Arkansas River Corridor Projects
Existing Geotechnical Resource Review

TO:	Tulsa County
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FROM	CH2M HILL
DATE:	November 19, 2009
PROJECT NUMBER:	386594

Tulsa County, as part of the Arkansas River Corridor Master Plan (Carter & Burgess, 2004; C. H. Guernsey and Company et al., 2005), is undertaking an improvement project on the Arkansas River. The primary goals of the overall project are to improve least tern habitat, improve fish habitat and fish passage, improve the function of the river system itself, enhance economic development, increase recreational opportunities, and increase connectivity between the river and surrounding communities. The conceptual project components are described in detail in the Technical Memorandum (TM) entitled Baseline Project Summary for the Arkansas River Corridor Project (CH2M HILL, 2009). Key components include:

- Design of habitat improvements along the corridor
- Design of bank stabilization in select areas
- Design of a new Sand Springs low-head dam, pedestrian bridge, and amenities
- Design of modifications to Zink Dam and lake with whitewater features
- Design of a new South Tulsa/Jenks low-head dam, pedestrian bridge, and amenities

This TM provides a summary of the existing geotechnical and geological resources for the Arkansas River Corridor Project, specifically near the three low-water dam sites (Sand Springs, Zink Lake, and South Tulsa/Jenks). The purpose is to develop an understanding of the general subsurface conditions in the vicinity of the project, and to identify gaps and data needs for future geotechnical efforts. The information sources reviewed, and a brief summary of the observations, are provided herein.

Background and Site Location

As part of a master plan for the Arkansas River corridor, Tulsa County is considering a series of improvement projects on the Arkansas River, along a corridor stretching nearly 42 miles from Keystone Dam to the Tulsa County/Wagoner County border. Included in this corridor are three dam sites:

1. Sand Springs (proposed)

2. Zink Lake (upgraded)
3. South Tulsa/Jenks Dam (proposed)

Existing geologic literature and engineering reports were reviewed in order to summarize existing geotechnical subsurface information at these sites.

Literature Review

Existing geologic mapping has been reviewed and summarized in the figures in Attachment A (Surficial Geology, Maps A through O). The data for these maps were taken from available literature and mapping archived with the U.S. Geological Survey for the Enid, Tulsa, Oklahoma City, and Fort Smith Quadrangles (USGS, 2009).

In addition, existing geotechnical information from five available sources in the project vicinity was reviewed. These five information sources are synopsized below.

Reference 1—Stantec, Near Sand Springs and South Tulsa/Jenks

Stantec Consulting Services. Geotechnical Investigation and Testing; Arkansas River Corridor Project, Arkansas River. Prepared for the USACE Tulsa District, Tulsa, Oklahoma. Contract No. DACW912BV-07-D-1000. Sand Springs/Jenks, Oklahoma. May 2008.

Exploration Program

Eight borings were drilled by Stantec Consulting Services, under contract to the U.S. Army Corps of Engineers (USACE), in March 2008. Five of these borings (J1-J5) were advanced at the proposed South Tulsa/Jenks dam location; the other three borings (S1, S2, and S4) were advanced at the proposed Sand Springs dam location. The approximate locations of the borings advanced by Stantec are shown on the figures in Attachment B. The borings were advanced to depths ranging from 10.5 to 75 feet (ft) below ground surface (bgs). Subsurface conditions at both locations generally consisted of sandy overburden (recent alluvium) overlying shale bedrock. At one location (S2), a thin layer (< 2 ft) of sandstone was encountered overlying the shale.

Overburden

The thickness of the overburden ranged from approximately 4 to 10 ft within the river channel, and from 18 to 35 ft in the river banks. This material consisted of poorly graded sand to silty sand, with infrequent clay seams and low gravel content. The consistency of the overburden was typically very loose to loose, and medium dense at a few locations.

Laboratory tests performed on overburden samples included Atterberg limits tests and gradation tests.

Bedrock

Each boring was terminated in shale bedrock. This material is gray to dark gray, thinly bedded, and moderately weathered and fractured in zones. The rock quality designation (RQD) was determined for the rock. In the South Tulsa/Jenks borings, the average RQD ranged from 46 to 86 percent, which corresponds to a poor to good rock mass (Deere and

Deere, 1989). In the three Sand Springs borings, the RQD ranged from 42 to 57 percent, which corresponds to a poor to fair rock mass.

Unconfined compression tests were conducted on rock core samples (15 tests performed). The average unconfined compressive strength in the South Tulsa/Jenks borings (9 tests) was 737 pounds per square inch (psi). In the Sand Springs borings (6 tests), the average unconfined compressive strength was 565 psi. This range in unconfined compressive strength indicates very weak rock with an average hardness of R1 (Deere and Miller [1966], Piteau [1971], and Robertson [1971]).

Reference 2 – Kleinfelder, Near Jenks

Kleinfelder. Geotechnical Exploration--Confidential. Jenks, Oklahoma. August 2008.

Exploration Program

Eight borings were drilled and logged by Kleinfelder, Inc. in August 2008 (B1-B8), near Jenks. The borings were advanced to depths ranging from 19 to 29 ft bgs, all along the right river bank of the Arkansas River. Subsurface conditions generally consisted of sandy overburden (recent alluvium) overlying shale bedrock.

Overburden

The thickness of the overburden ranged from approximately 5.5 to 19 ft. This material consisted of very loose to medium dense poorly graded sand, with low gravel content. In a few locations, a thin (1- to 2.4-ft thick) layer of stiff lean clay was encountered interbedded within the sandy overburden material. No laboratory test results from samples of the overburden material were reported.

Bedrock

Each boring was terminated in shale bedrock. This material is characterized as light gray to dark gray, soft to moderately hard, and moderately weathered in thin zones in some borings. No rock quality evaluation or laboratory testing was performed on the rock.

Reference 3—State of Oklahoma Department of Transportation (ODOT), Near Bixby

State of Oklahoma, Department of Transportation. U.S. Highway No. 64, Memorial Drive. Design Plans for a bridge replacement (Bridge A) and subsurface information, near Bixby, OK. September 2002.

Exploration Program

Borings were advanced in 2002 (B-1, -2, -4, and -5) at each corner of the proposed bridge, near Bixby (see Attachment C). All four of these borings were located away from the Arkansas River channel, just over a mile west of the river bank. The four borings were advanced to depths ranging from 50 to 54 ft bgs. Subsurface conditions generally consisted of interbedded clay and sand (recent alluvium) overlying highly weathered gray shale.

Overburden

The thickness of the overburden ranged from approximately 20 to 23.3 ft. This material consisted of approximately 8 to 23 ft of very soft to soft lean to fat clay, overlying sand. No laboratory test results were reported in the overburden material.

Bedrock

Each boring was terminated in shale bedrock. This material is characterized as gray, dry to wet, and unweathered to highly weathered. Texas Cone Penetrometer (TCP) testing was performed at regular intervals within the rock. These test values ranged from ½ inch to over 2 inches per 100 blows. No rock quality evaluation or laboratory testing was reported.

Reference 4—ODOT, Near Jenks

State of Oklahoma, Department of Transportation. Arkansas River Bridge and West Approach: City of Jenks. East Approach: City of Tulsa. Design Plans, near Tulsa, OK. July 1994.

Exploration Program

Twenty-two borings were advanced in 1994 adjacent to the existing bridge piers across the Arkansas River near Jenks (see Attachment D). The borings were advanced to depths ranging from 24.1 to 55 ft bgs. Subsurface conditions generally consisted of sand within the river bottom (recent alluvium) overlying weathered shale.

Overburden

The thickness of the overburden ranged from approximately 6 to 9.5 ft within the Arkansas River bottom, and increased to between 20 and 31 ft on the river banks. The predominant overburden material within the river bottom is sand. In the borings along the river banks, the sand overburden is interbedded with silt and clay layers of varying thickness. No laboratory test results were reported in the overburden material.

Bedrock

Each boring was terminated in unweathered to weathered shale bedrock. TCP testing was performed periodically in some borings within the rock. These test values ranged from ¼ inch to 1.5 inches per 100 blows. No rock quality evaluation or laboratory testing was reported.

Reference 5—W.R. Holway & Associates. Tulsa River Parks Authority, at Zink Lake Dam

W.R. Holway & Associates. Tulsa River Parks Authority, Low Water Dam Project: A Project of the Tulsa Urban Renewal Authority. Record Drawing for Zink Lake Low Water Dam, near Tulsa, OK. June 1983.

Exploration Program

Ten borings were advanced in 1980 (Core Holes A through H, and Core Holes #2 and #8), along the alignment of the Zink Lake Dam (see Attachment E). Two borings were advanced near each abutment, and six borings were advanced within the Arkansas River channel. The

borings were advanced to depths ranging from 55.1 to 84.6 ft bgs. Subsurface conditions generally consisted of sand, silt, and clay (recent alluvium) overlying sandstone, overlying shale. The foundation drawing indicates boring logs are available, though they were not obtained as part of this review.

Overburden

The thickness of the overburden ranged from approximately 2 to 10 ft within the Arkansas River bottom, and increased to between 23 and 28 ft on the river banks. This material was described as sand, silt, and clay. No description of bedding sequence or interbed layer thickness was available. No laboratory test results from samples of the overburden material were reported.

Sandstone

The thickness of the sandstone was observed to be relatively consistent in the 10 borings, ranging from 31 to 39 ft over the length of the Zink Lake Dam. The elevation of the sandstone surface was also relatively consistent, and was encountered between El. 603 and 610. The surface of the sandstone was actually encountered higher in elevation beneath the river channel than beneath the abutments on the river bank. No information on rock quality, degree of weathering, jointing or fracture patterns, or hardness was available.

Bedrock (Shale)

Each boring was terminated in shale bedrock. The elevation of the shale surface ranged from El. 564 to 579, and the borings indicate the surface of the shale gradually dips from east to west. No information on rock quality, degree of weathering, jointing or fracture patterns, or hardness was reported.

General Subsurface Conditions

Based on conditions reviewed and summarized above, the subsurface conditions are anticipated to be relatively consistent near the Arkansas River in the project vicinity. The typical subsurface conditions documented in existing reports and bridge investigations include interbedded silt, clay, and sand overburden overlying predominantly shale bedrock. The stick logs from borings advanced at the Zink Lake Dam indicate a layer of sandstone overlying the shale bedrock at this location. The sand-dominated overburden was observed to have a consistency of very loose to medium dense. Layers of clay were observed to range from lean clay to fat clay, with a consistency of very soft to soft. Groundwater elevations along the river banks are presumably similar to the adjacent river level.

The shale bedrock in the project vicinity is massive and was encountered in every boring location reviewed for this TM. Typically, it is encountered at depths ranging from 5 to 10 ft bgs within the river bottom, to between 20 and 30 ft along the river banks. The shale is identified as part of several geologic formations, including the Nellie Bly formation, the Wewoka formation, and the Senora formation. The shale is described as gray, thinly bedded, and highly weathered in zones (independent from depth below surface). Based on limited TCP testing within the shale, it is estimated to have a typical allowable point bearing greater than 30 tons/square foot (~420 psi).

In recent borings advanced at the Sand Springs and South Tulsa/Jenks areas (Stantec, 2008), RQD and unconfined compressive strength were evaluated at each location. Near the Sand Springs location, the average RQD of the shale was observed to be 48 percent, based on findings from 3 borings. The average unconfined compressive strength of tested specimens was 565 psi. At the South Tulsa/Jenks location, the average RQD of the shale was observed to be 72 percent. The average tested unconfined compressive strength of shale was 737 psi.

Key Concerns and Data Gaps

The depth and properties of the bedrock, based on the limited information reviewed, indicate that the material would provide a suitable foundation for the proposed dams and improvements. However, there is still key information that needs to be obtained in order to minimize the potential geotechnical risk at each of the sites. The primary concerns at the three dam sites include identifying the erosion and seepage potential of the shale rock upon which the dams will be constructed, determining the depth of weathering, and identifying the locations of possible ancient river channels in the bedrock surface.

Additional geotechnical information on consistency, strength, and grain size should be collected within the overburden at both proposed dam sites (Sand Springs and South Tulsa/Jenks), and at the existing Zink Lake Dam site. Standard Penetration Tests (SPTs) should be conducted at regular intervals in boreholes advanced within the overburden. The thickness of the overburden and depth to rock should also be more closely examined along specific alignments of the proposed dams.

At the Sand Springs, South Tulsa/Jenks, and Zink Lake dam sites, additional strength data and characterization of the bedrock are necessary both in the river channel and along the banks in order to determine specific rock mass properties and guide final selection of dam locations. Borings should be advanced into rock using rock coring methods, in order to determine rock quality, degree of weathering, durability, and strength as a function of depth. The general type and extent of recommended geotechnical exploration will be outlined in a separate TM by CH2M HILL (Arkansas River Corridor Projects: Preliminary Geotechnical Exploration).

References

Bingham, R.H. and Moore, R.L. 1975, Reconnaissance of the water resources of the Oklahoma City quadrangle, central Oklahoma: Oklahoma Geological Survey Hydrologic Atlas 4, scale 1:250,000, 4 sheets. (Geology on sheet 1 compiled by R.H. Bingham and R.O. Fay, in 1973.)

Bingham, R.H., and Bergman, D.L. 1980, Reconnaissance of the water resources of the Enid quadrangle, north-central Oklahoma: Oklahoma Geological Survey Hydrologic Atlas 7, scale 1:250,000, 4 sheets. (Geology on sheet 1 compiled by R.H. Bingham and R.O. Fay, 1973.)

Carter & Burgess. 2004. *Final Arkansas River Corridor Master Plan, Phase I Vision Plan.* Prepared for Indian Nations Council of Governments (INCOG).

CH2M HILL. 2009. *Baseline Project Summary for the Arkansas River Corridor Project.* Technical Memorandum prepared for Tulsa County – AR River Projects.

Deere, D. U., and R. P. Miller. Engineering Classification and Index Properties for Intact Rock. 1966. Technical Report No. AFNL-TR-65-116 Air Force Weapons Laboratory.

Deere, D. U., and D. W. Deere. Rock Quality Designation (RQD) after Twenty Years. 1989. Contract Report GL-89-1. U.S. Vicksburg, Mississippi. Army Corps of Engineers, Waterways Experiment Station.

Guernsey, C.H. and Company, Edaw Inc., Hisinc, LLC, Alaback Design and Associates, Adaptive Ecosystems, Inc., Schnake Turnbo Frank, Inc. 2005. *Final Arkansas River Corridor Master Plan, Phase II Master Plan and Pre-Reconnaissance Study*. Prepared for the USACE. (Volume 1 - 4.2 Cultural Resources, 9.1 Public Involvement).

W.R. Holway & Associates. 1983. Tulsa River Parks Authority, Low Water Dam Project: A Project of the Tulsa Urban Renewal Authority. Record Drawing for Zink Lake Low Water Dam, near Tulsa, OK. 1983.

Kleinfelder Inc. Geotechnical Exploration—Confidential. 2008. Jenks, Oklahoma. August.

Marcher, M.V. and Bingham R.H. 1971. Reconnaissance of the water resources of the Tulsa quadrangle, northeastern Oklahoma: Oklahoma Geological Survey Hydrologic Atlas 2, scale 1:250,000, 4 sheets. (Geology on sheet 1 compiled by M.V. Marcher, in 1969.)

Marcher, M.V. 1969. Reconnaissance of the water resources of the Fort Smith quadrangle, northeastern Oklahoma: Oklahoma Geological Survey Hydrologic Atlas 1, scale 1:250,000, 4 sheets. (Geology on sheet 1 compiled by M.V. Marcher, 1967.)

Piteau, D. R. 1971. "Geological Factors Significant to the Stability of Slopes Cut in Rock." Proceedings, Symposium on Planning Open Pit Mines. Johannesburg. Published by A. A. Balkema. Amsterdam. Pp. 33-53.

Robertson, A. M. 1971. The Interpretation of Geological Factors for Use In Slope Theory. Proceedings Symposium on Planning Open Pit Mines. Johannesburg. Published by A. A. Balkema. Amsterdam. Pp. 55-70.

