Volumetric and Sedimentation Survey of INKS LAKE

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Executive summary

In May 2019, the Texas Water Development Board (TWDB) entered into an agreement with the Lower Colorado River Authority (LCRA) to perform a volumetric and sedimentation survey of Inks Lake (Burnet and Llano 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 in select locations and correlated with sub-bottom acoustic profiles to estimate sediment accumulation thicknesses and sedimentation rates.

Roy B. Inks (Inks) Dam and Inks Lake are located on the Colorado River in Burnet and Llano counties, 12 miles west of Burnet, Texas. The conservation pool elevation of Inks Lake is 888.0 feet above mean sea level, however, the target operating range is between 886.9 and 887.7 feet. The TWDB collected bathymetric data for Inks Lake on August 24-25, 2021, while the daily average water surface elevation measured 887.1 feet above mean sea level.

The 2021 TWDB volumetric survey indicates Inks Lake has a total reservoir capacity of 14,012 acre-feet and encompasses 803 acres at conservation pool elevation (888.0 feet above mean sea level). The 2021 TWDB volumetric survey measured 283 acre-feet of capacity below elevation 844.5 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 Inks Lake is 13,729 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 0.71 feet. The value 0.71 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 top of spatial interpolation elevation 887.14 feet suggest the total reservoir capacity estimate at 887.14 feet is accurate to within ± 3.8 percent (± 504 acre-feet). The reservoir above elevation 887.14 feet is modeled with LIDAR data.

Previous capacity estimates at elevation 888.0 feet include a 1960 estimate of 17,545 acre-feet by the Lower Colorado River Authority, a 1995 Lower Colorado River Authority estimate revised by the Texas Water Development Board in 2007 of 14,878 acre-feet, and a 2007 TWDB estimate of 13,902 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 is presented here for informational purposes only.

The 2021 TWDB sedimentation survey measured 829 acre-feet of sediment. The sedimentation survey indicates sediment accumulation is greatest towards the dam. Comparison with previous capacity estimates indicate the TWDB sediment estimate may be an underestimate of accumulated sediment. The TWDB recommends a similar methodology be used to resurvey Inks Lake in 10 years or after a major high flow event. Due to the irregular bottom, rocky substrate of the reservoir, and potential responses to high flow events, a multibeam survey should be considered to more accurately measure capacity and identify changes in the reservoir bottom.

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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 May 2019, the TWDB entered into an agreement with the Lower Colorado River Authority (LCRA), to perform a volumetric and sedimentation survey of Inks Lake (Texas Water Development Board, 2019). 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).

Inks Lake general information

Roy B. Inks (Inks) Dam and Inks Lake are located on the Colorado River in Burnet and Llano counties, 12 miles west of Burnet, Texas (Figure 1). Inks Lake is owned and operated by the LCRA. Construction of the dam began in 1936, and the dam was completed in June 1938 (Texas Water Development Board, 1971). The reservoir was built primarily for hydroelectric power and recreation (Texas Water Development Board, 1971). Additional pertinent data about Inks Dam and Inks Lake can be found in Table 1.

Water rights for Inks Lake have been appropriated to the Lower Colorado River Authority through Certificate of Adjudication No. 14-5479 (Texas Commission on Environmental Quality, 2021). The complete permits are on file at the Texas Commission on Environmental Quality.

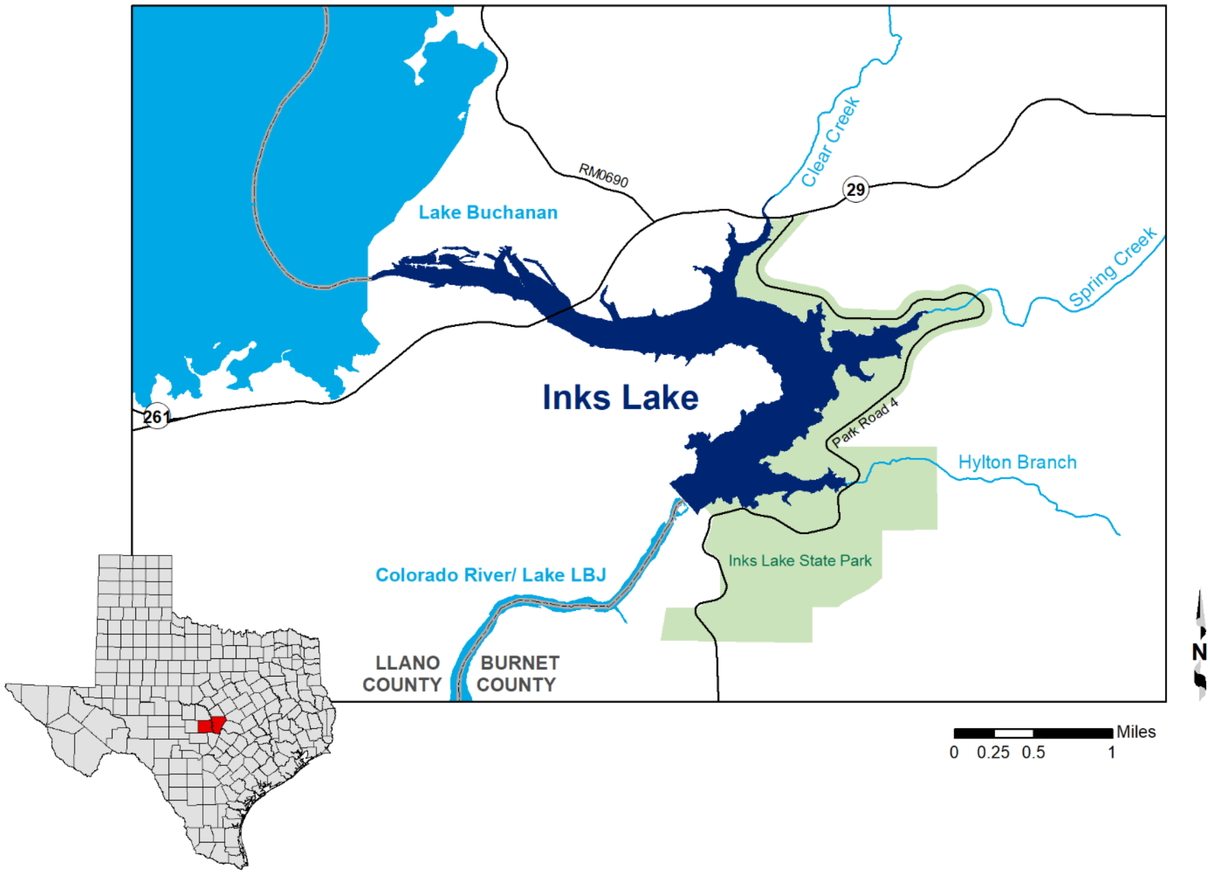


Figure 1. **Location map**

Table 1. Pertinent Data for Roy B. Inks Dam and Inks Lake.			
Owner			
Lower Colorado River Authority (LCRA)			
Engineer (Design)			
Fargo Engineering Company			
LCRA			
General Contractor			
Morrison-Knudsen Company (dam construction)			
LCRA (power features)			
Drainage Area			
Total Drainage Area	31,290 square miles		
Contributing Area	19,390 square miles		
Non-contributing Area	11,900 square miles		
Dam			
Type	Concrete gravity		
Total Length	1,547.5 feet		
Maximum Height	96.5 feet		
Top Width (non-overflow section)	16.5 feet		
Spillway			
Type	Uncontrolled gravity section of dam		
Crest Length	871.0 feet		
Crest Elevation	888.32 feet above mean sea level		
Outlet Works			
Number and Type	None		
Discharge Control	water releases are controlled by turbine operation		
Power Features			
Number of Hydropower units	1		
Discharge capacity	3,380 cubic feet per second		
Number of Floodgates	None		
Total production capacity	13.8 megawatts		
Invert Elevation	844.5 feet above mean sea level		
Reservoir Data (Based on 2021 TWDB survey)			
Feature	**Elevation (feet above MSL[a])**	**Capacity (acre-feet)**	**Area (acres)**
Top of dam (concrete)	922.0	59,882	1,947
Overflow spillway	888.32	14,270	811
Top of Conservation Pool	888.0	14,012	803
Invert/dead pool elevation	844.5	283	46
Conservation storage capacity[b]	—	13,729	—

Sources: Lower Colorado River Authority, 2021; Texas Water Development Board, 1971; Texas Water Development Board, 2007.

[a] Mean Sea Level (MSL) indicates a reference to the LCRA Legacy Datum for Inks Dam and Inks Lake. North American Vertical Datum 1988 (NAVD88) equals LCRA Legacy Datum plus 0.31 feet. National Geodetic Vertical Datum 1929 (NGVD29) equals LCRA Legacy Datum minus 0.05 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 Inks Lake

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, 2021). To convert to standard datum North American Vertical Datum 1988 (NAVD88), add 0.31 feet to LCRA Legacy Datum. To convert to standard datum National Geodetic Vertical Datum 1929 (NGVD29), subtract 0.05 feet from LCRA Legacy Datum. Water surface elevation data were downloaded from the United States Geological Survey (USGS) for the reservoir elevation gage *TX071 08148100 LCRA Inks Lk nr Kingland, 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, 2021). 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 Inks Lake on August 24-25, 2021, while daily average water surface elevations measured between 887.1 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 250 feet apart. Many of the same survey lines also were used by the TWDB for the *Volumetric and Sedimentation Survey of Inks Lake, April 2007 Survey* (Texas Water Development Board, 2007). 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 2021 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 13 locations to collect sediment core samples (Figure 2). Sediment samples were collected on December 16, 2021, in the form of 12 sediment cores and one grab sample using a custom-coring boat, an SDI VibeCore system, and a petite Ponar grab sampler.

Sediment cores are collected in 3-inch diameter aluminum tubes. Analysis of the acoustic data collected during the bathymetric survey assists in determining the depth of penetration the tube must be driven during sediment sampling. 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.

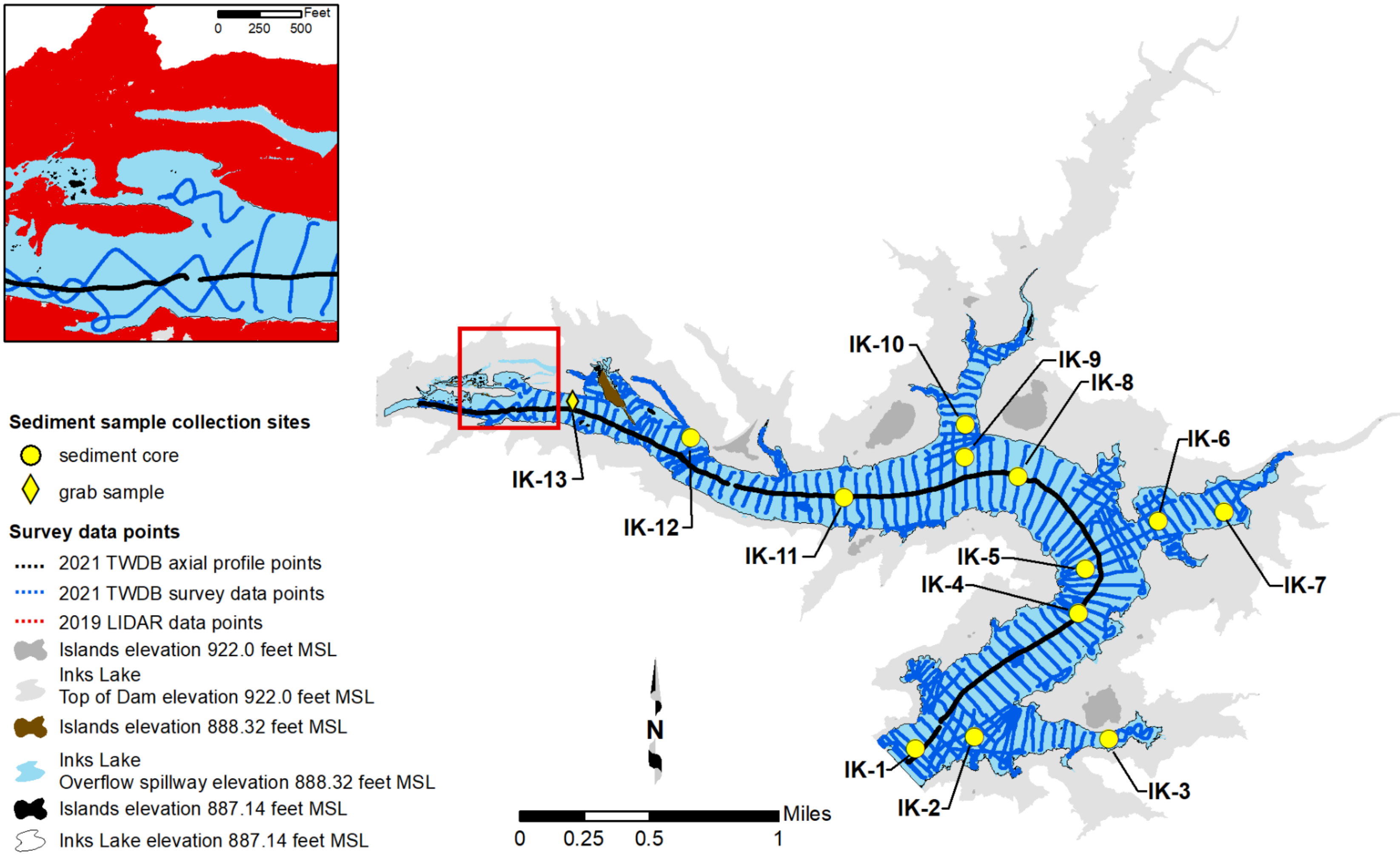


Figure 2. **2021 TWDB Inks Lake survey data (*blue dots*), sediment coring locations (*yellow circles*), and 2019 LIDAR data (*red dots*).**

Data processing

Model boundary

The topographic model boundary of the reservoir was generated with Light Detection and Ranging (LIDAR) Data available from the Texas Natural Resource Information System (TNRIS). The LIDAR data were collected on January 27, 2019 (Texas Water Development Board, 2021), while the daily average water surface elevation of the reservoir measured between 887.18 feet. The LIDAR data files (.las) were imported into an LAS Dataset and the dataset was converted to a raster using a cell size of 1.0 meters by 1.0 meters. A contour at 281.120088 meters NAVD88 equivalent to 922.31 feet NAVD88 or 922.00 feet above mean sea level, was extracted as the upper extent of the model. The horizontal datum of the LIDAR data is Universal Transverse Mercator (UTM) North American Datum 1983 (NAD83; meters) Zone 14, and the vertical datum is North American Vertical Datum 1988 (NAVD88; meters). The vertical datum transformation offset of 0.31 feet was used to convert from feet NAVD88 to feet above mean sea level. The contour was edited to close the contour across the top of the dam. Horizontal coordinate transformations to NAD83 State Plane Texas Central Zone (feet) coordinates were done using the ArcGIS Project tool.

