

The Vision



- * 2016 Promotional TV videos just prior to voting

Note to readers: Many underlined text and graphical pictures link to enlarged or actual videos, etc. Move mouse pointer over items to access them.



Zink Lake – Promises Made

- * Explore the perceptions and expectations of citizens in Tulsa for the new dam, other structures, and features to be built
- * See if all promises and public expectations will be fulfilled
- * Provide information not presented to the public



Various Expectations Presented to Voters

- * Public meetings, newspaper articles, and other media touted numerous benefits
- * Series of three low water dams at Sand Springs, Zink Dam, South Tulsa/ Jenks
- * Creation of lakes with the following benefits
 - * Boating, sailing, swimming/tubing, rafting, white water kayaking, triathlons
 - * Olympic class lake for competitive rowing events
 - * Recreational and competitive kayak flume that would draw several high level events per year
 - * Huge economic value to the area from various events and uses to the tune of \$122 million annually and over 1,800 new jobs annually
 - * Pedestrian bridges at all lakes
 - * Improve the ecosystem for fish and other wildlife
 - * Eliminate safety problems with existing dam caused by “roller effect”



Initial Problems

- * Full funding currently unavailable for Sand Springs or South Tulsa/ Jenks dams
 - * Corps of Engineers has plans to eventually rebuild old Sand Springs dam that was removed due to deaths caused by “roller effect” of water
- * Zink Dam is the only dam fully funded, designed, and awarded for construction
 - * Bids came in too high for dam, recreational water flume, and pedestrian bridge from certified estimates. Additional funding sources under review.
 - * Vision 2025 budget is \$63 million for Zink Dam excluding new bridge
- * No valid economic analysis produced to show economic benefits of lake
 - * Initial econ study completed in Jan 2016 by OU relied on **key activities which cannot take place in Zink Lake**
 - * Therefore, study is flawed and should be reworked or retracted
 - * Public was not made aware of this report prior to Vision 2025 voting so that it could be scrutinized. Report is now available on web.
 - * The TV sales pitch ad, presented on first slide, touted an economic impact of \$122 million annually and 1,850 new jobs . Ad was based on this flawed study.
- * Vision 2025 voting April 2016 approved with less than 19% turnout



New Zink Dam

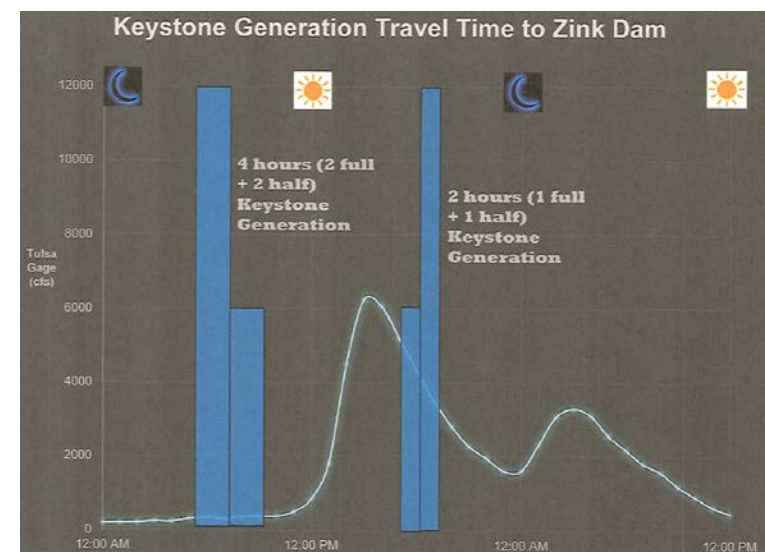
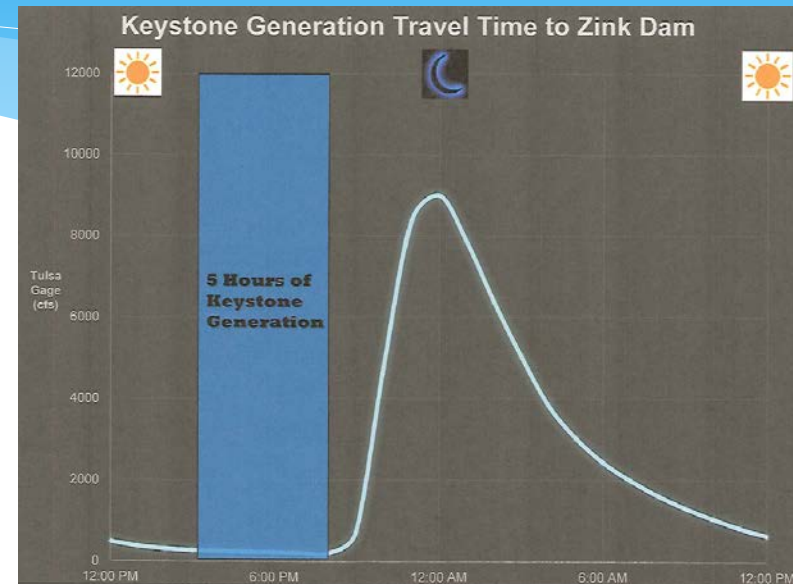
Features

- * New dam will raise the water level by 3 feet above existing dam water levels
- * Operable gates in dam that can be lowered flat in the river when needed to allow near unobstructed flow in the river
- * **New design reduces the flooding dangers to homes and Gathering Place upstream of Zink Dam**
- * Gates are made by Obermeyer Hydro with steel upstream panels and inflatable bags to raise and lower them
- * Recreational and competitive water flume on east bank adjoining Gathering Place
- * New pedestrian bridge upstream to replace existing bridge



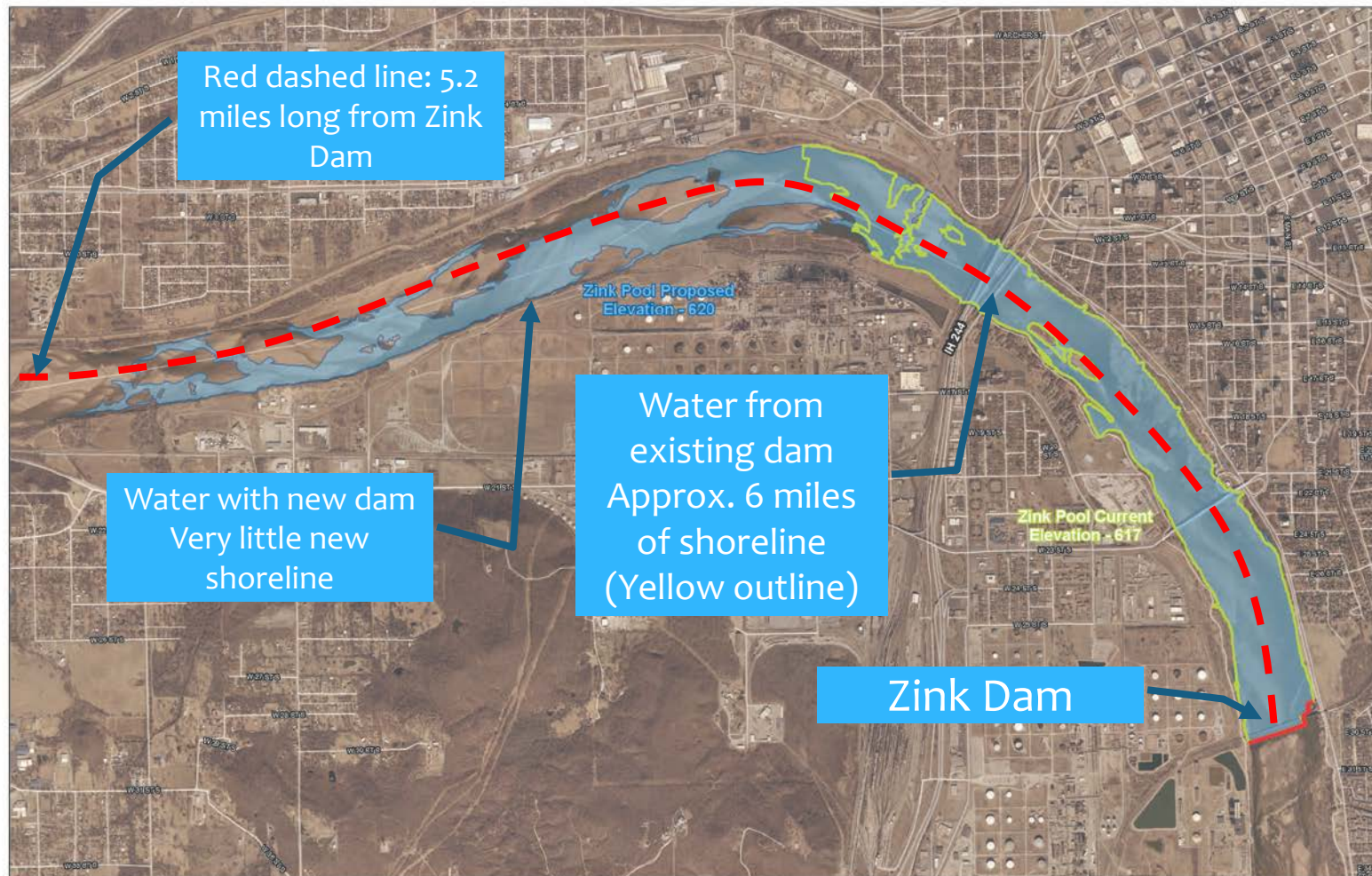
Why build a dam at all?

