



PROJECT: BIRNAMWOOD DRIVE

CLIENT: HARRIS COUNTY

DATE: SPRING 2012

Birnamwood Drive

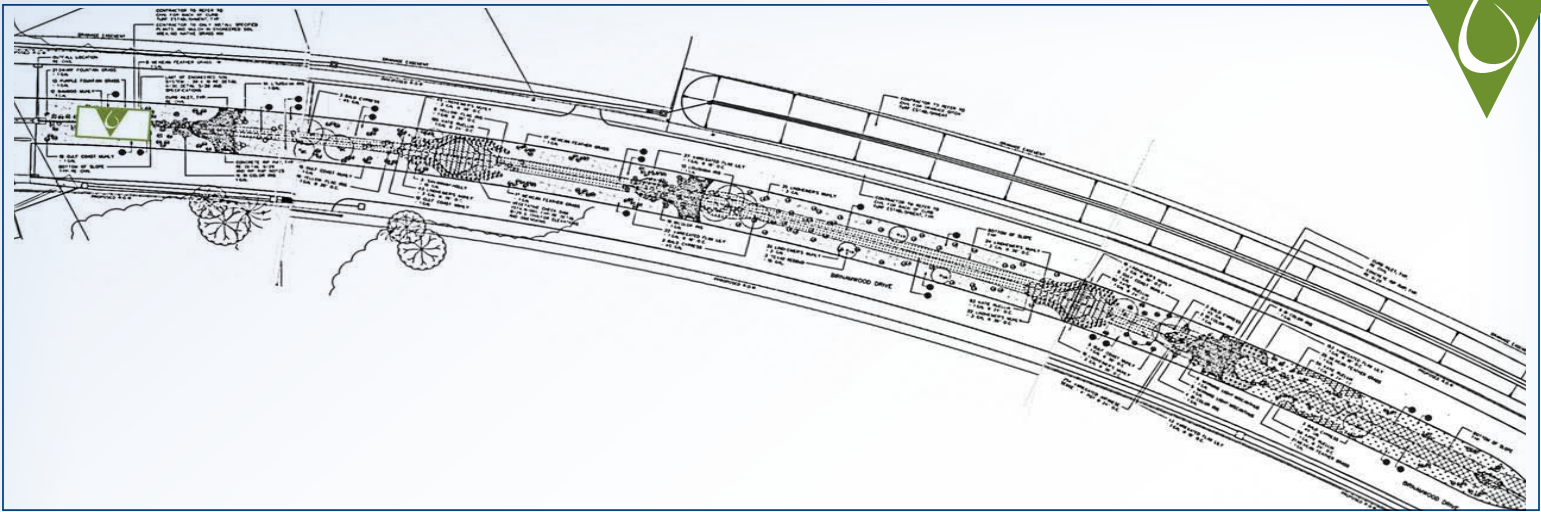
Birnamwood Drive is located in northern Harris County, east of Spring, Texas. The existing roadway, runs north/south between Fern Hill Drive and intersects Cypresswood Drive. The new section of Birnamwood Drive is approximately 0.68 miles in length and extends north to Spring Creek Drive. This project is the first roadway project in the Houston area to formally implement Low Impact Development (LID) techniques and is viewed by Harris County as a stepping stone to implementing LID as its default design approach throughout the County.

This roadway was required to deal with a very large (27 AC) drainage area, and for the sake of additional factors of safety, despite surrounding park lands, the drainage area was to be considered .95% impervious. A desire not to stray too far from standard designs for this initial project was an important consideration in this design. Safety considerations were important in a number of design decisions, including the utilization of full curbs on this roadway, limitations on ponding depth in the swale and protection of sight lines related to the vegetation. Stormwater enters the depressed center media via false-backed curb inlets.

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PLAN VIEW OF BIRNAMWOOD DRIVE: You can see in the small footprint of the FocalPoint Biofiltration System in relation to the remainder of the bioswale.

LESSONS LEARNED

During the design and consultation phase of Birnamwood Drive, it was important to consider all possible problems that might arise in the construction and maintenance of the roadway. Utilizing a dry swale as the primary conveyance feature, the design team explored the various biofiltration medias available for filtering pollutants.

Option 1: Low Flow Media

The design team first examined typical engineered biofiltration medias that have a flow rate of less than 5" per hour and are relatively inexpensive to make and supply. However, due to the low flow rate a designer is required to use almost 900 SF of bioretention surface area per acre of impervious drainage surface. This requires a lot of real estate, and extensive costs related to excavation, stone, underdrain, and media. The upkeep of these larger systems are also much more difficult due to the roadway maintenance organization's sensitivity to 'specialized' maintenance needs.

Option 2: Medium Flow Media

By using a media that flowed at a rate of approximately 20" per hour, similar to the media used in USGA golf greens, the design team felt they could drastically decrease the biofiltration bed size to 300 SF per acre treated, and as opposed to placing the media over the entire surface area of the swale, could instead place a six foot wide strip the length of the swale to account for the treatment volume needed. Although this resolved many of the issues the design team was faced with when considering low flow media, the numbers still but this design option at a higher cost than a traditional roadway design.

Option 3: High Flow Media

High performance media design which offers a flow rate of 100" per hour was the final consideration. For the needs of Birnamwood Drive, only 70 SF of infiltration bed surface area per acre treated was required. The small footprint, allowed the design team to use two small systems, one in each of the two swales in the center median of the roadway, leaving everything upstream of the systems to be designed with traditional landscaping and maintained without special considerations. Lower construction and maintenance costs, along with improved constructability made high flow media the logical choice for Birnamwood Drive.

FOCALPOINT BIOFILTRATION SYSTEM

The FocalPoint Biofiltration System is a combination of a high performance flat pipe underdrain, a bridging mesh that is completely clog proof, bridging stone, and a high performance biofiltration media that flows at a rate of over 100" per hour. What this unique combination of parts creates is a system that provides unsurpassed water quality and drainage characteristics. For the purpose of Birnamwood Drive, FocalPoint was able to do in 2,000SF what the traditional bioswale design would have require a full acre of biofiltration to accomplish.

LOW IMPACT DEVELOPMENT

Many Low Impact Development practices were designed within the Birnamwood Drive depressed center median, including native landscaping, check dams, and the FocalPoint Biofiltration Systems adjacent to each of the outfalls. The plantings were chosen based on their ability to maximize the filtration of larger debris particles, to adapt to the conditions for this area, and to minimize maintenance. The earthen check dams were designed to slow down the velocity of water flowing through the swale and extend time of concentration while the FocalPoint Biofiltration System was in place to filter contaminants out of the water prior to discharge into Spring Creek. In high rainfall events, runoff not filtered through the FocalPoint Biofiltration System is designed to bypass through a pipe directly to the outfall. The detention capacity of the center swale eliminated the need for offsite detention, an important but often uncalculated cost savings on LID-based roadways.