



When It Rains, Plan for Damage

Full Mitigation Best Practice Story

Stephens County, Oklahoma



Duncan, OK - The year 2007 went into the history books as the sixth wettest for Duncan, Oklahoma. Residents saw five major floods with three of them greater than 100-year flood event. The flood on June 28 resulted in a sewer main failure. But quick action and Rip Rap saved the City from unsanitary contaminants, a fate that could have occurred when Tropical Storm Erin dropped 6.2 inches of intense rain on August 19.

Duncan's Public Works Director R. Scott Vaughn said, "Included in our five storms that reached the 100-year event threshold, three exceeded those limits by either rain amounts or intensity."

Following the June flood, Vaughn's inspections on July 2 revealed damage to a 27-inch sewer main line that carried an average of 2 million gallons of raw sewage per day. The inspections further revealed that a wall separating the sewer line from the adjacent creek had eroded. Consequently, health and regulatory concerns dictated immediate emergency repairs. Within 24 hours, Vaughn ordered the sewage field pumped dry, and within the following 48 hours released bid packages for repair work. Less than five days later, the City awarded the bid and construction began.

As an experienced civil engineer, Vaughn knew Rip Rap would slow the creek's flow while protecting the embankment against erosion. Rip Rap consists of stones or rocks placed like a rock wall on a creek bank in ways that resist water conveyance, especially where waterways bend. Without Rip Rap, high velocity water on the outside of a bend increases erosion and can eventually cause a rupture in the shoreline.

On July 23, nearly 20 days after noting the damage, final inspections were completed on the last of the repair work. Less than 30 days later, remnants of Tropical Storm Erin hit the City of Duncan with enough rain to exceed the 100-year flood event criterion, putting the repair project to the test. The 450 feet of 18-inch limestone Rip Rap slowed the water flow and flattened the creek, confining it within its natural shoreline. The creek walls remained stable, and the sewer line secure.

The City of Duncan spent nearly \$150,000 on the sewer repair project that included making emergency repairs and constructing the Rip Rap shoreline. The community's 22,000 residents have now gained greater protection from improved creek walls, newly installed manholes, plugged pipe holes, and repairs to the sewer main.

Vaughn summed up the effective actions saying, "Any number of things could have gone wrong in this repair, but our staff took quick, effective action and the contractors knew how to make the final fixes to last well beyond my lifetime."

Activity/Project Location

Geographical Area: **Single County in a State**

FEMA Region: **Region VI**

State: **Oklahoma**

County: **Stephens County**

City/Community: **Duncan**

Key Activity/Project Information

Sector: **Public**
Hazard Type: **Flooding**
Activity/Project Type: **Floodplain Management**
Activity/Project Start Date: **07/2007**
Activity/Project End Date: **Ongoing**
Funding Source: **Local Sources**
Funding Recipient: **Local Government**
Funding Recipient Name: **City of Duncan**

Activity/Project Economic Analysis

Cost: **\$147,343.00 (Actual)**
Non FEMA Cost:

Activity/Project Disaster Information

Mitigation Resulted From Federal
Disaster? **Yes**
Federal Disaster #: **1707 , 06/07/2007**
Federal Disaster Year: **2007**
Value Tested By Disaster? **Yes**
Tested By Federal Disaster #: **1718 , 08/24/2007**
Repetitive Loss Property? **Unknown**

Reference URLs

Reference URL 1: <http://www.floodsmart.gov>
Reference URL 2: <http://www.duncanok.org>

Main Points

- Frequent storms in 2007 resulted in five floods.
- The flood on June 28 resulted in sewer failure. Health and regulatory concerns dictated immediate emergency repairs.
- The decision was made to add rip-rap to the creek responsible for damaging the sewer line.
- Rip-rap would slow the creek's flow while protecting the embankment against erosion.
- The addition of rip-rap saved the sewer line from failing during intense rain on August 19th.



Duncan Sewer Failure - Creek wall breach



New rip-rap Creek wall.