Appendix B
Conservation Design and Low Impact Development Site Design

COUNTY-WIDE
ACT 167
STORMWATER MANAGEMENT
MODEL ORDINANCE

Appendix B: Site Design

- PA DEP now emphasizes the use of Green Infrastructure, Low Impact Development (LID), and Conservation Design (CD).

  Such practices can help address the root cause of water quality impairment by using systems and practices that mimic natural processes to: 1) infiltrate and recharge, 2) evapotranspire, and/or 3) harvest and use precipitation near where it falls to earth.

  Furthermore, such practices contribute to the restoration or maintenance of pre-development hydrology and be used to meet the pollutant load obligations of the NPDES Permit

Appendix B: Site Design

- Suggested ordinance language:

  "If methods other than green infrastructure, LID, and CD methods are proposed to achieve the volume and rate controls required under this Ordinance, the SWM Site Plan must include a detailed justification demonstrating that the use of LID, green infrastructure, and CD are not practicable."

Definitions

Conservation Design - A series of holistic land development design goals that maximize protection of key land and environmental resources, preserve significant concentrations of open space and greenways, evaluate and maintain site hydrology, and ensure flexibility in development design to meet community needs for complimentary and aesthetically pleasing development. Conservation design encompasses the following objectives: conservation/enhancement of natural resources, wildlife habitat, biodiversity corridors, and greenways (interconnected open space); minimization of environmental impact resulting from a change in land use (minimum disturbance, minimum maintenance); maintenance of a balanced water budget by making use of site characteristics and infiltration; incorporation of unique natural, scenic and historic site features into the configuration of the development; preservation of the integral characteristics of the site as viewed from adjoining roads; and reduction in maintenance required for stormwater management practices. Such objectives can be met on a site through an integrated development process that respects natural site conditions and attempts, to the maximum extent possible, to replicate or improve the natural hydrology of a site.

Definitions

- Green Infrastructure – Systems and practices that use or mimic natural processes to infiltrate, evapotranspire, or reuse stormwater on the site where it is generated.

- Low Impact Development (LID) - Site design approaches and small-scale stormwater management practices that promote the use of natural systems for infiltration, evapotranspiration, and reuse of rainwater. LID can be applied to new development, urban retrofits, and revitalization projects. LID utilizes design techniques that infiltrate, filter, provide evapotransporation and store runoff close to its source. Rather than rely on costly large-scale conveyance and treatment systems, LID addresses stormwater through a variety of small, cost-effective landscape features located on-site.

Content of Appendix B

- Introduction to CD and LID
- Implementation Challenges
  - Introduction to Techniques
  - Need for Dialogue between developers, municipalities, and planners
  - One of the greatest challenges - control the volume of stormwater runoff generated from a site

Content of Appendix B

- Design Principles and Techniques
  - Conservation Design Principles and Objectives (two figures)
  - Site Design Process Principles and Techniques (table)

Appendix B: Site Design

Figure 1
Conservation Design Principles
Maintaining Site Hydrology and Managing Stormwater

Step 1 – Minimize Generation of Stormwater Runoff through Development Design: Achieved by Designing to the Land & Optimizing the Cumulative Benefits of the Site's Natural Hydrologic Features

- Consider Natural Drainage Patterns and Infiltration Characteristics
- Reduce Grading and Compaction by Utilizing Natural Topography
- Consider Placement and Scale of Streets and Buildings
- Minimize Land Disturbance – both Surface and Subsurface
- Minimize Cumulative Area to be Covered by Impervious and Compacted Surfaces

Step 2 – Manage Stormwater as Close to the Point of Generation as Possible using Distributed LID Practices

- Take Advantage of the Natural Hydrologic Landscape to Achieve Runoff Controls
- Disconnect Impervious Surfaces
- Distribute Storm Flows to Green Infrastructure

Step 3 – Utilize Open Channel Conveyance (as needed)

Step 4 – Management in Common Open Space (or as conveyed to other green infrastructure practices)

- Integrate Management Facilities into the Natural Environment
- Incorporate Natural Site Features into the Design
- Create Site Amenities that can be Enjoyed by Residents and Provide a Community Aesthetic

Appendix B: Site Design

Table 1 – Site Design Process Principles and Techniques

Conservation Design Principles	Select Design Techniques
Development Design that Minimizes the Generation of Stormwater Runoff: Achieved by Designing to the Land & Optimizing the Cumulative Benefits of the Site's Natural Hydrologic Features	• Maintain the natural soil structure and vegetative cover that are often critical components of maintaining the hydrologic functions of natural infiltration, bioretention, flow attenuation, evapotranspiration, and pollutant removal. Strive to achieve multiple stormwater objectives (i.e., maintain hydrologic regime including both peak rate and total volume control, water quality control, and temperature control. • Protect, or improve, natural resources to reduce the needs for environmental mitigation, future environmental restoration, and cumulative flow and water quality impacts of unnecessary disturbances within the watershed system. • Minimize the disturbance of natural surface and groundwater drainage features and patterns, discharge points and flow characteristics, natural infiltration and evapotranspiration patterns and characteristics, natural stream channel stability, and floodplain conveyance, etc. • Minimize the size of individual impervious surfaces. • Separate large impervious surfaces into smaller components. • Avoid unnecessary impervious surfaces. • Utilize porous materials where suited in lieu of impervious materials. • Prioritize on-site hydrologic features (i.e., for protection, improvement, utilization, or alteration) and natural site drainage patterns and infiltration characteristics and consider them for the cornerstones of the conceptual site design. Prevent rather than minimize. • Reduce grading and compaction by applying selective grading design methods to provide final grading patterns that preserve existing topography where it most benefits natural hydrologic functions and where needed; this results in graded areas that evenly distribute runoff and minimize concentrated runoff flows. • Consider the scale and placement of buildings and other infrastructure to minimize impact to natural hydrologic features. • Incorporate unique natural, scenic, and historic site features into the configuration of the development, and ensure flexibility in development design to meet community needs for complementary and aesthetically pleasing development.

