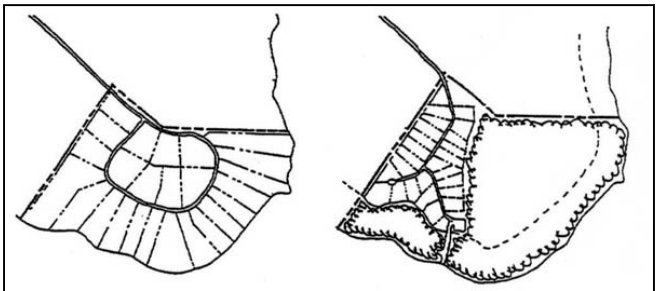
BMP 5.5.1: Cluster Uses at Each Site; Build on the Smallest Area Possible



DNREC and Brandywine Conservancy, 1997)

As density is held constant, lot size is reduced, disturbed area is decreased, and undisturbed open space is increased.

Key Design Elements

- Reduce total site disturbance/total site maintenance and increase undisturbed open space by clustering proposed uses on a total site basis through moving uses closer together (i.e., reducing lot size) and/or through stacking uses (i.e., building vertically), even as amount of use (i.e., gross density) is held constant as per existing zoning (or any other gross density determination). As density is held constant (Example A), lot size is reduced, disturbed area decreases, and undisturbed open space increases (Example B).
- Per lot values/prices may decline marginally; however, development costs also decrease.
- Cluster provisions may/may not be allowed by municipal zoning; if no zoning exists, ability to cluster may not be clear (lacking zoning, has the municipality in any way set standards for site uses, gross densities of these uses, etc.?).
- Pending answers to above questions, have lot sizes been reduced to the minimum, given proposed uses? Given existing ordinance provisions? Given other development feasibility factors such as public water/sewer vs. on-site water and sewer and others?
- Is the applicant maximizing clustering as much as possible legally?
- Is the applicant maximizing clustering functionally within municipal ordinance limits?

Potential Applications

Residential: Yes
Commercial: Yes*
Ultra Urban: Limited
Industrial: Limited
Retrofit: Yes
Highway/Road: No

*Depending on site size, constraints and other factors.

Stormwater Functions

Volume Reduction: Very High
Recharge: Very High
Peak Rate Control: Very High
Water Quality: Very High

Water Quality Functions

TSS: Preventive
TP: Preventive
NO3: Preventive

Description

See Key Design Elements.

Variations

- Clustering can be mandated by a municipality as the so-called by-right provision of the zoning district, rather than allowed as a zoning option.

- Density bonus with reduced lot size. In some cases, when lot size is reduced, gross density allowed at the site may be increased, in order to balance what might be lesser values/profitability from smaller lots (Example C). Extent of bonus density is variable, becoming larger as lot size reduction increases (net effect is to always reduce net disturbed area); density bonuses may be made to increase as total undisturbed open space provisions are increased (e.g., for every 10 percent increase in undisturbed open space being provided, density is allowed to increase by 5 percent, and so forth; Example D).

- Extreme Clustering in the form of the Growing Greener 4-Step Design Process which includes: Step 1: Map of Primary and Secondary Conservation Areas; Step 2: Map of Potential Development Area with Yield Plan, calculated as per allowed gross density; Step 3: Map of Street and Trail Connection; Step 4: Map of Lot Lines

Applications

- Residential Clustering:
    - Example A, shown in Figure 5.4-1: The kind of subdivision most frequently created in Pennsylvania is the type which blankets the development parcel with house lots and pays little attention to designing around the special features of the property. In this example, the house placement avoids the primary conservation areas, but disregards the secondary conservation features. Such a sketch can provide a useful estimate of a site's capacity to accommodate new houses at the base density allowed under zoning- and is therefore known as a "Yield Plan."

