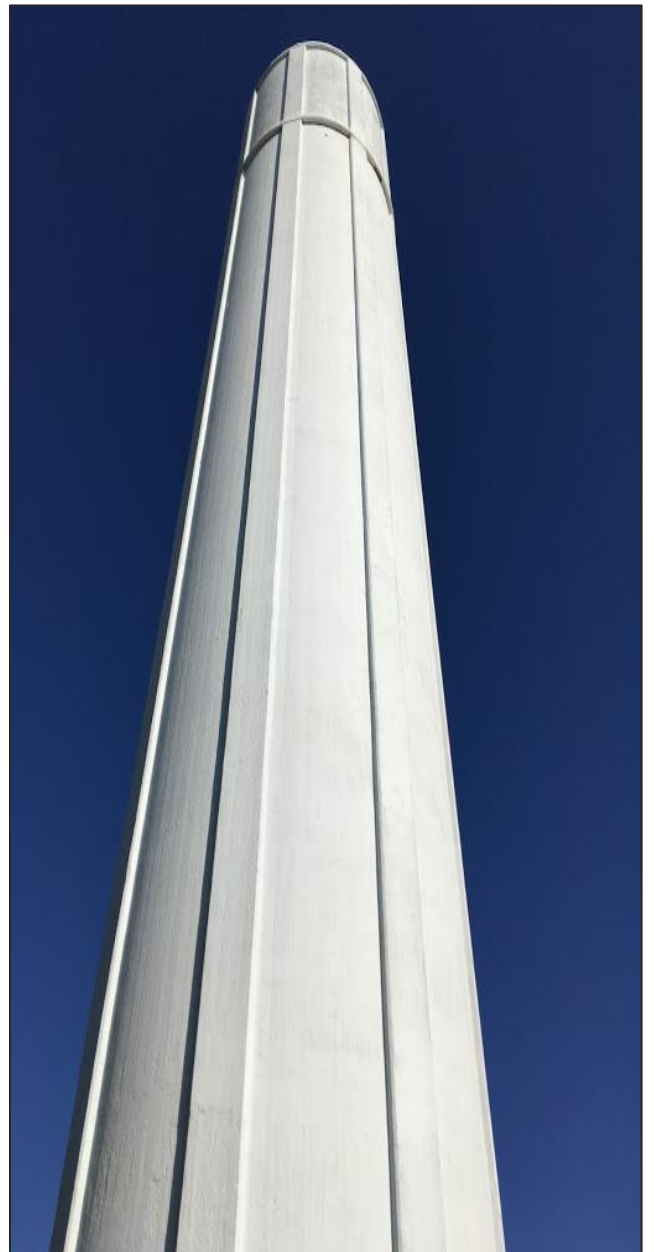

Kansas Water- Related Resources Reconnaissance Survey

Cynthia Ammerman

September 2017



Introduction/Purpose of the survey

The purpose of the Kansas Water-Related Resources Survey (KWRRS) was to document a geographically disperse set of water towers and other water-holding resources of various types, styles, capacities and ages. In recent years there have been a number of water towers that have been demolished and/or placed out of service. Structures included in the survey were limited to water-holding structures and excluded canals, reservoirs, water treatment plants, power plants, and retention ponds. Overall, the focus of the survey was to capture a record of water tower structures constructed prior to 1970. The following report provides an overview of the methodology, summary of findings, typology and National Register of Historic Places eligibility. Survey work was conducted beginning in May of 2017 and concluded in August of 2017.

Process/Methodology

Personnel

Cynthia Ammerman, Special Projects Historian for the Kansas Historical Society, served as the survey coordinator for the KWRRS. Ms. Ammerman conducted field work that included a series of site visits across Kansas. In partnership with staff at the Kansas Rural Water Association (KRWA), Ms. Ammerman prepared a questionnaire that was distributed to representatives of the approximately 600 rural and city water districts operating in Kansas. Katrina Ringler, Grants Coordinator, and Amanda Loughlin, National Register Coordinator, for the Kansas Historical Society provided direction and assistance throughout the survey process.

Project Area

The boundaries of the survey included structures located within the state of Kansas. Although water-holding resources occur in each county, only a sampling of counties was surveyed, yet each region of the state was visited.

Identification of structures to survey

Over the course of previous survey work and site visits conducted by Kansas Historical Society staff, a compiled list of structures was included in the 2017 survey. Additional GIS data provided by KRWA provided a record of **576 structures** that included all storage tanks of record, many of which were constructed after the 1970 cutoff (Appendix II).

At the time of survey in May 2017, there were ninety-five water-related structures included in the Kansas Historic Resource Inventory (KHRI) database (Appendix III); of these, eighteen were water plants.

