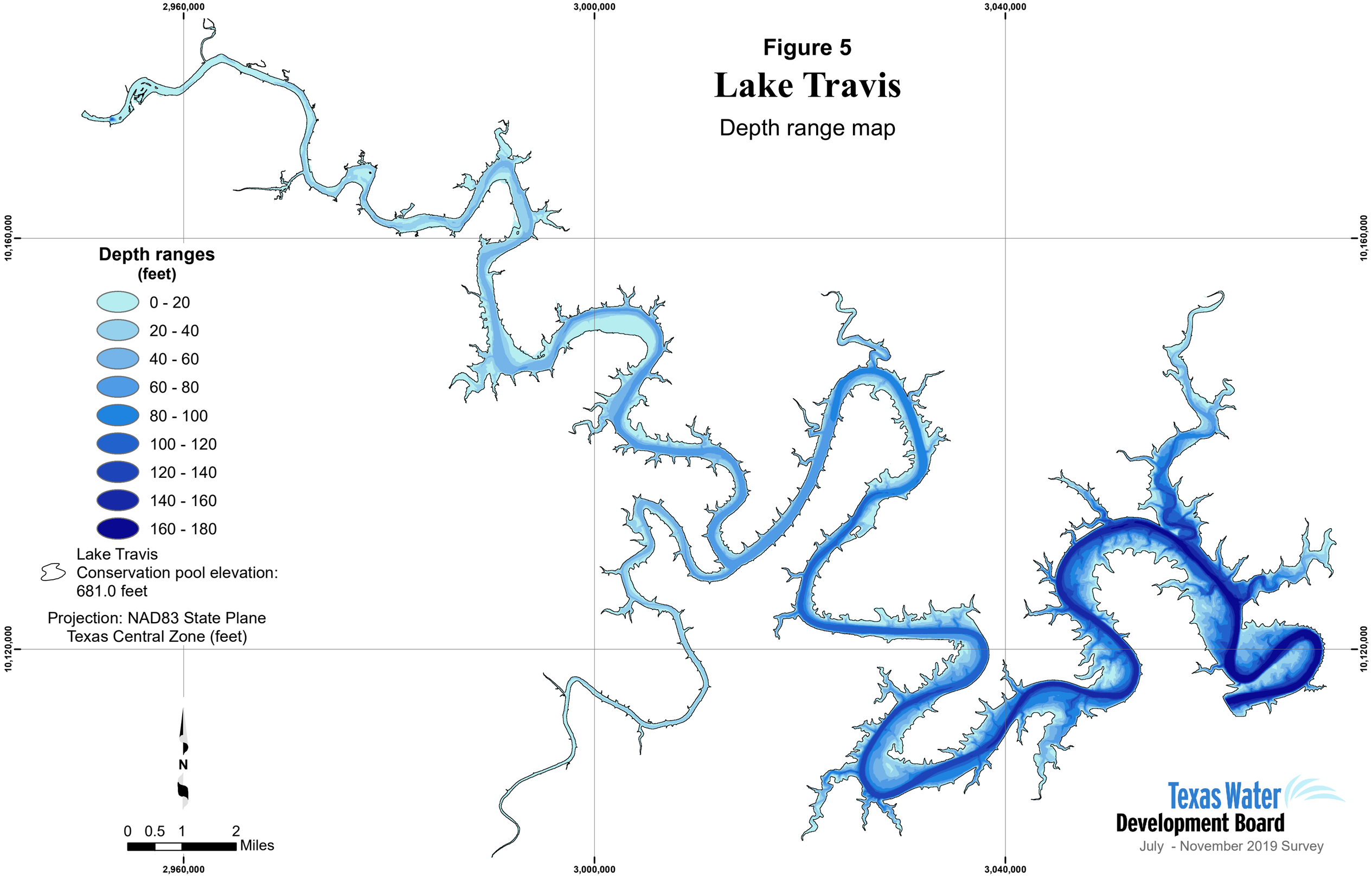
Figure 5

Lake Travis

Depth range map



Analysis of sediment data from Lake Travis

Sedimentation in Lake Travis was determined by analyzing the acoustic signal returns of all three depth sounder frequencies using customized software called Hydropick. While the 208 kHz signal is used to determine the current bathymetric surface, the 208 kHz, 50 kHz, and 12 kHz are analyzed to determine the reservoir bathymetric surface at the time of initial impoundment, *i.e.*, pre-impoundment surface. Sediment core samples collected in the reservoir are correlated with the acoustic signals in each frequency to assist in identifying the pre-impoundment surface. The difference between the current surface bathymetry and the pre-impoundment surface bathymetry yields a sediment thickness value at each sounding location.

Sediment cores were analyzed at TWDB headquarters in Austin. Each core was split longitudinally and analyzed to identify the location of the pre-impoundment surface. The pre-impoundment surface was identified within the sediment core using the following methods: (1) a visual examination of the sediment core for terrestrial materials, such as leaf litter, tree bark, twigs, intact roots, *etc.*, concentrations of which tend to occur on or just below the pre-impoundment surface; (2) recording changes in texture from well sorted, relatively fine-grained sediment to poorly sorted mixtures of coarse and fine-grained materials; and, (3) identifying variations in the physical properties of the sediment, particularly sediment water content and penetration resistance with depth (Van Metre and others, 2004). Total sediment core length, post impoundment sediment thickness, and pre-impoundment thickness were recorded. Physical characteristics of the sediment core, such as Munsell soil color, texture, relative water content, and presence of organic materials are presented in Table 2.

Table 2. Sediment core sample analysis data.

Sediment core sample	Easting[a] (feet)	Northing[a] (feet)	Total core sample / post-impoundment sediment length (inches)	Sediment core description[b]		Munsell soil color
LT-1	2990510.53	10156614.46	44.5 / 3.0	post-impoundment	0.0–3.0” high water content, sandy silt, soupy, bits of clay present, woody debris throughout, organic matter present	7.5YR 3/1 very dark gray
				pre-impoundment	3.0–39.0” moderate water content, dense silty clay, sticky, fibrous roots throughout, sticks and woody debris with organic matter near top of layer, organic matter present	7.5YR 3/1 very dark gray
					39.0–44.5” low water content, sandy clay, fibrous roots, small gravel mixed, organic matter present	7.5YR 3/1 very dark gray
LT-2	2989042.91	10156171.79	N/A	N/A	No recovery after multiple attempts	N/A
LT-3	2990839.37	10148393.88	16.0 / 13.0	post-impoundment	0.0–3.0” very high water content, silt, soupy, smooth	10YR 3/2 very dark grayish brown
					3.0–6.0” high water content, silt, puddinglike, smooth	10YR 4/2 dark grayish brown
					6.0–9.0” low water content, dense, fine sand with minimal silt, some woody debris, organic matter present	10YR 3/2 very dark grayish brown
					9.0–13.0” moderate water content, silt, peanut butter consistency, organic matter at 13.0”, organic matter present	10YR 2/1 black
				pre-impoundment	13.0–16.0” low water content, dense silty clay with bits of harder clay, malleable, fibrous roots throughout, organic matter present	10YR 3/1 very dark gray

[a] Coordinates are based on NAD83 State Plane Texas Central System (feet).

[b] Sediment core samples are measured in inches with zero representing the current bottom surface.

Table 2 (continued). Sediment core sample analysis data.

Sediment core sample	Easting[a] (feet)	Northing[a] (feet)	Total core sample / post-impoundment sediment length (inches)	Sediment core description[b]		Munsell soil color
LT-4	3004810.84	10146896.68	68.0 / 52.0	pre-impoundment	0.0–3.0" very high water content, silt, smooth, soupy	10YR 3/2 very dark grayish brown
					3.0–26.0" high water content, silt, woody debris between 10.0–12.0", fibrous roots, dense, sticky, puddinglike, organic matter present	10YR 3/1 very dark gray
					26.0–41.0" high water content, dense silt, density increasing with depth, consistent texture, peanut butter consistency, mottled coloration	2.5Y 2.5/1 black 10YR 4/2 dark grayish brown
					41.0–43.0" low water content, dense, fine sand with minimal silt	10YR 4/2 very dark grayish brown
					43.0–45.0" moderate water content, silty clay, dense	10YR 3/1 very dark gray
					45.0–52.0" high water content, silty sand, loosely packed, soupy	10YR 3/1 very dark gray
				pre-impoundment	52.0–68.0" low water content, coarse sand, some gravel mixed in, small amount of woody debris, organic matter present	10YR 4/3 brown
LT-5	3004776.8	10134275.62	120.0 / 117.0	post-impoundment	0.0–4.0" very high water content, soupy, silt	10YR 3/2 very dark grayish brown
					4.0–8.0" high water content, silt, puddinglike, smooth	10YR 3/2 very dark grayish brown
					8.0–90.0" moderate water content, silty clay, dense, organic matter at 46" and 69", woody debris at 85", organic matter present, mottled coloration	10YR 2/1 black 10YR 3/1 very dark gray
					90.0–117.0" low water content, smooth, silty clay, very dense, some organic matter at top of layer, fibrous roots, organic matter present	10YR 3/1 very dark gray
				pre-impoundment	117.0–120.0" very low water content, very dense silty clay, densely packed, hard clay throughout, very sticky, organic material throughout	10YR 3/1 very dark gray

a. Coordinates are based on NAD83 State Plane Texas Central System (feet).

b. Sediment core samples are measured in inches with zero representing the current bottom surface.

Table 2 (continued). Sediment core sample analysis data.

Sediment core sample	Easting[a] (feet)	Northing[a] (feet)	Total core sample / post-impoundment sediment length (inches)	Sediment core description[b]		Munsell soil color
LT-6	3013045.99	10128323.23	120.0 / 80.0	post-impoundment	0.0–8.0” high water content, silt, large amount of organic matter, leaf litter, bits of woody debris	10YR 4/1 dark gray
					8.0–80.0” low water content, water content decreases with depth, sticky, silty clay, few fibrous roots, organic matter present	10YR 4/1 dark gray
				pre-impoundment	80.0–120.0” low water content, water content decreases with depth, very dense, sticky, silty clay, few fibrous roots with some woody debris, organic matter present	10YR 3/1 very dark gray
LT-7	3027594.43	10149323.43	120.0 / 30.0	post-impoundment	0.0–10.0” very high water content, water content decreases with depth, silt, smooth, puddinglike	10YR 3/2 very dark grayish brown
					10.0–15.0” high to moderate water content, lots of organic matter, leaf litter, woody debris, fibrous roots, silt	10YR 2/1 black
					15.0–18.0” moderate to low water content, fine sand, dense, minimal silt	10YR 5/2 grayish brown
					18.0–22.0” moderate water content, silty sand, dense organic matter/bits of leaf litter present	10YR 4/1 dark gray
					22.0–25.0” moderate water content, silt and sand, lots of organic matter, leaf litter, woody debris, fibrous roots,	10YR 2/1 black
					25.0–30.0” low water content, medium fine sand, dense, minimal silt, bits of small gravel	10YR 5/2 grayish brown
				pre-impoundment	30.0–120.0” low water content, water content decreases with depth dense silty clay, density increases with depth, fibrous roots throughout, organic matter present	10YR 3/1 very dark gray

[a] Coordinates are based on NAD83 State Plane Texas Central System (feet).
[b] Sediment core samples are measured in inches with zero representing the current bottom surface.

Table 2 (continued). Sediment core sample analysis data.

Sediment core sample	Easting[a] (feet)	Northing[a] (feet)	Total core sample / post-impoundment sediment length (inches)	Sediment core description[b]		Munsell soil color
LT-8	3032002.96	10138413.44	79.0 / 76.0	post-impoundment	0.0–9.0” very high water content, silt, soupy, smooth	10YR 4/2 dark grayish brown
					9.0–76.0” moderate water content, silty clay, density increases with depth, bands of black at 12”, 20”, and 68”, uniform consistency, smooth	10YR 3/1 very dark gray
				pre-impoundment	76.0–79.0” low water content, silty clay, higher density, smooth, sticky, malleable, unknown plastic debris near bottom, no organic matter present	10YR 3/1 very dark gray
LT-9	3026353.17	10122044.21	120.0 / NA	post-impoundment	0.0–120.0” high to moderate water content, water content decreases with depth, silty clay, density increases with depth, some mottled coloration near top, texture uniform throughout	10YR 3/1 very dark gray
LT-10	3032946.52	10108036.24	73.0 / 73.0	post-impoundment	0.0–2.0” very high water content, soupy silt, smooth	10YR 4/2 dark grayish brown
					2.0–73.0” high to moderate water content, water content decreases with depth, silt, pudding like, uniform consistency, organic matter at very bottom, fibrous roots in bottom cap	10YR 3/1 very dark gray
LT-11	3043964.19	10110084.32	15.0 / 11.0	post-impoundment	0.0–2.0” very high water content, silt, smooth, soupy	10YR 3/2 very dark grayish brown
					2.0–6.0” high water content, sandy silt, pudding like, some hard bits of clay, fibrous roots, organic matter present	10YR 3/1 very dark gray
					6.0–11.0” moderate water content, sandy clay, fibrous roots, organic matter present	10YR 2/1 black
				pre-impoundment	11.0–15.0” low water content, silty clay, bits of gravel, dense, some coarse sand present, fibrous roots, organic material at bottom	10YR 2/1 black

[a] Coordinates are based on NAD83 State Plane Texas Central System (feet).

[b] Sediment core samples are measured in inches with zero representing the current bottom surface.

Table 2 (continued). Sediment core sample analysis data.

Sediment core sample	Easting[a] (feet)	Northing[a] (feet)	Total core sample / post-impoundment sediment length (inches)	Sediment core description[b]		Munsell soil color
LT-12	3058246.92	10140887.67	43.0 / 15.0	post-impoundment	0.0–6.0" very high water content, silt, soupy, smooth	10YR 4/2 dark grayish brown
					6.0–15.0" moderate to low water content, silty sand, density increases with depth, small gravel mixed throughout	10YR 2/1 black
				pre-impoundment	15.0–43.0" low to very low water content, dense fine sand, some mixed gravel, fibrous roots, organic matter present	10YR 5/2 grayish brown
LT-13	3055570.63	10135991.68	30.0 / 18.0	post-impoundment	0.0–6.0" very high water content, soupy silt, smooth	10YR 4/2 dark grayish brown
					6.0–11.0" high water content, silt, puddinglike, loosely packed	10YR 4/1 dark gray
					11.0–13.0" moderate to high water content, silty sand, dense, small gravel present	10YR 2/1 black
					13.0–18.0" high water content, silt, puddinglike, loosely packed	10YR 4/1 dark gray
				pre-impoundment	18.0–30.0" low to very low water content, water content decreases with depth, dense sandy clay, fibrous roots, organic matter present	10YR 2/2 very dark brown
LT-14	3064513.65	10126881.83	67.0 / 37.0	post-impoundment	0.0–3.0" very high water content, silt, soupy, smooth	10YR 4/2 dark grayish brown
					3.0–24.0" high water content, silt, puddinglike, uniform consistency	10YR 3/1 very dark gray
					24.0–37.0" moderate water content, silty sand, rocks mixed throughout, fibrous roots, woody debris throughout, snail shell, organic matter present	10YR 2/1 black
				pre-impoundment	37.0–67.0" low water content, water content decreases with depth, dense fine sand, small gravel mixed throughout, fibrous roots, dendritic roots throughout, organic matter present	10YR 4/2 dark grayish brown

[a.] Coordinates are based on NAD83 State Plane Texas Central System (feet).