- * Without the new dams water will flow due to hydropower generators at Keystone
- * Unfortunately most of the flow from Keystone generation will not be visible many times when it arrives at Gathering Place area
- * Generators are primarily used for peaking power to match power loads
 - * Summer profile (top)
 - * Winter profile (bottom)
 - * This information briefed by SWPA to City committee during planning meetings
- * This sporadic flow was the primary justification for the new dams and will help even out the flows somewhat downstream of Zink Dam
- * **When existing Zink Dam is operating properly, it fulfills the same purposes**



How Much Water?

- * The new dam will only raise the water level by 3 feet.
- * There will not be “12 miles of new shoreline”. It would take construction of multiple dams to result in that value of new shoreline.



How Will It Look?

Since:

- * The new dam will only raise the water level 3 more feet
 - * Existing depth at dam 7-8 feet
 - * Depth at new dam 10 feet
- * The existing dam gates supposedly allow for fish migration when they are down
- * The new dam must allow some low flows of 1,000 cfs to pass through dam to avoid fish kills just like the existing dam

Result:

- * “River will look about the same as now.”
 - * Source of statement: Historical river flow data and [Vision 2025 website Q&A](#)



Why will it look about the same?

* Answer:

- * 1000 cfs of flow downstream of new Zink Dam will be barely noticeable (100' wide x 2.25' deep) even if it flowing down the river
- * Zink Lake pool will be empty weeks on end February through May to allow fish migration
- * Pool empty December through January and July through August due to low flows into river from Keystone
 - * No inflow to lake – No outflow
 - * No power generation at times due to lack of water, generator maintenance, power grid constraints, or major work on turbines or generators
 - * Generation does not occur 5 days per week on average as claimed
 - * Historic low flows in river can be 300 cfs or lower

What does this mean?

We can compare it with how it looks now during varying conditions or months

Note: While viewing the next slides, keep in mind that the present Zink dam was in operation during these photos and impounding water when available



How Will It Look?

January
2019

Good to moderate flow possibly due to generation and Keystone releases

River would look the same with no dam

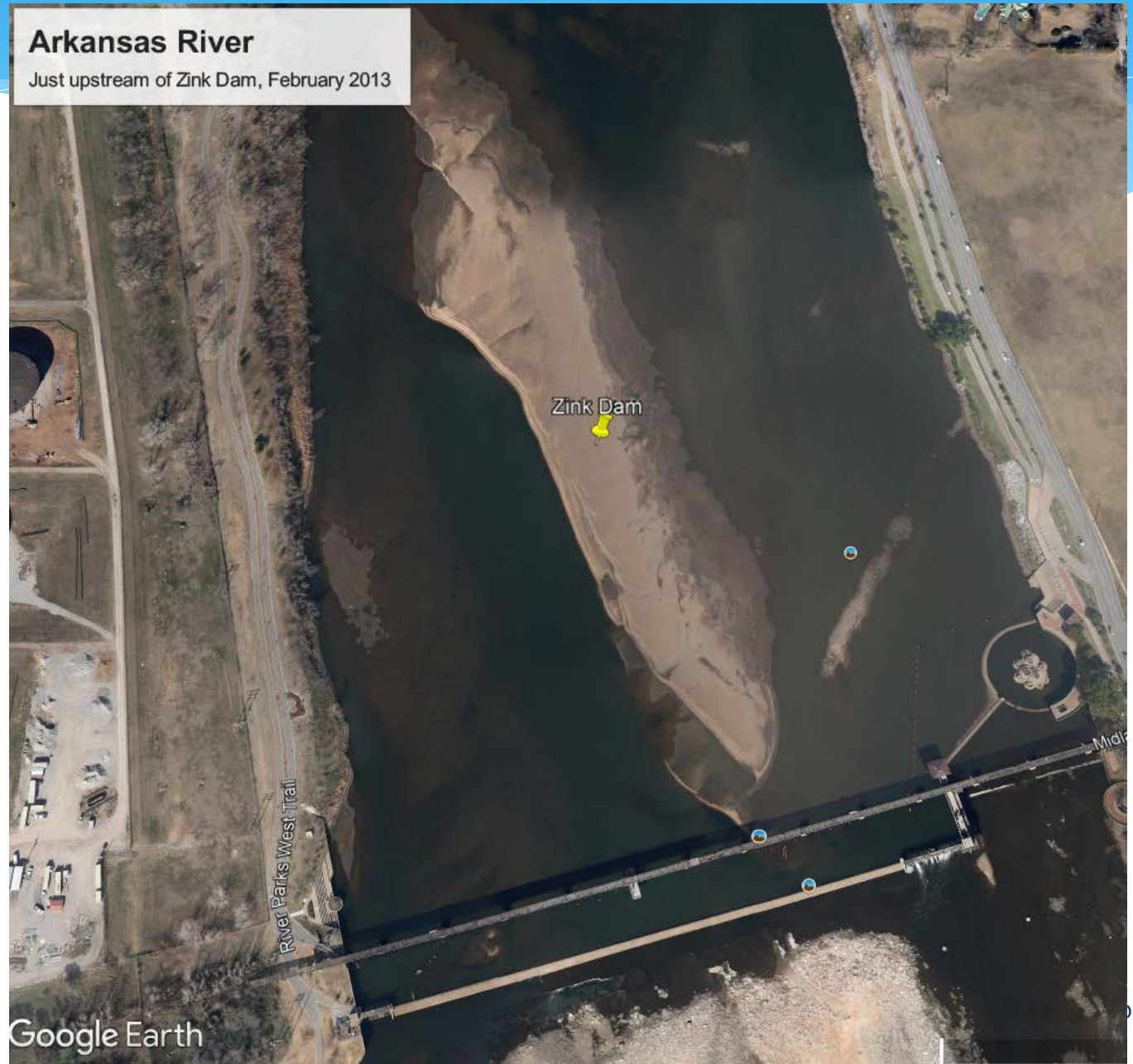


How Will It Look?

February
2013

Low flows with
no generation
taking place.