Planning the survey and fieldwork

Due to the large geographical footprint of the state of Kansas it was necessary to gather data that could be used to develop selection criteria for the survey. Reconnaissance level survey was conducted for most structures, with intensive level for as many structures as possible.

Prior to conducting site visits, Ms. Ammerman reviewed previous literature on the water towers and water-related systems. The literature included a seminal thesis by Carol Ann Dubie (1980) titled "*The Architecture and Engineering of Elevated Water Storage Structures: 1870-1940*" and a historic resource survey report conducted in South Dakota by Gregory R. Mathis and John Chlebeck of The 106 Group, Ltd. (2012). Additionally, local newspaper archives were accessed to develop context on the conditions and reasons that municipalities were constructing water towers. A summary of key findings from the aforementioned sources is included in this report.

Using the provided list of fifty-seven water towers that were not previously included in KHRI, Ms. Ammerman created a Google Maps dataset to plan for site visits across the state of Kansas (Appendix IV). Additionally, a Google Maps dataset was created for the forty-three structures already included in KHRI. These two datasets allowed for a visual comparison of where various structures had been identified and recorded and served as the basis in prioritizing site visits. It was first priority to visit sites that had not been entered in KHRI. The second priority was to visit and verify sites that had limited data or photographs. These site visits were conducted on June 13, 14, 22, 27, 28 and July 20 of 2017. While conducting site visits observation for other potential structures to include in the survey increased the final data set.

Site visits included visual assessment, recordation based on the Historic Resources Inventory Field Survey Form and photographing each structure.

Questionnaire

A copy of the KRWA questionnaire is provided as Appendix V. As respondents returned the questionnaire to the Kansas Historical Society office, responses were tracked in an Excel Spreadsheet for analysis. The questionnaire was prepared to gather a swath of data that would not have been possible within the limited timeframe. Additionally, the questionnaire allowed the localities and water districts an opportunity to participate and serve as knowledgeable local resource. While the focus of the survey was to capture a record of water towers and storage tanks constructed prior to 1970, a large portion of the water districts that were solicited have newer structures and many representatives returned their questionnaires. The positive response and participation of the KRWA and the municipalities will contribute greatly to future survey efforts. All questionnaires indicating structures that were constructed after 1970 have been included in the overall response count but not included in the detailed survey responses. Responses have been filed and will be made available for future survey work.

Nearly **280 surveys** were returned to the Kansas Historical Society office, **115** of the surveys were for structures that had been **constructed prior to 1970**. Respondents returned the questionnaire with thoughtful answers, some with photographs and historical newspaper clippings and/or facts for various water towers. Each survey form will be kept on file at the Kansas Historical Society for future survey reference (Appendix V).

Compilation of data and analysis

Using the survey results (Appendix VI), statistical analysis was conducted to develop a set of criteria to help in the selection of water towers to include in the survey. This analysis also supplied alternates for survey in the instance that some structures had been removed or that inferior data was conveyed in the KRWA questionnaire, as some surveys were returned with partial information. For example, some KRWA surveys were returned with addresses that were not site specific and included intersection names. Additionally, other KRWA surveys were returned without providing the structural typology of the water tower. To maximize data integrity for the survey, Ms. Ammerman utilized Google Maps and Google Street View to compile complete address records and to classify structure typology when possible.

Summary of findings

Our survey partner, KRWA, provided the GIS dataset for the location of **576 water storage tanks** located across the state of Kansas, including structures constructed prior to and after the 1970 cutoff date for the reconnaissance survey. This data set allows for a broad record of the location of water storage tanks that are within the state as of the date of this survey. A copy of the data set is included as an appendix to this report (Appendix II). Additional information and interactive maps can be found at <https://krwa.net/ONLINE-RESOURCES/RWD-Maps>.

Typologies

Below are general descriptions for each type of water-tower structure identified in this survey. Typologies include: the common Elevated Traditional, Hemispherical Bottom Tower (Tin-Can), Elevated Double-Ellipsoidal, Pedestal Spheroid (Balloon), Ground Tank, and Standpipe. Photos are provided in Appendix II.

Elevated Towers

Traditional (circa 1900 to 1970s)

The Traditional, Hemispherical Bottom tower, type is best identified as a “tin can” tank atop four canted truss legs with diagonal tie rod suspension bracings. Rectangular panels form the tank, riveted. Conical roof overlaps the tank that is enclosed by balcony with “W”, “XX” or and “IXIX” pattern handrail balustrading. The handrail design usually is an identifier feature of the designing engineer. The classic

Traditional (circa 1900 to 1970s) continued.

tin-can type steel riveted tank water tower dating from the early twentieth century. The tank sits atop a steel structure with tension cables between the elevated posts.