[b.] Sediment core samples are measured in inches with zero representing the current bottom surface.

Table 2 (continued). Sediment core sample analysis data.

Sediment core sample	Easting[a] (feet)	Northing[a] (feet)	Total core sample / post-impoundment sediment length (inches)	Sediment core description[b]		Munsell soil color
LT-15	3064890.63	10125913.65	N/A	N/A	No recovery after multiple attempts	N/A
LT-16	3066323.27	10121921.17	20.0 / 15.0	post-impoundment	0.0–3.0" very high water content, silty sand, soupy	10YR 4/1 dark gray
					3.0–15.0" high water content, fine silty sand, bits of gravel, large 2-inch rock at 9"	10YR 4/1 dark gray
				pre-impoundment	15.0–20.0" moderate to low water content, sandy clay, large amount of gravel mixed throughout, fibrous and dendritic roots near bottom, organic matter present	10YR 4/1 dark gray
LT-17	3066383.90	10121711.40	N/A	N/A	No recovery. Could not secure anchors after multiple attempts.	N/A
LT-18	3063181.84	10118461.8	27.0 / 6.0	post-impoundment	0.0–6.0" very high water content, soupy silt, smooth	10YR 4/2 dark grayish brown
				pre-impoundment	6.0–27.0" moderate to low water content, water content decreases with depth, dense sandy clay, compact, density increases with depth, dendritic and fibrous roots throughout, organic matter present	10YR 3/3 dark brown

[a.] Coordinates are based on NAD83 State Plane Texas Central System (feet).

[b.] Sediment core samples are measured in inches with zero representing the current bottom surface.

A photograph of sediment core LT-6 (for location, refer to Figure 2) is shown in Figure 7. The base, or deepest part of the sample is denoted by the blue line. The pre-impoundment boundary (yellow line closest to the base) was evident within this sediment core sample at 80.0 inches and identified by the change in color, texture, moisture, porosity, and structure. Identification of the pre-impoundment surface for each sediment core followed a similar procedure.

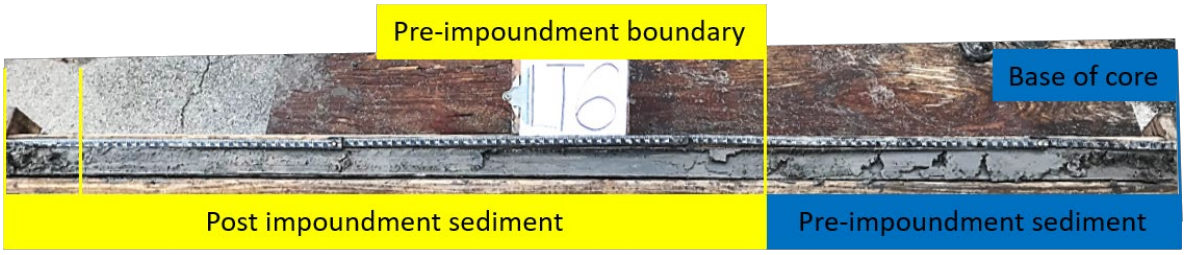


Figure 7. Sediment core LT-6. Post-impoundment sediment layers occur in the top 80.0 inches of this sediment core (identified by the yellow box). Pre-impoundment sediment layers were identified and are defined by the blue box.

Figure 8 illustrates the relationships between acoustic signal returns and the depositional layering seen in sediment cores. In this example, sediment core LT-6 is shown correlated with each frequency: 208 kHz, 50 kHz, and 12 kHz. The current bathymetric surface is determined based on signal returns from the 208 kHz transducer as represented by the top red line in Figure 8. The pre-impoundment surface is identified by comparing boundaries observed in the 208 kHz, 50 kHz, and 12 kHz signals to the location of the pre-impoundment surface of the sediment core sample. Many layers of sediment were identified during analysis based on changes in observed characteristics such as water content, organic matter content, and sediment particle size, and each layer is classified as either post-impoundment or pre-impoundment. Yellow boxes represent post-impoundment sediments identified in the sediment core. Blue boxes indicate pre-impoundment sediments.

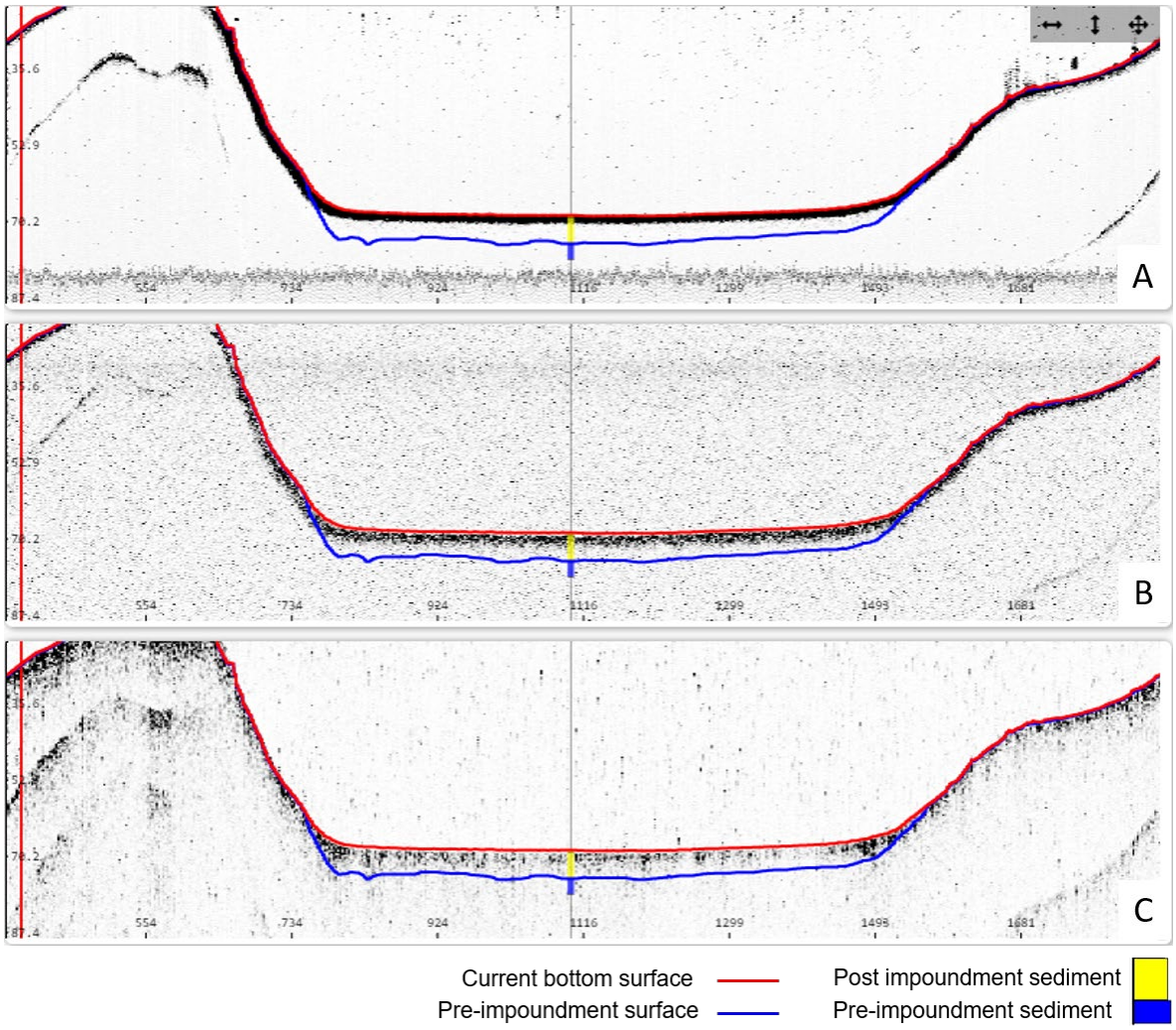


Figure 8. Sediment core sample LT-6 compared with acoustic signal returns. A) 208 kHz frequency, B) 50 kHz frequency, and C) 12 kHz frequency.

The pre-impoundment boundary in sediment core LT-6 most closely aligned with the different layers picked up by the 12 kHz acoustic returns (Figure 8). The pre-impoundment surface is first identified along cross-sections for which sediment core samples were collected. This information then is used as a guide for identifying the pre-impoundment surface along cross-sections where sediment core samples were not collected.

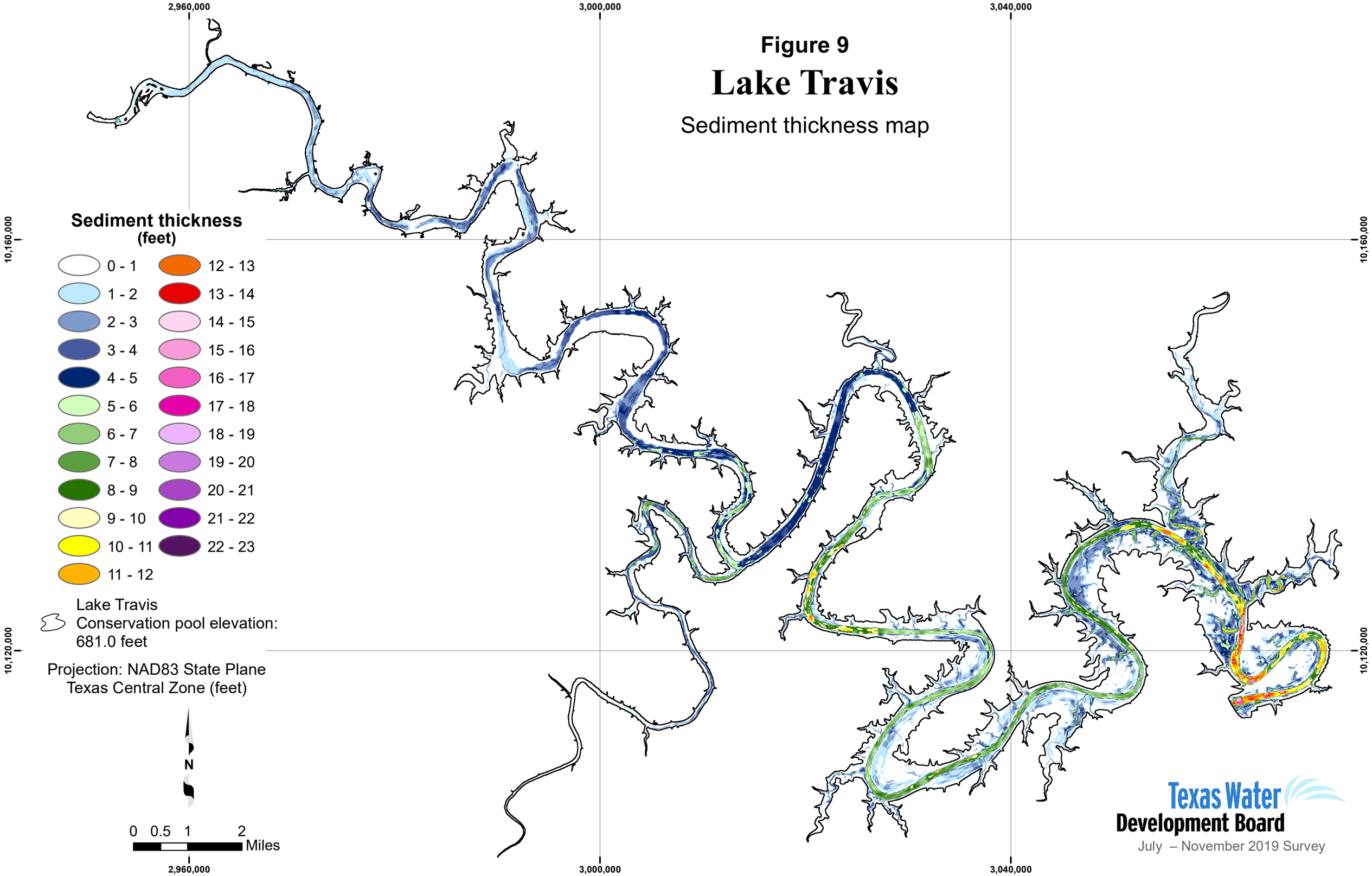
After the pre-impoundment surface for all cross-sections is identified, a pre-impoundment TIN model and a sediment thickness TIN model are created. Pre-impoundment elevations and sediment thicknesses are interpolated between surveyed cross-sections using HydroTools with the same interpolation definition file used for bathymetric interpolation. For the purposes of TIN model creation, the TWDB assumed the sediment thickness at each LIDAR data point and the reservoir boundary was 0 feet (defined as the 740.0-foot elevation contour). LIDAR data points overlapping survey data were deleted

from the pre-impoundment and sediment thickness TIN models. The sediment thickness TIN model was converted to a raster representation using a cell size of 5 feet by 5 feet and was used to produce a sediment thickness map (Figure 9). Elevation-capacity and elevation-area tables were computed from the pre-impoundment TIN model for the purpose of calculating the total volume of accumulated sediment.

Figure 9

Lake Travis

Sediment thickness map



Texas Water Development Board

July – November 2019 Survey

Survey results

Volumetric survey

The 2019 TWDB volumetric survey indicates that Lake Travis has a total reservoir capacity of 1,115,076 acre-feet and encompasses 19,044 acres at conservation pool elevation (681.0 feet above mean sea level). Current area and capacity estimates are compared to previous area and capacity estimates in Table 3. Because of differences in past and present survey methodologies, direct comparison of volumetric surveys to others to estimate loss of area and capacity can be unreliable.

Table 3. Surface area, total capacity, and conservation pool elevation.