To complete spatial interpolation, a boundary was digitized from aerial photography taken on January 18, 2015, while the daily average water surface elevation measured 887.14 feet above mean sea level. Where shoreline development had occurred since 2015, imagery collected on November 22, 2019, while the daily average surface elevation measured 887.24 feet above mean sea level, was referenced. This imagery was obtained through the Texas Imagery Service. The Texas Natural Resources Information System manages the Texas Imagery Service allowing public organizations in the State of Texas to access Google Imagery as a service using Environmental Systems Research Institute's ArcGIS software. The photographs have a resolution of 6 inches (Texas Natural Resources Information System, 2021). The 2015 boundary was input into the bathymetric and topographic model as a hard line.

The model boundary at elevation 888.32 feet above mean sea level was extracted from the bathymetric and topographic model raster, edited to close across the dam, and used to create the bathymetric model.

LIDAR data points

To utilize the LIDAR data in the reservoir model, the LIDAR data files (.las) were converted to a multipoint feature class in an Environmental Systems Research Institute's ArcGIS file geodatabase filtered to include only data classified as ground points. A topographical model of the data was generated. The ArcGIS tool Terrain to Points was used to extract points from the Terrain, or topographical model of the reservoir. The Terrain was created using the z-tolerance Pyramid Type. All LIDAR points were extracted from the Terrain, equivalent to all points classified as ground. 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 outside of the 922.0-foot contour were deleted and the feature class projected to NAD83 State Plane Texas Central Zone (feet). LIDAR data inside the 887.14-foot contour was also deleted. 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 is 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 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. Additionally, in the case of Inks Lake, a multibeam survey completed in 2007 in the main stem between Inks Dam and upstream approximately one-mile, guided interpolation in these areas. 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 Inks Lake. 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.

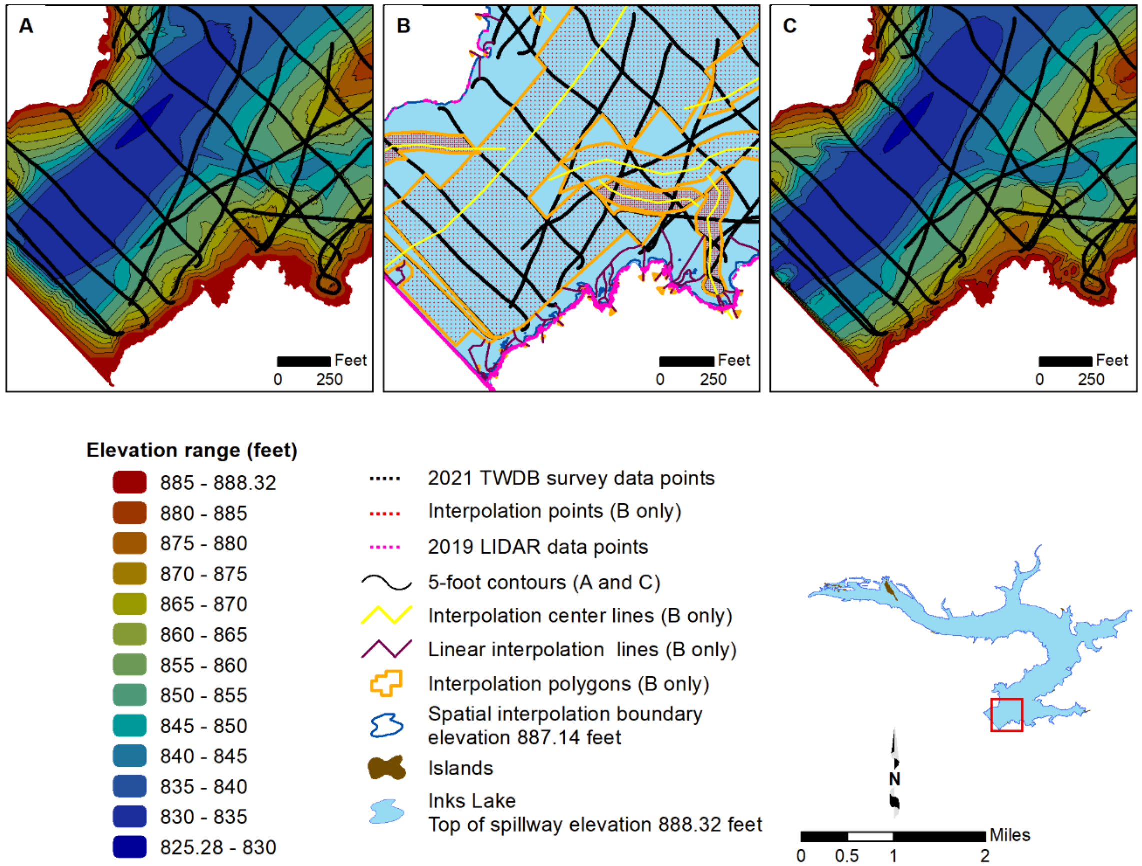


Figure 3. **Anisotropic spatial interpolation as applied to Inks Lake sounding data; A) bathymetric contours without interpolated points, B) sounding points (*black*) and interpolated points (*red*), C) bathymetric contours with interpolated points.**

Area, volume, and contour calculation

Volumes and areas for the bathymetric TIN were computed for the entire reservoir at 0.01-foot intervals, from 825.28 to 888.32 feet above mean sea level. Volumes and areas are presented in this report at 0.1-foot increments. The bathymetric elevation-capacity table and bathymetric elevation-area table, based on the 2021 survey and analysis, are presented in Appendices A and B, respectively. The bathymetric capacity curve is presented in Appendix C, and the bathymetric area curve is presented in Appendix D. Volumes and areas for the bathymetric and topographic TIN were computed for the entire reservoir at 0.01-foot intervals, from 825.28 to 922.00 feet above mean sea level. Volumes and areas are presented in this report at 0.1-foot increments. The bathymetric and topographic elevation-capacity table and bathymetric and topographic elevation-area table, based on the 2021 survey and analysis, are presented in Appendices E and F, respectively. The bathymetric and topographic capacity curve is presented in Appendix G, and the bathymetric and topographic area curve is presented in Appendix H.

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

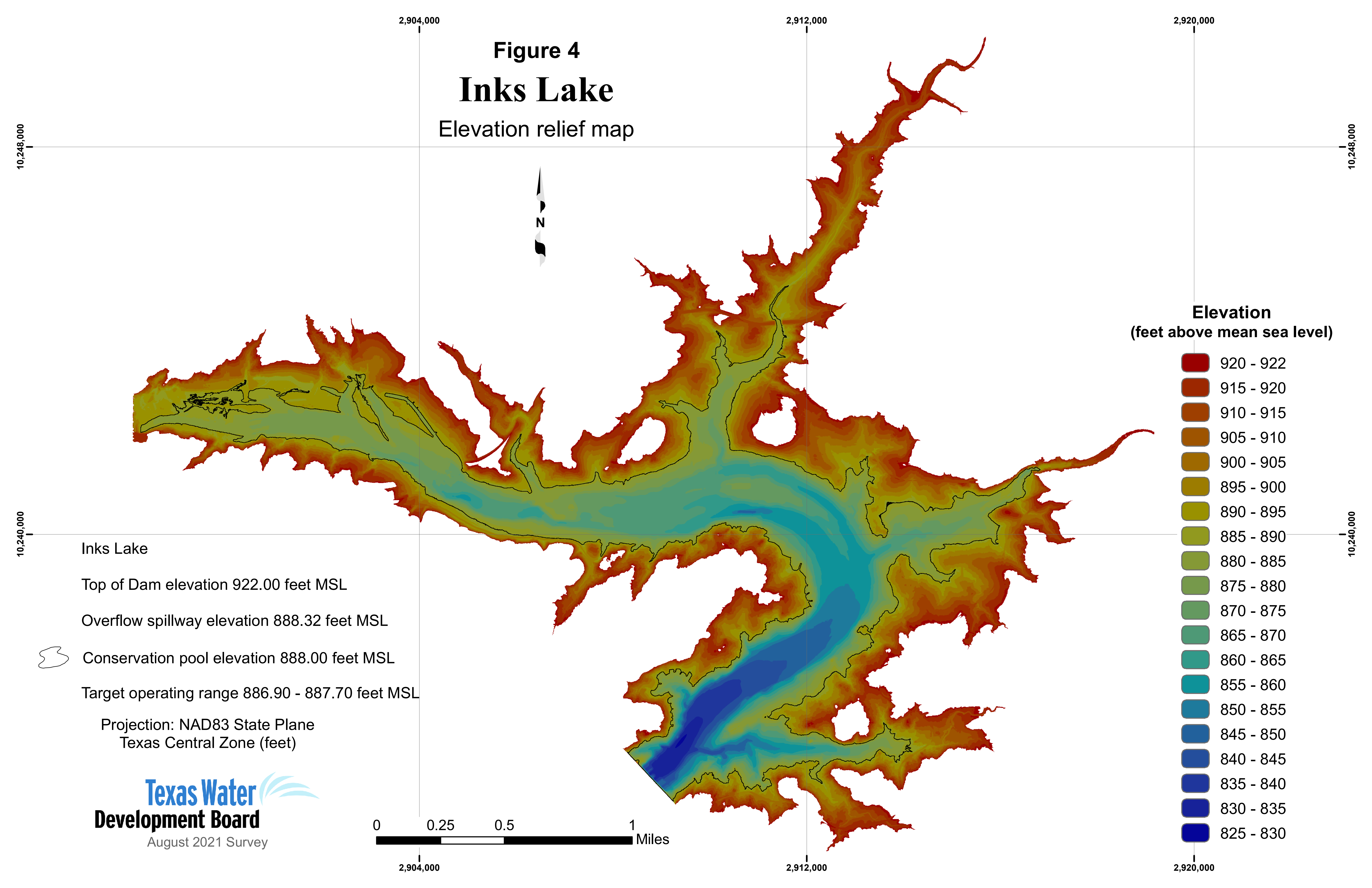


Figure 4
Inks Lake
Elevation relief map
N
2,904,000
2,912,000
2,920,000
10,248,000
10,240,000
Elevation
(feet above mean sea level)
920 - 922
915 - 920
910 - 915
905 - 910
900 - 905
895 - 900
890 - 895
885 - 890
880 - 885
875 - 880
870 - 875
865 - 870
860 - 865
855 - 860
850 - 855
845 - 850
840 - 845
835 - 840
830 - 835
825 - 830
Inks Lake
Top of Dam elevation 922.00 feet MSL
Overflow spillway elevation 888.32 feet MSL
Conservation pool elevation 888.00 feet MSL
Target operating range 886.90 - 887.70 feet MSL
Projection: NAD83 State Plane
Texas Central Zone (feet)
Texas Water
Development Board
August 2021 Survey
0
0.25
0.5
1
Miles

