
Arkansas River Corridor Projects

Illustrative Concept Plans and Montages for the Arkansas River Corridor Project.

To: Tulsa County

Copies: File

From: LandPlan Consultants, Inc.

Date: December 15, 2009

I. Introduction:

Tulsa County, as part of a master plan for the Arkansas River Corridor, is undertaking an improvement project on the Arkansas River (Carter Burgess, 2004; Guernsey and Company et al., 2005; U.S. Army Corps of Engineers [USACE], 2009). The primary goals of the project are to increase connectivity between the river and surrounding communities, improve habitat for the federally endangered interior population of the least tern, improve the function of the river system itself, and improve recreational opportunities. Key components of the proposed project include:

- 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
- Design of bank stabilization and habitat improvements in selected areas

This Technical Memorandum (TM) presents a photo inventory summary, a discussion of existing conditions, general illustrative concept plans, montages, and additional considerations, as well as estimated costs of ancillary/supporting features in conjunction with the Arkansas River Corridor project elements (see Conceptual Cost Estimate TM). This TM also identifies general items for consideration in the aesthetic design of the project components, as well as ancillary supporting features which would enhance the basic project. Although this effort identifies potential opportunities along the Arkansas River, it does not address specific design for each of the dam locations. Without a detailed preliminary design, the budget cost estimates for the proposed improvements are based upon experience and expert opinion.

General Description:

The initial project inventory was conducted with the aid of helicopter flight photography along the Arkansas River corridor for data collection. This was a useful inventory tool, providing a unique detailed visual perspective of the entire project corridor. From the helicopter flight photography, geographic information system (GIS) data, and existing aerial photographs, an onsite photographic inventory/analysis of each site was compiled.

An existing conditions diagram was prepared to better understand each dam location and how the facility might affect surrounding properties. Coordination among the project stakeholders and the project design team was important to ensure that all pertinent issues were addressed. The design team also conducted meetings with adjacent property owners to identify other important issues. The Arkansas River Corridor Vision Plan and Master Plan, as well as numerous other technical documents, were reviewed to better understand the corridor and dam locations. The design team also reviewed:

- Topographic Conditions and Natural Drainage
- Existing Natural and Man Made Site Features
- Adjacent Zoning and Land Use
- Future Planned Development
- Public Access to the River Water Edge
- Existing and Future Recreational Elements

With this information as a basis, general illustrative concept plans were developed. These plans show the location of the proposed dams and other project improvements as approved. The proposed shoreline that would be created by the impounded water was also depicted within the limits of each plan. Focusing on the specific sites, a variety of other “non-project” supporting features were also identified. These items were presented to the public as “future supporting features” if additional funding were to become available. Some of these supporting features included a light house, water taxi stops, marinas, recreational water features, park and open space elements, scenic overlooks, trails, habitat restoration areas, and educational areas.

As part of this effort, photo montage renderings of improvements were created to convey a visual image of the area around the dams. The primary goal of the montages was to generate renewed public excitement about the Arkansas River low water (also known as low-head) dam projects. Significant landmarks in the renderings help orient the public to the specific area of the improvements. All montage renderings were reviewed and approved by a stakeholder committee before the presentation to the public.

In addition to the illustrative concept plans and photo montage images provided by LandPlan, an extensive PowerPoint slide presentation was developed. The purpose of the presentation was to illustrate the team’s general concepts with images of similar corridor elements currently used in other locations around the United States. The presentation included images of low water dams, a dam gate (with corresponding video of gate operation), pedestrian bridges, whitewater venues, fish passages, river edge treatments, public access to the water, parks and open spaces, water recreation activities, and green sources of energy.

As part of this TM, budgets are provided for various developments at each of the sites within the corridor. The budgets include a variety of improvements within the project scope of the dam infrastructure project, as well as other “non-project” supporting features which could be funded by other sources.

II. Sand Springs Site:

Sand Springs Existing Aerial:



Existing Conditions & Aerial Photograph

Sand Springs Existing Conditions:

A variety of land uses surround the proposed dam location in Sand Springs, including a public park, recreation facilities, sand and gravel operations, concrete production facility, light industrial uses, steel manufacturing industry, FFA educational area, native vegetated areas, and two tributaries.

On the north bank of the Arkansas River is Sand Springs River City Park. This is a heavily used city park and a regional draw to the area. The park includes soccer fields, a BMX bike race course, softball and baseball fields, rodeo grounds, picnic areas, shelters, and a multi-use bicycle and pedestrian trail. The newly constructed Case Community Center located in the northwest corner of the park is also heavily used. The center includes meeting rooms, educational areas, a kitchen, and exercise facilities.

Franklin Creek flows through River City Park and has been channelized approximately 1,250 feet upstream of the confluence with the Arkansas River where a low water pedestrian/bicycle trail bridge crossing has been constructed. Upstream from this point, the creek is in an unimproved condition, flowing under the public access road for the main park. A substantial portion of River City Park is within the regulatory 100-year floodplain, including most of the southern portion of the park, which is within the regulatory floodway. As a result, development within the park would be limited based on regulatory compliance.

Directly north of the park, separated by a flood control levee, is the 100-acre industrial site of the Gerdau Steel Plant. Gerdau Steel has stopped operation and is looking for funding sources to bring its facility into environmental compliance. Whether the plant will be restarted at some point in the future is currently unknown.

On the south bank of the Arkansas River is a functioning sand and gravel operation with access to US Highway 51. Immediately east of the Highway 97 bridge are FFA facilities, including hog raising pens and other features. Most of the area to the east of this location is unimproved except at the mouth of Prattville Creek where bank stabilization has occurred. The bank at Prattville Creek has been stabilized to protect an AEP/PSO transmission tower.

Sand Springs Photo Inventory:

The helicopter flight photography was initially used to assess conditions of the river bank affecting the location of various project elements. Most of the river bank is very difficult to access on foot, so the helicopter photography helped find openings in the vegetation and access points to the river where site photos could be taken.

