# Watershed Protection Roundtable

Final Report
July 2001
City of Wilmington
North Carolina

# WATERSHED PROTECTION ROUNDTABLE

# FINAL REPORT

**July 2001**

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## INTRODUCTION

Wilmington, North Carolina is bounded on the west by the Cape Fear River and on the east by Middle, Greenville and Masonboro Sounds. These sounds are part of the Intracoastal Waterway that runs along the coast of the Atlantic Ocean. These water bodies, and the small coastal creeks that flow into them, are major contributors to Wilmington's high quality of life.

Attracted by this high quality of life, the area has experienced a high rate of population growth and economic activity. Along with growth has been concurrent expansion of impermeable surfaces in the watersheds that drain into the Cape Fear estuary and the small estuaries on the mainland side of the sounds. Rainwater runoff from these surfaces carry a variety of physical, chemical and biological pollutants into these creeks. Research has demonstrated that when impervious surface coverage of a watershed (i.e. parking lots, driveways, rooftops, sidewalks), exceeds 10%, water quality of urban streams and tidal creeks can deteriorate. Impervious surfaces concentrate pollutants, prevent infiltration of rainwater, increase polluted runoff and increase flooding. However, according to other sources at the North Carolina Department of Environment and Natural Resources (NCDENR), the extent to which impervious cover contributes to water quality degradation can be dependent on topography, hydrology, hydrography, soil type, depth to ground water, vegetative cover and land use.

Along the sounds, pollutants have caused numerous tidal creeks to be closed to shell fishing. On the Cape Fear River side, Greenfield Lake and Burnt Mill Creek have non-supporting use ratings according to the Cape Fear River Basin Plan. Both of these waterbodies are Class C freshwaters with a supplemental classification as swamp waters (SW). Class C is defined by the State as freshwaters protected for secondary recreation, fishing, aquatic life including propagation and survival, and wildlife. All freshwaters are protected for these uses at a minimum. Class SW refers to waters which have low velocities and other natural characteristics which are different from adjacent streams.

In January of 1999, the Wilmington City Council requested the City staff to make recommendations for changes that could be made in the existing development policies and ordinances to lessen the impact of new development on the surface waters of the City. The recommendations could involve the City subdivision and zoning ordinances, storm water management practices, and the Technical Standards Manual or necessary changes in New Hanover County or the State of North Carolina regulations.

On September 7, 1999, Wilmington City Council and New Hanover County Board of Commissioners adopted the Wilmington – "New Hanover County CAMA Land Use Plan Update & Comprehensive Plan" (hereinafter referred to as the "Comprehensive Plan"). The Comprehensive Plan set forth a series of policies and implementing actions to govern the future of the two jurisdictions. Many of those policies and implementing actions are directly relevant to the impacts of the built environment on not only surface waters of the City, but on the water quality of the unincorporated areas as well. Obviously, recommendations emerging from City Council's charge to staff should be consistent with the intent of the Comprehensive Plan.

### The Watershed Protection Roundtable

To assist in formulating recommendations to Council, the staff proposed forming a committee of citizens with interest and knowledge in the interactions between development and managing surface water quality. The resulting committee became the Watershed Protection Roundtable.

To focus the work of the Roundtable, staff recommended using a publication entitled "Better Site Design: A Handbook for Changing Development Rules in Your Community" (referred to as the "Better Site Design Handbook"), produced by the Center for Watershed Protection, a private, non-profit organization headquartered in Ellicott City, Maryland.

**Better Site Design Handbook**

The Better Site Design Handbook outlines 22 model development principles that, when applied together, measurably reduce impervious cover, conserve natural areas and reduce storm water pollution from new development. Other benefits when applying these principles include lower construction costs, more open space and easier compliance with environmental regulations. These principles are broken down into three categories or habitats as described in the Better Site Design Handbook:

- Streets and Parking Lots (Habitats for Cars)
- Lot Development (Habitats for People)
- Conservation of Natural Areas (Habitats for Nature)

The 22 principles provide design guidance for economically viable, yet environmentally sensitive development. Local officials, planners and developers can use the principles as benchmarks to assess where existing standards might be changed to conserve natural areas, prevent pollution from runoff and reduce impervious cover.

The Better Site Design Handbook authors recognized that these principles must be adapted to reflect the unique characteristics of each community. The purpose of this local Roundtable was to determine how the principles may apply to the Wilmington area. The principles should be considered with the larger economic and environmental goals that are outlined in plans for comprehensive growth management, resource protection and watershed management.

**A Unified Development Ordinance for the City and County**

Implementation of a significant number of policies contained in the Comprehensive Plan depend upon developing a Unified Development Ordinance (UDO). Work on the UDO began in 1997.

With the adoption of the Comprehensive Plan, the pace of work on the UDO was accelerated. A Unified Development Ordinance Oversight Committee was seated to advise City and County staff in drafting a final version of an ordinance that combines the majority, if not all, of the development related ordinances in a single document for submission to Council and the Commissioners for adoption.

The recommendations developed by the Watershed Protection Roundtable are consistent with the intent of the Comprehensive Plan. They can be used by the City and County planning staffs and members of the UDO Oversight Committee in drafting relevant sections of the UDO.

**How Well Do Existing Rules Compare to the Model Development Principles?**

The Better Site Design Handbook provides a worksheet to help assess how well current regulations and policies stack up against the model development principles. The initial review of this worksheet revealed a score of 62 out of a possible 100 when assessing current City requirements. Some regulatory changes during the Roundtable process added five points, moving the score to 67 as shown in Table 1 in the attached Codes and Ordinances Worksheet. The Handbook recommends that a score less than 80 may warrant systematic reform to local development rules. If all of the recommendations in this report are adopted, the score of our assessment would change from 67 to 88. The improvements are shown in Table 2, Watershed Roundtable Recommendations Summary.

**Roundtable Committee Activities**

Over the past two years and in more than 30 meetings, the Roundtable Committee reviewed each of the individual principles, recommended practices and current City, County or State requirements. Open discussions were held among the committee members as they developed recommendations. The Committee went on a field trip to learn more about

stream buffers. In addition, several guests were invited to speak about their area of expertise as it related to specific principles. Those guests included:
Camilla Herlevich – North Carolina Coastal Land Trust
Beth Easley – New Hanover County Erosion Control Specialist
Bonnie Duncan – North Carolina Wetlands Restoration Program

Staff then prepared a draft report for the Committee to review and provide comments. Several additional meetings were held in order to review the draft report.

**Comprehensive Plan and Unified Development Ordinance**

The City of Wilmington and New Hanover County have experienced a high level of population and employment growth throughout the 1990's. This growth is exerting increasing pressure on the City and County's ability to provide services, insure wise development of the land and minimize further degradation of our resources and loss of our natural landscape. The intent of the Wilmington – New Hanover County CAMA Land Use Plan Update and Comprehensive Plan is to address the needs of both governments in dealing with these growth pressures. The plan was adopted by the City Council and the County Board of Commissioners on September 7, 1999.

This report will provide guidance and recommendations to the UDO Oversight Committee in their development of Ordinance language. A unified City-County development ordinance is a significant element in implementing the Comprehensive Plan.

**Recommendations Summary and Implementation**

Table 2 summarizes the recommendations of the Roundtable Committee members, identifies the entity responsible for the regulation to be modified or action to be performed and any changes to the assessment score. The Committee members recognize that these recommendations are only a step in the process towards modifying existing regulations. They also recognize that any modifications that are made are only a part of the overall improvement or protection of the watersheds in New Hanover County. Specific examples of how this information may be used include:

- Conditional criteria in Special Use Permits, Special Use Districts and Subdivision Review recommendations;
- Suggestions for better site design at the Technical Review Committee (TRC);
- Changes to the Zoning Ordinance and Subdivision Regulations;
- Additional options for infrastructure design in the Technical Standards Manual.

The protection of our water resources is essential to the economic vitality and quality of life in Wilmington and New Hanover County. These recommendations have been developed for the purpose of protecting our water resources and reducing the impact of future development. The implementation of these recommendations will improve the ability to meet some of the goals established in the Comprehensive Plan. They are only a part of the overall improvement/protection of the water resources in New Hanover County. Further efforts will need to be pursued in public awareness, education and structural best management practices.

