2.5 REDUCTION OF IMPERVIOUS COVER

Once a development or redevelopment project has undergone a site assessment to identify all the features mentioned above, and the initial planning and design phase has begun, there are several additional non-structural sustainable development tools to implement. Two of these that will be discussed in this section are: reduce total impervious cover and disconnect impervious surfaces.

Methods of reducing total impervious cover include reducing the total square feet of rooftops, parking lots, roadways, sidewalks and other surfaces that do not allow rainfall to infiltrate into the soil. This reduces the volume of stormwater runoff, increases groundwater recharge, and reduces pollutant loadings generated from a site.

Another non-structural sustainable development tool is disconnection of hard surfaces. However, the degree to which this is true is a function of several factors, such as soil type, rainfall intensity, flow path and the amount of connected impervious cover, among others. Thus, the effectiveness of disconnection practices – directing gutter downspouts into vegetated areas or disconnecting pavement – can be difficult to quantify. Therefore, many municipalities may not give any credit for these types of activities, even though there is obviously some benefit. The following section describes techniques to reduce overall impervious cover and methods to disconnect existing or proposed impervious areas to maximize the benefit of sustainable development.

2.5.1. STREETS

The first step in achieving a reduction in impervious cover for streets is examining street lengths and widths. The use of alternative road layouts that reduce the total linear length of roadways can significantly reduce overall imperviousness of a development site. Site designers are encouraged to analyze different site and roadway layouts to see if they can reduce overall street length. Streets should be designed for the minimum required pavement width needed to support travel lanes, on-street parking, and emergency access. Several design options exist to reduce the total length and width of streets, including:

- One-way single-lane loop roads can reduce the width of lower traffic streets;
- On-street parking can be reduced to one lane or eliminated on local access roads with less than 200 average daily trips (ADT), and on short cul-de-sac streets;
- Reducing side yard setbacks and using narrower frontages can reduce total street length, which is especially important in Conservation Designs (Section 3.3);
- Emphasizing grid patterns for roadways;
- Eliminating dead ends and cul-de-sacs; and
- Designing/building narrower, neighborhood-scale streets.

Another large opportunity to reduce impervious cover on streets is with alternative turnaround areas, such as cul-de-sac design. Many of these cul-de-sacs can have a radius of more than 40 feet. From a stormwater perspective, cul-de-sacs create a huge bulb of impervious cover, increasing the amount of runoff. For this reason, reducing the size of cul-de-sacs through the use of alternative turnarounds or eliminating them altogether can reduce the amount of impervious cover created at a site. Alternative design options include:

- Reducing cul-de-sacs to a 30-foot radius;
- Allowing hammerheads as an alternative cul-de-sac form;
- Creating uncurbed, below-grade pervious areas (rain gardens) in the center of the cul-de-sac to provide stormwater attenuation;

- Incorporating sustainable development features in the center of the cul-de-sac such as bioretention areas to capture and treat runoff from the circular pavement; or
- Eliminating turnarounds altogether or building loop roads and pervious islands in the cul-de-sac center.

Sufficient turnaround area is a significant factor to consider in the design of these cul-de-sacs. For example, fire trucks, service vehicles and school buses are often cited as needing large turning radii. However, some fire trucks are designed for smaller turning radii. In addition, many newer large service vehicles are designed with a tri-axle (requiring a smaller turning radius) and many school buses usually do not enter individual cul-de-sacs.

Another option for designing cul-de-sacs involves the placement of a pervious island in the center. Vehicles only travel along the outside of the cul-de-sac when turning, leaving an unused “island” of pavement in the center. These islands can be attractively landscaped and designed as bioretention areas to treat stormwater.

2.5.1. SIDEWALKS

Most codes require that sidewalks be placed on both sides of residential streets (e.g. double sidewalks) and should be constructed of impervious concrete or asphalt. Many subdivision codes also require sidewalks to be 4 to 6 feet wide and 2 to 10 feet from the street. These codes are enforced to provide sidewalks as a safety measure. Alternative sidewalk designs include:

- Placing sidewalks on only one side of the street;
- Placing sidewalks further from the street. The added space in between the street and sidewalk is an ideal location to place sustainable development practices to capture runoff from the road;
- Grading sidewalks to drain to vegetated areas between the sidewalk and the street, rather than directly to the street;
- Using alternative surfaces for sidewalks and walkways, such as pervious pavements, to reduce total impervious cover; and
- Reducing sidewalk requirements, as allowed under the Americans with Disabilities Act, if developers include alternative pedestrian networks, such as trails.

Providing a landscaped area between sidewalks and the streets will also provide substantial opportunity for stormwater infiltration.

Figure 2-3: Example of Residential narrow street and disconnected impervious cover. (Picture courtesy of Google Earth)

2.5.3. DRIVEWAYS & SETBACKS

Typical residential driveways range from 12 feet wide for one car to 20 feet wide for two. There are several alternative driveway designs developers should be allowed to implement which help reduce impervious cover and these include:

- Share driveways, which can reduce impervious cover and should be encouraged with enforceable maintenance agreements and easements;
- Narrower driveway widths and lengths when homes are positioned with a greater setback. This allows the first portion of the driveway to be a single lane, while the second portion expands to the full width of the garage;
- Alternative design such as double-tracks; and
- Alternative surfaces such as reinforced grass, or permeable paving materials.

Building and home setbacks should be shortened to reduce the amount of impervious cover from driveways and entry walks. A setback of 20 feet is more than sufficient to allow a car to park in a driveway without encroaching into the public right-of-way and reduces driveway and walk pavement by more than 30% compared with a setback of 30 feet.

Figure 2-4: Sustainable design in medium density residential development. (Chambers County, Texas)

2.5.4. PARKING

Many parking lots are built with more spaces than are actually used. In part, this is because minimum parking standards are often set to accommodate the highest hourly parking during the peak season or the highest hourly parking demand for the particular site and use. Since ordinance language provides flexibility for the designer and developer to provide additional parking spaces beyond the minimum, the result is often excessive levels of parking. Setting parking standards as both a minimum and maximum can ensure that sufficient parking is established to meet the demand without creating excess spaces.

There are many options available to reduce the overall parking footprint and site imperviousness. First steps include determining average parking demand and lot location. A lower maximum number of parking spaces can be set to accommodate most of the demand. The number of parking spaces needed may be reduced by a site's accessibility to public transportation. Additional design strategies include:

- Setting maximums for parking spaces rather than minimums;
- Minimizing stall dimensions (by reducing both the length and width of the parking stall);
- Requiring a certain number of spaces be sized for compact vehicles;
- Using structured parking (which can reduce the conversion of land to impervious cover);
- Incorporating efficient parking lanes such as utilizing one-way drive aisles with angled parking rather than the traditional two-way aisles;
- Encouraging shared parking, particularly in mixed-use areas and for non-competing parking lot users; and
- Using alternative porous surfaces.

Utilizing alternative surfaces such as porous pavers or porous concrete is an effective way to reduce the amount of runoff generated by parking lots. This can replace conventional asphalt or concrete in both new development and redevelopment projects.