Subsequently, a photo inventory of the project area was created around the proposed dam location. Numerous photos were taken to better familiarize LandPlan with the existing site and were then evaluated for use in the photo montages. Included below are a sample of photographs from the photo inventory. For additional inventory photos, refer to the Site Reconnaissance TM.



Looking across the Arkansas River at the steel plant



US Highway 97 Bridge with downtown Tulsa skyline



Remnants of piers from old turbine with emergency access in background



Concrete plant on north bank of Arkansas River



Bank stabilization along Prattville Creek



Softball fields with steel plant in background



Mouth of Franklin Creek at River City Park



North Bank of Arkansas River

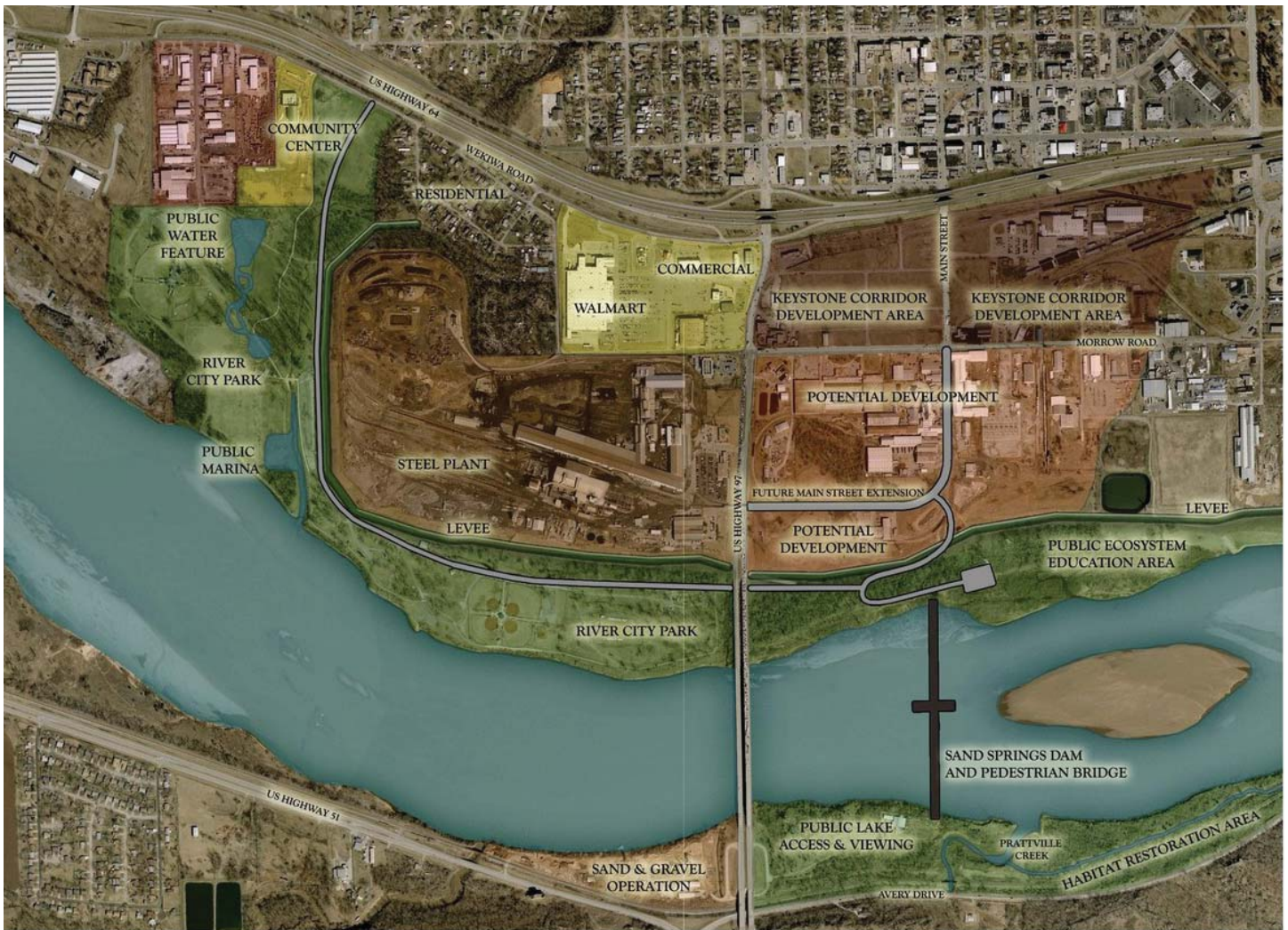


Sand and gravel operation on south bank



Image of Arkansas River looking north bank

Sand Springs General Illustrative Concept Plan:



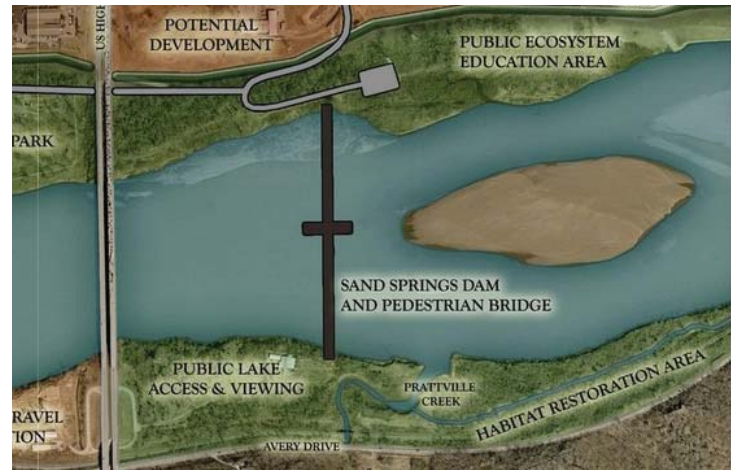
Sand Springs Illustrative Concept Plan

Based on the stakeholders' approved development program, the Sand Springs Low Water Dam General Illustrative Concept Plan was created and distributed for public viewing. The concept plan shows the location of the low water dam with pedestrian bridge, created shoreline, and other public facilities. The design team identified major elements in the plan while taking into account the public's potential concern about relocation of some existing recreation facilities. The design team coordinated with City officials and the Sand Springs Home to evaluate the various concepts.