New dam would
look the same
with main gates
down for weeks
for fish migration

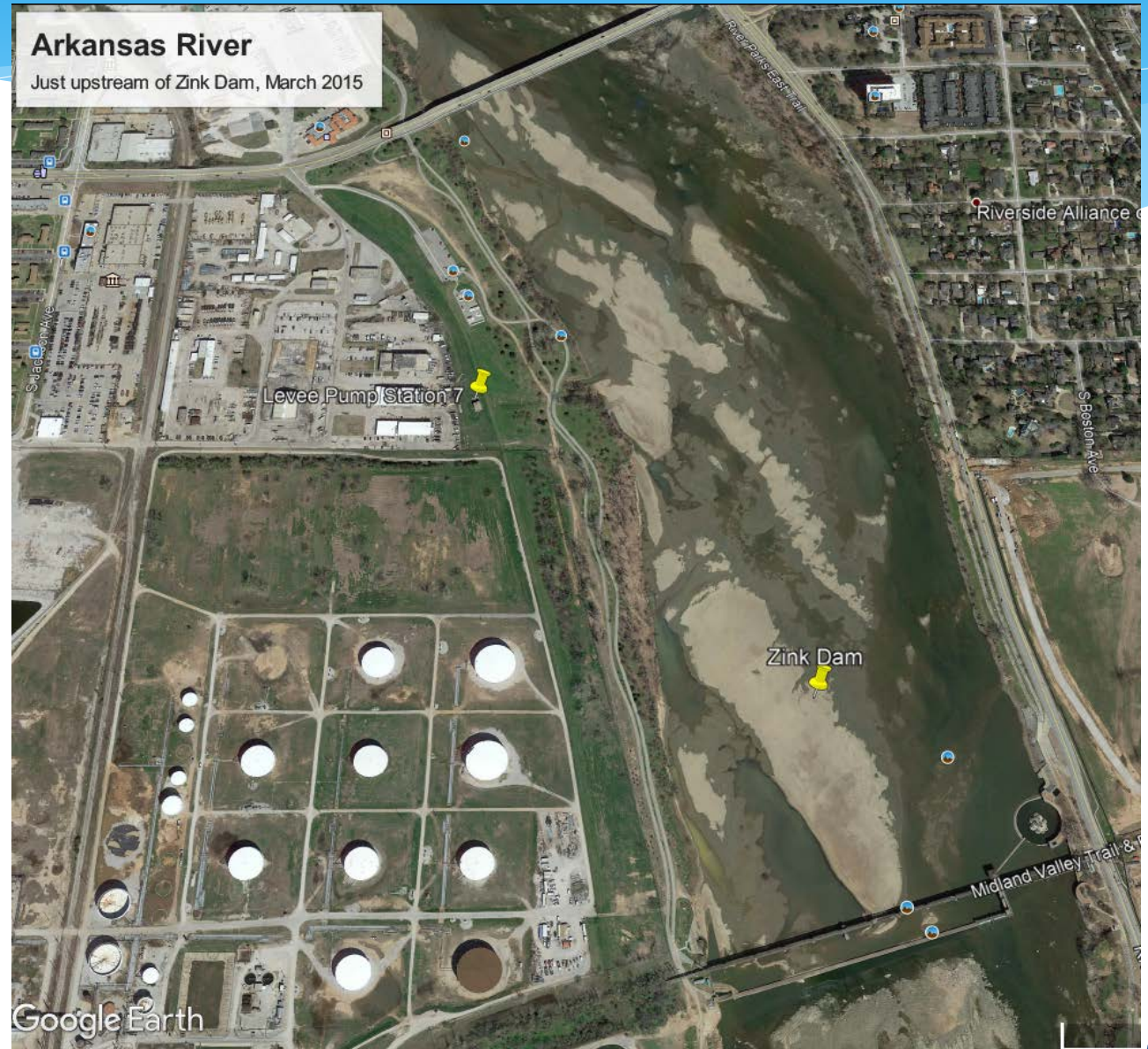


How Will It Look?

March 2015

Low flows during wetter season with no generation taking place.

New dam would look the same with main gates down for weeks for fish migration



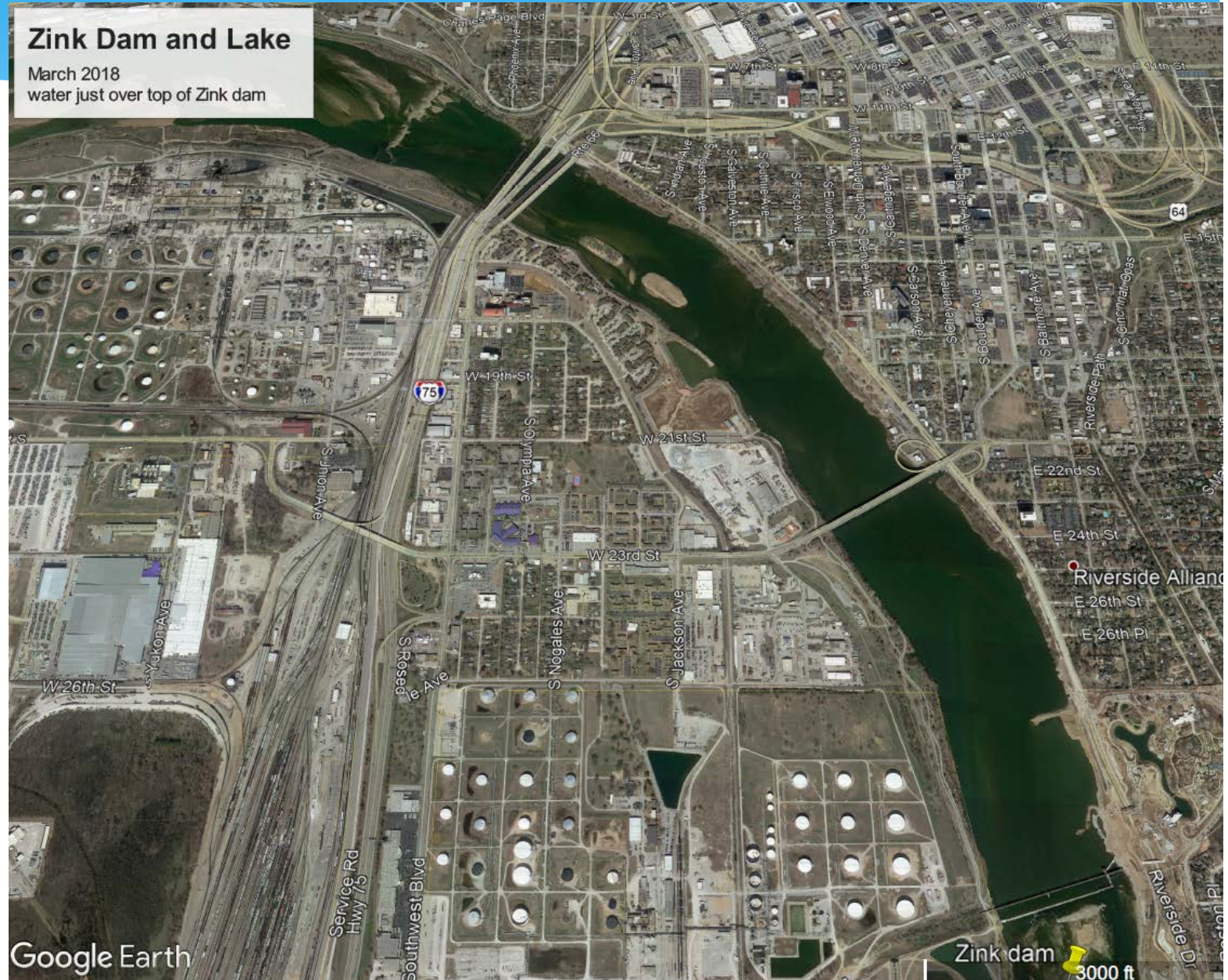
How Will It Look?

March
2018

Moderate flows

If dam gates are up, this is about what it would look like after power generation releases

New dam would probably not look the same with main gates down for fish migration



How Will It Look?



March 20,
2015

Low flows with
no generation
taking place.

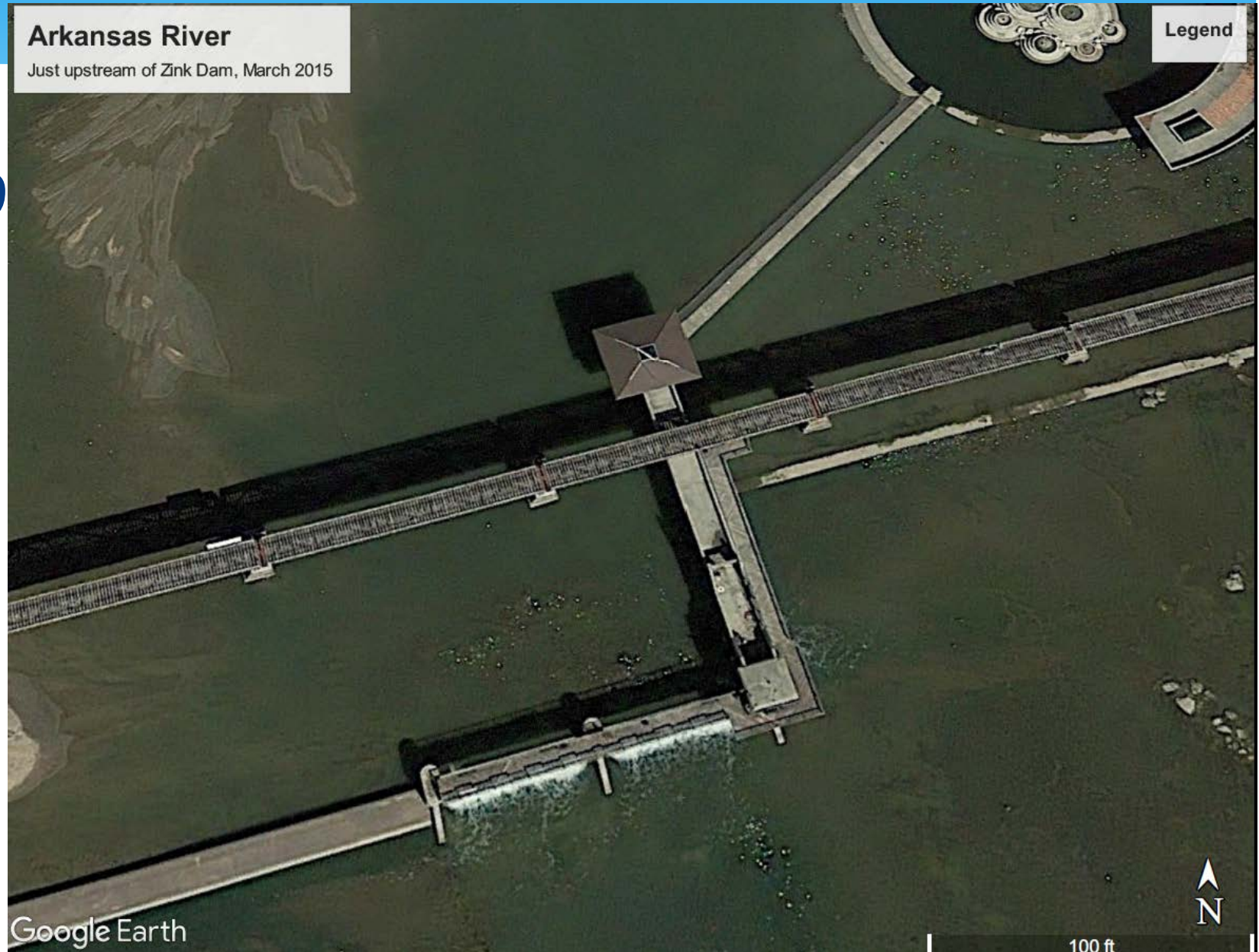
New dam would
look the same
with main gates
down for fish
migration



How Will It Look?

