WAURIKA LAKE WATER INTAKE CHANNEL MAINTENANCE PROJECT

A truly successful public-private venture:

- Five cities, totaling 8% of Oklahoma's population, recognized their water supply was at risk and voluntarily raised their water meter rates by $1 per meter per month to finance a 20 year $9M OWRB construction loan;
- Except for a $300K USBR grant, no direct federal or state money financed the project;
- USACE-Tulsa expedited their permitting process to facilitate construction on the USACE lake;
- OWRB, ODEQ fully cooperated for loan and required state permits

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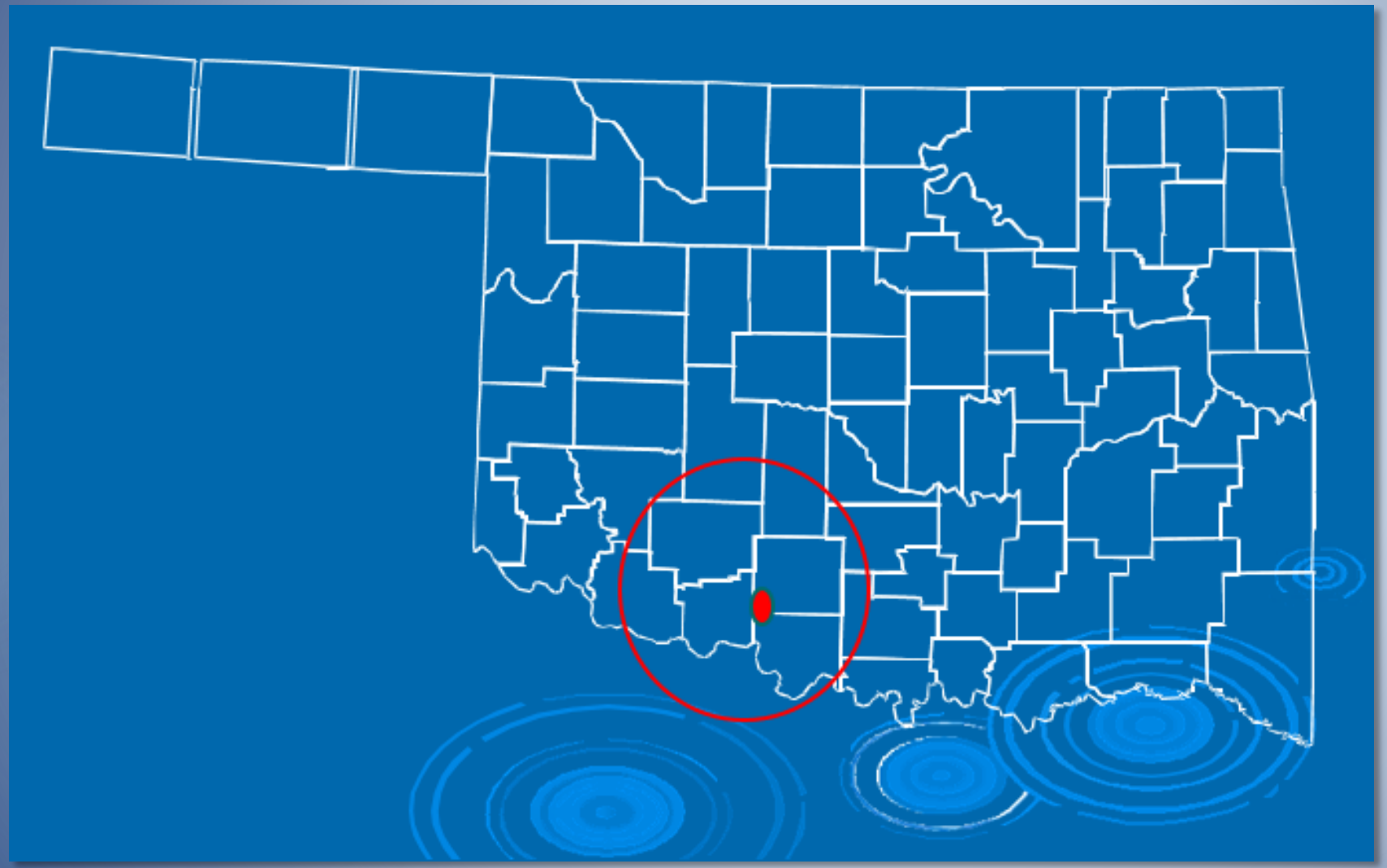
BRIEFING SUMMARY:

Waurika Lake is an example of a lake brought from severe drought-impacted conditions back to its raw water supply mission.

Demonstrates that natural lake sedimentation process can be offset and restored to original mission by:
1) cooperative efforts of stakeholders and
2) improved intake configuration

Waurika Project Location



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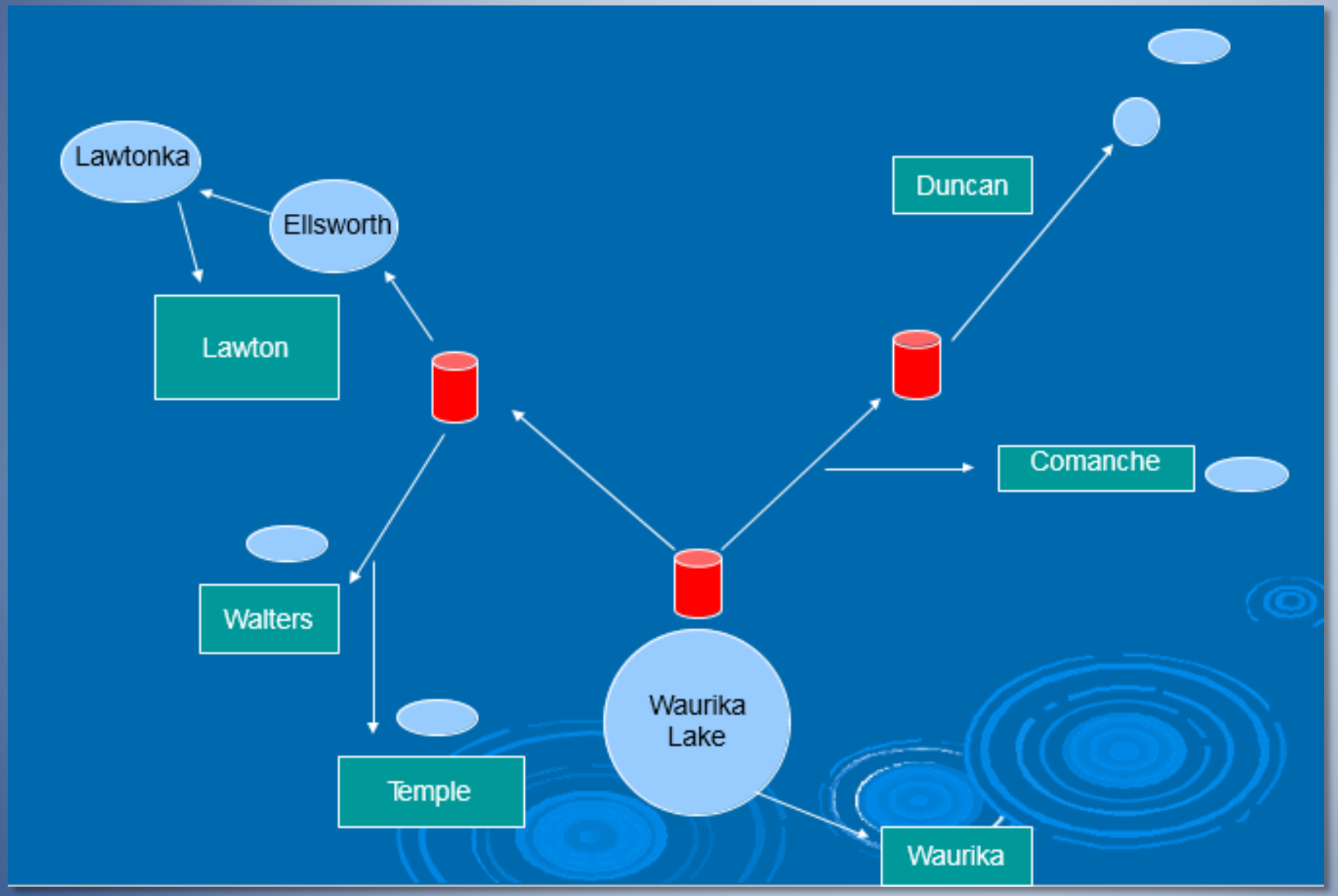
Waurika Lake Raw Water Distribution



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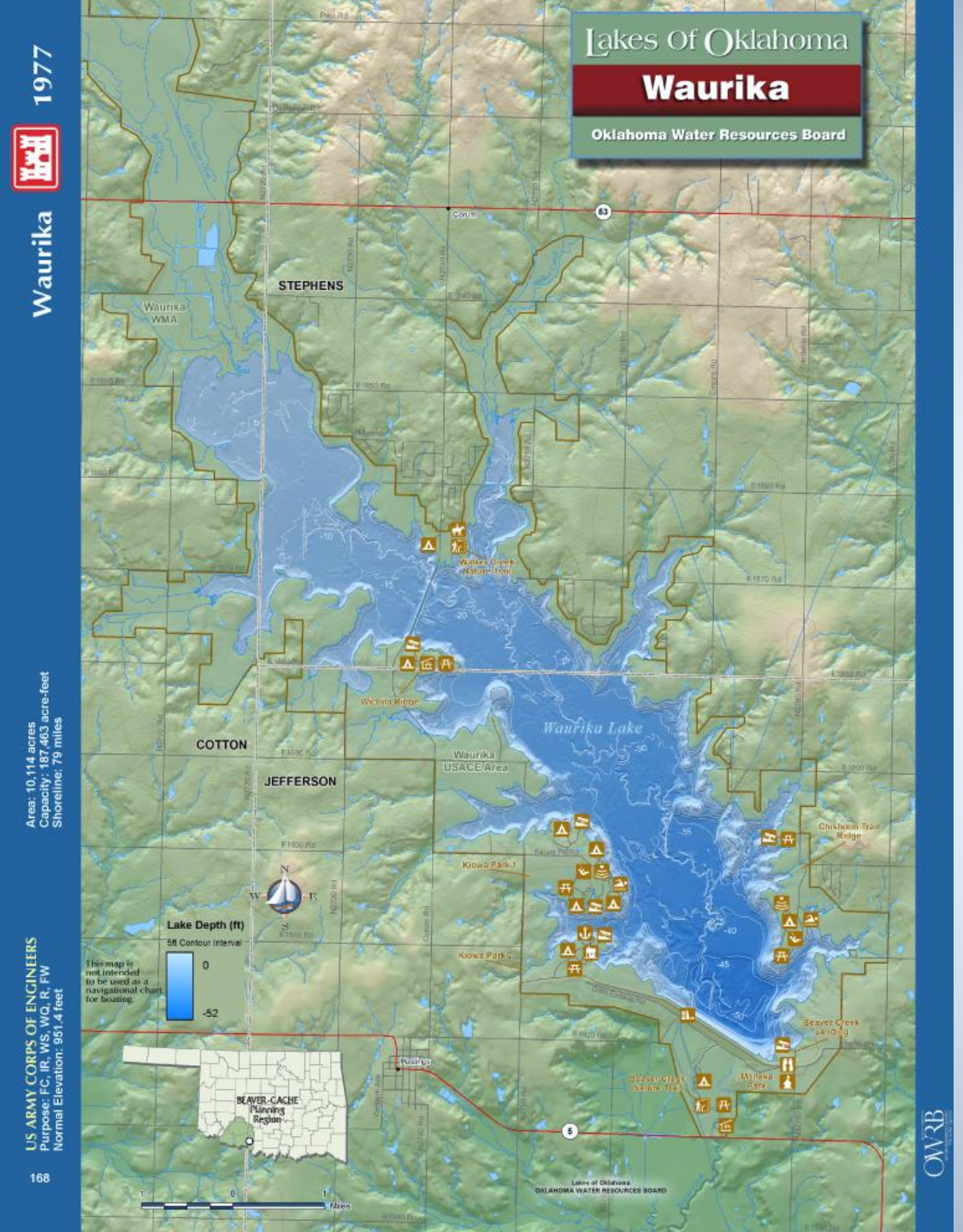

WAURIKA LAKE WATER INTAKE CHANNEL MAINTENANCE PROJECT

"FIRST INLAND DREDGING PROJECT IN THE NATION SINCE 408 PERMITS WERE INTRODUCED IN 2005"

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Problem Statement

- Local surface erosion sediment has filled in the lower section of the underwater intake channel.
- Upper 18'section cannot be accessed due to the recent drought, eliminating 75,000 Ac-Ft
- Middle 10' section of the conservation pool has 70,000 Ac-Ft available or 41%.
- Lower 18' of approx. 25,000 Ac-Ft can not be accessed due to sediment in intake channel.
- Combined results is a dramatic decrease of 59% of water supply of 170,000 Ac-Ft (44.4' normal pool supply depth available to Intake).
- A decrease in quantity and quality of water available for water district conveyance.
- Waurika Lake entered LEVEL 4 DROUGHT conditions 19 FEB 2015. **No available water starting April 2016.**
- Drought Outlook from NOAA suggests that the drought would continue to intensify in near future.

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MAY 2015 PROJECT UPDATE

May/June 2015 –

26 inches of rainfall occurred, raising lake levels from EL 931 to 951+ (normal conservation pool)

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Project Mission

- Increase amount of water available for conveyance, increase dependable yield
- Lowering the intake channel by maintenance dredging to access lower elevations of conservation pool
- Installing HDPE pipe from lower gates along intake channel to allow continued access
- Keithline Engineering Group retained to investigate permitting and dredging of the channel or other alternatives

1) Develop long-term solution to reduce, minimize or stop continued siltation from interfering with water supply operations for members

2) Investigate Alternate Solutions

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USACE Project Oversight –
Bi-Weekly Meetings Sept 2013 thru Aug 2015

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Project Phasing

Phase 1.0 – Reconnaissance & Scoping Study

- Sediment fill was 18' thick at intake structure
- Sediment fill was at least 7' thick the length of the channel
- Sediment determined non-toxic non-hazardous

Phase 2.0 – Preliminary Design Report

- Replace gates and investigate current pumps
- Dredge Channel, then install 42" HDPE pipe along intake channel bottom
- Dewater dredged material

Schedule of Project Phases	
Phase 1.0 - Reconnaissance and Scoping Study	Completed December 2013
Phase 2.0 - Preliminary Design Reports	Completed October 2014
Phase 3.0 - Procure Funding/Permits/Prospective Contractors	Completed June 2015
Phase 4.0 - Permit Disposal Site	Completed June 2015
Phase 5.0 - Develop Final Plans, Specifications and Proposal	Completed May 2015
Phase 6.0 - Advertise-Bidding-Award Services	Adv: Apr 29 Prebid: May 21 Bid: Jun 23 2015
Phase 7.0 - Construction and General/Inspection during Construction	August 2015 to July 2016

Phase 3.0 – Funding, Permits

- 35% Section 408 Permit filed with USACE on November 12, 2014
- 95% Section 408 Permit filed with USACE on April 8, 2015*
- 408 Approval expected June 2015
- Complete funding - June 2015
- City/County permits not required
- ODEQ NPDES discharge permit to be issued in conjunction with 408 Approval

TASK 1 - Maintenance Prep., Monitoring & Management	$2,160,000
TASK 2 - Maintenance Dredging & Related Activities	$3,740,000
TASK 3 - Lower Gate Extension	$5,800,000
TASK 4 - Post Maintenance Operations	$300,000
Total Project Estimate	**$12,000,000**

Dredging	$4,200,000
Gates	$1,500,000
Lower Gate Extension	$6,300,000
Total Project Estimate	**$12,000,000**

* Included all soil, sediment, elutriate, cultural surveys

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Phase 4.0 – Disposal Site and Procedures

- Dewatering of dredged material on Site performed in Confined Dredged Material Storage Area (CDMSA)
- <u>Dried material will remain on-site</u>
- <u>Material monitored for toxicity</u>

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Phase 5.0 – Plans, Specification, and Proposal

- 95% Plans submitted to USACE January 6 2015 – "no comments"
- 100% Plans completed May 2015
- Project divided into 4 'Tasks'
  - Task 1 – Maintenance Preparation, Monitoring, and Management
  - Task 2 – Maintenance Dredging & Related Activities
  - Task 3 – Intake Structure Repair & Lower Gate Extension
  - Task 4 – Post Maintenance Operations
- <u>Total construction time of 330 days.</u>

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Phase 6.0 & 7.0

Phase 6.0 – Advertise-Bidding-Award Services

- Advertising: April 29 2015 (Lawton, Duncan, Waurika, national plan rooms)
- Mandatory Pre-Bid: May 21 2015. Ten contractors attended.
- Bid Opening: June 23 2015; three bidders
- Contract awarded to Wynn Construction Company Inc, Oklahoma City, in the amount of $8,734,535.00 on July 7 2015
- Contract executed July 7 2015 for TOTAL BASE BID plus Additive Alternates 2 and 3
- Pre-Construction Conference: August 18 2015
- Project Notice-to-Proceed: August 14 2015 w/ 10 days to proceed. Day 1 is Aug 24 2015.