Elevated Spherical (circa 1920s)

Spherical tank atop circular bracket supported by the individual panels that form the tank; riveted or welded. The domed base is connected to a tank with single pipe protruding down into the ground. **This type was not observed in the 2017 survey, but has been previously included in KHRI.*

Double-Ellipsoidal (circa 1928 to 1970)

A Double-Ellipsoidal (Photo 2.) water tower features: four support columns (legs), two levels of support struts with tie rod suspension located at all elevations, and a center riser pipe. The tank ladder provides access to the balcony, and is a standard feature. Concrete column shoes are at the base of all legs. Depending on the holding capacity, Double-Ellipsoidal towers may have seven to nine legs.

Pedestal/Spheroid Water Tower (circa 1960s)

A typical Spheroid Water Tower (Photo 3.), or Balloon Tower, is a flared pedestal design with a ground level access door. The base consists of poured concrete. Two 'painters rings' are located at the base of the riser shaft and tank.

Stand Pipe or Standpipe/Ground (circa 1918, predominately 1960s)

Standpipes (Photo 4.) are a simple tower that can be supported by a foundation of brick, concrete or stone. The tower portion is a single-column that extends from the ground level foundation. Tanks can be constructed of iron, steel, concrete or brick. Earlier standpipes have elevated bases; whereas, later structures rise directly from a foundation flush with the ground. Ground tanks are essentially smaller, lower versions of a standpipe, but may be wider in diameter.

Type	Total Surveyed (113)
Elevated	72
Stand Pipe/Ground	35
Single Pedestal	2
Spheroid	4

Dates of construction

Construction Era	Total Surveyed (113)
1880 to 1910	5
1911 to 1920	13
1921 to 1930	14
1931 to 1940	5
1941 to 1950	4
1951 to 1960	14
1961 to 1970	32
Post 1970	3
Not provided	23

Future Phases

The intent of this reconnaissance level survey is to provide baseline data for the possibility of developing a statewide historic context related to water-related resources and use the historic context to evaluate historic significance for eligibility for historic designation.

Photos



Figure 1. Elevated, Tin-Can/Traditional Tower



Figure 2. Elevated, Double-Ellipsoidal Tower



Figure 3. Elevated, Spheroid/Balloon



Photo 4. Standpipes with Ground Tank at right

Appendix I.

Notes on Reviewed Outside Sources

In preparing for the survey, staff reviewed a selection of limited sources that provide historical context on the construction of water storage tanks and water-related systems structures. The two sources that were of the greatest benefit were an existing historic resource survey report for the South Dakota State Historical Society (Mathis and Chlebeck, 2012) and *The Architecture and Engineering of Elevated Water Storage Structures: 1870-1940* (Dubie, 1980). The following provides a summary of the key elements to considering the origins of engineering, eras of construction and historical significance based on the consulted sources.

***Steel Water Towers Associated with South Dakota Water Systems, 1894-1967 An Historic Context.* South Dakota State Historical Society. September 2012. By: Gregory R. Mathis and John Chlebeck. The 106 Group Ltd.**

The Mathis and Chlebeck report is an excellent reference source for future study of Kansas water systems due to the relatively standard practices of water tower and water systems construction.

Applicable Sources from Bibliography:

Anfinson, John. A Crude and Imperfect Affair: The Origins of Water Supply and Waste Disposal in the Twin Cities. Paper. National Park Service: Mississippi National River and Recreation Area, 2010.

American Water Works Association. *Water Works Practice: A Manual*. Baltimore: Williams & Wilkins, 1926.

James, William. A Historical Perspective on the Development of Urban Water Systems. Last revised January, 1998.

<http://www.soe.uoguelph.ca/webfiles/wjames/homepage/Teaching/437/wj437hi.htm#historyWS>.

Leach, Donald A. "Progress in the Design of Elevated Steel Tanks." *Journal-American Water Works Association*. 39 (1947) 7:651-658.

Dubie, Carol Ann. "The Architecture and Engineering of Elevated Water Storage Structures: 1870-1940." George Washington University. May 1980.

The Dubie (1980) text is an excellent resource on the history of the development of elevated water structures. Dubie provides one of the first formal histories of water tower structures in the United States, tracing the influence of the technological advances and architectural styles from 1880 to 1940. She defines the three key distinctive styles as follows: "a water tower is a tank supported on a brick, stone, or concrete tower; a standpipe is a wrought iron, steel, or concrete column rising from a ground level foundation and containing water for its entire length; an elevated tank is a wood or metal tank supported on an open trestle" (Dubie 1980:1).

Appendix II.

Kansas Rural Water Association GIS Data

Appendix III.

KHRI Water-Related Resources as of May 2017

Appendix IV.