The low water dam and pedestrian bridge is shown on the plan east of US Highway 97 in general alignment with Main Street to the north. An access road is located directly north of the proposed dam with a crossing of the levee. A parking lot is shown just east of the north dam connection to provide a construction staging area as well as a public parking area. The future extension of Main Street will connect Highway 97 north of the bridge at a signalized intersection near the primary entrance to the steel plant. This extension will allow suitable public access to the low water dam and River City Park. The potential Main Street levee crossing is shown east of US Highway 97.

Habitat restoration, ecosystem restoration, and public education areas have been identified downstream of the proposed low water dam and pedestrian bridge in an effort to maintain and enhance the natural native flora and fauna. The Prattville Creek bed (now dry) is shown to the east of the current outflow and has been identified as an ecosystem enhancement opportunity. The dry creek bed was a result of construction of the railroad immediately north of Avery Drive and local drainage modifications near the river to reduce localized flooding problems. The proposed improvements near the Prattville Creek confluence would enhance the habitat and return flow to the natural channel and ecosystem as it once existed.



The lake impounded by the low water dam would be 11 feet deep at River City Park and extend as far as Keystone Dam (approximately 11 miles). One of the stakeholder concerns, therefore, was the need to define the type of water sports/recreational activities to be promoted and authorized within the lake. After much discussion and deliberation by the design team and stakeholders, the following tentatively approved uses were identified: bank fishing, rowing and paddling, sailing, small motorized boating (motors with less than 25 horsepower), wind surfing, and similar activities.



To facilitate the proposed water activities in the lake, a public marina was identified as a “non-funded” supporting feature. The proposed marina would be located within the Franklin Creek improved channel, approximately 1,000 feet upstream from its confluence with the Arkansas River. It was proposed at this location for public safety, ease of access, and the potential “self-cleaning” advantages associated with the creek outflow.

Another “non-funded” supporting feature shown in the illustrative concept plan is a public recreation water feature. The “lazy river” tubing concept was shown immediately south of the Case Community Center within River City Park. Intended for full body contact, the feature might become a regional destination. It was envisioned that this water recreation facility would be constructed above the 100-year floodplain and use fresh water delivered to the site through an existing 18-inch water line from Shell Lake to the north. The “lazy river” concept would include an upstream reservoir with a series of slow moving waterways and channels to a lower reservoir. Water would be pumped from the lower to the upper reservoir at the flow rate needed for recreation. Inner tubes and other flotation devices could be used in this public swimming recreation facility. Interest for the recreational water feature is high, but funding for this supporting feature has not been identified.

Sand Springs Montages:



This rendering shows the south bank of the Arkansas River framing River City Park and the Gerdau Steel Plant looking north. The water elevation is shown approximately 11 feet above river bed. Some of the planned activities are shown and include fishing, rowing and paddling, sailing, small motorized boating, and wind surfing. Extensive clearing and substantial stabilization are shown along with water access and a scenic overlook.

Sand Springs Montages:



This rendering demonstrates a number of proposed marina features, such as a boat access ramp and floating docks for overnight storage of a variety of watercraft. The location of the marina was chosen for public safety, ease of access, and protection from the peak flows of the Arkansas River. The rendering also shows the extensive bank stabilization and excavation needed for the marina. New access roads would improve public vehicular traffic circulation; in addition adequate parking for the marina and other park activities would be provided.

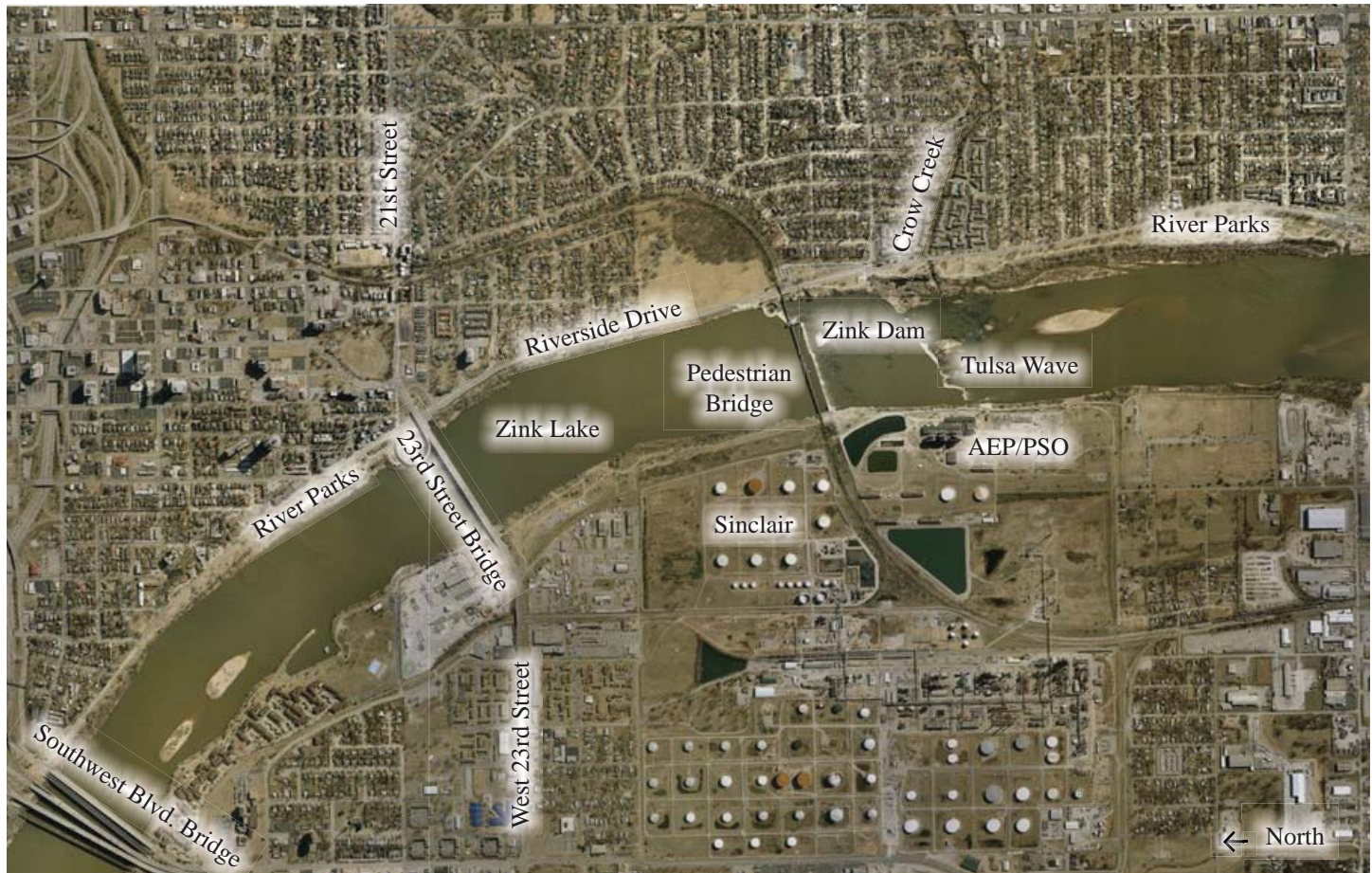
Sand Springs Montages:



This rendering illustrates the concept of the “lazy river” recreational water feature within the River City Park. The recirculated water would flow through a newly designed area to accommodate water recreation as well as other park-related activities. The foreground illustrates the upper reservoir flow into the tubing flume created by the lazy river. The water envisioned for this facility would be suitable for human contact and would be conveyed via an 18-inch water line from Shell Lake to the north.

III. Zink Lake Site:

Zink Lake Existing Aerial:



Existing Conditions & Aerial Photograph

Zink Existing Conditions:

Most of the land adjacent to the Arkansas River at this site is either owned or leased by the Tulsa River Parks Authority (RPA). Adjacent to the river banks are miles of public trails and other ancillary recreational facilities developed by the RPA since the early 1980s.

On the east bank is a newly constructed bicycle/pedestrian dual trail. Restrooms, drinking fountains, rest areas, overlooks, parking lots, and emergency boat access are a few of the amenities that service the eastern portion of the dual trail. Riverside Drive separates the River Parks from the residential uses to the east. Most residential areas are single-family with some multi-family apartments near 31st Street and north of the 23rd Street Bridge. North of the 23rd Street Bridge is the proposed location of the Blue Rose Cafe, a local restaurant venture. The east bank RPA facilities provide the primary public access to the trail and park amenities. Major parking areas are located at 17th and 31st Streets near Zink Dam. Crow Creek flows into the Arkansas River on the east bank just south of 31st Street.

The west bank trail and park are slated for an upgrade in 2010 and the features will be very similar to those on the east bank. Preliminary design is underway for the RPA West Festival Park, which will result in improved facilities for outdoor festivals. Just north of the Southwest Boulevard/11th Street Bridge (historic Route 66) is Holly Refining and multi-family apartments just south of the bridge. From that location, the RPA trail system extends south through Festival Park west of the GCC Concrete plant, connecting to the 23rd Street Bridge. South of the 23rd Street Bridge, the RPA trail extends through land previously owned by Sinclair Refinery but

recently purchased by Holly Refining. South of the refinery, the RPA trail extends through the AEP/PSO plant approximately 3,000 feet to the PSO Soccer Park. On the west bank of the river, a flood control levee extends from approximately the Southwest Blvd. Bridge to the southern end of the AEP/PSO plant. Both the Southwest Blvd. and 23rd Street Bridges include a pedestrian/bicycle trail for east/west RPA trail connection across the river.

Constructed in the 1980s, the Zink Low Water Dam extends parallel to the original Midland Valley railroad bridge across the Arkansas River and impounds water upstream of the Southwest Boulevard Bridge. The Dam is in need of retrofit due to the dangerous “Keeper” hydraulics, as noted and diagrammed in McLaughlin Whitewater Design Group’s Technical Memorandum (McLaughlin Whitewater, 2009). The Midland Valley railroad bridge is a pedestrian bridge connecting the east and west bank trails along the Arkansas River and is heavily used. The flows below the dam are very popular with anglers, who like to wade low flows at certain times of the year.

Some rip-rap bank stabilization efforts have taken place along the river above and below the Zink Dam, with various degrees of success. In areas where stabilization has not taken place, the river banks are steep and in many instances have either eroded or become covered with dense invasive vegetation, providing minimal visual or public access to the river. Public access to the river or water’s edge is primarily limited to hardened facilities such as concrete piers at Zink Lake upstream of the dam, at West Festival Park, and at the future home of the Blue Rose Landing. Boat ramps are located at the Tulsa Rowing Club in West Festival Park, below the dam on the east bank, and on the west bank just south of the 23rd Street Bridge. The latter two ramps are primarily for emergency access, but are occasionally used by anglers. Kayak access to the “Tulsa Wave” is also provided at AEP/PSO.

Zink Lake Photo Inventory:

Many photographs were taken around the proposed dam site, the whitewater/fish passage location, and the existing lake shoreline to better understand existing conditions and to evaluate locations for photo montages. Included below are photo samples of the pictorial inventory. For additional inventory photos, refer to the Site Reconnaissance TM.