Phase 7.0 – Construction and General Inspection during Construction

- August 2015 thru July 2016 (330 days)
- Intake Structure will be fully operational throughout project; however, one wetwell closed during gate replacement.
- Keithline Engineering will provide a 3/4-time time professional engineer inspector.
- Water supply interruptions are not anticipated; however, contingencies are in-place

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Phase 6.0 Permit Approvals

33 USC Section 408 (alter/occupy/use Waurika Lake) - July 2015

USACE "Findings of No Significant Impact" FONSI - July 2015

USACE NWP-12 (authorizes repairs/construction) – July 2015

USACE NWP-16 (approval to discharge CDMSA decant into Waurika Lake) - July 2015

USACE Real Estate Early-Right-of-Entry Aug 2015

USACE Real Estate Land and Water Easements Sept 2015

ODEQ SWP3 Erosion and Sediment Control Mar 2013

ODEQ 401 (Oklahoma Authorizes CDMSA discharge to Waurika Lake using USACE BMPs) July 2015

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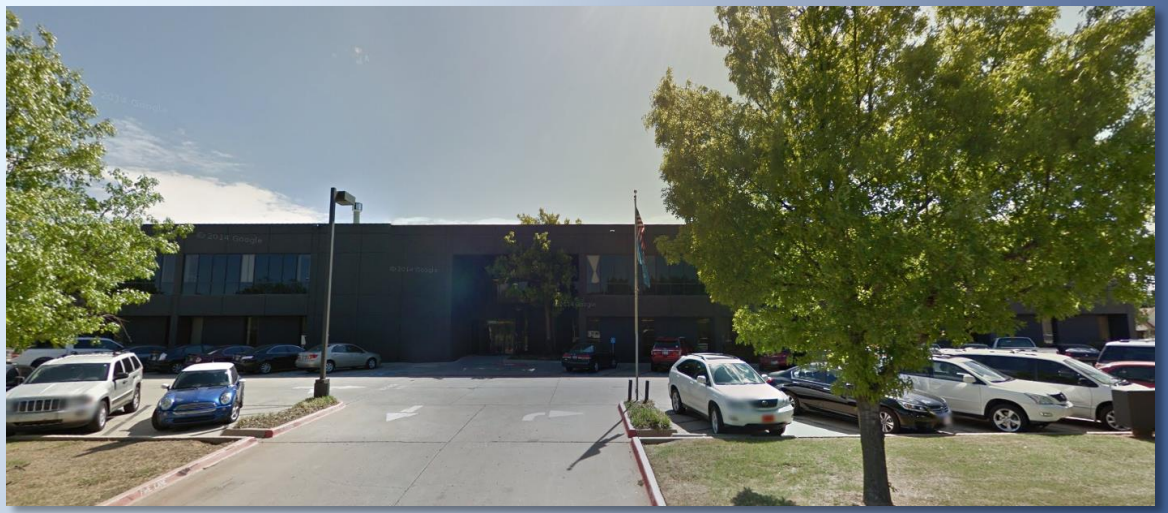
Phase 6.0 Funding Approvals

Project fully funded

OWRB – $ 9M - Approved June 16, 2015

US Bureau of Reclamation - $300K grant

FEMA grant declined due to May rainfall



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TSS and pH Monitoring at Intake Structure and CDMSA discharge

Conducted daily when inspector on-site

WAURIKA LAKE WATER INTAKE CHANNEL MAINTENANCE PROJECT
Dredging, Gate Extensions Gate Replacements
Daily Water Sampling Log

Date-Time and Inspector			NW Corner North CDMSA					SE Corner South CDMSA				CDMSA Outfall				Outside Curtain of CDMSA Outfall				Lake Water - West of Intake Str			
			Northern CDMSA (Across from DM Inlet Outfall, NWC)					Southern CDMSA - Cell 3 (SEC)				CDMSA Outfall in Lake (LITC)				50' Outside Turbidity Curtain (LOTC)				Lake Water West of Intake Structure (Lake)			
DATE	DAY	INSP INITIALS	pH	Water Temp (°F)	TSS (mg/L)	Turbidity (NTU)	Sludge Level (feet)	pH	Water Temp (°F)	TSS (mg/L)	Turbidity (NTU)	pH	Water Temp (°F)	TSS (mg/L)	Turbidity (NTU)	pH	Water Temp (°F)	TSS (mg/L)	Turbidity (NTU)	pH	Water Temp (°F)	TSS (mg/L)	Turbidity (NTU)
2/21/2016	Sun																						
2/22/2016	Mon	MM	8.2	69	1193	785	7	8.7	65.3	69	43.9	8.8	63.1	57	38.8	8.6	59	24	14.5	8.4	58.6	26	18.3
2/23/2016	Tue	MM	8.5	48.5	210	133	7	8.5	52.9	131	85.5	8.7	49.7	35	22.5	8.7	48.8	35	24.3	8.5	48.1	37	23.5
2/24/2016	Wed	MM	8.4	58.3	282	183	7.5	8.5	54.9	84	53.6	9	56.2	48	30.5	8.9	58.4	47	27.5	8.3	57.6	32	20.3
2/25/2016	Thur-AM	MM	8.4	50.1	477	325	8	8.5	48.4	67	45.5	8.8	47.9	42	24.6	8.6	47.6	30	18.2	8.4	48.3	31	19.3
2/25/2016	Thur-PM	MM	8.5	48.6	205	136		8.7	48.7	60	40.5	8.9	55.1	27	18.5	8.7	49.4	25	14.3	8.5	50	26	15.6
2/26/2016	Fri-AM	MM	8.1	50.1	756	550		8.5	49.1	57	37.3	8.6	47.1	24	15.2	8.7	46.9	22	13.5	8.3	48.8	24	15.3
2/26/2016	Fri-PM	MM	8.2	55.5	217	162		8.5	54	52	35.8	9	54.9	52	36.5	9	54.7	82	55.2	8.6	55.7	29	19.3
2/27/2016	Sat-AM	RSV	8.11	51.5	865	622		8.53	48.6	54	34.1	8.82	49.5	78	37.8	8.77	50.5	43	24	8.45	54.3	34	20.1
2/27/2016	Sat-PM	RSV	8	61.2	1419	1059		8.54	59.4	52	35.4	8.76	59.9	173	111	8.64	58.5	109	75.3	8.69	58.7	174	110

Note 1: TSS and turbidity are always high during windy days. Note elevated readings on Wed 2/24, Friday-PM 2/26, and Sat-PM 2/27.
Note 2: No CDMSA discharge entered the lake from Tuesday 2/23 onward due to the CDMSA batterboards being raised to allow only two feet of freeboard for the duration of dredging.
Note 3: A pH of 9 was noted in the lake in the vicinity of the outfall on Wednesday 2/24 and Friday 2/26 PM; however, no CDMSA discharge was entering the lake on that day.

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HANDHELD TSS, SLUDGE LEVEL, pH METERS

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Logging Geotechnical Measurements

Soil Densities and Constituent Sampling – Terracon OKC

Soil Sampling – Terracon & Accurate Labs - OKC

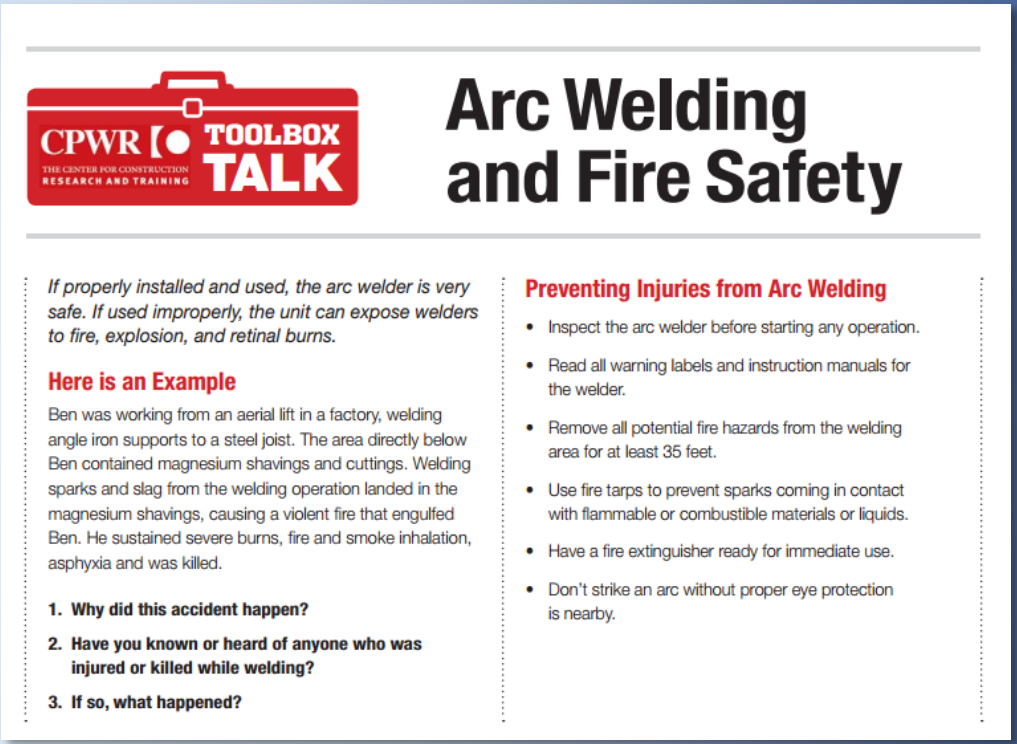
Dredged Material Sampling – Environmental Testing Inc & Accurate Labs - OKC

Health-Safety-Environmental and Work Plans

Each Project Task is accompanied by:

- Safety Plan *
  - Medical Emergencies
  - Weekly Safety Toolbox Talks
  - Safety Inspections
- Equipment Safety Plan *
  - Equipment Accidents
  - Submerged Equipment
- Environmental Plan *
  - Oil Spills
  - Fuel Storage Areas
- Work Plan
  - Means/Methods/Procedures

* references 2014 EM 385-1-1USACE Safety and Health Manual



CPWR THE CENTER FOR CONSTRUCTION RESEARCH AND TRAINING TOOLBOX TALK

Arc Welding and Fire Safety

If properly installed and used, the arc welder is very safe. If used improperly, the unit can expose welders to fire, explosion, and retinal burns.

Here is an Example

Ben was working from an aerial lift in a factory, welding angle iron supports to a steel joist. The area directly below Ben contained magnesium shavings and cuttings. Welding sparks and slag from the welding operation landed in the magnesium shavings, causing a violent fire that engulfed Ben. He sustained severe burns, fire and smoke inhalation, asphyxia and was killed.

1. **Why did this accident happen?**
2. **Have you known or heard of anyone who was injured or killed while welding?**
3. **If so, what happened?**

Preventing Injuries from Arc Welding

- Inspect the arc welder before starting any operation.
- Read all warning labels and instruction manuals for the welder.
- Remove all potential fire hazards from the welding area for at least 35 feet.
- Use fire tarps to prevent sparks coming in contact with flammable or combustible materials or liquids.
- Have a fire extinguisher ready for immediate use.
- Don't strike an arc without proper eye protection is nearby.

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PROJECT PLANS

WAURIKA LAKE MASTER CONSERVANCY DISTRICT

WAURIKA LAKE WATER INTAKE CHANNEL MAINTENANCE PROJECT

PLAN OF PROPOSED

DREDGING, GATE EXTENSIONS & GATE REPLACEMENTS

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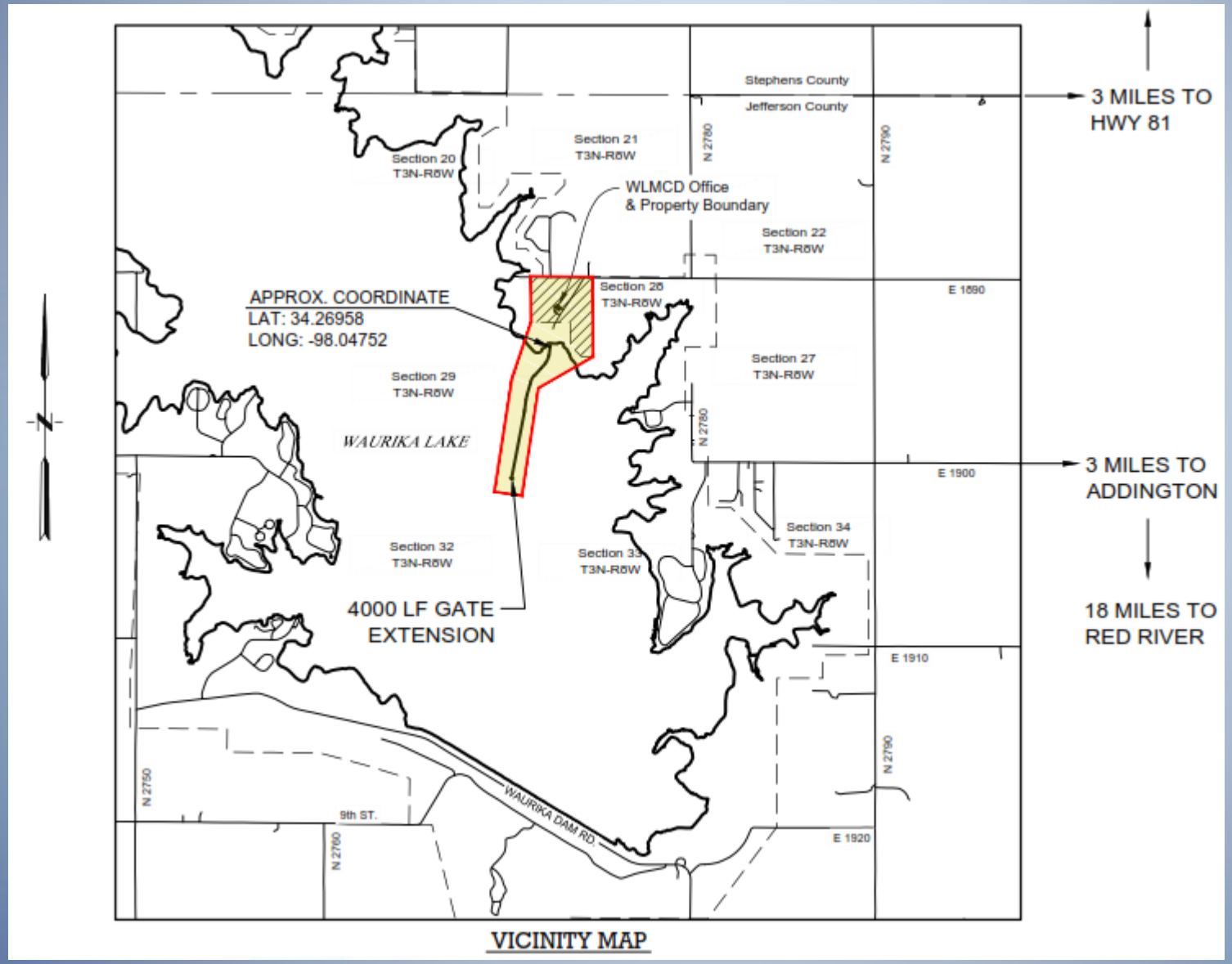
VICINITY MAP



