Stormwater Best Management Practice

Eliminating Curbs and Gutters

Minimum Measure: Post Construction Stormwater Management in New Development and Redevelopment
Subcategory: Innovative Practices for Site Plans

Description

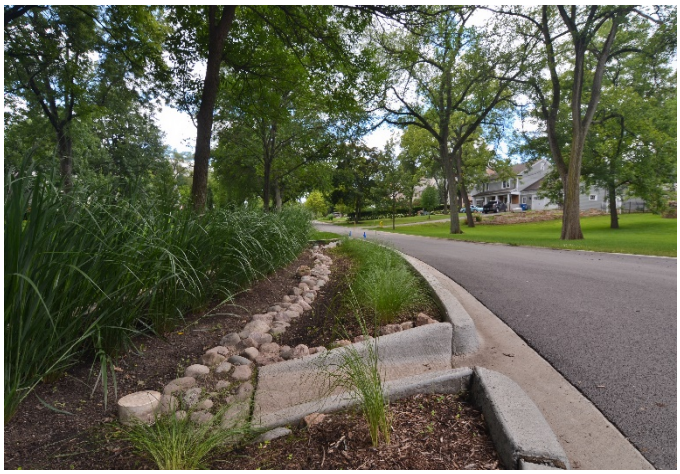
Curbs and gutters quickly convey stormwater from the street to the storm drain and, ultimately, to a local receiving water. Consequently, they remove little to no stormwater pollutants. Instead, curbs often trap deposited pollutants in between storms that are washed away during the next storm.

Green infrastructure alternatives to curbs and gutters exist that—in addition to conveying stormwater—can address some of the problems associated with curbs and gutters. These alternatives include grassed swales, vegetated bioswales, bioretention systems or rain gardens, tree boxes and permeable pavement; all of these can provide a range of additional benefits, including stormwater discharge reduction, pollutant removal and enhanced curb appeal (Harris, 2013; Ruby & Gillespie, n.d.; U.S. EPA, 2007). Often, a community can best implement these practices as part of a larger Green Streets program.

Many communities require curbs and gutters as standard elements of road sections. Traditionally, the alternative to curbs and gutters has been grassed swales. In some cases, localities would need to revise current local road and drainage regulations to promote greater use of green infrastructure alternatives in lieu of curbs and gutters.

Applicability

Alternatives to curbs and gutters vary according to site or neighborhood conditions. Alternatives that need more space, such as grassed or vegetated swales, are more suitable in low- and medium-density residential zones where the soils, slope and housing density may accommodate them. Developers can overcome space limitations, to an extent, if they implement swales in conjunction with narrower streets or alternative street designs and patterns. For applications in higher-density residential, commercial or industrial areas that require curbs for parking purposes, developers can use regularly spaced curb cuts to direct small accumulations of stormwater to compact practices such as bioretention practices or tree boxes. Examples of successful curb cut applications appear in the City of Mesa's *Low Impact Development Toolkit* as well as the California Water Boards' guidance for low impact development projects.



Curb cuts that drain to green infrastructure practices can be used as an alternative to traditional curbs and gutters.

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Siting and Design Considerations

Several factors—not just the space constraints mentioned above—determine whether eliminating curbs and gutters is appropriate and which green infrastructure alternative practices best suit a particular site.

The following fact sheets provide more detailed siting and design considerations for suitable green infrastructure alternatives to curbs and gutters:

- Grassed Swales
- Bioretention (Rain Gardens)
- Permeable Pavements
- Site Design and Planning Strategies
- Right-Sized Residential Streets

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Development density. Practices such as grassed swales are often difficult to use when development density increases above four dwelling units per acre because the number of driveway culverts increases and the swale essentially becomes a broken-pipe system. In higher-density areas, other practices such as permeable pavement or tree boxes may be more appropriate.

Contributing drainage area. Most green infrastructure practices are for small or "micro" applications, not large drainage areas. For any individual green infrastructure practice serving as an alternative to curbs and gutters, where drainage areas are mostly—if not all—impervious, the drainage area should generally be smaller than 0.5 acres. In many cases, drainage areas less than 0.1 acres may be best.

Soils. Hydrologic soil groups A and B are most suitable for practices with an infiltration component. For hydrologic soil groups C and D, engineers may need to design practices with an underdrain to minimize the ponding of water.