March 29
2015

Enlarged view
at the existing
dam from
previous slide
showing
amount of
water flowing
through
existing gates



How Will It Look?

Arkansas River

Just upstream of Zink Dam, April 2010

Note: Flow just over top of dam and large sand bar barely under water



Note sand bar
just below
surface

April 2010

What happens
when boats,
especially sail boats
run aground on the
numerous sand
bars?



How Will It Look?

2018

Sand bars and channel will constantly shift depending upon flow direction in the river.

Any proposed boating activities must be aware of shallows and sand bar locations.



How Will It Look?

May
2017

It does not
flood every May
like in 2019!

Construction
contractor is
allowed to use
river sediment up
to 23rd St. bridge
for temporary
coffer dams. Other
than that, no sand
will be removed.



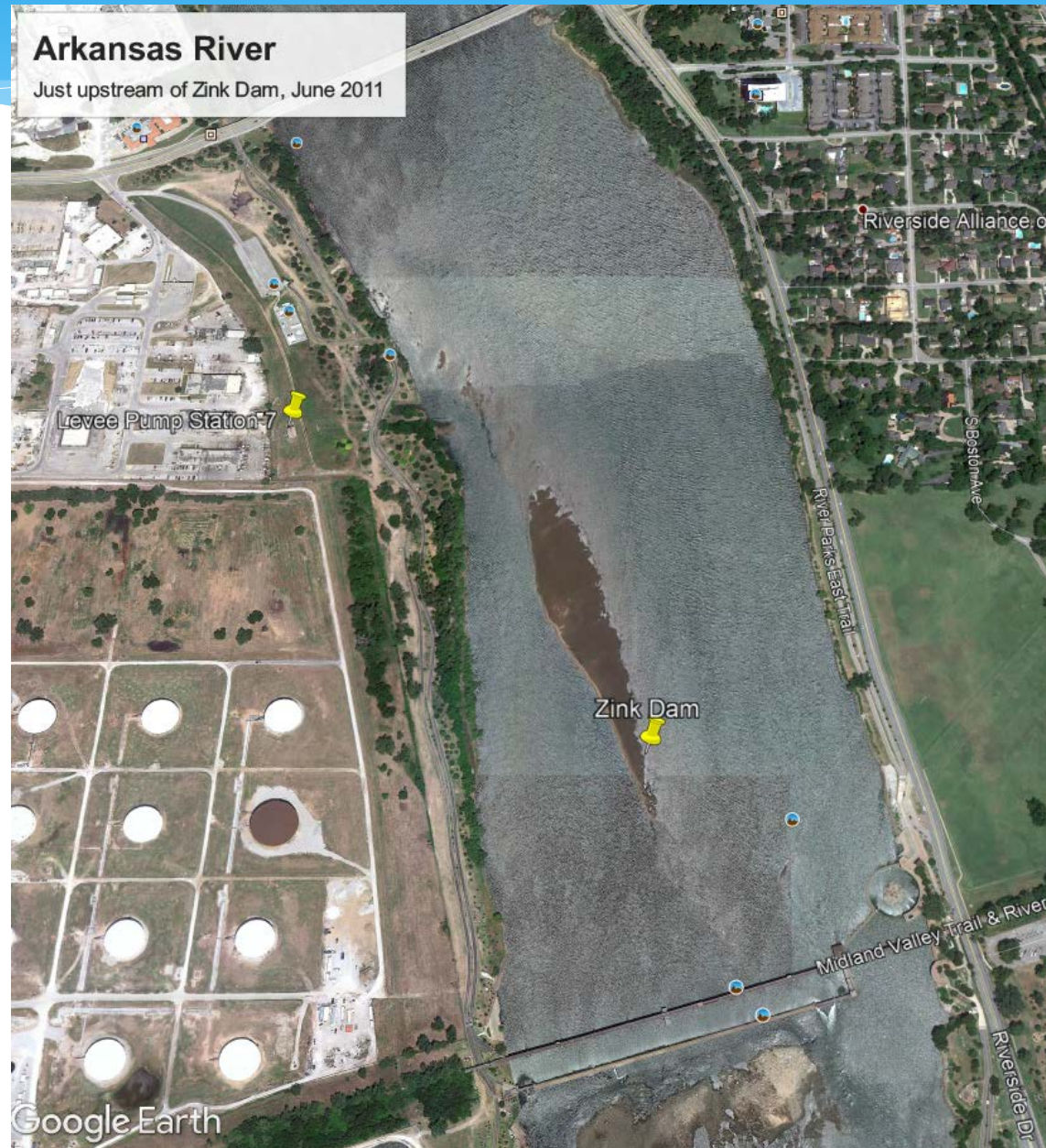
How Will It Look?

June
2011

Beginning of drier
summer months.

End of fish
migration season

Most likely some
releases from
Keystone providing
water in this photo

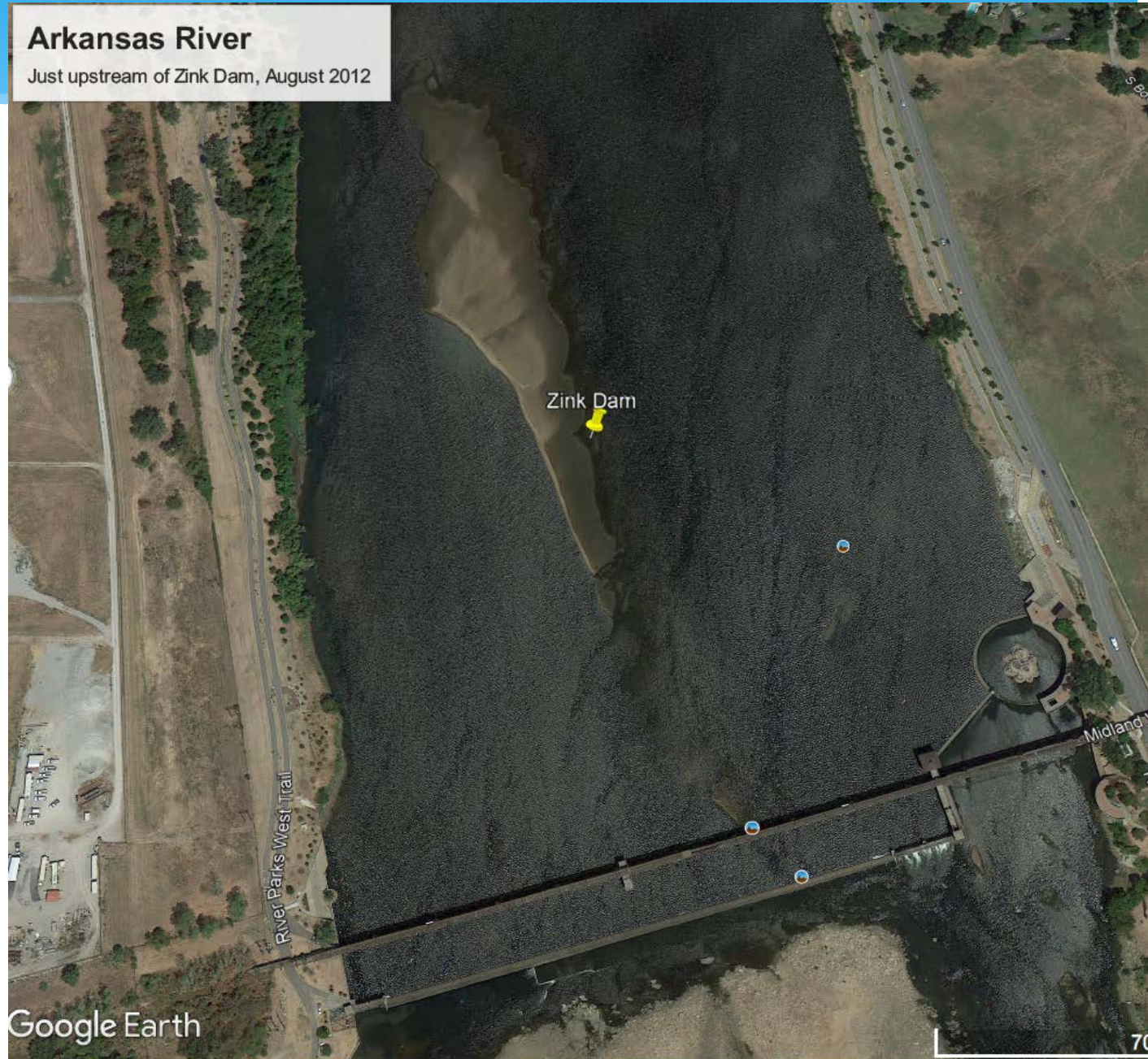


How Will It Look?