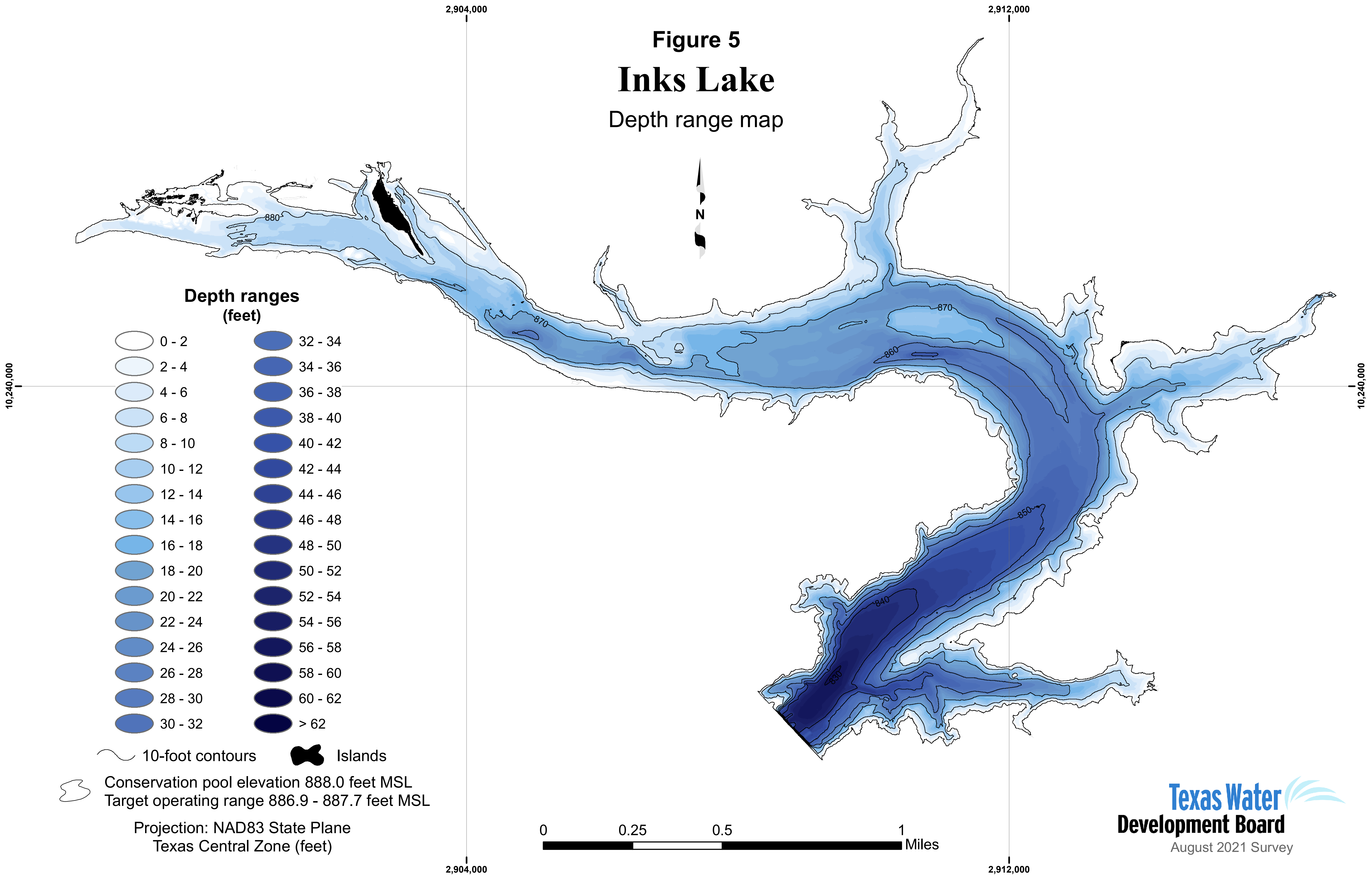


Figure 5
Inks Lake
Depth range map
N
2,904,000
2,912,000
10,240,000
880
870
860
850
840
830
Depth ranges
(feet)
0 - 2
2 - 4
4 - 6
6 - 8
8 - 10
10 - 12
12 - 14
14 - 16
16 - 18
18 - 20
20 - 22
22 - 24
24 - 26
26 - 28
28 - 30
30 - 32
32 - 34
34 - 36
36 - 38
38 - 40
40 - 42
42 - 44
44 - 46
46 - 48
48 - 50
50 - 52
52 - 54
54 - 56
56 - 58
58 - 60
60 - 62
> 62
10-foot contours
Islands
Conservation pool elevation 888.0 feet MSL
Target operating range 886.9 - 887.7 feet MSL
Projection: NAD83 State Plane
Texas Central Zone (feet)
0
0.25
0.5
1
Miles
Texas Water
Development Board
August 2021 Survey

Analysis of sediment data from Inks Lake

Sedimentation in Inks Lake 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 were recorded (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 (Hue Value/Chroma)
IK-1	2909101.66	10235318.93	72.0 / N/A	post-impoundment	0.0-5.0" high water content, silt, soupy, smooth, uniform consistency and texture throughout	10YR 3/1 very dark gray
					5.0-56.0" high to moderate water content, water content decreases with depth, silty clay, pudding like, uniform consistency and texture throughout	10YR 2/1 black
					56.0-72.0" moderate water content, clay, smooth, fine, small bits of clay present, uniform consistency and texture throughout	10YR 3/2 very dark grayish brown with bands of black
IK-2	2910301.54	10235553.25	71.0 / N/A	post-impoundment	0.0-6.0" very high to moderate water content, silt, soupy, smooth	10YR 3/1 very dark gray
					6.0-34.0" high water content, silty clay, pudding like, smooth, uniform texture, density increases with depth	10YR 2/1 black
					34.0-53.0" moderate water content, silty clay, peanut butter like, smooth, sticky, more dense than previous layer	10YR 2/1 black
					53.0-64.0" moderate water content, silty clay, peanut butter like, smooth, sticky, more dense than previous layer	10YR 3/2 very dark grayish brown
					64.0-71.0" moderate water content, clay, smooth, fine, uniform consistency and texture throughout, mottled coloration	7.5YR 3/2 dark brown 10YR 2/1 black
IK-3	2913058.20	10235507.39	19.0 / 17.0	post-impoundment	0.0-12.0" high to moderate water content, water content decreases with depth, silt, smooth, soupy at the top, pudding like, density increases with depth, uniform texture throughout	10YR 2/1 black
					12.0-17.0" low water content, sandy silt, medium grain sand, dense, uniform consistency and texture throughout	10YR 3/1 dark gray
				pre-impoundment	17.0-19.0" low water content, sandy clay, moderately packed, malleable, uniform consistency and texture throughout, organic matter present (fibrous roots, twig, leaf litter)	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 (Hue Value/Chroma)
IK-4	2912431.92	10238076.68	53.0 / N/A	post-impoundment	0.0-39.0” high to moderate water content, water content decreases with depth, silty clay, smooth, density increases with depth, uniform consistency and texture throughout, organic matter present (fibrous roots present at 34 inches)	10YR 2/1 black
					39.0-40.0” moderate water content, narrow band of clay, smooth, malleable, play dough consistency	2.5YR 4/8 red
					40.0-49.0” moderate water content, silty clay, smooth, peanut butter like, uniform consistency and texture throughout	10YR 2/1 black
					49.0-49.0” moderate water content, narrow band of clay, smooth, malleable, play dough consistency	2.5YR 4/8 red
					49.0-53.0” moderate water content, silty clay, smooth, peanut butter like, uniform consistency and texture throughout	10YR 2/1 black
IK-5	2912577.37	10238981.01	32.0 / N/A	post-impoundment	0.0-5.0” high water content silt, smooth, soupy, uniform consistency and texture throughout	10YR 3/1 very dark gray
					5.0-32.0” high to moderate water content, water content decreases with depth, silty clay, sticky, pudding like consistency throughout, organic matter present (fibrous roots, wood debris)	10YR 2/1 black
IK-6	2914061.15	10239963.14	7.0 / N/A	post-impoundment	0.0-5.0” high water content, silt, smooth, soupy, organic matter present (woody debris, twigs, bark near bottom of layer)	10YR 2/1 black
					5.0-7.0” moderate water content, silty clay, loosely packed, high organic matter content (leaf litter, bark, woody debris)	10YR 2/1 black
IK-7	2915411.51	10240150.19	20.0 / 8.0	post-impoundment	0.0-2.0” moderate water content, sandy silt, loosely packed, organic matter present (roots, bark, leaves, vegetation)	10YR 2/2 very dark brown
					2.0-8.0” moderate to low water content, water content less than previous layer, silty sand, more dense than previous layer, holds shape but not malleable, organic matter present (twigs, leaves, woody debris)	10YR 2/2 very 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

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 (Hue Value/Chroma)
IK-7 (continued)	2915411.51	10240150.19	20.0 / 8.0	pre-impoundment	8.0-18.0” moderate to low water content, silty clay, trace amounts of fine grain sand present at top of layer, increased density, smooth, malleable, organic matter present (fibrous roots, woody debris)	10YR 2/1 black
					18.0-20.0” low water content, sandy clay (fine grain sand), malleable, dense, fractures when broken, organic matter present (fibrous roots, twigs)	10YR 2/1 black
IK-8	2911197.73	10240873.28	41.0 / 16.0	post-impoundment	0.0-8.0” moderate water content, fine sand, dense, packed, uniform color, consistency, and texture throughout, macroinvertebrate present	10YR 3/2 very dark grayish brown
					8.0-16.0” high to moderate water content, water content decreases with depth, sandy clay, peanut butter like, malleable, dense, organic matter present (fibrous roots throughout)	10YR 3/3 dark brown
				pre-impoundment	16.0-41.0” moderate to low water content, water content decreases with depth, clay, malleable, play dough like, density increases with depth, uniform consistency and texture throughout, organic matter present (fibrous roots throughout)	7.5YR 3/2 dark brown
IK-9	2910115.10	10241268.25	29.0 / 23.0	post-impoundment	0-5.0” high water content, silt, smooth, soupy, uniform consistency and texture throughout	5Y 2.5/1 black
					5.0-23.0” high to moderate water content, water content decreases with depth, silt, smooth, pudding like, uniform consistency and texture throughout	10YR 2/1 black
				pre-impoundment	23.0-29.0” moderate water content, silty clay, smooth, more dense than previous layers, small bits of clay present at top of layer, organic matter present (twigs)	10YR 2/1 black
IK-10	2910129.02	10241937.07	19.0 / 8.0	post-impoundment	0.0-8.0” moderate water content, sandy silt, loosely packed, peanut butter like, organic matter present (fibrous roots and woody debris)	5Y 2.5/1 black
				pre-impoundment	8.0-19.0” moderate to low water content, water content decreases with depth, silty sand, very dense, uniform texture throughout, organic matter present (fibrous roots)	10YR 3/2 very 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 (Hue Value/Chroma)
IK-11	2907641.40	10240449.42	30.0 / 27.0	post-impoundment	0.0-26.0" low water content, coarse grain sand, very dense, uniform consistency and texture throughout, mottled coloration	10YR 2/1 black 10YR 3/2 very dark grayish brown
					26.0-27.0" low water content, narrow band of clay, smooth, sticky	5YR 4/4 reddish brown
				pre-impoundment	27.0-30.0" low water content, sandy clay, very dense, uniform consistency and texture throughout	10YR 3/2 very dark grayish brown
IK-12	2904516.48	10241666.50	31.0 / 28.0	post-impoundment	0.0-1.0" high water content, silty sand, coarse grain, dense, uniform consistency and texture throughout	10YR 3/1 dark gray
					1.0-17.0" moderate water content, coarse grain sand mixed with small gravel, dense, 1.5-inch gravel at 9 inches, mottled coloration	7.5YR 4/4 brown 10YR 4/3 brown
					17.0-28.0" moderate water content, coarse grain sand with small gravel, loosely packed, trace amounts of silt, increasing clay content at bottom of layer	10YR 2/2 very dark brown
				pre-impoundment	28.0-31.0" moderate water content, sandy clay, dense, malleable, sticky, peanut butter like, some red clay present	10YR 2/2 very dark brown
IK-13	2902098.12	10242420.09	Grab[c]	post-impoundment	high water content, medium grain silty sand with small gravel and bits of shell	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
c. Grab samples were collected using a petite Ponar dredge sampler

A photograph of sediment core IK-4 (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 was not identified in this core sample. The pre-impoundment surface is identified by a change in color, texture, moisture, porosity, and structure. Identification of the pre-impoundment surface for each sediment core followed a similar procedure.

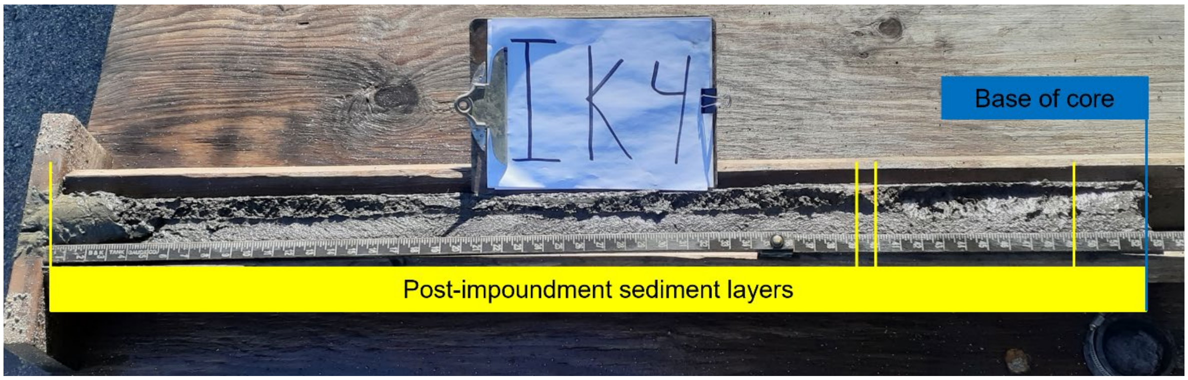


Figure 7. **Sediment core IK-4 from Inks Lake. Post-impoundment sediment layers occur throughout the entire 53.0 inches of this sediment core (identified by the yellow box). The base of the core is denoted by the blue line.**

Figure 8 illustrates the relationships between acoustic signal returns and the depositional layering seen in sediment cores. In this example, sediment core IK-4 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.

The pre-impoundment boundary in sediment core IK-4 most closely aligned with the different layers picked up by the 50 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.