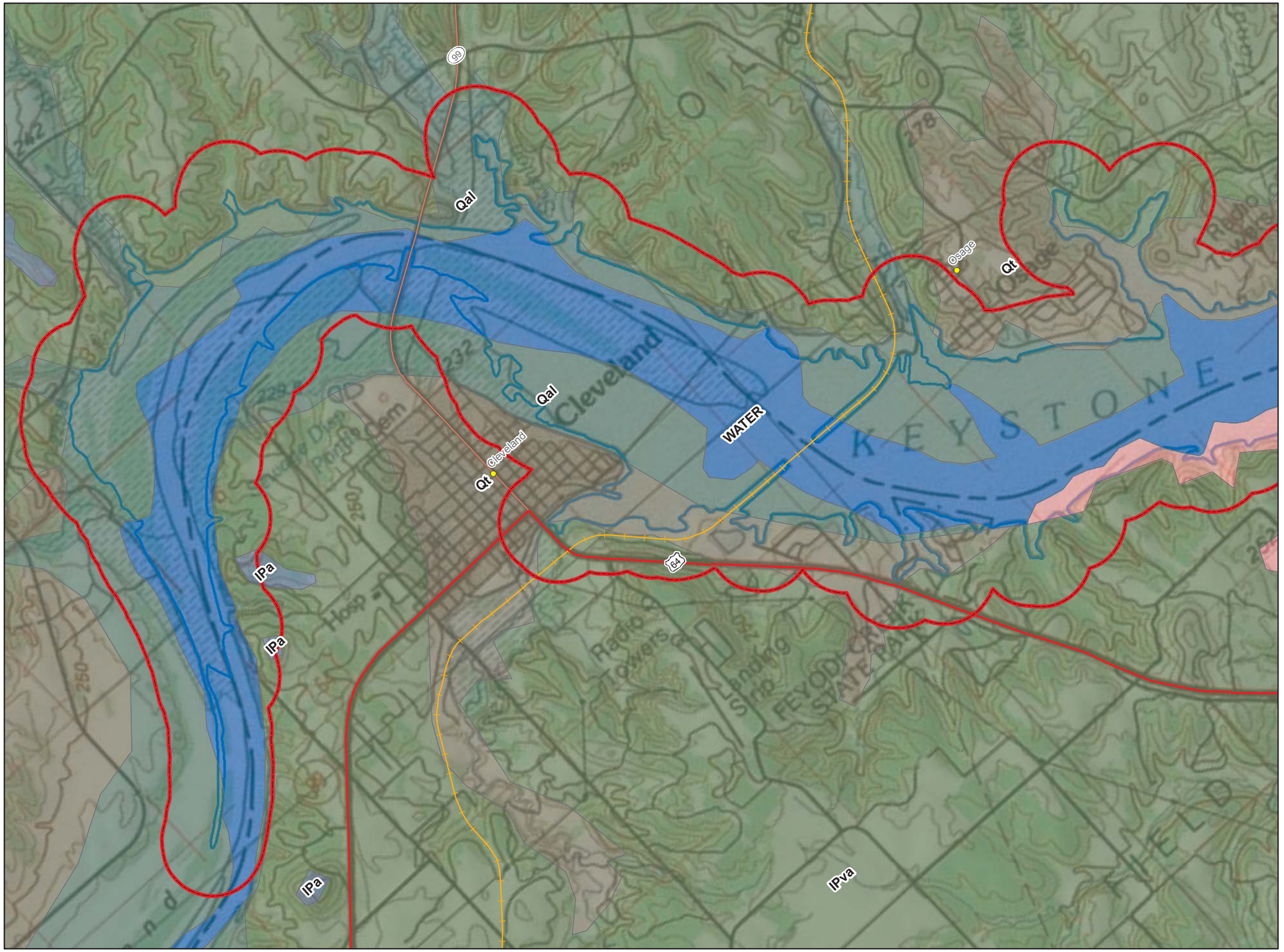
Stantec Consulting Services. 2008. Geotechnical Investigation and Testing; Arkansas River Corridor Project, Arkansas River. Prepared for the USACE Tulsa District, Tulsa, Oklahoma. Contract No. DACW912BV-07-D-1000. Sand Springs/Jenks, Oklahoma. May.

State of Oklahoma, Department of Transportation. 1994. Arkansas River Bridge and West Approach: City of Jenks. East Approach: City of Tulsa. Design Plans, near Tulsa, OK. July.

State of Oklahoma, Department of Transportation. 2002. U.S. Highway No. 64, Memorial Drive. Design Plans for a bridge replacement (Bridge A) and subsurface information, near Bixby, OK. September.

U.S. Geological Survey. 2009. Online GIS-based Geologic Mapping Database. Metadata accessed April 2009. Available at http://ok.water.usgs.gov/gis/geology/#state_map.

Attachment A
Surficial Geology Maps



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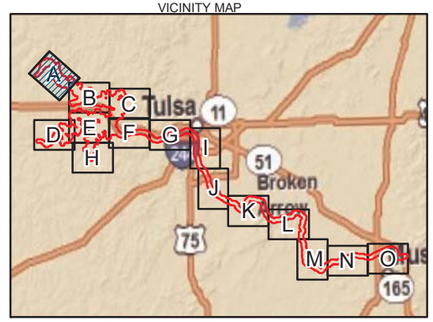

LEGEND

- Existing Dam
- Proposed Dam
- Arkansas River Buffer
- Interstates
- US & State Highways
- Secondary State & County Roads
- Railroads
- Keystone Lake

Symbol	Name
Qal	Alluvium
Qt	Terrace Deposits
IPva	Vamoosa Formation
IPt	Tallant Formation / (Thurman Sandstone)
IPbd	Barnsdall Formation
IPwi	Wann and Iola Formations
IPa	Atoka Formation
IPch	Chanute Formation
IPnh	Nellie Bly Formation and Hogshooter Limestone
IPd	Dewey Formation
IPh	Hogshooter Formation / (Holdenville Shale)
IPcc	Coffeyville and Checkerboard Formations
IPsl	Seminole Formation
IPhl	Holdenville and Lenapah Formations
IPnw	Nowata Formation
IPhd	Holdenville Shale
IPwk	Wewoka Formation
IPsn	Senora Formation
IPcv	Calvin Sandstone
IPbg	Boggy Formation
IPmh	McAlester and Hartshorne Formations
IPsm	Savanna, McAlester, and Hartshorne Formations
IPsv	Savanna Formation

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Surficial Geology

Existing Geotechnical Resource Review

Arkansas River Corridor

Tulsa, OK

Map A

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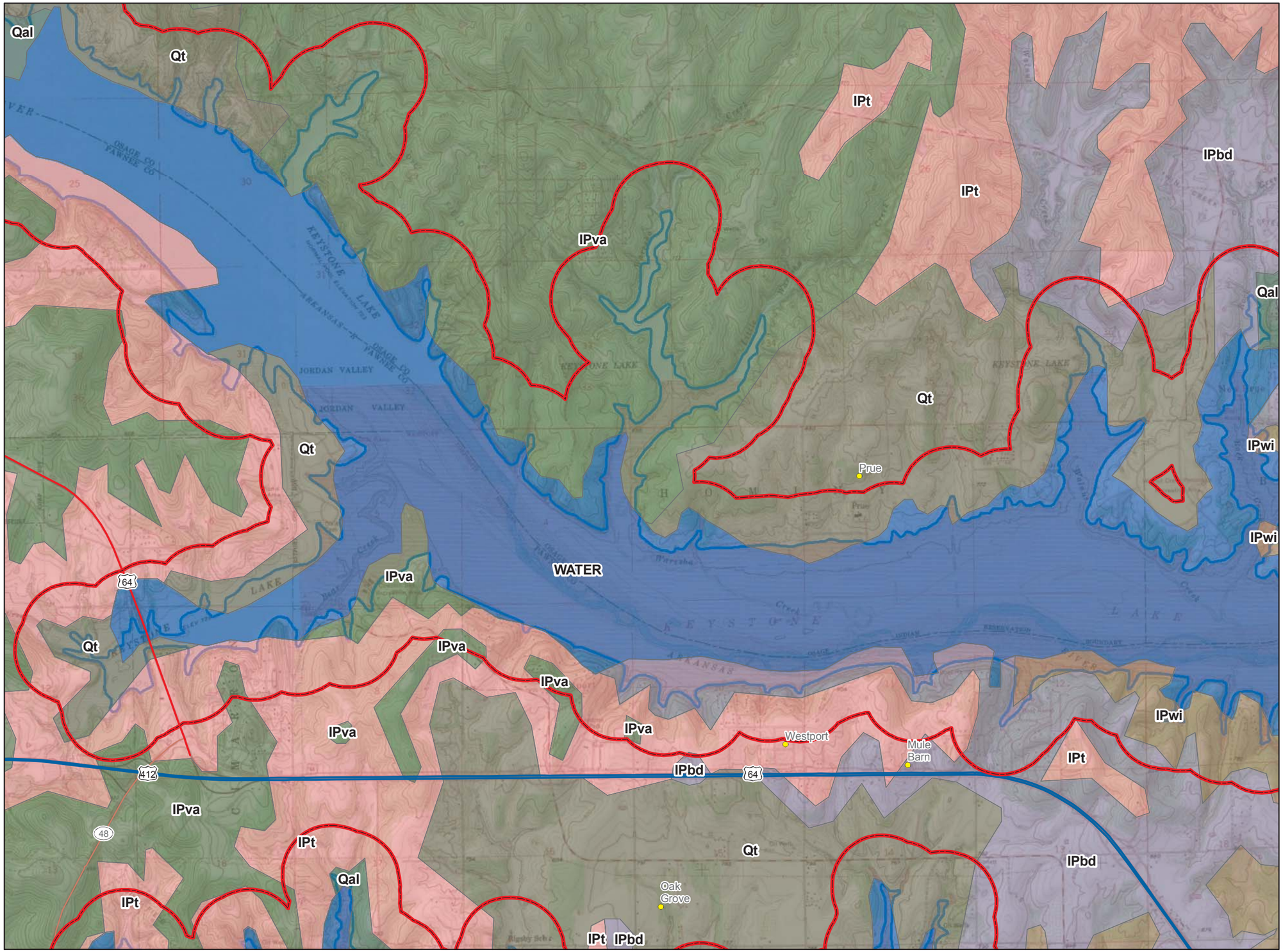

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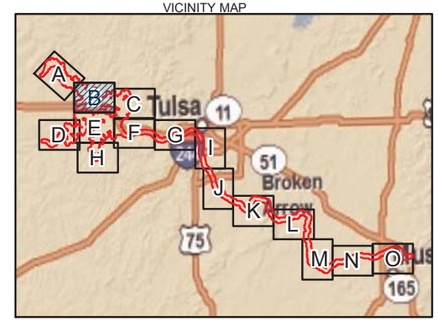

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Surficial Geology

Existing Geotechnical Resource Review

Arkansas River Corridor

Tulsa, OK

Map B

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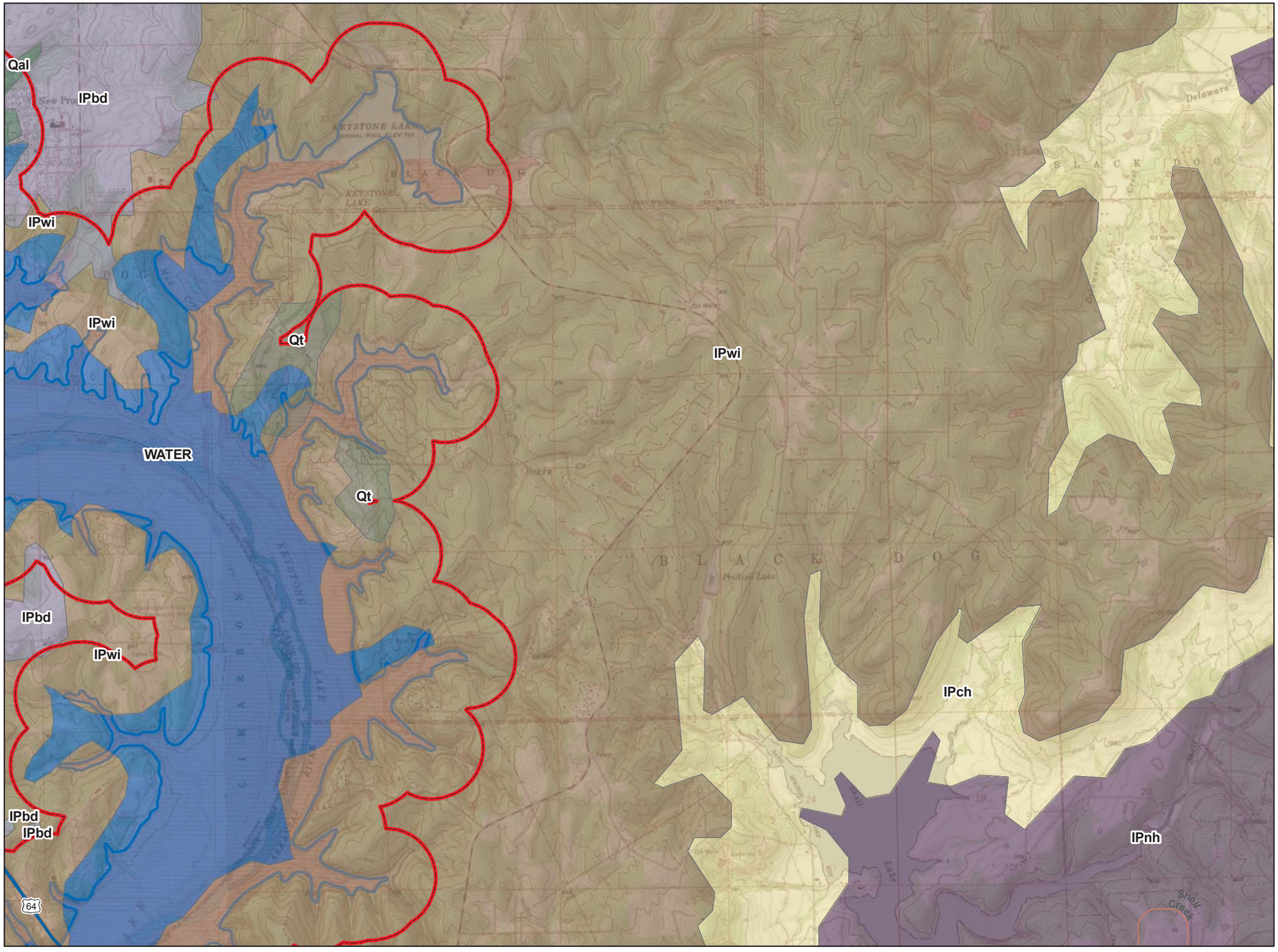

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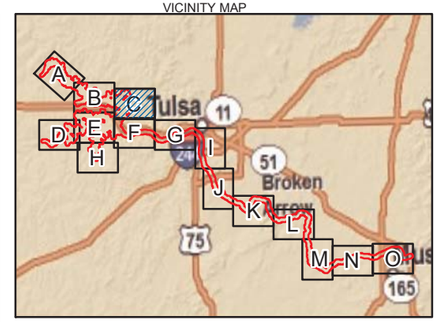

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Surficial Geology

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Arkansas River Corridor

Tulsa, OK

Map C

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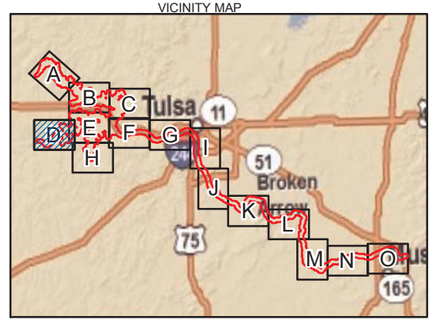
VICINITY MAP



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Arkansas River Corridor

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Map D

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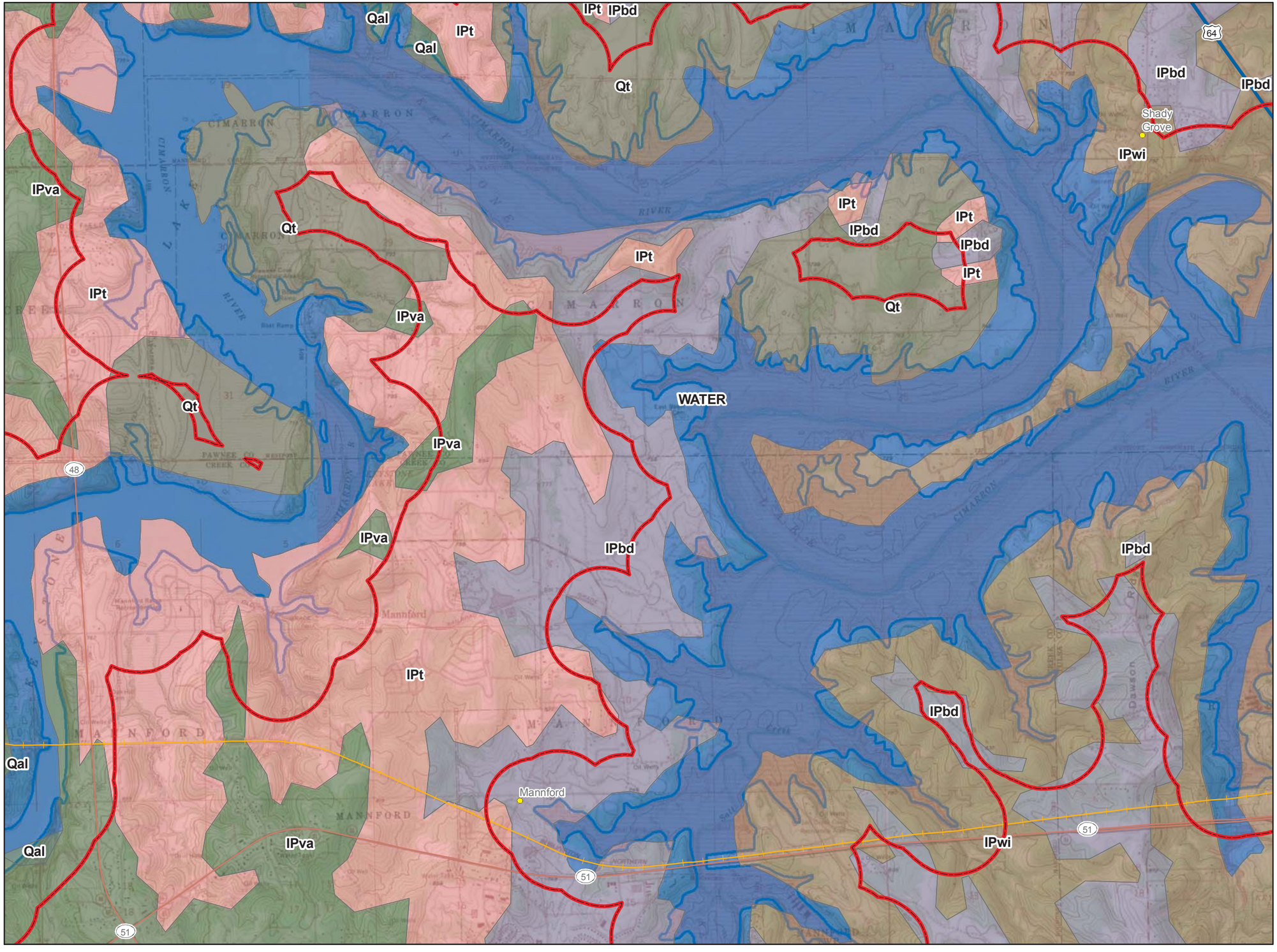