Survey	Surface area (acres)	Total capacity (acre-feet)	Conservation pool elevation[a]	Source
LCRA original design	18,622	1,170,752	681.00	Texas Department of Water Resources, 1984
LCRA 1995	N/A	1,132,172	681.00	M. Luna, P.E., written commun(s)., 2008
TWDB 2008	19,199	1,134,863	681.00	Texas Water Development Board, 2009
TWDB 2019	19,044	1,115,076	681.00	

[a] Feet above mean sea level, LCRA legacy datum.

Volumetric survey accuracy assessment

Axial profile data were collected at the culmination of the survey to evaluate the accuracy of the volumetric survey. For location of the axial profile points see Figure 2. For other uses of the axial profile data see the section below titled “Axial profile”. First, the accuracy of the survey data was assessed by calculating the root mean square error (RMSE) of the differences between the axial profile points and the survey data points within 1.5 feet. Second, the accuracy of the interpolated data was assessed by calculating the RMSE of the differences between the axial profile points and the model surface. The RMSE of the survey data points is 0.41 feet and the RMSE of the model surface is 2.75 feet. Using the RMSE value of 2.75 feet as the range of uncertainty for the volumetric survey, 2.75 feet was added to and subtracted from only the survey data and interpolated data points. Elevation-area-capacity tables of the resulting models provide the range of potential error throughout the survey. Results at conservation pool elevation suggest the total reservoir capacity estimate is accurate to within ± 4.20 percent (± 46,690 acre-feet). The highly variable terrain within Lake Travis is difficult to model in several locations, including the undulating, irregular

sandy bottom upstream of Muleshoe Bend, and the area around Hudson Bend where axial profile points coincided with steep terrain. A minor deviation in the directionality of the model in these areas can result in a large mismatch against actual measurements, i.e. axial profile points. Additionally, as depth increases the percent of uncertainty increases as a small change in elevation can lead to a much larger percent change in area and capacity.

Sedimentation survey

The 2019 TWDB sedimentation survey measured 40,992 acre-feet of sediment. The sedimentation survey indicates sediment accumulation is greatest in the river channels. Comparison of capacity estimates of Lake Travis derived using differing methodologies are provided in Table 4 for sedimentation rate calculation. The 2019 TWDB sedimentation survey indicates Lake Travis has lost capacity at an average of 519 acre-feet per year since impoundment due to sedimentation below conservation pool elevation (681.0 feet above mean sea level). Previous capacity estimates and comparison with historical contour maps suggest the TWDB sedimentation survey results are likely an underestimate of the total sediment volume in Lake Travis. Lake Travis has periodically experienced low water levels leading to the desiccation of any exposed sediment. Upon inundation and re-saturation, exposed sediment will not return to its original high level of water content (Dunbar and Allen, 2003). Drying of sediment in exposed areas create hard surfaces that cannot be penetrated with gravity coring techniques, and compressive stresses on the sediments may also increase sediment density, inhibiting the measurement of the original, pre-impoundment surface. Density stratification in the sediment layers can also scatter and attenuate acoustic return signals of the multi-frequency depth sounder (U.S. Army Corps of Engineers, 2013b). Long-term trends indicate Lake Travis loses capacity at an average of 543 acre-feet per year since impoundment due to sedimentation below conservation pool elevation (681.0 feet above mean sea level) (Figure 10).

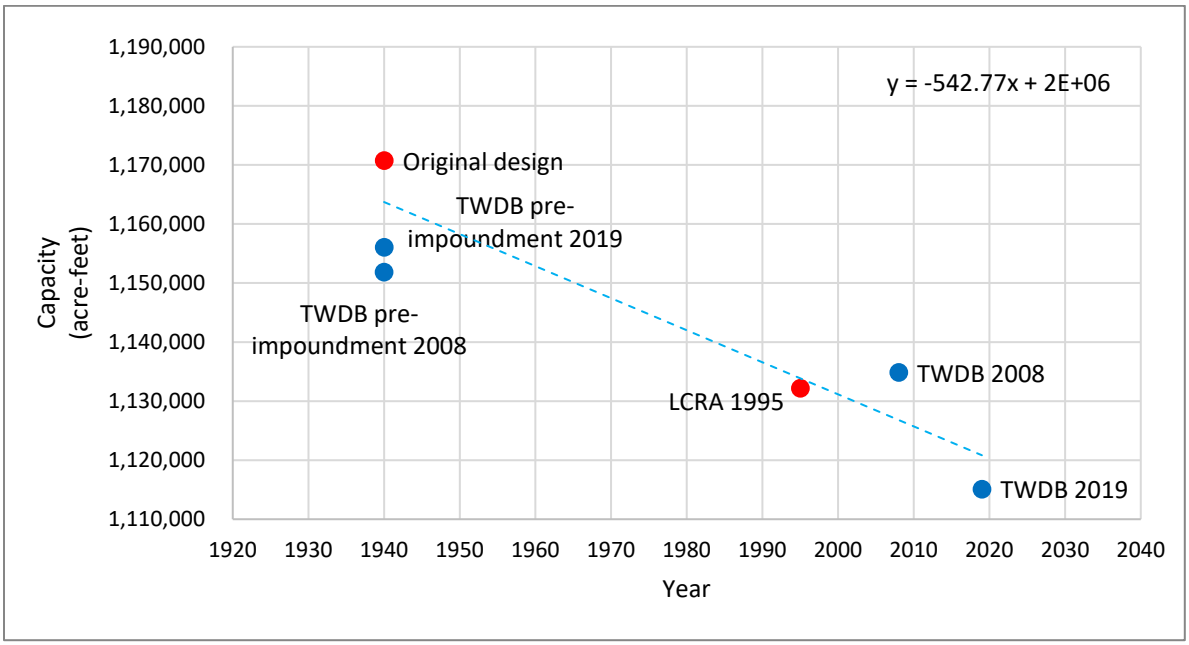


Figure 10. Plot of current and previous capacity estimates (acre-feet) at elevation 681.0 feet. Capacity estimates for each TWDB survey plotted as blue dots and other surveys as red dots. The blue trend line illustrates the total average loss of capacity through 2019. The TWDB pre-impoundment estimate from 2008 is plotted for informational purposes and was not considered in the trend line calculation.

Table 4. Average annual capacity loss comparisons.

Survey	Top of conservation pool elevation 681.0 feet above mean sea level (acre-feet)			
Original design[a]	1,170,752	<>	<>	<>
LCRA 1995[b]	<>	1,132,172	<>	<>
TWDB 2008[c]	<>	<>	1,134,863	<>
TWDB pre-impoundment estimate based on 2019 survey	<>	<>	<>	1,156,068
2019 volumetric survey	1,115,076	1,115,076	1,115,076	1,115,076
Volume difference (acre-feet)	55,676 (4.76%)	17,096 (1.51%)	19,787 (1.74%)	40,992 (3.55%)
Number of years	79	24	11	79
Capacity loss rate (acre-feet/year)	705	712	1,799	519
Capacity loss rate (acre-feet/square mile of drainage area of 27,352 square miles /year)	0.03	0.03	0.07	0.02

a. Source: Texas Department of Water Resources, 1984, note: Mansfield Dam was completed in May 1942, and the deliberate impoundment began on September 9, 1940.
b. Source: M. Luna, P.E., written commun(s)., 2008
c. Source: Texas Water Development Board, 2008

Axial profile

The axial profile of the reservoir, showing both the 2019 current and pre-impoundment surfaces, is plotted in Appendix E. Also presented in Appendix E are a map, depicting the TWDB location of the axial profile, and a table listing the coordinates of each vertex defining the axial line.

Identification of the pre-impoundment surface on the axial profile was based on the acoustic returns identified in the cross-sections where sediment cores were collected. Sediment core sites were selected to recollect cores where previously collected in 2008 and to correlate with unique acoustic returns throughout the reservoir. Axial profile data points within 1.5 feet of survey data points were compared to refine identification of the pre-impoundment surface along survey transects. Pre-impoundment acoustic signature interpretation was refined based on the agreement between intersecting data and applied during pre-impoundment identifications throughout the reservoir.

Recommendations

The TWDB recommends a detailed analysis of sediment deposits in the areas where exposure of the lake bottom may have led to identification of a false pre-impoundment using augured-coring techniques, as well as a volumetric survey in 10 years or after a major high flow event to further improve estimates of sediment accumulation rates. As technology improves, a volumetric and sedimentation survey may better define the pre-impoundment surface further improving estimates of sediment accumulation rates.

TWDB contact information

For more information about the TWDB Hydrographic Survey Program, visit www.twdb.texas.gov/surfacewater/surveys. Any questions regarding the TWDB Hydrographic Survey Program or this report may be addressed to: Hydrosurvey@twdb.texas.gov.

References

Dunbar, J.A. and Allen, P.M., 2003, Sediment Thickness from Coring and Acoustics within Lakes Aquilla, Granger, Limestone, and Proctor: Brazos River Watershed, TX: Baylor University, Department of Geology.

Environmental Systems Research Institute, 1995, ARC/INFO Surface Modeling and Display, TIN Users Guide: ESRI, California.

Lower Colorado River Authority, 2020a, LCRA dams form the Highland Lakes, Mansfield Dam and Lake Travis, accessed November 10, 2020, at https://www.lcra.org/water/dams-and-lakes/#mansfield

Lower Colorado River Authority, 2020b, Lakes Buchanan and Travis Water Management Plan and Drought Contingency Plan, accessed April 22, 2021, at http://centraltexaswatercoalition.org/wp-content/uploads/2020_Water_Management_Plan.pdf

McCune, C. J., 2000, Colorado River Project, U.S. Bureau of Reclamation, accessed June 3, 2020, at https://www.usbr.gov/history/ProjectHistories/COLORADO%20RIVER%20PROJECT%20MASTER%20ZLA%20HC%20FC%20BC%20IC%20SC%207.2010.pdf

McEwen, T., Brock, N., Kemp, J., Pothina, D. and Weyant, H., 2011a, HydroTools User's Manual: Texas Water Development Board.

McEwen, T., Pothina, D. and Negusse, S., 2011b, Improving efficiency and repeatability of lake volume estimates using Python: Proceedings of the 10th Python for Scientific Computing Conference.

Specialty Devices, Inc., 2018, SDI DepthPic post-processing software instruction manual: Wylie, Texas, Specialty Devices, Inc., p. 45.

Texas Commission on Environmental Quality, 2021, Texas Water Rights Viewer, accessed March 4, 2021, at https://tceq.maps.arcgis.com/home/webmap/viewer.html?webmap=796b001513b9407a9818897b4dc1ec4d

Texas Department of Water Resources, 1984, Water for Texas—Technical appendix: Austin, Tex., Texas Department of Water Resources, v. 2, p. III–14–1—III–14–11, accessed July 8, 2020, at https://www.twdb.texas.gov/publications/State_Water_Plan/1984/Water%20for%20Texas%20Volume%202%20Technical%20Appendix.pdf?d=14835

Texas Water Development Board, 1971, Mansfield Dam and Lake Travis, Report 126: Engineering Data on Dams and Reservoirs in Texas, Part III.

Texas Water Development Board, 2009, Volumetric and Sedimentation Survey of Lake Travis, accessed July 8, 2020, at

https://www.twdb.texas.gov/hydro_survey/Travis/2008-07/Travis2008_FinalReport.pdf

Texas Water Development Board, 2018, Contract No. 1848012279 with the Lower Colorado River Authority.

U.S. Army Corps of Engineers, 2013a, Draft Finding of No Significant Impact - Environmental Assessment Revisions to Mansfield (Marshall Ford) Dam and Lake Travis Water Control Manual, Colorado River, Colorado River Basin: U.S. Army Corps of Engineers, Appendix A, accessed June 3, 2020, at https://www.swf.usace.army.mil/Media/Public-Notices/Article/480316/draft-finding-of-no-significant-impact-environmental-assessment-revisions-to-ma/

U.S. Army Corps of Engineers, 2013b, Engineering and Design, Hydrographic Surveying - Engineer Manual, EM 1100-2-1003 (30 Nov 13): U.S. Army Corps of Engineers, Appendix P.

U.S. Bureau of the Budget, 1947, United States National Map Accuracy Standards, accessed September 21, 2017, at http://nationalmap.gov/standards/pdf/NMAS647.PDF.

U.S. Geological Survey, 2020, U.S. Geological Survey National Water Information System: Web Interface, *TX071 08154500 LCRA Lk Travis nr Austin, TX*, accessed July 9, 2020, at https://nwis.waterdata.usgs.gov/usa/nwis/uv/?cb_00062=on&cb_62614=on&cb_62615=on&format=rdb&site_no=08154500&period=&begin_date=2019-07-17&end_date=2019-11-14.

Van Metre, P.C., Wilson, J.T., Fuller, C.C., Callender, E., and Mahler, B.J., 2004, Collection, analysis, and age-dating of sediment cores from 56 U.S. lakes and reservoirs sampled by the U.S. Geological Survey, 1992-2001: U.S. Geological Survey Scientific Investigations Report 2004-5184, 180 p.