TABLE 1

# Codes and Ordinances Worksheet

## 1. Street Width - Total point score: 4 out of 7

a. What is the minimum pavement width allowed for streets in low density residential developments that have less than 500 average daily trips (ADT)? **18 feet** **4 points**

*If the answer is between **18-22 feet**, award **4** points*

b. At higher densities, are parking lanes allowed to also serve as traffic lanes (i.e., queuing streets)? **0 points**

**No**

*If the answer is **YES**, award **3** points*

## 2. Street Length - Total point score: 1 out of 1

a. Do street standards promote the most efficient street layouts that reduce overall street length? **1 point**

**Yes**

*If the answer is **YES**, award **1** point*

## 3. Right-of-Way Width - Total point score: 4 out of 4

a. What is the minimum right-of-way (ROW) width for a residential street? **40 feet** **3 points**

*If the answer is **less than 45 feet**, award **3** points*

b. Does the code allow utilities to be placed under the paved section of the ROW? **Yes** **1 point**

*If the answer is **YES**, award **1** point*

## 4. Cul-de-Sacs - Total point score: 3 out of 5

a. What is the minimum radius allowed for cul-de-sacs? **40 feet** **1 point**

*If the answer is **less than 35 feet**, award **3** points*

*If the answer is **36 feet to 45 feet**, award **1** point*

b. Can a landscaped island be created within the cul-de-sac? **Yes** **1 point**

*If the answer is **YES**, award **1** point*

c. Are alternative turn arounds such as "hammerheads" allowed on short streets in low density residential developments? **Yes** **1 point**

*If the answer is **YES**, award **1** point*

## 5. Vegetated Open Channels – Total point score: 2 out of 4

a. Are curb and gutters required for most residential street sections? **Yes** **0 points**

*If the answer is **NO**, award **2** points*

b. Are there established design criteria for swales that can provide stormwater quality treatment (i.e., dry swales, biofilters, or grass swales)? **Yes** **2 points**

*If the answer is **YES**, award **2** points*

## 6. Parking Ratios - Total point score: 3 out of 5

a. What is the minimum parking ratio for a professional office building (per 1000 $ft^2$ of gross floor area)? **3.33 spaces** **0 points**

*If the answer is **less than 3.0 spaces**, award **1** point*

b. What is the minimum required parking ratio for shopping centers (per 1,000 $ft^2$ gross floor area)? **5 spaces** **0 points**

*If the answer is **4.5 spaces or less**, award **1** point*

c. What is the minimum required parking ratio for single family homes (per home)? **1 space** **1 point**

*If the answer is **less than or equal to 2.0 spaces**, award **1** point*

d. Are the parking requirements set as maximum or median (rather than minimum) requirements? **Yes** **2 points**

*If the answer is **YES**, award **2** points*

TABLE 1

## 7. Parking Codes - Total point score: 3 out of 4

a. Is the use of shared parking arrangements promoted? **Yes** — **1 point**

*If the answer is **YES**, award **1** point*

b. Are model shared parking agreements provided? **Yes** — **1 point**

*If the answer is **YES**, award **1** point*

c. Are parking ratios reduced if shared parking arrangements are in place? **No** — **0 points**

*If the answer is **YES**, award **1** point*

d. If mass transit is provided nearby, is the parking ratio reduced? **Yes** — **1 point**

*If the answer is **YES**, award **1** point*

## 8. Parking Lots - Total point score: 4 out of 5

a. What is the minimum stall width for a standard parking space? **8 feet** — **1 point**

*If the answer is **9 feet or less**, award **1** point*

b. What is the minimum stall length for a standard parking space? **18 feet** — **1 point**

*If the answer is **18 feet or less**, award **1** point*

c. Are at least 30% of the spaces at larger commercial parking lots required to have smaller dimensions for compact cars? **No** — **0 points**

*If the answer is **YES**, award **1** point*

d. Can pervious materials be used for spillover parking areas? **Yes** — **2 points**

*If the answer is **YES**, award **2** points*

## 9. Structured Parking - Total point score: 0 out of 1

a. Are there any incentives to developers to provide parking within garages rather than surface parking lots? **No** — **0 points**

*If the answer is **YES**, award **1** point*

## 10. Parking Lot Runoff - Total point score: 4 out of 4

a. Is a minimum percentage of a parking lot required to be landscaped? **Yes** — **2 points**

*If the answer is **YES**, award **2** points*

b. Is the use of bioretention islands and other storm water practices within landscaped areas or setbacks allowed? **Yes** — **2 points**

*If the answer is **YES**, award **2** points*

## 11. Open Space Design - Total point score: 7 out of 8

a. Are open space or cluster development designs allowed in the community? **Yes** — **3 points**

*If the answer is **YES**, award **3** points. If the answer is **NO**, skip to question No. 12*

b. Is land conservation or impervious cover reduction a major goal or objective of the open space design ordinance? **Yes** — **1 point**

*If the answer is **YES**, award **1** point*

c. Are the submittal or review requirements for open space design greater than those for conventional development? **Yes** — **0 points**

*If the answer is **NO**, award **1** point*

d. Is open space or cluster design a by-right form of development? **Yes** — **1 point**

*If the answer is **YES**, award **1** point*

e. Are flexible site design criteria available for developers that utilize open space or cluster design options (e.g, setbacks, road widths, lot sizes) **Yes** — **2 points**

*If the answer is **YES**, award **2** points*

## 12. Setbacks and Frontages - Total point score: 4 out of 6

a. Are irregular lot shapes (e.g., pie-shaped, flag lots) allowed in the community? **Yes** — **1 point**

*If the answer is **YES**, award **1** point*

b. What is the minimum requirement for front setbacks for a **one half (½) acre** residential lot? **30 feet** — **0 points**

*If the answer is **20 feet or less**, award **1** point*

c. What is the minimum requirement for rear setbacks for a **one half (½) acre** residential lot? **25 feet** — **1 point**

*If the answer is **25 feet or less**, award **1** point*

d. What is the minimum requirement for side setbacks for a **one half (½) acre** residential lot? **10 feet** — **0 points**

*If the answer is **8 feet or less**, award **1** point*

e. What is the minimum frontage distance for a **one half (½) acre** residential lot? **80 feet** — **2 points**

*If the answer is **less than 80 feet**, award **2** points*

## 13. Sidewalks - Total point score: 5 out of 6

a. What is the minimum sidewalk width allowed in the community? **4 feet** — **2 points**

*If the answer is **4 feet or less**, award **2** points*

b. Are sidewalks always required on both sides of residential streets? **No** — **2 points**

*If the answer is **NO**, award **2** points*

c. Are sidewalks generally sloped so they drain to the front yard rather than the street? **No** — **0 points**

*If the answer is **YES**, award **1** point*

d. Can alternate pedestrian networks be substituted for sidewalks (e.g., trails through common areas)? **Yes** — **1 point**

*If the answer is **YES**, award **1** point*

## 14. Driveways - Total point score: 4 out of 6

a. What is the minimum driveway width specified in the community? **10 feet and 23 feet** — **0 points**

*If the answer is **9 feet or less (one lane) or 18 feet (two lanes)**, award **2** points*

b. Can pervious materials be used for single family home driveways (e.g., grass, gravel, porous pavers, etc)? **Yes** — **2 points**

*If the answer is **YES**, award **2** points*

c. Can a "two track" design be used at single family driveways? **Yes** — **1 point**

*If the answer is **YES**, award **1** point*

d. Are shared driveways permitted in residential developments? **Yes** — **1 point**

*If the answer is **YES**, award **1** point*

## 15. Open Space Management - Total point score: 5 out of 6

a. Does the community have enforceable requirements to establish associations that can effectively manage open space? **Yes** — **2 points**

*If the answer is **YES**, award **2** points*

b. Are open space areas required to be consolidated into larger units? **Yes** — **1 point**

*If the answer is **YES**, award **1** point*

c. Does a minimum percentage of open space have to be managed in a natural condition? **No** — **0 points**

*If the answer is **YES**, award **1** point*

d. Are allowable and unallowable uses for open space in residential developments defined? **Yes** **1 point**

*If the answer is **YES**, award **1** point*

e. Can open space be managed by a third party using land trusts or conservation easements? **Yes** **1 point**

*If the answer is **YES**, award **1** point*

## 16. Rooftop Runoff - Total point score: 4 out of 4

a. Can rooftop runoff be discharged to yard areas? **Yes** **2 points**

*If the answer is **YES**, award **2** points*

b. Do current grading or drainage requirements allow for temporary ponding of storm water on front yards or rooftops? **Yes** **2 points**

*If the answer is **YES**, award **2** points*

## 17. Buffer Systems - Total point score: 0 out of 4

a. Is there a stream buffer ordinance in the community? **No** **0 points**

*If the answer is **YES**, award **2** points*

b. If so, what is the minimum buffer width? **NA** **0 points**

*If the answer is **75 feet or more**, award **1** point*

c. Is expansion of the buffer to include freshwater wetlands, steep slopes or the 100-year floodplain required? **NA** **0 points**

*If the answer is **YES**, award **1** point*

## 18. Buffer Maintenance - Total point score: 0 out of 4

a. Does the stream buffer ordinance specify that at least part of the stream buffer be maintained with native vegetation? **NA** **0 points**

*If the answer is **YES**, award **2** points*

b. Does the stream buffer ordinance outline allowable uses? **NA** — **0 points**

*If the answer is **YES**, award **1** point*

c. Does the ordinance specify enforcement and education mechanisms? **NA** — **0 points**

*If the answer is **YES**, award **1** point*

## 19. Clearing and Grading - Total point score: 3 out of 3

a. Is there any ordinance that requires or encourages the preservation of natural vegetation at residential development sites? **Yes** — **2 points**

*If the answer is **YES**, award **2** points*

b. Do reserve septic field areas need to be cleared of trees at the time of development? **No** — **1 point**

*If the answer is **NO**, award **1** point*

## 20. Tree Conservation - Total point score: 2 out of 3

a. If forests or specimen trees are present at residential development sites, does some of the stand have to be preserved? **Yes** — **2 points**

*If the answer is **YES**, award **2** points*

b. Are the limits of disturbance shown on construction plans adequate for preventing clearing of natural vegetative cover during construction? **No** — **0 points**