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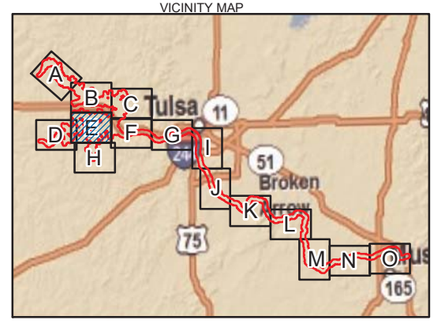

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Arkansas River Corridor

Tulsa, OK

Map E

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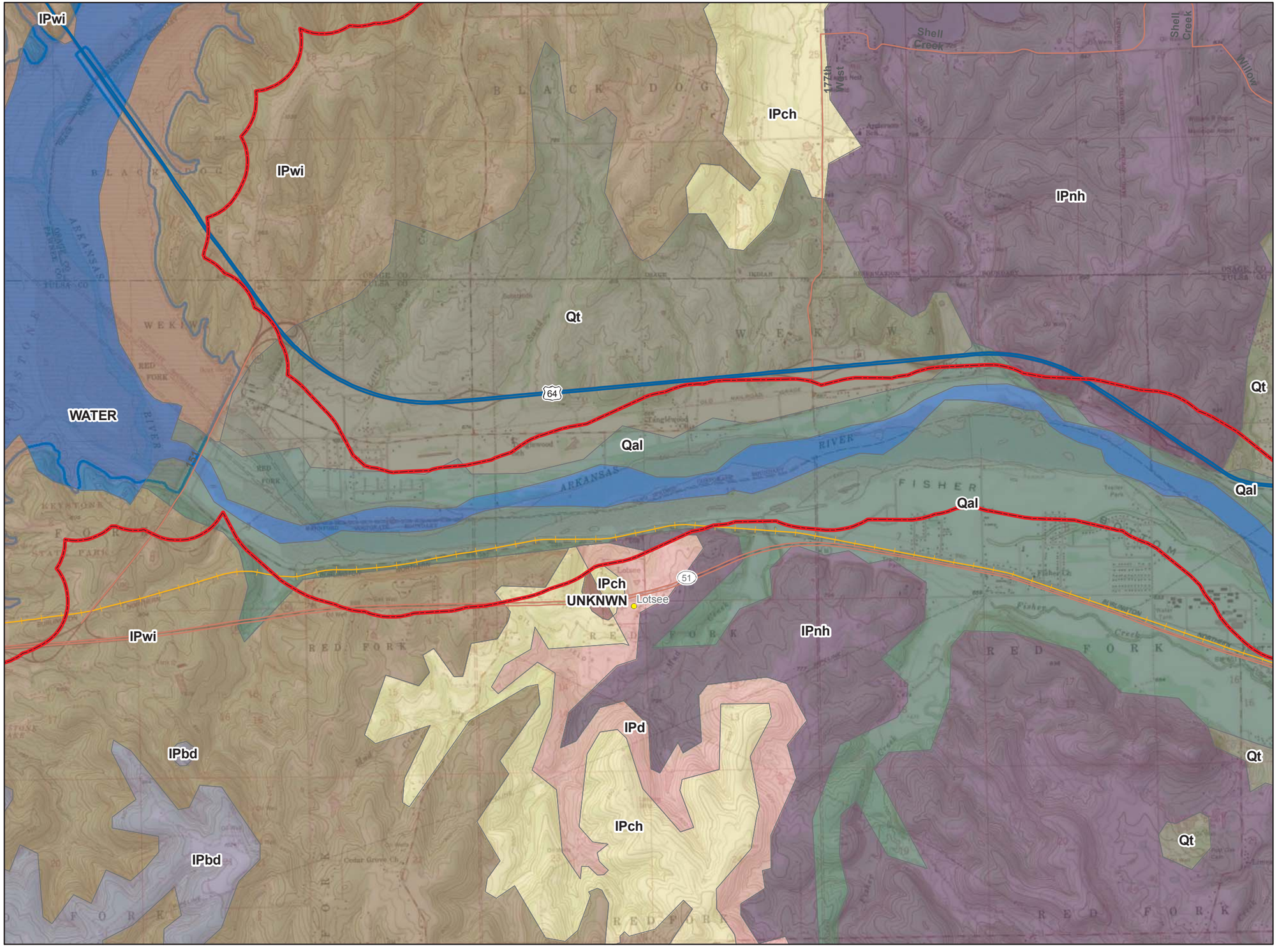

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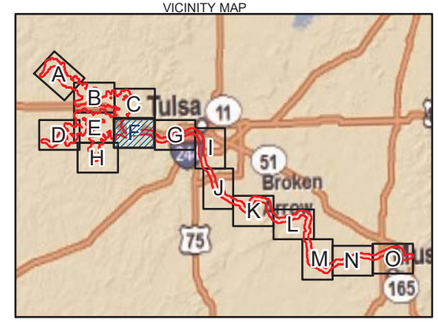

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Arkansas River Corridor

Tulsa, OK

Map F

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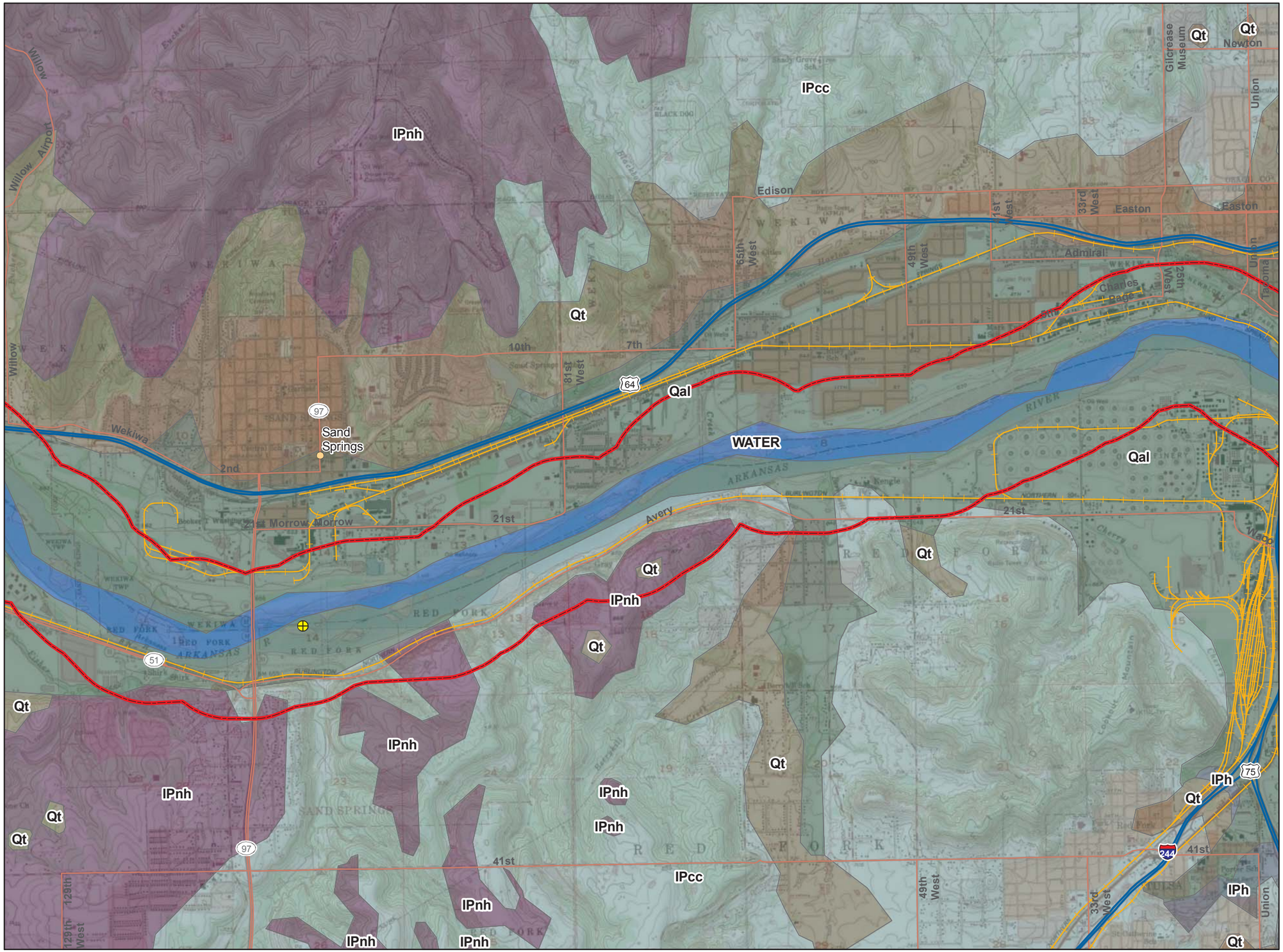

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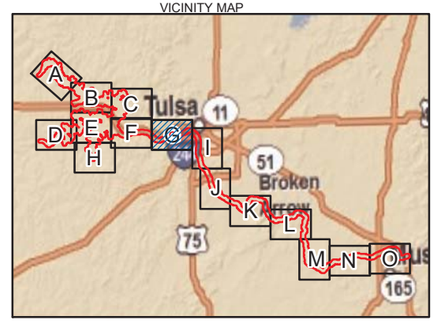

LEGEND

- Existing Dam
- Proposed Dam
- Arkansas River Buffer
- Interstates
- US & State Highways
- Secondary State & County Roads
- Railroads
- Keystone Lake

Symbol	Name
Qal	Alluvium
Qt	Terrace Deposits
IPva	Vamoosa Formation
IPt	Tallant Formation / (Thurman Sandstone)
IPbd	Barnsdall Formation
IPwi	Wann and Iola Formations
IPa	Atoka Formation
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IPsm	Savanna, McAlester, and Hartshorne Formations
IPsv	Savanna Formation

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Surficial Geology

Existing Geotechnical Resource Review

Arkansas River Corridor

Tulsa, OK

Map G

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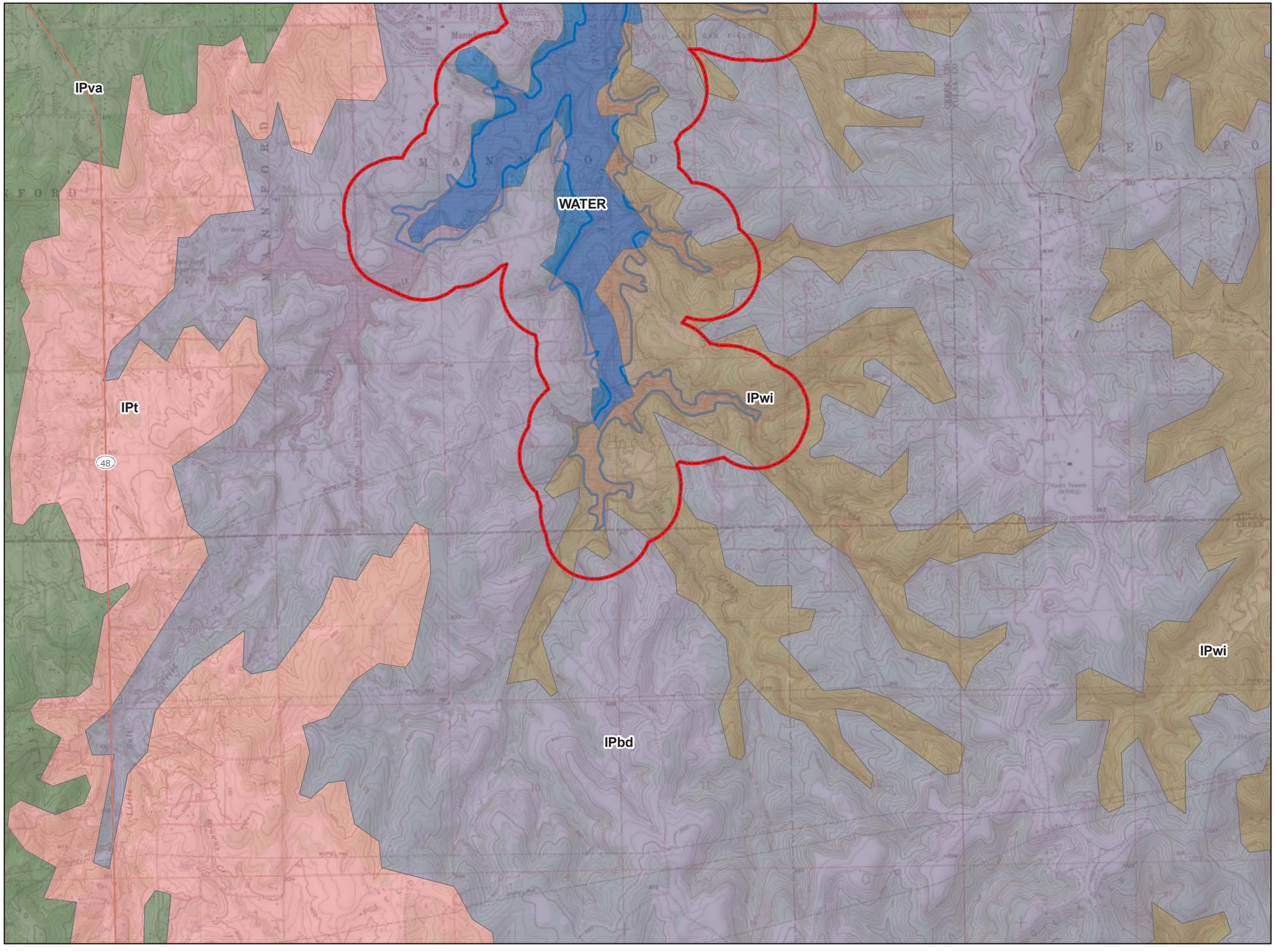

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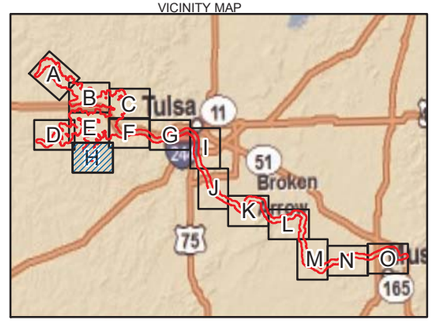

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Surficial Geology

Existing Geotechnical Resource Review

Arkansas River Corridor

Tulsa, OK

Map H

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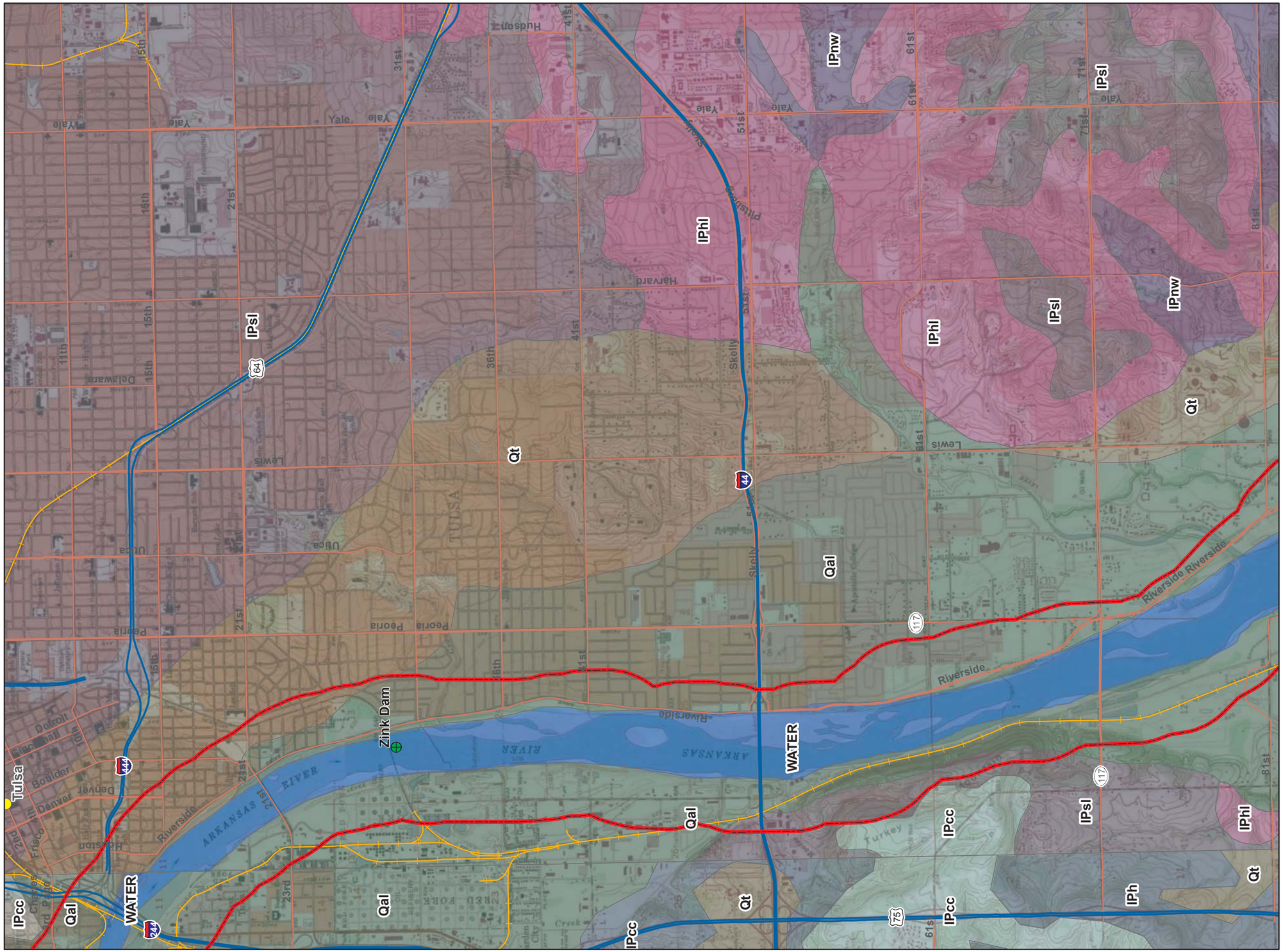