Appendix A

Lake Travis

RESERVOIR CAPACITY TABLE

TEXAS WATER DEVELOPMENT BOARD
CAPACITY IN ACRE-FEET
ELEVATION INCREMENT IS ONE TENTH FOOT

July – November 2019 Survey
Conservation Pool Elevation 681.0 feet above mean sea level

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
504						0	0	0	0	0
505	0	0	0	0	1	1	2	3	5	6
506	9	11	14	18	22	26	30	35	41	46
507	52	59	65	72	80	88	96	105	114	123
508	132	142	152	162	173	183	195	206	218	231
509	244	257	271	286	301	316	332	349	366	383
510	401	420	439	458	478	498	519	540	561	582
511	604	626	649	673	697	721	747	773	799	826
512	853	881	910	938	967	997	1,027	1,057	1,087	1,118
513	1,149	1,180	1,212	1,243	1,275	1,308	1,340	1,373	1,406	1,440
514	1,473	1,507	1,542	1,576	1,611	1,647	1,682	1,718	1,754	1,791
515	1,827	1,865	1,902	1,940	1,978	2,017	2,055	2,095	2,134	2,174
516	2,214	2,254	2,295	2,336	2,377	2,419	2,461	2,504	2,546	2,589
517	2,632	2,676	2,720	2,764	2,808	2,852	2,897	2,942	2,987	3,033
518	3,078	3,125	3,171	3,218	3,266	3,314	3,363	3,412	3,461	3,511
519	3,561	3,611	3,662	3,712	3,763	3,815	3,866	3,918	3,970	4,022
520	4,075	4,128	4,181	4,234	4,288	4,342	4,396	4,450	4,505	4,560
521	4,615	4,671	4,727	4,784	4,841	4,899	4,957	5,015	5,074	5,133
522	5,192	5,252	5,313	5,373	5,435	5,497	5,559	5,621	5,684	5,748
523	5,811	5,875	5,940	6,005	6,070	6,136	6,202	6,269	6,336	6,403
524	6,471	6,539	6,608	6,676	6,745	6,815	6,884	6,954	7,025	7,095
525	7,166	7,237	7,309	7,381	7,453	7,525	7,598	7,671	7,744	7,818
526	7,892	7,967	8,043	8,119	8,195	8,271	8,348	8,426	8,504	8,582
527	8,661	8,740	8,820	8,901	8,982	9,064	9,146	9,228	9,311	9,395
528	9,479	9,563	9,648	9,733	9,819	9,905	9,992	10,079	10,166	10,254
529	10,342	10,430	10,519	10,607	10,697	10,786	10,876	10,966	11,057	11,148
530	11,239	11,330	11,422	11,514	11,606	11,698	11,791	11,884	11,977	12,071
531	12,165	12,260	12,355	12,450	12,545	12,641	12,738	12,834	12,931	13,029
532	13,127	13,225	13,324	13,423	13,522	13,622	13,722	13,822	13,923	14,024
533	14,125	14,226	14,328	14,430	14,533	14,635	14,739	14,842	14,946	15,049
534	15,154	15,258	15,363	15,469	15,574	15,680	15,787	15,893	16,000	16,108
535	16,215	16,323	16,431	16,540	16,649	16,758	16,867	16,977	17,087	17,197
536	17,308	17,419	17,530	17,641	17,753	17,865	17,977	18,089	18,202	18,315
537	18,428	18,542	18,656	18,770	18,884	18,999	19,114	19,229	19,345	19,460
538	19,577	19,693	19,809	19,926	20,043	20,161	20,278	20,397	20,515	20,634
539	20,753	20,873	20,994	21,115	21,236	21,358	21,481	21,604	21,728	21,852
540	21,977	22,102	22,227	22,353	22,479	22,606	22,733	22,861	22,989	23,118
541	23,247	23,376	23,506	23,637	23,767	23,899	24,030	24,163	24,295	24,428
542	24,562	24,696	24,830	24,965	25,100	25,235	25,371	25,508	25,644	25,781
543	25,919	26,056	26,195	26,333	26,472	26,612	26,752	26,892	27,032	27,173
544	27,315	27,456	27,599	27,741	27,884	28,027	28,171	28,315	28,460	28,605
545	28,750	28,895	29,041	29,188	29,334	29,481	29,629	29,777	29,925	30,073
546	30,222	30,372	30,522	30,672	30,822	30,974	31,125	31,277	31,430	31,583
547	31,736	31,890	32,044	32,199	32,354	32,510	32,667	32,824	32,983	33,141
548	33,301	33,462	33,623	33,784	33,946	34,109	34,272	34,436	34,600	34,765
549	34,930	35,096	35,262	35,429	35,596	35,764	35,932	36,101	36,270	36,440

Appendix A (continued)

Lake Travis

RESERVOIR CAPACITY TABLE

TEXAS WATER DEVELOPMENT BOARD — July – November 2019 Survey

CAPACITY IN ACRE-FEET — Conservation Pool Elevation 681.0 feet above mean sea level

ELEVATION INCREMENT IS ONE TENTH FOOT

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
550	36,610	36,781	36,952	37,124	37,296	37,469	37,642	37,816	37,990	38,164
551	38,339	38,515	38,691	38,867	39,044	39,221	39,398	39,576	39,755	39,934
552	40,113	40,293	40,474	40,654	40,836	41,018	41,200	41,384	41,567	41,752
553	41,936	42,122	42,307	42,494	42,680	42,868	43,056	43,245	43,434	43,624
554	43,815	44,006	44,197	44,389	44,582	44,775	44,969	45,163	45,357	45,553
555	45,748	45,945	46,141	46,339	46,537	46,735	46,934	47,134	47,334	47,534
556	47,735	47,937	48,139	48,341	48,544	48,748	48,952	49,156	49,361	49,566
557	49,771	49,978	50,184	50,391	50,599	50,806	51,015	51,224	51,433	51,643
558	51,853	52,064	52,275	52,486	52,698	52,911	53,124	53,337	53,551	53,765
559	53,980	54,196	54,411	54,628	54,844	55,061	55,279	55,497	55,716	55,935
560	56,154	56,374	56,595	56,816	57,038	57,260	57,483	57,706	57,930	58,155
561	58,381	58,607	58,834	59,061	59,290	59,518	59,747	59,977	60,208	60,438
562	60,670	60,902	61,134	61,367	61,601	61,835	62,070	62,305	62,541	62,778
563	63,014	63,252	63,490	63,729	63,969	64,209	64,450	64,692	64,935	65,178
564	65,422	65,667	65,912	66,158	66,405	66,653	66,901	67,150	67,399	67,649
565	67,900	68,152	68,404	68,656	68,910	69,164	69,418	69,673	69,929	70,186
566	70,443	70,700	70,959	71,217	71,477	71,737	71,997	72,258	72,520	72,782
567	73,045	73,309	73,573	73,838	74,104	74,370	74,637	74,905	75,173	75,442
568	75,712	75,982	76,252	76,524	76,796	77,068	77,342	77,615	77,890	78,165
569	78,440	78,716	78,993	79,270	79,549	79,827	80,107	80,387	80,668	80,950
570	81,232	81,515	81,799	82,083	82,369	82,655	82,942	83,229	83,518	83,807
571	84,097	84,387	84,679	84,971	85,264	85,557	85,851	86,146	86,442	86,738
572	87,035	87,333	87,632	87,931	88,231	88,531	88,833	89,134	89,437	89,741
573	90,045	90,350	90,656	90,962	91,270	91,578	91,887	92,197	92,508	92,820
574	93,132	93,446	93,760	94,075	94,391	94,708	95,025	95,343	95,662	95,982
575	96,303	96,625	96,947	97,271	97,595	97,921	98,247	98,575	98,904	99,235
576	99,566	99,898	100,232	100,566	100,901	101,237	101,574	101,912	102,251	102,590
577	102,931	103,272	103,615	103,958	104,302	104,647	104,993	105,340	105,688	106,036
578	106,386	106,737	107,088	107,441	107,795	108,149	108,505	108,861	109,218	109,576
579	109,935	110,295	110,655	111,017	111,380	111,743	112,107	112,473	112,840	113,208
580	113,577	113,947	114,318	114,690	115,063	115,437	115,812	116,188	116,566	116,944
581	117,323	117,704	118,085	118,468	118,852	119,236	119,622	120,009	120,396	120,785
582	121,174	121,565	121,957	122,349	122,743	123,138	123,533	123,930	124,327	124,726
583	125,125	125,525	125,926	126,328	126,731	127,135	127,539	127,945	128,351	128,758
584	129,165	129,574	129,983	130,394	130,805	131,216	131,629	132,042	132,456	132,871
585	133,286	133,703	134,120	134,537	134,956	135,375	135,795	136,215	136,637	137,059
586	137,481	137,905	138,329	138,754	139,179	139,606	140,033	140,460	140,889	141,318
587	141,748	142,178	142,610	143,042	143,475	143,909	144,343	144,778	145,214	145,651
588	146,088	146,526	146,965	147,405	147,845	148,287	148,729	149,172	149,616	150,060
589	150,506	150,952	151,399	151,847	152,296	152,746	153,196	153,647	154,099	154,552
590	155,006	155,461	155,917	156,373	156,830	157,288	157,748	158,207	158,668	159,130
591	159,592	160,056	160,520	160,985	161,451	161,918	162,385	162,854	163,324	163,795
592	164,267	164,740	165,215	165,691	166,168	166,647	167,128	167,609	168,092	168,576
593	169,062	169,548	170,036	170,524	171,014	171,505	171,996	172,489	172,982	173,477
594	173,973	174,469	174,966	175,465	175,964	176,464	176,965	177,467	177,969	178,473
595	178,977	179,482	179,988	180,495	181,002	181,511	182,020	182,530	183,040	183,552
596	184,064	184,578	185,092	185,607	186,122	186,639	187,156	187,674	188,193	188,712
597	189,233	189,754	190,276	190,799	191,323	191,848	192,373	192,899	193,426	193,954
598	194,483	195,012	195,542	196,073	196,605	197,138	197,671	198,206	198,741	199,278
599	199,815	200,353	200,891	201,431	201,972	202,513	203,055	203,598	204,142	204,687

Appendix A (continued)

Lake Travis

RESERVOIR CAPACITY TABLE

TEXAS WATER DEVELOPMENT BOARD — July – November 2019 Survey

CAPACITY IN ACRE-FEET — Conservation Pool Elevation 681.0 feet above mean sea level

ELEVATION INCREMENT IS ONE TENTH FOOT

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
600	205,233	205,779	206,326	206,874	207,423	207,973	208,524	209,075	209,628	210,181
601	210,734	211,289	211,845	212,401	212,959	213,517	214,076	214,636	215,197	215,759
602	216,322	216,885	217,450	218,015	218,582	219,150	219,718	220,288	220,858	221,429
603	222,001	222,575	223,149	223,724	224,300	224,876	225,454	226,033	226,613	227,193
604	227,775	228,358	228,942	229,526	230,113	230,700	231,289	231,879	232,470	233,063
605	233,656	234,250	234,846	235,443	236,041	236,640	237,240	237,842	238,444	239,048
606	239,653	240,260	240,867	241,477	242,087	242,700	243,314	243,929	244,546	245,164
607	245,783	246,405	247,027	247,651	248,277	248,903	249,531	250,160	250,791	251,423
608	252,056	252,691	253,327	253,964	254,603	255,242	255,883	256,526	257,169	257,814
609	258,460	259,107	259,756	260,405	261,057	261,709	262,363	263,018	263,674	264,332
610	264,991	265,651	266,313	266,975	267,639	268,304	268,971	269,638	270,306	270,976
611	271,647	272,318	272,991	273,665	274,340	275,016	275,692	276,370	277,049	277,729
612	278,410	279,092	279,775	280,458	281,143	281,830	282,517	283,205	283,894	284,585
613	285,276	285,969	286,662	287,357	288,053	288,750	289,448	290,147	290,847	291,548
614	292,250	292,954	293,658	294,364	295,071	295,780	296,489	297,200	297,912	298,625
615	299,340	300,055	300,772	301,490	302,210	302,930	303,652	304,376	305,100	305,826
616	306,553	307,280	308,010	308,740	309,472	310,204	310,939	311,674	312,410	313,148
617	313,887	314,627	315,368	316,110	316,853	317,598	318,344	319,090	319,838	320,588
618	321,338	322,090	322,843	323,597	324,353	325,110	325,868	326,627	327,388	328,149
619	328,913	329,678	330,444	331,211	331,980	332,751	333,523	334,296	335,071	335,847
620	336,625	337,404	338,185	338,968	339,752	340,538	341,325	342,113	342,903	343,695
621	344,487	345,282	346,077	346,874	347,673	348,473	349,274	350,077	350,881	351,686
622	352,493	353,301	354,111	354,922	355,735	356,548	357,364	358,180	358,998	359,818
623	360,639	361,461	362,284	363,109	363,936	364,764	365,593	366,424	367,256	368,089
624	368,924	369,761	370,598	371,437	372,278	373,119	373,962	374,807	375,652	376,499
625	377,348	378,198	379,049	379,901	380,755	381,609	382,466	383,323	384,182	385,042
626	385,903	386,766	387,630	388,496	389,363	390,231	391,100	391,971	392,844	393,717
627	394,592	395,468	396,346	397,225	398,106	398,988	399,871	400,756	401,643	402,530
628	403,420	404,310	405,202	406,095	406,990	407,886	408,784	409,683	410,583	411,485
629	412,389	413,294	414,200	415,108	416,017	416,927	417,839	418,752	419,666	420,582
630	421,499	422,418	423,338	424,259	425,182	426,106	427,031	427,958	428,886	429,816
631	430,746	431,679	432,612	433,547	434,484	435,422	436,361	437,301	438,243	439,187
632	440,131	441,077	442,025	442,974	443,924	444,876	445,829	446,784	447,740	448,697
633	449,655	450,616	451,577	452,540	453,505	454,471	455,439	456,408	457,378	458,351
634	459,324	460,299	461,276	462,254	463,233	464,214	465,197	466,180	467,166	468,152
635	469,140	470,130	471,121	472,113	473,107	474,102	475,098	476,096	477,095	478,096
636	479,098	480,102	481,107	482,114	483,122	484,131	485,142	486,154	487,168	488,184
637	489,200	490,219	491,238	492,260	493,282	494,306	495,332	496,359	497,388	498,418
638	499,449	500,483	501,517	502,554	503,591	504,631	505,671	506,714	507,757	508,803
639	509,850	510,898	511,948	512,999	514,052	515,106	516,162	517,219	518,278	519,338
640	520,400	521,463	522,528	523,594	524,662	525,732	526,803	527,876	528,950	530,026
641	531,104	532,183	533,264	534,346	535,430	536,516	537,603	538,692	539,782	540,874
642	541,968	543,063	544,160	545,259	546,359	547,461	548,564	549,669	550,776	551,884
643	552,994	554,105	555,218	556,333	557,449	558,567	559,687	560,808	561,931	563,056
644	564,182	565,310	566,440	567,571	568,704	569,839	570,975	572,113	573,252	574,393
645	575,536	576,680	577,826	578,974	580,123	581,274	582,426	583,580	584,736	585,894
646	587,053	588,213	589,375	590,539	591,704	592,871	594,040	595,210	596,382	597,556
647	598,731	599,908	601,087	602,267	603,449	604,632	605,817	607,004	608,193	609,383
648	610,575	611,768	612,963	614,160	615,359	616,559	617,761	618,965	620,170	621,377
649	622,586	623,797	625,009	626,223	627,439	628,657	629,876	631,098	632,321	633,545

Appendix A (continued)

Lake Travis

RESERVOIR CAPACITY TABLE

TEXAS WATER DEVELOPMENT BOARD — July – November 2019 Survey

CAPACITY IN ACRE-FEET — Conservation Pool Elevation 681.0 feet above mean sea level