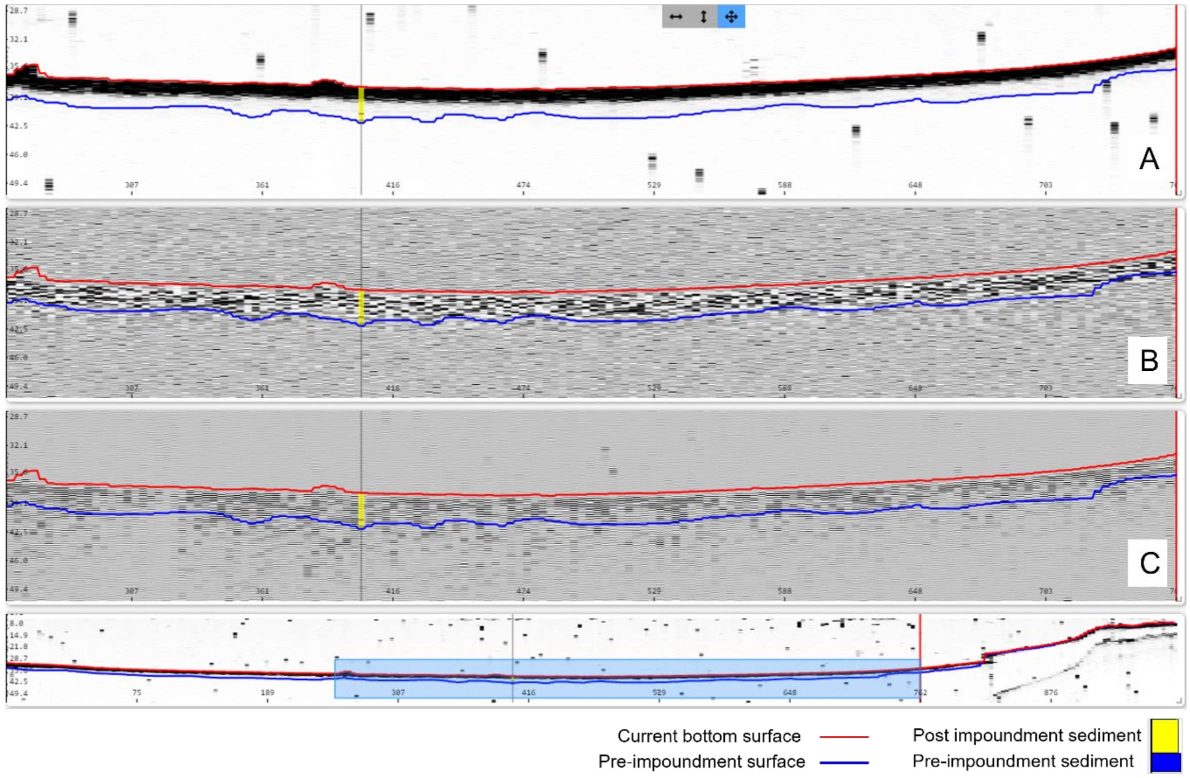


Figure 8. **Comparison of sediment core IK-4 with acoustic signal returns. A) 208 kHz frequency, B) 50 kHz frequency, and C) 12 kHz frequency. The current surface in red and pre-impoundment surface in blue.**

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 888.32-foot elevation contour). The sediment thickness TIN model was converted to a raster representation using a cell size of 2 feet by 2 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.

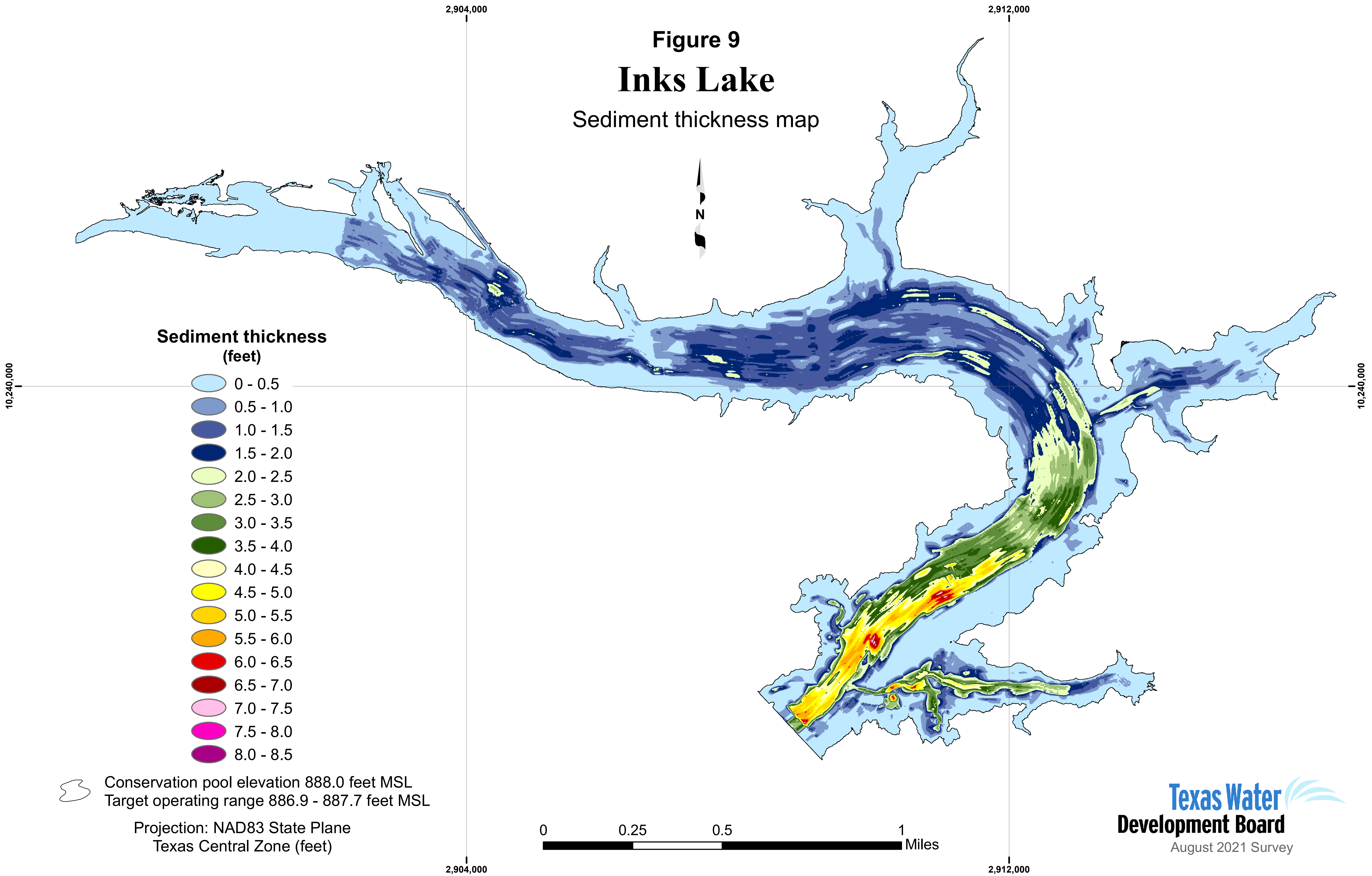


Figure 9
Inks Lake
Sediment thickness map
2,904,000
2,912,000
10,240,000
N
Sediment thickness
(feet)
0 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
2.0 - 2.5
2.5 - 3.0
3.0 - 3.5
3.5 - 4.0
4.0 - 4.5
4.5 - 5.0
5.0 - 5.5
5.5 - 6.0
6.0 - 6.5
6.5 - 7.0
7.0 - 7.5
7.5 - 8.0
8.0 - 8.5
Conservation pool elevation 888.0 feet MSL
Target operating range 886.9 - 887.7 feet MSL
Projection: NAD83 State Plane
Texas Central Zone (feet)
0
0.25
0.5
1
Miles
Texas Water
Development Board
August 2021 Survey

Survey results

Volumetric survey

The 2021 TWDB volumetric survey indicates that Inks Lake has a total reservoir capacity of 14,012 acre-feet and encompasses 803 acres at conservation pool elevation (888.00 feet above mean sea level). Current area and capacity estimates are compared to previous area and capacity estimates at different elevations 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. Current and previous survey capacity and surface area estimates.

Survey	Surface Area (acres)	Total Capacity (acre-feet)	Conservation Pool Elevation[a]	Source(s)
Original design LCRA 1960	825	17,545	888.00	Texas Water Development Board, 1971
LCRA 1995 TWDB revised[b]	831	14,878	888.00	Texas Water Development Board, 2007
TWDB 2007	783	13,902	888.00	Texas Water Development Board, 2007
TWDB 2021	803	14,012	888.00	

[a] Feet above mean sea level, LCRA legacy datum.
[b] Developed from a combination of 1995 LCRA survey data, 1995 aerial photographs, and TWDB self-similar and line extrapolation techniques (Texas Water Development Board, 2009).

Volumetric survey accuracy assessment

Axial profile data were collected 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 0.34 feet and the RMSE of the model surface is 0.71 feet. Using the RMSE value of 0.71 as the range of uncertainty for the volumetric survey, 0.71 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 top of conservation pool elevation 888.0 feet suggest the total reservoir capacity estimate at elevation 888.0 feet is accurate to within ± 3.5 percent (± 504 acre-feet). 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 therefore, capacity.

Comparison of the 2021 TWDB survey results with the 2007 TWDB survey results indicate the reservoir has gained capacity. This is likely not the case, as the survey results are very similar. Data coverage in 2021 is denser with 250 feet line spacing versus 500 feet line spacing in 2007. Other differences are likely due to differences in modeling. In 2021, the LIDAR data points were not thinned and covered the entire area of the lake between conservation pool elevation and top of dam elevation. In 2007, part of the topographic model boundary at elevation 920.0 feet came from USGS digital quarter quadrangle map contours, or hypsography.

Sedimentation survey

The 2021 TWDB sedimentation survey measured 829 acre-feet of sediment. The sedimentation survey indicates sediment accumulation is greatest near the dam. Comparison of capacity estimates of Inks Lake derived using differing methodologies are provided in Table 4 for sedimentation rate calculation. The 2021 TWDB sedimentation survey indicates Inks Lake has lost capacity at an average of 10 acre-feet per year since impoundment due to sedimentation below conservation pool elevation (888.00 feet above mean sea level). A linear regression of the LCRA 1960, LCRA 1995 TWDB revised, TWDB 2007, and TWDB 2021 capacity estimates indicate Inks Lake loses capacity at an average of 25 acre-feet per year since impoundment due to sedimentation below conservation pool elevation (888.0 feet above mean sea level) (Figure 10). Differences in methodology may also contribute to differences between these surveys.

The TWDB sedimentation estimate may be an underestimate of accumulated sediment. A mixture of sediment textures, as found in Inks Lake, can complicate pre-impoundment identification efforts as density stratification in the sediment layers can impair acoustic return signals of the multi-frequency depth sounder (U.S. Army Corps of Engineers, 2013).

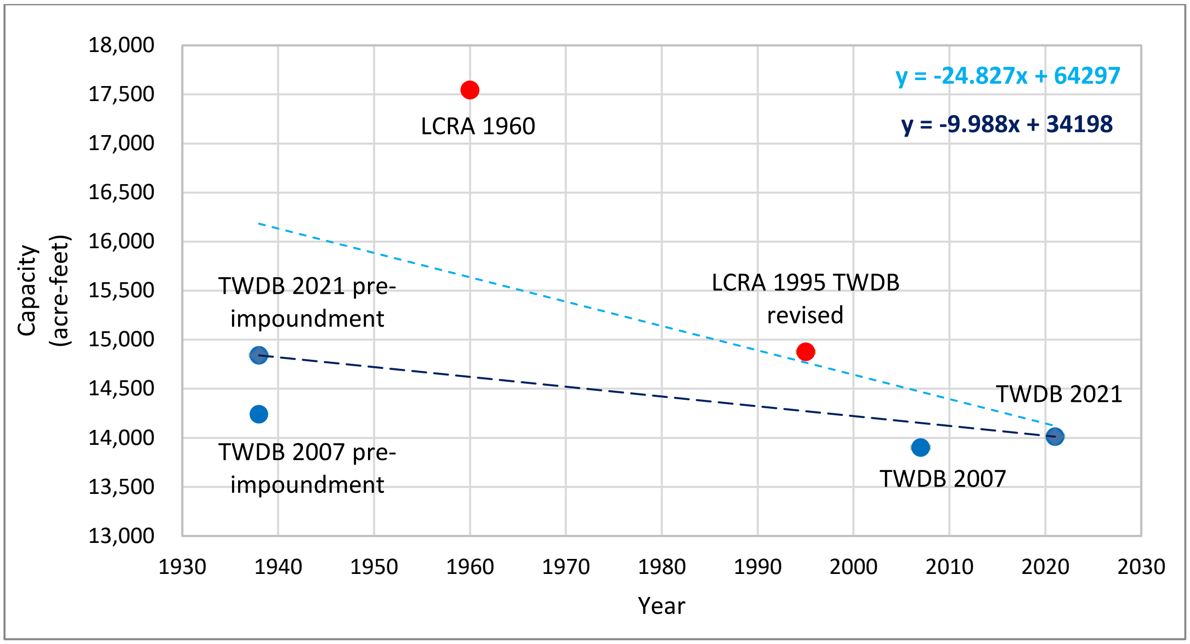


Figure 10. **Plot of current and previous capacity estimates (acre-feet) at elevation 888.0 feet for Inks Lake. Capacity estimates for each TWDB survey plotted as blue dots and other surveys as red dots. The light blue trend line illustrates the total average loss of capacity through 2021. The dark blue trend line illustrates the average loss of capacity based on the 2021 survey results. Trendlines illustrating the average loss of capacity are shown here for informational purposes only. The 2007 TWDB pre-impoundment estimate is not included in the trendline calculation and is for informational purposes only.**

Table 4. Average annual capacity loss comparisons.

Survey	Top of conservation pool elevation (888.0 feet above mean sea level)			
LCRA 1960[a]	17,545	<>	<>	<>
LCRA 1995 TWDB revised[b]	<>	14,878	<>	<>
TWDB 2007	<>	<>	13,902	<>
TWDB pre-impoundment estimate based on 2021 survey[c]	<>	<>	<>	14,841
2021 volumetric survey	14,012	14,012	14,012	14,012
Volume difference (acre-feet) Percent change	3,533 20.1	866 5.8	-110 -0.8	829 5.6
Number of years	61	26	14	83
Capacity loss rate (acre-feet/year)	58	33	-7.9	10.0
Capacity loss rate (acre-feet/square mile of drainage area of 19,390 square miles /year)	0.003	0.002	0.0004	0.0005

[a] Source(s): M. Luna, P.E., written commun(s)., 2006; Texas Water Development Board, 1971.
[b] Source: Texas Water Development Board, 2009. Developed from a combination of 1995 LCRA survey data, 1995 aerial photographs, and TWDB self-similar and line extrapolation techniques.
[c] Inks Dam was completed in June 1938.