*If the answer is **YES**, award **1** point*

## 21. Land Conservation Incentives - Total point score: 4 out of 4

a. Are there any incentives to developers or landowners to conserve non-regulated land (open space design, density bonuses, storm water credits or lower property tax rates)? **Yes** — **2 points**

*If the answer is **YES**, award **2** points*

b. Is flexibility to meet regulatory or conservation restrictions (density compensation, buffer averaging, transferable development rights, off-site mitigation) offered to developers? **Yes** — **2 points**

*If the answer is **YES**, award **2** points*

## 22. Stormwater Outfalls - Total point score: 1 out of 6

a. Is storm water required to be treated for quality before it is discharged? **No** — **0 points**

*If the answer is **YES**, award **2** points*

b. Are there effective design criteria for storm water best management practices (BMPs)? **Yes** — **1 point**

*If the answer is **YES**, award **1** point*

c. Can storm water be directly discharged into a jurisdictional wetland without pretreatment? **Yes** — **0 points**

*If the answer is **NO**, award **1** point*

d. Does a floodplain management ordinance that restricts or prohibits development within the 100 year floodplain exist? **No** — **0 points**

*If the answer is **YES**, award **2** points*

**TOTAL SCORE 67 points FOR WILMINGTON**

TABLE 1

# Test Scores and What They Mean According to the Center for Watershed Protection

| | |
|---|---|
| **90 - 100** | **Community has above-average provisions that promote the protection of streams, lakes and estuaries.** |
| **80 - 89** | **Local development rules are good, but could use minor adjustments or revisions in some areas.** |
| **70 - 79** | **Opportunities exist to improve development rules. Consider creating a site planning roundtable.** |
| **60 - 69** | **Development rules are likely inadequate to protect local aquatic resources. A site planning roundtable would be very useful.** |
| **less than 60** | **Development rules are definitely not environmentally friendly. Serious reform is needed.** |

The test score reflects the strengths and weaknesses of current development codes. There is much to be done in the areas of alternative street design, buffers and storm water quality. The Unified Development Ordinance Oversight Committee is currently making recommendations to change the development codes, and it is important to incorporate these Watershed Roundtable recommendations into the final UDO document. This implementation action will enable the City and County to strengthen the role of best management practices in the local development process.

**TABLE 2**

**WATERSHED ROUNDTABLE RECOMMENDATIONS SUMMARY TABLE**

| *Principle* | *Recommendations* | *Old Test Score* | *Test Score Change* | *New Test Score Total* | *Remarks* | *Implementation Strategy* |
|---|---|---|---|---|---|---|
| **1 - Street Width** | Standard detail for Local A or B Street - consider x-section of 22 feet | *4* | *3* | *7* | Existing standard for 18 foot Local street width is not used | Amend Technical Standards & Specifications Manual |
| | Standard detail for Collector A - consider x-section of 30 feet | | | | On street parking would not be allowed | Amend Technical Standards & Specifications Manual |
| | Include bike lanes in street section details | | | | NOTE: Mixed use allows queuing streets (+3 pts) | Amend Technical Standards & Specifications Manual |
| **2 - Street Length** | Look for opportunities to reduce cul-de-sacs and encourage interconnecting streets | *1* | *0* | *1* | | Technical Review Committee process |
| **3 - Right-of-Way** | Pursue narrower right of way width for local street in conjunction with Principles 1 and 13 | *4* | *0* | *4* | | Amend Technical Standards & Specifications Manual |
| **4 - Cul-de-Sacs** | Add standard detail for hammerhead style cul-de-sac | *3* | *0* | *3* | Hammerhead has been used but no standard detail exists | Amend Technical Standards & Specifications Manual |
| | Consider standard detail for cul-de-sac with radius of less than 40 feet | | | | | Amend Technical Standards & Specifications Manual |
| | Drainage should be directed toward landscaped island in cul-de-sac when practical | | | | Use this landscaped area for bioretention/infiltration | Amend Technical Standards & Specifications Manual |
| **5 - Vegetated Open Channels** | Develop standard for use of curb openings and grassed swales | *2* | *0* | *2* | Similar to proposed Park Ave Improvements and still allows use of curb and gutter | Amend Technical Standards & Specifications Manual |
| | Develop standard for use of alternative types of header curbing | | | | Promotes sheet flow off of streets | Amend Technical Standards & Specifications Manual |
| **6 - Parking Ratio** | Review parking requirements and consider decrease for retail | *3* | *1* | *4* | Changes for Big Box retail was a start but change needs to be across the board; suggest 4.5 space/1000 sq. ft. | Unified Development Ordinance process |
| **7 - Parking Codes** | | *3* | *0* | *3* | | |
| **8 - Parking Lots** | | *4* | *0* | *4* | | |
| | Encourage minimum amt of paved parking through reducing amount of impervious | | | | | Unified Development Ordinance process |
| | Use pervious materials | | | | | Unified Development Ordinance process |
| | Delete small car parking in UDO | | | | | Unified Development Ordinance process |
| | Promote angled parking with one-way traffic | | | | | Amend Technical Standards & Specifications Manual |
| **9 - Structured Parking** | Promote parking under buildings where possible with incentives like tax credits, stormwater credits, density, floor area or height bonuses | *0* | *1* | *1* | Mixed use provides incentives | Technical Review Committee process |
| | Increase building height to allow parking on first floor | | | | | Amend Zoning Ordinance |

**TABLE 2**

**WATERSHED ROUNDTABLE RECOMMENDATIONS SUMMARY TABLE**

| *Principle* | *Recommendations* | *Old Test Score* | *Test Score Change* | *New Test Score Total* | *Remarks* | *Implementation Strategy* |
|---|---|---|---|---|---|---|
| **10 - Parking Lot Runoff** | Develop recommendations on wet ponds that promote vegetation around perimeter and improve maint. Stds. | *4* | *0* | *4* | Use of vegetation and trees around wet ponds; Revise City maintenance standards | Unified Development Ordinance process |
| | Encourage State to evaluate benefits of natural feature vs. engineered BMP | | | | Already in progress | Work with NCDENR |
| | Improve Technical Manual with BMP standards and promote their use in parking lot design | | | | To encourage use of more innovative BMP techniques | Amend Technical Standards & Specifications Manual |
| | Encourage landscaping around detention areas | | | | | Amend Technical Standards & Specifications Manual |
| | Encourage landscaping requirements as found in the large scale retail section of the Zoning Ordinance by adding to the requirements for the UDO | | | | | Unified Development Ordinance process |
| | Fast track these particular recommendations through the UDO process | | | | | Unified Development Ordinance process |
| **11 - Open Space Design** | Distinguish type of open space desired (natural, manmade, passive, active) | *7* | *0* | *7* | | Unified Development Ordinance process |
| | Need to map existing conservation easements | | | | Having more accurate information available speeds up plan review process | City/County update to existing surveys |
| | Have County adopt open space requirements with incentives | | | | | Unified Development Ordinance process |
| | Encourage clustering when environmentally valuable areas would be impacted by residential or commerical development | | | | | Technical Review Committee process |
| **12 - Setbacks and Frontages** | Make changes in Area & Height table to allow more flexibility; change R20 side setback to 8 feet and front setback to 20 feet | *4* | *2* | *6* | | Amend Zoning Ordinance |
| **13 - Sidewalks** | Develop criteria for streets that would require sidewalks on only one side | *5* | *0* | *5* | For example, cul-de-sacs or looped streets with a minimal # of units | Amend Technical Standards & Specifications Manual |
| | Adjusting the width and location of sidewalk on a case-by-case basis | | | | | Technical Review Committee process |
| | Allowing lower density developments in the County to use pedestrian trails instead of sidewalks | | | | | Unified Development Ordinance process |

**TABLE 2**

**WATERSHED ROUNDTABLE RECOMMENDATIONS SUMMARY TABLE**

| *Principle* | *Recommendations* | *Old Test Score* | *Test Score Change* | *New Test Score Total* | *Remarks* | *Implementation Strategy* |
|---|---|---|---|---|---|---|
| **14 - Driveways** | Develop alternative driveway options that reduce impervious (pervious surfaces, narrower widths) | *4* | *2* | *6* | Mixed Use and Performance Residential allows narrower widths | Amend Technical Standards & Specifications Manual |
| | A standard detail for a 9 foot residential driveway be added to the Technical Standards Manual | | | | | Amend Technical Standards & Specifications Manual |
| **15 - Open Space Mgt.** | Require minimum % of open space be left in natural condition | *5* | *1* | *6* | Present ordinances focus more on recreation portion of park land dedication; Mixed Use already does this | Unified Development Ordinance process |
| | Conduct inventory of natural areas for New Hanover through NC Heritage Trust | | | | Inventory can be a tool that objectifies the process of selecting areas worth preserving and supports open space bond ref. | City/County survey |
| | Require minimum setback from significant open space or natural areas | | | | Ongoing debate of CAMA rules has not produced consensus on this issue on the State level or within the Committee members | Participate in State rule making |
| | Differentiate between open space and parkland dedication requirements | | | | Modify technical standards to encourage this design | Amend Technical Standards & Specifications Manual |
| | Educate community on open space and protect or manage of natural areas | | | | Public Outreach programs | Public Outreach |
| | Explore Transfer of Development Rights (TDRs) & Purchase of Development Rights (PDRs) for protection of natural areas | | | | Further research of state enabling statutes | Encourage elected officials to promote changes |
| | The City and County should explore alternative methods of protecting or acquiring open space | | | | | Staff research |
| **16 - Rooftop Runoff** | Encourage designers to collect roof drainage via grassed swales prior to going into a standard retention pond | *4* | *0* | *4* | Modify technical standards to encourage this practice | Amend Technical Standards & Specifications Manual |
| | Obtain more information on Green Roof designs | | | | | Staff research |
| | Encourage BMPs such as rain barrels, cisterns, water gardens | | | | | Amend Technical Standards & Specifications Manual |
| **17 - Buffer Systems** | Alt. A - Require buffers along all blueline creeks and | *0* | *3* | *3* | Extends further up into watershed | Unified Development Ordinance process |
| **18 - Buffer Maintenance** | conservation resources | *0* | *4* | *4* | | |
| | Alt. A - Transition zone only applies in COD areas | | | | | Unified Development Ordinance process |
| | Alt. B - Require buffers against conservation res. | | | | Goes along with current UDO language | Unified Development Ordinance process |
| | Measure marsh buffers from mean high water | | | | | Unified Development Ordinance process |