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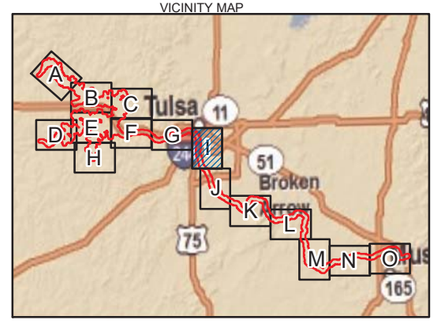

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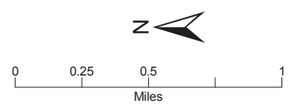

Surficial Geology

Existing Geotechnical Resource Review

Arkansas River Corridor

Tulsa, OK

Map I

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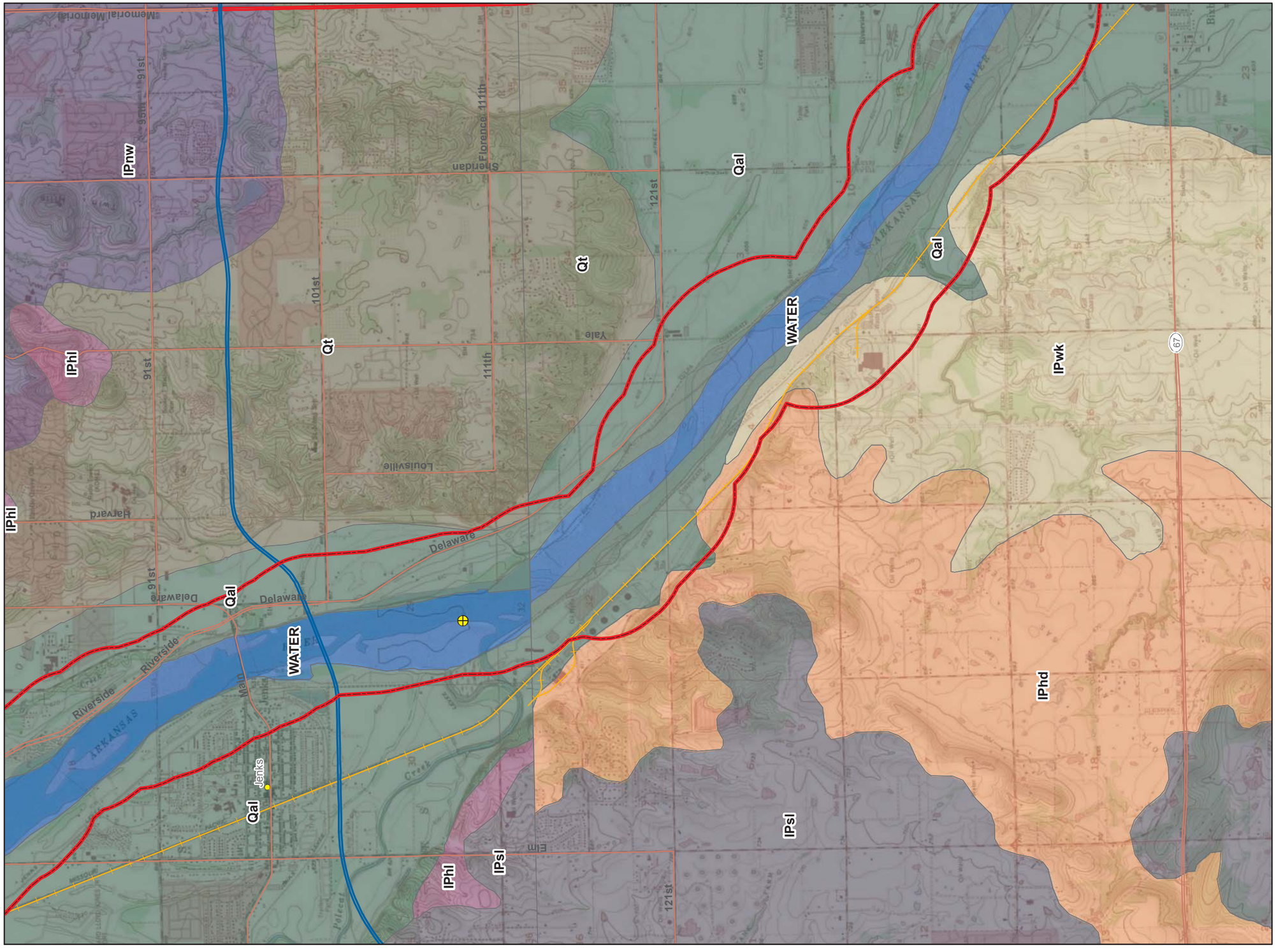

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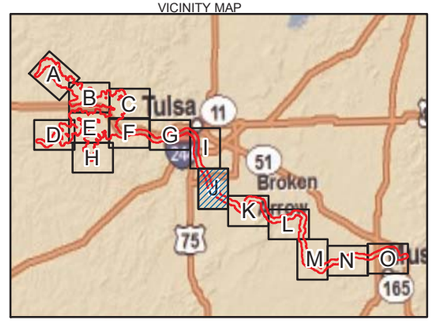

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Surficial Geology

Existing Geotechnical Resource Review

Arkansas River Corridor

Tulsa, OK

Map J

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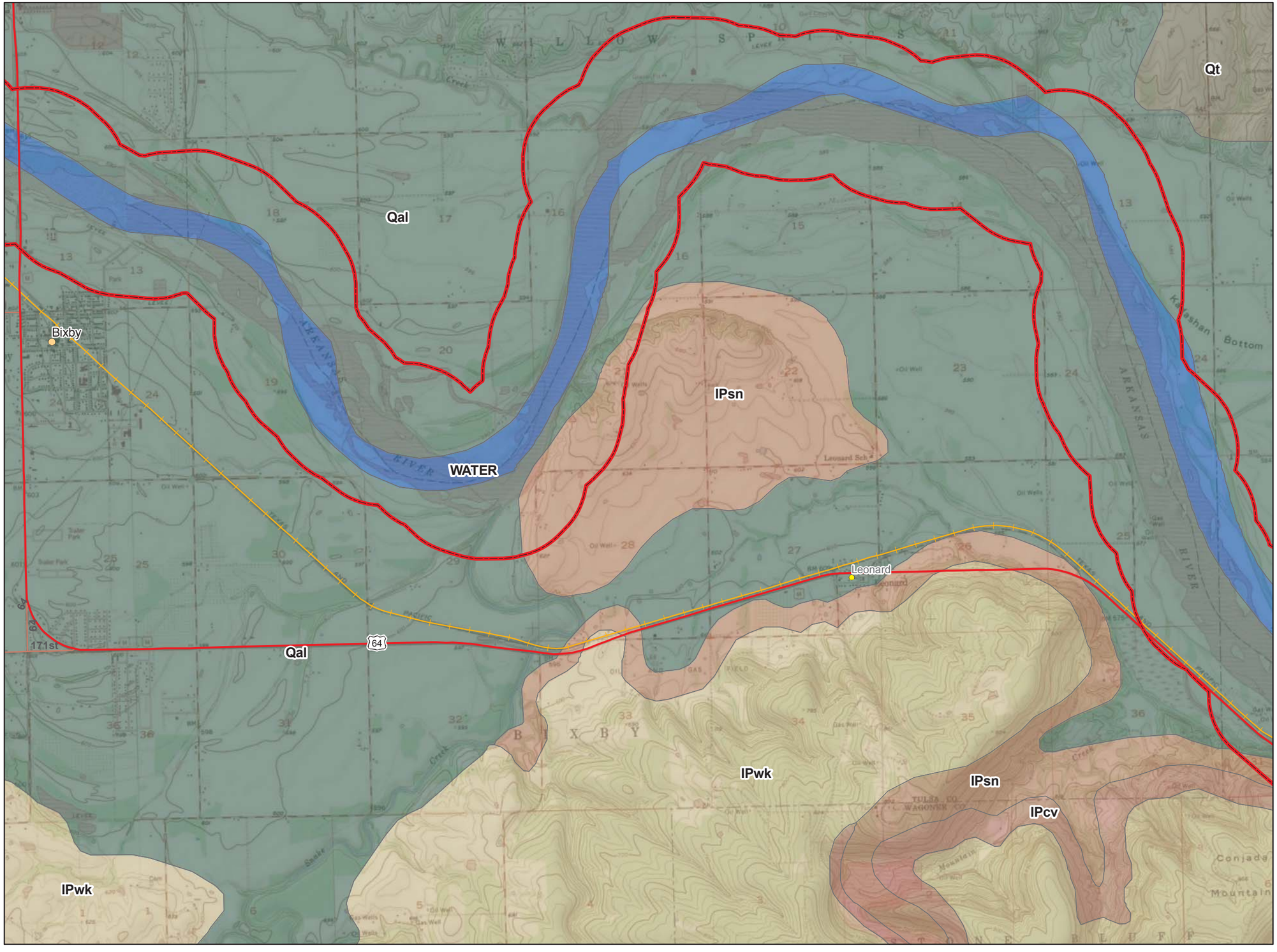

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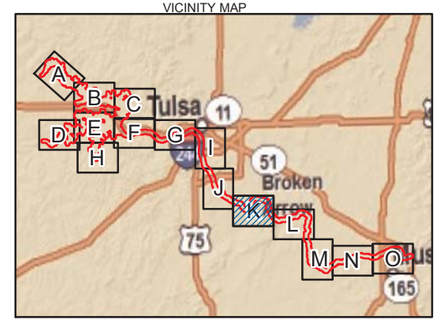

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Surficial Geology

Existing Geotechnical Resource Review

Arkansas River Corridor

Tulsa, OK

Map K

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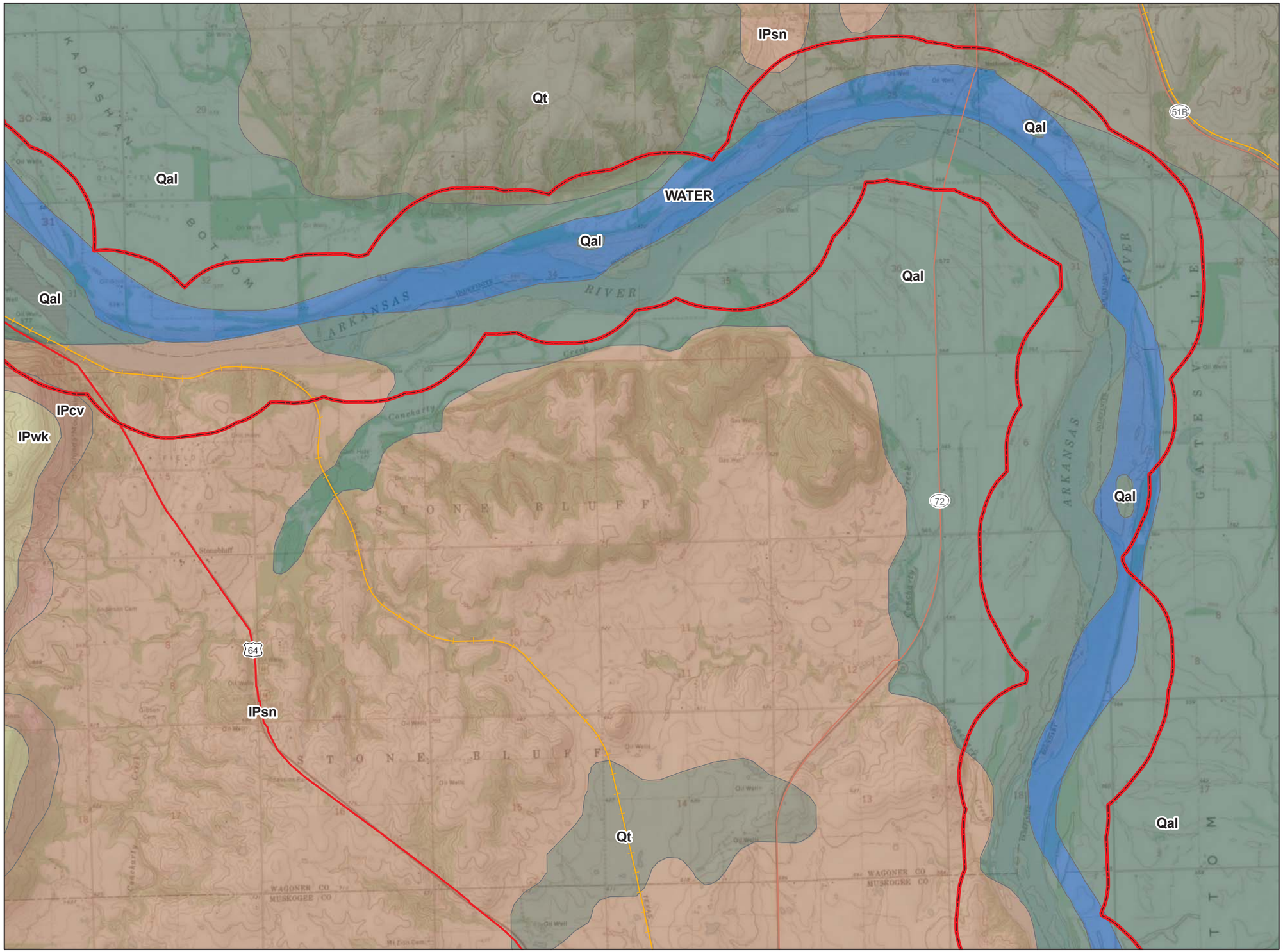

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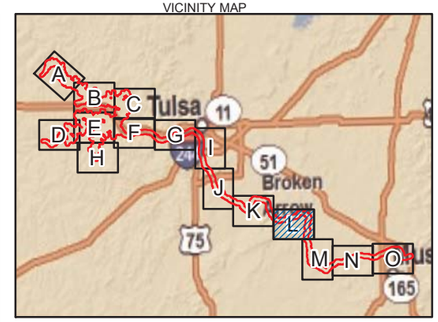

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Surficial Geology

Existing Geotechnical Resource Review

Arkansas River Corridor

Tulsa, OK

Map L

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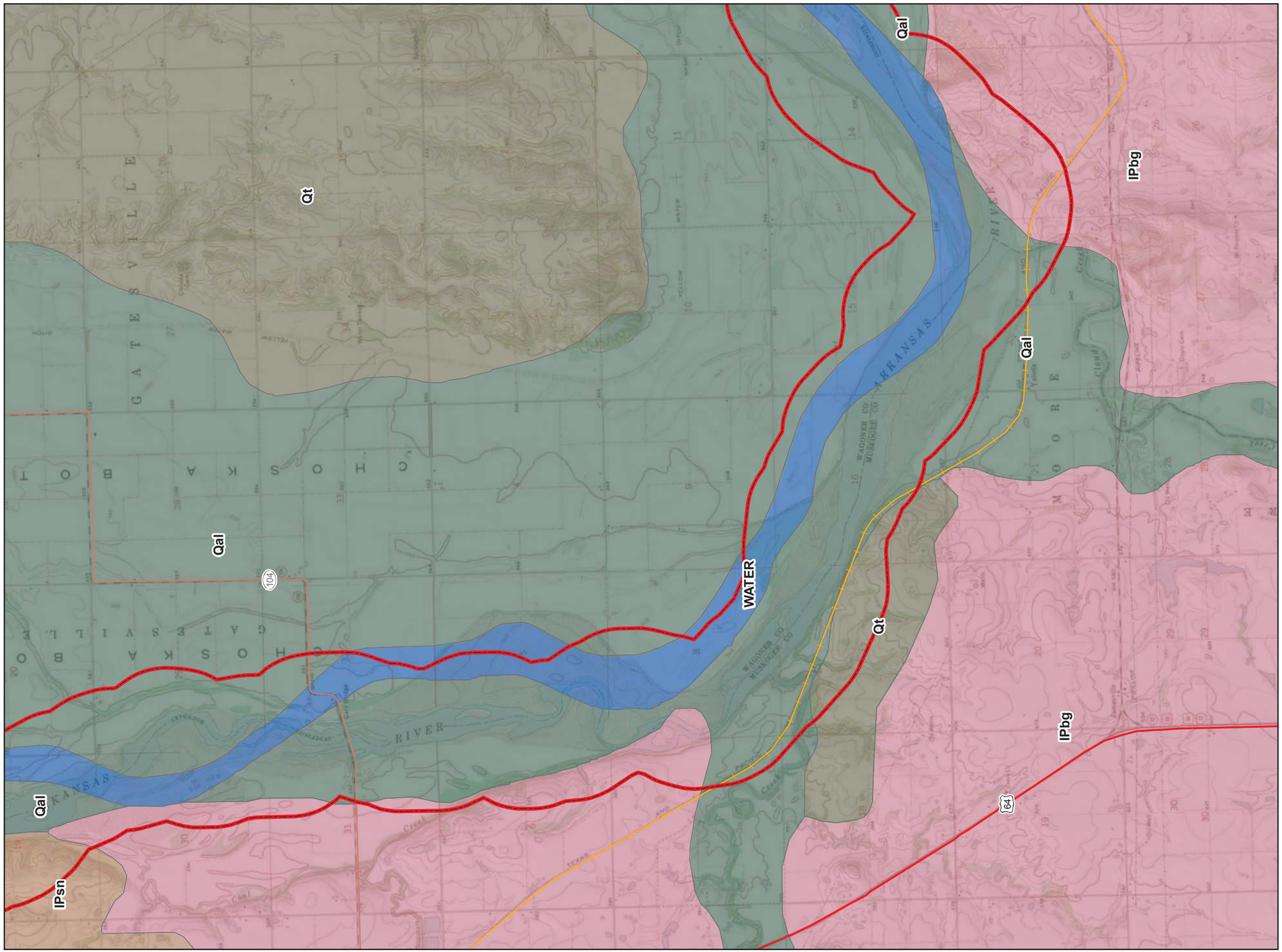