Axial profile

The axial profile of the reservoir, showing both the 2021 current and pre-impoundment surfaces, is plotted in Appendix I. Also presented in Appendix I 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 2007 and to correlate with unique acoustic returns throughout the reservoir. 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 volumetric survey of Inks Lake within a 10-year timeframe or after a major high flow event to assess changes in reservoir capacity and 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. Due to the irregular bottom, rocky substrate of the reservoir, and potential responses to high flow events, a multibeam survey should be considered to more accurately measure capacity and identify changes in the reservoir bottom.

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

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

Lower Colorado River Authority, 2021, Highland Lakes and Dams, accessed May 31, 2021, at https://www.lcra.org/water/dams-and-lakes/.

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 May 26, 2021, at https://tceq.maps.arcgis.com/home/webmap/viewer.html?webmap=796b001513b9407a9818897b4dc1ec4d

Texas Natural Resources Information System, 2021, Texas Imagery Service | TNRIS – Texas Natural Resources Information System, accessed May 14, 2021, at https://www.tnris.org/texas-imagery-service/.

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

Texas Water Development Board, 2009, Volumetric and Sedimentation Survey of Inks Lake, accessed May 27, 2021, at http://www.twdb.texas.gov/hydro_survey/LyndonBJohnson/2007-05/LBJ2007_FinalReport.pdf

Texas Water Development Board, 2019, Contract No. 1948012326 with the Lower Colorado River Authority.

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

U.S. Geological Survey, 2021, U.S. Geological Survey National Water Information System: Web Interface, *USGS 08148100 LCRA Inks Lk nr Kingsland, TX,* accessed December 1, 2021, at https://waterdata.usgs.gov/tx/nwis/uv/?site_no=08148100&PARAmeter_cd=00054,62614,62615,62619,62620.

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

Inks Lake

RESERVOIR BATHYMETRIC CAPACITY TABLE

TEXAS WATER DEVELOPMENT BOARD — August 2021 Survey

CAPACITY IN ACRE-FEET — Conservation pool elevation 888.0 feet MSL

ELEVATION INCREMENT IS ONE TENTH FOOT

ELEVATION (Feet MSL)	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
825	0	0	0	0	0	0	0	0	0	0
826	0	0	0	0	0	0	0	0	0	0
827	0	0	0	0	0	0	0	0	0	0
828	0	0	0	0	0	0	0	0	0	0
829	0	0	0	0	0	0	0	0	0	1
830	1	1	1	1	1	1	1	1	1	1
831	1	1	1	1	2	2	2	2	3	3
832	4	4	5	5	6	6	7	8	8	9
833	10	11	11	12	13	14	15	16	16	17
834	18	19	20	21	22	23	24	25	26	27
835	28	29	31	32	33	34	35	36	38	39
836	40	42	43	44	46	47	49	50	51	53
837	55	56	58	59	61	63	65	67	69	71
838	73	75	77	79	81	83	86	88	90	93
839	95	97	100	102	105	108	110	113	115	118
840	121	124	126	129	132	135	138	141	144	147
841	150	153	156	159	163	166	169	172	176	179
842	182	186	189	193	196	200	204	208	211	215
843	219	223	227	231	235	239	243	248	252	256
844	261	265	269	274	279	283	288	293	297	302
845	307	312	317	322	327	332	337	342	348	353
846	359	364	370	375	381	387	393	399	404	410
847	417	423	429	435	441	448	454	461	467	474
848	480	487	494	500	507	514	521	528	535	542
849	549	557	564	571	578	586	593	601	608	616
850	624	632	639	647	655	663	671	679	687	695
851	704	712	720	729	737	745	754	763	771	780
852	789	798	806	815	824	834	843	852	861	871
853	880	890	899	909	919	928	938	948	958	968
854	978	989	999	1,009	1,020	1,031	1,041	1,052	1,063	1,073
855	1,084	1,095	1,106	1,117	1,128	1,140	1,151	1,162	1,174	1,185
856	1,197	1,209	1,220	1,232	1,244	1,256	1,269	1,281	1,293	1,306
857	1,319	1,331	1,344	1,357	1,371	1,384	1,398	1,411	1,425	1,440
858	1,454	1,469	1,483	1,498	1,514	1,529	1,545	1,560	1,576	1,592
859	1,608	1,624	1,641	1,657	1,674	1,690	1,707	1,724	1,741	1,758
860	1,776	1,793	1,810	1,828	1,846	1,863	1,881	1,899	1,917	1,936
861	1,954	1,972	1,991	2,010	2,028	2,047	2,066	2,085	2,105	2,124
862	2,143	2,163	2,182	2,202	2,222	2,242	2,262	2,282	2,302	2,323
863	2,343	2,364	2,385	2,406	2,427	2,448	2,470	2,491	2,513	2,535
864	2,556	2,578	2,601	2,623	2,646	2,668	2,691	2,714	2,737	2,760
865	2,784	2,807	2,831	2,855	2,879	2,903	2,927	2,952	2,976	3,001
866	3,026	3,051	3,076	3,102	3,128	3,153	3,180	3,206	3,232	3,259
867	3,286	3,313	3,340	3,368	3,396	3,423	3,452	3,480	3,509	3,538
868	3,567	3,596	3,626	3,656	3,686	3,717	3,748	3,779	3,810	3,842
869	3,874	3,906	3,938	3,970	4,003	4,036	4,069	4,102	4,136	4,169
870	4,203	4,237	4,272	4,306	4,341	4,376	4,411	4,446	4,481	4,517
871	4,553	4,589	4,625	4,661	4,698	4,735	4,772	4,809	4,846	4,884
872	4,922	4,960	4,998	5,036	5,075	5,113	5,152	5,191	5,231	5,270
873	5,309	5,349	5,389	5,429	5,469	5,510	5,550	5,591	5,632	5,673
874	5,715	5,756	5,798	5,839	5,881	5,924	5,966	6,008	6,051	6,094
875	6,137	6,180	6,223	6,267	6,311	6,354	6,398	6,442	6,487	6,531
876	6,576	6,621	6,666	6,711	6,756	6,802	6,848	6,894	6,940	6,986
877	7,033	7,080	7,127	7,175	7,223	7,271	7,320	7,369	7,418	7,468
878	7,518	7,568	7,618	7,669	7,720	7,771	7,823	7,875	7,927	7,979
879	8,032	8,085	8,138	8,192	8,245	8,299	8,354	8,408	8,463	8,519
880	8,574	8,630	8,686	8,743	8,800	8,857	8,914	8,972	9,030	9,089

Appendix A

Inks Lake

RESERVOIR BATHYMETRIC CAPACITY TABLE (Continued)

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

August 2021 Survey
Conservation pool elevation 888.0 feet MSL

ELEVATION (Feet MSL)	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
881	9,147	9,206	9,266	9,326	9,386	9,446	9,507	9,568	9,629	9,691
882	9,753	9,815	9,877	9,940	10,003	10,067	10,130	10,194	10,258	10,323
883	10,388	10,453	10,518	10,584	10,650	10,716	10,782	10,849	10,916	10,983
884	11,051	11,119	11,187	11,255	11,324	11,393	11,462	11,532	11,602	11,672
885	11,742	11,813	11,884	11,955	12,027	12,099	12,171	12,244	12,317	12,390
886	12,463	12,537	12,611	12,686	12,761	12,836	12,912	12,988	13,064	13,141
887	13,218	13,296	13,375	13,454	13,533	13,613	13,692	13,772	13,852	13,932
888	14,012	14,092	14,173	14,254						

Appendix B

Inks Lake

RESERVOIR BATHYMETRIC AREA TABLE

TEXAS WATER DEVELOPMENT BOARD

AREA IN ACRES

ELEVATION INCREMENT IS ONE TENTH FOOT

August 2021 Survey

Conservation pool elevation 888.0 feet MSL

ELEVATION (Feet MSL)	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
825	0	0	0	0	0	0	0	0	0	0
826	0	0	0	0	0	0	0	0	0	0
827	0	0	0	0	0	0	0	0	0	0
828	0	0	0	0	0	0	0	0	0	0
829	0	0	0	0	0	0	0	0	0	0
830	0	0	0	1	1	1	1	1	1	1
831	1	1	1	1	2	2	2	3	4	4
832	5	5	6	6	6	6	7	7	7	7
833	7	8	8	8	8	8	9	9	9	9
834	9	9	10	10	10	10	10	10	11	11
835	11	11	11	12	12	12	12	12	13	13
836	13	13	13	14	14	14	14	15	15	15
837	16	16	17	17	18	18	19	19	20	20
838	21	21	21	22	22	22	23	23	23	24
839	24	24	25	25	25	26	26	26	27	27
840	27	28	28	28	29	29	30	30	30	31
841	31	31	31	32	32	32	33	33	33	34
842	34	35	35	36	36	37	37	38	38	39
843	39	40	40	41	41	42	42	42	43	43
844	44	44	45	45	46	46	47	47	48	48
845	49	49	50	50	51	51	52	53	53	54
846	55	55	56	57	57	58	59	59	60	60
847	61	62	62	63	63	64	64	65	65	66
848	66	67	67	68	68	69	70	70	71	71
849	72	72	73	73	74	75	75	76	76	77
850	77	78	78	79	79	80	80	81	81	82
851	82	83	83	84	84	85	86	86	87	88
852	88	89	89	90	91	91	92	93	93	94
853	95	95	96	97	98	98	99	100	101	101
854	102	103	104	104	105	106	106	107	108	108
855	109	110	110	111	112	113	113	114	115	115
856	116	117	118	120	121	122	123	124	125	126
857	128	129	130	131	133	135	136	138	141	143
858	145	147	149	151	153	154	156	157	159	160
859	161	163	164	165	166	168	169	170	171	172
860	173	174	175	176	177	178	179	181	182	183
861	184	185	186	187	188	189	190	191	192	193
862	194	195	197	198	199	200	201	203	204	205
863	207	208	209	210	212	213	214	216	217	218
864	220	221	223	224	226	227	229	230	232	233
865	235	236	238	239	240	242	244	245	247	248
866	250	252	254	256	258	260	262	264	266	268
867	270	272	274	276	278	281	283	285	288	291
868	293	296	298	301	304	307	310	313	315	317
869	320	322	324	326	328	330	332	334	336	338
870	340	342	344	345	347	349	351	353	355	357
871	359	361	363	365	367	369	371	373	375	377
872	379	381	383	384	386	388	389	391	393	394
873	396	398	400	402	403	405	407	409	410	412
874	414	416	417	419	421	423	424	426	428	429
875	431	432	434	436	437	439	440	442	444	446
876	448	449	451	453	455	457	459	461	463	466
877	468	471	474	478	481	485	488	491	494	497
878	500	503	506	509	511	514	517	520	523	525
879	528	531	534	537	539	542	545	548	551	554
880	557	560	564	567	570	573	576	579	582	586

Appendix B

Inks Lake

RESERVOIR BATHYMETRIC AREA TABLE (Continued)