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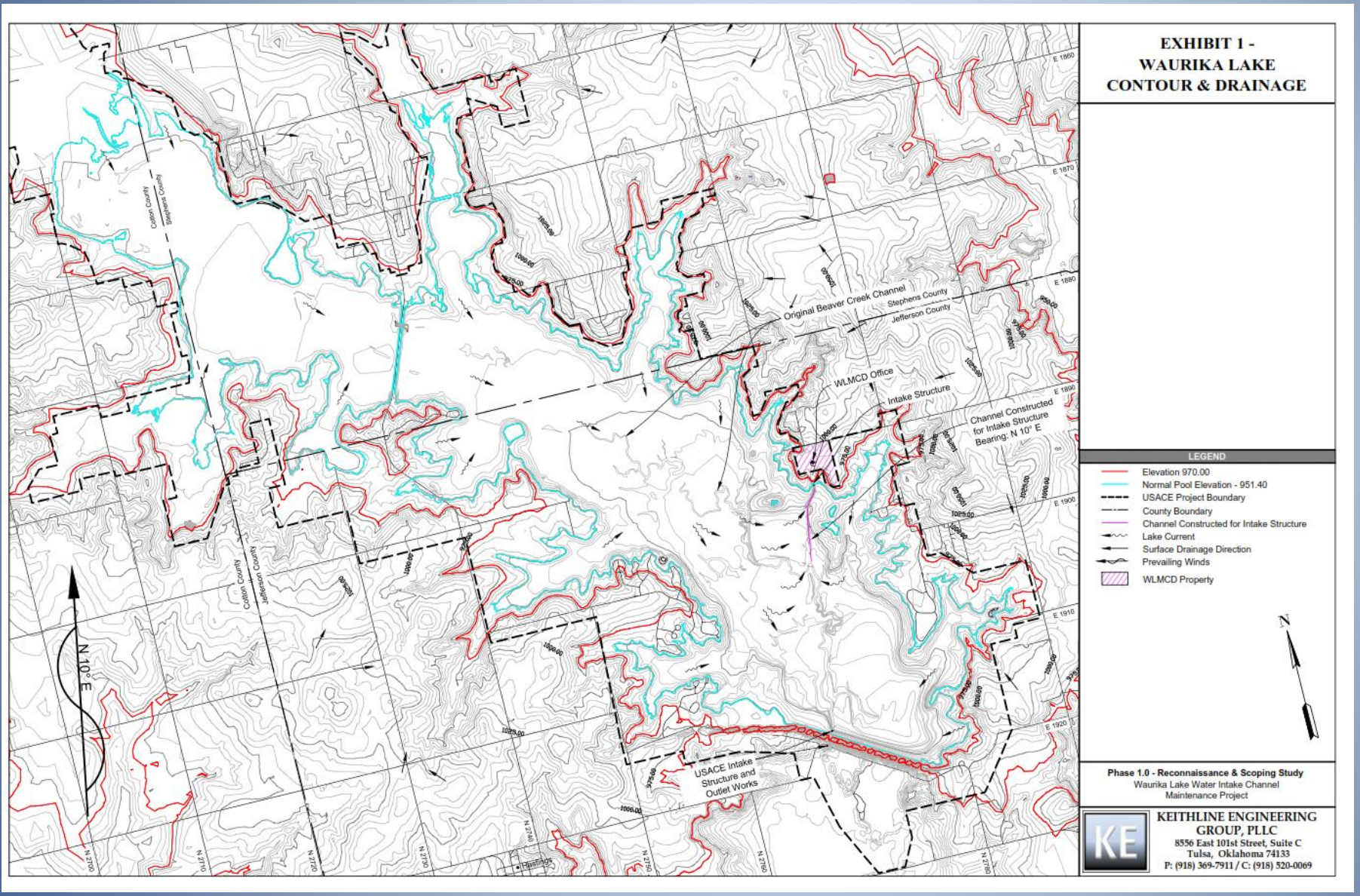
CONTOURS AND DRAINAGE



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LAKE AERIAL

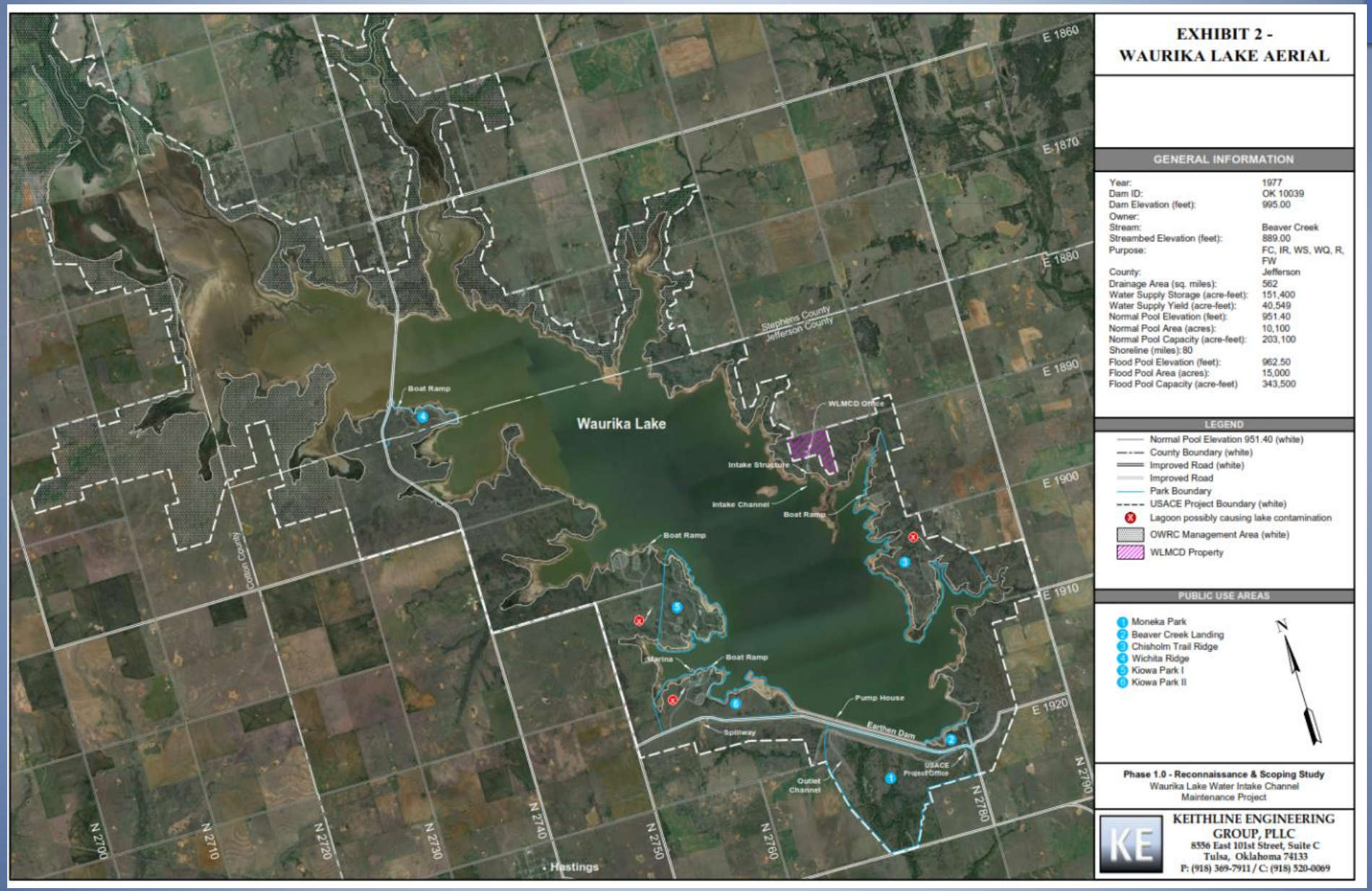
EXHIBIT 2 -
WAURIKA LAKE AERIAL
GENERAL INFORMATION
Year: 1977
Dam ID: OK 10039
Dam Elevation (feet): 995.00
Owner:
Stream: Beaver Creek
Streambed Elevation (feet): 889.00
Purpose: FC, IR, WS, WQ, R, FW
County: Jefferson
Drainage Area (sq. miles): 562
Water Supply Storage (acre-feet): 151,400
Water Supply Yield (acre-feet): 40,549
Normal Pool Elevation (feet): 951.40
Normal Pool Area (acres): 10,100
Normal Pool Capacity (acre-feet): 203,100
Shoreline (miles): 80
Flood Pool Elevation (feet): 962.50
Flood Pool Area (acres): 15,000
Flood Pool Capacity (acre-feet) 343,500
LEGEND
Normal Pool Elevation 951.40 (white)
County Boundary (white)
Improved Road (white)
Improved Road
Park Boundary
USACE Project Boundary (white)
Lagoon possibly causing lake contamination
OWRC Management Area (white)
WLMCD Property
PUBLIC USE AREAS
1 Moneka Park
2 Beaver Creek Landing
3 Chisholm Trail Ridge
4 Wichita Ridge
5 Kiowa Park I
6 Kiowa Park II
N
Phase 1.0 - Reconnaissance & Scoping Study
Waurika Lake Water Intake Channel
Maintenance Project
KEITHLINE ENGINEERING GROUP, PLLC
8556 East 101st Street, Suite C
Tulsa, Oklahoma 74133
P: (918) 369-7911 / C: (918) 520-0069
KE
Waurika Lake
Boat Ramp
Stephens County
Jefferson County
WLMCD Office
Intake Structure
Intake Channel
Boat Ramp
Boat Ramp
Marina
Boat Ramp
Pump House
Earthen Dam
Spillway
Outlet Channel
USACE Project Office
Cotton County
Hastings
E 1860
E 1870
E 1880
E 1890
E 1900
E 1910
E 1920
N 2700
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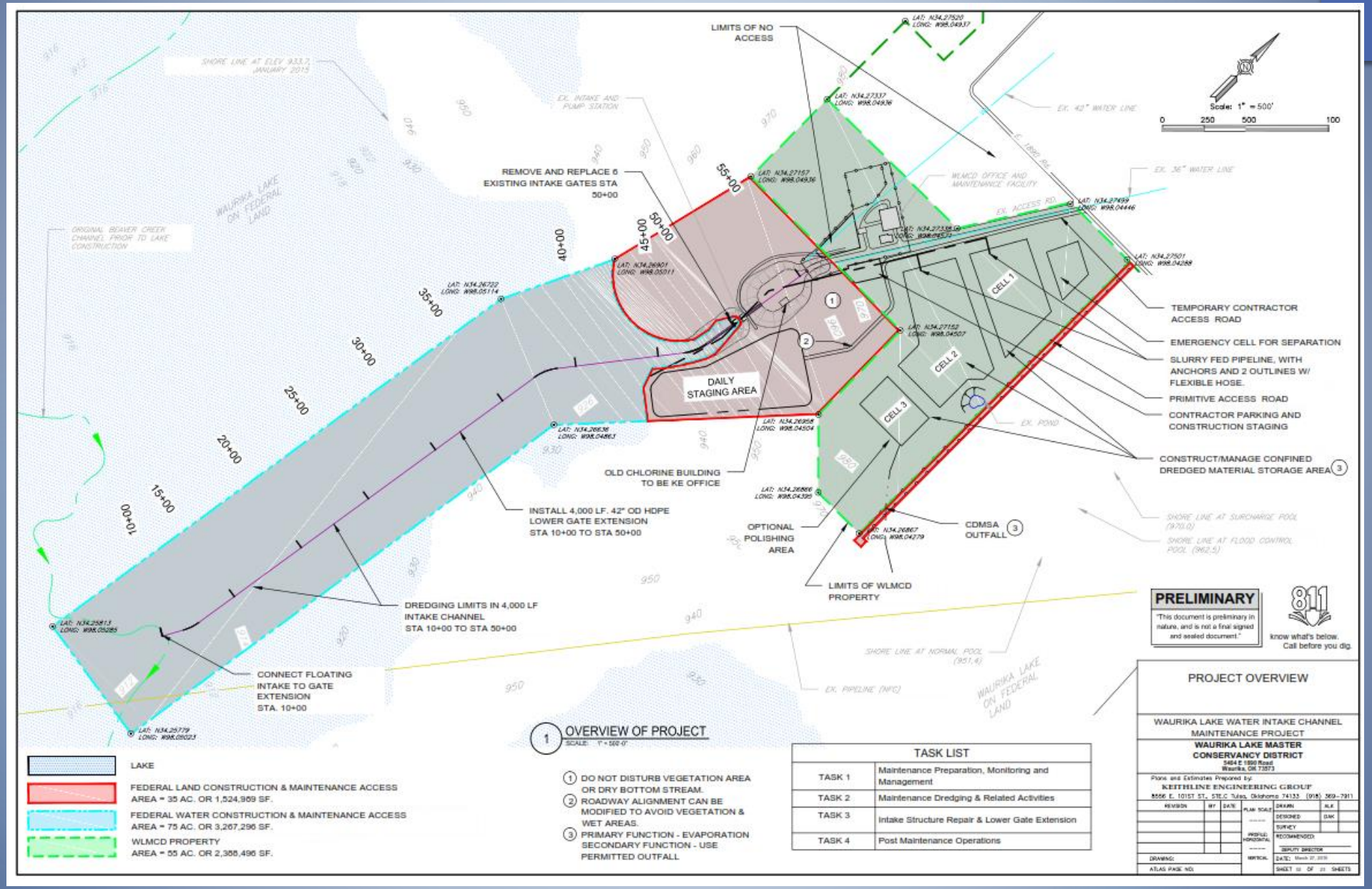
N 2770
N 2780

USACE PROJECT LAND AND WATER EASEMENTS



TASK 1 – PREPARATION BID ITEMS

		TASK 1 - Maintenance Preparation, Monitoring and Management
1	01 71 13	Mobilization
2	35 51 00	Temporary Access to Lake
3	01 71 15	Initial Purchases for WLMCD
4	01 57 19	Environmental Barrier, Instrumentation and Monitoring
5	02 21 13	Oklahoma Water Resources Board (OWRB) Pre-Dredge Bathymetric Survey
6	02 21 13	OWRB Mid-Dredge Bathymetric Survey
7	02 21 13	OWRB Post-Dredge Bathymetric Survey
8	35 20 16.1	Remove/Replace Two (2) 4'x6' High-Level Slide Gates
9	35 20 16.2	Remove/Replace Two (2) 4'x6' Mid-Level Slide Gates
10	35 20 16.3	Remove/Replace Two (2) 4'x6' Low-Level Slide Gates And Install Diffuser
11		Engineering Surveying During Construction As Directed By Engineer
12		Field and Sampling Testing During Construction As Directed By Engineer