August
2012

Low flow summer
months

Most likely some
releases from
Keystone



How Will It Look?

November
2013

Fall and winter are
not higher flow
months

Arkansas River

Just upstream of Zink Dam, November 2013



How Will It Look?

November
2017

November through
January can be low
flow months



How Fast Will the Lake Fill or Empty?

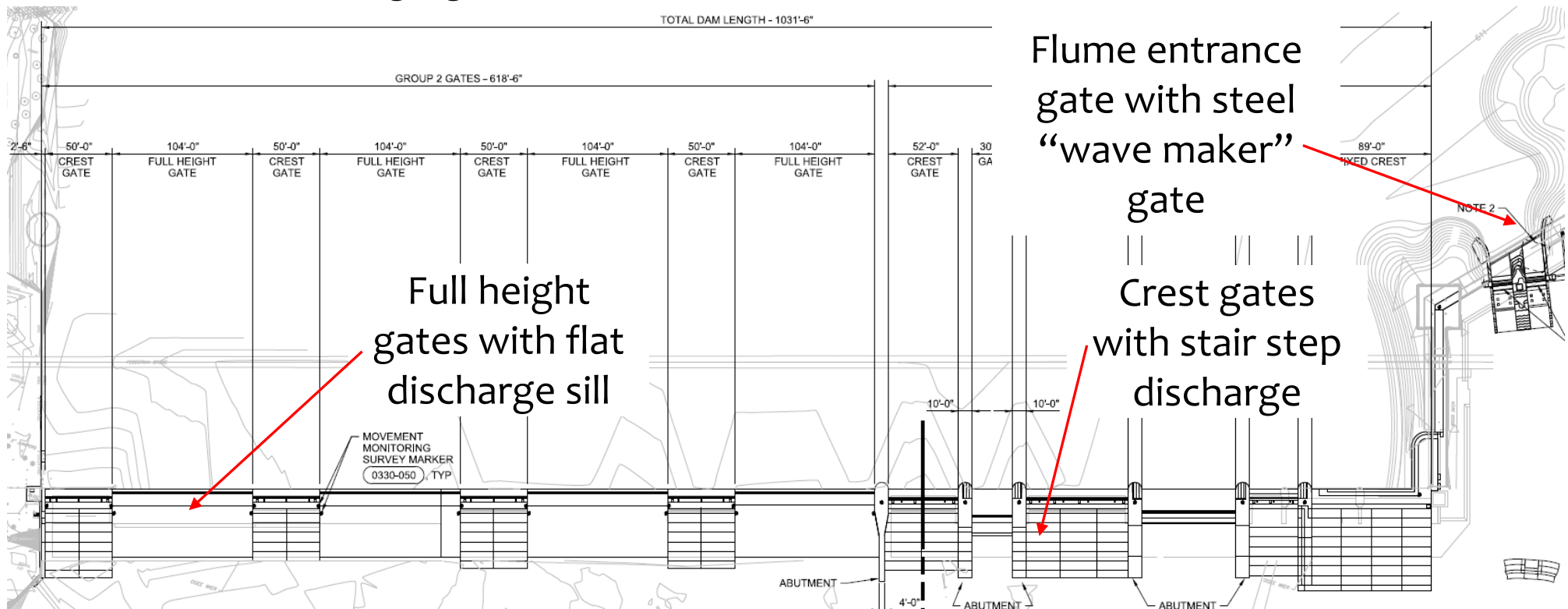
- * As long as a single Keystone generator is running or dam releases are 6,000 cfs or higher, lake pool can fill in a few hours
- * No inflow and a full Zink Lake pool
 - * Zink Lake will drain the pool in short order
 - * Flume needs (50-500 cfs). The useful water would be consumed in 1 to 7 days
 - * Additional flow required through Zink dam gates for fish (1,000 cfs). At this rate the pool would drop below 8 ft. in depth in 9-10 hours and pool totally emptied in 1 day.
 - * **Bottom line: Since Keystone generation does not occur over many consecutive days, especially in low flow summer months, a single day of generation water will be depleted in a day unless water is completely trapped in the pool or water releases are made through Keystone dam.**
 - * If pool water is trapped and not released, fish kills will result downstream of Zink Dam like in 2018.
 - * **Corps of Engineers has no legal requirement at Keystone Lake to release water for wildlife or river water quality improvement**



How Is The Dam Supposed To Operate?

Full height gates: Always up except during fish migration and high flows in river, then fully down. During low flow conditions they will need to lower to keep flows moving.

Crest gates: Regulate pool levels and visual effects during adequate flow conditions. Gates down during high river flows

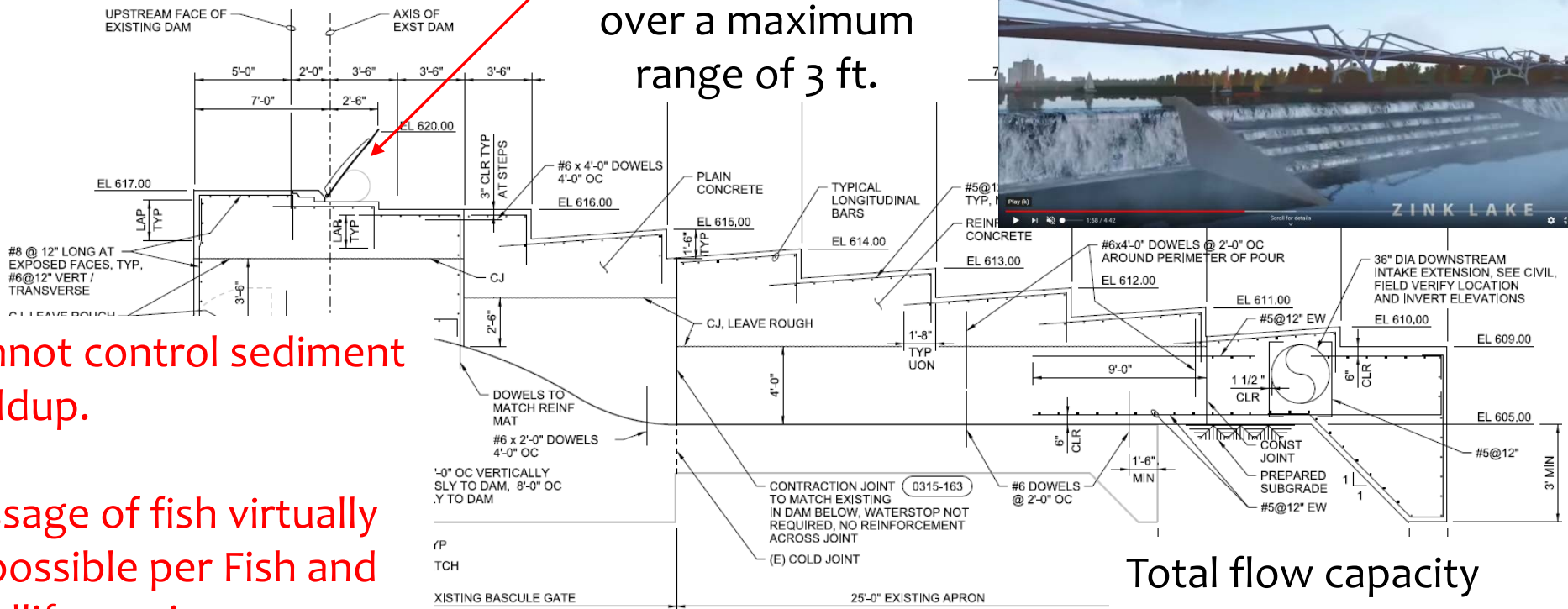


New Zink Dam Plan View



New Zink Dam Crest Gate

Regulates pool level over a maximum range of 3 ft.