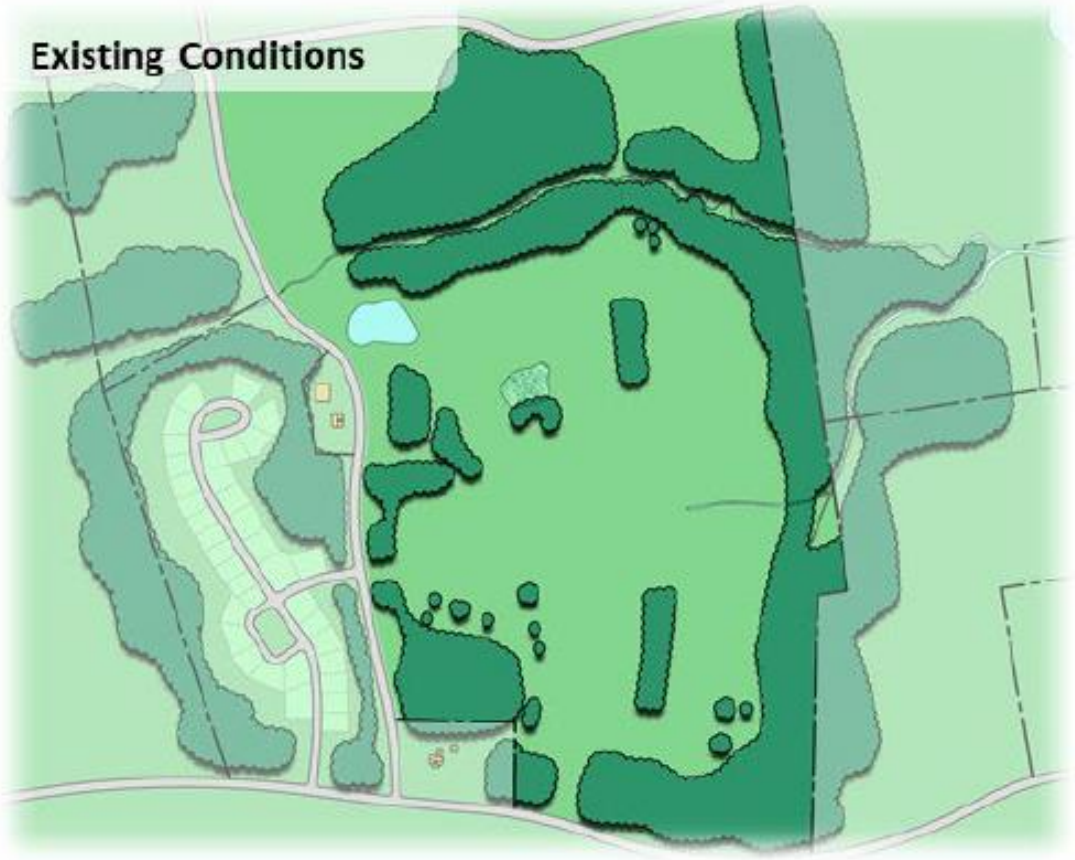
Content of Appendix B

- Design Process
  - Evaluating a Site Using Conservation Design Principles
    - Determine Development Goals
    - Conduct a Resource Inventory
    - Undertake a Site Analysis
    - Create Conceptual Designs or Sketch Plans
    - Formulate a Final Design
    - Obtain municipal/county approvals
- Design Practices
  - Site Layout and LID Practices and Stormwater Control Measures

Content of Appendix B

- Benefits of Conservation Design
  - Logistical and Financial Benefits to homeowners, developers, and municipalities, including:
    - Reduced Site preparation costs
      - Elimination of mass re-grading
      - Decrease in erosion and sediment control measures
    - Reduced Infrastructure costs
      - Reduced need for storm water basins
      - Reduced roadway lengths
      - Reduced drainage pipe installations
    - Increased value of units
      - Located adjacent to open space
      - Positioned to coexist with natural resource areas
- Conclusion
- References – citations and internet sites for further information

Existing Conditions



89

Total acres of site

33

Existing acres of woodland

Conventional Layout

- Large cul-de-sacs
- Clearing and building
- in stream corridor
- Wide streets throughout
- Convention stormwater facilities
- Natural areas significantly disturbed
- Site layout not designed to fit terrain resulting in excessive grading

Conservation Design

Note: While the Conservation Design graphics shown above optimize unit types and lot sizes (and thus allow greater density), it is recognized that that this type of mixed use may not be appropriate in some zoning districts. However, Conservation Design works equally well where housing diversity is not appropriate.

- Provides open space linkages with adjacent parcels
- Designed to the site to minimize grading
- Narrower roads and smaller lots to reduce impervious cover
- Maintains natural drainage patterns
- Preserves natural features and habitat
- Community commons and green space
- Trail systems
- Characteristic of site preserved as viewed from adjoining roads

Questions?