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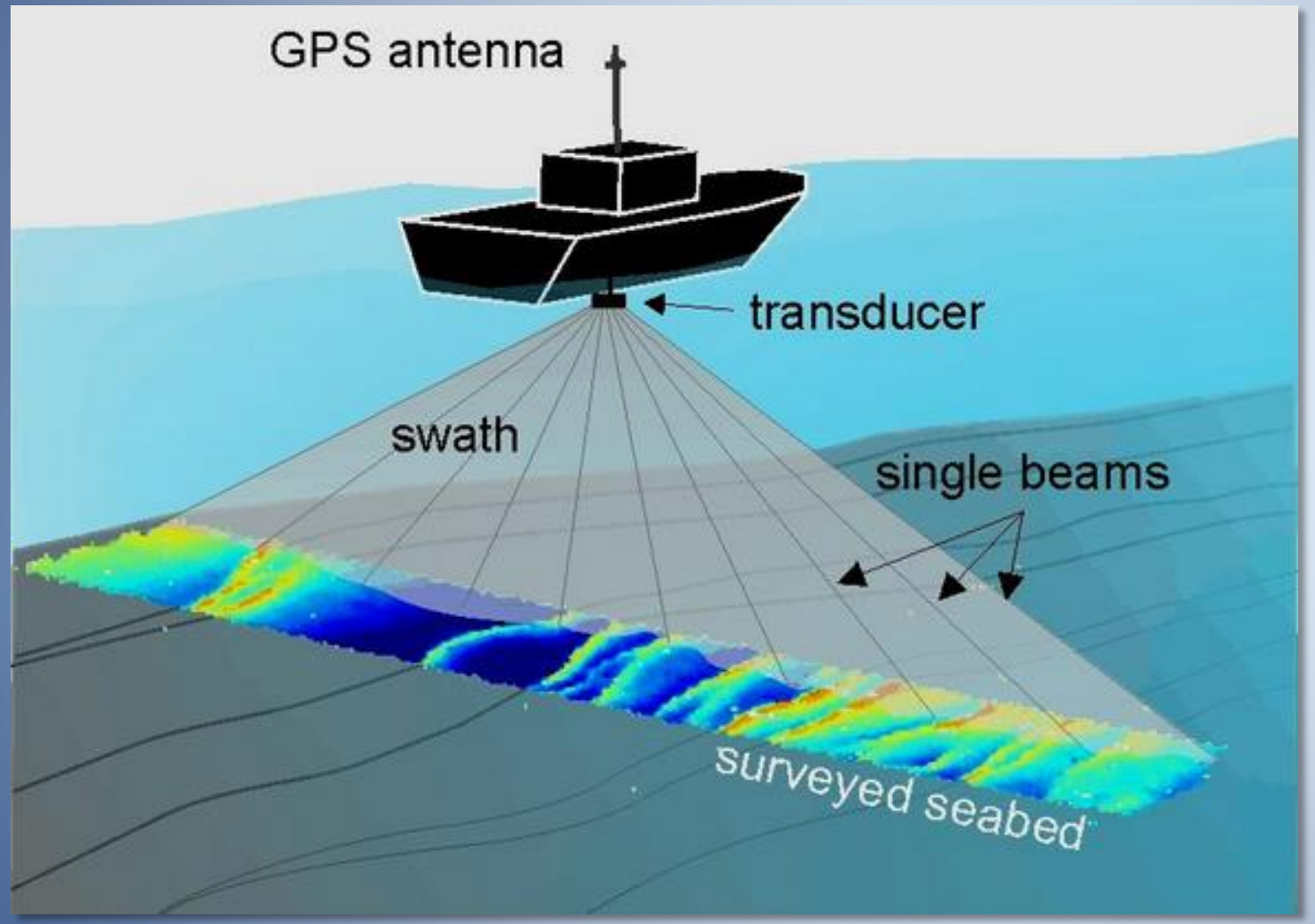
PRE- MID- POST-BATHYMETRY (OWRB)



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LOWRANCE HDS GEN 3 SIDE-SCAN SONAR

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LOWERING 800 FT SECTION OF 42" HDPE INTO DREDGED CHANNEL

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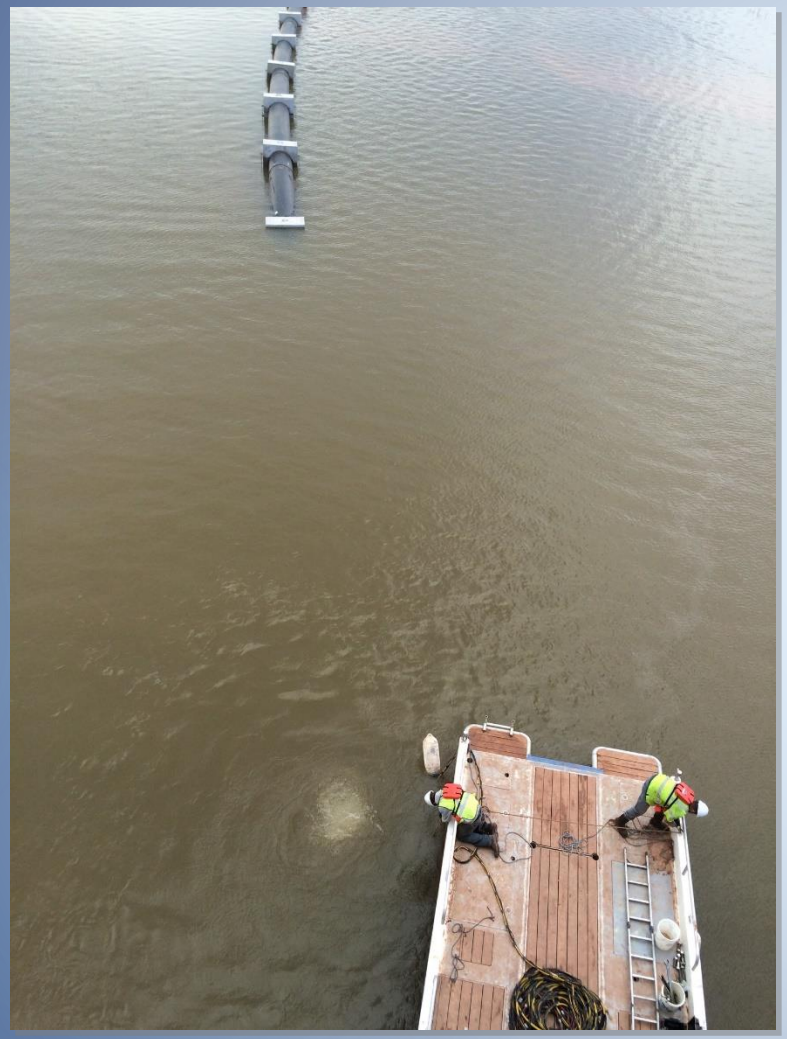
SIDE-SCAN IMAGES



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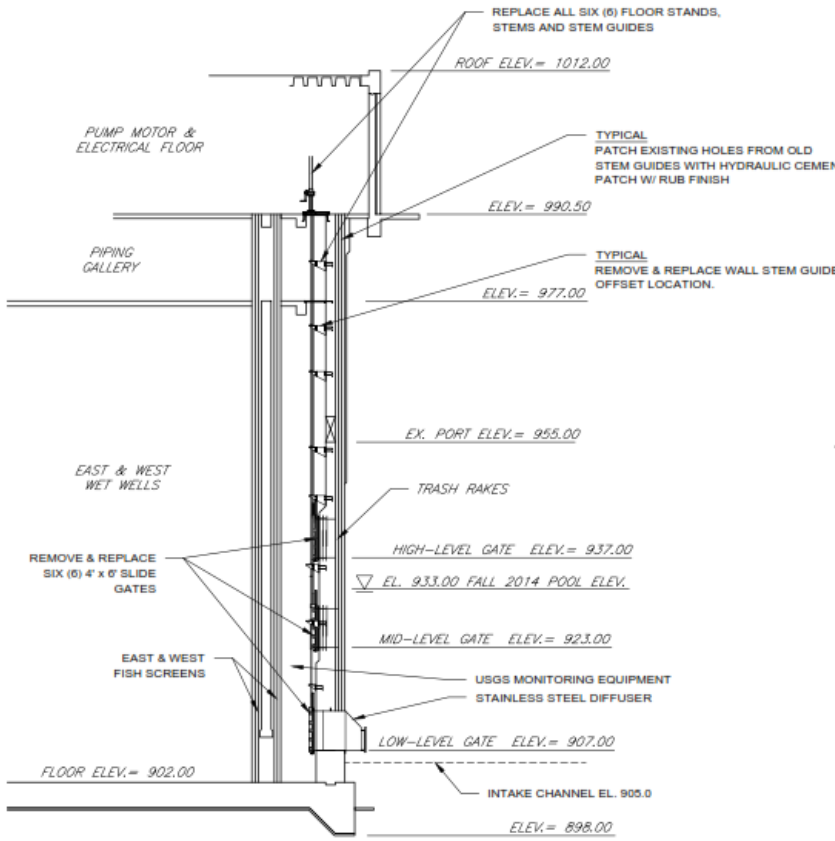
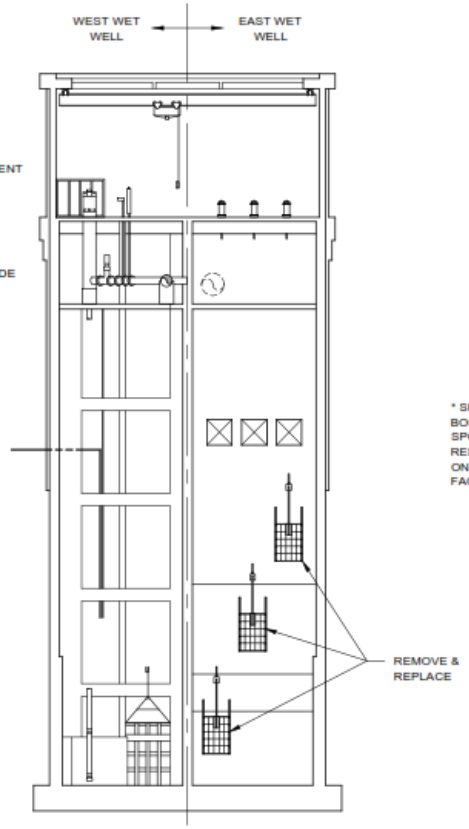
SIDE SCAN IMAGES

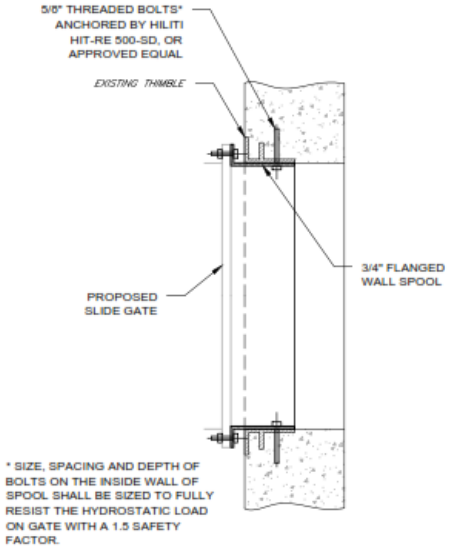
TASK 1 - GATE REPLACEMENT



1 INTAKE STRUCTURE SLIDE GATE SECTION
SCALE: NTS



2 INTAKE STRUCTURE SLIDE GATE ELEVATION
SCALE: NTS



3 UPPER/MID-LEVEL GATES STAINLESS STEEL FLG WALL SPOOL
SCALE: NTS
BID ITEM 5 & 9

PRELIMINARY
"This document is preliminary in nature, and is not a final signed and sealed document."

811 know what's below. Call before you dig.

TASK 1 - GATE REPLACEMENT IN INTAKE STRUCTURE

WAURIKA LAKE WATER INTAKE CHANNEL MAINTENANCE PROJECT

WAURIKA LAKE MASTER CONSERVANCY DISTRICT
5484 E 1850 Road
Waurika, OK 73573

Plans and Estimates Prepared by:
KEITHLINE ENGINEERING GROUP
8556 E. 101ST ST., STE.C Tulsa, Oklahoma 74133 (918) 369-7911

REVISION	BY	DATE

PLAN SCALE: ----
PROFILE: HORIZONTAL ----
VERTICAL

DRAWN	ALK
DESIGNED	DAK
SURVEY	
RECOMMENDED:	
DEPUTY DIRECTOR	
DATE: March 27, 2015	
SHEET 06 OF 23 SHEETS	

DRAWING:
ATLAS PAGE NO:

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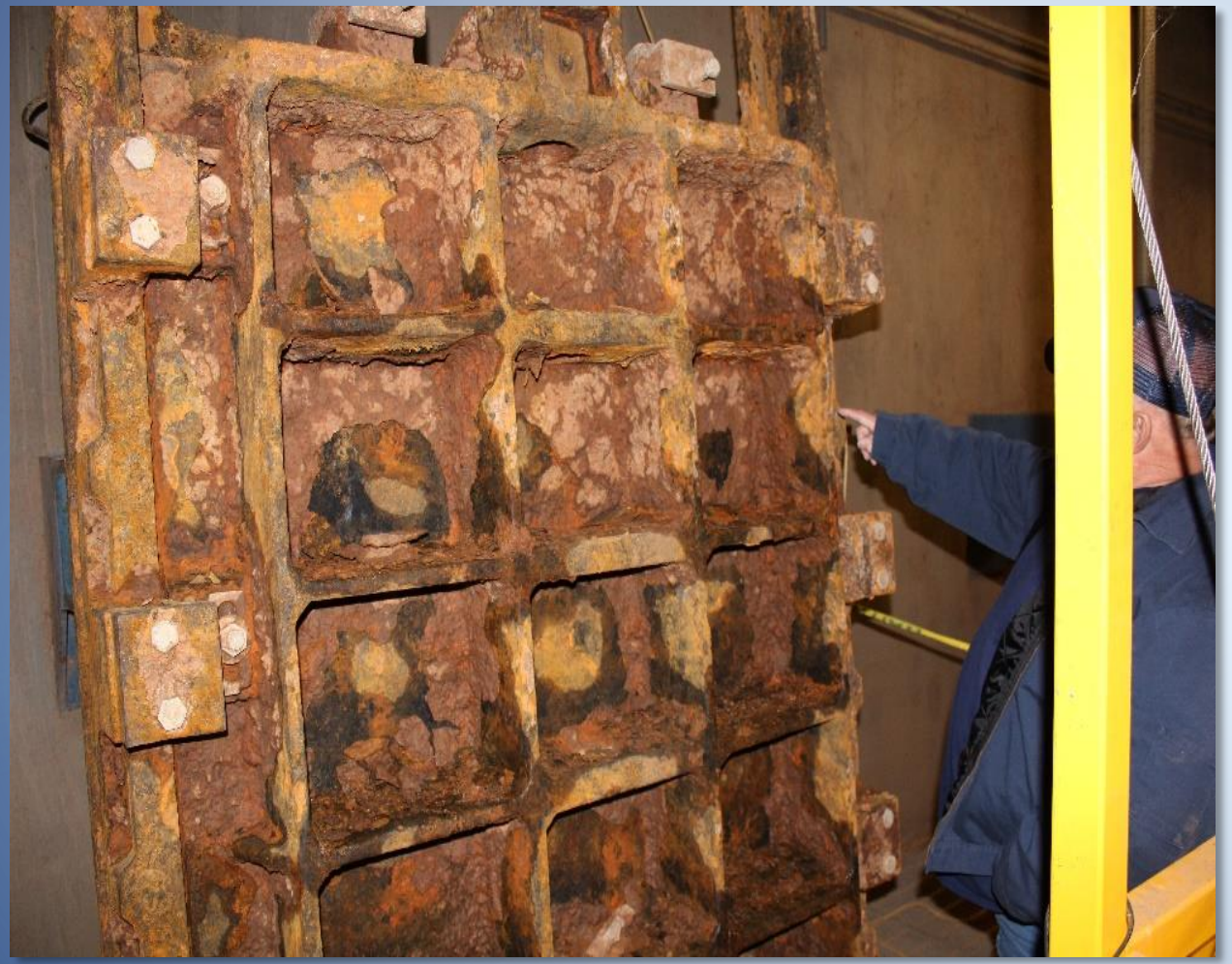
REMOVE / REPLACE SIX SLIDE GATES



