

The Green Highways Program An Icon of Sustainable Design

The Green Highways Partnership (GHP) is a voluntary, public and private scheme that is very unique to our nation's transportation infrastructure. The GHP practices concepts such as integrated planning, regulatory flexibility, and market-based rewards. In addition, the GHP has a wide association of environmental, industrial and governmental partners. Some of the key partners are the US EPA, US Federal Highway Administration and Maryland State Highway Administration. Moreover, the collective resources of the partner base allow Green highways to make sure that sustainability grows to be the motivating strength behind infrastructure development. Thereby, the GHP connects the resources of the marketplace to make improved and safer highways and makes the transportation industry towards a more environmentally sustainable system.

Background

The Green Highway Partnership gave birth in 2002; it was initiated by the Federal Highway Administration (FHWA). (FHWA) focused on three main goals to establish a greener highway system. They are

- *Partnerships* - Integrates public and private interests through the federal and state transportation and regulatory agencies. In addition get contractors, materials industry, trade associations, academic institutions, and non-governmental organizations associated.

- *Recognition*- Identify programs and projects that are pursuing Green highway technology. The categories are defined through a collaborative process involving key stakeholders and emphasize integrated sustainable planning, design, construction, maintenance, and materials recycling.
- *Opportunities*- To enhance the visibility of creative solutions and inspire others to pursue green choices in surface transportation infrastructure. Examples : U.S. Route 301.



Reference: <http://www.tfhrc.gov>

What Makes a Highway a Green Highway?

In general Green highways are characterized by an effort to make the project area improved than it was before. It does it through community partnering, environmental stewardship, and transportation network. Thereby it improves the safety and functionality of the highways systems. This can differ from project to project, and location to location.

The Characteristics of a Green highway is shown below by a picture of a virtual Green Highway.

A Virtual Green Highway



Reference: <http://www.greenhighways.org/Template.cfm?FrontID=5102>.

1-Bioretention Swale

2-Porous Pavement Shoulder

3-Environmentally Friendly Concrete

4-Preserved Forest Buffer

5-Restored and Storm water Wetlands

6- Stream Restoration

7-Wildlife Crossing

8-Soil Amendments

1-Bioretention Swale

Bioretention is a best management practice (BMP) developed by the Prince George's County, MD, Department of Environmental Resources (PGDER). Bioretention uses soils, woody and herbaceous plants to eliminate pollutants from storm water runoff. Figure 1, shows that runoff passes on as a sheet flow to the treatment area. The sheet flow consists of a grass buffer strip, sand bed, ponding area, organic layer (or mulch layer), planting soil, and plants. Firstly, runoff goes through a sand bed, which then slows the runoff's velocity, distributes it consistently down the extent of the ponding part, which consists of a surface organic layer and/or ground cover and the underlying planting soil.