**TABLE 2**

**WATERSHED ROUNDTABLE RECOMMENDATIONS SUMMARY TABLE**

| *Principle* | *Recommendations* | *Old Test Score* | *Test Score Change* | *New Test Score Total* | *Remarks* | *Implementation Strategy* |
|---|---|---|---|---|---|---|
| **17 - Buffer Systems**<br>**18 - Buffer Maintenance (cont'd)** | Measure creek buffers from top of bank of base flow channel | | | | | Unified Development Ordinance process |
| | Width of 35 feet should be minimum | | | | Wider is preferred when feasible | Unified Development Ordinance process |
| | Buffer averaging should be allowed | | | | Necessary for flexibility | Unified Development Ordinance process |
| | Develop map showing where buffers would be required | | | | | City/County survey |
| | Agree with uses proposed by UDO; no other uses should be allowed | | | | | Unified Development Ordinance process |
| | Allow limited encroachment of stormwater BMPs | | | | Necessary for topography of site | Unified Development Ordinance process |
| | Minimize encroachment of utilities; keep parallel utilities out when possible | | | | | Unified Development Ordinance process |
| | Agree with vegetation language from UDO | | | | | Unified Development Ordinance process |
| | Provide outreach on buffers, their function, management | | | | | Unified Development Ordinance process |
| | Consider buffer restoration programs | | | | Tidal Creeks Program is already working on a program | Unified Development Ordinance process |
| | Selective clearing and pruning for sight vistas is okay | | | | | Unified Development Ordinance process |
| | Existing developed lots w/structures would be exempt unless redeveloped | | | | Developed lots can implement buffers voluntarily | Unified Development Ordinance process |
| **19 - Clearing & Grading** | Support providing adequate staffing to NHC Eng. for effective administration of local ordinance | *3* | *0* | *3* | Permanent staff consists of one person to review and inspect | Additional staff/training |
| | Require pre-construction meeting with inspector prior to land disturbance | | | | For commercial and subdivision development | Amend policies and procedures for construction release |
| | Require limits of disturbance be shown on plan and flagged in field prior to land disturbance | | | | | Amend policies and procedures for construction release |
| | Train City inspectors on erosion control and establish reporting mechanism | | | | | Training for City Inspectors |
| | Utilize natural vegetation in land use buffers when practical | | | | | Technical Review Committee process |
| **20 - Tree Conservation** | Limits of disturbance shown on plan | *2* | *1* | *3* | TRC requirement | Technical Review Committee process |
| | Tree preservation or land disturbance permit for NHC | | | | Requirement for release of plans | Amend County Ordinances |
| | Increase caliper of required plantings | | | | | Unified Development Ordinance process |

**TABLE 2**

**WATERSHED ROUNDTABLE RECOMMENDATIONS SUMMARY TABLE**

| *Principle* | *Recommendations* | *Old Test Score* | *Test Score Change* | *New Test Score Total* | *Remarks* | *Implementation Strategy* |
|---|---|---|---|---|---|---|
| **20 - Tree Conservation (cont'd)** | Encourage preservation of natural stands of trees to give incentive to reduce landscaping requirements | | | | | Unified Development Ordinance process |
| **21 - Cons. Incentives** | City and County work with the State on crediting stormwater designs when natural wetlands or pervious pavements are used | *4* | *0* | *4* | Go to State with recommendations for more flexible design standards<br>City is working on a test site for pervious pavement | |
| | Local standards need to be more flexible to encourage alternative BMPs | | | | Add BMP standards to Technical Standards & Specifications manual | Amend Technical Standards & Specifications Manual |
| | Use native trees and plantings to enhance wet ponds | | | | Plant trees to promote evapotranspiration | Technical Review Committee process |
| | Design performance standards for stormwater | | | | Consider other level of pollutant loading than State BMP reqs | Amend Technical Standards & Specification Manual |
| | Propose a study of Transferable Development Rights and Purchase of Development Rights | | | | | Change State legislation |
| | Encourage residential and commercial clustering | | | | | Technical Review Committee process |
| **22- Stormwater Outfalls** | Pursue design flexibility, local and state levels, to promote better site design principles | *1* | *3* | *4* | Tech. Stds. Review will provide additional BMP options | Regulation amendments |
| | Recommend incentives similar to MX ordinances for other land uses | | | | | Unified Development Ordinance process |
| | Implement BMPs on redeveloping sites and retrofitting SW infrastructure to the extent practicable | | | | | Technical Review Committee and City Storm Water Services |
| | *OLD TEST SCORE* | *67* | | | | |
| | *TOTAL SCORE CHANGE* | | *21* | | | |
| | *NEW SCORE TOTAL* | | | *88* | | |

**Implementation Strategy**

1) Amend Technical Standards Specifications Manual:
   -Minor changes can be approved by the City Engineer
   -Major changes require approval by the Subdivision Review Board
2) Technical Review Committee Process (TRC):
   -The TRC reviews development proposals in the early planning stages. These recommendations would be implemented by staff working with the designer or developer to promote these design features. No regulatory change would be needed.
3) Unified Development Ordinance Process:
   -The City and County have agreed to create a unifed development ordinance that applies to the entire County. The Oversight Committee reviews proposed language for ordinances and recommends changes. These recommendations would be presented to the Oversight Committee for their use in developing the UDO.
4) Amend Zoning Ordinance:
   -Text amendments to the zoning ordinance have to be approved by the Planning Commission and City Council.

## Principle 1: Street Width

Design residential streets for the minimum required pavement width needed to support travel lanes, on-street parking and emergency, maintenance and service vehicle access. These widths should be based on traffic volume.

***Better Site Design Handbook Recommended Practice***

Narrow local street requirements are a growing trend in subdivision development across the country. On-street parking demand, safety and service vehicle access must be considered in determining acceptable widths, but developers and municipalities are finding benefits in *not* planning for the most extreme pavement width. Several national engineering organizations support the recommendation that residential streets can be as narrow as 22 feet in width when they serve lower traffic volumes (less than 50 units). Construction cost savings can be achieved, as paving can cost $15 per square yard. Additional economic benefits could include reduced clearing and grading costs, lower storm water management costs and less long-term maintenance expense. The benefit to the watershed is that narrower streets mean less impervious surface (see figs. 1-1 and 1-2).

***Current Requirements***

Technical Standards for Local A and B Street options include street widths of 18 and 26 feet for developments between 10 and 50 units. The 18 foot width is allowed only when an alley serves the rear of lots or for a maximum of 10 units. On-street parking is allowed for in the 26 foot section. Collector A and B street options include street widths between 24 and 36 feet for over 50 units. The 24 feet width is allowed for only up to 150 units. On-street parking is only allowed for the 36 feet width collector street (City Technical Standards Manual).

