

## **BMP T5.21 Better Site Design**

### ***Purpose and Definition***

Fundamental hydrological concepts and stormwater management concepts can be applied at the site design phase that are:

- more integrated with natural topography,
- reinforce the hydrologic cycle,
- more aesthetically pleasing, and
- often less expensive to build.

A few site planning principles help to locate development on the least sensitive portions of a site and accommodate residential land use while mitigating its impact on stormwater quality.

### ***Design Guidelines***

- **Define Development Envelope and Protected Areas** - The first step in site planning is to define the development envelope. This is done by identifying protected areas, setbacks, easements and other site features, and by consulting applicable local standards and requirements. Site features to be protected may include important existing trees, steep slopes, erosive soils, riparian areas, or wetlands.

By keeping the development envelope compact, environmental impacts can be minimized, construction costs can be reduced, and many of the site's most attractive landscape features can be retained. In some cases, economics or other factors may not allow avoidance of all sensitive areas. In these cases, care can be taken to mitigate the impacts of development through site work and other landscape treatments.

- **Minimize Directly Connected Impervious Areas** - Impervious areas directly connected to the storm drain system are the greatest contributors to urban nonpoint source pollution. Any impervious surface that drains into a catch basin or other conveyance structure is a "directly connected impervious surface." As stormwater runoff flows across parking lots, roadways, and other paved areas, the oil, sediment, metals, and other pollutants are collected and concentrated. If this runoff is collected by a drainage structure and carried directly along impervious gutters or in sealed underground pipes, it has no opportunity for filtering by plant material or infiltration into the soil. It also increases in velocity and amount, causing increased peak-flows in the winter and decreased base-flows in the summer.

A basic site design principle for stormwater management is to minimize these directly connected impervious areas. This can be done by limiting overall impervious land coverage or by infiltrating and/or dispersing runoff from these impervious areas.

- **Maximize Permeability** - Within the development envelope, many opportunities are available to maximize the permeability of new construction. These include minimizing impervious areas, paving with permeable materials, clustering buildings, and reducing the land coverage of buildings by smaller footprints. All of these strategies make more land available for infiltration and dispersion through natural vegetation.

Clustered driveways, small visitor parking bays and other strategies can also minimize the impact of transportation-related surfaces while still providing adequate access.

Once site coverage is minimized through clustering and careful planning, pavement surfaces can be selected for permeability. A patio of brick-on-sand, for example, is more permeable than a large concrete slab. Engineered soil/landscape systems are permeable ground covers suitable for a wide variety of uses. Permeable/porous pavements can be used in place of traditional concrete or asphalt pavements in many low traffic applications.

Maximizing permeability at every possible opportunity requires the integration of many small strategies. These strategies will be reflected at all levels of a project, from site planning to materials selection. In addition to the environmental and aesthetic benefits, a high-permeability site plan may allow the reduction or elimination of expensive runoff underground conveyance systems, flow control and treatment facilities, yielding significant savings in development costs.

- **Build Narrower Streets** - More than any other single element, street design has a powerful impact on stormwater quantity and quality. In residential development, streets and other transportation-related structures typically can comprise between 60 and 70 percent of the total impervious area, and, unlike rooftops, streets are almost always directly connected to the stormwater conveyance system.

The combination of large, directly connected impervious areas, together with the pollutants generated by automobiles, makes the street network a principal contributor to stormwater pollution in residential areas.

Street design is usually mandated by local municipal standards. These standards have been developed to facilitate efficient automobile traffic

and maximize parking. Most require large impervious land coverage. In recent years, new street standards have been gaining acceptance that meet the access requirements of local residential streets while reducing impervious land coverage. These standards generally create a new class of street that is narrower than the current local street standard, called an “access” street. An access street is intended only to provide access to a limited number of residences.

Because street design is the greatest factor in a residential development’s impact on stormwater quality, it is important that designers, municipalities and developers employ street standards that reduce impervious land coverage.

- **Maximize Choices for Mobility** - Given the costs of automobile use, both in land area consumed and pollutants generated, maximizing choices for mobility is a basic principle for environmentally responsible site design. By designing residential developments to promote alternatives to automobile use, a primary source of stormwater pollution can be mitigated.

Bicycle lanes and paths, secure bicycle parking at community centers and shops, direct, safe pedestrian connections, and transit facilities are all site-planning elements that maximize choices for mobility.

- **Use Drainage as a Design Element** - Unlike conveyance storm drain systems that hide water beneath the surface and work independently of surface topography, a drainage system for stormwater infiltration or dispersion can work with natural land forms and land uses to become a major design element of a site plan.

By applying stormwater management techniques early in the site plan development, the drainage system can suggest pathway alignments, optimum locations for parks and play areas, and potential building sites. In this way, the drainage system helps to generate urban form, giving the development an integral, more aesthetically pleasing relationship to the natural features of the site. Not only does the integrated site plan complement the land, it can also save on development costs by minimizing earthwork and expensive drainage features.