East bank of Arkansas River near 23rd Street bridge



Existing dual trail along east bank of Arkansas River



Zink Dam along east bank



Bank stabilization upstream of the Zink Dam (east bank)



Existing Zink Dam and pedestrian bridge looking west



Zink Dam and "Keeper" hydraulics



"Tulsa Wave" looking east



East bank of Arkansas River with
downtown Tulsa skyline in background



Existing west bank trail looking north



East bank dual trail near 17th Street

Zink Lake General Illustrative Concept Plan:



Zink Lake Illustrative Concept Plan

Based on the stakeholder-approved development program, the Zink Low Water Dam General Illustrative Concept Plan was developed and distributed for public viewing. The plan identifies existing amenities, the enhanced Zink Dam, existing pedestrian bridge, public ecosystem restoration/education area, and proposed whitewater venue/fish passage channel on the east bank. Proposed improvements to Zink Dam include adding 3 feet to the existing dam height with full depth gates in various locations for sediment and fish passage. Below the dam, energy dissipaters would be provided to break up the dangerous “Keeper” hydraulics for public safety.

The whitewater venue and fish passage will provide a regional public river attraction within the Arkansas River Corridor Project. The venue is located along the east bank of the Arkansas River and is



approximately 1,000 feet in length. The dual purpose venue is to provide whitewater recreation and a roughened channel for fish passage. Whitewater enthusiasts will be provided access to the venue at several locations. Viewing areas will allow spectators access to each side of the channel and will provide a unique seating area showcasing whitewater events and the overall venue.

A 3-foot increase in the dam elevation will impound water an additional 1/2 mile upstream of the Southwest Boulevard Bridge. Stakeholders tentatively approved several water activities within the lake, including fishing, rowing and paddling, and other non-motorized water activities. Public use of the lake with outboard motors will be prohibited. The public will have waterfront dining opportunities with the addition of the Blue Rose Landing upstream of the 23rd Street Bridge. Stakeholders have also expressed interest in adding more waterfront restaurants as well as shopping areas along the east bank of the lake near Zink Dam close to the whitewater venue.

A public ecosystem education/restoration area has been identified downstream of the Zink Dam on the east bank below the confluence with Crow Creek. This area will provide the opportunity to introduce appropriate native plant species and provide the general public with educational opportunities to learn about the Arkansas River's unique ecosystem. Natural trails through the area will minimize human impact while providing access for nature and photography enthusiasts to observe plants and animals in their natural environment.

Zink Dam Area Montages:



This rendering is taken from the west bank near the GCC/Mid Continent Concrete plant looking toward the east bank. The image illustrates the 3-foot increase in water surface elevation and illustrates the location of the proposed Blue Rose Landing restaurant. Non-motorized watercraft are shown in this rendering, along with minor rip-rap bank stabilization and the clearing of overgrown invasive vegetation. Public access to the water is shown at the Blue Rose Landing docks, existing concrete access pier, and natural paths to the lake shore.

Zink Dam Area Montages:



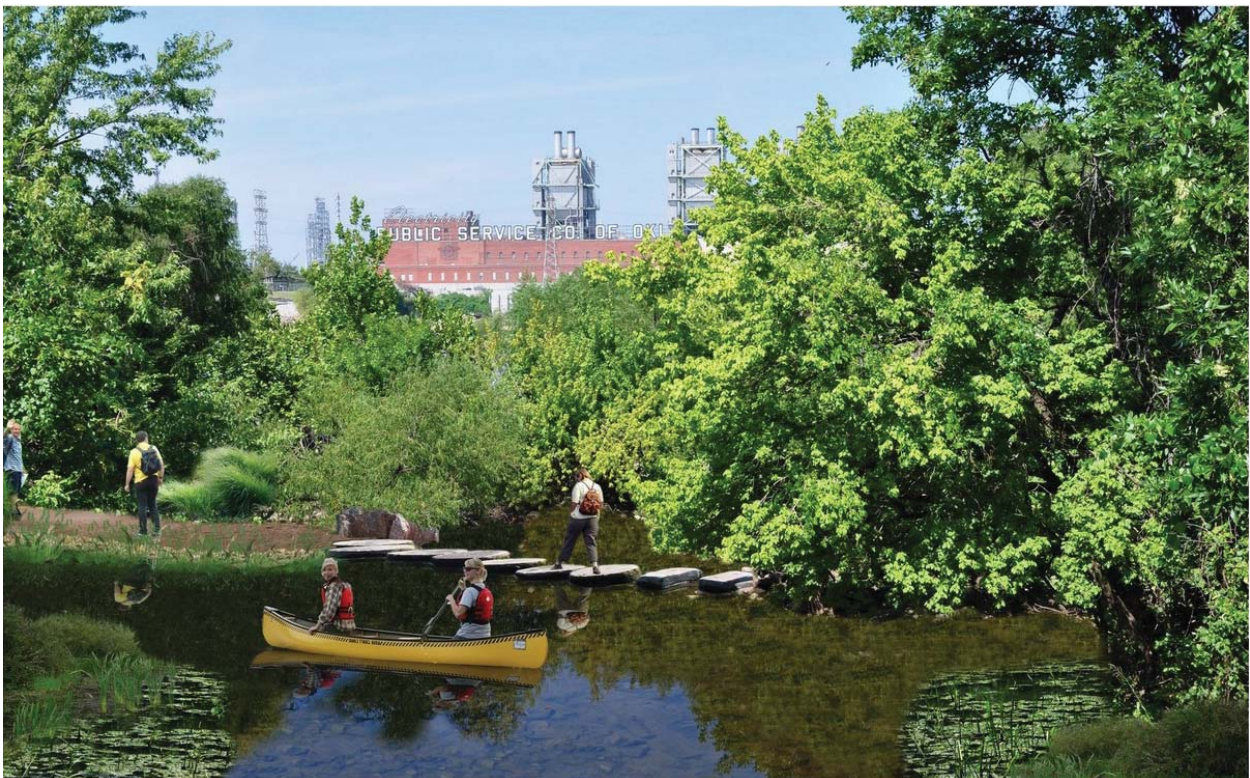
This rendering shows how anglers might use the Arkansas River after the water surface elevation is increased 3 feet. Man-made formed concrete ledges are shown to illustrate natural rock formations that might be created as part of the project. These natural looking concrete ledges would provide safe access down to the water, as well as areas to launch small watercraft into the river.