TEXAS WATER DEVELOPMENT BOARD

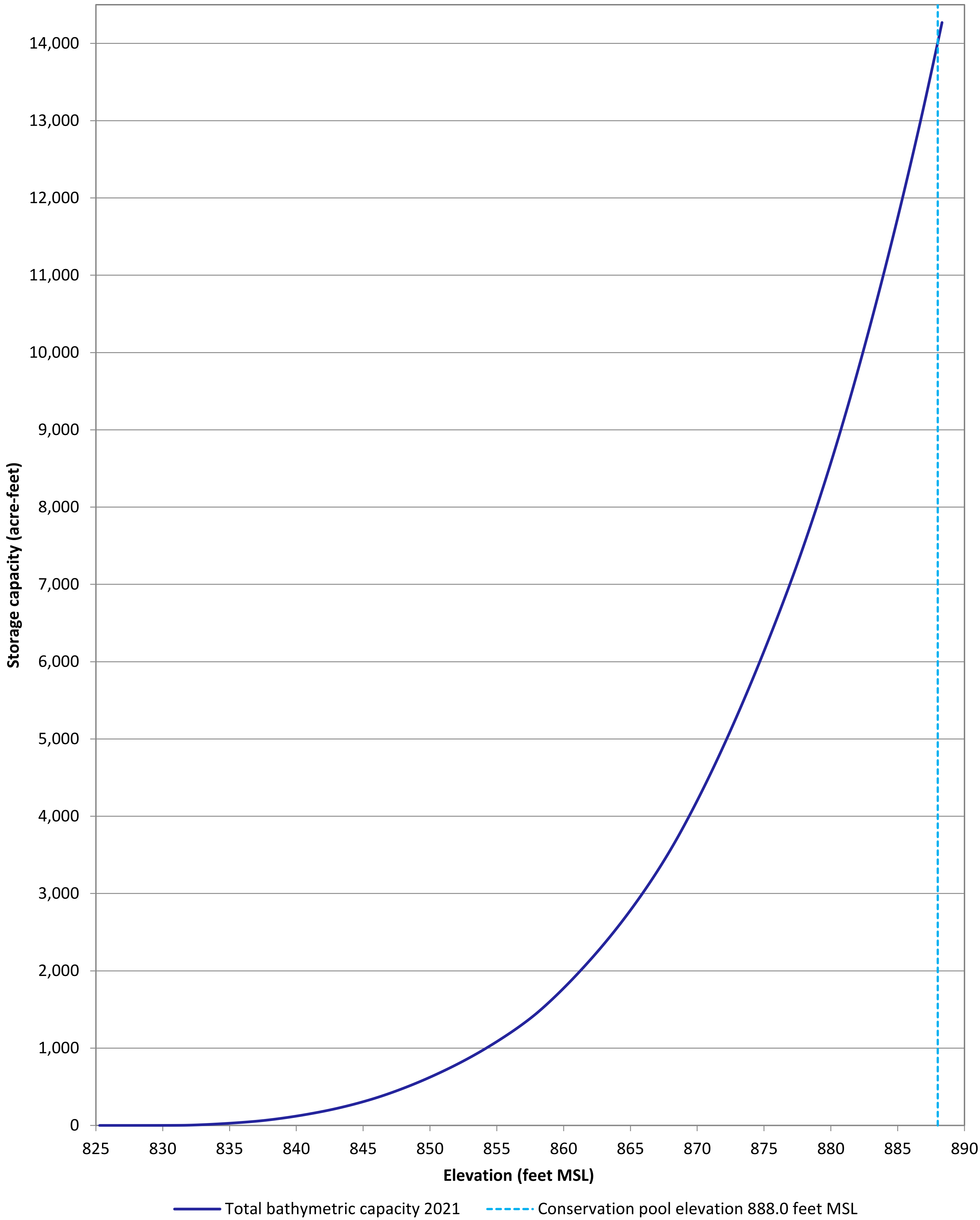
AREA IN ACRES

ELEVATION INCREMENT IS ONE TENTH FOOT

August 2021 Survey

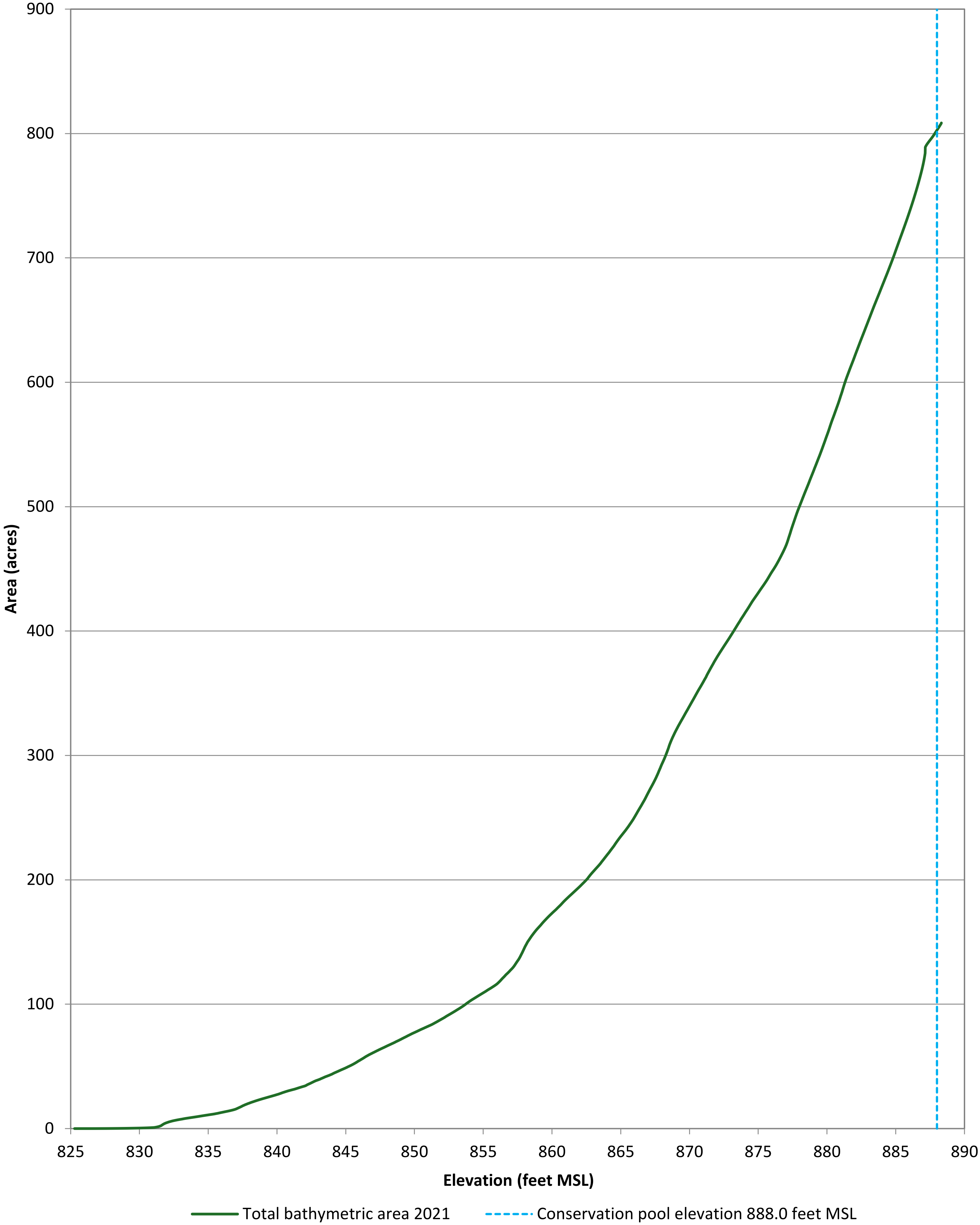
Conservation pool elevation 888.0 feet MSL

ELEVATION (Feet MSL)	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
881	589	592	596	600	603	606	609	612	615	617
882	620	623	626	629	632	635	638	641	643	646
883	649	652	655	658	661	663	666	669	672	674
884	677	680	683	685	688	691	694	697	700	703
885	706	709	712	715	718	721	724	727	731	734
886	737	740	744	747	751	754	758	762	766	771
887	776	781	790	792	793	795	796	798	799	801
888	803	804	806	808						



Inks Lake
August 2021 Survey
Prepared by: TWDB

Appendix C: 2021 Bathymetric capacity curve



Inks Lake
August 2021 Survey
Prepared by: TWDB

Appendix D: 2021 Bathymetric area curve

Appendix E

Inks Lake

RESERVOIR BATHYMETRIC AND TOPOGRAPHIC CAPACITY TABLE

TEXAS WATER DEVELOPMENT BOARD — August 2021 Survey

CAPACITY IN ACRE-FEET — Conservation pool elevation 888.0 feet MSL

ELEVATION INCREMENT IS ONE TENTH FOOT — Top of dam elevation 922.0 feet MSL

ELEVATION (Feet MSL)	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
825	0	0	0	0	0	0	0	0	0	0
826	0	0	0	0	0	0	0	0	0	0
827	0	0	0	0	0	0	0	0	0	0
828	0	0	0	0	0	0	0	0	0	0
829	0	0	0	0	0	0	0	0	0	1
830	1	1	1	1	1	1	1	1	1	1
831	1	1	1	1	2	2	2	2	3	3
832	4	4	5	5	6	6	7	8	8	9
833	10	11	11	12	13	14	15	16	16	17
834	18	19	20	21	22	23	24	25	26	27
835	28	29	31	32	33	34	35	36	38	39
836	40	42	43	44	46	47	49	50	51	53
837	55	56	58	59	61	63	65	67	69	71
838	73	75	77	79	81	83	86	88	90	93
839	95	98	100	102	105	108	110	113	115	118
840	121	124	126	129	132	135	138	141	144	147
841	150	153	156	159	163	166	169	172	176	179
842	182	186	189	193	196	200	204	208	211	215
843	219	223	227	231	235	239	243	248	252	256
844	261	265	269	274	279	283	288	293	297	302
845	307	312	317	322	327	332	337	342	348	353
846	359	364	370	375	381	387	393	399	404	411
847	417	423	429	435	441	448	454	461	467	474
848	480	487	494	500	507	514	521	528	535	542
849	549	557	564	571	578	586	593	601	608	616
850	624	632	639	647	655	663	671	679	687	695
851	704	712	720	729	737	745	754	763	771	780
852	789	798	806	815	825	834	843	852	861	871
853	880	890	899	909	919	928	938	948	958	968
854	979	989	999	1,010	1,020	1,031	1,041	1,052	1,063	1,073
855	1,084	1,095	1,106	1,117	1,128	1,140	1,151	1,162	1,174	1,185
856	1,197	1,209	1,220	1,232	1,244	1,256	1,269	1,281	1,293	1,306
857	1,319	1,332	1,344	1,358	1,371	1,384	1,398	1,411	1,425	1,440
858	1,454	1,469	1,483	1,499	1,514	1,529	1,545	1,560	1,576	1,592
859	1,608	1,624	1,641	1,657	1,674	1,690	1,707	1,724	1,741	1,758
860	1,776	1,793	1,810	1,828	1,846	1,863	1,881	1,899	1,917	1,936
861	1,954	1,972	1,991	2,010	2,028	2,047	2,066	2,085	2,105	2,124
862	2,143	2,163	2,182	2,202	2,222	2,242	2,262	2,282	2,302	2,323
863	2,343	2,364	2,385	2,406	2,427	2,448	2,470	2,491	2,513	2,535
864	2,556	2,579	2,601	2,623	2,646	2,668	2,691	2,714	2,737	2,760
865	2,784	2,807	2,831	2,855	2,879	2,903	2,927	2,952	2,976	3,001
866	3,026	3,051	3,076	3,102	3,128	3,154	3,180	3,206	3,232	3,259
867	3,286	3,313	3,340	3,368	3,396	3,424	3,452	3,480	3,509	3,538
868	3,567	3,596	3,626	3,656	3,686	3,717	3,748	3,779	3,810	3,842
869	3,874	3,906	3,938	3,970	4,003	4,036	4,069	4,102	4,136	4,170
870	4,203	4,237	4,272	4,306	4,341	4,376	4,411	4,446	4,481	4,517
871	4,553	4,589	4,625	4,661	4,698	4,735	4,772	4,809	4,847	4,884
872	4,922	4,960	4,998	5,036	5,075	5,114	5,152	5,192	5,231	5,270
873	5,310	5,349	5,389	5,429	5,469	5,510	5,551	5,591	5,632	5,673
874	5,715	5,756	5,798	5,840	5,882	5,924	5,966	6,009	6,051	6,094
875	6,137	6,180	6,224	6,267	6,311	6,354	6,398	6,443	6,487	6,531
876	6,576	6,621	6,666	6,711	6,757	6,802	6,848	6,894	6,940	6,987
877	7,033	7,080	7,128	7,175	7,223	7,271	7,320	7,369	7,418	7,468
878	7,518	7,568	7,618	7,669	7,720	7,772	7,823	7,875	7,927	7,979
879	8,032	8,085	8,138	8,192	8,246	8,300	8,354	8,409	8,464	8,519
880	8,575	8,630	8,687	8,743	8,800	8,857	8,915	8,973	9,031	9,089

Appendix E

Inks Lake

RESERVOIR BATHYMETRIC AND TOPOGRAPHIC CAPACITY TABLE (Continued)

TEXAS WATER DEVELOPMENT BOARD — August 2021 Survey

CAPACITY IN ACRE-FEET — Conservation pool elevation 888.0 feet MSL

ELEVATION INCREMENT IS ONE TENTH FOOT — Top of dam elevation 922.0 feet MSL

ELEVATION (Feet MSL)	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
881	9,148	9,207	9,266	9,326	9,386	9,447	9,507	9,568	9,630	9,691
882	9,753	9,815	9,878	9,941	10,004	10,067	10,131	10,195	10,259	10,323
883	10,388	10,453	10,519	10,584	10,650	10,716	10,783	10,850	10,917	10,984
884	11,052	11,119	11,188	11,256	11,325	11,394	11,463	11,533	11,602	11,672
885	11,743	11,814	11,885	11,956	12,028	12,100	12,172	12,245	12,318	12,391
886	12,465	12,538	12,613	12,687	12,762	12,837	12,913	12,989	13,066	13,143
887	13,220	13,298	13,377	13,456	13,535	13,615	13,694	13,774	13,854	13,934
888	14,014	14,095	14,175	14,256	14,337	14,418	14,500	14,582	14,664	14,746
889	14,829	14,912	14,995	15,078	15,162	15,246	15,330	15,415	15,500	15,586
890	15,671	15,758	15,844	15,931	16,018	16,106	16,194	16,282	16,371	16,460
891	16,549	16,639	16,729	16,819	16,910	17,001	17,093	17,185	17,277	17,369
892	17,462	17,555	17,649	17,743	17,837	17,932	18,026	18,122	18,217	18,313
893	18,409	18,506	18,603	18,700	18,797	18,895	18,993	19,092	19,191	19,290
894	19,389	19,489	19,589	19,689	19,790	19,891	19,992	20,093	20,195	20,298
895	20,400	20,503	20,606	20,710	20,813	20,918	21,022	21,127	21,232	21,337
896	21,443	21,549	21,655	21,762	21,868	21,976	22,083	22,191	22,299	22,407
897	22,516	22,625	22,734	22,844	22,953	23,064	23,174	23,285	23,396	23,507
898	23,619	23,730	23,843	23,955	24,068	24,181	24,294	24,408	24,522	24,636
899	24,751	24,866	24,981	25,096	25,212	25,328	25,445	25,561	25,678	25,796
900	25,913	26,031	26,149	26,268	26,387	26,506	26,625	26,745	26,865	26,985
901	27,106	27,227	27,348	27,470	27,592	27,714	27,836	27,959	28,082	28,206
902	28,329	28,453	28,578	28,702	28,827	28,952	29,078	29,204	29,330	29,457
903	29,583	29,710	29,838	29,966	30,094	30,222	30,351	30,480	30,609	30,738
904	30,868	30,999	31,129	31,260	31,391	31,523	31,655	31,787	31,919	32,052
905	32,185	32,319	32,453	32,587	32,721	32,856	32,991	33,126	33,262	33,398
906	33,535	33,671	33,808	33,946	34,084	34,222	34,360	34,499	34,638	34,777
907	34,917	35,057	35,197	35,338	35,479	35,620	35,762	35,904	36,046	36,189
908	36,332	36,475	36,619	36,763	36,907	37,052	37,197	37,342	37,488	37,634
909	37,780	37,927	38,074	38,221	38,369	38,517	38,665	38,814	38,963	39,112
910	39,262	39,412	39,563	39,714	39,865	40,017	40,168	40,321	40,473	40,626
911	40,780	40,933	41,087	41,242	41,397	41,552	41,707	41,863	42,019	42,176
912	42,333	42,490	42,648	42,806	42,964	43,122	43,281	43,441	43,601	43,761
913	43,921	44,082	44,243	44,405	44,567	44,729	44,891	45,054	45,218	45,381
914	45,546	45,710	45,875	46,040	46,205	46,371	46,537	46,704	46,871	47,038
915	47,206	47,374	47,542	47,711	47,880	48,049	48,219	48,389	48,560	48,731
916	48,902	49,074	49,246	49,418	49,591	49,764	49,938	50,112	50,286	50,461
917	50,636	50,811	50,987	51,163	51,340	51,517	51,694	51,872	52,050	52,228
918	52,407	52,587	52,766	52,946	53,127	53,308	53,489	53,671	53,853	54,035
919	54,218	54,401	54,585	54,769	54,953	55,138	55,323	55,508	55,694	55,881
920	56,067	56,254	56,442	56,630	56,818	57,007	57,196	57,385	57,575	57,765
921	57,955	58,146	58,338	58,529	58,721	58,914	59,107	59,300	59,494	59,688
922	59,882									