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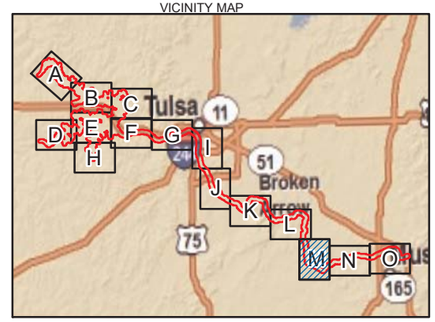

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Surficial Geology

Existing Geotechnical Resource Review

Arkansas River Corridor

Tulsa, OK

Map M

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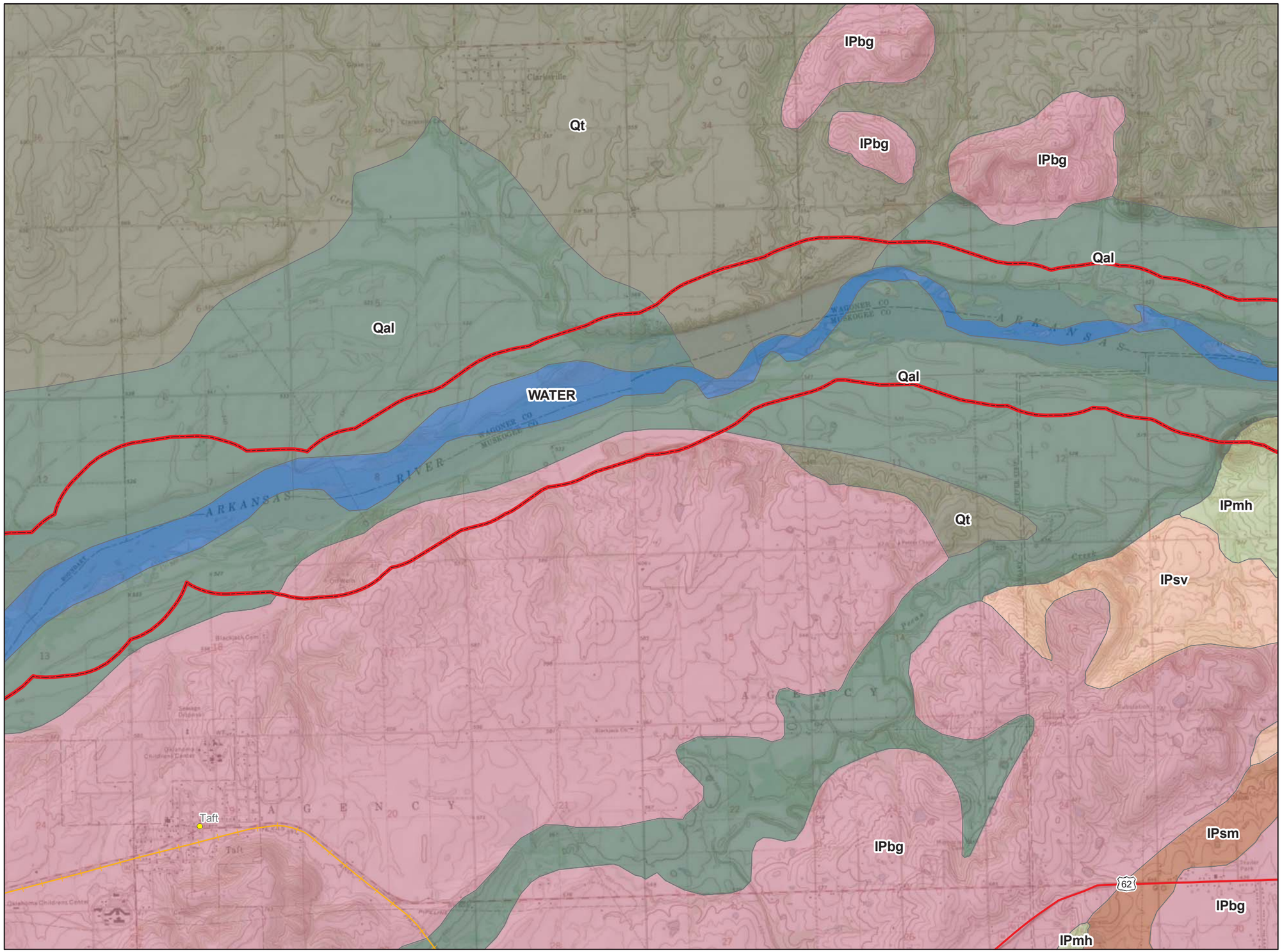

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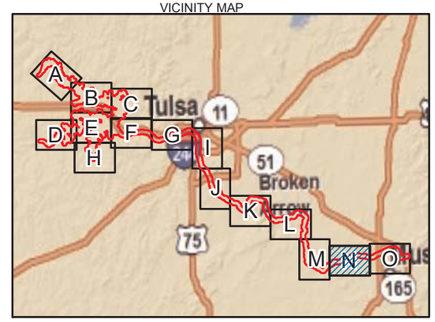

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Surficial Geology

Existing Geotechnical Resource Review

Arkansas River Corridor

Tulsa, OK

Map N

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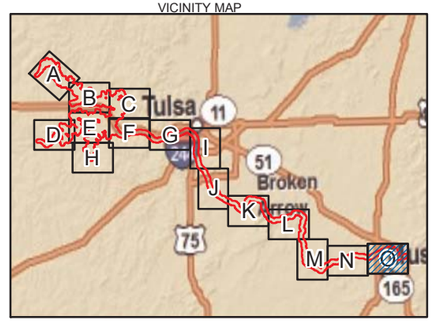
VICINITY MAP



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Surficial Geology

Existing Geotechnical Resource Review

Arkansas River Corridor

Tulsa, OK

Map O

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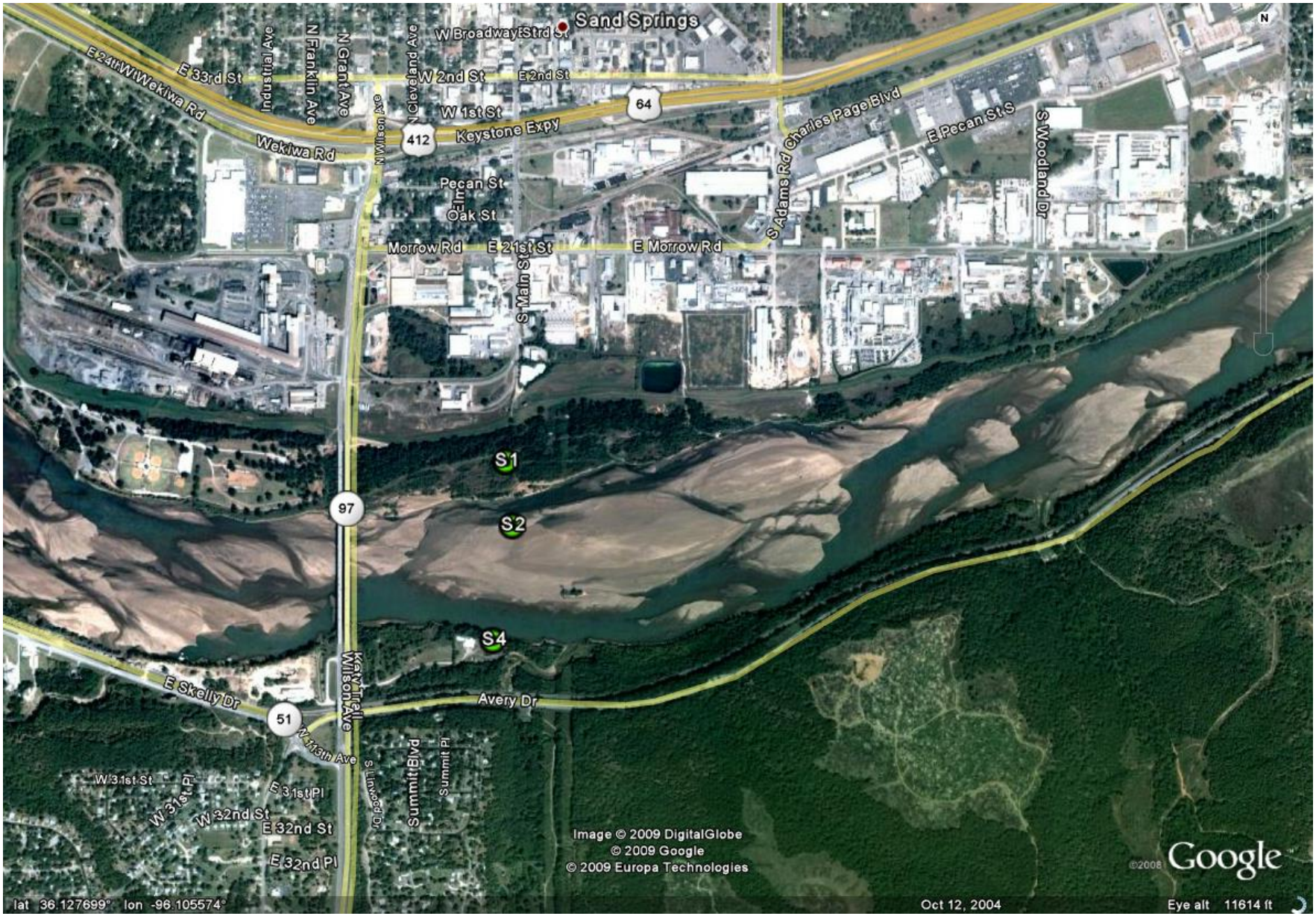
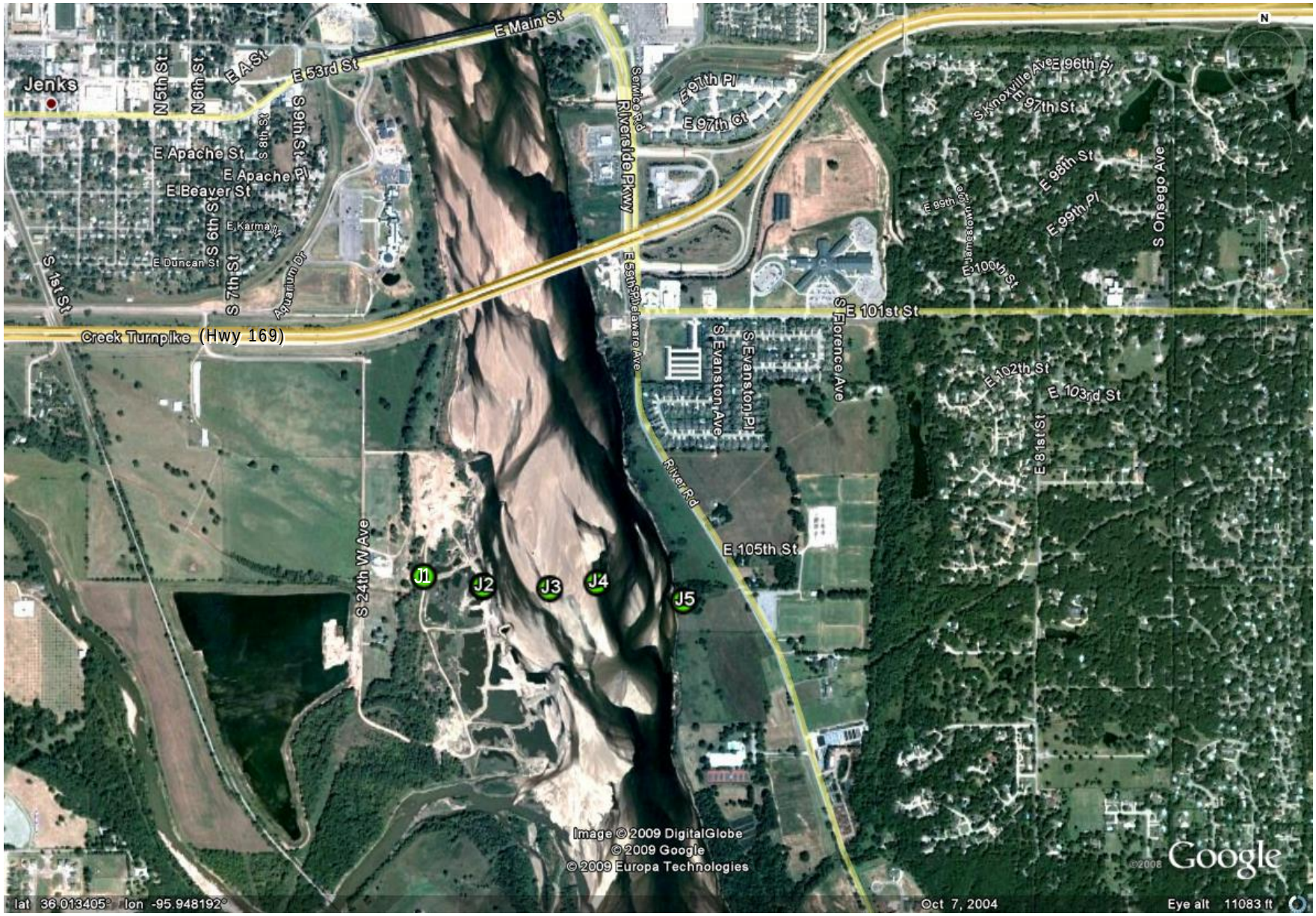
Attachment B
Approximate Locations of Borings Advanced by Stantec



Arkansas River Corridor Projects
Existing Geotechnical Resource Review TM
Stantec Report (2008)
Proposed Sand Springs Vicinity Boring Locations



Arkansas River Corridor Projects
Existing Geotechnical Resource Review TM
Stantec Report (2008)
Proposed South Tulsa/Jenks Vicinity Boring Locations

Attachment C
Locations of 2002 Borings Advanced by Oklahoma Department of Transportation near Bixby

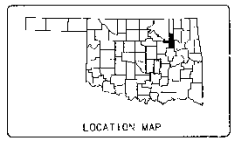
Sub 9-20-02

CONTROL SURVEY DATA

SEE SURVEY DATA SHEETS

STATE OF OKLAHOMA
DEPARTMENT OF TRANSPORTATION

PLAN OF PROPOSED
STATE HIGHWAY
FEDERAL AID PROJECT NO. STPY-172A(008), BRFY-172A(098)
GRADING, DRAINAGE, SURFACING & BRIDGE PLANS
U.S. HIGHWAY NO. 64, MEMORIAL DRIVE
TULSA COUNTY
CONTROL SECTION NO. 64-72-06
STATE JOB NO. 11286(04)(08)
CONTRACT NO. 1



INDEX OF SHEETS
SEE SHEET NO. 2 FOR INDEX OF SHEETS AND STANDARD DRAWINGS.

STA. 4+633.600 END FEDERAL AID PROJECT NO. STPY-172A(008)

STA. 3+640.000 END FEDERAL AID PROJECT NO. BRFY-172A(098)
BEGIN FEDERAL AID PROJECT NO. STPY-172A(008)

Bridge "A"
END BRIDGE STA. 3+445.000
BRIDGE LENGTH = 32.000 m
BEGIN BRIDGE STA. 3+413.000
LOCATION NO. 7206-0635X
EXISTING NBI NO. 00572
NEW NBI NO. 26791

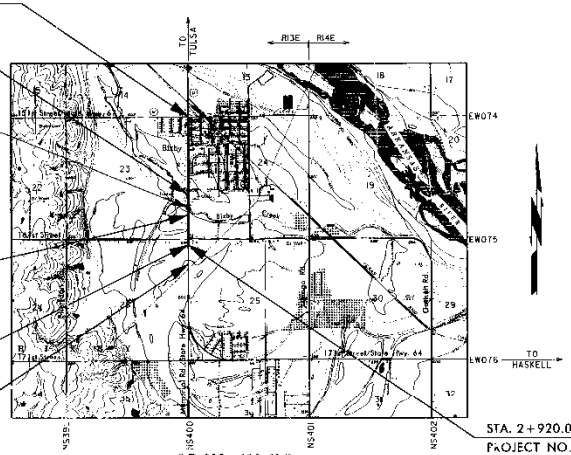
STA. 3+280.000 END FEDERAL AID PROJECT NO. STPY-172A(008)
BEGIN FEDERAL AID PROJECT NO. BRFY-172A(098)

STA. 2+920.000
END INCIDENTAL CONSTRUCTION

STA. 2+740.000
BEGIN INCIDENTAL CONSTRUCTION

DESIGN DATA		
ADT	2002	= 16,125
ADT	2022	= 30,800
DHV (TWO-WAY)		= 2,350
K (DHV/ADT)		= 10%
D		= 60%
T (%DHV)		= 4%
T (%ADT)		= 6%
T_S (%ADT)		= 3%
V		= 70 km/h

SCALES
PLAN 1:500
PROFILE HOR. 1:500
VER. 1:50
LAYOUT MAP 1:25000



STA. 2+920.000 BEGIN FEDERAL AID PROJECT NO. STPY-172A(008)

AS-BUILT PLANS

Prepared by:
HJR-Gerver
Engineers
5411 South 12th East Ave.
Tulsa, Oklahoma

J.P. NO. 11286(04)
STPY-172A(008)

ROADWAY LENGTH	1353.600 m	1.353 km
BRIDGE LENGTH	0.000 m	0.000 km
PROJECT LENGTH		1.353 km
INCIDENTAL CONSTRUCTION	180.000 m	

EQUATIONS: NONE
EXCEPTIONS: NONE

J.P. NO. 11286(08)
BRFY-172A(098)