Figure 5.4-1 Conventional Development, (Source: Growing Greener: Putting Conservation Into Local Codes. Natural Lands Trust, Inc., 1997)

- Example B, shown in Figure 5.4-2: Density-neutral with Pre-existing Zoning; 18 lots; Lot Size Range: 20,000 to 40,000 sq. ft.; 50% undivided open space
- Example C, shown in Figure 5.4-3: Enhanced Conservation and Density; 24 lots; Lot Size Range: 12,000 to 24,000 sq. ft.; 60% undivided open space
- Example D, shown in Figure 5.4-4: Hamlet or Village; 36 lots; Lot Size Range: 6,000 to 12,000 sq. ft.; 70% undivided open space

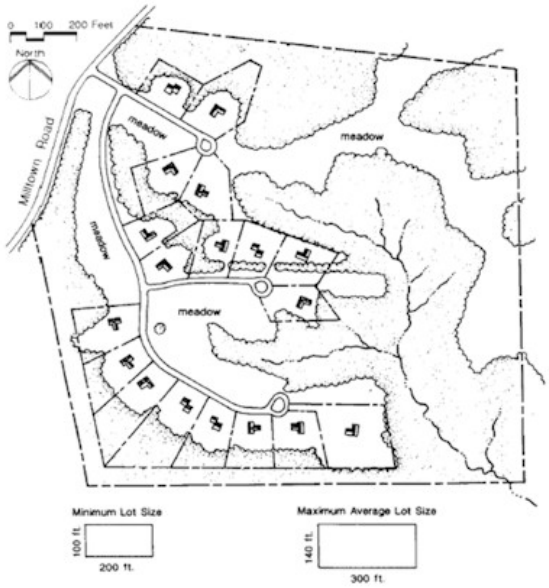


Figure 5.4-2 Clustered Development, (Source: Growing Greener: Putting Conservation Into Local Codes. Natural Lands Trust, Inc., 1997)

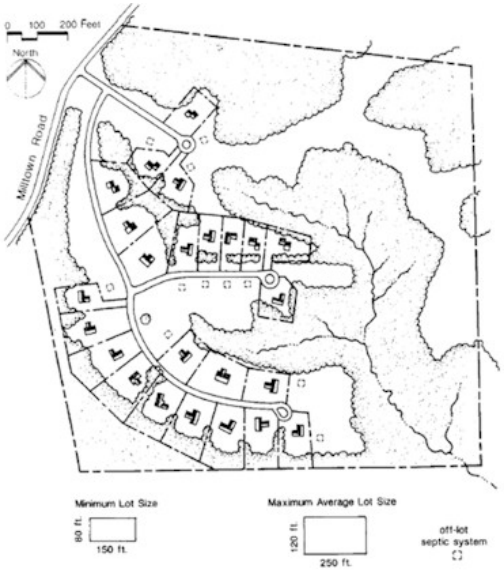


Figure 5.4-3 Modest Density Bonus, (Source: Growing Greener: Putting Conservation Into Local Codes. Natural Lands Trust, Inc., 1997)

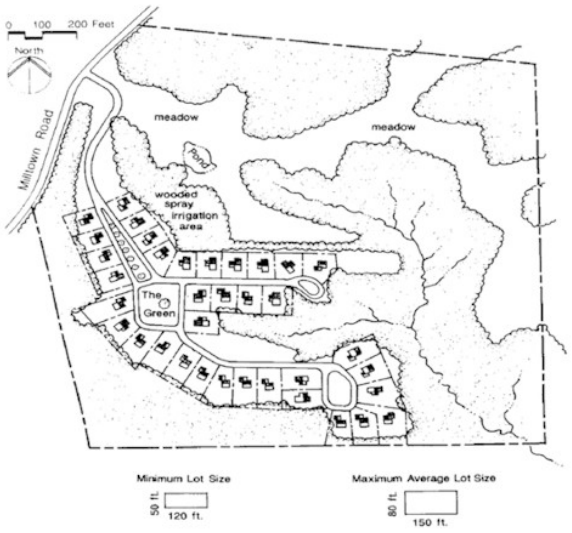


Figure 5.4-4 Hamlet or Village, (Source: Growing Greener: Putting Conservation Into Local Codes. Natural Lands Trust, Inc., 1997)

- Non-Residential Clustering:
    - Conventional Development
    - Preferred Vertical Neo-Traditional Development

Design Considerations

Objectives:

- Maximize open space, especially when it includes sensitive areas (primary and secondary).
- Maximize access to open space.
- Maximize sense of place design qualities.
- Balance infrastructure needs (sewer, water, roads, etc.)