***Roundtable Discussion***

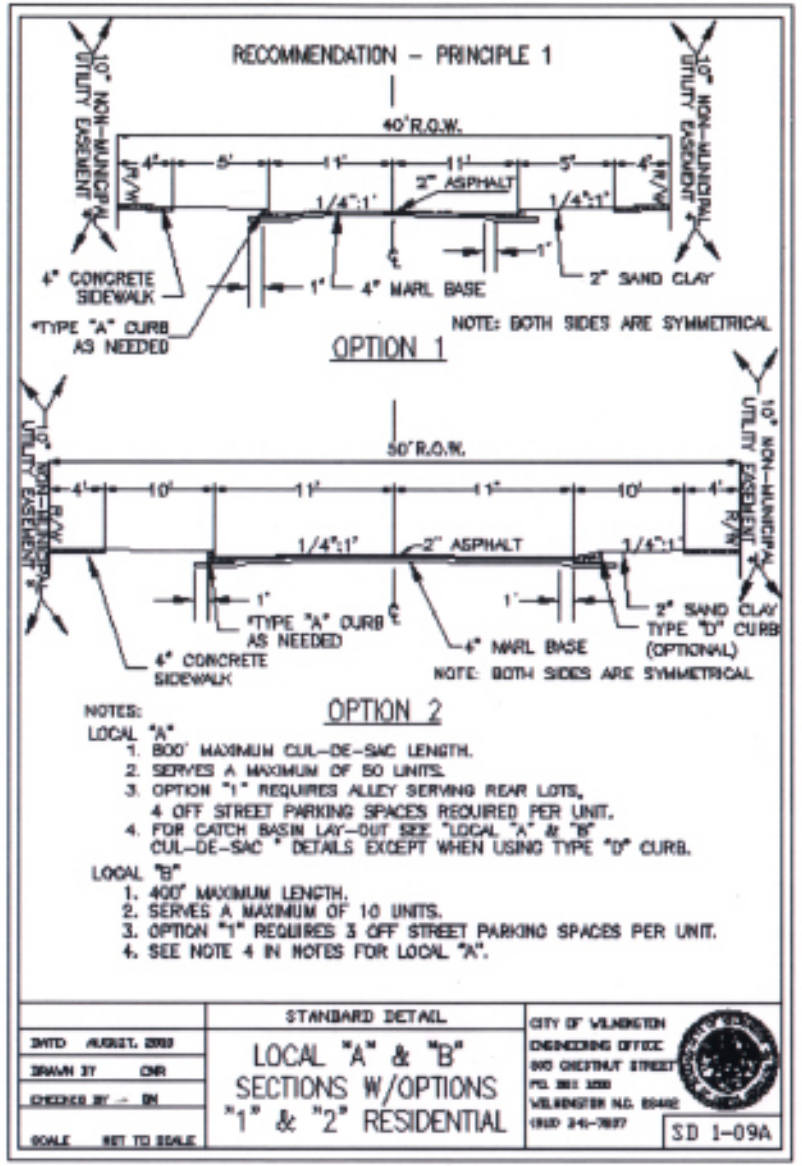
The most typical local street cross-sections that are used in single-family residential areas include 26 feet of driving width within 50 feet of right of way. The narrower 18 foot width is not typically used. Roundtable members discussed the possibility of adopting a standard local street width of 24 feet or less. Chippenham Drive in the Carriage Hills residential subdivision was discussed as a good candidate for a narrower street width for a collector street cross section (see fig. 1-3). This street has 36 feet of driving width within 60 feet of right of way. Since the homes along this street front on other streets, there is no demand for on-street parking. A narrower street width would have been appropriate since the area is residential and no on-street parking is needed.


**Fig. 1-1.** ***The redevelopment of Wrightsville Avenue to one-way travel is another example of using the narrower cross section, providing sidewalks and on-street parking and preserving trees***

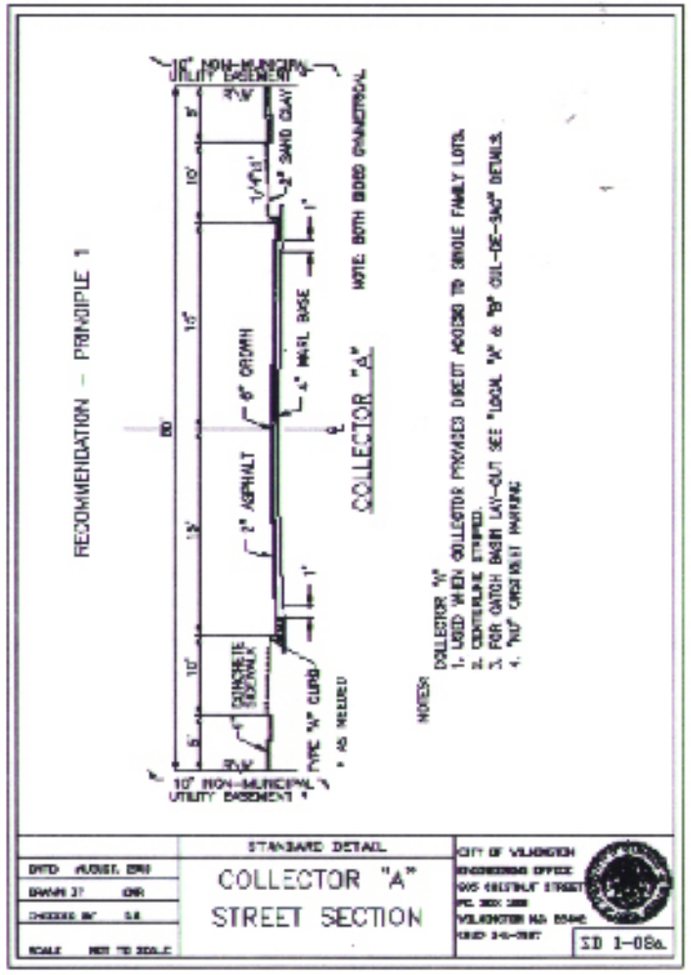
## Roundtable Recommendations: Principle 1

1. Pursue local street standard of less than 24 feet without alley requirements and allow up to 50 units. (See proposed detail #1).
2. Pursue collector A street standard of less than 36 feet. (See proposed detail #2).
3. Include bike lanes in street section details.


**Fig. 1-2.** ***Wrightsville Avenue Street Redevelopment***




**Detail #1**




**Detail #2**


**Fig. 1-3.** ***Improperly applied collector street standard – Chippenham Drive***

**DEFINITION**

PARKING LANE: A section of the roadway which has been designed to provide on-street parking for residential neighborhoods.

## Principle 2: Street Length

Reduce the total length of residential streets by examining alternative street layouts to determine the best option for increasing the number of homes per unit length.

***Better Site Design Handbook Recommended Practice***

Traditional Neighborhood Development (TND) and Open Space Development are site-designing techniques that lend themselves to more efficient street patterns. TND employs various land uses that are intended to allow people to walk to commercial areas. Open space focuses more on minimizing disturbance to natural areas and hybrid street patterns that follow topography. Site designers should look for opportunities to reduce street length in residential developments. There is no one layout that is guaranteed to minimize total street length; however, grid pattern development allows for greater density without lengthening streets. Non-frontage roads should be discouraged because they promote higher speed traffic and create a barrier in the neighborhood. By reducing street length, economic benefits can be realized from lower construction costs and less long-term maintenance.

***Current Requirements***

City standards include minimum and maximum distances for different street design parameters. For example the Mixed Use zoning district, encourages flexible street widths. Historically the grid pattern was used successfully in the downtown Wilmington area and in the early streetcar suburbs.

***Roundtable Discussion***

The Committee felt that current standards could promote efficient street layouts and reduce overall street length. With the support of Technical Standards and a Technical Review Committee that embraces these techniques, the design of street networks becomes a part of the planning process as well as the responsibility of the developer or his engineer. Making the layout efficient can be difficult when parcel lines or other lot constraints force the design. The impetus to make them efficient falls on the municipality to encourage the designer to focus on street lengths as they relate to cost and overall livability of the neighborhood. The adopted Comprehensive Plan Transportation Policy 1.5 recommends street interconnectivity and minimizing cul-de-sac development.

## Roundtable Recommendation: Principle 2

Look for opportunities to reduce cul-de-sacs and encourage interconnecting streets.

## Principle 3: Right-of-Way Width

Wherever possible, residential street right-of-way widths should reflect the minimum required to accommodate the travel way, sidewalk and vegetated open channels. Utilities and storm drains should be located within the pavement section of the right-of-way wherever feasible.

***Better Site Design Handbook Recommended Practice***

Narrow streets correspond to lower traffic volumes and slower speeds, which provides more safety for the pedestrian. A narrower right-of-way width can generally be accommodated without unduly compromising safety or utility access by:

- Reducing pavement width (Principle 1)
- Restricting sidewalks to one side or narrowing them (Principle 13)
- Slightly reducing the plaza area between the sidewalk and street, and
- Allowing water and sewer utilities under pavement where appropriate also helps reduce needed right-of-way.

Other factors may generate a reasonable need for a wider right-of-way. For instance, storm water swales may require a wider right-of-way that benefits water quality through another Best Management Practice.

***Current Requirements***

Local street standards currently require right-of-way widths of either 40 or 50 feet with 4 feet of sidewalk on both sides. (The 40 feet width is only applicable when an alley serves the rear of lots or for a maximum of 10 units and this option is not often used). There are few examples of *new* developments in the City that have chosen to use an alley access and narrower right-of-way width. A majority of the alley access neighborhoods are over 50 years old.

**DEFINITION**

RIGHT-OF-WAY: 1. Right of passage, as over another's property. 2. A route that is lawful to use. 3. A strip of land acquired for transport or utility construction. 4. The design area of a roadway which includes the pavement width, vegetated strip, sidewalk and space designated for utility location

***Roundtable Discussion***

This principle is linked with several other principles about pavement and sidewalk widths (Principle 1 and 13). If a subdivision is designed in a compact nature then all of these improvements can be narrowed, including right-of-way width. Pedestrian safety and recreation opportunities away from the street areas should be heavily considered when designing a subdivision with an alternate right-of-way width standard. This change is proposed for local streets—not collectors and arterials.

## Roundtable Recommendation: Principle 3

Pursue a narrower right-of-way width for a local street standard in conjunction with recommendation for Principle 1 and Principle 13.

## Principle 4: Cul-de-Sacs

Minimize the number of residential street cul-de-sacs and incorporate landscaped areas to reduce their impervious cover. The radius of cul-de-sacs should be the minimum required to accommodate emergency and maintenance vehicles. Alternative turnarounds should be considered.