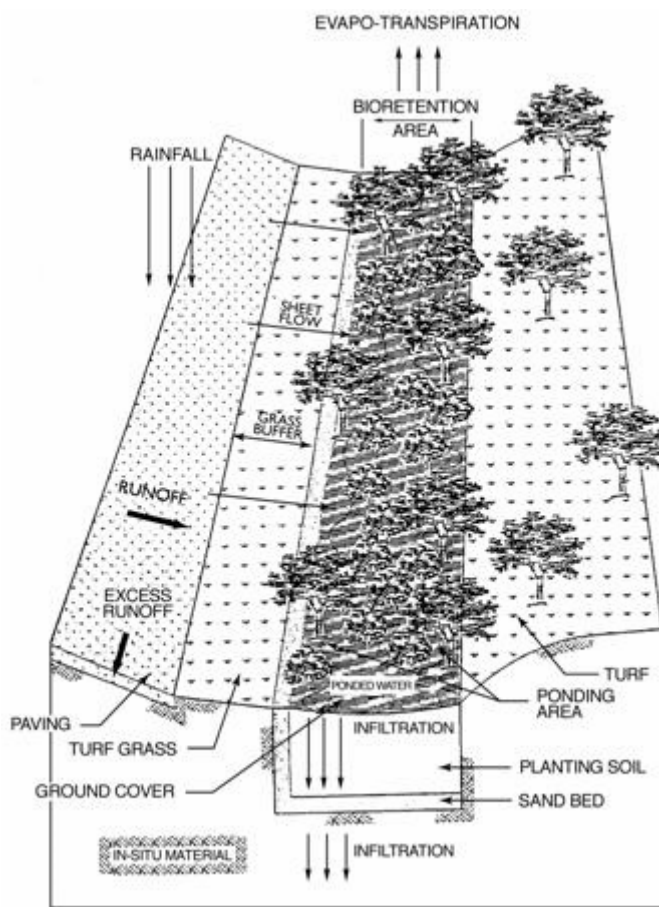
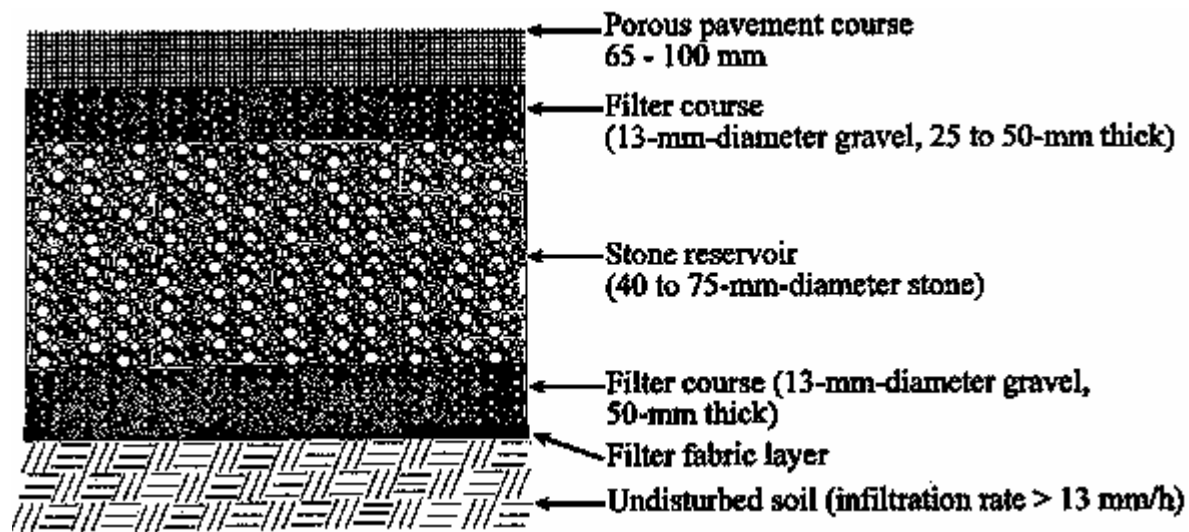


Figure 1

Reference: <http://www.epa.gov/owm/mtb/biortn.pdf>.

2-Porous Pavement Shoulder

A porous pavement is a porous pavement surface that has an underlying stone basin that for a short time stores surface runoff prior to infiltrating into the subsoil. This permeable surface trade in for the traditional pavement, which let parking lot runoff to infiltrate straight into the soil and get water quality treatment. There are a number of pavement options. They are porous asphalt, pervious concrete, and grass pavers. The grass pavers are concrete blocks joined by a synthetic fibrous grid systems with open parts designed to let grass to grow within the empty spaces.



Reference: <http://www.stormwatercenter.net/>.

3-Environmentally Friendly Concrete

The traditional concrete requires a vast amount of resources and emits large amounts of waste. Also highways constructed from traditional concrete leak toxins into the adjacent ecosystems. With Green Highways it uses recycled industrial byproducts that can significantly reduce concrete production waste and resources. For example, coal combustion products, slag cement. In addition, GHP eliminate toxic leaching by its porous concrete pavement technology. The

porous pavement increases groundwater recharge, reduces pollutants in storm water runoff, and helps alleviate flooding and contamination to streams.

4-Preserved Forest Buffer

According to Chesapeake Bay foundation riparian forest buffers are “areas of forested land adjacent to streams, rivers, marshes or shoreline that form the transition between land and water environments. Although riparian areas comprise only about 5 to 10 percent of the land in the watershed, they play an important role in maintaining the health of watersheds”. Forests are a great example of a type of riparian buffer. Riparian forest buffers perk up water quality while giving habitat for wildlife and fish. Riparian buffers control non-point source pollution. In addition, they also assist to maintain stream channels and shorelines. This helps to cut down on the impact of upland sources of pollution by trapping, filtering and converting sediments, nutrients and other chemical. Moreover, they also provide food, cover and protection to fish and other wildlife. The type, size and usefulness of riparian buffers differ based on the location, environmental management needs and landowner needs.