ROADWAY LENGTH	3293.400 m	3.326 km
BRIDGE LENGTH	32.000 m	0.032 km
PROJECT LENGTH		0.360 km

EQUATIONS: NONE
EXCEPTIONS: NONE

LENGTH BASED ON CRL

THE ENTIRE PROJECT IS WITHIN THE CORPORATE LIMITS OF THE CITY OF BIXBY

CONVENTIONAL SYMBOLS
PROPOSED R/W
RAILROADS
SECTION LINES
SURVEY SECTION LINES
FENCES
CROSS LINES
EXIST. ROADS
RAILLINE
TOPE LINES
TELEPHONE & TELEGRAPH
POWER LINES
BUILDINGS
WELLS
DRAINAGE STRUCTURES - IN PLACE
DRAINAGE STRUCTURES - NEW
RIGHT-OF-WAY LINES - EXISTING
RIGHT-OF-WAY LINES - NEW
CONTROLLED ACCESS
RIGHT-OF-WAY FENCE

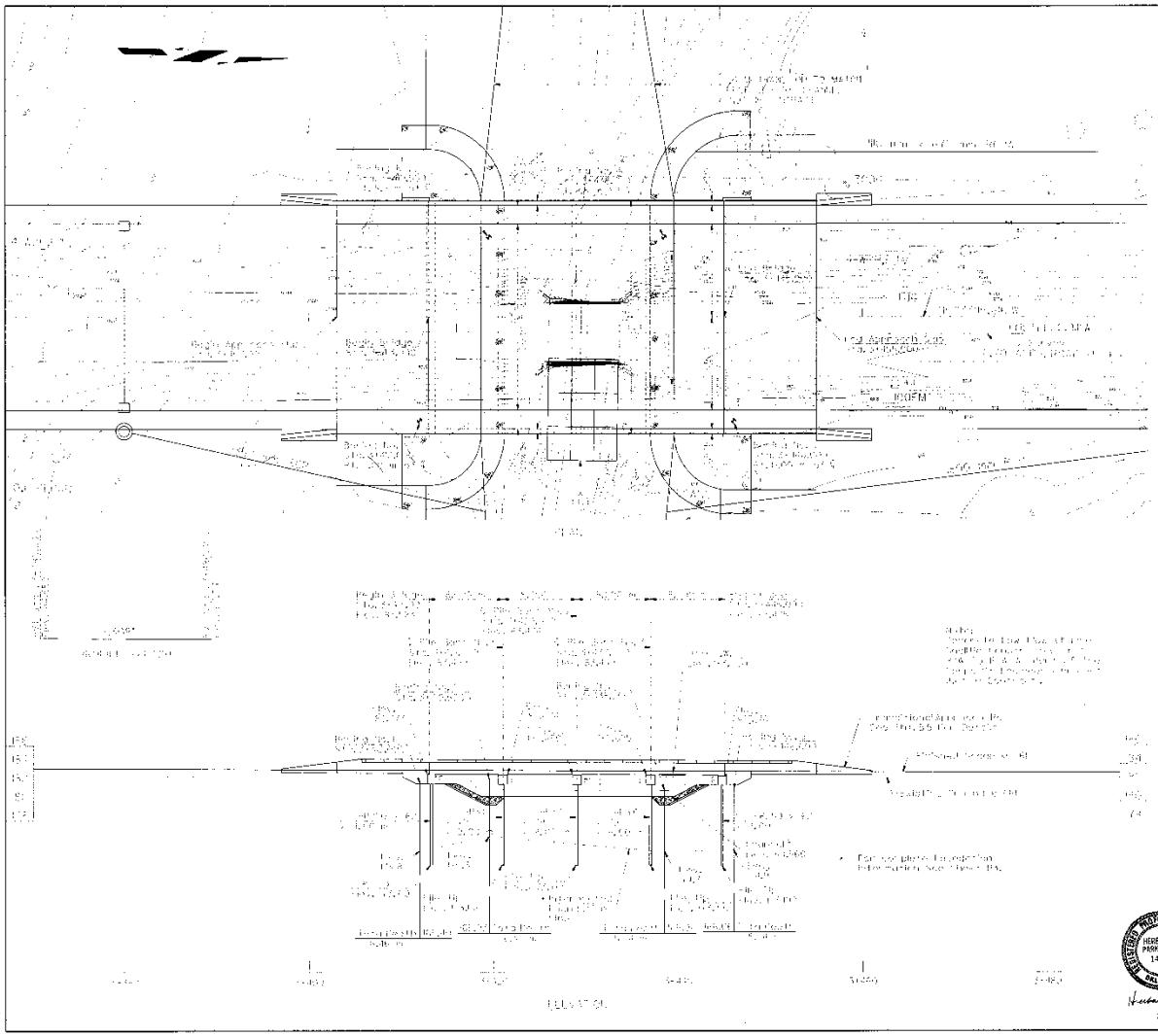
1982 OKLAHOMA STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION - METRIC COVERS, AS APPROVED BY THE U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION, SEPTEMBER 21, 1982.

Terry L. Eddings
TERRY L. EDDINGS P.E.
PE NO. OK-15072
DATE: 9/6/02

OKLAHOMA DEPARTMENT OF TRANSPORTATION	DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION
DATE APPROVED	DATE APPROVED
BY	BY
CHIEF ENGINEER	DIVISION ADMINISTRATOR

640 383911 F.A. PROJECT NO. STPY-172A(008), BRFY-172A(098) SHEET NO. 1

TULSA COUNTY



STATE OF OKLAHOMA

Attachment D
Locations of 1994 Borings Advanced by Oklahoma Department of Transportation at Bridge Piers near Jenks

SUB-6.7.94

Q-11

SURVEY DATA

1. HORIZONTAL CONTROL:
   A. HORIZONTAL CONTROL FOR THIS SURVEY IS THE USC & GS OKLAHOMA STATE PLANE COORDINATE SYSTEM, LAMBERT PROJECT, NORTH ZONE. ALL COORDINATES SHOWN ARE OKLAHOMA STATE PLANE COORDINATES.
   B. ACCURACY – 3RD ORDER OR BETTER.

2. BEARINGS:
   THE BEARINGS SHOWN HEREIN ARE GRID BEARINGS DERIVED FROM THE USC & GS OKLAHOMA PLANE COORDINATE SYSTEM AND ARE NOT ASTRONOMICAL.

3. VERTICAL CONTROLS:
   A. LEVEL DATUM IS MEAN SEA LEVEL (USC&GS).
   B. ACCURACY – 3RD ORDER OR BETTER.

TRAFFIC DATA *	
ADT– 1991	= 16,000
ADT– 2011	= 26,000
DHV	= 2,600
D	= 55%
T(%ADT)	= 6%
V	= 45 MPH

* NOTE: ADDITIONAL TRAFFIC DATA IS SHOWN ON SIGNALIZATION SHEETS.

SCALES

PLAN 1" = 20'
PROFILE HOR. 1" = 20'
VER. 1" = 5'
LAYOUT MAP 1" = 800'

1"

CONVENTIONAL SYMBOLS

- PROPOSED ROAD
- RAILROADS
- RANGE & TOWNSHIP
- SECTION LINES
- QUARTER SECTION LINES
- FENCES
- GROUND LINE
- EXISTING ROADS
- BASE LINE (SBL & CRL)
- GRADE LINE
- TELEPHONE & TELEGRAPH
- POWER LINES
- OIL WELLS
- BUILDINGS
- DRAINAGE STRUCTURE – IN PLACE
- DRAINAGE STRUCTURE – NEW
- RIGHT-OF-WAY LINES – EXISTING (PRES. R/W)
- RIGHT-OF-WAY LINES – NEW (R/W)
- TREE
- TRAFFIC SIGNAL CASE
- TRANSFORMER
- SIGN
- FIRE HYDRANT
- TELEPHONE TERMINAL
- MANHOLE – TELEPHONE
- MANHOLE – SANITARY SEWER
- MANHOLE – STORM SEWER
- GAS METER
- WATER METER
- LIGHT POLE
- UTILITY POLE
- TELEPHONE UNDERGROUND
- WATER
- GAS
- SANITARY SEWER
- STORM SEWER

THE 1988 OKLAHOMA STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION GOVERN, APPROVED BY THE U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION, JANUARY 3, 1989. SUPPLEMENTAL SPECIFICATIONS TO THE 1988 STANDARD SPECIFICATIONS GOVERN OVER THE STANDARD SPECIFICATIONS.

2 DELETED SHEET 4C 7-14-94

FED.ROAD DIST. NO.	STATE	F.A. PROJ. NO.	FISCAL YEAR	SHT. NO.	TOTAL SHEETS
5	OKLA		1994	1	111

REVISIONS	
DESCRIPTION	DATE
1 REV. PROJECT NUMBER	6-15-94

STATE OF OKLAHOMA
DEPARTMENT OF TRANSPORTATION

PLAN OF PROPOSED

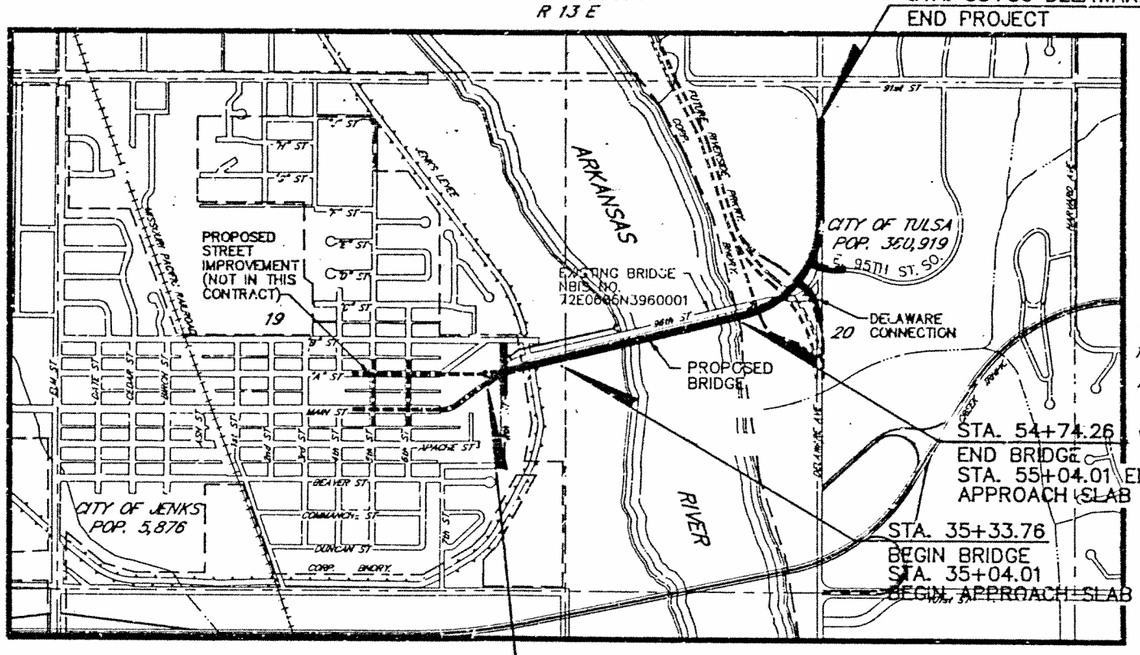
CITY BRIDGE

FEDERAL AID PROJECT NO. MA-M-STP-072B (410) IG
ARKANSAS RIVER BRIDGE AND WEST APPROACH: CITY OF JENKS
EAST APPROACH: CITY OF TULSA

TULSA COUNTY

STATE JOB NO. 07313 (04)
LOCATION NO. 72E0685N3960001
NBIS NO. 10573

R 13 E



LAYOUT MAP

ROADWAY LENGTH	3143.00	0.595 MI.
BRIDGE LENGTH	1940.50 FT.	0.367 MI.
PROJECT LENGTH		0.962 MI.

EQUATIONS: ON WEST APPROACH:
STA. 32+04.93 BACK=
STA. 35+04.01 FWD.
ON EAST APPROACH:
STA. 55+04.01=
STA. 9+86.82 96th ST.

INDEX OF SHEETS

ROADWAY STANDARDS:

SPI–2–3	WCR–1–3		RCB–1B–4
PCES–2–2	MI–1–2	RDSD–1–2	PUD 1–23
MFC–2–4	MD–2–31	RDSD–2–2	SUEL–4–0
MJB–1–3	FHTCP–1–1	RDSD–3–2	
SSCD–1–15	ASCD–3–3	SMD–1–22	
CICI–1–11	CSCD–3–5	LTU–2–2	
SBI–2–3	CIG–1–2	CET–1–3	
SSIF–2–4	LECS–2–4	DC–1–22	

BRIDGE STANDARDS:

P–1–16	SEJ–3–3		
	SFP–1–2		

SIGNING STANDARDS:

GMS–1–22	TCD–15–0	PM–7–5	CWS–2–8
FGS–1–34	TCD–15–1	TCD–1–11	TCD–1A–1
SPA–1–17	RSD–3–11	TCD–2–6	
SPA–2–5	RSD–4–8	TCD–3–5	
SSA–1–1	WSD–1–21	TCD–5–9	
PM–1–16	WSD–3–7	TCD–8–7	
PM–3–10	WSD–4–6	TCD–10–5	
PM–4–12	WSD–5–10	CWS–1–7	
PM–5–4	SBS–1–10	CWS–3–8	
RSD–1–25	SBS–2–9	CWS–4–7	
RSD–2–6	SBS–3–9	CWS–8–6	
TCD–9–4	SBS–4–7	PM–8–3	

LIGHTING STANDARDS:

CCD–1–4	GMF–1–6	HLP–2–2	HLD–1–2
CCD–2–2	BBD–1–3	HLP–3–1	SPD–1–10
PBD–1–8	HLP–1–5	PPD–1–3	SCD–1–5
			TWD–1–3

APPROVED BY: _____
CHARLES HARDT, DIRECTOR OF PUBLIC WORKS, CITY OF TULSA

BY: _____
HAROLD G. WILMOTT, MAYOR, CITY OF JENKS

ENGINEERS: WEST ROADWAY & BRIDGE
FHC, Inc.

BY: _____
JON D. NELSON, P.E.
OK P.E. NO. 11442

BY: _____
D. NEIL PULLIAM, JR., P.E.
OK. P.E. NO. 15688

EAST SIDE ROADWAY
BRUTON KNOWLES & LOVE, Inc.

Robert O. Bruton
ROBERT O. BRUTON, P.E.
OK P.E. NO. 4298

5-27-94

MICROFILMED 7.14.94
SCALE: 2 Inches

OKLAHOMA DEPARTMENT OF TRANSPORTATION	DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION
DATE APPROVED	DATE APPROVED
BY	BY
CHIEF ENGINEER	DIVISION ADMINISTRATOR

F. A. Project No. MA-M-STP-072B(410)IG Sheet No. 1

FED. ROAD DIST. NO.	STATE	J/P NO	FISCAL YEAR	SHEET NO.	TOTAL SHEET
6	OKLA	07313(04)	1994	49	111

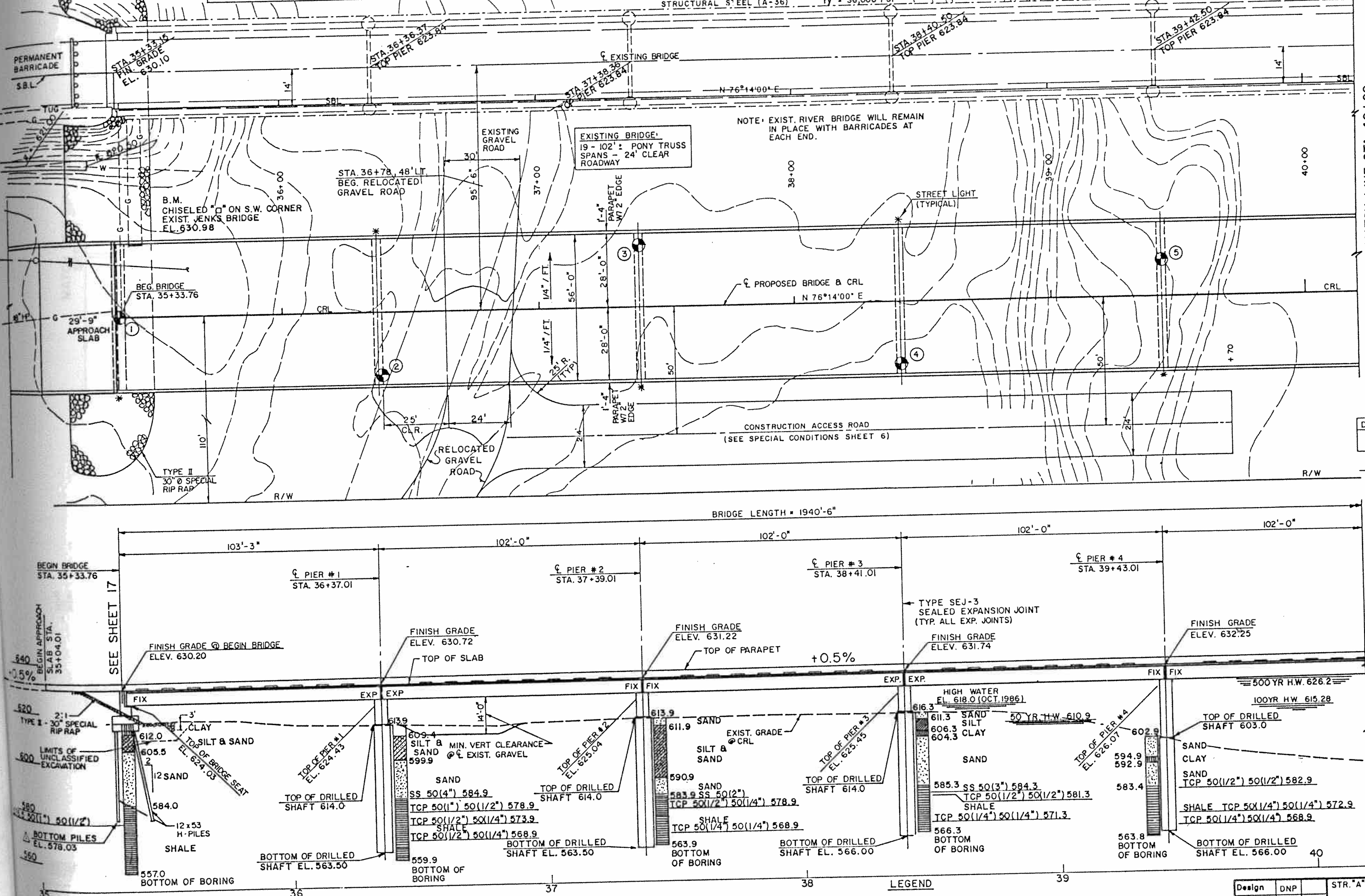
REVISIONS DESCRIPTION	DATE
△1 ELEV	6-24-94