Limitations

A number of real and perceived limitations hinder the use of green infrastructure alternatives to curbs and gutters:

- ***Snowplow operations can be more difficult without a defined road edge.*** However, roadside swales can offer more room for snow storage at the road edge; thus, smaller snowplows may be adequate. Communities may also mark the road edge using poles to help guide snowplow operators.
- A pavement edge along a swale or pervious area can experience more cracking and structural failure, increasing maintenance costs. Developers can alleviate the potential for pavement failure at the road/grass interface by "hardening" the interface with grass pavers, permeable concrete or geo-synthetics placed beneath the grass. Other options include placing a low-rising concrete strip along the pavement edge.
- ***Local code can require the use of curbs and gutters.*** Communities can consider initiating a local site-planning round table to change some of these regulations, starting with a collective effort to review local codes to promote better site design. The following resources may be helpful in addressing and overcoming barriers to implementation:
  - *Tackling Barriers to Green Infrastructure: An Audit of Local Codes and Ordinances*
  - *Green Infrastructure Opportunities and Barriers in the Greater Los Angeles Region*
  - *Barriers and Gateways to Green Infrastructure*
  - EPA's Water Quality Scorecard

Maintenance Considerations

Curbs and gutters generally require little maintenance aside from regular street cleaning and debris removal. Communities can remove accumulated pollutants in curbs and gutters using street sweepers. Maintenance requirements for vegetated roadside practices are different and can be more demanding depending on the type of practice. Practices with grass, such as swales or open pervious areas, require mowing during the growing season, while vegetated systems such as bioretention practices require periodic trimming and debris removal. In addition, it may be necessary to remove sediment deposits from the bottom of the roadside practice if clogging becomes a concern.

Effectiveness

Replacing curbs and gutters with green infrastructure practices can decrease peak flow rates and total discharge of stormwater and can provide enhanced pollutant removal in some cases. Developers can enhance the effectiveness of these approaches by implementing them within a comprehensive Green Streets design. EPA's Green Streets handbook provides guidance on how to design and implement an effective Green Streets program. A groundbreaking project in Seattle, Washington, dubbed the Street Edge Alternatives, incorporated vegetated swales, bioretention cells and narrower streets without curbs within a single neighborhood to reduce stormwater discharge and enhance infiltration. Compared to a conventional curb and gutter system, the project reduced the volume of stormwater discharge by 99 percent and reduced peak flows to pre-developed rates. There are additional examples of successful projects that eliminated curbs and gutters in the EPA report *Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices*.

Cost Considerations[1]

The cost of curbs and gutters ranges from about $20 to $40 per linear foot (RS Means, 2019). This standalone cost is often used to justify the cost-effectiveness of this traditional approach. However, this cost does not include drainage pipes or downstream stormwater controls necessary to treat stormwater discharge that is generated by this practice. Especially for new development projects, a comprehensive comparison of all relevant costs of traditional curbs and gutters and alternative practices is necessary to provide a more accurate evaluation of cost-effectiveness. In many cases, sound design using green infrastructure can offer cost savings compared to traditional curb and gutter approaches. In the case of Seattle's Street Edge Alternatives, which incorporated bioretention and other green infrastructure alongside curbless streets, the total cost was approximately $1 million, compared to an estimated cost of $1.3 million for a conventional curb and gutter approach. Moreover, at a total project length of 660 feet, curb and gutter costs would have only been around $40,000 (3 percent of the total conventional cost), illustrating how small their direct costs are relative to total system costs. In a review of the cost of 12 green infrastructure projects compared to conventional counterparts, U.S. EPA (2007) similarly found average cost savings of 35 percent in 11 of the 12 projects.

[1] Prices updated to 2019 dollars. Inflation data obtained from the Bureau of Labor Statistics CPI Inflation Calculator Web site: https://data.bls.gov/cgi-bin/cpicalc.pl. Reference dates for the calculation are January 2001 and January 2019.

Additional Information

Additional information on related practices and the Phase II MS4 program can be found at EPA's National Menu of Best Management Practices (BMPs) for Stormwater website

References

Harris, H. (2013). *Alternatives to curb and gutter on streets: Benefits and challenges* [Fact sheet]. Kansas Local Technical Assistance Program.

RSMeans. (2019). RSMeans data from Gordian [Online data file]. 3216 Curbs, gutters, sidewalks and driveways.

Ruby, E., & Gillespie, D. (n.d.). *Low impact development (LID): A sensible approach to land development and stormwater management* [Fact sheet]. Office of Environmental Health Hazard Assessment and the California Water & Land Use Partnership.

U.S. Environmental Protection Agency (U.S. EPA). (2007). *Reducing stormwater costs through low impact development (LID) strategies and practices* (EPA 841-F-07-006).