

## **Geotex<sup>®</sup> 104F Woven Monofilament Geotextile**

### **Used in Sims Bayou Flood Control Project**

#### ***Background***

Located in the rapidly growing southern part of Houston, Texas, the Sims Bayou watershed has long represented flooding threats to the community. This \$300 million watershed improvement project became environmentally sensitive after concerns were voiced from nearby residents.

After numerous meetings and proposals, funds for the improvements to the bayou were authorized to include:



Workers excavate Sims Bayou in preparation for the project

- Enlargement and rectification of 31 km of channel to provide protection for a 25 year event
- Installation of environmental quality improvement measures
- Construction of wildlife habitat improvements
- Establishment of hiking and biking trails to connect to existing parks

#### ***Introduction***

The Galveston (Texas) District, U.S. Army Corps of Engineers (USACE), in a joint venture with the Harris County Flood Control District in Houston, was charged with designing the project, using cellular concrete mattresses and woven monofilament geotextile underlayments. The ultimate goal was to provide the city of Houston with a linear park running the length of the bayou, rather than a concrete-lined drainage ditch.

For nearly twenty years, the USACE has successfully used combinations of cellular mats and geotextile underlayments as flexible linings in high flow channels. Cellular concrete mats are a pre-manufactured assembly of concrete blocks connected into a mattress using polyester revetment cables. Once assembled, these mattresses display an open area to allow for vegetative establishment.

Early excavation of the channel exposed a stiff layer of clay over a thick silty sand layer which was transmitting subsurface water. This created an artesian condition that caused uplifting in the existing channel bottom. These conditions required the selection of a geotextile that would prevent loss of foundation beneath the hard armor system, allow seepage relief and resist future heaving of channel slopes over the life of the project.

### ***Design and Selection***

The Sims Bayou Flood Control Project posed unusual conditions for the USACE as it designed and selected the channel's lining system. The presence of stiff clays and silty sands, steep side slopes and local environmental concerns presented difficult parameters in the selection process.

Channel lining techniques such as concrete paving and rock rip-rap were introduced, but conflicted with the goals of the Sims Bayou project. Due to its urban setting, the lining system needed to prevent disturbance of highly erodible clays and silty sands during the maximum design storm event, enhance the aesthetic appearance by promoting the growth of vegetation and provide for groundwater recharge.

Design analysis pointed to these most important factors:

- Slope Stability
- Channel Bottom Stability
- Hydraulic Stability
- Filtration Selection
- Aesthetics
- Cost

The preferred system consisted of a vegetated cellular concrete mat underlain with a woven monofilament filtration geotextile. The design required the selection of a geotextile that would prevent loss of foundation soil beneath the hard armor system and allow seepage relief, resisting future uplifting of channel slopes over the life of the project. A woven monofilament geotextile was specified due to its excellent filtration characteristics and high resistance to clogging.

Geotex<sup>®</sup> 104F woven monofilament geotextile, was selected by the contractor, and approved by the USACE and Harris County Flood Control District for use in the Sims Bayou project. The geotextile act as a filter to keep the clay soil from washing into the river, as well as maintain stabilization of the slope.

## **Construction**

The specifications required phased excavation of the new channel to minimize possible slope failures due to upheaval of the clay from overburden. The surface was initially prepared by compacting the subgrade. All depressions, obstructions, debris and rills were removed to provide a smooth bank for geotextile deployment. Geotex 104F woven monofilament geotextile was supplied to the contractor in specially fabricated 5.5 meter (18 feet) wide rolls for easy installation. The geotextile was carefully installed to prevent damage to the product, while not leaving it exposed for more than seven days prior to placement of the cellular concrete mattress.



Close-up of cellular concrete mat system with Geotex 104F geotextile underlayment.

## **Conclusions**

With two of the nine total contracts of the Sims Bayou project complete, Geotex 104F woven monofilament geotextile and the cellular concrete block system are living up to their expectations. The channel lining system is stable and a healthy stand of vegetation has been established. The sedimentation levels in Sims Bayou are satisfactory in fine grained soil conditions and there appear to be no signs of channel uplifting or slope instability.

Since its first use in 1958, the ACE has preferred the use of woven monofilament geotextiles such as Geotex over medium weight nonwoven geotextiles. These two-dimensional filters allow water to pass without the risk of clogging over time. The long-term stability of the concrete mattress and underlying soils is therefore guaranteed. The Sims Bayou Flood Control Project is one of thousands that demonstrate the superior filtration characteristics of these woven geotextiles.



The Installation concrete mat system with a crane equipped with spreader bar.



Three months after installation, a healthy stand of vegetation has been established.