

# Mitigation best practices



FEMA

## Mitigation Measures Protected University from Floods

Steps taken after Tropical Storm Allison kept Rice above water in Hurricane Ike



Flooding at Rice University following Tropical Storm Allison.

**HOUSTON, TX**— As a leading research institution with a distinctive commitment to undergraduate education, Rice University aspires to path-breaking research, unsurpassed teaching and contributions to the betterment of our world. It's no wonder that the institute fosters its values by protecting its property against floods. The university has invested more than \$2 million in flood mitigation measures with astounding success.

Noted for its strength in the applied sciences and its elite undergraduate division, the university has been a pioneer in the fields of nanotechnology, artificial heart research,

structural chemical analysis and space science. Unfortunately, it shares a history of flooding with other critical facilities in Houston.

In September 2008, Hurricane Ike slammed into Texas, causing extensive damage. With the deluge of rainfall that accompanied Ike, the university experienced rising water – but did not flood. Mitigation works!

“We have a great deal of surface flooding. With a strong summer thunderstorm, we would get surface flooding,” said Doug Tomlinson, assistant vice president in the Project Management and Engineering

Department at Rice. “The water would impede traffic flow.”

In 2001, Tropical Storm Allison devastated southeastern Texas. The storm dropped heavy rainfall along its path, peaking at over 40 inches in Texas. The worst flooding occurred in Houston. Downtown Houston was inundated, causing severe damage to hospitals and businesses. Rice was not spared.

“Following Tropical Storm Allison, we had a lot of surface flooding,” said Tomlinson. “We have a bunch of underground utility systems that provide services to the campus. We got some water in them, which migrated to some of the buildings. We had water come in through some basement level windows also. In some places the water got up as high as 5 feet. Street flooding was probably around 2 feet.”

While Tropical Storm Allison may have been a factor in the university's decision to apply for funding to initiate mitigation measures,

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Overland water flows to a detention pond.

poor drainage was a constant woe long before the storm.

A portion of the university's 285 acres sits on top of what is commonly known as Harris Gulley. In the 1950s two 11-by-11 box culverts were installed. Surface water was supposed to drain off the campus into Harris Gulley and find its way to the Brays Bayou. Over time this feat became less likely. With the amount and rate of rainfall, Harris Gulley would surcharge and water could simply stand on the surface.

"The projects executed following Tropical Storm Allison were multiple small projects; however, all were initiated as a result of the storm," said Tomlinson.

The university received a \$2,059,747 grant from the Federal Emergency Management Agency (FEMA) through its Hazard Mitigation Grant Program (HMGP) to fund 11 projects. HMGP pays 75 percent on approved projects that will prevent or reduce damage from storms and other natural hazards. These grants are made available for both public and private projects. With Rice University's 25 percent portion, the total funding was \$2,746,328.

Mitigation measures began in January 2002 and were completed in a year. A flood alert system, a new concrete flow channel and manual "swing logs" to the doorways of the university's central plant were installed. A submarine door was added in the gymnasium, floodwalls were erected around areaways to protect the basements in two campus buildings, and flood logs and interior door gaskets were placed in two buildings. The storm sewer system was upgraded,

improving tunnel access points, and areas at five campus buildings were elevated.

"The two biggest projects and the most expensive projects were, first, the overland flow channel to get water down to the detention pond easier and faster and, second, the installation of an underground drain line that ties into the city line," said Tomlinson.

Tomlinson continued, "The storm on Nov. 17, 2003, was the first real test of the mitigation measures. It rained, and it rained and it rained! And we thought, oh boy, this is going to be fun! But our stuff was working. It got the water off the campus!"

The flood mitigation projects on the Rice campus are tested every time there's a heavy rain; however, not every rain poses a threat.

"Following Hurricane Ike we spent a lot of time getting trees out of the roadway because flooding wasn't a problem," said Tomlinson.

"Rice Boulevard floods big time. When it floods, we get the water. Everywhere that we have an entrance, the water enters. That's because the ground slopes," said Tomlinson. "The FEMA money helped us tremendously to get our drainage up to date and it works like it is designed to do. This campus drains a lot better than it did in the past."

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Doug Tomlinson in Central Control Room.