ELEVATION INCREMENT IS ONE TENTH FOOT

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
650	634,772	636,001	637,231	638,463	639,697	640,933	642,171	643,411	644,652	645,895
651	647,140	648,387	649,636	650,887	652,139	653,394	654,650	655,908	657,167	658,429
652	659,693	660,958	662,225	663,494	664,765	666,038	667,313	668,590	669,868	671,149
653	672,431	673,715	675,001	676,289	677,579	678,870	680,164	681,459	682,756	684,055
654	685,356	686,659	687,964	689,271	690,580	691,891	693,203	694,518	695,834	697,153
655	698,473	699,795	701,119	702,445	703,773	705,103	706,435	707,768	709,104	710,442
656	711,781	713,123	714,466	715,812	717,159	718,508	719,859	721,213	722,568	723,925
657	725,283	726,644	728,007	729,372	730,739	732,108	733,478	734,851	736,226	737,602
658	738,981	740,362	741,745	743,129	744,516	745,905	747,296	748,688	750,083	751,480
659	752,878	754,279	755,681	757,086	758,492	759,901	761,311	762,724	764,138	765,555
660	766,973	768,394	769,816	771,241	772,668	774,096	775,527	776,960	778,395	779,831
661	781,270	782,711	784,154	785,599	787,046	788,496	789,947	791,400	792,856	794,314
662	795,773	797,235	798,699	800,165	801,633	803,104	804,576	806,050	807,527	809,006
663	810,486	811,969	813,454	814,942	816,431	817,923	819,417	820,913	822,411	823,912
664	825,415	826,920	828,427	829,937	831,449	832,962	834,479	835,997	837,518	839,041
665	840,566	842,094	843,624	845,156	846,690	848,227	849,766	851,308	852,852	854,398
666	855,946	857,497	859,051	860,606	862,164	863,725	865,287	866,852	868,420	869,989
667	871,562	873,136	874,713	876,292	877,874	879,458	881,044	882,633	884,224	885,818
668	887,413	889,011	890,612	892,214	893,819	895,426	897,036	898,647	900,261	901,878
669	903,496	905,117	906,740	908,365	909,993	911,623	913,255	914,889	916,526	918,165
670	919,806	921,450	923,096	924,745	926,395	928,048	929,704	931,362	933,022	934,684
671	936,349	938,016	939,686	941,358	943,033	944,710	946,389	948,070	949,755	951,441
672	953,130	954,821	956,515	958,211	959,910	961,611	963,314	965,020	966,729	968,439
673	970,153	971,868	973,586	975,307	977,030	978,756	980,484	982,215	983,949	985,685
674	987,423	989,165	990,909	992,655	994,405	996,157	997,912	999,669	1,001,430	1,003,192
675	1,004,958	1,006,726	1,008,496	1,010,268	1,012,043	1,013,820	1,015,600	1,017,382	1,019,166	1,020,952
676	1,022,740	1,024,531	1,026,324	1,028,120	1,029,917	1,031,717	1,033,520	1,035,324	1,037,131	1,038,941
677	1,040,752	1,042,566	1,044,382	1,046,201	1,048,022	1,049,845	1,051,670	1,053,497	1,055,327	1,057,159
678	1,058,993	1,060,830	1,062,669	1,064,510	1,066,353	1,068,199	1,070,046	1,071,896	1,073,749	1,075,603
679	1,077,460	1,079,319	1,081,180	1,083,044	1,084,909	1,086,777	1,088,648	1,090,520	1,092,395	1,094,272
680	1,096,152	1,098,034	1,099,918	1,101,804	1,103,693	1,105,584	1,107,478	1,109,374	1,111,272	1,113,173
681	1,115,076	1,116,982	1,118,890	1,120,800	1,122,713	1,124,628	1,126,545	1,128,465	1,130,387	1,132,312
682	1,134,239	1,136,169	1,138,101	1,140,035	1,141,972	1,143,911	1,145,853	1,147,797	1,149,743	1,151,692
683	1,153,645	1,155,600	1,157,558	1,159,520	1,161,485	1,163,454	1,165,425	1,167,400	1,169,378	1,171,359
684	1,173,343	1,175,330	1,177,319	1,179,312	1,181,307	1,183,304	1,185,304	1,187,307	1,189,312	1,191,320
685	1,193,330	1,195,343	1,197,358	1,199,375	1,201,395	1,203,417	1,205,441	1,207,468	1,209,497	1,211,529
686	1,213,563	1,215,599	1,217,637	1,219,678	1,221,721	1,223,767	1,225,815	1,227,865	1,229,917	1,231,972
687	1,234,029	1,236,088	1,238,150	1,240,213	1,242,280	1,244,348	1,246,419	1,248,492	1,250,568	1,252,645
688	1,254,725	1,256,808	1,258,893	1,260,980	1,263,069	1,265,161	1,267,255	1,269,351	1,271,450	1,273,551
689	1,275,654	1,277,760	1,279,868	1,281,979	1,284,091	1,286,207	1,288,324	1,290,444	1,292,567	1,294,691
690	1,296,818	1,298,948	1,301,080	1,303,215	1,305,351	1,307,491	1,309,633	1,311,777	1,313,923	1,316,072
691	1,318,224	1,320,378	1,322,535	1,324,694	1,326,855	1,329,019	1,331,186	1,333,355	1,335,526	1,337,700
692	1,339,877	1,342,056	1,344,238	1,346,422	1,348,609	1,350,798	1,352,990	1,355,185	1,357,382	1,359,582
693	1,361,784	1,363,989	1,366,196	1,368,406	1,370,619	1,372,834	1,375,052	1,377,273	1,379,496	1,381,722
694	1,383,951	1,386,182	1,388,416	1,390,653	1,392,893	1,395,135	1,397,380	1,399,628	1,401,878	1,404,132
695	1,406,388	1,408,646	1,410,908	1,413,172	1,415,439	1,417,709	1,419,981	1,422,257	1,424,535	1,426,815
696	1,429,099	1,431,385	1,433,674	1,435,966	1,438,261	1,440,559	1,442,859	1,445,162	1,447,468	1,449,777
697	1,452,088	1,454,402	1,456,720	1,459,040	1,461,362	1,463,688	1,466,016	1,468,348	1,470,682	1,473,019
698	1,475,359	1,477,702	1,480,047	1,482,396	1,484,747	1,487,102	1,489,459	1,491,819	1,494,183	1,496,549
699	1,498,918	1,501,290	1,503,665	1,506,043	1,508,424	1,510,807	1,513,194	1,515,584	1,517,977	1,520,372

Appendix A (continued)

Lake Travis

RESERVOIR CAPACITY TABLE

TEXAS WATER DEVELOPMENT BOARD — July – November 2019 Survey

CAPACITY IN ACRE-FEET — Conservation Pool Elevation 681.0 feet above mean sea level

ELEVATION INCREMENT IS ONE TENTH FOOT

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
700	1,522,771	1,525,173	1,527,577	1,529,985	1,532,395	1,534,809	1,537,226	1,539,645	1,542,068	1,544,493
701	1,546,922	1,549,354	1,551,788	1,554,226	1,556,667	1,559,111	1,561,558	1,564,008	1,566,461	1,568,917
702	1,571,376	1,573,838	1,576,303	1,578,771	1,581,243	1,583,717	1,586,195	1,588,675	1,591,159	1,593,646
703	1,596,136	1,598,629	1,601,125	1,603,625	1,606,127	1,608,632	1,611,141	1,613,653	1,616,168	1,618,686
704	1,621,208	1,623,732	1,626,260	1,628,791	1,631,325	1,633,863	1,636,404	1,638,948	1,641,495	1,644,046
705	1,646,600	1,649,158	1,651,719	1,654,283	1,656,850	1,659,422	1,661,996	1,664,574	1,667,156	1,669,741
706	1,672,330	1,674,922	1,677,517	1,680,116	1,682,719	1,685,325	1,687,935	1,690,548	1,693,165	1,695,785
707	1,698,409	1,701,037	1,703,668	1,706,303	1,708,941	1,711,583	1,714,229	1,716,878	1,719,531	1,722,187
708	1,724,847	1,727,510	1,730,177	1,732,848	1,735,522	1,738,200	1,740,881	1,743,566	1,746,255	1,748,947
709	1,751,643	1,754,342	1,757,045	1,759,752	1,762,462	1,765,176	1,767,893	1,770,614	1,773,339	1,776,068
710	1,778,800	1,781,536	1,784,275	1,787,018	1,789,765	1,792,515	1,795,269	1,798,027	1,800,788	1,803,553
711	1,806,322	1,809,095	1,811,871	1,814,652	1,817,436	1,820,224	1,823,015	1,825,810	1,828,609	1,831,412
712	1,834,219	1,837,029	1,839,843	1,842,661	1,845,483	1,848,308	1,851,137	1,853,970	1,856,807	1,859,647
713	1,862,491	1,865,339	1,868,191	1,871,047	1,873,906	1,876,769	1,879,635	1,882,506	1,885,380	1,888,257
714	1,891,138	1,894,023	1,896,912	1,899,805	1,902,701	1,905,600	1,908,504	1,911,411	1,914,321	1,917,236
715	1,920,154	1,923,076	1,926,001	1,928,931	1,931,864	1,934,800	1,937,741	1,940,685	1,943,633	1,946,585
716	1,949,541	1,952,500	1,955,463	1,958,430	1,961,400	1,964,375	1,967,353	1,970,335	1,973,320	1,976,309
717	1,979,302	1,982,299	1,985,300	1,988,304	1,991,312	1,994,324	1,997,340	2,000,359	2,003,382	2,006,408
718	2,009,439	2,012,473	2,015,511	2,018,552	2,021,598	2,024,647	2,027,699	2,030,756	2,033,816	2,036,881
719	2,039,948	2,043,020	2,046,096	2,049,175	2,052,258	2,055,345	2,058,435	2,061,529	2,064,628	2,067,729
720	2,070,835	2,073,945	2,077,058	2,080,176	2,083,297	2,086,422	2,089,552	2,092,685	2,095,822	2,098,963
721	2,102,108	2,105,257	2,108,410	2,111,567	2,114,728	2,117,893	2,121,062	2,124,235	2,127,411	2,130,592
722	2,133,777	2,136,965	2,140,158	2,143,354	2,146,554	2,149,759	2,152,967	2,156,179	2,159,395	2,162,615
723	2,165,839	2,169,067	2,172,299	2,175,535	2,178,774	2,182,018	2,185,265	2,188,517	2,191,773	2,195,032
724	2,198,296	2,201,564	2,204,835	2,208,111	2,211,391	2,214,675	2,217,964	2,221,256	2,224,553	2,227,853
725	2,231,158	2,234,467	2,237,780	2,241,098	2,244,419	2,247,744	2,251,073	2,254,407	2,257,744	2,261,086
726	2,264,431	2,267,781	2,271,134	2,274,492	2,277,853	2,281,219	2,284,589	2,287,962	2,291,340	2,294,722
727	2,298,118	2,301,492	2,304,890	2,308,287	2,311,685	2,315,106	2,318,503	2,321,924	2,325,344	2,328,765
728	2,332,185	2,335,629	2,339,050	2,342,493	2,345,937	2,349,380	2,352,847	2,356,290	2,359,757	2,363,223
729	2,366,690	2,370,156	2,373,646	2,377,112	2,380,601	2,384,091	2,387,580	2,391,093	2,394,582	2,398,095
730	2,401,607									

Appendix B

Lake Travis

RESERVOIR AREA TABLE

TEXAS WATER DEVELOPMENT BOARD — July – November 2019 Survey

AREA IN ACRES — Conservation Pool Elevation 681.0 feet above mean sea level

ELEVATION INCREMENT IS ONE TENTH FOOT

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
504						0	0	0	0	0
505	0	0	1	2	4	6	9	13	18	22
506	25	28	31	35	41	44	48	51	54	58
507	62	65	69	73	77	81	84	87	90	93
508	96	99	101	104	106	110	113	118	122	128
509	133	138	143	147	152	157	162	168	173	178
510	183	188	192	196	199	203	207	210	214	217
511	221	225	230	237	245	251	257	262	267	271
512	276	280	285	289	293	296	299	303	306	309
513	311	314	317	319	322	324	327	330	333	336
514	339	342	345	348	351	354	357	360	363	367
515	370	374	377	380	383	386	389	392	396	399
516	402	406	409	413	416	419	423	425	428	431
517	433	436	439	441	444	446	449	451	453	456
518	460	464	468	474	480	484	488	492	495	498
519	501	504	506	509	511	514	517	519	522	525
520	527	530	533	535	537	540	542	544	547	552
521	556	561	565	569	574	578	581	585	588	592
522	597	602	607	611	616	619	624	628	632	636
523	639	643	647	651	655	660	665	668	672	676
524	679	682	686	689	692	695	699	702	705	708
525	710	713	716	719	722	726	729	732	735	740
526	747	752	756	760	764	768	772	776	780	785
527	790	798	804	809	814	819	823	828	833	837
528	841	846	850	855	859	863	867	871	875	878
529	881	885	888	891	894	898	901	904	906	909
530	912	915	917	920	923	926	929	932	936	940
531	944	947	950	954	957	961	965	970	974	978
532	981	985	988	992	995	998	1,001	1,004	1,007	1,010
533	1,013	1,017	1,020	1,023	1,026	1,029	1,032	1,035	1,038	1,041
534	1,044	1,048	1,051	1,055	1,058	1,061	1,065	1,069	1,072	1,075
535	1,078	1,081	1,084	1,087	1,090	1,093	1,096	1,099	1,101	1,104
536	1,107	1,110	1,112	1,115	1,118	1,120	1,123	1,126	1,128	1,131
537	1,134	1,137	1,140	1,143	1,146	1,148	1,151	1,154	1,156	1,159
538	1,162	1,164	1,167	1,170	1,172	1,176	1,179	1,183	1,186	1,191
539	1,197	1,202	1,208	1,214	1,219	1,225	1,230	1,234	1,239	1,243
540	1,248	1,252	1,257	1,261	1,266	1,270	1,275	1,279	1,284	1,288
541	1,292	1,297	1,301	1,306	1,310	1,315	1,319	1,324	1,329	1,333
542	1,337	1,341	1,345	1,349	1,353	1,357	1,361	1,365	1,369	1,372
543	1,376	1,380	1,384	1,388	1,392	1,396	1,400	1,404	1,408	1,412
544	1,416	1,419	1,423	1,428	1,431	1,435	1,439	1,443	1,447	1,450
545	1,454	1,458	1,461	1,465	1,469	1,472	1,476	1,480	1,484	1,488
546	1,492	1,496	1,500	1,504	1,509	1,514	1,518	1,522	1,527	1,532
547	1,536	1,541	1,546	1,551	1,557	1,563	1,570	1,577	1,585	1,594
548	1,600	1,607	1,613	1,619	1,624	1,630	1,635	1,640	1,645	1,650
549	1,655	1,660	1,665	1,670	1,675	1,680	1,685	1,690	1,695	1,701