***Better Site Design Handbook Recommended Practice***

The traditional cul-de-sac can be modified to benefit the developer in terms of cost and reduce the amount of impervious surface. Reduction in the radius of cul-de-sacs will reduce the overall impervious cover of the turnaround. Another option is to place a landscaping island in the center of the cul-de-sac (reduction of impervious cover by 800 square feet for a 40-foot radius). Alternative turnarounds that should be considered are hammerhead (T-shaped) and small loop roads. Hammerhead turnarounds can have as little as one fourth of the impervious cover of a standard 40-foot radius cul-de-sac.

***Current Requirements***

The City Technical Standards Manual includes a detail for a cul-de-sac with a radius of 40 feet (SD 1-10). The standard details also allow for a landscaping island to be placed in the center of the bulb. Loop roads have been used on occasion even though they are not detailed in the Standards Manual.

**DEFINITION**

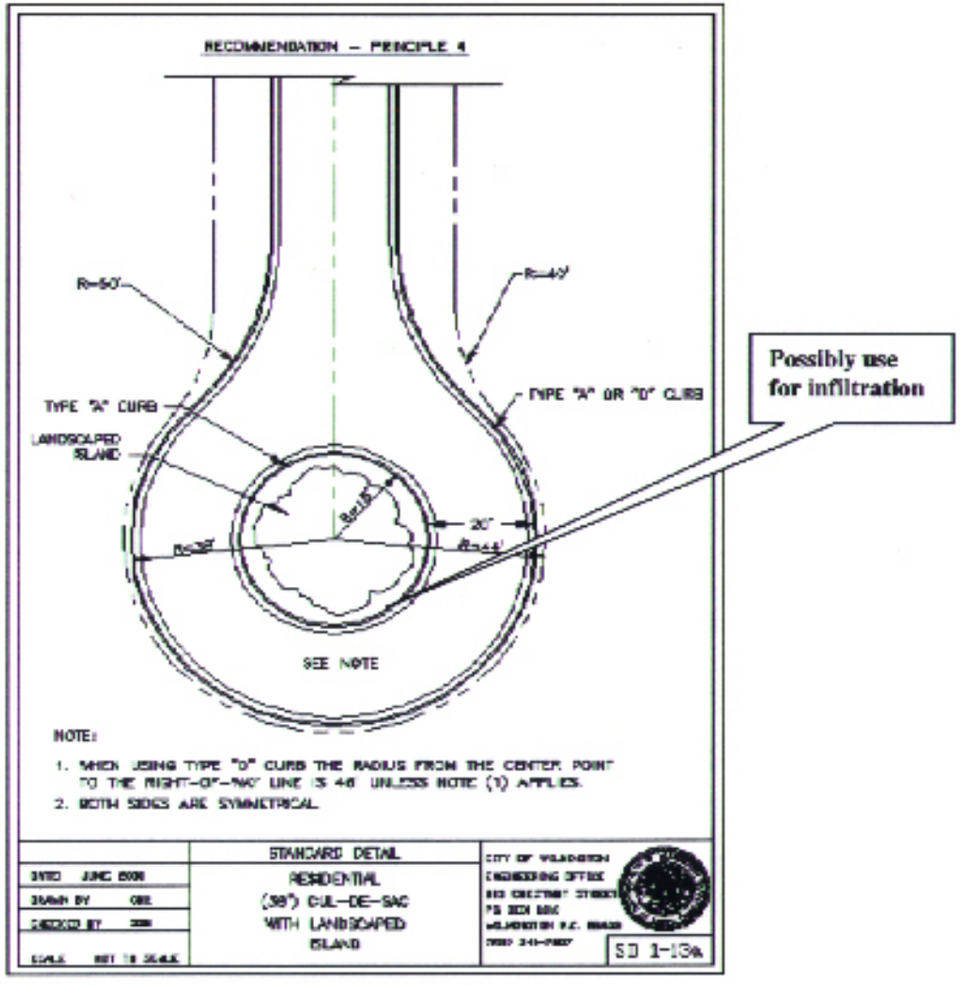
IMPERVIOUS: The characteristic of a material which prevents the infiltration or passage of liquid through it. This may apply to roads, streets, parking lots, rooftops, dense sod and sidewalks.

***Roundtable Discussion***

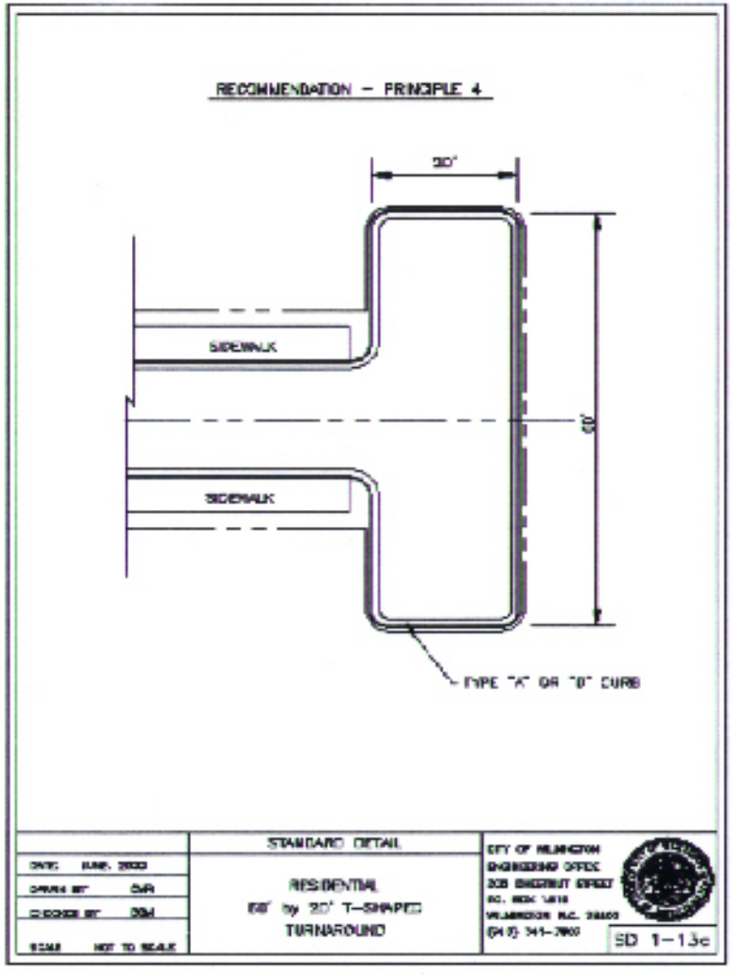
The Committee discussed the necessary requirements for cul-de-sacs. One of the main points was adequate turning radius for City service and emergency vehicles. A fire truck would require a 45-foot outside radius while a garbage truck would require a 42-foot outside radius. Sometimes, these vehicles can actually do tighter turns than the design standard. Options for smaller radii should be made available for developments that can successfully use them and still provide safe access for large vehicles.

## Roundtable Recommendations: Principle 4

1. Standard detail should be adopted for a hammerhead or T-shaped turnaround. (See proposed detail #2).
2. Standard detail for cul-de-sacs should also include a radius option of less than 40 feet. (See proposed detail #1).
3. Storm water drainage systems should be directed to flow inward to the landscaped cul-de-sac whenever practical, in effect designing them as a bioretention facility.




**Detail #1**




**Detail #2**

***Proposed turnaround details to add to the Technical Standards Manual***

## Principle 5: Vegetated Open Channels

Where density, topography, soils and slope permit, vegetated open channels should be used in the street right-of-way to convey and treat storm water runoff.

***Better Site Design Handbook Recommended Practice***

Unlike curb and gutter systems, which move storm water with virtually no treatment, open vegetated channels can remove pollutants by allowing infiltration and filtering to occur. They can also reduce the velocity and volume of runoff. These dry swales or grass channels are generally appropriate for smaller drainage areas, mildly sloping topography and housing density of less than 4 units per acre.

***Current Requirements***

Current details in the Technical Standards Manual for streets do not include a cross-section with grassed swales. Curb and gutter is required for each local and collector street to be built within the City.

***Roundtable Discussion***

Grassed swales can remove anywhere from 15% to 90% of different pollutants. Part of the concern of using swales is the increased maintenance of the road shoulder and failure of the pavement edge. The Committee heard a presentation on the design for a current City street project on Park Avenue that utilizes curb and gutter with flume openings, bioretention areas and grassed swales to convey and treat storm water (see figs. 5-1, 5-2 and 5-3). The curbing will protect the edge of pavement while mowing and periodic sediment removal will be the predominant maintenance activities. Header curbs were also discussed. Header curbs are made of concrete and are placed flush with the edge of pavement to allow for sheet flow off the road. This technique is already being used in New Hanover County.

Economic benefits can include a less expensive construction cost since swales cost less to build than a typical curb and gutter/pipe system.

**DEFINITIONS**

BIORETENTION: A water quality practice that utilizes landscaping and soils to treat urban stormwater runoff by collecting it in shallow depressions, before filtering through a fabricated planting soil media.

GRASS CHANNEL: An open vegetated channel used to convey runoff and to provide treatment by filtering out pollutants and sediments.

OPEN CHANNELS: Also known as swales, grass channels, and biofilters. These systems are used for the conveyance, retention, infiltration and filtration of stormwater runoff.

VEGETATED OPEN CHANNELS: Also known as swales, grass channels, and biofilters. These systems are used for the conveyance, retention, infiltration and filtration of stormwater runoff.