Zink Dam Area Montages:



This rendering illustrates the whitewater venue and how spectators might use the bank areas. On each side of the whitewater channel are natural looking boulder/seating areas where spectators can observe whitewater events. Energy dissipaters are shown behind dam gates to break up hazardous “Keeper” hydraulics for public safety. Fishing scenes from shore and from non-motorized boats are shown outside of the whitewater channel below the low water dam.

Zink Dam Area Montages:



This rendering illustrates how people might use the public ecosystem education area. This area will provide the opportunity to introduce appropriate native plant species and provide the public with educational opportunities to learn about the Arkansas River's unique ecosystem. Natural trails through the area will minimize human impact while providing access for nature and photography enthusiasts to observe plants and animals in their natural environment.

IV. South Tulsa/Jenks Site:

South Tulsa/Jenks Existing Aerial:



Existing Conditions & Aerial Photograph

South Tulsa/Jenks Existing Conditions:

The South Tulsa/Jenks dam site is surrounded by a number of different land uses. On the east bank of the Arkansas River near 81st Street and Riverside Drive is the Muscogee (Creek) Nation River Spirit Casino property, which includes the Mackey Sandbar adjacent to the river. Immediately south of the casino is the eagle habitat mitigation area extending along Riverside Drive to the 96th Street Bridge. RPA maintains a narrow section of land between the casino/eagle habitat and Riverside Drive for a multi-use trail. Between the 96th Street Bridge and Vensel Creek is a public park with playground and picnic facilities, restrooms, and parking. The Creek Turnpike multi-use trail spurs to the east along Vensel Creek under the Riverside Drive Bridge to the turnpike right-of-way.

The area south of Vensel Creek to 101st Street is developed commercially with restaurants, shops, and convenience stores. The RPA trail is constructed in front of this commercial development and terminates at approximately 101st Street. South of this area is undeveloped privately owned land which is envisioned for commercial development in conjunction with the proposed dam in the future.

On the west bank across from River Spirit Casino is undeveloped privately owned land. Across the river from the eagle habitat is Riverwalk Crossing Phase 2, which is currently under construction. This new development will include additional waterfront shopping and dining similar to the existing Riverwalk Crossing. This development is home to various restaurants and shops and has become a major commercial draw to the river. Amenities include an amphitheater, extensive landscaping, walking trail, benches, and outdoor dining areas.

Connected with multi-use trails south of the 96th Street Bridge is a Holiday Inn Express Hotel & Suites, which is adjacent to the Oklahoma Aquarium. The Oklahoma Aquarium is located on a 66 acre campus along the west bank of the Arkansas River with the 72,000 square foot facility built in 2002.

South of the aquarium and the Creek Turnpike Bridge is River District. The River District is envisioned as a world-class destination for shopping, dining and working. With a mile of frontage on the river, River District comprises over 330 acres of small-town, urban excitement and resort-style development in a walkable or drivable setting.

Public access to the river edge is minimal due to either dense vegetation, steep eroded banks or private property for much of the South Tulsa/Jenks corridor in and around this dam site. Joe Creek, Fred Creek, Vensel Creek and Polecat Creek are major creeks which discharge into the Arkansas River within the proposed dam area and lake impoundmen. Joe Creek is located on the east bank just south of land owned by the Muscogee (Creek) Nation with Fred Creek running through the middle of the Nation's property. Both of these creeks are hardened with concrete lined banks or other similar measures to prevent erosion. Vensel Creek is located south of the 96th Street Bridge adjacent to land maintained by RPA. An emergency rescue access concrete boat ramp is located on the north bank of the creek within River Parks. West of Riverside Drive the creek banks are lined with concrete as result of significant erosion in the past. On the west side of the river, Polecat Creek is located south of the River District property. The creek will require extensive bank stabilization due to significant erosion problems.

South Tulsa/Jenks Photo Inventory:

Steep slopes, dense vegetation, and minimal access to the proposed site created difficult conditions for capturing inventory images. Helicopter flight photography was therefore used to assist in assessing riverbank conditions that might affect the location of various project elements. Many photographs were taken around the proposed dam location for photo montages. Included below are a sample of photos from the South Tulsa/Jenks photo inventory. For additional inventory photos, please refer to Site Reconnaissance TM.