Appendix B (continued)

Lake Travis

RESERVOIR AREA TABLE

TEXAS WATER DEVELOPMENT BOARD — July – November 2019 Survey

AREA IN ACRES — Conservation Pool Elevation 681.0 feet above mean sea level

ELEVATION INCREMENT IS ONE TENTH FOOT

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
550	1,706	1,710	1,715	1,720	1,725	1,729	1,734	1,739	1,743	1,748
551	1,752	1,756	1,761	1,765	1,770	1,774	1,778	1,783	1,787	1,792
552	1,796	1,801	1,806	1,811	1,816	1,823	1,829	1,835	1,840	1,845
553	1,850	1,855	1,860	1,866	1,872	1,879	1,885	1,891	1,896	1,902
554	1,907	1,912	1,918	1,923	1,928	1,933	1,939	1,944	1,949	1,954
555	1,960	1,966	1,971	1,977	1,982	1,988	1,993	1,998	2,003	2,008
556	2,013	2,018	2,022	2,027	2,032	2,036	2,041	2,045	2,050	2,054
557	2,059	2,063	2,068	2,072	2,077	2,082	2,086	2,091	2,095	2,100
558	2,104	2,109	2,113	2,118	2,123	2,127	2,132	2,137	2,141	2,146
559	2,150	2,155	2,160	2,165	2,169	2,174	2,179	2,184	2,188	2,193
560	2,198	2,203	2,208	2,213	2,219	2,225	2,232	2,239	2,246	2,253
561	2,259	2,265	2,272	2,277	2,283	2,289	2,295	2,301	2,306	2,312
562	2,317	2,323	2,328	2,334	2,339	2,345	2,350	2,356	2,361	2,367
563	2,372	2,378	2,385	2,393	2,401	2,408	2,415	2,422	2,429	2,436
564	2,443	2,451	2,458	2,465	2,472	2,478	2,485	2,491	2,498	2,506
565	2,512	2,518	2,524	2,530	2,536	2,542	2,549	2,555	2,561	2,567
566	2,573	2,579	2,585	2,591	2,596	2,602	2,608	2,614	2,620	2,627
567	2,633	2,639	2,646	2,653	2,660	2,666	2,673	2,679	2,686	2,692
568	2,699	2,705	2,711	2,717	2,723	2,729	2,734	2,740	2,746	2,752
569	2,759	2,764	2,771	2,777	2,785	2,792	2,799	2,806	2,813	2,819
570	2,826	2,833	2,842	2,850	2,858	2,866	2,873	2,880	2,888	2,895
571	2,902	2,910	2,917	2,924	2,931	2,938	2,946	2,953	2,960	2,968
572	2,975	2,981	2,988	2,995	3,002	3,009	3,016	3,023	3,031	3,039
573	3,047	3,054	3,063	3,071	3,079	3,087	3,095	3,103	3,113	3,122
574	3,130	3,139	3,147	3,155	3,162	3,170	3,178	3,186	3,195	3,203
575	3,212	3,222	3,231	3,240	3,250	3,260	3,272	3,285	3,297	3,308
576	3,319	3,329	3,338	3,347	3,356	3,365	3,374	3,383	3,392	3,400
577	3,410	3,419	3,428	3,437	3,446	3,455	3,464	3,474	3,483	3,493
578	3,502	3,512	3,521	3,531	3,540	3,549	3,558	3,567	3,576	3,585
579	3,594	3,603	3,612	3,621	3,630	3,639	3,650	3,661	3,673	3,684
580	3,695	3,705	3,715	3,725	3,736	3,747	3,757	3,768	3,779	3,789
581	3,800	3,810	3,821	3,831	3,841	3,851	3,861	3,871	3,881	3,891
582	3,901	3,911	3,921	3,931	3,941	3,951	3,960	3,970	3,980	3,989
583	3,998	4,007	4,016	4,024	4,033	4,041	4,049	4,057	4,065	4,074
584	4,082	4,090	4,098	4,106	4,113	4,121	4,129	4,136	4,144	4,151
585	4,159	4,166	4,174	4,181	4,188	4,195	4,202	4,209	4,216	4,223
586	4,230	4,238	4,245	4,252	4,259	4,266	4,274	4,281	4,288	4,295
587	4,303	4,310	4,318	4,325	4,333	4,340	4,348	4,355	4,363	4,370
588	4,378	4,385	4,393	4,401	4,409	4,417	4,425	4,434	4,442	4,451
589	4,459	4,467	4,476	4,484	4,492	4,500	4,509	4,517	4,526	4,534
590	4,543	4,551	4,560	4,569	4,578	4,586	4,595	4,603	4,612	4,620
591	4,629	4,638	4,647	4,655	4,664	4,673	4,683	4,693	4,704	4,715
592	4,727	4,738	4,751	4,766	4,783	4,797	4,811	4,824	4,836	4,848
593	4,859	4,870	4,880	4,891	4,901	4,911	4,921	4,932	4,941	4,951
594	4,960	4,969	4,979	4,988	4,997	5,005	5,013	5,022	5,030	5,038
595	5,047	5,055	5,063	5,071	5,079	5,088	5,096	5,104	5,112	5,120
596	5,128	5,136	5,144	5,152	5,160	5,168	5,176	5,184	5,192	5,200
597	5,209	5,218	5,226	5,234	5,242	5,250	5,258	5,266	5,273	5,281
598	5,290	5,298	5,306	5,315	5,323	5,331	5,340	5,350	5,358	5,367
599	5,376	5,384	5,392	5,401	5,409	5,418	5,426	5,435	5,443	5,452

Appendix B (continued)

Lake Travis

RESERVOIR AREA TABLE

TEXAS WATER DEVELOPMENT BOARD — July – November 2019 Survey

AREA IN ACRES — Conservation Pool Elevation 681.0 feet above mean sea level

ELEVATION INCREMENT IS ONE TENTH FOOT

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
600	5,460	5,468	5,477	5,485	5,494	5,503	5,511	5,519	5,527	5,535
601	5,543	5,552	5,561	5,570	5,579	5,588	5,596	5,605	5,613	5,622
602	5,631	5,641	5,651	5,661	5,671	5,681	5,690	5,699	5,708	5,718
603	5,727	5,736	5,745	5,754	5,764	5,773	5,783	5,792	5,802	5,812
604	5,822	5,832	5,843	5,856	5,868	5,881	5,895	5,906	5,917	5,928
605	5,939	5,950	5,962	5,974	5,986	5,998	6,009	6,021	6,032	6,044
606	6,057	6,070	6,085	6,100	6,117	6,132	6,146	6,160	6,174	6,188
607	6,204	6,219	6,233	6,247	6,260	6,273	6,286	6,299	6,313	6,326
608	6,340	6,353	6,366	6,379	6,391	6,404	6,417	6,430	6,442	6,454
609	6,466	6,478	6,491	6,504	6,518	6,530	6,543	6,556	6,570	6,584
610	6,597	6,610	6,622	6,633	6,645	6,657	6,668	6,679	6,690	6,701
611	6,712	6,723	6,733	6,743	6,753	6,763	6,773	6,784	6,794	6,803
612	6,814	6,824	6,834	6,845	6,855	6,866	6,877	6,888	6,899	6,910
613	6,920	6,931	6,942	6,952	6,963	6,973	6,984	6,995	7,006	7,017
614	7,028	7,040	7,053	7,066	7,078	7,090	7,102	7,114	7,126	7,138
615	7,150	7,162	7,175	7,187	7,200	7,213	7,226	7,239	7,251	7,262
616	7,274	7,286	7,297	7,310	7,322	7,335	7,347	7,359	7,371	7,383
617	7,394	7,405	7,416	7,428	7,439	7,451	7,462	7,474	7,487	7,499
618	7,511	7,524	7,537	7,550	7,562	7,574	7,586	7,599	7,612	7,626
619	7,640	7,655	7,669	7,683	7,697	7,712	7,726	7,741	7,756	7,770
620	7,785	7,802	7,817	7,834	7,849	7,864	7,878	7,893	7,907	7,921
621	7,935	7,950	7,964	7,978	7,992	8,006	8,020	8,034	8,048	8,062
622	8,076	8,090	8,103	8,117	8,132	8,146	8,160	8,173	8,187	8,201
623	8,215	8,228	8,243	8,258	8,272	8,286	8,300	8,314	8,330	8,343
624	8,356	8,370	8,383	8,397	8,410	8,423	8,436	8,450	8,464	8,477
625	8,491	8,504	8,517	8,530	8,543	8,555	8,568	8,581	8,594	8,608
626	8,621	8,634	8,648	8,662	8,676	8,689	8,702	8,716	8,729	8,742
627	8,756	8,770	8,784	8,799	8,814	8,828	8,843	8,857	8,870	8,884
628	8,897	8,911	8,925	8,939	8,954	8,969	8,984	8,999	9,014	9,028
629	9,042	9,056	9,070	9,083	9,097	9,110	9,124	9,138	9,151	9,165
630	9,179	9,192	9,206	9,220	9,233	9,247	9,261	9,275	9,288	9,302
631	9,316	9,330	9,343	9,357	9,371	9,384	9,398	9,413	9,426	9,440
632	9,455	9,469	9,483	9,497	9,511	9,524	9,538	9,552	9,566	9,579
633	9,594	9,609	9,624	9,639	9,654	9,668	9,684	9,699	9,714	9,729
634	9,743	9,758	9,772	9,787	9,802	9,817	9,831	9,845	9,859	9,874
635	9,888	9,902	9,916	9,930	9,944	9,958	9,972	9,986	10,000	10,015
636	10,029	10,043	10,058	10,072	10,087	10,102	10,117	10,131	10,146	10,161
637	10,175	10,190	10,204	10,219	10,234	10,249	10,264	10,279	10,294	10,309
638	10,324	10,339	10,354	10,370	10,385	10,400	10,416	10,431	10,446	10,460
639	10,475	10,490	10,505	10,520	10,535	10,550	10,565	10,580	10,595	10,610
640	10,625	10,640	10,656	10,672	10,688	10,703	10,719	10,736	10,752	10,768
641	10,784	10,800	10,816	10,832	10,848	10,864	10,880	10,896	10,912	10,929
642	10,945	10,962	10,978	10,994	11,010	11,026	11,041	11,057	11,074	11,090
643	11,106	11,123	11,139	11,155	11,172	11,188	11,205	11,221	11,238	11,255
644	11,272	11,288	11,305	11,321	11,337	11,354	11,370	11,386	11,403	11,419
645	11,436	11,452	11,468	11,484	11,500	11,517	11,533	11,549	11,565	11,582
646	11,598	11,614	11,630	11,646	11,662	11,678	11,694	11,711	11,728	11,744
647	11,761	11,777	11,794	11,810	11,827	11,843	11,860	11,877	11,893	11,910
648	11,926	11,943	11,960	11,977	11,994	12,012	12,029	12,046	12,063	12,081
649	12,098	12,115	12,132	12,150	12,168	12,185	12,203	12,221	12,239	12,258

Appendix B (continued)

Lake Travis

RESERVOIR AREA TABLE

TEXAS WATER DEVELOPMENT BOARD — July – November 2019 Survey

AREA IN ACRES — Conservation Pool Elevation 681.0 feet above mean sea level

ELEVATION INCREMENT IS ONE TENTH FOOT

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
650	12,276	12,295	12,314	12,332	12,350	12,368	12,387	12,405	12,423	12,441
651	12,460	12,479	12,497	12,516	12,534	12,552	12,571	12,589	12,607	12,625
652	12,644	12,663	12,682	12,701	12,720	12,738	12,757	12,776	12,795	12,813
653	12,832	12,851	12,870	12,888	12,906	12,925	12,944	12,963	12,982	13,001
654	13,020	13,039	13,059	13,078	13,098	13,117	13,136	13,155	13,174	13,193
655	13,212	13,231	13,250	13,269	13,289	13,309	13,328	13,348	13,367	13,387
656	13,406	13,425	13,444	13,463	13,483	13,502	13,521	13,540	13,560	13,579
657	13,599	13,619	13,639	13,658	13,678	13,698	13,717	13,737	13,757	13,777
658	13,797	13,818	13,838	13,858	13,877	13,897	13,917	13,937	13,956	13,976
659	13,996	14,015	14,035	14,055	14,075	14,095	14,115	14,135	14,155	14,175
660	14,195	14,215	14,236	14,256	14,277	14,297	14,317	14,337	14,358	14,378
661	14,399	14,419	14,440	14,461	14,482	14,503	14,524	14,545	14,566	14,587
662	14,608	14,629	14,650	14,671	14,692	14,713	14,734	14,755	14,776	14,798
663	14,819	14,840	14,862	14,884	14,906	14,928	14,950	14,973	14,995	15,017
664	15,039	15,062	15,084	15,106	15,128	15,150	15,173	15,196	15,218	15,241
665	15,265	15,288	15,310	15,333	15,356	15,380	15,404	15,427	15,451	15,474
666	15,498	15,521	15,545	15,568	15,592	15,615	15,639	15,662	15,685	15,709
667	15,733	15,757	15,781	15,805	15,828	15,852	15,876	15,900	15,923	15,946
668	15,969	15,992	16,015	16,037	16,060	16,083	16,106	16,128	16,151	16,173
669	16,196	16,219	16,242	16,265	16,287	16,310	16,333	16,356	16,379	16,402
670	16,426	16,449	16,472	16,495	16,519	16,542	16,566	16,590	16,614	16,637
671	16,661	16,685	16,709	16,733	16,757	16,781	16,805	16,829	16,853	16,878
672	16,902	16,926	16,950	16,974	16,998	17,022	17,046	17,071	17,095	17,120
673	17,145	17,169	17,194	17,219	17,245	17,270	17,296	17,321	17,347	17,373
674	17,400	17,426	17,454	17,481	17,508	17,536	17,562	17,589	17,615	17,641
675	17,666	17,690	17,714	17,738	17,760	17,783	17,806	17,829	17,851	17,874
676	17,896	17,919	17,942	17,965	17,989	18,012	18,035	18,058	18,081	18,104
677	18,127	18,151	18,174	18,196	18,219	18,241	18,264	18,286	18,309	18,331
678	18,354	18,376	18,399	18,421	18,444	18,466	18,489	18,511	18,534	18,556
679	18,579	18,601	18,624	18,646	18,669	18,692	18,714	18,737	18,760	18,783
680	18,806	18,830	18,853	18,877	18,900	18,924	18,948	18,972	18,996	19,020
681	19,044	19,068	19,091	19,115	19,138	19,162	19,186	19,210	19,235	19,259
682	19,283	19,308	19,332	19,356	19,380	19,404	19,428	19,453	19,479	19,506
683	19,536	19,569	19,601	19,635	19,668	19,701	19,733	19,765	19,795	19,824
684	19,853	19,881	19,909	19,936	19,963	19,989	20,015	20,040	20,064	20,089
685	20,113	20,138	20,162	20,186	20,209	20,233	20,257	20,280	20,303	20,327
686	20,350	20,373	20,396	20,420	20,443	20,466	20,489	20,512	20,535	20,558
687	20,581	20,604	20,627	20,650	20,674	20,697	20,720	20,743	20,766	20,789
688	20,812	20,836	20,859	20,882	20,906	20,929	20,952	20,976	20,999	21,022
689	21,046	21,069	21,093	21,116	21,140	21,164	21,187	21,212	21,236	21,260
690	21,284	21,308	21,332	21,357	21,381	21,405	21,430	21,454	21,479	21,503
691	21,528	21,553	21,578	21,603	21,628	21,653	21,678	21,703	21,728	21,754
692	21,779	21,805	21,830	21,856	21,881	21,907	21,932	21,958	21,983	22,009
693	22,035	22,061	22,088	22,114	22,140	22,167	22,193	22,220	22,246	22,273
694	22,300	22,328	22,355	22,382	22,409	22,437	22,464	22,491	22,519	22,546
695	22,574	22,601	22,629	22,656	22,684	22,711	22,739	22,766	22,794	22,822
696	22,850	22,877	22,905	22,933	22,961	22,989	23,017	23,045	23,073	23,101
697	23,129	23,158	23,186	23,214	23,242	23,270	23,299	23,327	23,356	23,385
698	23,413	23,442	23,472	23,501	23,530	23,559	23,588	23,617	23,647	23,676
699	23,706	23,735	23,764	23,794	23,823	23,853	23,883	23,912	23,942	23,972