Cannot control sediment buildup.

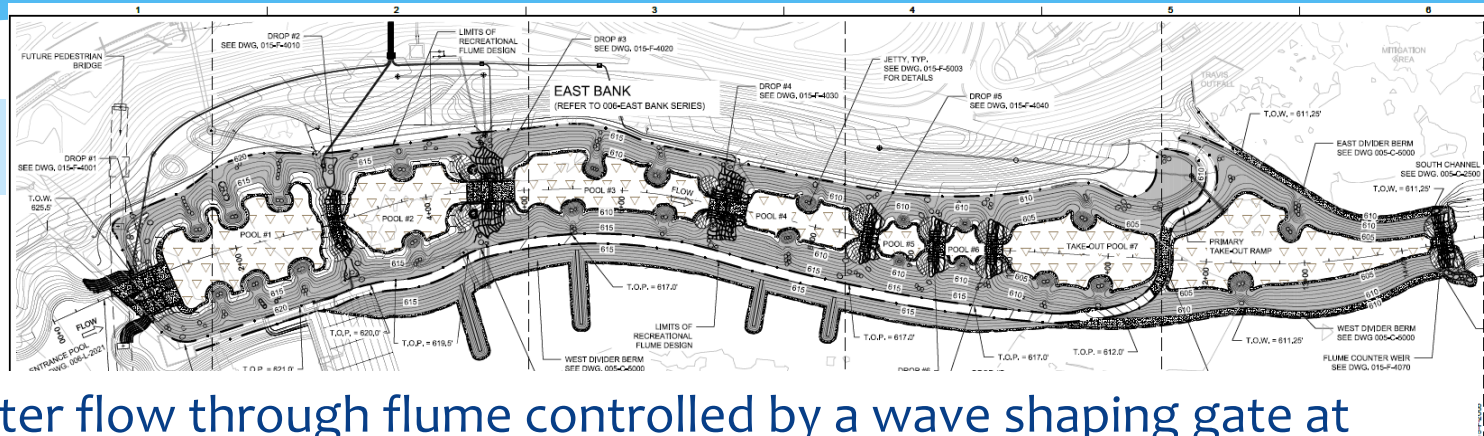
Passage of fish virtually impossible per Fish and Wildlife service

Total flow capacity all crest gates approx. 12,000 cfs to match generation flows

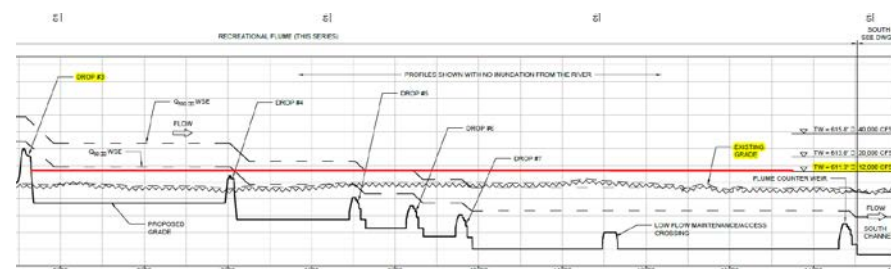
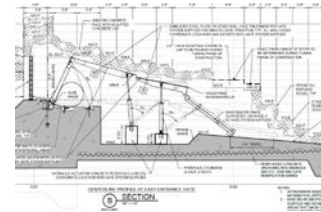
A CREST GATE (T.O. EXST APRON EL 605.00)
1/4"=1'-0"
10-S-2001



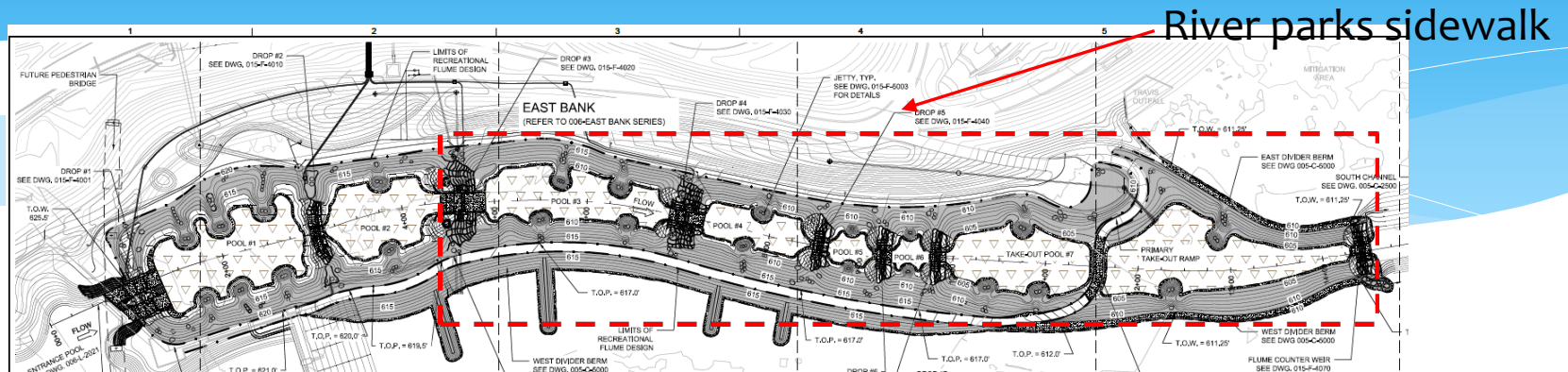
RECREATIONAL “WHITE” WATER FLUME



- * River water flow through flume controlled by a wave shaping gate at north end
- * Water turbulence (white water effects) controlled manually by a hydraulically operate gate at flume entrance point and next two weirs along with concrete blocks in bottom
- * Need 50-500 cfs of flow through flume for operability
- * If more than one Keystone generator operates or similar flows from Keystone dam gates occur, lower portions of flume will just be normal river water with no drops



RECREATIONAL “WHITE” WATER FLUME



* Safety issues:

- * Operation indefinite at this time
- * Riverparks sidewalk trail at Gathering place on east bank, high pedestrian traffic
- * No fencing to keep small children and others from flume during use
- * No policies set to limit access for purposes other than kayaks therefore flume should only flow water during controlled events or for flushing flume
- * Occasional ingestion of some polluted water nearly certain
- * Only have [cable barriers upstream](#) to keep boaters away from main and crest gates but not the flume.
- * Flume pools accessible 24/7.
- * Liability issues: **Accidents will happen**
- * **Unforeseen Maintenance: Normal water levels in river downstream of new dam during power generation will inundate flume and trap debris and fish in the various pools (dashed outline)**



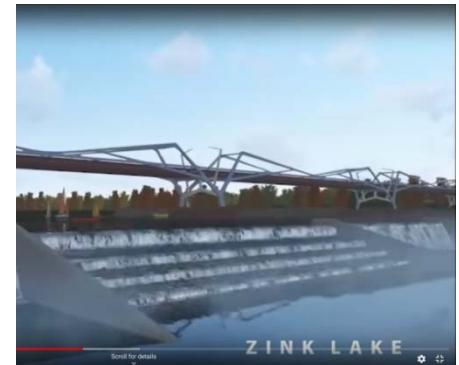
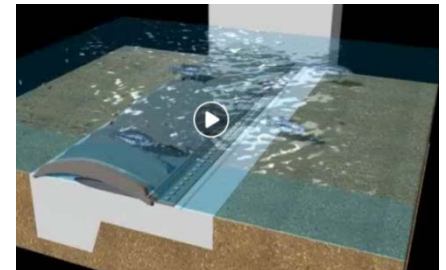
“WHITE” WATER FLUME CONCERNS

- * Other concerns:
- * Turned over to River Parks Authority after completion.
- * Who will operate the boating activities, recreational flume controls, and be liable for injuries? River Parks Authority?
 - * City can be sued due to injuries, sickness, death
- * Security, policing, and emergency response assumed by City
- * Unfenced access to flume and entire downstream side of dam by fishermen and other pedestrians
- * Maintainability
 - * Repair, maintenance, or large debris removal for a gate is only possible during low or no flow conditions
 - * Flume and other river debris clean up to be contracted out from [maintenance trust fund](#). \$10,000/yr set up for this maintenance.
 - * No access bridge over Zink Dam for routine debris removal. South Tulsa dam will have a bridge but not Zink