## Roundtable Recommendations: Principle 5

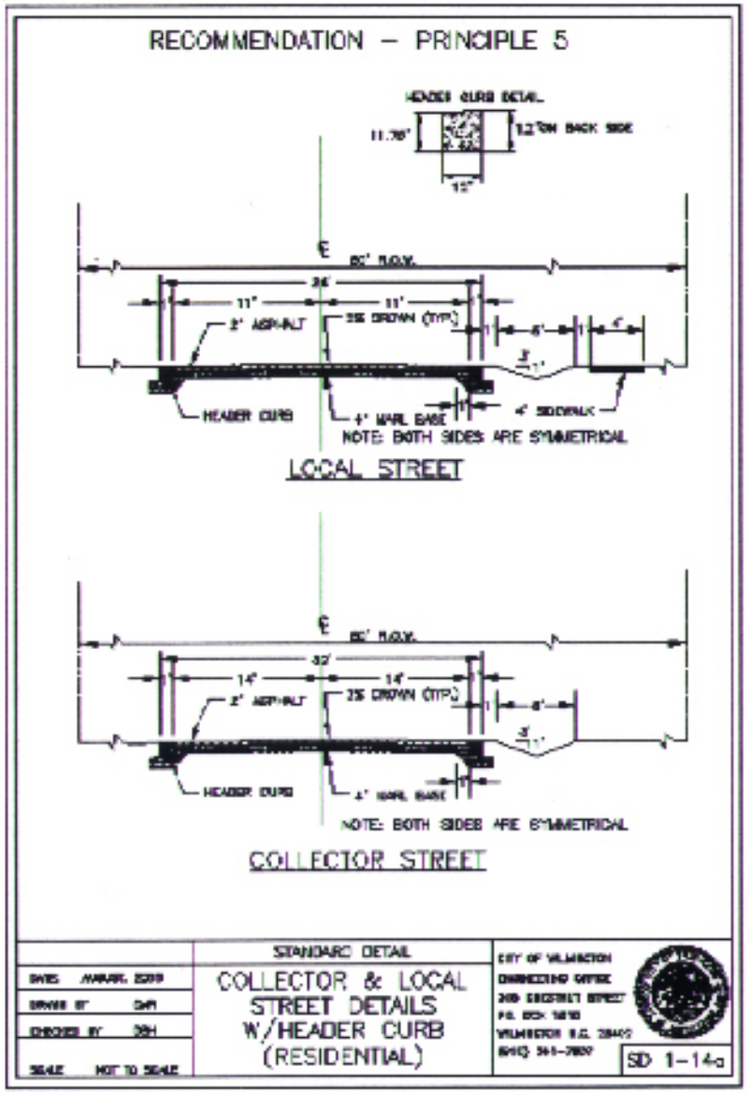
1. Develop a standard detail for use of curb openings and grassed swales.
2. Develop a street cross-section detail that incorporates alternative types of header curbing for incorporation into the Technical Standards Manual. (See proposed detail #1).

*City of Wilmington Capital Improvement Program*

# PARK AVENUE STREET IMPROVEMENT PROJECT


**Fig. 5-1.** ***Park Avenue Project bioretention area***


**Fig. 5-2.** ***Park Avenue Project grass swale***




**Detail #1**


**Fig. 5-3.** ***Example of Curb Opening on Park Avenue Project***

## Principle 6: Parking Ratios

The required parking ratio governing a particular land use or activity should be enforced as both a maximum and a minimum in order to curb excess parking space construction. Existing parking ratios should be reviewed for conformance taking into account local and national experience to see if lower ratios are warranted and feasible.

## Principle 7: Parking Codes

Parking codes should be revised to lower parking requirements where mass transit is available or enforceable, shared parking arrangements are made.

## Principle 8: Parking Lots

Reduce the overall imperviousness associated with parking lots by providing compact car spaces, minimizing stall dimensions, incorporating efficient parking lanes, and using pervious materials in the spillover parking areas where possible.

***Better Site Design Handbook Recommended Practice***

The handbook recommends that communities study a variety of options for reducing the size and the impact of parking lots. The development of not only minimum parking space requirements but also maximum possible spaces per use sets a limit to the amount of impervious surface allowed. This requirement provides more opportunity for retaining natural areas to handle storm water and to benefit from mature landscaping.

The handbook recommends that communities provide incentives to encourage shared parking and the use of mass transit. Some successful ways of accomplishing this are:

- A maximum parking ratio for office use,
- The development of a transit center,
- The addition of high occupancy vehicle (HOV) lanes in urban areas,
- Increase in the cost of public parking,
- Shared parking arrangements between complementary peak hour users (i.e. professional offices and movie theaters), and
- Parking space credits for those uses in proximity to mass transit.

**DEFINITIONS**

PARKING DEMAND: The number of parking spaces actually used for a particular land use.

PARKING LANE: A section of the roadway which has been designed to provide on-street parking for residential neighborhoods.

PARKING RATIOS: An expression of the required parking spaces that must be provided for a particular land use, often stated as a ratio of x spaces per y units.

POROUS PAVEMENT: Permeable pavement surface with an underlying stone reservoir to temporarily store surface runoff before it infiltrates into the subsoil.

SHARED PARKING: A parking strategy which reduces the total number of parking spaces needed by allowing adjacent users to share a parking area during non-competing hours of operation.

***Current Requirements***

City Council approved an amendment to its parking requirements in 1996 to include maximum parking space allowances. The Transportation Planning staff recommended that the maximum allowable parking for land use categories be 150% of the current minimum standard. This standard would not apply to lots of 20 spaces or less. The maximum parking requirement can be exceeded by 25% with pervious surface parking.

In 1999, City Council adopted "big box" regulations (large scale retail developments over 50,000 square feet in size) that limited parking for office uses to 3 spaces per 1000 square feet and for retail uses to 4.5 spaces per 1000 square feet (see figs. 6-1 and 6-2).


**Fig. 6-1.** ***Preservation of natural landscaping areas required by Large Scale Retail Ordinance***

The Mixed Use Ordinance includes increased density as a bonus for providing mass transit connections, building parking garages to reduce impervious cover and shared parking allowances.


**Fig. 6-2.** ***Preservation of natural landscaping areas required by Large Scale Retail Ordinance***

***Roundtable Discussion***

Discussion was held among Committee members regarding the need to update the standards and allowing for greater maximums for some uses creating more parking for those uses that needed. In particular, medical offices have been in great need of additional spaces above the typical office requirement. This isolated case does not apply to all office uses, and therefore can be singled out in the parking group table as a separate category.

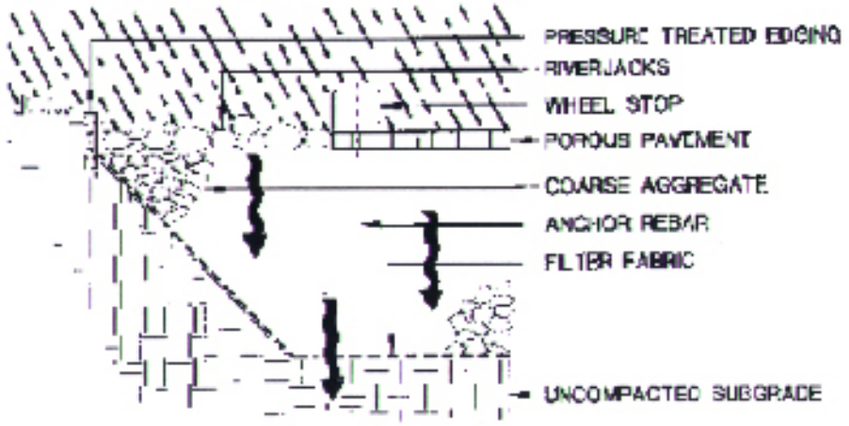
The Roundtable members discussed pervious parking surfaces at length (see figs. 6-3 and 6-4). Although it is seen as a preferred alternative, the State storm water review does not consider it a "pervious" surface to the extent that would be necessary to grant a waiver of this area from the drainage area calculations. Therefore, the cost savings are questionable from the developers' standpoint; and the results are questionable from the regulating agency's perspective as well. The subject continues to be

studied by various groups and no recommendation was put forward on this subject.


**Fig. 6-3.** ***Examples of Turf stone pervious parking material***


**Fig. 6-4.** ***Typical Diagram for Pervious Pavement***

Figure 21.1: A typical porous pavement/recharge bed design




Source: Cahill Associates

## Roundtable Recommendations: Principles 6,7, & 8

1. The Watershed Roundtable recommends that the Unified Development Ordinance Oversight Committee consider reviewing all parking space requirements in the Zoning Ordinance and consider making changes to reduce the amount for retail uses.
2. Encourage a minimum amount of paved parking through reducing the amount of impervious surface required.
3. Encourage the use of pervious materials.
4. Delete small car parking in the UDO.
5. Promote angled parking with one-way traffic flow where appropriate.

## Principle 9: Structured Parking

Provide meaningful incentives to encourage structured and shared parking to make it more economically viable.

***Better Site Design Handbook Recommended Practice***

The handbook recommends that communities consider using incentives to encourage the building of multi-level, underground and under-the-building parking garages (see fig. 9-1). Some incentives could be in the form of:

- Tax credits,
- Storm water waivers, or
- Density bonuses.