Appendix F

Inks Lake

RESERVOIR BATHYMETRIC AND TOPOGRAPHIC AREA TABLE

TEXAS WATER DEVELOPMENT BOARD — August 2021 Survey

AREA IN ACRES — Conservation pool elevation 888.0 feet MSL

ELEVATION INCREMENT IS ONE TENTH FOOT — Top of dam elevation 922.0 feet MSL

ELEVATION (Feet MSL)	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
825	0	0	0	0	0	0	0	0	0	0
826	0	0	0	0	0	0	0	0	0	0
827	0	0	0	0	0	0	0	0	0	0
828	0	0	0	0	0	0	0	0	0	0
829	0	0	0	0	0	0	0	0	0	0
830	0	0	0	1	1	1	1	1	1	1
831	1	1	1	1	2	2	2	3	4	4
832	5	5	6	6	6	6	7	7	7	7
833	7	8	8	8	8	8	9	9	9	9
834	9	9	10	10	10	10	10	10	11	11
835	11	11	11	12	12	12	12	12	13	13
836	13	13	13	14	14	14	14	15	15	15
837	16	16	17	17	18	18	19	19	20	20
838	21	21	21	22	22	22	23	23	23	24
839	24	24	25	25	25	26	26	26	27	27
840	27	28	28	28	29	29	30	30	30	31
841	31	31	31	32	32	32	33	33	33	34
842	34	35	35	36	36	37	37	38	38	39
843	39	40	40	41	41	42	42	42	43	43
844	44	44	45	45	46	46	47	47	48	48
845	49	49	50	50	51	51	52	53	53	54
846	55	55	56	57	57	58	59	59	60	60
847	61	62	62	63	63	64	64	65	65	66
848	66	67	67	68	68	69	70	70	71	71
849	72	72	73	73	74	75	75	76	76	77
850	77	78	78	79	79	80	80	81	81	82
851	82	83	83	84	84	85	86	86	87	88
852	88	89	89	90	91	91	92	93	93	94
853	95	95	96	97	98	98	99	100	101	101
854	102	103	104	104	105	106	106	107	108	108
855	109	110	110	111	112	113	113	114	115	115
856	116	117	118	120	121	122	123	124	125	126
857	128	129	130	131	133	135	136	138	141	143
858	145	147	149	151	153	154	156	157	159	160
859	161	163	164	165	166	168	169	170	171	172
860	173	174	175	176	177	178	179	181	182	183
861	184	185	186	187	188	189	190	191	192	193
862	194	195	197	198	199	200	201	203	204	205
863	207	208	209	210	212	213	214	216	217	218
864	220	221	223	224	226	227	229	230	232	233
865	235	236	238	239	241	242	244	245	247	248
866	250	252	254	256	258	260	262	264	266	268
867	270	272	274	276	278	281	283	285	288	291
868	293	296	298	301	304	307	310	313	315	317
869	320	322	324	326	328	330	332	334	336	338
870	340	342	344	345	347	349	351	353	355	357
871	359	361	363	365	367	369	371	373	375	377
872	379	381	383	384	386	388	389	391	393	394
873	396	398	400	402	403	405	407	409	410	412
874	414	416	417	419	421	423	424	426	428	429
875	431	432	434	436	437	439	440	442	444	446
876	448	449	451	453	455	457	459	461	463	466
877	468	471	474	478	481	485	488	491	494	497
878	500	503	506	509	512	514	517	520	523	525
879	528	531	534	537	539	542	545	548	551	554
880	557	561	564	567	570	573	576	579	582	586

Appendix F

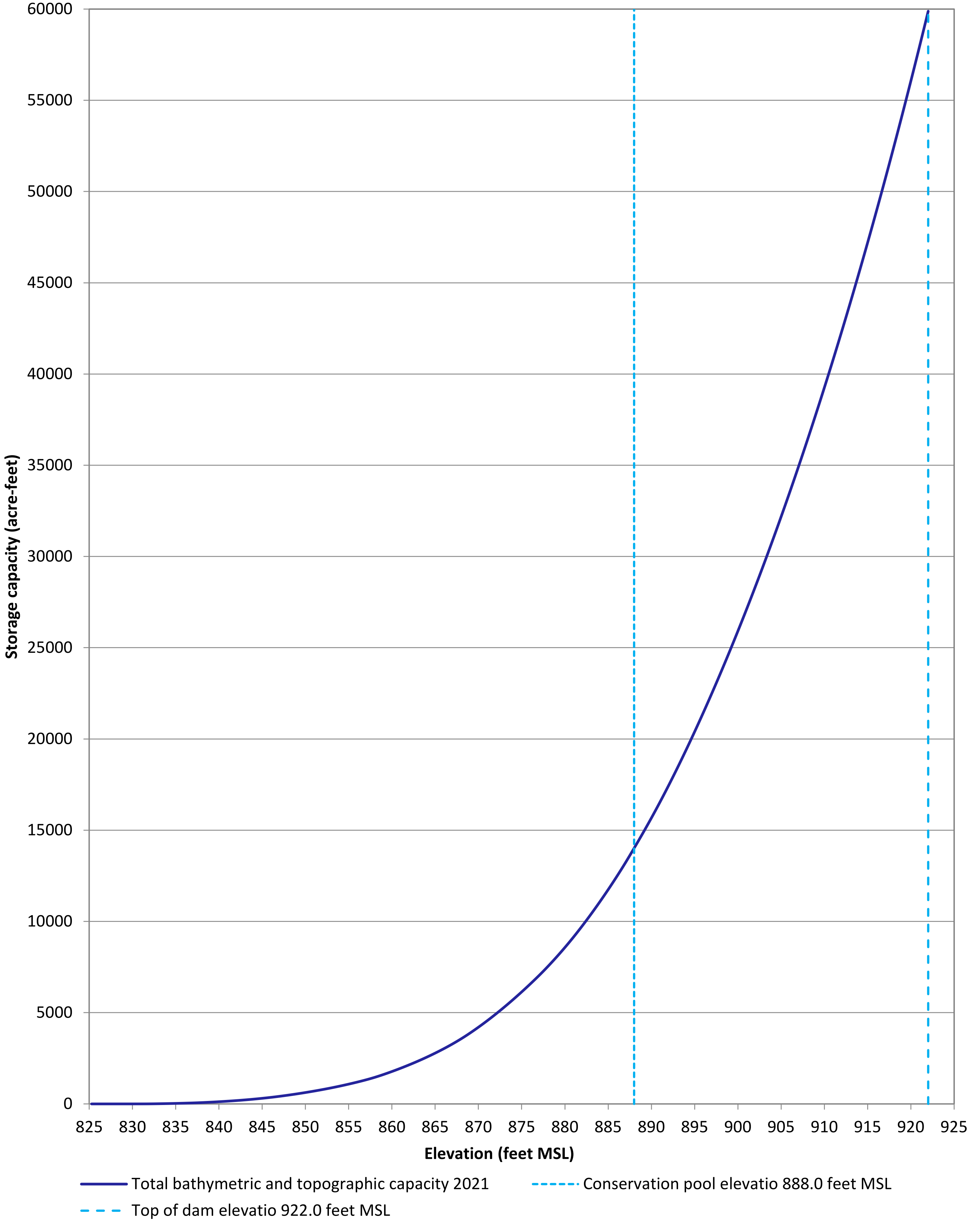
Inks Lake

RESERVOIR BATHYMETRIC AND TOPOGRAPHIC AREA TABLE (Continued)

TEXAS WATER DEVELOPMENT BOARD
AREA IN ACRES
ELEVATION INCREMENT IS ONE TENTH FOOT

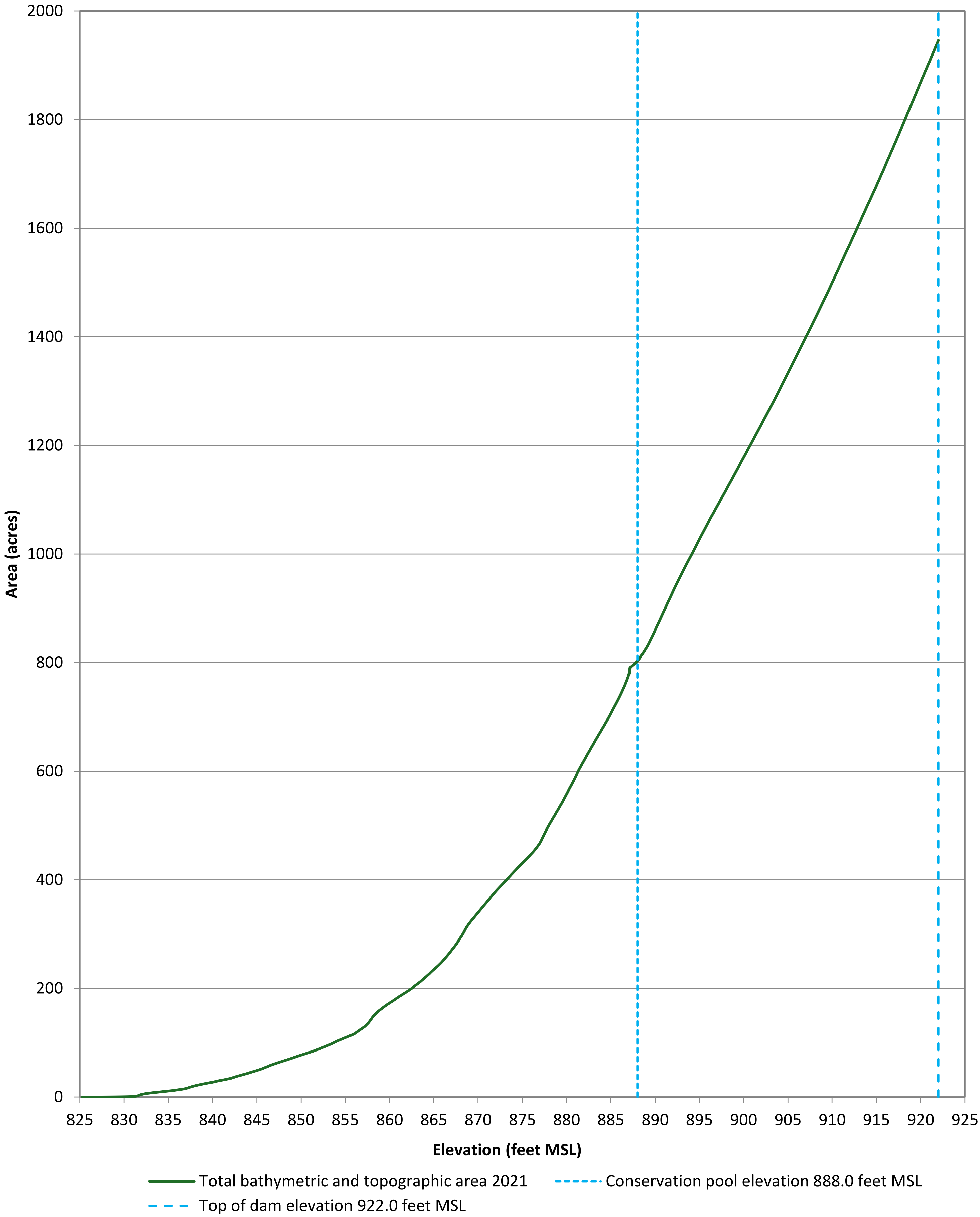
August 2021 Survey
Conservation pool elevation 888.0 feet MSL
Top of dam elevation 922.0 feet MSL