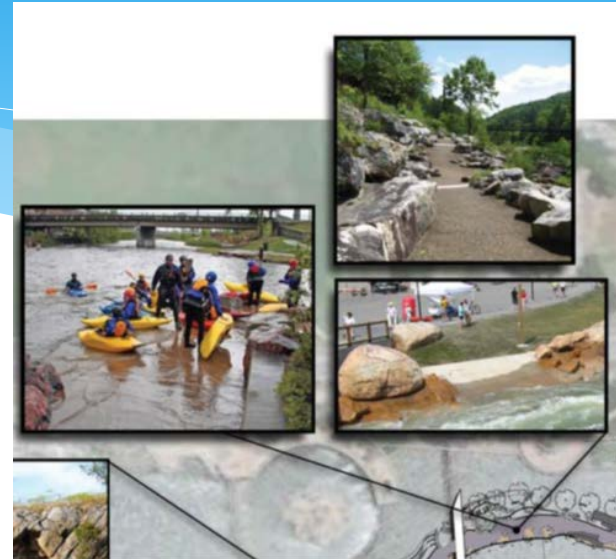


Zink Dam Operations Summary

- * Large full height gates
 - * Up all the time except when need for flood releases from Keystone
 - * Down completely for months during fish migration and spawning seasons covering a period from February through May-June depending on species
 - * No lake during those times!
 - * No other way for fish to get past new dam other than through large full height gates.
 - * The requirement to lower during this season is extensively documented in project materials and was used in justifying project (video to right shown at planning committee meetings and public presentations)
 - * Full height gate must be completely down for weeks so that high velocities will not inhibit spawning and migration of several species. Velocities 2-5 ft/sec required for passage. (J. Johnson, Fish and Wildlife)
 - * No written agreement with operating entities to abide by this requirement to lower the gates during migration and spawning
 - * If main gates are daily operated from full down to full up position unexpected wear will occur on gate seals resulting in unanticipated higher maintenance
- * Crest Gates
 - * Used to control pool levels during lower flows and to provide a visual water fall effect over stepped discharge areas.
 - * Fish passage impossible through these due to steps and higher velocities



New Zink Dam Benefits Promised



Note: These graphics and promises were those shown to citizens at public meetings and statements made by City Council, Mayor, and TV ads prior to Vision 2025 vote.

Benefits: Claimed or Actual

- * Provides a recreation lake for boating, floating, kayaking, etc.
- * Will bring Olympic and/or high level class sports to the river lake and possibly the flume
- * Will provide year round water in the river
- * Will provide economic returns that will more than pay for the construction
- * Increase in safety to people, fishermen, or boats going over existing dam due to elimination of “roller effect”
- * Will provide benefits to fish
 - * **Not impede spawning and migrations like existing dam**
 - * Will help even out flows downstream by providing minimum flows around 1,000 cfs for water quality



Benefit Analysis – Recreation Lake

- * Claim: Provides a recreation lake for sail boating, competitive rowing, rafting, tubing, etc.
 - * Water quality would preclude any events other than those that would keep people from ingesting water
 - * Water has always failed testing due to bacteria and toxins
 - * Canoes, kayaks, and small sail boats overturn regularly
 - * Triathlons are out of the question
 - * No certifications from health dept. or state that would allow for accidental ingestion of water
 - * No in depth testing for toxins has been done by State, County, or Federal entities. Only routine chemicals screened.
 - * **During public meetings voters were told the water was “cleaner than Grand Lake” and that it was safe for swimming**



Zink Lake Water Quality

- * ODEQ desired rating: Primary body contact such as swimming and accidental ingestion approved (PBCR)
- * Table 6.3-1: Arkansas River Master Plan 2005
- * River from Sand Springs to Jenks has never been approved for primary body contact (PBCR)
- * Primary issue fecal coliforms, e-coli, and enterococci
- * OKC river not suitable either and same designation as Tulsa river
- * This stretch of river never fully tested for all hazardous chemicals of concern
- * Proposed cyclic operation of new dam will exacerbate movement of underground chemicals from west bank into the river. This effect not studied.



Table 6.3-1
BUMP OWQS BENEFICIAL USES

WIBD #	FS	PS	NS/T	CBD
OK120420010010_00 <u>Sand Springs-Brkn Arrow</u>	AG, FWP, AES, EWS	NONE	<u>PBCR</u>	NONE
OK120420010080_00	FWP, AES, EWS	AG	PBCR	NONE
OK120410010130_00 <u>Keystone - Sand Springs</u>	AG, FWP, AES, <u>PBCR, EWS</u>	NONE	NONE	NONE
Assigned OWQS Beneficial Uses and Support Codes				
FWP = fish & Wildlife Propagation (Warm Water Aquatic Community)		PBCR = Primary Body Contact Recreation		
PPWS = Public and Private Water Supply		AG = Agricultural		
AES = Aesthetics		EWS = Emergency Water Supply		
FS = Fully Supporting		PS = Partially Supporting		
<u>NS/T = Not Supporting/ Threatened</u>		CBD = Cannot Be Determined		

Excerpt from USACE water quality report for water in Zink Lake Pedestrian Bridge: The bacterial criterion was exceeded in 3 of 15 data sets. Two of the exceedances occurred at the east and west bank sampling points in the month of September. The other exceedance occurred in June at the east bank station. This was the only one of all the exceedances that did not occur in August or September. The range of fecal coliform values was 9-12,000. The range of fecal streptococcus values was 9-7,000 The "FC/FS Ratio" reveals that 10.6% of the samples were contaminated by human waste while in 73% of the samples, the contamination can be attributed to animal wastes. In general, the month of September yielded the worst data at this site while the east bank station again proved to be the worst sampling point The data from this site is never quite as bad as that from the other two bridge sites.

BUMP = Beneficial Use Monitoring Program
2016 report same.



New Zink Dam Effect on Water Quality

Since:

- * New dam will be 3 ft. higher than the existing dam thus water levels will be higher in the river and more frequent than now
- * During normal operations with the gates down the water levels in the lake will be lower than with the existing dam

Result: There will be more subsurface pollution and toxins discharged into the river from the refinery (Source: OKDEQ reports from refinery)

- * Exacerbated health concerns from water contact and fish consumption

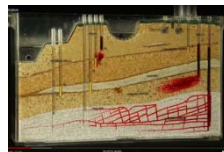
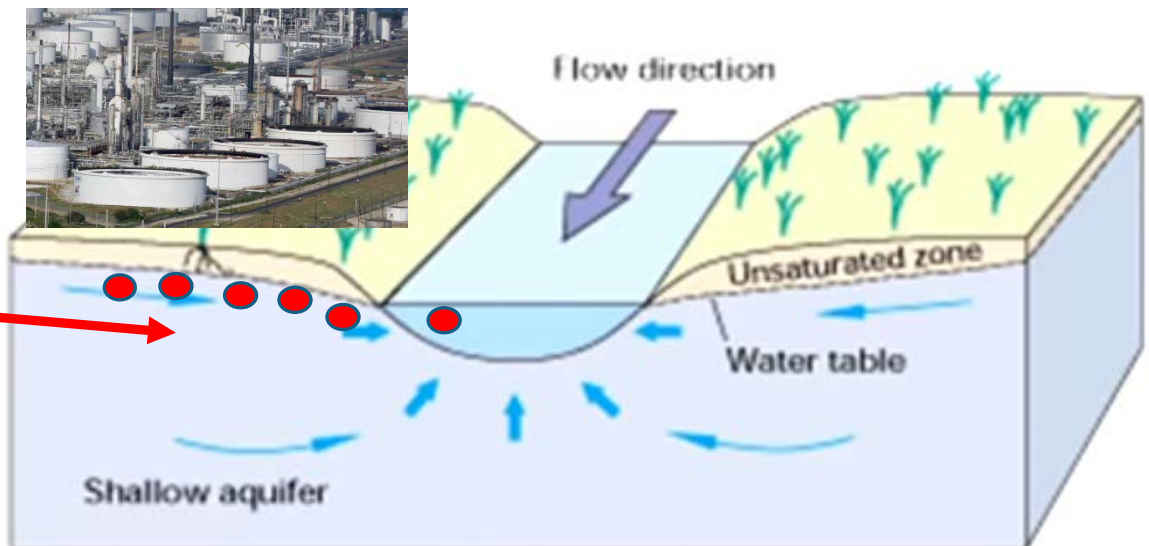
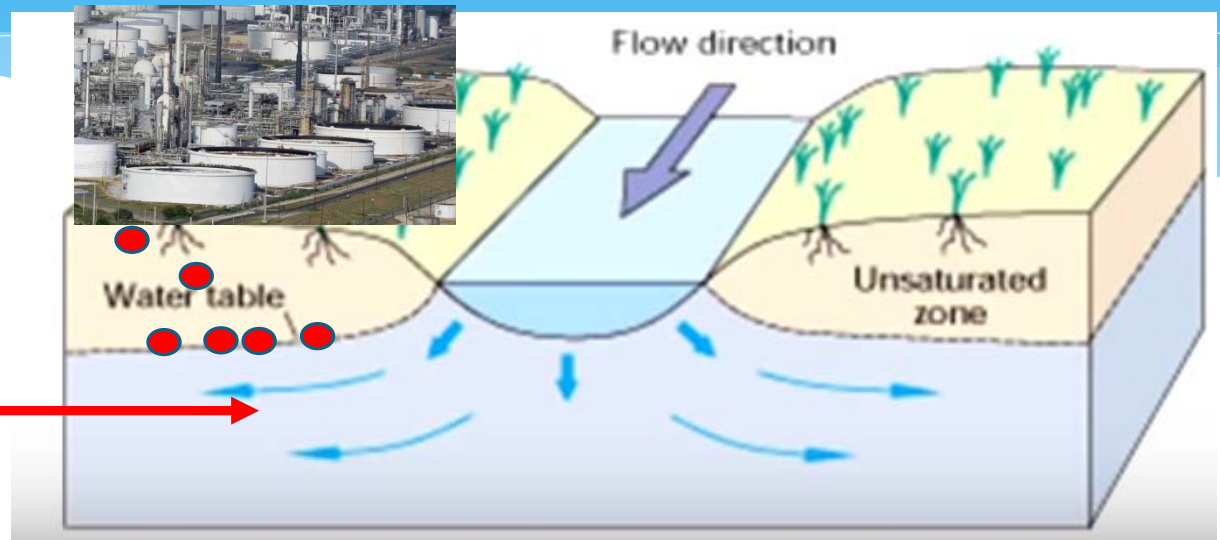
Solutions:

- * Refinery must provide long term effective measures to prevent toxin migration into the river and west bank soils. Such measures have not been realized and will not change without action
- * If refinery toxins are controlled a reduction in toxin migration would eventually occur
- * New Zink dam operations must mimic that of the short term natural river flow
 - * Long term lake pools are not created that causes more water to migrate greater distances into the refinery subsurface



Subsurface Water Movement

- * Water with pollutants will flow from the river to the refinery or vice versa depending on which water level is higher
- * Storage tanks can leak
- * When Zink Lake is full, water will flow out of the river and into subsurface of refinery
- * When Zink Lake is empty, water will flow from the refinery and into the river carrying toxins with the water
- * Confirmation: Corps of Engrs (CH2M) EIS [report](#) for Zink Lake



Benefit Analysis – High Level Competitive Rowing Venue

- * **Claim: Will bring Olympic class sports to Zink Lake and flume**

Competitive Rowing

- * Water is only about 10 ft. deep at dam and rapidly falls off in many areas just upstream due to silt and the bedrock river bottom.
- * Water depth, length, and course straightness **cannot meet national or international rowing standards** that require:
 - * Length needed: .75 to 1.3 miles
 - * Constant width needed: 355 ft.
 - * Minimum depth needed: 9.8 ft.
 - * Dredging/excavation and straightening river required and not budgeted for (\$\$ millions)
- * Competitive rowing would be possible at Sand Springs and South Tulsa dams if built or if Zink Dam was relocated south to I-44 bridge and river deepened (\$\$ millions)



Canoe Races

- * Intl. Canoe Federation also requires a straight 1500m course
 - * 6 ft deep all lanes, full length
 - * Strict water quality requirements
 - * Would require year round testing
 - * Zink Lake exceeds these standards
- b) Inland waters
- ICF canoe racing water quality requirements**
- PH between 6 and 9
 - Enterococci: not more than 200 per 100 ml(ufc/100ml)
 - E. Coli not more than 500 per 100 ml(ufc/100ml)
 - The presence of Blue-Green Algal blooms/scum (cyanobacteria) with more than 100.000 cells/ml

If the water quality test shows values out of the tolerance limits as indicated above, the competition will be cancelled, unless the ICF Medical Committee permits.



Benefit Analysis – Water Flume

- * Claim: Will bring sports to the flume

Water flume

- * Recreational flume will not meet typical standards for white water competition let alone Olympic class competitions assumed by many
 - * OKC has an Olympic class \$45 million venue of treated water and methods to change the class of the course depending on complexity of competition
 - * OKC already an Olympic training site and American Canoe Assoc. moving HQ to there
 - * Tulsa flume could only be used for low level local recreational competitions II or lower
 - * Tulsa could never compete with OKC even if water is proven to be safe due to a comparative lower level of water class
 - * Population served?
 - * Questionable
 - * (Kayak club never responded to email request for membership or count of people in Tulsa area who would use the flume on a regular basis)



Cost: Zink flume \$4 million + 5 years too late and \$40 million short to compete with OKC



Water Quantity Analysis

Claim: Will finally provide nearly year round water in the river

- * During low flow conditions in winter Dec-Jan and June-Aug water will stagnate as usual and possibly disappear during drier years
 - * Recreational flume or any other activities requiring useful water depths will be unavailable
- * Pool will visually appear exactly the same as the existing dam when full or during low flow conditions
- * Pool will be very low or non-existent during fish migration Feb-May if operated as promised
 - * Level depends solely on releases from Keystone and normal rainfall
 - * Full benefits will not be realized until Sand Springs dam is built (Corps of Engineers [report](#) Feb. 2009)



Economic Benefit Analysis

Claim: Will provide economic returns that will pay for the construction

- * Only econ study done was faulty and hidden from the public prior to voting
 - * Study based upon hyped potential benefits and not facts for Zink Lake
 - * Economic flow of money into City hinged on holding competitive rowing, boat parades, triathlon (swimming in river), stand up paddle boarding, etc.
 - * Even if study was factual, it would take longer than the economic life of the dam for tax revenues to pay for the dam at 0.3% to 0.8% sales tax revenue
- * **No factual or proven economic benefits beyond what we now see with the existing Zink Dam**



Safety Benefit Analysis

- * Claim: Increase in safety to people or boats going over existing dam due to elimination of “roller effect”
- * Possibly true.
 - * “Roller effect” will not be significant over crest gates. Full height gates roller effect still possible. ([youtube](#) video)
- * **Remaining hazards**
 - * Boats accidentally going over new gates can encounter equal or greater hazards
 - * Extreme drops over new gates of up to 11 feet over full height gates
 - * Drops of 3 feet plus serious head and body trauma going over crest gates
 - * Fishing will occur on downstream sides of dam on concrete surfaces due to [easy access from east and west banks](#)
 - * Excessive policing will be required to keep people off the downstream side of gates
 - * 24-hr security is only from video cameras. No budget for security patrols
 - * Original estimate only provided equivalent for one-half time employee to operate flume gates for recreation



Wildlife Benefit Analysis

- * Claim: Will provide benefits to fish
 - * Not impede spawning migrations like existing dam
 - * True: Only if enforced by lowering large gates and draining pool!
 - * Will help even out flows downstream of dam by providing minimum flows around 1,000 cfs for water quality
 - * True: Only when adequate water available upstream
 - * Existing dam does the same flow control and was supposedly designed to allow fish migration
 - * Construction of Sand Springs dam important to achieving minimal flows
 - * [Historical flow data](#)
- * However:
 - * “Water quality upstream will suffer during lower flows and impoundment of water during no flow” (Fish and Wildlife Service)
 - * Permanent pools during spawning season will kill stripper eggs
 - * Probable entrapment of fish in pools created in flume
 - * Existing dam was designed to accomplish the same purposes and operations have not been adhered to by City or County



Summary

Zink Dam needs to be replaced or removed

Existing dam:

- * A safety hazard
- * High maintenance from silt build up and corrosion
- * By restricting water flow, it increases flooding probability for upstream homes and Gathering Place and increases chances of levee failures
- * Historically has impeded fish migration and spawning due to not operating the dam in accordance with its designed purposes



Summary

Questions to ponder

- * Is the present design the best option to achieve meaningful benefits to Tulsa while meeting goals of public safety and wildlife support?
- * Will the existing design meet all of the expectations of and promises to citizens who voted for it?
- * Is the recreational flume that can only be used by a limited number of citizens worth the investment?
- * If the new lake will only be 3 ft. deeper than the existing lake, why is there no boating or other recreation on the lake now?
- * Why have government entities not operated the existing dam for wildlife enhancement as promised?
- * Since the existing dam could allow for wildlife migration, why weren't the existing dam gates replaced with the same type of gates as in the new design? This could have been done for the repair costs spent in 2014.
- * Other than 3-ft deeper water and reducing the flood risk to some locations upstream of dam, existing dam fulfills same basic requirements as new dam

Each citizen has to decide if this is truly worth the investment of \$127 million and if the project fulfills their expectations



Arkansas River Development

Additional Smaller Generators in Keystone Dam
“Putting More Water in the River”
An unexplored improvement in separate presentation