Appendix B (continued)

Lake Travis

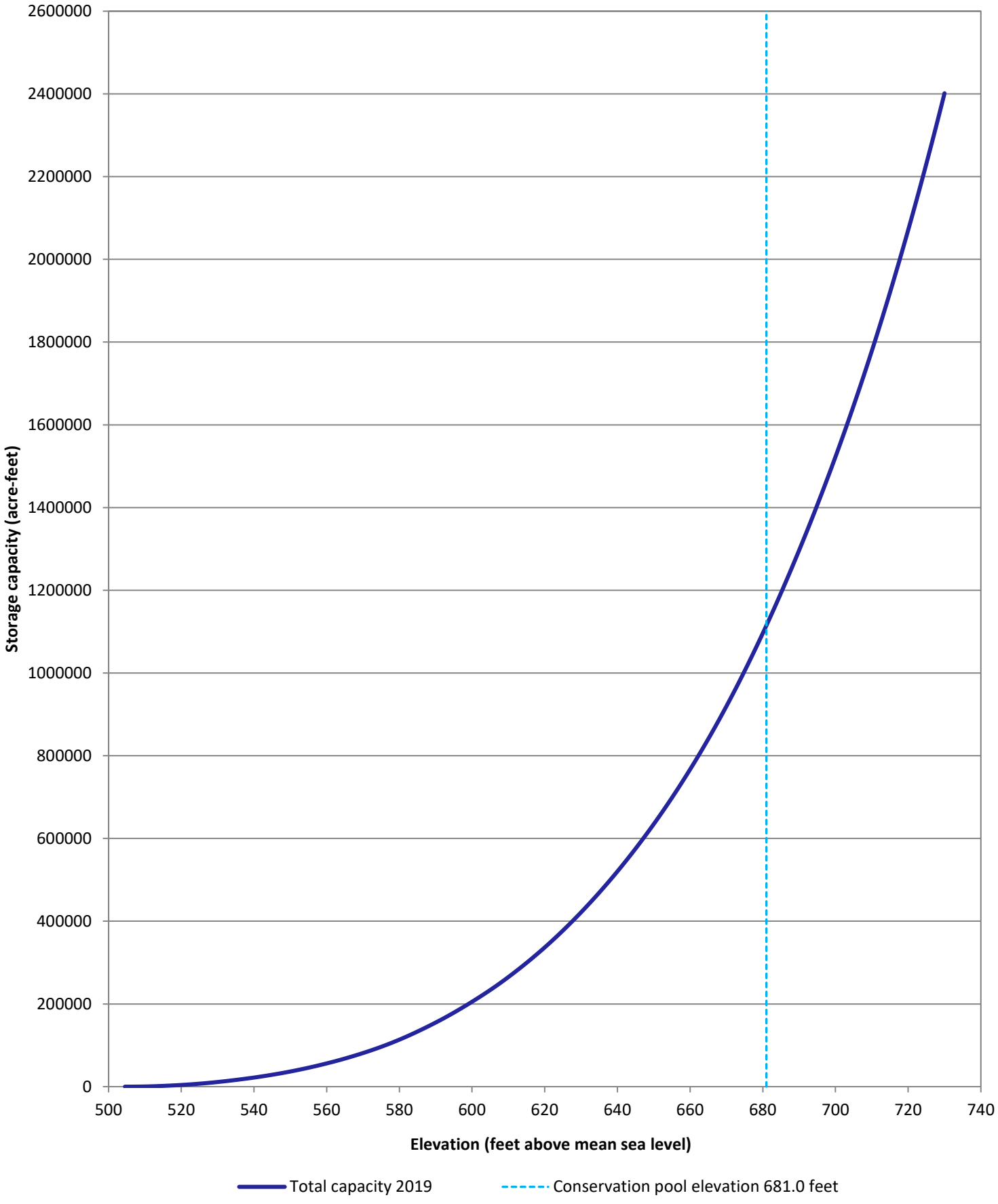
RESERVOIR AREA TABLE

TEXAS WATER DEVELOPMENT BOARD — July – November 2019 Survey

AREA IN ACRES — Conservation Pool Elevation 681.0 feet above mean sea level

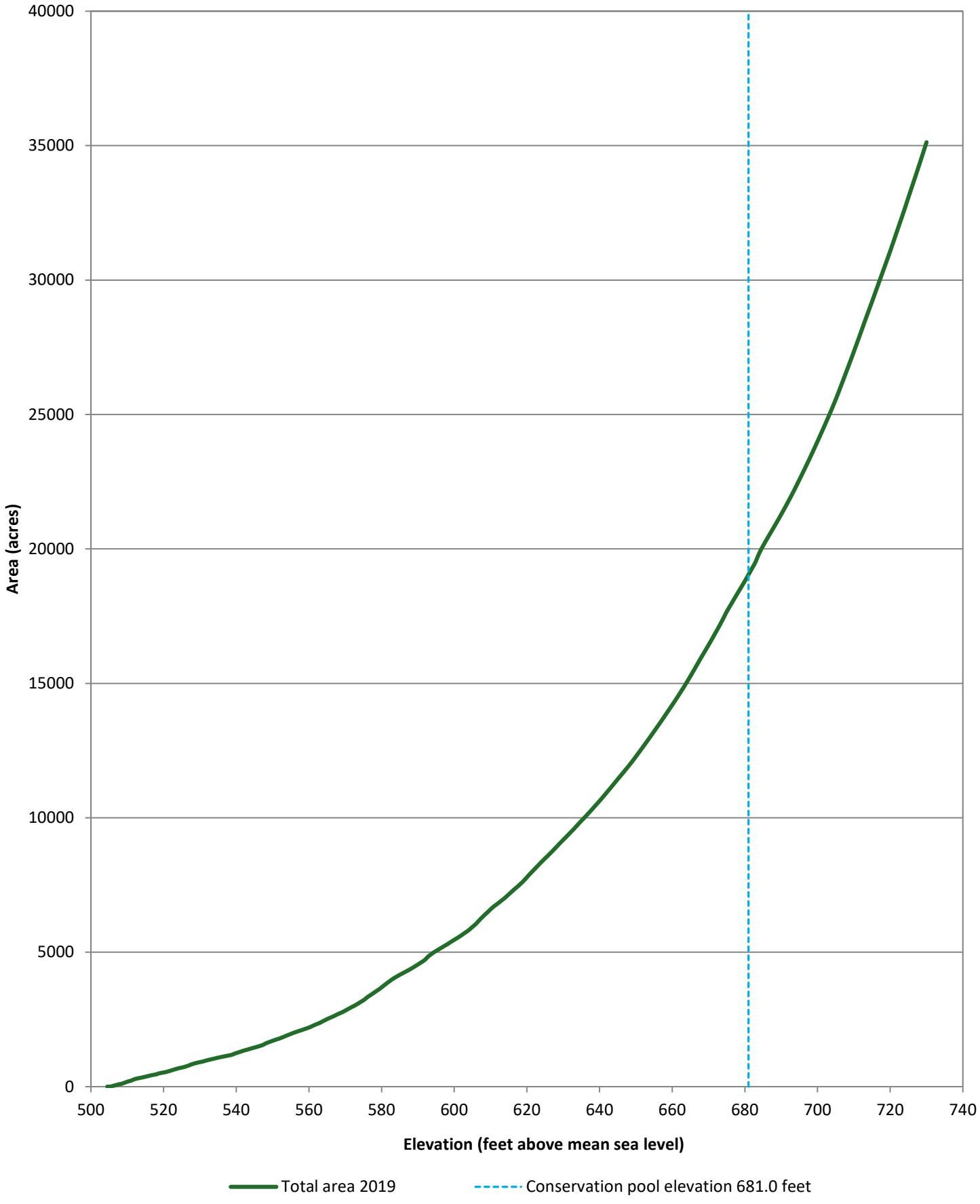
ELEVATION INCREMENT IS ONE TENTH FOOT

ELEVATION in Feet	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
700	24,001	24,031	24,061	24,091	24,121	24,151	24,181	24,211	24,241	24,271
701	24,302	24,332	24,362	24,393	24,423	24,453	24,484	24,514	24,545	24,575
702	24,606	24,637	24,667	24,698	24,729	24,760	24,791	24,822	24,853	24,884
703	24,915	24,946	24,977	25,008	25,040	25,071	25,103	25,134	25,166	25,198
704	25,230	25,262	25,294	25,327	25,359	25,392	25,425	25,458	25,491	25,524
705	25,558	25,592	25,626	25,660	25,694	25,729	25,764	25,798	25,833	25,868
706	25,903	25,938	25,973	26,009	26,044	26,080	26,115	26,151	26,187	26,222
707	26,258	26,294	26,330	26,366	26,402	26,438	26,473	26,509	26,545	26,581
708	26,617	26,653	26,688	26,724	26,759	26,795	26,831	26,867	26,903	26,940
709	26,976	27,012	27,048	27,084	27,120	27,157	27,194	27,230	27,267	27,303
710	27,340	27,376	27,412	27,449	27,485	27,521	27,558	27,595	27,633	27,671
711	27,708	27,746	27,784	27,821	27,859	27,897	27,934	27,972	28,009	28,047
712	28,085	28,123	28,160	28,197	28,235	28,272	28,310	28,348	28,385	28,423
713	28,461	28,498	28,536	28,573	28,610	28,647	28,684	28,721	28,758	28,795
714	28,832	28,868	28,905	28,942	28,979	29,016	29,052	29,089	29,126	29,163
715	29,200	29,237	29,274	29,311	29,349	29,386	29,424	29,463	29,500	29,537
716	29,575	29,612	29,649	29,686	29,724	29,761	29,799	29,837	29,874	29,912
717	29,950	29,987	30,025	30,062	30,099	30,136	30,174	30,211	30,248	30,286
718	30,323	30,360	30,397	30,434	30,471	30,509	30,547	30,585	30,623	30,661
719	30,698	30,736	30,774	30,811	30,849	30,886	30,924	30,962	31,000	31,038
720	31,077	31,116	31,154	31,193	31,233	31,273	31,313	31,352	31,391	31,431
721	31,470	31,509	31,549	31,589	31,629	31,669	31,709	31,748	31,787	31,826
722	31,866	31,905	31,944	31,984	32,023	32,063	32,102	32,142	32,181	32,220
723	32,259	32,298	32,337	32,377	32,416	32,456	32,496	32,536	32,576	32,616
724	32,657	32,698	32,738	32,779	32,821	32,862	32,904	32,945	32,987	33,028
725	33,069	33,110	33,151	33,192	33,232	33,273	33,314	33,354	33,394	33,435
726	33,475	33,515	33,555	33,596	33,636	33,677	33,717	33,758	33,798	33,839
727	33,879	33,920	33,961	34,002	34,043	34,084	34,125	34,167	34,208	34,249
728	34,291	34,332	34,373	34,415	34,456	34,498	34,539	34,581	34,622	34,664
729	34,706	34,748	34,790	34,832	34,874	34,916	34,958	35,001	35,043	35,085
730	35,127									