ELEVATION (Feet MSL)	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
881	589	593	596	600	603	606	609	612	615	617
882	620	623	626	629	632	635	638	641	644	646
883	649	652	655	658	661	664	666	669	672	675
884	677	680	683	686	688	691	694	697	700	703
885	706	709	712	715	718	721	725	728	731	734
886	737	741	744	748	751	755	759	763	767	771
887	776	782	791	793	794	795	797	798	800	802
888	803	805	807	809	813	815	817	819	822	824
889	827	830	833	836	839	842	846	849	852	856
890	860	864	867	871	874	878	881	885	888	892
891	895	899	902	906	909	913	916	920	923	927
892	930	934	937	941	944	947	951	954	957	960
893	964	967	970	973	977	980	983	986	989	992
894	995	998	1,001	1,005	1,008	1,011	1,014	1,017	1,021	1,024
895	1,027	1,030	1,033	1,036	1,040	1,043	1,046	1,049	1,052	1,055
896	1,058	1,061	1,064	1,067	1,070	1,073	1,076	1,079	1,082	1,085
897	1,088	1,091	1,094	1,097	1,100	1,103	1,105	1,108	1,111	1,114
898	1,117	1,120	1,123	1,126	1,129	1,132	1,135	1,138	1,141	1,144
899	1,147	1,150	1,153	1,156	1,159	1,163	1,166	1,169	1,172	1,175
900	1,178	1,181	1,184	1,187	1,190	1,193	1,196	1,199	1,202	1,205
901	1,208	1,211	1,214	1,217	1,220	1,223	1,226	1,229	1,232	1,236
902	1,239	1,242	1,245	1,248	1,251	1,254	1,257	1,260	1,263	1,266
903	1,269	1,273	1,276	1,279	1,282	1,285	1,288	1,291	1,294	1,298
904	1,301	1,304	1,307	1,311	1,314	1,317	1,320	1,323	1,327	1,330
905	1,333	1,336	1,339	1,343	1,346	1,349	1,353	1,356	1,359	1,362
906	1,366	1,369	1,372	1,376	1,379	1,382	1,386	1,389	1,392	1,395
907	1,399	1,402	1,405	1,408	1,412	1,415	1,418	1,422	1,425	1,428
908	1,432	1,435	1,438	1,441	1,445	1,448	1,452	1,455	1,458	1,462
909	1,465	1,468	1,472	1,475	1,479	1,482	1,486	1,489	1,493	1,496
910	1,500	1,503	1,507	1,510	1,514	1,517	1,521	1,525	1,528	1,532
911	1,535	1,539	1,543	1,546	1,550	1,553	1,557	1,560	1,564	1,567
912	1,571	1,574	1,578	1,581	1,585	1,588	1,592	1,596	1,599	1,603
913	1,606	1,610	1,614	1,617	1,621	1,625	1,628	1,632	1,635	1,639
914	1,642	1,646	1,649	1,653	1,657	1,660	1,664	1,667	1,671	1,674
915	1,678	1,682	1,685	1,689	1,693	1,697	1,700	1,704	1,708	1,711
916	1,715	1,719	1,722	1,726	1,730	1,734	1,737	1,741	1,745	1,749
917	1,752	1,756	1,760	1,764	1,768	1,771	1,775	1,779	1,783	1,787
918	1,791	1,795	1,799	1,803	1,807	1,811	1,814	1,818	1,822	1,826
919	1,830	1,834	1,838	1,842	1,845	1,849	1,853	1,857	1,861	1,865
920	1,869	1,873	1,877	1,881	1,884	1,888	1,892	1,896	1,900	1,903
921	1,907	1,911	1,915	1,919	1,923	1,927	1,930	1,934	1,938	1,942
922	1,947									



Inks Lake
August 2021 Survey
Prepared by: TWDB

Appendix G: 2021 Bathymetric and topographic capacity curve



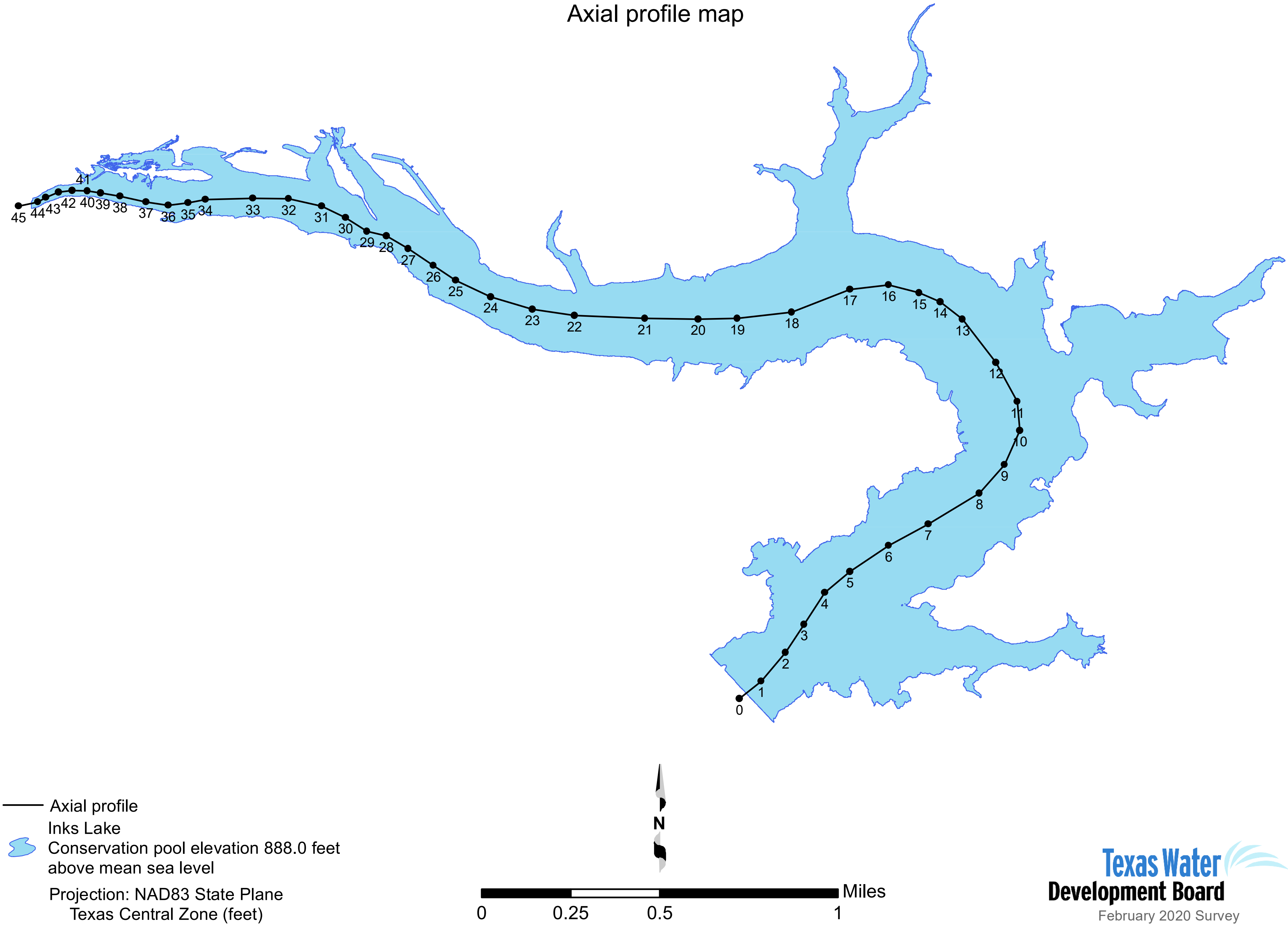
Inks Lake
August 2021 Survey
Prepared by: TWDB

Appendix H: 2021 Bathymetric and topographic area curve

Appendix I

Inks Lake

Axial profile map



Texas Water Development Board

February 2020 Survey

Table I1. Inks Lake axial profile vertice coordinates		
Point ID	**x**	**y**
0	2,908,728.75	10,234,840.84
1	2,909,058.61	10,235,101.26
2	2,909,414.51	10,235,526.61
3	2,909,692.29	10,235,943.27
4	2,909,996.11	10,236,412.02
5	2,910,369.37	10,236,724.52
6	2,910,942.29	10,237,106.47
7	2,911,532.57	10,237,427.65
8	2,912,287.77	10,237,887.72
9	2,912,661.04	10,238,304.38
10	2,912,886.73	10,238,816.54
11	2,912,852.01	10,239,241.88
12	2,912,530.83	10,239,823.48
13	2,912,035.75	10,240,461.94
14	2,911,710.23	10,240,722.35
15	2,911,397.73	10,240,852.56
16	2,910,942.00	10,240,969.75
17	2,910,369.08	10,240,904.65
18	2,909,510.00	10,240,570.01
19	2,908,702.70	10,240,474.52
20	2,908,121.11	10,240,465.84
21	2,907,331.18	10,240,474.52
22	2,906,289.51	10,240,517.93
23	2,905,664.51	10,240,613.41
24	2,905,048.19	10,240,795.70
25	2,904,527.36	10,241,038.76
26	2,904,197.50	10,241,255.77
27	2,903,824.23	10,241,507.51
28	2,903,503.05	10,241,698.48
29	2,903,216.59	10,241,767.93
30	2,902,895.41	10,241,967.58
31	2,902,539.51	10,242,141.19
32	2,902,053.40	10,242,245.36
33	2,901,523.89	10,242,254.04
34	2,900,820.76	10,242,236.68
35	2,900,560.34	10,242,184.59
36	2,900,265.20	10,242,149.87
37	2,899,935.92	10,242,201.95
38	2,899,553.98	10,242,281.82
39	2,899,265.78	10,242,333.90
40	2,899,071.34	10,242,361.68
41	2,898,845.64	10,242,368.62
42	2,898,644.26	10,242,347.79
43	2,898,453.28	10,242,264.45
44	2,898,338.70	10,242,201.95
45	2,898,050.51	10,242,135.98
XY Coordinates Feet NAD83 State Plane Texas Central Zone		

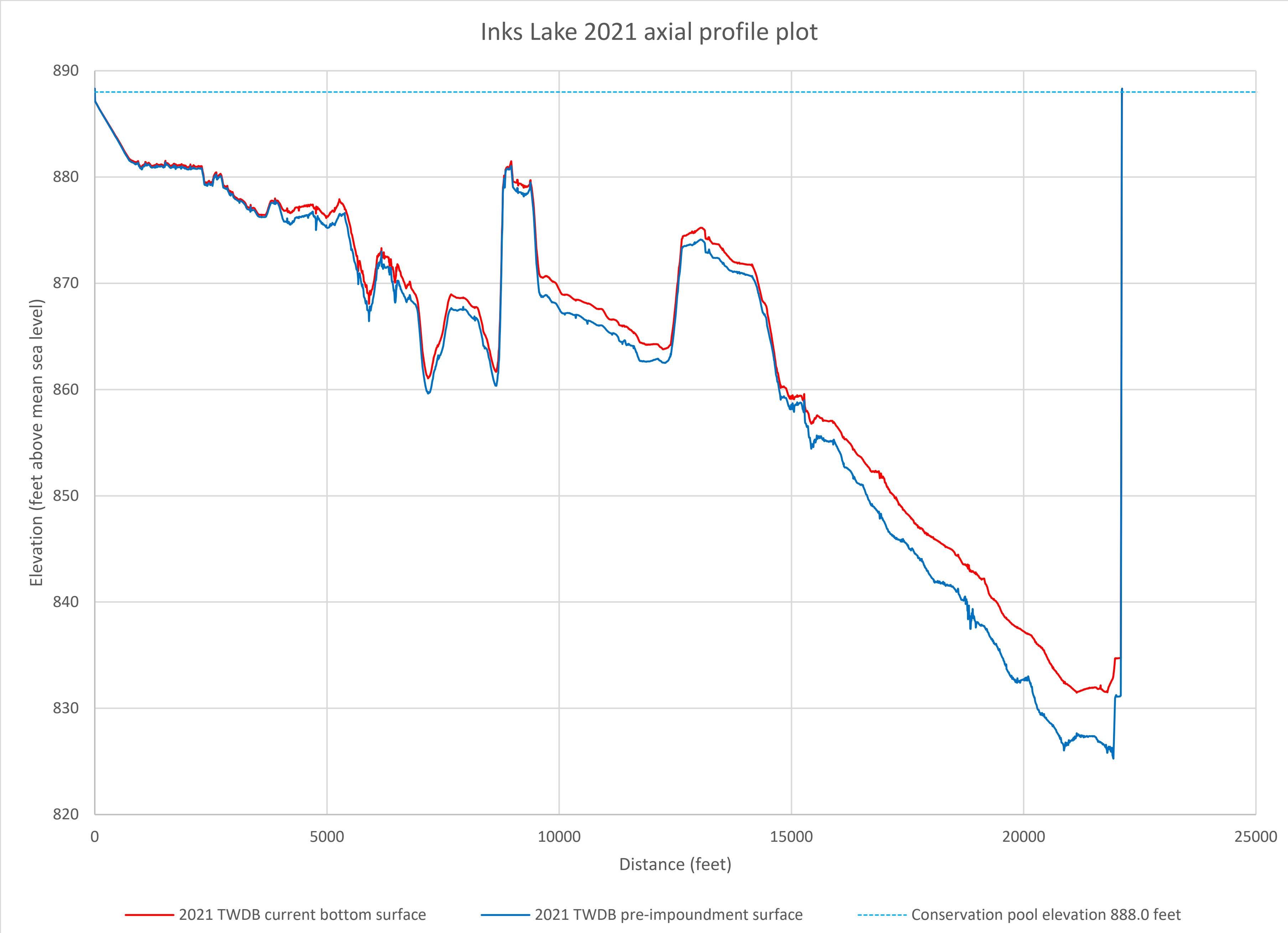

Inks Lake 2021 axial profile plot
890
880
870
860
850
840
830
820
0
5000
10000
15000
20000
25000
Elevation (feet above mean sea level)
Distance (feet)
2021 TWDB current bottom surface
2021 TWDB pre-impoundment surface
Conservation pool elevation 888.0 feet

Figure 6

CONTOURS
(feet above mean sea level)

Topographic contours

920
915
910
905
900
895
890

Bathymetric contours

885
880
875
870
865
860
855
850
845
840
835
830

Islands
elevation 888.0 feet MSL

Islands
elevation 922.0 feet MSL

Conservation pool elevation
888.0 feet MSL

Top of Dam
elevation 922.0 feet MSL

Projection: NAD83 State Plane
Texas Central Zone (feet)

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