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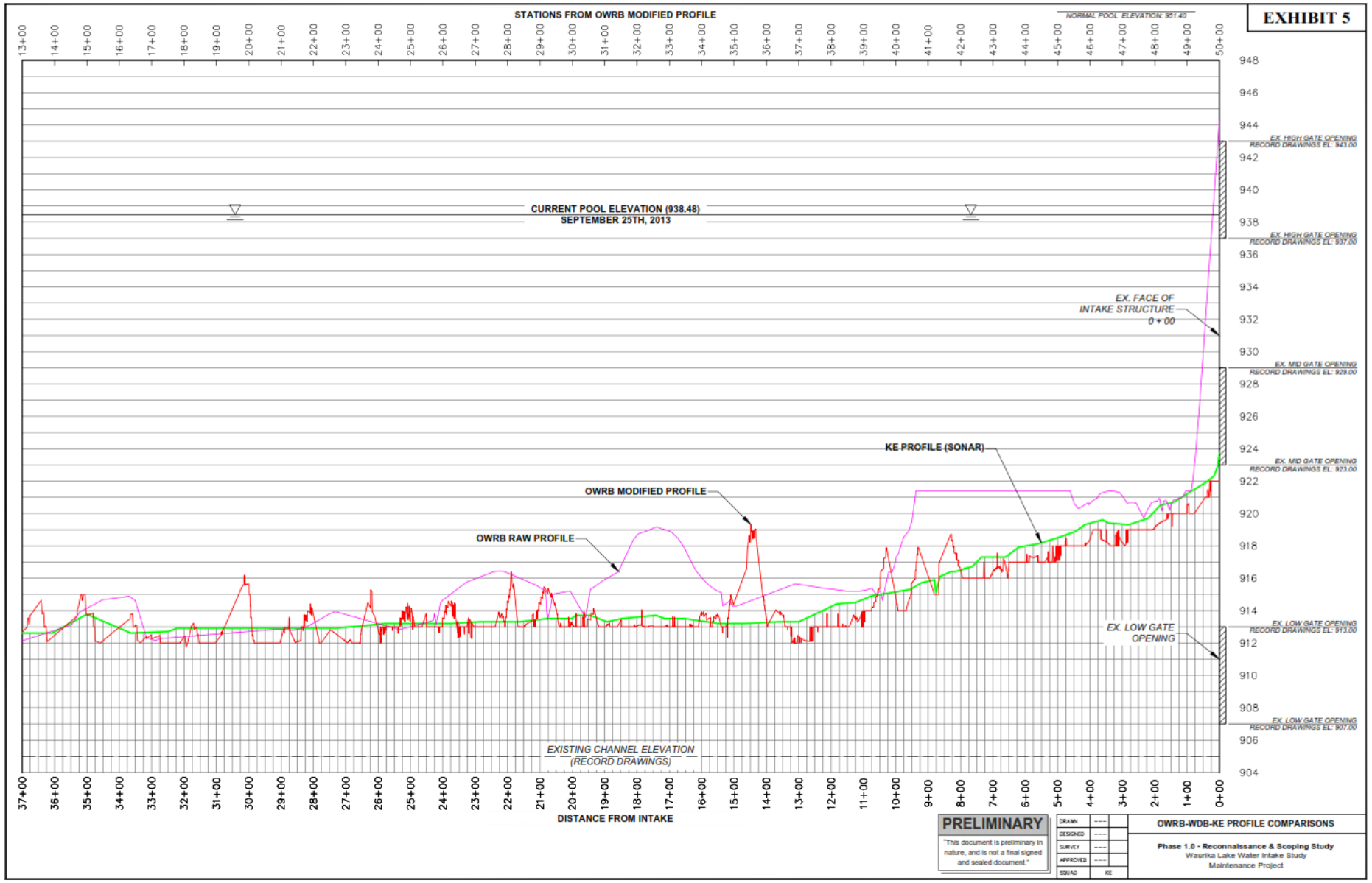
FINAL GATE INSPECTION - 1

FINAL GATE INSPECTION - 2

TASK 2 – DREDGING BID ITEMS

		TASK 2 - Maintenance Dredging & Related Activities
13	01 71 13	Mobilization
14	41 01 50	Construct Confined Dredge Material Storage Area (CDMSA) - Cell 1
15	41 01 50	Construct Confined Dredge Material Storage Area (CDMSA) - Cell 2
16	41 01 50	Construct Confined Dredge Material Storage Area (CDMSA) - Cell 3 & Starter Cell
17	01 51 36	Maintain Water Supply and Quality for Pump Station Conveyance
18	35 20 23	Section A Dredging
19	35 20 23	Section B Dredging
20	35 20 23	Section C Dredging
21	02 71 00	Dewater, Treatment, Manage Water Volume and Release for CDMSAs
22		Remove Submerged Riprap and Stockpile
23	31 25 13	Erosion and Sediment Control for Field Operations

TASK 2 – EXISTING INTAKE CHANNEL PROFILE



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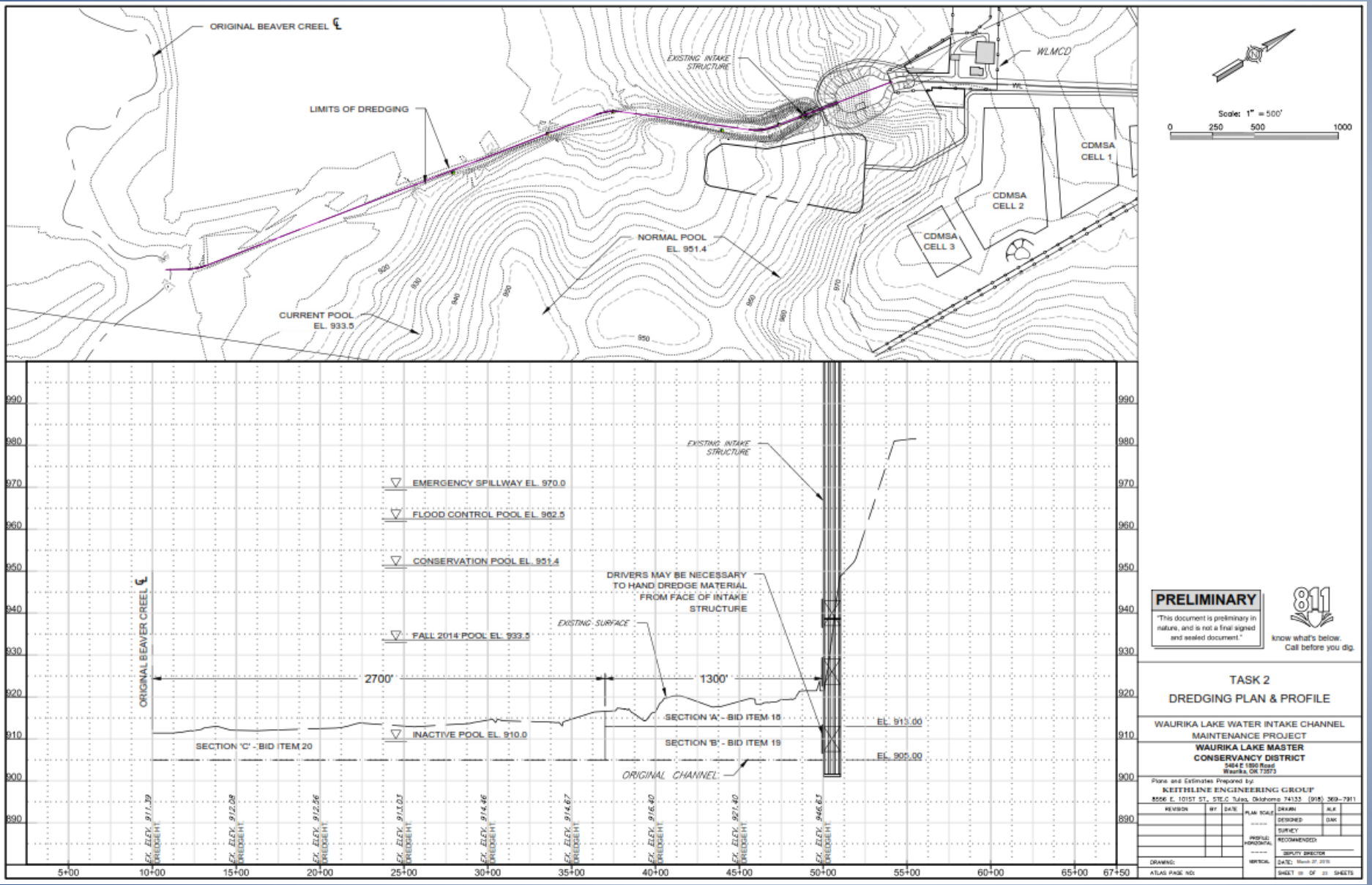
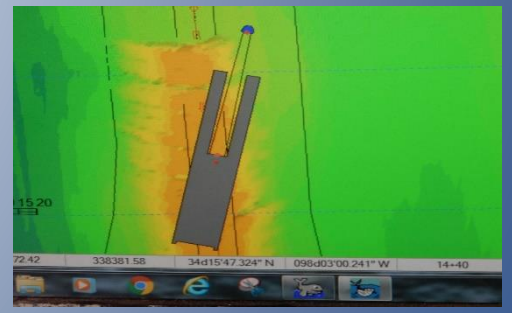
TASK 2 - DREDGING PLAN AND PROFILE





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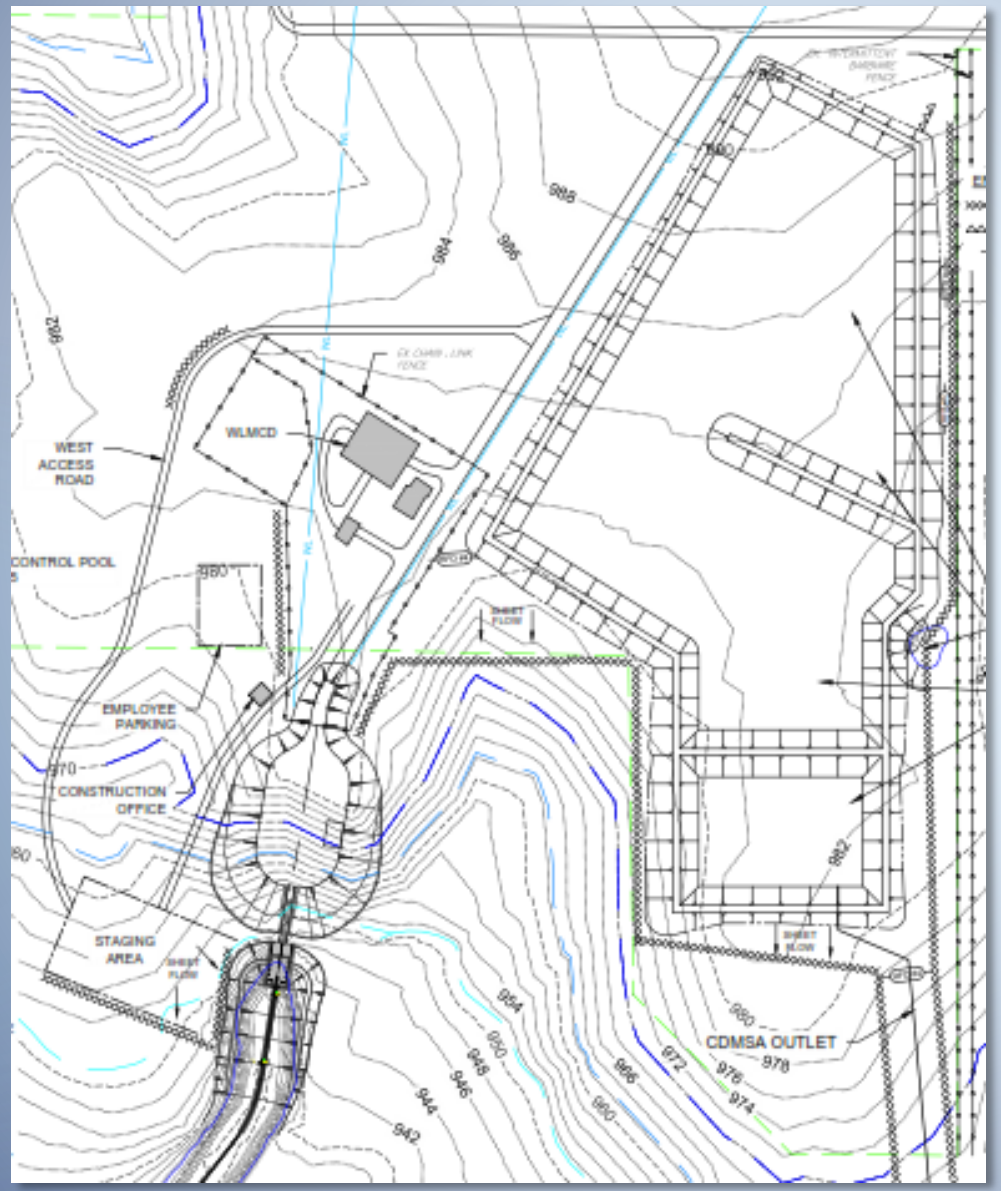
TASK 2 - EROSION CONTROL



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TASK 2 - STORMWATER MANAGEMENT PLAN

STORMWATER MANAGEMENT PLAN

ODOT 2009 SPECIFICATIONS

SITE DESCRIPTION

PROJECT LIMITS: A AREA SOUTH OF COUNTY ROAD E. 1890 RD IN JEFFERSON COUNTY. ALL LOCATED ON WAURIKA LAKE MASTER CONSERVANCY DISTRICT LAND

PROJECT DESCRIPTION: DREDGE THE EXISTING INTAKE CHANNEL FOR (WLMCD) INTAKE STRUCTURE. DE-WATER AND DISPOSE OF DREDGED MATERIAL. REPLACE EXISTING INTAKE GATES, AND EXTEND BOTTOM GATES TO ALLOW FOR DROUGHT RESILIENCE.

SUGGESTED SEQUENCE OF EROSION CONTROL ACTIVITIES:

1 – MAINTENANCE PREPARATION, MONITORING, AND MANAGEMENT
2 – PLACE SILT FENCE DOWNSTREAM OF AREAS TO BE DISTURBED. PLACE SILT DIKES IN DRAINAGE CHANNELS VERY 300'
3 – MAINTAIN ALL EROSION CONTROL ACTIVITIES
4 – SOD, MULCH, OR REHABILITATE ALL DISTURBED AREAS

SOIL TYPE: Zanels Loam/Pawhuska/Luclen (B,C,D)

TOTAL AREA TO BE DISTURBED: APPROX. 100 ACRES

OFFSITE AREA TO BE DISTURBED: (FOR CONTRACTOR USE)

MAXIMUM ACRES TO BE DISTURBED AT ANY ONE TIME: (FOR CONTRACTOR USE)

LATITUDE & LONGITUDE OF CENTER OF PROJECT: 34°16'10"N, 98°02'50"W

NAME OF RECEIVING WATERS: WAURIKA LAKE

SENSITIVE WATERS OR WATERSHEDS: YES ☒ NO ☐

303(d) IMPAIRED WATERS: YES ☒ NO ☐

NOTE:
THIS SHEET SHOULD BE USED IN CONJUNCTION WITH A DRAINAGE MAP THAT ILLUSTRATES THE DRAINAGE PATTERNS/PATHWAYS AND RECEIVING WATERS FOR THIS PROJECT. THIS SHEET SHOULD ALSO BE USED WITH THE EROSION CONTROL SUMMARIES, PAY ITEMS, & NOTES.