Vensel Creek looking west towards Arkansas River



Looking at west bank of Arkansas River at Oklahoma Aquarium



Debris along west bank of Arkansas River



West bank with Oral Roberts University in background



Riverwalk Crossing in Jenks



Naturally vegetated area on east bank



Dense vegetation on east bank with
Holiday Inn Express in background



Erosion along river banks looking west

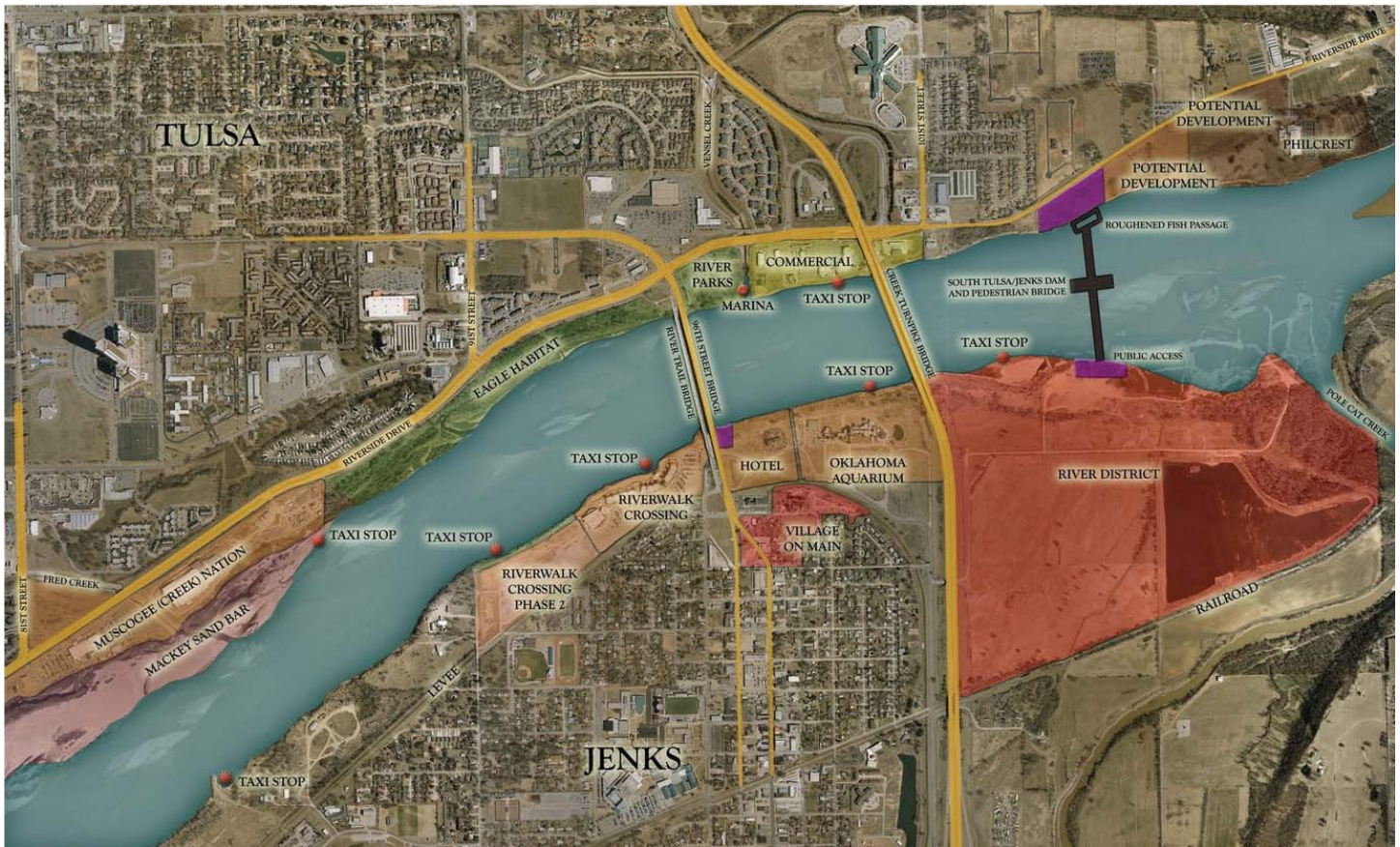


King's Landing on east bank of Arkansas River



Mackey Sandbar/River Spirit Casino (east bank)

South Tulsa/Jenks General Illustrative Concept Plan:



The concept plan identifies existing and proposed land uses, the proposed low water dam, pedestrian bridge, roughened fish passage channel, marina, and taxi stops. The proposed low water dam will increase water surface elevation as much as 8 feet, impounding water upstream beyond the Mackey Sandbar. The proposed location of the low water dam and pedestrian bridge generally aligns with 103rd Street south of the Creek Turnpike Bridge. The roughened fish passage channel is proposed on the east side of the low water dam.



The low water dam is expected to enhance economic opportunities for commercial development around the lake. The private property adjacent to the proposed low water dam is currently undeveloped. This land will provide great potential for commercial development after the construction of the dam. No developments are yet envisioned for the east side, but public access from Riverside Drive has been proposed. The River District development is planned for the west side around the dam with public access to the dam. Located upstream on the west bank, Riverwalk Crossing Phase 2 is currently under construction. The River Spirit Casino, King's Landing, and Riverwalk Crossing are existing developments which will be enhanced by the proposed low water dam and lake.

Tentatively approved public water activities for the lake include sailing, fishing, rowing and paddling, and other non-motorized activities. Public use of the lake with outboard motors will be prohibited. The South Tulsa/Jenks Lake will include private water taxis as alternate transportation to the various public and private facilities using the newly created lake. Water taxis would be convenient and Americans with Disabilities Act (ADA) accessible.

As shown on the plan, taxi stops are proposed in front of the River Spirit Casino, each phase of the Riverwalk Crossing, King's Landing upstream of the Creek Turnpike Bridge, River District, and Oklahoma Aquarium. Other taxi stops could be added as needed. A public marina/boat ramp is shown on Vensel Creek. This location provides safety from the Arkansas River's peak flows and good public access from the existing River Parks. The proposed marina and boat ramp can also be used to store water taxis.



South Tulsa/Jenks Montages:



This rendering shows a water taxi stop in front of King's Landing upstream of the Creek Turnpike Bridge on the east bank. The water surface elevation is shown approximately 8 feet higher than existing conditions. An example of a water taxi is shown in the foreground. The taxi stop would be ADA accessible and would have floating adjustable hinged docks to allow for water elevation fluctuations.

South Tulsa/Jenks Montages:



This is another example of a taxi stop at the Riverwalk Crossing upstream of the 96th Street Bridge on the west bank. The taxi stop would be sited in a small existing cove to provide some protection from Arkansas River currents. Ramps are shown to provide ADA access down to the docks. Floating adjustable hinged docks would be used to allow for water elevation fluctuations. Water activities shown include sailing, kayaking, and canoeing.

South Tulsa/Jenks Montages:



This rendering of the Vensel Creek Marina shows limited small boat storage and home for the water taxis. The marina would be used for loading and unloading recreational boats as well as emergency craft if needed. A lighthouse designating the entrance of the marina will provide a lake landmark. The boardwalk style pier shown around the perimeter of the marina would help minimize the impact on the existing ecosystem.

