



# MEMORANDUM

TO: Michael Quint, Executive Director of Development Services

THROUGH: Mark Hines, PE, CFM, Director of Engineering

FROM: Danny Still, PE, CFM, Drainage Engineer

DATE: September 12, 2016

SUBJECT: Creek Erosion through the Westwood Park Addition

---

## SUMMARY:

Several residents of the Westwood Park Addition have come together to request that the City address on-going erosion of the natural drainage feature running through their neighborhood. This memo describes the situation and presents potential mitigation options.

## BACKGROUND:

There exists an unnamed tributary to Jean's Creek running through the Westwood Park Addition in McKinney that is experiencing erosion from stormwater runoff. This tributary is located within drainage easements on private residential properties between Westpark Drive South and Poppy Lane. Runoff reaches this tributary, or ravine, from a storm sewer outfall near Rockhill Road then flows through backyards of residential properties between Westpark Drive South and Poppy Lane. The ravine is approximately 900' in length and varies in depth from 6' to 14'. Erosion is causing tree roots to be exposed and threatening fences and other backyard improvements. One tree fell in June narrowly missing a home.

Historically, approximately 60 acres drained through this ravine to Jean's Creek. Development of this area began with the original Westwood Park addition in 1966. The remainder of the Westwood Park addition and another nearby subdivision called Raintree Estates were both built in 1979. Rockhill Road was improved in 1981. The various developments included curbs, gutters, and inlets draining to underground storm sewer systems leading to a 54" discharge pipe that discharges at the top of the ravine. Today the watershed is almost fully developed. It still drains approximately 60 acres.

## RECOMMENDATION:

At this time, it is the recommendation of City staff to spend approximately \$50,000 to make improvements to two City-owned structures in this ravine.

- First, make improvements to the existing stepped concrete retaining wall structure to address scour that is threatening the structure. The proposed repairs include a gabion grade control structure that will provide some erosion protection to upstream properties. (See option #2 below.)
- Second, install energy dissipators and riprap to the existing 54" storm sewer outfall at the upstream end of the ravine to reduce erosion in the vicinity of the headwall. (See option #3 below.)

These two items are recommended only because they will address known issues at City-owned structures and because they are in line with the revised drainage maintenance policy. This work could potentially be completed by 1/1/17.

## WORK PERFORMED TO DATE:

In response to resident concerns, the following work was recently completed at a cost of \$8,651:

- a. Because they were flooding hazards, the City's drainage team on 7/18/16 removed the stump portion of a fallen tree at 219 Westpark Drive South and on 7/27/16 removed woody debris that had collected behind 109 Poppy Lane.
- b. To protect the existing sanitary sewer aerial crossing behind 110 Poppy Lane, the City's drainage team on 8/4/16 added additional rock riprap near the base of the columns holding up this City-owned aerial sewer line.
- c. Based on the recommendation of the City's Landscape Architect, four trees in the creek have been removed. Three are clumped together behind 219 Westpark Drive South and one is behind 217 Westpark Drive South. These particular trees were removed because (1) erosion has caused significant root exposure and (2) these trees have the potential to damage homes if they were to fall.

## POTENTIAL MITIGATION OPTIONS:

The following options have been developed to further address the erosion concerns for this ravine:

1. **Do nothing further.** Continue to monitor this area and address future issues as they arise.
2. **Make improvements to the existing stepped concrete retaining wall structure** located behind 114 Poppy Lane and 112 Poppy Lane to address scour that is threatening the structure. The proposed repairs include a gabion grade control structure that will provide some erosion protection to upstream properties. Construction access may be difficult. However, because this structure is City-owned, maintenance is the responsibility of the City. This work will cost up to \$30,000. This work could potentially be completed by 1/1/17.

3. **Install energy dissipators and riprap** to the existing 54" storm sewer outfall at the upstream end of the ravine behind 219 Westpark Drive South and 115 Poppy Lane to reduce erosion in the vicinity of the headwall. Because the headwall is City-owned, maintenance is the responsibility of the City. This work will cost an additional \$20,000. Together with option 2, the total cost could be up to \$50,000. This work could potentially be completed by 1/1/17.

City staff recommends options 2 and 3. Options 1 through 3 are in compliance with the draft maintenance policy. Implementation of options 4 through 9 would not be in compliance with the policy and may warrant a corresponding revision. Either way, the policy does include an appeal process.

4. **Install additional gabion grade control structures** to prevent further headcutting of the ravine. Two additional grade control structures would be needed: one behind 215 Westpark Drive South and one behind 217 Westpark Drive South. Construction access may be difficult. This work could cost an additional \$40,000. Together with options 2 and 3, the total cost could be up to \$90,000. This work could potentially be completed by 2/1/17.
5. **Install gabion bank stabilization structures at the tight "hairpin" turns** in the ravine to prevent the most severe bank erosion. Four bends in the ravine would need to be protected: one behind 114 Poppy Lane, one behind 217 Westpark Drive South, one behind 215 Westpark Drive South, and one behind 213 Westpark Drive South. Some trees would be removed. Construction access may be difficult. This work could cost an additional \$400,000. Together with options 2 through 4, the total cost could be up to \$490,000. This work could potentially be completed by 4/1/17.
6. **Create a natural floodplain bench** to minimize erosion during high flow storm events. The idea for this option would be to create a more natural floodplain cross section that would better accommodate varying discharges. The lower portion of the narrow ravine would remain in its current condition. However, substantial amounts of excavation would be involved in the upper portion of the ravine to create a wider overall floodplain. Numerous trees would be removed. Fences, yard areas, and other backyard improvements would need to be relocated farther from the creek. This work could cost up to \$800,000. Together with options 2 and 3, the total cost could be up to \$850,000. This work could potentially be completed by 1/1/18.
7. **Divert higher, more erosive flows away from this ravine directly to Jean's Creek by a diversion pipe beneath Rockhill Road** to minimize future erosion. This would require a junction box, 800 linear feet of 54" RCP, an outfall structure, and partial roadway reconstruction. The total cost for this option could be up to \$900,000. This work could potentially be completed by 1/1/18.

8. **Enclose all runoff through this ravine in an underground pipe.** The ravine is approximately 900 linear feet. This would require a 54" RCP for 600' and a 60" RCP for 300'. The ravine would be backfilled above the pipe to completely remove it. Numerous trees would be removed. No further erosion would be anticipated with this option. Construction could cost up to \$900,000. Because some or all of the ravine is likely jurisdictional waters of the US, significant compensatory mitigation costs may be required as part of an Individual Permit from the US Army Corps of Engineers. Mitigation alone may cost anywhere from \$270,000 to \$2,000,000. Including mitigation costs, the total cost for this option could be up to \$2,900,000. This work could potentially be completed by 12/1/18.
  
9. **Install gabions along both channel banks and riprap on the channel bottom** to protect the entire ravine from future erosion. The ravine is approximately 900 linear feet. Numerous trees would be removed. Construction could cost up to \$1,400,000. Because some or all of the ravine is likely jurisdictional waters of the US, significant compensatory mitigation costs may be required as part of an Individual Permit from the US Army Corps of Engineers. Mitigation alone may cost anywhere from \$270,000 to \$2,000,000. Including mitigation costs and together with options 2 through 5, the total cost could be up to \$3,890,000. This work could potentially be completed by 12/1/18.

**NEXT STEPS:**

City staff will move forward with the selected options based on direction from City Council. If the recommended options are approved, City staff will prepare plans, schedules, and costs and the work will be underway as soon as possible. If time and workload permits, the work will be done by City drainage crews. If not, an outside contractor will be used. Both items could potentially be complete by 1/1/17.