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES:

- X TEMPORARY SEEDING
- X PERMANENT SODDING, SPRIGGING OR SEEDING
- VEGETATIVE MULCHING
- SOIL RETENTION BLANKET
- X PRESERVATION OF EXISTING VEGETATION

NOTE:
TEMPORARY EROSION CONTROL METHODS MUST BE USED ON ALL DISTURBED AREAS WHERE CONSTRUCTION ACTIVITIES HAVE CEASED FOR OVER 14 DAYS. METHODS USED WILL BE AS SHOWN ON PLANS, OR AS DIRECTED BY THE ENGINEER.

STRUCTURAL PRACTICES:

- X STABILIZED CONSTRUCTION EXIT
- X TEMPORARY SILT FENCE
- X TEMPORARY SILT DIKES
- TEMPORARY FIBER LOG
- DIVERSION, INTERCEPTOR OR PERIMETER DITCHES
- X DIVERSION, INTERCEPTOR OR PERIMETER SWALES
- X ROCK FILTER DAMS
- TEMPORARY SLOPE DRAIN
- PAVED DITCH W/ DITCH LINER PROTECTION
- TEMPORARY DIVERSION CHANNELS
- X TEMPORARY SEDIMENT BASINS
- TEMPORARY SEDIMENT TRAPS
- X TEMPORARY SEDIMENT FILTERS
- X TEMPORARY SEDIMENT REMOVAL
- RIP RAP
- X INLET SEDIMENT FILTER
- TEMPORARY BRUSH SEDIMENT BARRIERS
- SANDBAG BERMS
- TEMPORARY STREAM CROSSING

OFFSITE VEHICLE TRACKING:

- X HAUL ROADS DAMPENED FOR DUST CONTROL
- X LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
- X EXCESS DIRT ON ROAD REMOVED DAILY

ADDITIONAL INFORMATION:

DREDGING MATERIAL TO BE STORED AT CDMSA UNTIL DEWATERED AND DISPOSED OF.

THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR FOLLOWING:

MAINTENANCE AND INSPECTION:

ALL EROSION AND SEDIMENT CONTROLS WILL BE MAINTAINED IN GOOD WORKING ORDER FROM THE BEGINNING OF CONSTRUCTION UNTIL AN ACCEPTABLE VEGETATIVE COVER IS ESTABLISHED. INSPECTION BY THE CONTRACTOR AND ANY NECESSARY REPAIRS SHALL BE PERFORMED ONCE EVERY 7 CALENDAR DAYS AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.5 INCH AS RECORDED BY A NON-FREEZING RAIN GAUGE TO BE LOCATED ON SITE. POTENTIALLY ERODIBLE AREAS, DRAINAGE WAYS, MATERIAL STORAGE, STRUCTURAL DEVICES, CONSTRUCTION ENTRANCES AND EXITS ALONG WITH EROSION AND SEDIMENT CONTROL LOCATIONS ARE EXAMPLES OF SITES THAT NEED TO BE INSPECTED.

WASTE MATERIALS:

PROPER MANAGEMENT AND DISPOSAL OF CONSTRUCTION WASTE MATERIAL IS REQUIRED BY THE CONTRACTOR. MATERIALS INCLUDE STOCKPILES, SURPLUS, DEBRIS, AND ALL OTHER BY-PRODUCTS FROM CONSTRUCTION PROCESS. PRACTICES INCLUDE DISPOSAL, PROPER MATERIALS HANDLING, SPILL PREVENTION AND CLEAN UP MEASURES. CONTROLS AND PRACTICES SHALL MEET THE REQUIREMENTS OF ALL FEDERAL, STATE, AND LOCAL AGENCIES.

HAZARDOUS MATERIALS:

PROPER MANAGEMENT AND DISPOSAL OF HAZARDOUS WASTE MATERIAL IS REQUIRED. THE CONTRACTOR IS RESPONSIBLE FOR FOLLOWING MANUFACTURER'S RECOMMENDATIONS, STATE AND FEDERAL REGULATIONS TO ENSURE CORRECT HANDLING, DISPOSAL, SPILL PREVENTION AND CLEAN UP MEASURES. EXAMPLES INCLUDE BUT ARE NOT LIMITED TO: PAINTS, ACIDS, CLEANING SOLVENTS, CHEMICAL ADDITIVES, CONCRETE CURING COMPOUNDS AND CONTAMINATED SOILS.

GENERAL NOTES:

A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) IS REQUIRED TO COMPLY WITH THE OKLAHOMA POLLUTION DISCHARGE ELIMINATION SYSTEM (OPDES) REGULATIONS. THIS PLAN OS INITIATED DURING THE DESIGN PHASE, CONFIRMED IN THE PRE-WORK MEETINGS AND AVAILABLE ON THE JOB SITE ALONG WITH COPIES OF THE NOTICE OF INTENT (NOI) FORM AND PERMIT CERTIFICATE THAT HAVE BEEN FILED WITH THE OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY (ODEQ). THE PLAN MUST BE KEPT CURRENT WITH UP-TO-DATE AMENDMENTS DURING THE PROGRESSION OF THE PROJECT. ALL CONTRACTOR OFF-SITE OPERATIONS ASSOCIATED WITH THE PROJECT MUST BE DOCUMENTED IN THE SWPPP, I.E., BORROW PITS, WORK ROADS, DISPOSAL SITES, ASPHALT/CONCRETE PLANTS, ECT. THE BASIC GOAL OF STORM WATER MANAGEMENT IS TO IMPROVE WATER QUALITY BY REDUCING POLLUTANTS IN STORM WATER DISCHARGES. RUNOFF FROM CONSTRUCTION SITES HAS POTENTIAL FOR POLLUTION DUE TO EXPOSED SOILS AND THE PRESENCE OF HAZARDOUS MATERIALS USED IN THE CONSTRUCTION PROCESS. THE INTERCEPTION OF SOIL EROSION, CONTAINMENT OF HAZARDOUS MATERIALS AND/OR THE INTERCEPTION OF THE POLLUTANTS BEFORE LEAVING THE CONSTRUCTION SITE ARE THE BEST PRACTICES FOR CONTROLLING STORM WATER POLLUTION.

THE FOLLOWING SECTIONS OF THE 2009 ODOT STANDARD SPECIFICATIONS SHOULD BE NOTED:

103.05 BONDING REQUIREMENTS
104.10 FINAL CLEANING UP
104.12 CONTRACTOR'S RESPONSIBILITY FOR WORK
104.13 ENVIRONMENTAL PROTECTION
106.08 STORAGE AND HANDLING OF MATERIALS
107.01 LAWS, RULES AND REGULATIONS TO BE OBSERVED
107.20 STORM WATER MANAGEMENT
220 MANAGEMENT OF EROSION, SEDIMENTATION AND STORM WATER POLLUTION PREVENTION AND CONTROL
221 TEMPORARY SEDIMENT CONTROL

IN ADDITION:

"ODEQ GENERAL PERMIT (OKR10) FOR STORM WATER DISCHARGES FROM CONSTRUCTION ACTIVITIES WITHIN THE STATE OF OKLAHOMA." ODEQ, WATER QUALITY DIVISION, SEPTEMBER 13, 2012

PRELIMINARY
"This document is preliminary in nature, and is not a final signed and sealed document."

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TASK 2
STORMWATER MANAGEMENT PLAN

WAURIKA LAKE WATER INTAKE CHANNEL MAINTENANCE PROJECT

WAURIKA LAKE MASTER CONSERVANCY DISTRICT
5484 E 1890 Road
Waurika, OK 73573

Plans and Estimates Prepared by:
KEITHLINE ENGINEERING GROUP
8556 E. 101ST ST., STE.C Tulsa, Oklahoma 74133 (918) 369-7911

REVISION	BY	DATE

PLAN SCALE: ----- PROFILE: HORIZONTAL ----- VERTICAL

DRAWN: ALK
DESIGNED: DAK
SURVEY
RECOMMENDED:
DEPUTY DIRECTOR
DATE: March 27, 2015
SHEET 11 OF 22 SHEETS

DRAWING:
ATLAS PAGE NO:

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TASK 2 – DREDGE AMERICA CDMSA CONFIGURATION

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CDMSA Considerations

- Real Estate – no wetlands, no groundwater conflicts, no cultural conflicts
- Suitable material to construct berms
- CDMSA to hold 2-3 times the volume of dredged material
- Dredged material should dewater easily
- Final destination of dewatered dredged material
- ODEQ BMP parameters on effluent decant water discharge

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Waurika CDMSA Construction starting August 2015

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WAURIKA CDMSA IN OPERATION

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DREDGE AMERICA "LIBERTY" CUTTERHEAD DREDGE

TASK 2 – FLASHBOARD RISER WEIR

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CDMSA DISCHARGE INTO LAKE

12" Discharge Pipes

Turbidity Curtain

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PROJECT AT PEAK OF CONSTRUCTION ACTIVITIES

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DRONE VIDEO OCT 25 2015

TASK 3 – EXTENDING LOWER GATES

		TASK 3 - Lower Gate Extension
24	01 71 13	Mobilization
25	05 05 19	Install Underwater Pipe Anchors
26	40 05 33.1	Install Fuzed 42" (42.41" OD/36.762"ID) PE4710 DR 17 125 psi HDPE Pipe
27	40 05 33.2	Install 36" Expansion Joints
28	40 05 33.3	Install 36" Flexible Expansion Joints
29	40 05 33.4	Install 42"x42"x42" DR 17 HDPE WYE
30	40 05 33.5	Install 100' (5 ea 20' sections) of 36" SBR Flexible Hose w/ molded Stainless Steel Class 125/150 Flanges
31	40 05 33.5	Install 60' (3 ea 20' sections) of 36" SBR Flexible Hose w/ molded Stainless Steel Class 125/150 Flanges
32	40 05 33.6	Install 20'x14'x1' Concrete Pad and Pipe Fasteners
33		Install 36" DR17 HDPE Flange Adapters
34		Install 36" IPS Class 125/150 316 Stainless Steel Back Up Rings
35		Install 42"x36" DR17 HDPE Concentric Reducer
36	35 01 41.1	Install 30 MGD Floating Intake Screen
37	35 01 41.2	Install Intake Screen Protective Enclosure
38	35 01 41.3	Install Navigation Buoy
39	35 01 41.4	Install Floating Intake Anchor System
40	35 01 41.5	Install Permanent 13" Spar Buoys with anchors
41	35 01 41.6	Install Temporary 30" Float Balls with anchors

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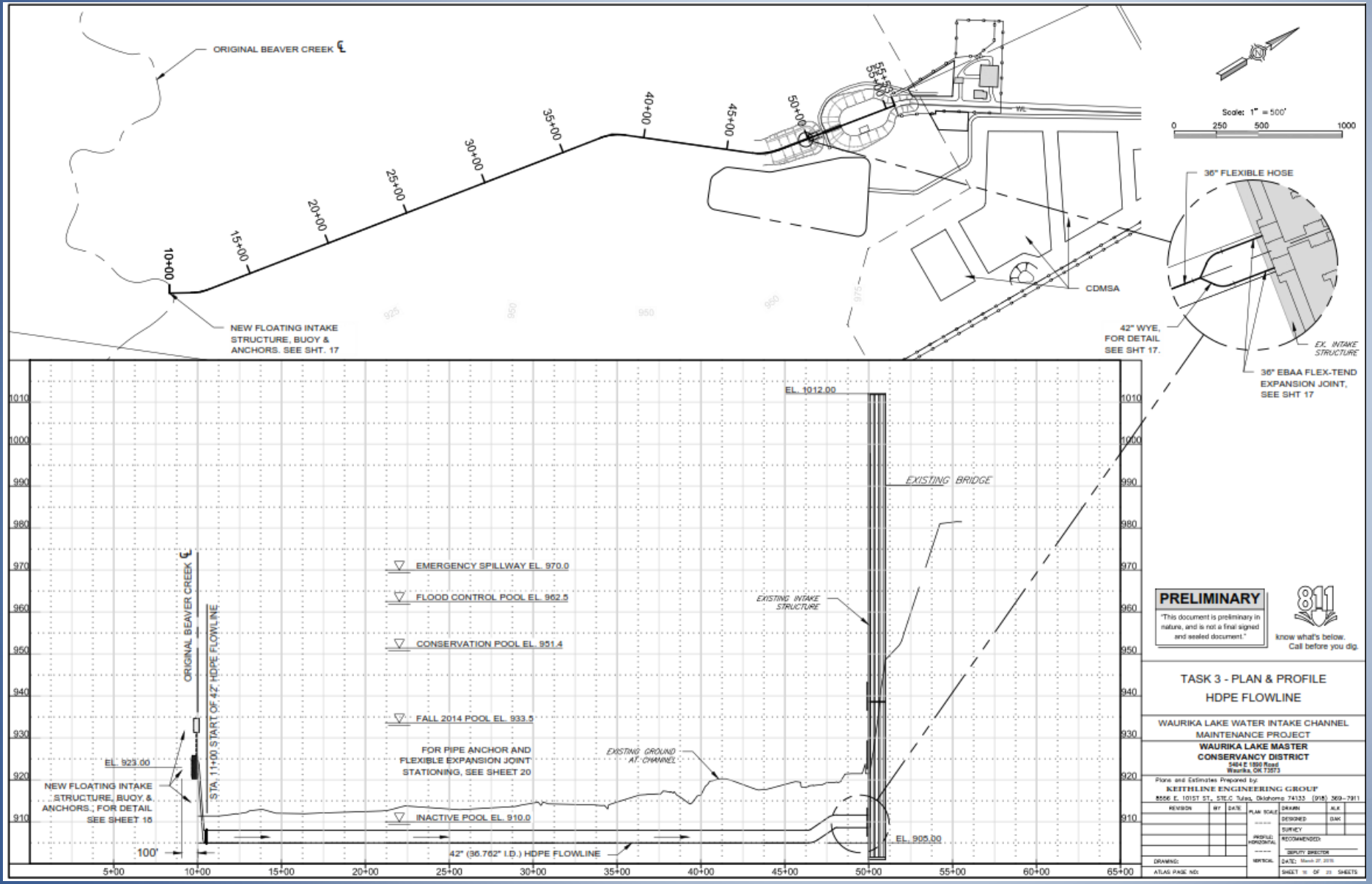
TASK 3 – 42" HDPE PLAN AND PROFILE



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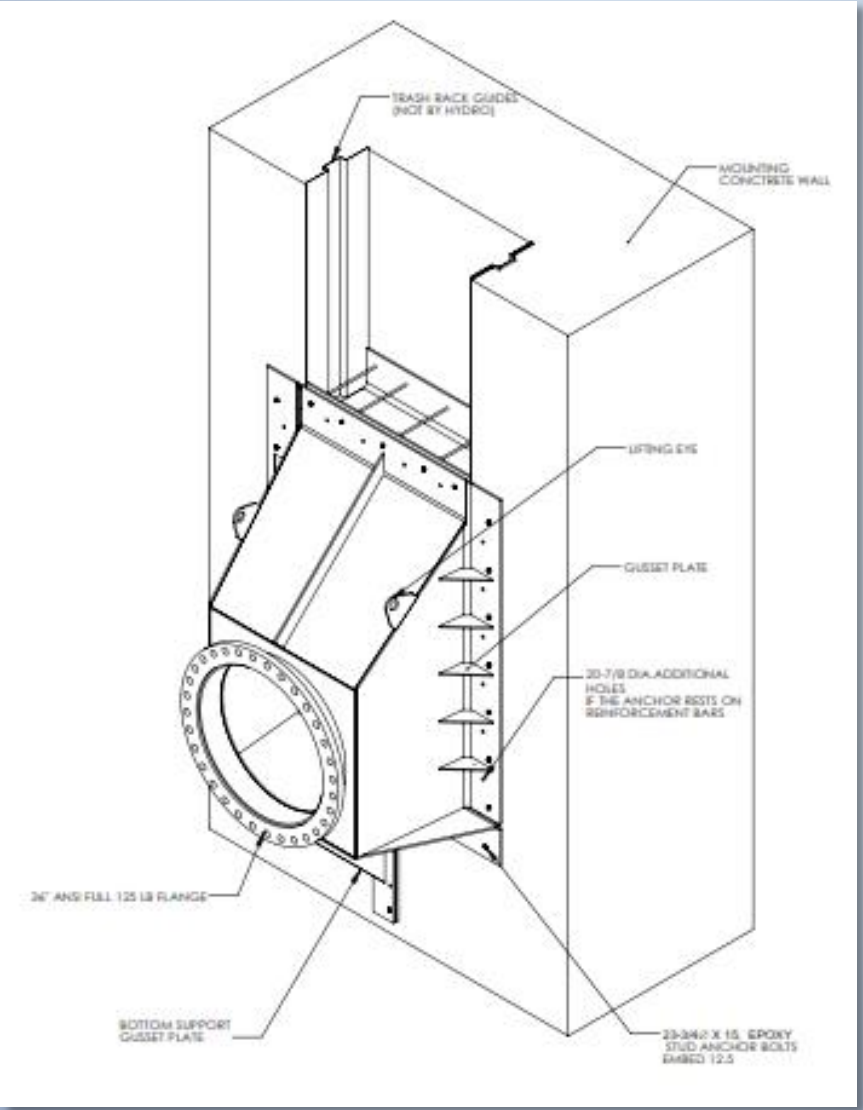
TASK 3 - LOWER GATE DIFFUSER