5- Storm water Wetlands

Storm water wetlands are also called constructed wetlands. These wetlands help catch the storm water runoff flows and also assist in pollutant removal. Wetlands are one of most effective storm water practices in terms of pollutant removal. On the other hand native wetlands can sometimes be used to treat storm water runoffs that are properly pretreated. However, storm water wetlands are designed specifically for the purpose of treating storm water runoff, and typically have less biodiversity than natural wetlands both in terms of plant and animal life. There are a few design

variations of the storm water wetland, each design can differ in the amounts of shallow and deep water, and dry storage above the wetland.

6- Stream Restoration

“Stream restoration actions can range from passive approaches that involve removal or attenuation of chronic disturbance activities to active restoration that involves intervention and installation of measures to repair damages to the structure of stream corridors “according to the (nrca.usda –Reference 5)) The stream corridors restoration practitioners have three basic approaches to restoration: They are

- *Nonintervention and undisturbed recovery* -where the stream corridor is recovering rapidly, and active restoration is needless and but yet damaging.
- *Partial intervention for assisted recovery*- where a stream corridor is trying to improve, but is doing so gradually or hesitantly.
- *Substantial intervention for managed recovery* -where recovery of preferred functions is ahead of the repair capacity of the ecosystem and lively restoration measures are needed.

7-Wildlife Crossing

There are millions of birds, reptiles, mammals, and amphibians that are killed each year by vehicles. Yearly more than 200 motorists are killed and thousands are injured in animal-vehicle collisions, according to The Wildlife Society. Besides, roadways many times cut through habitats, disrupting animal populations and ecosystems.

With the GHP they build bridges, culverts, tunnels, and barriers to redirect animals over, under, or around the highway that reduce the risk of vehicular collision. The crossings are planned to

match with natural animal movement paths. Therefore, it minimizes habitat disruption and fragmentation. Furthermore, Green Highways also built escape structures, to allow animals trapped on the highway to exit via a diversion fence.

Examples of Wildlife Crossings



Reference: <http://www.fhwa.dot.gov/environment/wildlifecrossings/>

8-Soil Amendments

Soil can best be utilized when the physical and the hydrological characteristics are restored. That soil can then be utilized for storm water management purposes. However, compared to compacted and unamended soils, the amended soils provide greater infiltration and subsurface storage. Thereby it helps to reduce a site's overall runoff volume.

Example of a Green Highway:

A great example of a Green highway is the U.S. Route 301. This will be the nation's first truly Green highway. The planning, building, and maintenance of the route will incorporate storm water management, recycled materials, and ecosystem conservation methods. The route 301 will be headed by the Maryland State Highway Administration (SHA).

The Uses and Benefits of a Green Highway Program (GHP)

- It offers net increase in the environmental functions and values of the watershed.
- Goes further than the minimum standards set by environmental laws and regulations.
- Identifies and keeps historical and cultural landmarks.
- Maps all resources in the area in the order locate avoid and protect important supply areas.
- Uses novel, natural techniques to decrease imperviousness, and wash all runoff within the project area.
- Associate local transportation procedures with local land use partnerships.
- Manage the inhabitants of invasive species and supports the growth of native species.

- Look after the hydrology of wetlands and stream channels through the restoration of natural drainage paths.
- Utilize recycled materials to remove the waste and decrease the energy required to construct the highway.
- Capitalize on the use of existing transportation infrastructure, offer multi model transportation opportunities, and supports a public transport system.
- Promote smart growth by integrating and guiding future developments and capacity building with ecological constraints.
- Decreases damage to ecological processes by promoting wildlife corridors and passages in parts identified through wildlife conservation plans.

Conclusion

The GHP program is a fairly new and eco-friendly technology. There are many benefits and innovative ideas to this program. Such as wildlife crossing which strives to conserve and protect the environment surrounding the highways. The fact that most products used to construct highways are recycled and are byproducts from coal. However, currently it costs more to build a Green highway than a regular highway. Mainly due to the novel planning costs. However, if more states adopt this program the costs will come down and we can build more a sustainable greener highway program throughout the nation.

References:

1-<http://www.tfhr.com/pubrds/06nov/07.htm>

2-<http://www.epa.gov/owm/mtb/biortn.pdf>.

3-<http://www.stormwatercenter.net/>.

4-<http://www.chesapeakebay.net/forestbuff.htm>

5-http://www.nrcs.usda.gov/technical/stream_restoration/newgra.html.

6- <http://www.fhwa.dot.gov/environment/wildlifecrossings/>.

7- <http://www.greenhighways.org/>

8- <http://www.greenhighways.org/Template.cfm?FrontID=5102>