South Tulsa/Jenks Montages:



Another example showing how people might use the public ecosystem education area. This area will provide the opportunity to introduce appropriate native plant species and provide hardened nature trails through the area. This will help minimize human impact while providing access for nature and photography enthusiasts to observe plants and animals in their natural environment.

Other Project Considerations:

Other project elements were also presented conceptually to the public during the PowerPoint presentation. Some of these were not represented in the illustrative plans or montage renderings because they are best illustrated with photographic images of similar elements from other locations around the United States. The presentation included images of low water dams, flow control gates (with a video of gate operation), pedestrian bridges, whitewater venues, fish passage, river edge treatments, public access to the water, parks and open spaces, water recreation activities, and green sources of energy. Some are project elements which are integral to the low water dams and are included in the project. Others are considered ancillary supporting features and are not budgeted in the project. The public was informed of the category for each element.

Pedestrian Bridges



Custom suspension bridge in San Diego



RPA Crow Creek (prefab) bridge



Steel prefab bridge

Pedestrian bridges built in conjunction with the Sand Springs and South Tulsa/Jenks low water dams are integral to the overall project. The budget allows for a prefabricated type steel bridge structure similar to those being used on the RPA trails and other trails throughout the metro area. These bridges could efficiently span between gate piers and provide access for needed maintenance. In the public PowerPoint presentation, the prefab bridges were described to the general public as being a style that is within the project budget. The idea of custom bridge spans for visual prominence was also described to the public as a possibility only if additional sources of funding were identified.

Obermeyer Dam Gates

The concept of the flow control for the new Sand Springs and South Tulsa/Jenks dams, as well as the Zink dam renovation, provides management of river flows. Although several options exist, a specific gate type, Obermeyer, was illustrated with photos from structures in use at other locations. The Obermeyer dam gates are elevated and are equipped with large air bladders with the option of metal covers to protect the bladders. The public PowerPoint presentation included examples of the Obermeyer dam gates along with an animated gate operation video.



Obermeyer gate with shield cover



Gates on existing dam



Large Obermeyer gates

Bank Erosion/Stabilization

Significant bank erosion is occurring along the entire river corridor. Bank stabilization has been performed in some locations along the corridor to protect recreation elements or other infrastructure, primarily with limestone rip-rap. Below are examples of typical bank erosion and rip-rap bank stabilization. The Technical Memorandum “Arkansas River Corridor Projects – River Bank Stabilization and Concept Design” (CH2M HILL, 2010) contains additional analysis on bank stabilization.



Bank erosion near 43rd Street in Tulsa



Rip rap bank stabilization near 41st St.



Rip rap stabilization near Zink Dam

Soft Shoreline Edge Treatment (Public Access)

In natural areas where the public will be accessing the water’s edge, the access improvement points (such as ramps, trails, and steps) would be stabilized and hardened so that they would not be destroyed during peak river flows. These access point improvements might be constructed below the dams or on the lakes, but in either location they will be designed to fit into the natural setting of the corridor.



Hardened natural trail access



Hardened steps with boulders



Ramp hardened with boulders

Hard Urban Shoreline Edge Treatment (Public Access)

Where the public will be accessing the water’s edge in greater numbers, the shoreline can be hardened in a much more urban manner. As with the soft edge treatments, these access improvements would be constructed to be impervious when inundated by peak river flows. These areas would provide flexibility and versatility for various public activities at the water’s edge.



River’s edge in Pittsburgh, Pennsylvania



River’s edge in Columbus, Ohio



Urban edge at Confluence Park in Denver

Green Energy Sources

Providing green energy could be an integral component of the low water dams by using the river's natural flow to generate power. The design team investigated several options for efficient and cost-effective river energy production and found the "Water Wheel" to be an option that might be easily incorporated into the dam structures. This green energy option was found to be much more viable for the low water dams than typical water turbine generators. While the "Water Wheel" option has not been evaluated in preliminary design by the team, it will be considered in future design efforts along with other potential green energy options. Rip-rap stabilization near Zink Dam.



Water wheel prior to installation








Water wheel in Caldwell, ID



Water wheel in Gilbert, SC

Cost:

This section defines a preliminary cost associated with the various elements of the project, including ancillary supporting features which will enhance the basic project. These ancillary supporting features are not included within the project budget, but costs are identified as private or other funding sources might become available.

	Prefabricated Pedestrian Bridge \$2,500/Linear foot "Funded"	Limestone Rip Rap Bank Stabilization \$1,000/Linear foot "Funded"	
	Custom Pedestrian Bridge \$8,000/Linear foot Ancillary "Non-Funded"	Interlocking Retaining Wall \$35/Square foot Ancillary "Non-Funded"	
	Ornamental Bank Stabilization \$2,000/Linear foot Ancillary "Non-Funded"	Boat Access Ramp with Dock \$150,000 Ancillary "Non-Funded"	
	Rest Area \$75,000 Ancillary "Non-Funded"	Taxi Stop/Landing \$500,000 Ancillary "Non-Funded"	
	Plaza/Gathering Area \$2,750,000 Ancillary "Non-Funded"	Restroom \$250,000 Ancillary "Non-Funded"	
	Dual Trail \$1,750,000/Mile Ancillary "Non-Funded"	Shelter \$150,000 Ancillary Non-Funded"	
	Single Trail \$850,000/Mile Ancillary "Non-Funded"	Habitat Restoration \$10,000/acre Ancillary "Non-Funded"	
	Marina \$3,000,000 Ancillary "Non-Funded"	Energy Water Wheel \$150,000 Ancillary "Non-Funded"	
	Scenic Overlook \$150,000 Ancillary "Non-Funded"	Hardened Public Water Access (Natural) \$2,200/Linear Foot Ancillary "Non-Funded"	
	40 Car Parking w/ Recreation Amenities \$500,000 Ancillary "Non-Funded"	Hardened Public Access (Urban) \$10,000/Linear Foot Ancillary "Non-Funded"	

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