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TASK 3 – TYPICAL 42"HDPE SUBMARINE INSTALLATION

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Underwater Pipe Installation Video

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HDPE FUSING - QUALITY CONTROL

Operator Certification

Joint Datalogging

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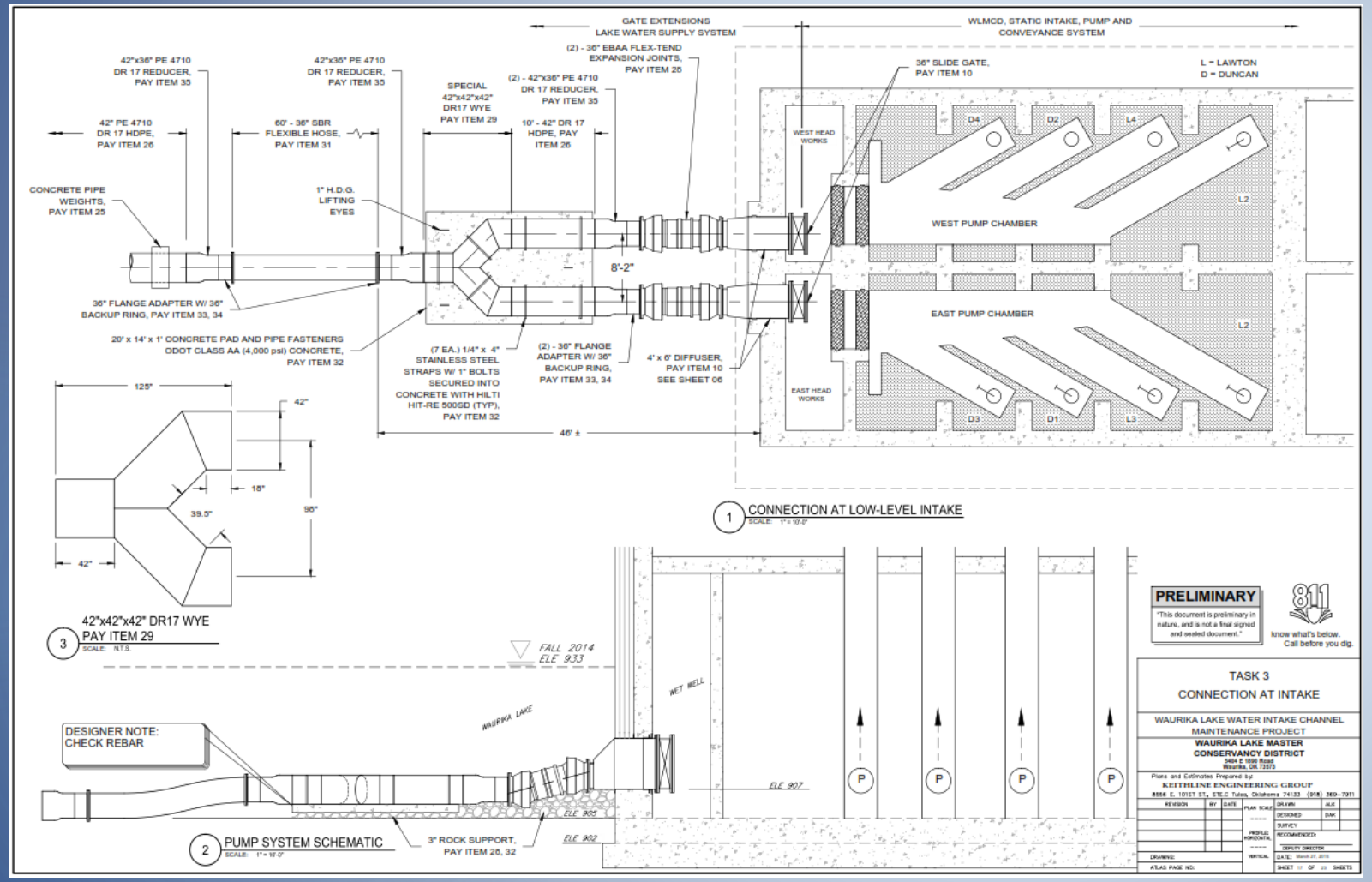
TASK 3 – INTAKE CONNECTION ASSY



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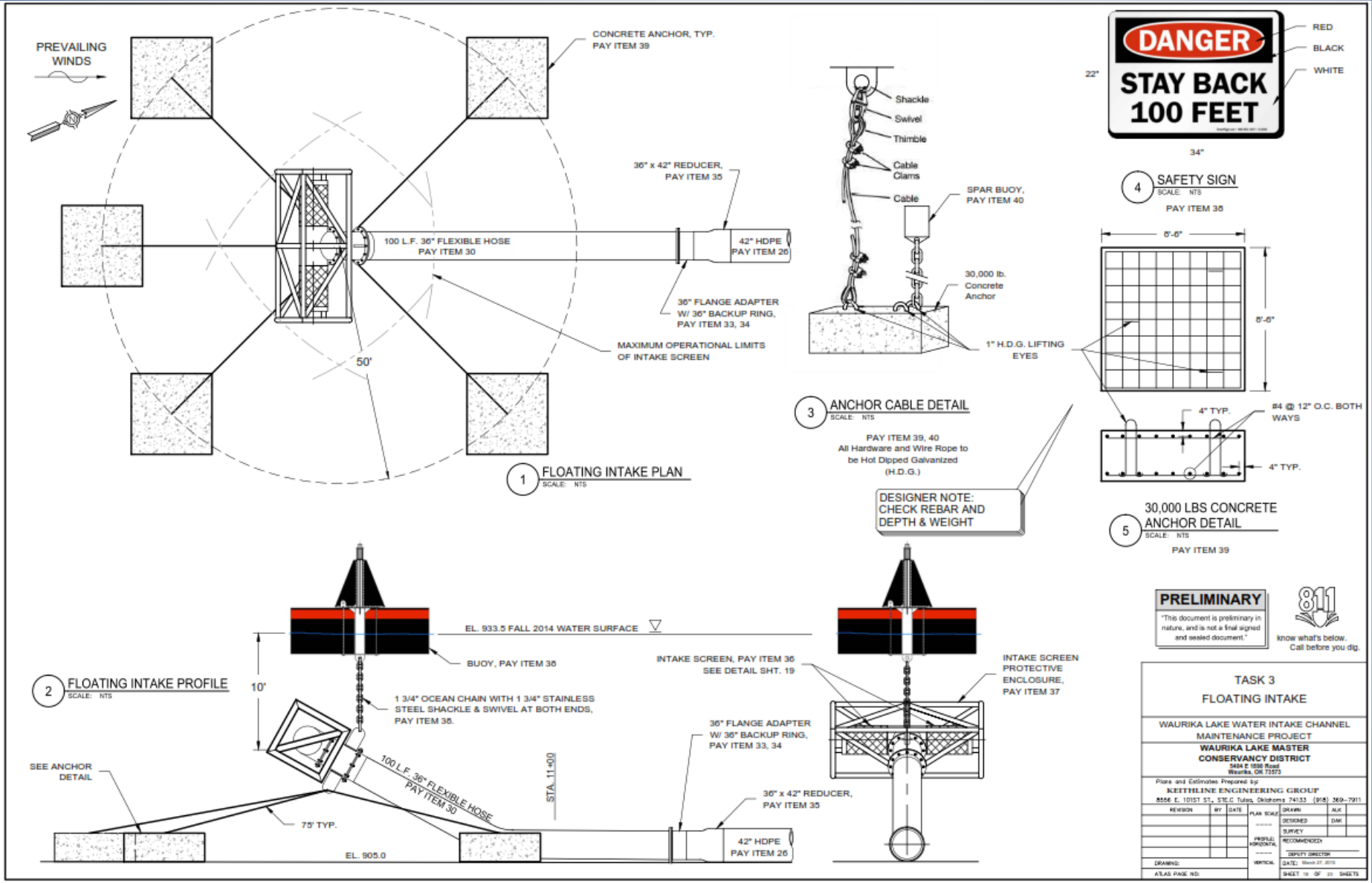
TASK 3 – FLOATING INTAKE



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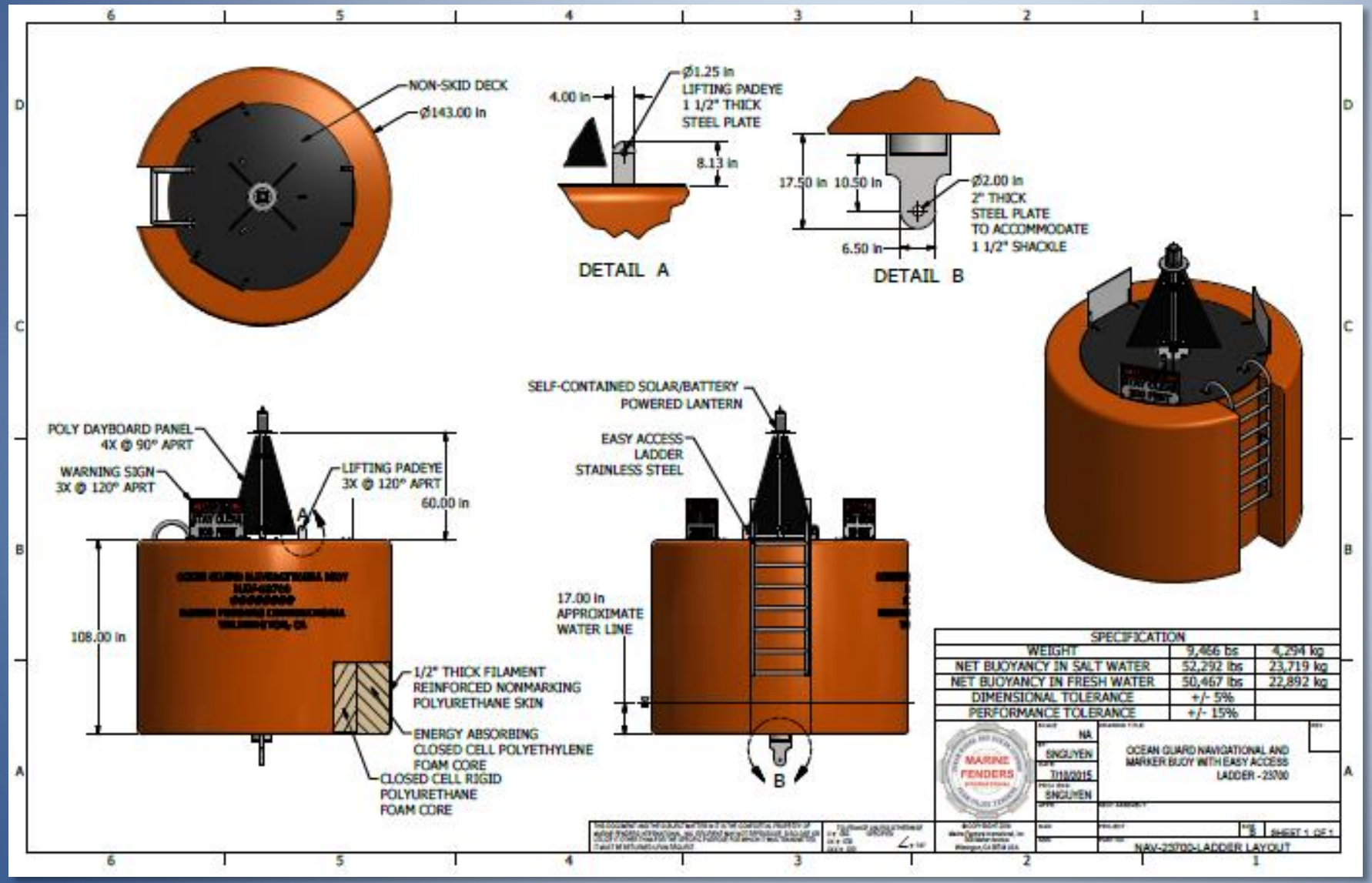
TASK 3 – NAVIGATION BUOY



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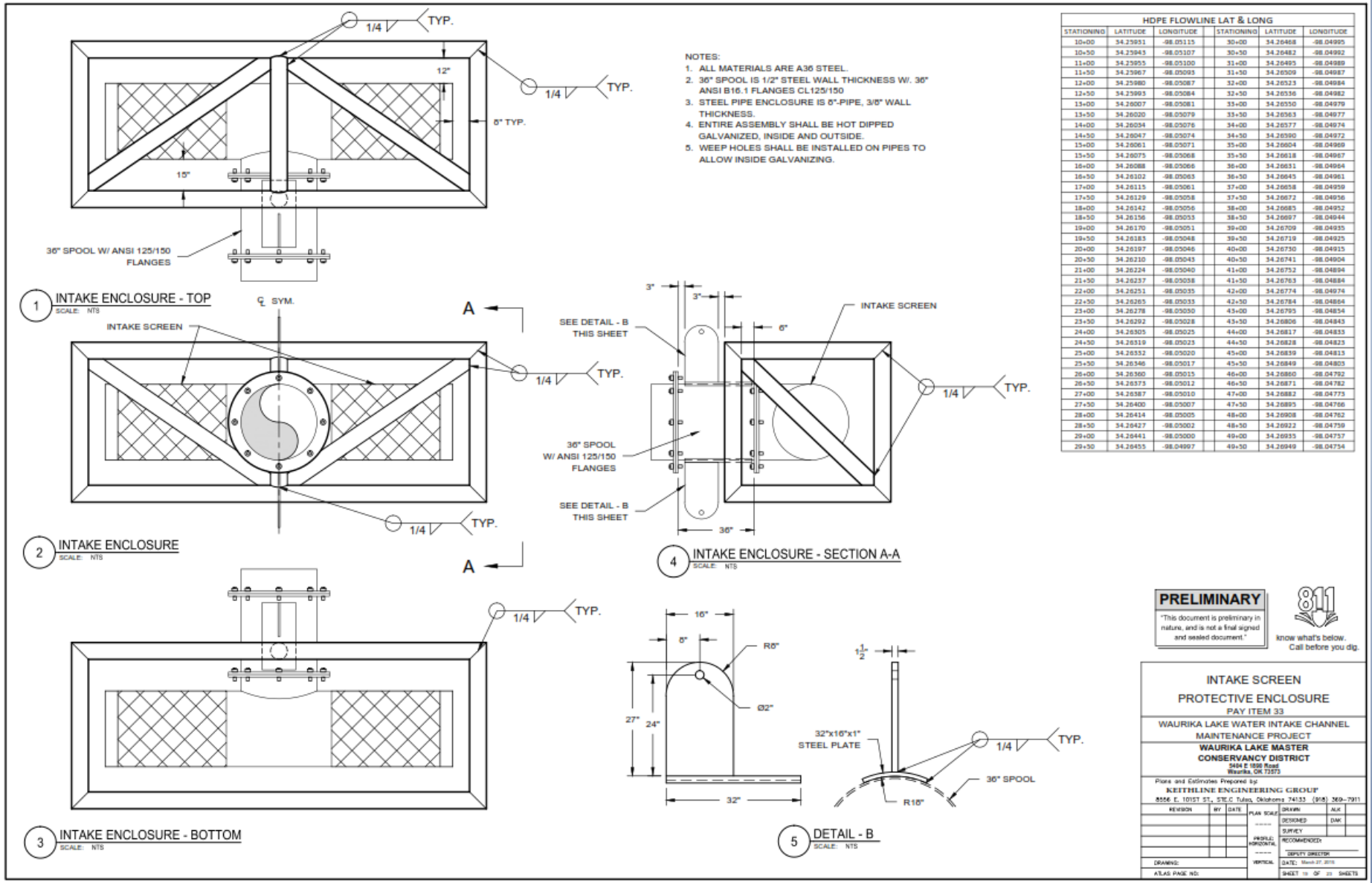
NAVIGATION BUOY / INTAKE