Clustering should respond to a variety of site considerations. This BMP discussion assumes that proper and effective work has been undertaken by the municipality to determine the proper site by site land uses and the proper densities/intensities of these land uses. The question is then: *how can X amount of Y uses be best clustered at a particular site*?

Detailed Stormwater Functions

Clustering, as defined here, is self-reinforcing. Clustering reduces total impervious areas, including street lengths and total paved area and is likely to link with other BMPs, as defined in this Chapter, including reduced imperviousness, reduced setbacks, reduced areas for drives and walkways, and so forth. All of this directly translates into reduced volumes of stormwater being generated and reduced peak rates of stormwater being generated, thereby benefiting stormwater planning. Additionally, clustering translates into reduced disturbance and increased preservation of the natural landscape and natural vegetative land cover, which further translates into reduced stormwater runoff, volume and peak. To the extent that this clustering BMP also involves increased vertical development, net site roof area and impervious area is reduced, holding number of units and amount of square footage of a use constant. In all cases, density bonuses, if utilized, should be scrutinized to make sure that additional density allowed is more than balanced by additional open space being provided, including further reductions in street lengths, other impervious surfaces, other disturbed areas, and so forth.

Water quality is affected by non-point source pollutant load from impervious areas, as well as the pollutant load from the newly created maintained landscape, much of which is soluble in form (especially fertilizer-linked nitrogen forms). Clustering, alone and when combined with other Chapter 5 Non-Structural BMPs, minimizes impervious areas and the pollutant loads related to these impervious areas. Similarly, clustering minimizes pollutant loads from lawns and other mowed areas. After Chapter 5 BMPs are optimized, “unavoidable” stormwater is then directed into BMPs as set forth in Chapter 6, to be properly treated. Chemical pollution prevention accomplished through Non-Structural BMPs is especially important because Structural BMPs remain poor performers in terms of mitigating/removing soluble pollutants that are especially problematic in terms of this pervious maintained landscape. See Appendix A for additional documentation of the water quality benefits of clustering.

See Chapter 8 for volume reduction calculation work sheets, peak rate reduction calculation work sheets, and water quality mitigation work sheets.

Construction Issues

Application of this BMP clearly is required from the start of the site planning and development process. Not only must the site owner/builder/developer embrace BMP 5.5.1 Cluster Uses at Each Site from the

start of the process, the respective municipal officials must have included clustering in municipal codes and ordinances, as is the case with so many of these Chapter 5 Non-Structural BMPs. Any areas to be protected from development must be clearly marked in the field prior to the beginning of construction.

Maintenance Issues

As with all Chapter 5 BMPs, maintenance issues are of a different nature and extent then the more specific Chapter 6 Structural BMPs. Typically, the primary issue is "who takes care of the open space?" Legally, the designated open space may be conveyed to the municipality, although most municipalities prefer not to receive these open space portions, including all of the maintenance and other legal responsibilities associated with open space ownership. Ideally, open space reserves will merge to form a unified open space system, integrating important conservation areas throughout the municipality and beyond. In reality, these open space segments may exist dispersed and unconnected for a considerable number of years. For those Pennsylvania municipalities that allow for and enable creation of homeowners associations or HOA's, the HOA, may assume ownership of the open space. The HOA is usually the simplest solution to the "who takes care of the open space" question.

In contrast to some of the other long-term maintenance responsibilities of a new subdivision and/or land development (such as maintenance of streets, water and sewers, play and recreation areas, etc.), the maintenance requirements of "undisturbed open space" should be minimal. The objective here is conservation of the natural systems already present, with minimal intervention and disturbance. Nevertheless, invariably some legal responsibilities must be assumed and need to be covered.