BRIDGE "A" 19-102'-0" PRESTRESSED CONC. BEAM SPANS WITH 1'-4" CONC. PARAPETS.
56'-0" CLEAR ROADWAY STA. 35+33.76 TO 48+61.01
56'-0" CLEAR ROADWAY STA. 48+61.01 BEGIN TRANSITION TO 68'-0" CLEAR ROADWAY STA. 52+69.01
68'-0" CLEAR ROADWAY STA. 52+69.01 TO 54+74.26

DESIGN DATA

LOADING: HS 20 W/ 20 psf (FUTURE WEARING SURFACE & OKLA. OVRLD. TRUCK)
LOAD FACTOR DESIGN
DESIGN: AASHTO-1989
CL. "A" CONC. f'c = 3,000 PSI
CL. "AA" CONC. f'c = 3,500 PSI
PRESTRESSED CONC. f'c = 6,000 PSI
REINF. STEEL (GR. 60) fy = 60,000 PSI
STRUCTURAL STEEL (A-36) fy = 36,000 PSI

BENCH MARK: CHISELED "□" ON N.E. CORNER CONC. SLAB OF GAS REGULATOR, APPROX. 89.5' E. & 70.5' N. OF EAST END EXIST. BRIDGE ELEV. 630.99



0 20 40 60 80
1" = 20' HORIZONTAL
STA. 35+33.15 FIN. GRADE EL. 630.10
STA. 36+36.37 TOP PIER 623.84
STA. 37+38.38 TOP PIER 623.84
STA. 38+40.50 TOP PIER 623.84
STA. 39+42.50 TOP PIER 623.84
PERMANENT BARRICADE
℄ EXISTING BRIDGE
N 76°14'00" E
NOTE: EXIST. RIVER BRIDGE WILL REMAIN IN PLACE WITH BARRICADES AT EACH END.
EXISTING GRAVEL ROAD
EXISTING BRIDGE: 19 - 102' ± PONY TRUSS SPANS - 24' CLEAR ROADWAY
STA. 36+78, 48' LT. BEG. RELOCATED GRAVEL ROAD
B.M. CHISELED "□" ON S.W. CORNER EXIST. JENKS BRIDGE EL. 630.98
STREET LIGHT (TYPICAL)
℄ PROPOSED BRIDGE & CRL
N 76°14'00" E
BEG. BRIDGE STA. 35+33.76
29'-9" APPROACH SLAB
PARAPET W/ 2' EDGE
CONSTRUCTION ACCESS ROAD (SEE SPECIAL CONDITIONS SHEET 6)
RELOCATED GRAVEL ROAD
TYPE II 30" Ø SPECIAL RIP RAP
R/W
MATCH LINE STA. 40+20 SEE SHEET 50
BRIDGE LENGTH = 1940'-6"
103'-3" 102'-0" 102'-0" 102'-0" 102'-0"
BEGIN BRIDGE STA. 35+33.76
℄ PIER #1 STA. 36+37.01
℄ PIER #2 STA. 37+39.01
℄ PIER #3 STA. 38+41.01
℄ PIER #4 STA. 39+43.01
TYPE SEJ-3 SEALED EXPANSION JOINT (TYP. ALL EXP. JOINTS)
SEE SHEET 17
END APPROACH SLAB STA. 35+04.01
FINISH GRADE @ BEGIN BRIDGE ELEV. 630.20
FINISH GRADE ELEV. 630.72
TOP OF SLAB
FINISH GRADE ELEV. 631.22
TOP OF PARAPET
+0.5%
FINISH GRADE ELEV. 631.74
FINISH GRADE ELEV. 632.25
500 YR H.W. 626.2
100YR H.W. 615.28
HIGH WATER EL. 618.0 (OCT. 1986)
50 YR. H.W. 610.9
TYPE II - 30" SPECIAL RIP RAP
LIMITS OF UNCLASSIFIED EXCAVATION
TOP OF BRIDGE SEAT EL. 624.03
TOP OF PIER #1 EL. 624.43
TOP OF PIER #2 EL. 625.04
TOP OF PIER #3 EL. 625.45
TOP OF PIER #4 EL. 626.07
MIN. VERT CLEARANCE @ ℄ EXIST. GRAVEL
EXIST. GRADE @ CRL
12 x 53 H-PILES
△1 BOTTOM PILES EL. 578.03
TOP OF DRILLED SHAFT 614.0
TOP OF DRILLED SHAFT 603.0
BOTTOM OF DRILLED SHAFT EL. 563.50
BOTTOM OF DRILLED SHAFT EL. 566.00
557.0 BOTTOM OF BORING
559.9 BOTTOM OF BORING
563.9 BOTTOM OF BORING
566.3 BOTTOM OF BORING
563.8 BOTTOM OF BORING
SS 50(4") 584.9
TCP 50(1") 50(1/2") 578.9
TCP 50(1/2") 50(1/4") 573.9
TCP 50(1/2") 50(1/4") 568.9
SS 50(2") 583.9
TCP 50(1/2") 50(1/4") 578.9
TCP 50(1/4") 50(1/4") 568.9
SS 50(3") 584.3
TCP 50(1/2") 50(1/2") 581.3
TCP 50(1/4") 50(1/4") 571.3
TCP 50(1/2") 50(1/2") 582.9
TCP 50(1/4") 50(1/4") 572.9
TCP 50(1/4") 50(1/4") 568.9
CLAY
SILT & SAND
SAND
SHALE
35 36 37 38 39 40

ELEVATION
SC: 1" = 20'

LEGEND

- SAND
- SILT
- CLAY
- SHALE

HYDRAULIC DATA

Q500 = 480,000cfs
V500 = 6.2 fps
H.W. EL. (500 YR.) = 626.20

Q100 = 170,000cfs
V100 = 7.22fps
H.W. EL. (100YR.) = 615.28

Q50 = 105,000cfs
V50 = 5.93fps
H.W. EL. (50YR.) = 610.90

DRAINAGE AREA:
TOTAL: 74,615 SQ. MI.
UNCONTROLLED: 22,621 SQ. MI.
PIER SCOUR DEPTH (CALC.) = 10.4 FT.
EXTREME HIGH WATER - N/A

FOUNDATION LOADS

STEEL PILING: 59.9 TONS
DRILLED SHAFT: ALLOWABLE BEARING = 30 tsf
ALLOWABLE FRICTION = 2 tsf

DRILLED SHAFT FOUNDATION LOADS IN TONS PER SHAFT				
LOCATION	DESIGN LOAD PER SHAFT	CAPACITY FRICTION*	CAPACITY BEARING	TOTAL CAPACITY
PIERS 1-18	532	283	477	760

* NEGLECT 4' OF ROCK FOR FRICTION

VERTICAL CURVE DATA

PVI STA. 45+04.01
PVI EL. 635.05
+0.5% −0.5%
400' VC.

STEEL PILING:
ALL ABUTMENT PILING SHALL BE DRIVEN THROUGH THE COMPACTED FILL. STEEL PILING SHALL BE DRIVEN TO POINT BEARING ON SOLID FOUNDATION MATERIAL AT THE APPROXIMATE ELEVATION SHOWN ON THE PLANS. IF PRACTICAL REFUSAL IS NOT OBTAINED AT THIS ELEVATION, DRIVING SHALL CONTINUE UNTIL THE MINIMUM REQUIRED BEARING OF 120 TONS IS OBTAINED.
THE LENGTH OF STEEL PILING SHOWN ON THE PLANS IS FOR ESTIMATING PUPPOSES ONLY.

Design	DNP	
Drawn	JMB	
Checked		
Approved		
Squad		

STR. "A" ARKANSAS RIVER — TULSA COUNTY

GENERAL ELEV. AND PLAN

19-102'-0" PRESTRESSED CONC BEAM SPANS
56'-0" CLR. RDY. W/ CONC. PARAPET

STATE J/P NO. 07313(04) Sheet No. 49

FED. ROAD DIST. NO.	STATE	J/P NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
6	OKLA.	07[illegible]04.2	1994	50	111

REVISIONS

DESCRIPTION	DATE

0 20 40 60 80

1" = 20' HORIZONTAL

MATCH LINE STA. 40+20
SEE SHEET 49

STA 40+34.62 TOP PIER 625.82
STA 41+46.61 TOP PIER 625.84
STA 42+48.88 TOP PIER 625.84
STA 43+50.76 TOP PIER 625.84
STA 44+53.04 TOP PIER 625.96
STA 45+55.09 TOP PIER 625.85

℄ EXISTING BRIDGE

68L

N 76°14'00" E

14'

41+00 42+00 43+00 44+00 45+00

RIVER

1'-4" PARAPET W/ 2' EDGE

95'-6"

STREET LIGHT (TYPICAL)

⑦ ⑨ ⑪ ⑥ ⑧ ⑩

CRL 1/4" FT SLOPE 56'-0" 28'-0"

℄ PROPOSED BRIDGE & CRL

110'

ARKANSAS

HYDRAULIC DATA

Q500 = 480,000 cfs
V500 = 6.2 fps
H.W.EL. (500 YR.) = 626.20

Q100 = 170,000 cfs
V100 = 7.22 fps
H.W.EL. (100 YR.) = 615.28

Q50 = 105,000 cfs
V50 = 5.93 fps
H.W EL. (50 YR.) = 610.90

DRAINAGE AREA:
TOTAL: 74,615 SQ. MI.
UNCONTROLLED: 22,621 SQ. MI.
PIER SCOUR DEPTH (CALC.) = 10.4 FT.
EXTREME HIGH WATER - N/A

R/W

MATCH LINE STA. 45+55.01
SEE SHEET 51

B.M. CHISELED "□" ON S.W. CORNER EXISTING JENKS BRIDGE ELEV. 630.98

PLAN

BRIDGE LENGTH = 1940'-6"

102'-0" 102'-0" 102'-0" 102'-0" 102'-0"

℄ PIER # 5 STA. 40+45.01
℄ PIER # 6 STA. 41+47.01
℄ PIER # 7 STA. 42+49.01
℄ PIER # 8 STA. 43+51.01
℄ PIER # 9 STA. 44+53.01
℄ PIER # 10 STA. 45+55.01

PVC STA. 43+04.01 EL. 634.05
PVI 45+04.01 EL. 635.05

BM: CHISELED '□' ON N.E. COR. CONC. SLAB OF GAS REGULATOR, APPROX. 89.5' E. & 70.5' N. OF EAST END EXIST. BR. ELEV. 630.99

FINISH GRADE ELEV. 632.76
FINISH GRADE ELEV. 633.27
TOP OF PARAPET
FINISH GRADE ELEV. 633.78
FINISH GRADE ELEV. 634.26
PROPOSED BRIDGE & CRL PROFILE
FINISH GRADE ELEV. 634.52
TYPE SEJ #3 SEALED EXPANSION JOINT (TYP. ALL EXP. JOINTS)
+0.5% -0.5%
FINISH GRADE ELEV. 634.52

EXP EXP FIX FIX EXP EXP FIX FIX EXP EXP FIX FIX

TOP OF PIER # 5 EL. = 628.47
TOP OF PIER # 5 EL. = 627.09
TOP OF PIER # 7 EL. = 627.49
TOP OF PIER # 8 EL. = 628.08
TOP OF PIER # 9 EL. = 628.23
TOP OF PIER # 10 EL. = 628.34

TOP OF DRILLED SHAFT 603.0

HIGH WATER EL. = 618.0 (OCT. 1986)
100 YR. H.W. EL. 615.28
500 YR. H.W. EL. 626.20
50 YR. H.W. EL. 610.90

EXIST GRADE @ CRL

591.9 SAND 583.2 TCP 50(1) 50(1/2") 580.7 SHALE TCP 50(1/2") 50(1/2") TCP 50(1/2") 50(1/2") 564.7 TCP 50(1/2") 50(1/2") 561.1 BOTTOM OF BORING

590.14 SAND 584.6 TCP 50(1/4") 50(1/4") SHALE TCP 50(1/2") 50(1/2") 573.1 TCP 50(1/2") 50(1/2") 559.5 BOTTOM OF BORING

591.8 SAND 584.8 TCP 50(1/2") 50(1/2") 581.8 SHALE TCP 50(1/2") 50(1/2") 571.8 562.2 BOTTOM OF BORING

594.9 SAND 585.9 TCP 50(1/4") 50(1/4") 584.4 SHALE TCP 50(1/4") 50(1/4") 574.4 564.9 BOTTOM OF BORING

594.6 SAND 585.1 TCP 50(1/2") 50(1/2") 581.6 SHALE TCP 50(1/4") 50(1/4") 571.6 562.5 BOTTOM OF BORING

594.9 SAND 586.9 TCP 50(1/8") 50(1/8") 584.9 SHALE TCP 50(1/4") 50(1/4") 574.9 565.3 BOTTOM OF BORING

BOTTOM OF DRILLED SHAFT 565.50
BOTTOM OF DRILLED SHAFT 564.5
BOTTOM OF DRILLED SHAFT 566.00
BOTTOM OF DRILLED SHAFT 566.00
BOTTOM OF DRILLED SHAFT 566.00
BOTTOM OF DRILLED SHAFT 566.00

640 620 600 580 560

40 41 42 43 44 45 46

400' V.C.

ELEVATION
SC: 1" = 20'

LEGEND
SAND
SHALE

Design	DNP	
Drawn	SGG	
Checked		
Approved		

STR. 'A' ARKANSAS RIVER TULSA COUNTY

GENERAL ELEV. AND PLAN

19-102'-0" PRESTRESSED CONC. BEAM SPANS
56'-0" CLR. RDY. W7 CONC. PARAPET

FED. ROAD DIST. NO.	STATE	J/P NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEET
6	OKLA	07313(04)	1994	51	111

REVISIONS

DESCRIPTION	DATE

STA 45+55.00 TOP PIER 623.86
STA 46+57.46 TOP PIER 628.82
STA 47+59.27 TOP PIER 625.84
STA 48+61.42 TOP PIER 628.85
STA 49+63.37 TOP PIER 628.86
STA 50+65.48 TOP PIER 623.73

℄ EXISTING BRIDGE
N 76°14'00" E
SBL
14'
46+00
47+00
48+00
49+00
50+00
95'-6"
STREET LIGHT (TYPICAL)
1'-4" PARAPET W/ 2" EDGE
RIVER
STA 48+61.01 BEG. ACCELERATION LANE TAPER
255
VARIES
CRL
56'-0"
28'-0"
1/4" / FT SLOPE
N 76°14'00" E
℄ PROPOSED BRIDGE & CRL
110'
R/W
ARKANSAS
0 20 40 60 80
1" = 20' HORIZONTAL

MATCH LINE STA. 45+55.01 SEE SHEET 50

MATCH LINE STA. 50+65.01 SEE SHEET 52

PLAN

HYDRAULIC DATA

Q500 = 480,000 cfs
V500 = 6.2 fps
H.W. EL. (500 YR.) = 626.20

Q100 = 170,000 cfs
V100 = 7.22 fps
H.W. EL. (100 YR) = 615.28

Q50 = 105,000 cfs
V50 = 5.93 fps
H.W. EL. (50 YR.) = 610.90

DRAINAGE AREA:
TOTAL: 74,615 SQ. MI.
UNCONTROLLED: 22,621 SQ. MI.
PIER SCOUR DEPTH (CALC.) = 10.4 FT.
EXTREME HIGH WATER - N/A

B.M. CHISELED "□" ON S.W. CORNER EXIST. JENKS BRIDGE ELEV. 630.98

B.M. CHISELED "□" ON N.E. CORNER CONC. SLAB OF GAS REGULATOR, APPROX. 89.5' E. & 70.5' N. OF END EXIST. BRIDGE EAST EL. 630.99