KEITHLINE ENGINEERING GROUP, PLLC

TASK 3 – INTAKE ENCLOSURE



HDPE FLOWLINE LAT & LONG					
STATIONING	LATITUDE	LONGITUDE	STATIONING	LATITUDE	LONGITUDE
10+00	34.25951	-98.05115	30+00	34.26468	-98.04995
10+50	34.25943	-98.05107	30+50	34.26482	-98.04992
11+00	34.25955	-98.05100	31+00	34.26495	-98.04989
11+50	34.25967	-98.05093	31+50	34.26509	-98.04987
12+00	34.25980	-98.05087	32+00	34.26523	-98.04984
12+50	34.25993	-98.05084	32+50	34.26536	-98.04982
13+00	34.26007	-98.05081	33+00	34.26550	-98.04979
13+50	34.26020	-98.05079	33+50	34.26563	-98.04977
14+00	34.26034	-98.05076	34+00	34.26577	-98.04974
14+50	34.26047	-98.05074	34+50	34.26590	-98.04972
15+00	34.26061	-98.05071	35+00	34.26604	-98.04969
15+50	34.26075	-98.05068	35+50	34.26618	-98.04967
16+00	34.26088	-98.05066	36+00	34.26631	-98.04964
16+50	34.26102	-98.05063	36+50	34.26645	-98.04961
17+00	34.26115	-98.05061	37+00	34.26658	-98.04959
17+50	34.26129	-98.05058	37+50	34.26672	-98.04956
18+00	34.26142	-98.05056	38+00	34.26685	-98.04952
18+50	34.26156	-98.05053	38+50	34.26697	-98.04944
19+00	34.26170	-98.05051	39+00	34.26709	-98.04935
19+50	34.26183	-98.05048	39+50	34.26719	-98.04925
20+00	34.26197	-98.05046	40+00	34.26730	-98.04915
20+50	34.26210	-98.05043	40+50	34.26741	-98.04904
21+00	34.26224	-98.05040	41+00	34.26752	-98.04894
21+50	34.26237	-98.05038	41+50	34.26763	-98.04884
22+00	34.26251	-98.05035	42+00	34.26774	-98.04874
22+50	34.26265	-98.05033	42+50	34.26784	-98.04864
23+00	34.26278	-98.05030	43+00	34.26795	-98.04854
23+50	34.26292	-98.05028	43+50	34.26806	-98.04843
24+00	34.26305	-98.05025	44+00	34.26817	-98.04833
24+50	34.26319	-98.05023	44+50	34.26828	-98.04823
25+00	34.26332	-98.05020	45+00	34.26839	-98.04813
25+50	34.26346	-98.05017	45+50	34.26849	-98.04803
26+00	34.26360	-98.05015	46+00	34.26860	-98.04792
26+50	34.26373	-98.05012	46+50	34.26871	-98.04782
27+00	34.26387	-98.05010	47+00	34.26882	-98.04773
27+50	34.26400	-98.05007	47+50	34.26895	-98.04766
28+00	34.26414	-98.05005	48+00	34.26908	-98.04762
28+50	34.26427	-98.05002	48+50	34.26922	-98.04759
29+00	34.26441	-98.05000	49+00	34.26935	-98.04757
29+50	34.26455	-98.04997	49+50	34.26949	-98.04754

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Task 3 – Intake Screen

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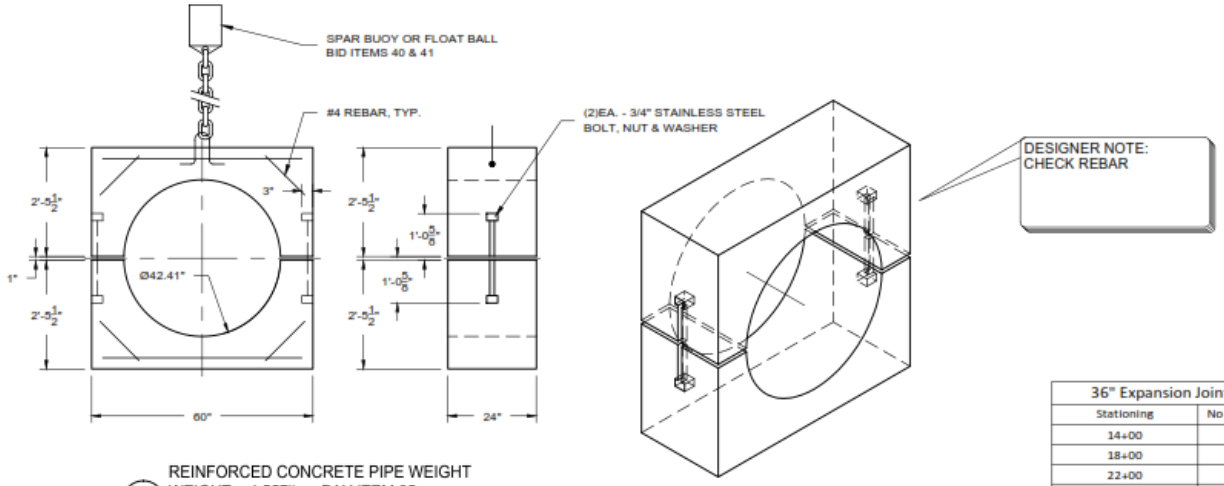
TASK 3 – EXPANSION JOINT DETAIL

Concrete Pipe Anchor Stationing				
Stationing	No of Anchors		Stationing	No of Anchors
11+00*	6		31+00*	1
11+50	1		31+50	1
12+00*	1		32+00*	1
12+50	1		32+50	1
13+00*	1		33+00*	1
13+50	1		33+50	1
14+00*	1		34+00*	1
14+50	1		34+50	1
15+00*	1		35+00*	1
15+50	1		35+50	1
16+00*	1		36+00*	1
16+50	1		36+50	1
17+00*	1		37+00*	1
17+50	1		37+50	1
18+00*	1		38+00*	1
18+50	1		38+50	1
19+00*	1		39+00*	1
19+50	1		39+50	1
20+00*	1		40+00*	1
20+50	1		40+50	1
21+00*	1		41+00*	1
21+50	1		41+50	1
22+00*	1		42+00*	1
22+50	1		42+50	1
23+00*	1		43+00*	1
23+50	1		43+50	1
24+00*	1		44+00*	1
24+50	1		44+50	1
25+00*	1		45+00**	1
25+50	1		45+50	1
26+00*	1		46+00**	1
26+50	1		46+50	1
27+00*	1		47+00**	1
27+50	1		47+50	1
28+00*	1		48+00**	1
28+50	1		48+50	1
29+00*	1		49+00**	1
29+50	1		49+30	3
30+00*	1		TOTAL	81
30+50	1			

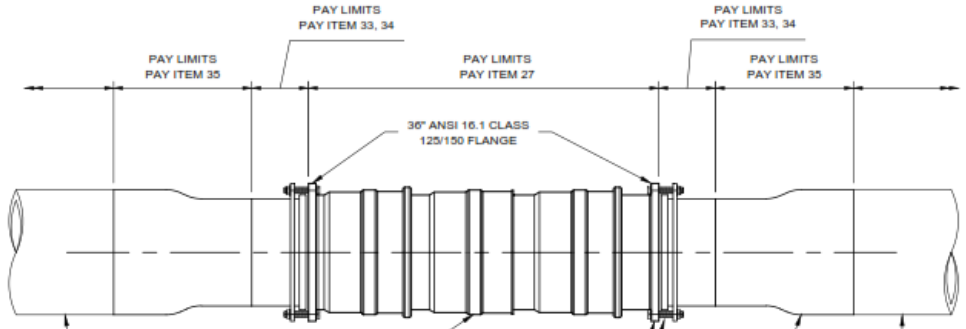
* ATTACH TEMPORARY 30" FLOAT BALL ONTO CONCRETE PIPE WEIGHT. SEE BID ITEM ??.
** ATTACH SPAR BUOY ONTO CONCRETE PIPE WEIGHT. SEE PAY ITEM ??.



DESIGNER NOTE:
CHECK REBAR

1 REINFORCED CONCRETE PIPE WEIGHT
WEIGHT = 4,557lbs., PAY ITEM 25
SCALE: NTS

36" Expansion Joint Stationing	
Stationing	No of Expansion Joints
14+00	1
18+00	1
22+00	1
26+00	1
30+00	1
34+00	1
35+00	1
39+00	1
44+00	1
46+00	1
TOTAL	10



2 36" EXPANSION JOINT
PAY ITEM 27
SCALE: NTS

PRELIMINARY
"This document is preliminary in nature, and is not a final signed and sealed document."

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TASK 3 - PIPE WEIGHTS
& EXPANSION JOINT DETAILS

WAURIKA LAKE WATER INTAKE CHANNEL
MAINTENANCE PROJECT

WAURIKA LAKE MASTER
CONSERVANCY DISTRICT
2494 E 1550 Road
Waurika, OK 73573

Plans and Estimates Prepared by:
KEITHLINE ENGINEERING GROUP
8556 E. 101ST ST., STE.C Tulsa, Oklahoma 74133 (918) 369-7911

REVISION	BY	DATE

PLAN SCALE: ----
PROFILE: HORIZONTAL ----
VERTICAL

DRAWN: AJK
DESIGNED: DAK
SURVEY
RECOMMENDED:
DEPUTY DIRECTOR
DATE: March 27, 2015
SHEET 20 OF 23 SHEETS

DRAWING:
ATLAS PAGE NO:

KEITHLINE ENGINEERING GROUP, PLLC

TASK 4 – Post Maintenance Operations

		TASK 4 - Post Maintenance Operations
42	32 72 00	Construction and Staging Site Restoration and Closing CDMSAs
43	01 55 24	WLMCD Road Repairs
44	01 71 14	Demobilization

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PROJECT CLEAN-UP

1) All county access roads – restore to pre-project condition, or better, as determined by county and WLMCD representatives

2) WLMCD and USACE Grounds – restore to pre-project condition, or better, as determined by WLMCD, USACE representatives

3) WLMCD frontage road – restore to pre-project condition <u>with</u> fog coat

4) CDMSA – remains as-is for about 12 months at conclusion of project to dry; under oversight of local contractor who is hired to maintain site and level / landscape CDMSA

DRONE FLIGHT JANUARY 29 2016

Waurika Lake Water Intake Channel Maintenance Project Demonstrates:

1) Access to all depths of the conservation pool is critical especially when reservoirs are lowered due to drought.

2) Natural lake sedimentation processes can be offset and lakes restored to their original mission thru cooperative efforts of stakeholders, regulators, and funding sources.

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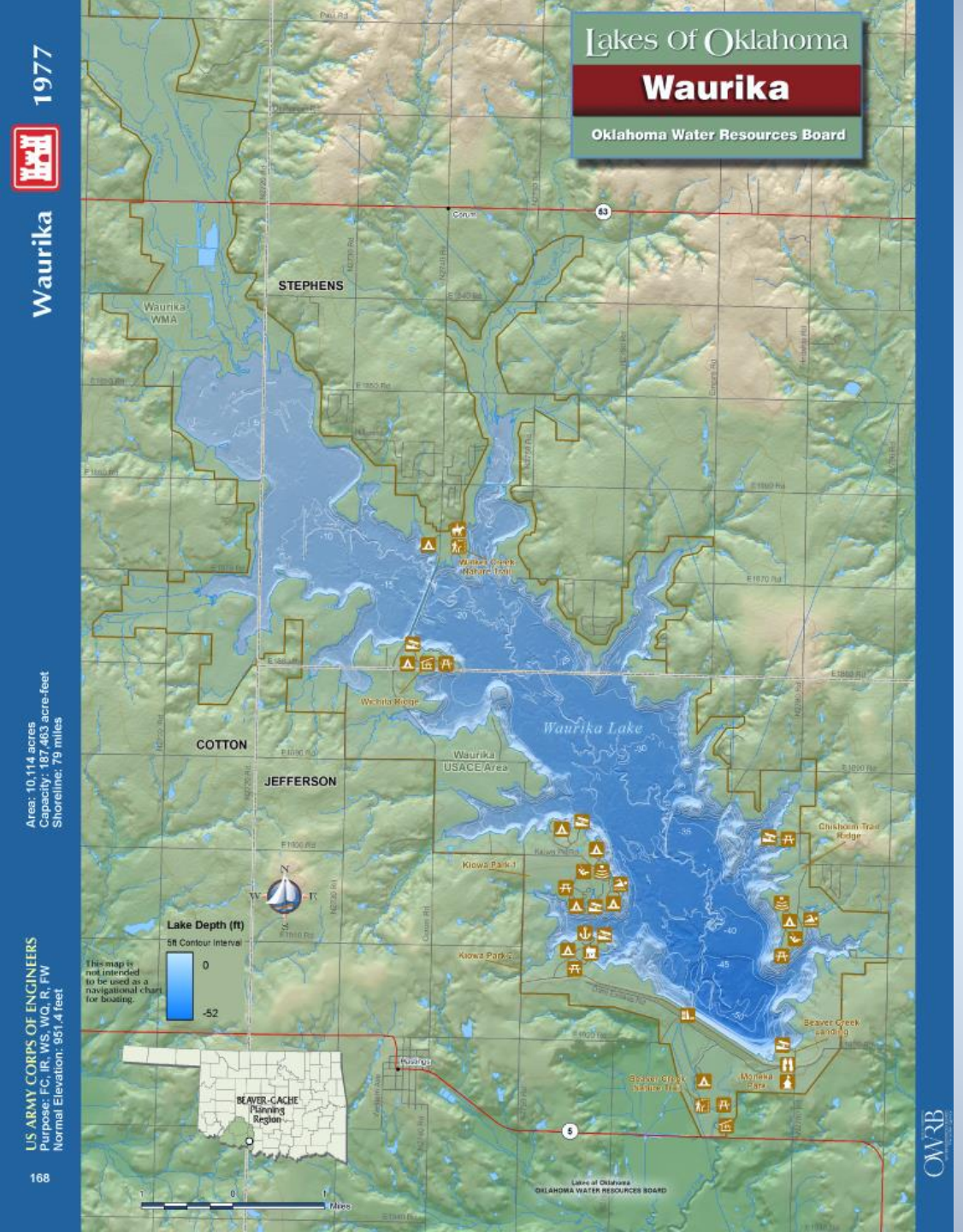

QUESTIONS & COMMENTS

Abstract for future Journal AWWA article available in back

KEITHLINE ENGINEERING GROUP, PLLC