Cost Issues

Clustering is beneficial from a cost perspective in several ways. Costs to build a single-family residential development is less when clustered than when not clustered, holding the home type and all other relevant infrastructure constant. Costs are decreased because of less land clearing and grading, less road construction (including curbing), less sidewalk construction, less lighting and street landscaping, potentially less sewer and water line construction, potentially less stormwater collection system construction, and similar savings.

Clustering also reduces post construction costs. A variety of studies from the landmark *Costs of Sprawl* study and later updates have shown that delivery of a variety of municipal services such as street maintenance, sewer and water services, and trash collection are more economical on a per person or per house basis when development is clustered. Even services such as police protection are made more efficient when residential development is clustered.

Additionally, clustering has been shown to positively affect land values. Analyses of market prices over time of conventional development in contrast with comparable residential units in clustered developments have indicated that clustered developments with their proximity to permanently protected open space increase in value at a more rapid rate than conventionally designed developments, even though clustered housing occurs on considerably smaller lots than the conventional residences.

Specifications

Clustering is not a new concept and has been defined, discussed, and evaluated in many different texts, reports, references, sources, as set forth below.

References

Arendt, Randall. Fall, 1991. "Cluster Development, A Profitable Way to Some Open Space." In *Land Development*.

Arendt, Randall. 1994. *Rural by Design*. Washington D.C.: Planners Press.

Brandywine Conservancy, Environmental Management Center. 2003. *Transfer of Development Rights: A Flexible Option for Redirecting Growth in Pennsylvania*. Chadds Ford, PA.

Chesapeake Bay Program and Redman/Johnston Associates. 1997. *Beyond Sprawl: Land Management Techniques to Protect the Chesapeake Bay, A Handbook for Local Governments.*

Delaware Department of Natural Resources and Environmental Control and the Brandywine Conservancy. 1997. *Conservation Design for Stormwater Management: A Design Approach to Reduce Stormwater Impacts from Land Development.* Dover, DE

Delaware Riverkeeper. 2001. *Stormwater Runoff: Lost Resource of Community Asset?* Washington Crossing, PA

Gottsegen, Amanda Jones. 1992. *Planning for Transfer of Development Rights: A Handbook for New Jersey Municipalities*. Burlington County Board of Chosen Freeholders.

Greenbelt Alliance. 1996. "Factsheet: Urban Growth Boundaries."

Hampton Roads Planning District Commission, 1992. *Vegetative Practices for Nonpoint Source Pollution Prevention Management*.

Herson-Jones, Lorraine M. 1995. *Riparian Buffer Strategies for Urban Watersheds.* Metropolitan Washington Council of Governments.

Lincoln Institute of Land Policy. 1995. *Alternatives to Sprawl.* Washington DC.

Maryland Office of Planning. 1995. *Managing Maryland's Growth: Transfer of Development Rights.*

Mauer, George. 1996. *A Better Way to Grow.* Chesapeake Bay Foundation.

National Association of Home Builders. 1982. *Cost Effective Site Planning.* Washington D.C.

Pennsylvania Environmental Council. 1992. *Guiding Growth: Building Better Communities and Protecting our Countryside, A Planning and Growth Management Handbook for Pennsylvania Municipalities. Philadelphia, PA*

Porter, Douglas R. et al. 2000. *The Practice of Sustainable Development.* The Urban Land Institute. Washington, D.C.

Report of the Pennsylvania 21st Century Commission, 1998.

Regional Plan Association and New York City Department of Environmental Protection, 1996. *Managing Watersheds: Combining Water Quality Protection and Community Planning.* New York, NY.

Schueler, Thomas R. and Heather K. Holland. 2000. *The Practice of Watershed Protection: Techniques for Protecting our Nation's Streams, Lakes, Rivers and Estuaries.* Center for watershed Protection Ellicott City, MD

Terrene Institute and the US Environmental Protection Agency. 1996. *A Watershed Approach to Urban Runoff: Handbook for Decisionmakers.* Washington DC.

US Environmental Protection Agency. 1993. *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters* 840-B-92-002.