BRIDGE LENGTH 1940'-6"
102'-0" | 102'-0" | 102'-0" | 102'-0" | 102'-0"
℄ PIER NO. 10 STA. 45+55.01
℄ PIER NO. 11 STA. 46+57.01
℄ PIER NO. 12 STA. 47+59.01
TYPE SEJ-3 SEALED EXPANSION JOINT (TYP. ALL EXP. JOINTS)
℄ PIER NO. 13 STA. 48+61.01
℄ PIER NO. 14 STA. 49+63.01
℄ PIER NO. 15 STA. 50+65.01
PVT STA. 47+04.01 EL. 634.05
PROPOSED BRIDGE & CRL PROFILE
-0.5%
TOP OF PARAPET
FINISH GRADE ELEV. 634.52
FINISH GRADE ELEV. 634.26
FINISH GRADE ELEV. 633.78
FINISH GRADE ELEV. 633.27
FINISH GRADE ELEV. 632.76
FINISH GRADE ELEV. 632.25
FIX | EXP | FIX | EXP | FIX | EXP | EXP | FIX | FIX | EXP EXP
500 YR. H.W. EL. 626.2
HIGH WATER EL. = 618.0 (OCT. 1986)
50 YR. H.W. EL. 610.9
100 YR H.W. EL. 615.28
TOP OF PIER NO. 10 EL. 628.54
TOP OF PIER NO. 11 EL. 627.97
TOP OF PIER NO. 12 EL. 627.60
TOP OF PIER NO. 13 EL. 626.98
TOP OF PIER NO. 14 EL. 626.49
TOP OF PIER NO. 15 EL. 625.80
TOP OF DRILLED SHAFT 603.0
594.9
SAND
586.9 TCP 50(1/8") 50(1/8") 584.9
SHALE
TCP 50(1/8") 50(1/8") 574.9
565.3 BOTTOM OF BORING
592.3
SAND
585.3 TCP 50(1/2") 50(1/2") 582.3
SHALE
TCP 50(1/2") 50(1/4") 572.3
562.7 BOTTOM OF BORING
591.7
SAND
585.7 TCP 50(1") 50(1/2") 581.7
SHALE
TCP 50(1/2") 50(1/2") 571.7
562.1 BOTTOM OF BORING
591.9
SAND
584.9
WEATHERED SHALE
587.4 BOTTOM OF BORING
EXIST. GRADE @ CRL
593.6
SAND
586.6 TPC 50(1/4") 50(1/4")
SHALE
TPC 50(1/4") 50(1/4")
565.3 BOTTOM OF BORING
593.4
SAND
587.9
WEATHERED SHALE
568.9 BOTTOM OF BORING
BOTTOM DRILLED SHAFT EL. 566.00
BOTTOM DRILLED SHAFT EL. 566.00
BOTTOM DRILLED SHAFT EL. 566.00
BOTTOM DRILLED SHAFT EL. 566.50
BOTTOM DRILLED SHAFT EL. 567.00
BOTTOM DRILLED SHAFT EL. 567.00
400' V.C.
640
620
600
580
560
LEGEND
SAND
SHALE
STA. 47+04.01 EL. 634.05
46 47 48 49
ELEVATION

Design	DNP	
Drawn	JMB	
Checked		
Approved		

STR. 'A' ARKANSAS RIVER — TULSA COUNTY

GENERAL ELEV AND PLAN

19 - 102'-0" PRESTRESSED CONC. BEAM SPANS
56'-0" CLR RDY W7, CONC. PARAPET
56'-0" TO 68'-0" CLR RDY W7, CONC. PARAPET

FED. ROAD DIST. NO.	STATE	J/P NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEET
6	OKLA.	07313(04)	1994	52	111

REVISIONS	
DESCRIPTION	DATE
1 ELEV	6-24-94

0 20 40 60 80
1" = 20' HORIZONTAL

STA. 50+65.48 TOP PIER 623.79
STA. 51+69.72 TOP PIER 623.77
STA. 52+88.72 TOP PIER 623.80
STA. 53+71.52 TOP PIER 623.82
℄ EXISTING BRIDGE
N 76°14'00" E
SBL
14'
20'
EL. 630.10 STA. 54+74.98
PERMANENT BARRICADE
TUG
P
W
51+00
52+00
53+00
54+00
25.5
1'-4" PARAPET W/ 2" EDGE
95'-6"
STA. 51+67.01 END ACCEL. LANE TAPER
RIVER
STREET LIGHT (TYPICAL)
TYPE II 30" Ø SPECIAL RIP-RAP
VARIES
CRL
28'-0"
68'-0"
40'-0"
1/4" FT. SLOPE
℄ PROPOSED BRIDGE & CRL
N 76°14'00" E
FUTURE LANE
END BRIDGE STA. 54+74.26
16
17
18
19
20
B.M. CHISELED "□" ON N.E. CORNER CONC. SLAB OF GAS REGULATOR, APPROX. 89.5' E & 70.5' N OF EAST END EXIST. BRIDGE. EL. 630.99
B.M. CHISELED "□" ON S.W. CORNER EXIST. JENKS BRIDGE EL. 630.98
MATCH LINE STA. 50+65.01 SEE SHEET 51.
110'
ARKANSAS
R/W

HYDRAULIC DATA
Q500 = 480,000 cfs
V500 = 6.2 fps
H.W. EL. (500 YR) = 626.20
Q100 = 170,000 cfs
V100 = 7.22 fps
H.W. EL. (100 YR) = 615.28
Q50 = 105,000 cfs
V50 = 5.93 fps
H.W. EL. (50 YR) = 610.90

DRAINAGE AREA:
TOTAL: 74,615 SQ. MI.
UNCONTROLLED: 22,621 SQ. MI.
PIER SCOUR DEPTH (CALC) = 10.4 FT.
EXTREME HIGH WATER - N/A

PLAN

BRIDGE LENGTH = 1940'-6"
102'-0" | 102'-0" | 102'-0" | 103'-3"
END BRIDGE STA. 54+74.26
NOTE: PSO TOWER APPROX. 150' SOUTH OF CRL
℄ PIER # 15 STA. 50+65.01
℄ PIER # 16 STA. 51+67.01
℄ PIER # 17 STA. 52+69.01
℄ PIER # 18 STA. 53+71.01
BEG. APPROACH SLAB 29'-9"
END APPROACH SLAB STA. 55+04.01
PROPOSED BRIDGE & CRL PROFILE
TYPE SEJ-3 SEALED EXPANSION JOINT (TYP. ALL EXP. JOINTS)
* THIS LOCATION REQUIRES AN ADDITIONAL 1 1/4" ANCHOR PLATE THICKNESS
70' PARAPET TRANSITION TO CURB HEIGHT
TOP OF PARAPET
FINISH GRADE ELEV. 632.25
FINISH GRADE ELEV. 631.74
FINISH GRADE ELEV. 631.22
FINISH GRADE ELEV. 630.72
FINISH GRADE EL. 630.20
FINISH GRADE EL. 630.05
FINISHED GRADE LINE
-0.5%
500 YR H.W. EL. 626.2
50 YR H.W. EL. 610.9
100 YR H.W. EL. 615.28
HIGH WATER EL. 618.0 (OCT. 1986)
EXP. FIX EXP. FIX EXP. * FIX EXP. FIX
TOP OF PIER # 15 EL. = 625.80
TOP OF PIER # 16 EL. = 625.31
TOP OF PIER # 17 EL. = 624.69
TOP OF PIER # 18 EL. = 624.18
TOP OF DRILLED SHAFT 603.00
TOP OF DRILLED SHAFT 603.0
TOP OF DRILLED SHAFT 603.0
TOP OF DRILLED SHAFT 603.0
EXISTING GRADE AT CRL
593.4 SAND 587.9 WEATHERED SHALE 568.9 BOTTOM OF BORING
595.5 SAND 588.0 TCP 50(1/2") 50(1/2") 587.5 SHALE TCP 50(1/4") 50(1/4") 572.5 567.2 BOTTOM OF BORING
595.6 SAND 587.1 TCP 50(1/8") 50(1/2") SHALE TCP 50(1/4") 50(1/4") 572.1 567.5 BOTTOM OF BORING
594.6 SAND 588.6 TCP 50(1/2") 50(1/2") 586.1 SHALE TCP 50(1/4") 50(1/4") 571.6 566.1 BOTTOM OF BORING
BOTTOM OF DRILLED SHAFT 567.00
BOTTOM OF DRILLED SHAFT 570.00
BOTTOM OF DRILLED SHAFT 570.00
BOTTOM OF DRILLED SHAFT 569.00
TYPE II 30" SPECIAL RIP-RAP
BRIDGE SEAT EL. = 623.77
12 X 53 H-PILES
BOTTOM OF PILES 580.77 1
617.4 611.9 CLAY SAND 592.4 SS 50(4") WEATHERED SHALE 587.4 TCP 50(1") 50(1/2") SHALE TCP 50(1/4") 50(1/4") 573.4 BOTTOM OF BORING
EL. 610.0
LIMITS OF UNCLASSIFIED EXCAVATION
2:1
10'
15'
3'
2
12
640
620
600
580
560
50 51 52 53 54 55

ELEVATION
SC: 1" = 20'

LEGEND
SAND
CLAY
SHALE

Design	DNP	
Drawn	SGG	
Checked		
Approved		
Squad		

STR "A" ARKANSAS RIVER — TULSA COUNTY

GENERAL ELEV AND PLAN

19 - 102'-0" PRESTRESSED CONC. BEAM SPANS
68'-0" CLR RDY W7, CONC. PARAPET

STATE J/P NO. 07313(04) Sheet No. 52

Attachment E
Locations of 1980 Borings Advanced by W.R. Holway & Associates, Tulsa River Parks Authority at Zink Lake Dam

TULSA RIVER PARKS AUTHORITY

LOW WATER DAM PROJECT

A PROJECT OF THE TULSA URBAN RENEWAL AUTHORITY

INDEX OF DRAWINGS

LEGEND

WATER LINE — W —
GAS LINE — G —
SANITARY SEWER
ELECTRICAL

ELEVATION MARK
DETAIL OR SECTION REFERENCE
GRID WORK POINTS

1 / C-10
1+70 N
3+20 W
W.P.

W. R. HOLWAY AND ASSOCIATES
4111 SOUTH DARLINGTON STREET
TULSA, OKLAHOMA 74135

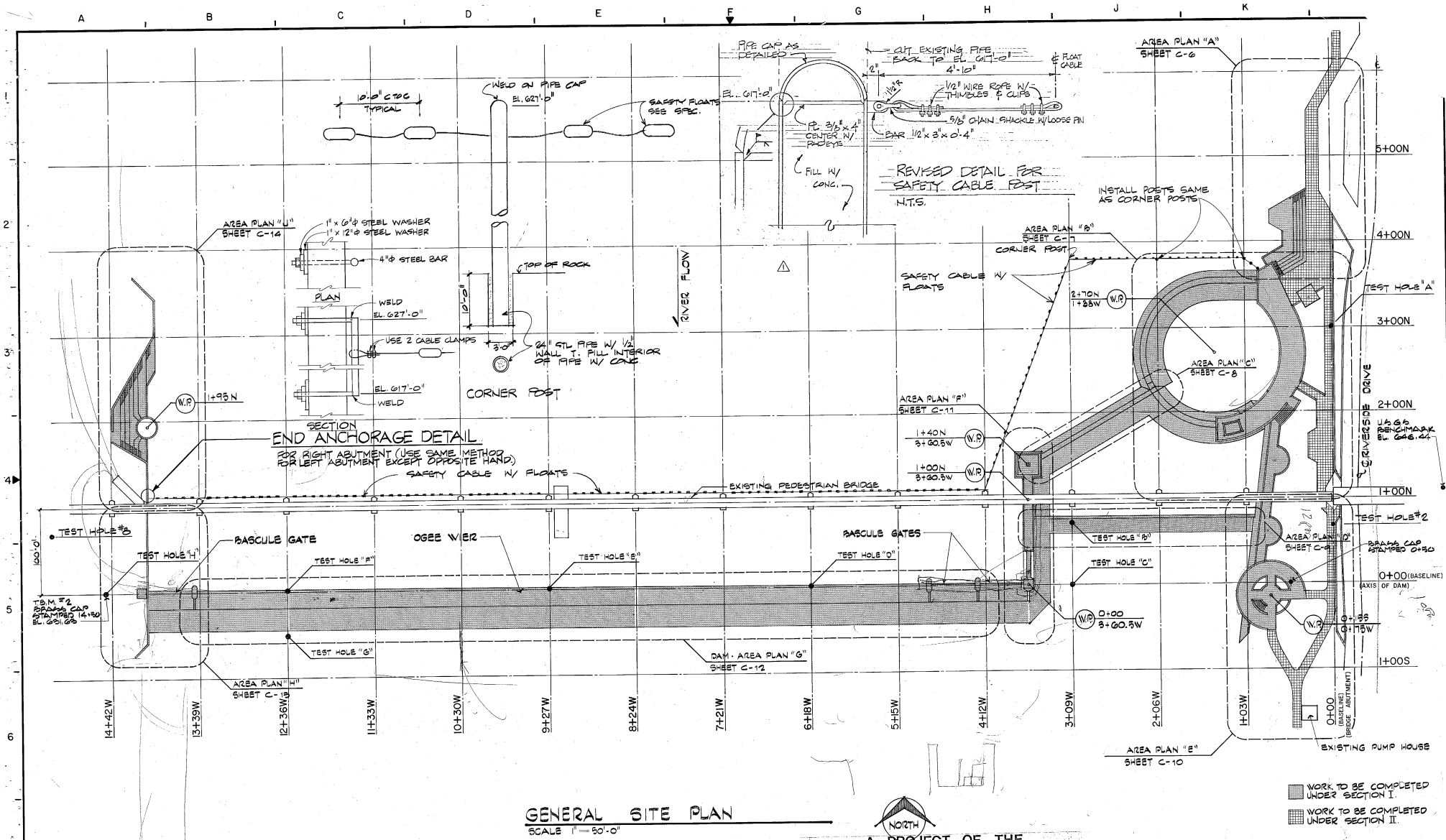
REVISION	DWN.	APP.	DATE
⚠ RECORD DRAWING	TM	JM	6/23/83

DRAWN BY DATE
CHECKED
SUPV. ENGR.
PROJ. MGR.

W. R. Holway and Associates
Consulting Engineers - Tulsa, Oklahoma

A PROJECT OF THE TULSA URBAN RENEWAL AUTHORITY
TULSA RIVER PARKS AUTHORITY
LOW WATER DAM PROJECT

COVER AND INDEX OF DRAWING



GENERAL SITE PLAN

SCALE 1" = 50'-0"

NORTH

A PROJECT OF THE TULSA URBAN RENEWAL AUTHORITY

RECORD DRAWING

REVISION	DWN.	APP.	DATE
⚠1 REVISED SAFETY CABLE POST	HA	JM	11/19/82
⚠2 RECORD DRAWING	TM	JM	6/23/83

	BY	DATE
DRAWN	J.C.W.	5-30-80
CHECKED	J.M.	5-30-80
SUPV. ENGR.		
PROJ. MGR.		

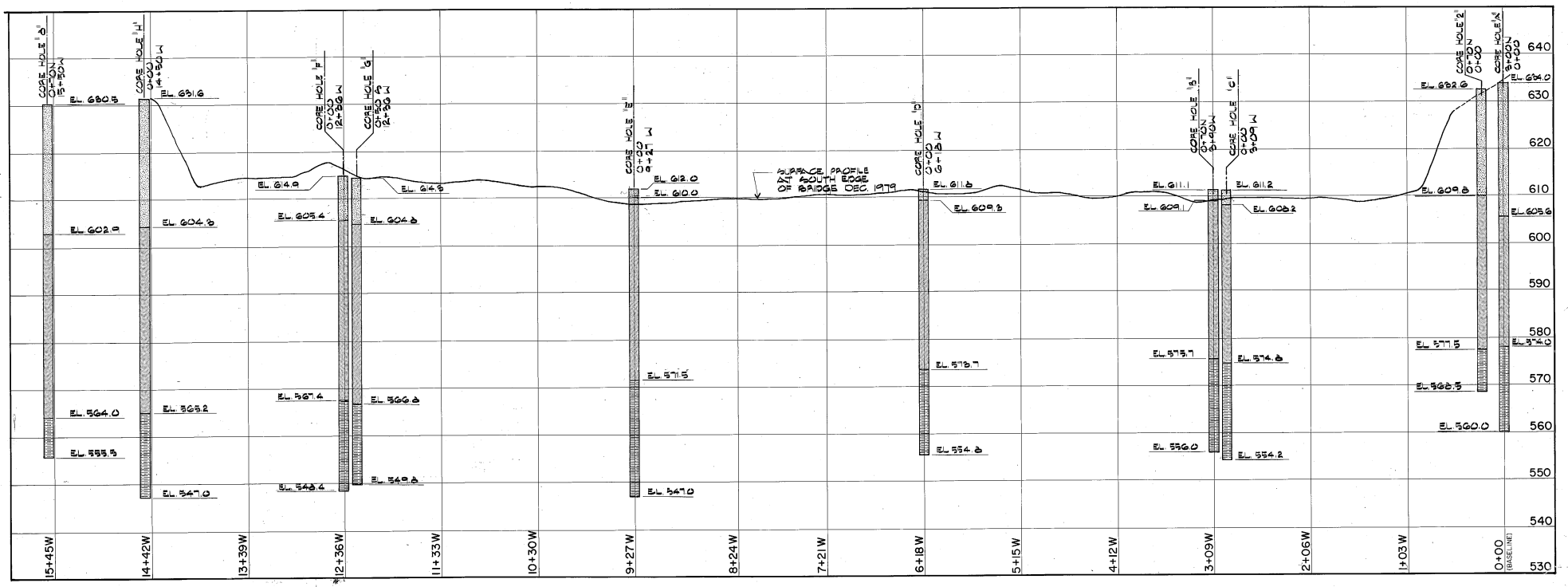
W. R. Holway and Associates
Consulting Engineers - Tulsa, Oklahoma

TULSA RIVER PARKS AUTHORITY
LOW WATER DAM PROJECT

GENERAL SITE PLAN

NOTED

REV. 2



FOUNDATION BORINGS (LOOKING NORTH)

SCALE: 1"=10' VERTICAL
1"=50' HORIZONTAL

LEGEND

SAND, SILT, CLAY
SANDSTONE
SHALE

NOTES

1) COPIES OF THE DRILLING LOGS ARE AVAILABLE IN THE OFFICE OF THE ENGINEERS.

A PROJECT OF THE
TULSA URBAN RENEWAL AUTHORITY

RECORD DRAWING

REVISION	DWN.	APP.	DATE
⚠ RECORD DRAWING	TM	JM	6/23/83

DRAWN TDA 4/12/80
CHECKED J.M. 5-20-80
SUPV. ENGR.
PROJ. MGR.

W. R. Holway and Associates
Consulting Engineers - Tulsa, Oklahoma

TULSA RIVER PARKS AUTHORITY
LOW WATER DAM PROJECT

FOUNDATION BORINGS

SCALE AS NOTED
DWG. NO. C-3
REV. 1

REG. NO. 11-81-012+01