Lake Travis
July – November 2019 Survey
Prepared by: TWDB

Appendix C: Capacity curve



Lake Travis
July – November 2019 Survey
Prepared by: TWDB

Appendix D: Area curve

Appendix E Axial profile

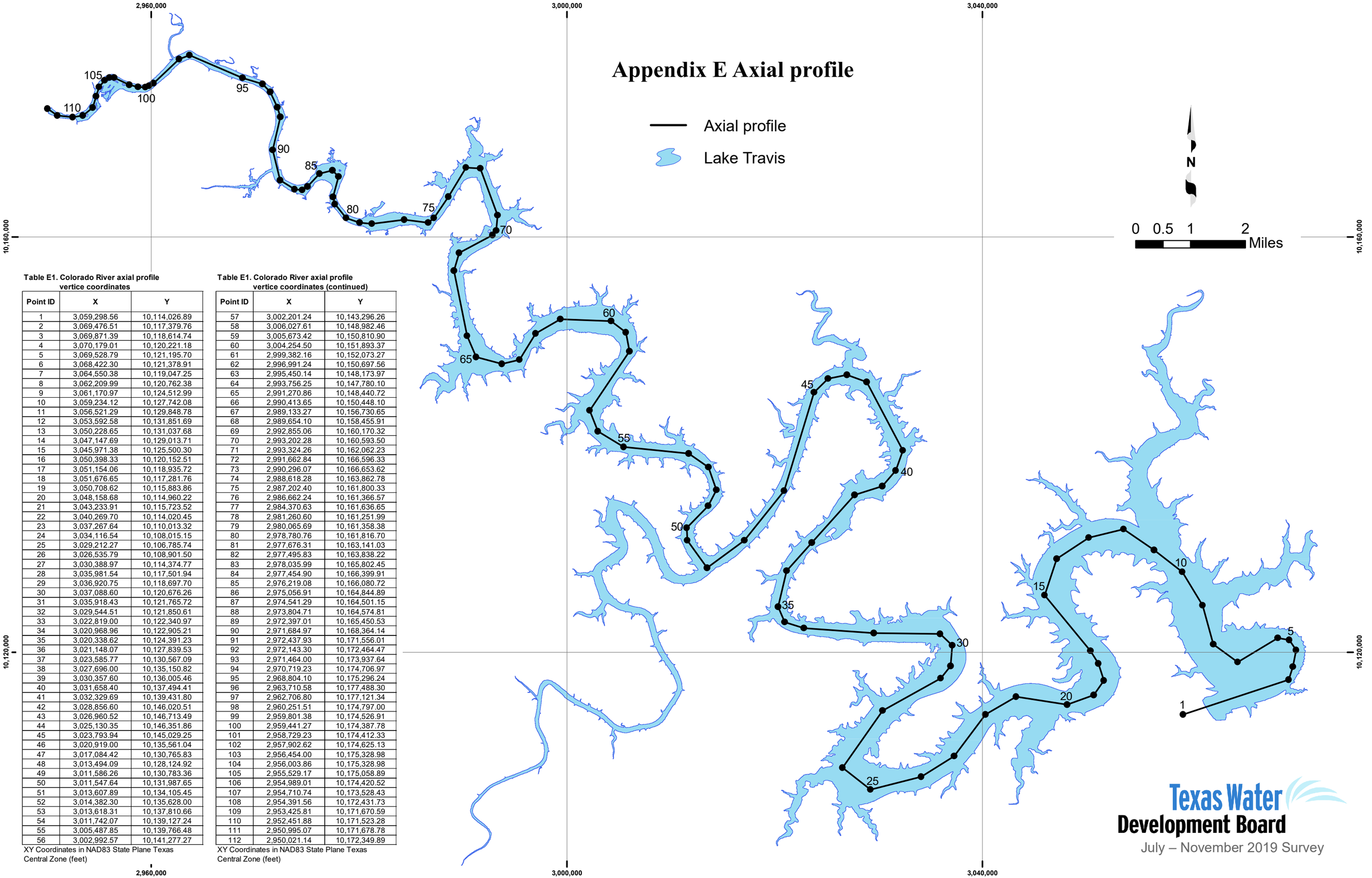


Table E1. Colorado River axial profile vertice coordinates

Point ID	X	Y
1	3,059,298.56	10,114,026.89
2	3,069,476.51	10,117,379.76
3	3,069,871.39	10,118,614.74
4	3,070,179.01	10,120,221.18
5	3,069,528.79	10,121,195.70
6	3,068,422.30	10,121,378.91
7	3,064,550.38	10,119,047.25
8	3,062,209.99	10,120,762.38
9	3,061,170.97	10,124,512.99
10	3,059,234.12	10,127,742.08
11	3,056,521.29	10,129,848.78
12	3,053,592.58	10,131,851.69
13	3,050,228.65	10,131,037.68
14	3,047,147.69	10,129,013.71
15	3,045,971.38	10,125,500.30
16	3,050,398.33	10,120,152.51
17	3,051,154.06	10,118,935.72
18	3,051,676.65	10,117,281.76
19	3,050,708.62	10,115,883.86
20	3,048,158.68	10,114,960.22
21	3,043,233.91	10,115,723.52
22	3,040,269.70	10,114,020.45
23	3,037,267.64	10,110,013.32
24	3,034,116.54	10,108,015.15
25	3,029,212.27	10,106,785.74
26	3,026,535.79	10,108,901.50
27	3,030,388.97	10,114,374.77
28	3,035,981.54	10,117,501.94
29	3,036,920.75	10,118,697.70
30	3,037,088.60	10,120,676.26
31	3,035,918.43	10,121,765.72
32	3,029,544.51	10,121,850.61
33	3,022,819.00	10,122,340.97
34	3,020,968.96	10,122,905.21
35	3,020,338.62	10,124,391.23
36	3,021,148.07	10,127,839.53
37	3,023,585.77	10,130,567.09
38	3,027,696.00	10,135,150.82
39	3,030,357.60	10,136,005.46
40	3,031,658.40	10,137,494.41
41	3,032,329.69	10,139,431.80
42	3,028,856.60	10,146,020.51
43	3,026,960.52	10,146,713.49
44	3,025,130.35	10,146,351.86
45	3,023,793.94	10,145,029.25
46	3,020,919.00	10,135,561.04
47	3,017,084.42	10,130,765.83
48	3,013,494.09	10,128,124.92
49	3,011,586.26	10,130,783.36
50	3,011,547.64	10,131,987.65
51	3,013,607.89	10,134,105.45
52	3,014,382.30	10,135,628.00
53	3,013,618.31	10,137,810.66
54	3,011,742.07	10,139,127.24
55	3,005,487.85	10,139,766.48
56	3,002,992.57	10,141,277.27

XY Coordinates in NAD83 State Plane Texas Central Zone (feet)

Table E1. Colorado River axial profile vertice coordinates (continued)

Point ID	X	Y
57	3,002,201.24	10,143,296.26
58	3,006,027.61	10,148,982.46
59	3,005,673.42	10,150,810.90
60	3,004,254.50	10,151,893.37
61	2,999,382.16	10,152,073.27
62	2,996,991.24	10,150,697.56
63	2,995,450.14	10,148,173.97
64	2,993,756.25	10,147,780.10
65	2,991,270.86	10,148,440.72
66	2,990,413.65	10,150,448.10
67	2,989,133.27	10,156,730.65
68	2,989,654.10	10,158,455.91
69	2,992,855.06	10,160,170.32
70	2,993,202.28	10,160,593.50
71	2,993,324.26	10,162,062.23
72	2,991,662.84	10,166,596.33
73	2,990,296.07	10,166,653.62
74	2,988,618.28	10,163,862.78
75	2,987,202.40	10,161,800.33
76	2,986,662.24	10,161,366.57
77	2,984,370.63	10,161,636.65
78	2,981,260.60	10,161,251.99
79	2,980,065.69	10,161,358.38
80	2,978,780.76	10,161,816.70
81	2,977,676.31	10,163,141.03
82	2,977,495.83	10,163,838.22
83	2,978,035.99	10,165,802.45
84	2,977,454.90	10,166,399.91
85	2,976,219.08	10,166,080.72
86	2,975,056.91	10,164,844.89
87	2,974,541.29	10,164,501.15
88	2,973,804.71	10,164,574.81
89	2,972,397.01	10,165,450.53
90	2,971,684.97	10,168,364.14
91	2,972,437.93	10,171,556.01
92	2,972,143.30	10,172,464.47
93	2,971,464.00	10,173,937.64
94	2,970,719.23	10,174,706.97
95	2,968,804.10	10,175,296.24
96	2,963,710.58	10,177,488.30
97	2,962,706.80	10,177,121.34
98	2,960,251.51	10,174,797.00
99	2,959,801.38	10,174,526.91
100	2,959,441.27	10,174,387.78
101	2,958,729.23	10,174,412.33
102	2,957,902.62	10,174,625.13
103	2,956,454.00	10,175,328.98
104	2,956,003.86	10,175,328.98
105	2,955,529.17	10,175,058.89
106	2,954,989.01	10,174,420.52
107	2,954,710.74	10,173,528.43
108	2,954,391.56	10,172,431.73
109	2,953,425.81	10,171,670.59
110	2,952,451.88	10,171,523.28
111	2,950,995.07	10,171,678.78
112	2,950,021.14	10,172,349.89

XY Coordinates in NAD83 State Plane Texas Central Zone (feet)

Texas Water Development Board

July – November 2019 Survey

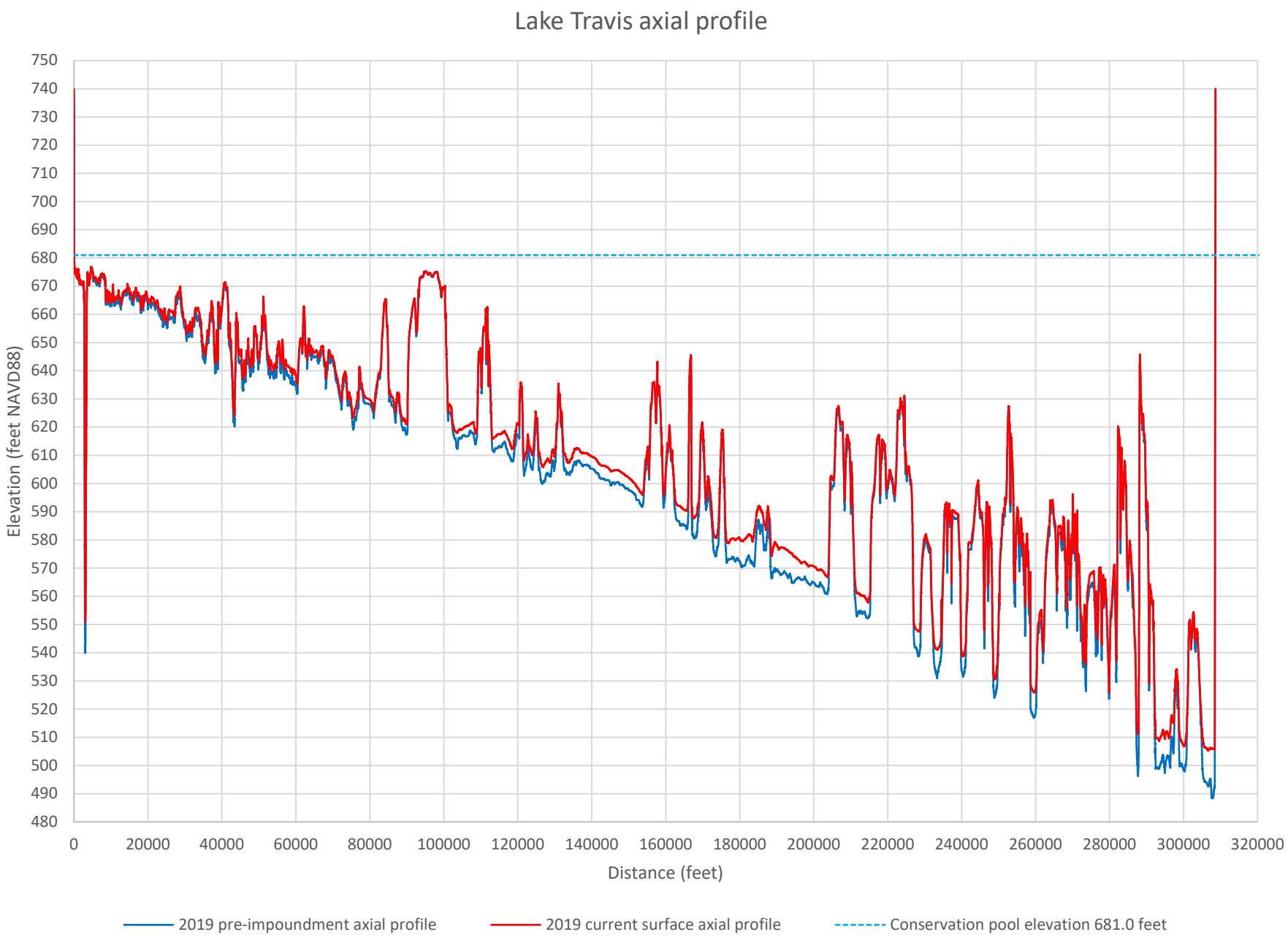

Lake Travis axial profile
Elevation (feet NAVD88)
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610
600
590
580
570
560
550
540
530
520
510
500
490
480
0
20000
40000
60000
80000
100000
120000
140000
160000
180000
200000
220000
240000
260000
280000
300000
320000
Distance (feet)
2019 pre-impoundment axial profile
2019 current surface axial profile
Conservation pool elevation 681.0 feet

Figure 6

Contours

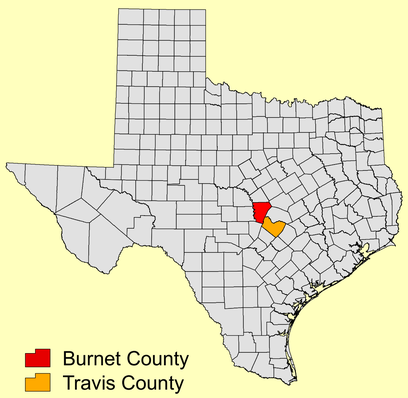
feet above mean sea level

680
670
660
650
640
630
620
610
600
590
580
570
560
550
540
530
520
510

Islands

Lake Travis conservation pool elevation 681.0 feet above mean sea level

Projection: NAD83
State Plane Texas
Central Zone (feet)

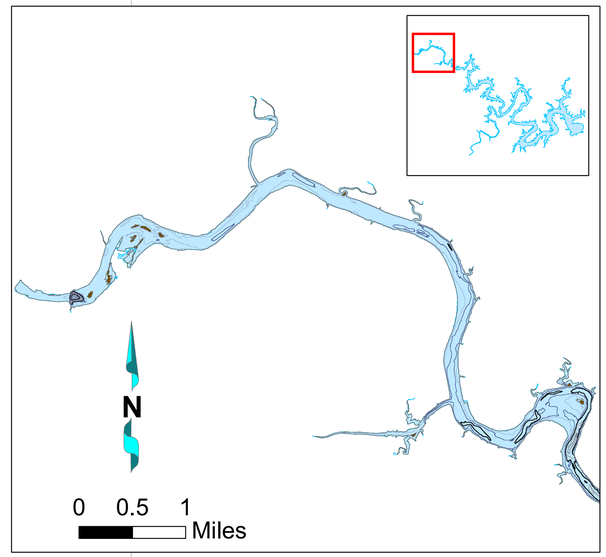


Burnet County
Travis County

This map is the product of a survey conducted by the Texas Water Development Board's Hydrographic Survey Program to determine the capacity of Lake Travis. The Texas Water Development Board makes no representations nor assumes any liability.

Lake Travis

10' - contour map



3,000,000
3,050,000
10,150,000
10,100,000

N

0 0.5 1 2
Miles

Texas Water Development Board

July - November 2019 Survey