

I. Existing Conditions and Explanation of Problem:

- The approximately 100-acre watershed that is draining through Red Oak Park is comprised mostly of ¼-acre residential lots. Predevelopment land use was undeveloped pasture.
Undeveloped pasture 20% to 30% storm water runoff
Residential development 60% to 75% storm water runoff
- The average storm water velocity within the park area and the downstream property computed by the City Engineering staff in 2004 was approximately 10 feet per second.
- The soils (cherty silt loam) are highly susceptible to erosion and the stream will likely continue to erode due to the geology of the adjacent soils, the volume of storm water and the resulting high velocities. However, survey data obtained in 2009 shows minimal changes in the stream channel when compared to the data collected in 2004 which may indicate that the erosion is stabilizing somewhat.
- Several mature trees that are in close proximity to the channel are in danger of falling due to the erosion within the root systems. Approximately 15 trees were removed within the park after the January 2009 ice storm.
- The railroad ties in the upstream portion of the channel are washing downstream.
- Severe erosion has occurred around the gabion structures located in the northern area of the park. The Parks and Recreation staff has removed one gabion structure to alleviate flooding and erosion.
- Severe erosion is also occurring on the property downstream from the park. The downstream property owner removed approx. 35 dump truck loads of gravel from a manmade dam area in 2002. The same level of sedimentation returned in less than two years.

II. Where Have We Been?

- 1986 Aerial photographs show the immediate area around what is now Red Oak Park as wooded. The aerial shows the land use from Wedington Drive north to Hamestring Creek and from 51st Avenue east to Ruppel Road was undeveloped. A small subdivision existed just north of Wedington Drive, and a few chicken houses were scattered throughout this area.
- 2004 A drainage study was performed by the City Engineering staff. Recommendations included 400 feet of 60" diameter storm pipe and 600 feet of creek stabilization using native stone boulders, compacted hillside material and colored concrete on the section south of New Bridge Road. On the section north of New Bridge Road, 275 feet of 66" diameter storm pipe with a small grass-lined swale was recommended.
- 2007 Mr. Dave Evans, Region 1 Stream Team Coordinator of the Arkansas Game and Fish Commission (AGFC), provided another design to attempt to resolve the erosion problems that exist in the stream that bisects the park. A permit for this design was obtained from the U.S. Army Corps of Engineers (USACE). Proposed project included:
- ◆ Removal of the existing concrete, railroad ties and gabion structures;
 - ◆ Significant tree removal (approximately 55 to 70 trees);
 - ◆ Modification of the existing channel to create a larger area to handle runoff events which included shaping one or both banks to increase the total channel area;
 - ◆ Construction of approximately 20 pairs and 14 individual rock plunge pools within the newly shaped channel; and
 - ◆ Tree and shrub planting plan to establish vegetation.

Parks and Engineering staff began to reconsider the natural stream channel approach after the stream restoration project was completed at Gulley Park.

II. Where Have We Been? (continued)

2009 Additional drainage calculations and analyses were performed by the City Engineering staff. Recommendations include two options as shown in the drawings and as described below:

Table 1. Comparison of Design Options

	Description	Pros	Cons	Cost Estimates*
Option 1	Debris collection at south end of park; channel restoration thru park; one 24" dia. pipe and one 36" dia. pipe in park; stilling basin on north end of park; two 42" dia. pipes and plunge pool on adjacent property north of park.	<p>Design will resolve the erosion problems in the park</p> <p>Will allow for some reclamation of park land near New Bridge Road</p> <p>Significantly less tree removal within park than AGFC design</p>	<p>More expensive than Option 2</p> <p>Will not provide significant infiltration of storm water</p>	<p>In Red Oak Park - \$320,000</p> <p>Downstream - \$170,000</p> <p>Total \$490,000</p>
Option 2	Control structure with debris collection in park south of New Bridge Road; removal of existing park pavilion; no channel restoration thru park; no pipes in park; stilling basin on north end of park; two 42" dia. pipes and plunge pool on adjacent property north of park.	<p>Will allow for some infiltration of storm water in the park south of New Bridge Road</p> <p>Basically no tree removal within park</p> <p>Less expensive than Option 1 allowing for park funds to be utilized at Bryce Davis Park (new Community Park under design) or at the southernmost 2.25 acres of Red Oak Park</p>	<p>Design will not resolve the erosion problems in the park</p> <p>Existing park will be reclassified and used only as a natural greenway area</p>	<p>In Red Oak Park - \$65,000</p> <p>Downstream - \$150,000</p> <p>Total \$215,000</p>

* Cost Estimates include construction by outside contractor(s)

III. Funding Items:

- This project is funded with Sales Tax funds. The cost estimates shown in Table 1 above include construction by outside contractor(s). Cost estimates of materials only for each option are:

Option 1 (Materials Only): In Red Oak Park-\$166,000; downstream \$96,000 **Total \$262,000**
 Option 2 (Materials Only): In Red Oak Park-\$35,000; downstream \$85,000 **Total \$120,000**

- Earlier plan included partnering with the Arkansas Game and Fish Commission. The cost estimate for Materials Only was **\$99,530**. The project was financially viable because of the assistance of AGFC staff (at no cost to the City) and the use of City staff and equipment for tree removal, excavation, placement of stone and revegetation with grass. The use of volunteers for the planting of the shrubs and trees also kept the project cost low.

IV. Where Are We Going?

- Storm water detention in the upper area of the watershed is most likely not possible due to the development. Engineers from the local USDA offices performed a preliminary assessment of the site to determine the size of detention basin that would be required to contain the flow. Their preliminary assessment concluded that there is not enough area available for detention. Additionally, City Engineering Staff confirmed that detention is not an option without significant tree removal and earthwork (i.e., removal of all trees and several feet of excavation of the entire park area).
- The use of rain gardens is not likely feasible due to the fact that the City cannot require residents to install and maintain the gardens on their properties. Additionally, a comprehensive study must be performed to determine the best placement of rain gardens, etc. The bulk of the storm water flow into the channel that runs through Red Oak Park is coming from the streets and underground piping associated with the surrounding subdivisions. In addition, rain gardens are typically designed for two-year or smaller rain events, and larger storm event flows and velocities are not affected by rain gardens.
- Any work in the channel requires a Section 404 permit from the U.S. Army Corps of Engineers (USACE), and any new or different design will require a new application to the Corps.

Proposed Schedule of Events:

- Select an option based on public input.
- Complete the construction documents for the chosen design and re-submit to the USACE for approval and permitting.
- After approval and permitting by USACE, the project may be advertised for bids.
- Construction can begin after a qualified contractor is selected.

V. Questions and Comments