***Current Requirements***

The Mixed Use Ordinance includes increased density as a bonus for providing mass transit connections, building parking garages to reduce impervious cover and shared parking allowances.

***Roundtable Discussion***

Discussion centered on the applicability of this principle to the downtown area and to the Mixed Use zoning districts, both of which encourage structured parking. Incentives have been developed for encouraging this type of parking through a bonus system for additional density that applies to the Mixed Use District.

**DEFINITION**

STRUCTURED PARKING: More commonly referred to as parking garages, these are parking facilities that expand vertically to provide parking on various levels. Structured parking allows more parking on sites where space for single level parking lots is no longer available.

## Roundtable Recommendations: Principle 9

1. Promote parking under buildings where possible with incentives like tax credits, stormwater credits, density, floor area or height bonuses.
2. Increase building height to allow parking on the first floor/ground floor.


**Fig. 9-1.** ***Shipyard Commons office building with parking underneath***

## Principle 10: Parking Lot Runoff

Wherever possible, provide storm water treatment for parking lot runoff using bioretention areas, filter strips and/or other practices that can be integrated into required landscaping areas and traffic islands.

***Better Site Design Handbook Recommended Practice***

The handbook encourages the use of bioretention areas, dry swales, sand filters and filter strips within the required landscaping to treat runoff before it ever leaves the parking lot. Preliminary data has shown that each of these techniques can significantly reduce sediment, nutrients, hydrocarbon and heavy metal pollutants. Maintenance requirements and cost can range from high (sand filters) to low (bioretention). These techniques can also reduce the volume and velocity of runoff that, in turn, can offset some other storm water management costs. Typically, required landscaping islands are used to enhance the appearance, provide shade, allow for $CO_2$ absorption of parking lots and may cover as much as 15% of the area. These islands are usually curbed, raised and irrigated. The only storm water that is absorbed by these areas is what falls on them.

***Current Requirements***

Landscaping in parking lots is required at the end of all parking rows and at least every 15 spaces. These islands are required to be protected from traffic and are usually curbed. Drainage typically flows away from the landscaped areas. Water quality requirements for treating runoff from the parking lot are handled by a State permit.

***Roundtable Discussion***

Required landscaping in parking lots should be used for treatment of runoff whenever feasible. City Technical Standards do not incorporate the best management practices that would allow some treatment before the runoff leaves the parking lot. The State Best Management Practice manual allows a designer to meet all water quality requirements using eight different techniques. The problem is that wet detention ponds have become the cookbook approach for designing the storm water management system (see figs. 10-1, 10-2 and 10-3). The other techniques are seldom used. These ponds, while they remove sediment, do not do a good job of removing the other pollutants listed above. Designers need to be encouraged to utilize other BMPs when designing parking lots.

**Fig. 10-1.** ***Example of a detention area that has a lack of aesthetic appeal in contrast to the development and the surrounding community.***

**Fig. 10-2.** ***Example of a detention area with heavily vegetated banks.***

**Fig. 10-3.**
***Algal Blooms--signs of poor water quality in a detention pond***

## Roundtable Recommendations: Principle 10

1. Develop recommendations on wet ponds that promote wetland vegetation around the perimeter, 3:1 length to width ratio, flatter slopes and improve maintenance standards (see proposed detail #1).
2. Encourage the State to evaluate the benefits of natural feature vs. engineered BMP.
3. Improve Technical Standards Manual with BMPs and promote their use in parking lot design.
4. Encourage landscaping around detention areas.
5. Encourage landscaping requirements as found in the large scale retail section of the Zoning Ordinance by adding it to the requirements for the UDO.
6. Fast track these particular recommendations through the UDO process.



## DEFINITIONS

BIORETENTION: Utilizes filtering media and plant material to treat runoff through adsorption and decomposition.

DETENTION: The temporary storage of storm runoff in a stormwater practice with the goals of controlling peak discharge rates and providing gravity settling of pollutants.

EROSIVE VELOCITIES: Velocities of water that are high enough to wear away the land surface. Exposed soil will generally erode faster than stabilized soils. Erosive velocities will vary according to the soil type, slope, structural, or vegetative stabilization used to protect the soil.

EUTROPHICATION: The process of over-enrichment of water bodies by nutrients often typified by the presence of algal blooms and other plants that consume.

EXTENDED DETENTION (ED): A stormwater design feature that provides for the gradual release of a volume of water over a 12 to 48 hour interval in order to increase settling of urban pollutants and protect downstream channels from frequent storm events.

FOREBAY: Additional storage space located near a stormwater practice inlet that serves to trap incoming coarse sediments before they accumulate in the main treatment area.

FREEBOARD (HYDRAULICS): The distance between the maximum water surface elevation anticipated in design and the top of retaining banks or structures. Freeboard is provided to prevent overtopping due to unforeseen conditions.

NUTRIENT: A substance that provides food or nourishment, such as usable proteins, vitamins, minerals or carbohydrates. Fertilizers, particularly phosphorus and nitrogen, are the most common nutrients that contribute to eutrophication.

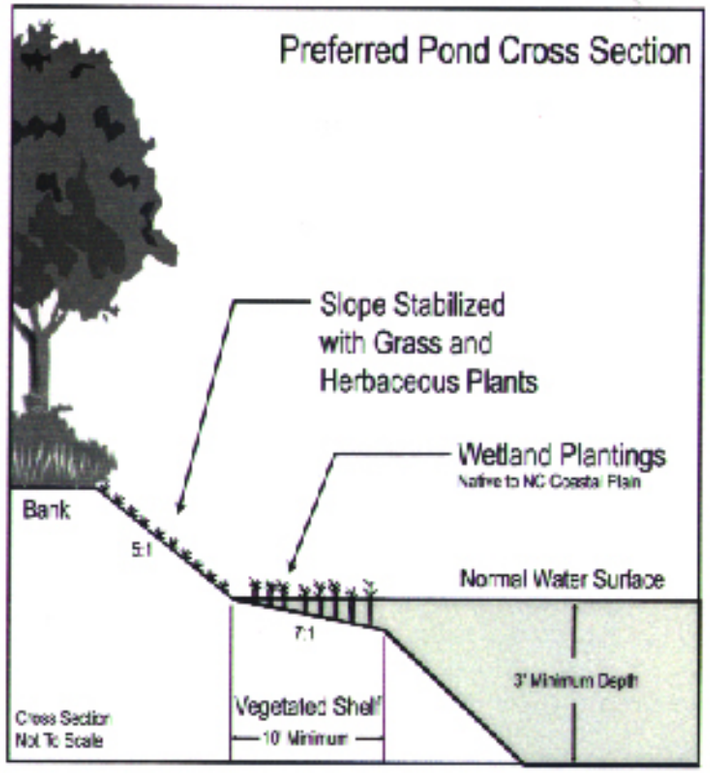
PRETREATMENT: Techniques employed in stormwater practices to provide storage or filtering to help trap coarse materials before they enter the system.

RETENTION: The amount of precipitation on a drainage area that does not escape as runoff. It is the difference between total precipitation and total runoff.

FILTER STRIPS: A vegetated area that treats sheetflow and/or interflow by removing sediment and other pollutants. The area may be grass-covered, forested or of mixed vegetative cover (e.g. wildflower meadow).

GRAVEL FILTER: Washed and graded sand and gravel aggregate placed around a drain or well screen to prevent the movement of fine materials from the aquifer into the drain or well.

GREEN PARKING: Refers to several techniques applied together to reduce the contribution of parking lots to the total impervious cover in a lot.




**Detail #1.**
***Cross section of slopes for wet detention pond***

## Principle 11: Open Space Design

Advocate open space development that incorporates smaller lot sizes to minimize total impervious area, reduce total construction costs, conserve natural areas, provide community recreational space and promote watershed protection.

***Better Site Design Handbook Recommended Practice***

The handbook recommends that communities make cluster developments allowed by right in a Zoning Ordinance. The density of these cluster developments is usually not feasible for more than six units per acre due to the amount of open space required to preserve. The flexibility goes down as the number of units is increased. Another benefit of open space design is that the annual runoff volume from a site can be reduced from 20% to 60%. Calculations of the increase in infiltration of storm water from these sites correspond with those reductions.

Open space development can be significantly less expensive to build than conventional subdivision developments. A majority of the cost recovery is through savings in road construction and storm water management costs. Savings in infrastructure costs can range from 11% to 66% according to studies cited in the *Better Site Design Handbook.*

***Current Requirements***

Cluster design is promoted in several forms in the City Zoning Ordinance. First, the inclusion of the Conservation Overlay District Standards require that certain areas be left in their natural state and the residential units then clustered around the resource. Performance Residential Standards have also been recently introduced with the 1995 Annexation area. These developments are by right, having the option to cluster units as long as the base density of the underlying zoning district is met and the setbacks bordering the development are in place.

***Roundtable Discussion***

Examples of good open space design were discussed with the Roundtable members, including residential design Charette drawings for the Futch Creek area. The Charette drawings came from the "Wilmington and New Hanover County Joint Development Ordinance Visioning Study," dated April 9, 1999. Several other subdivisions were featured during the Buffer Tour (April, 2000) with Roundtable members. Even during the tour, members had different opinions of what open space design was meant to accomplish. Some felt it provided privacy, some thought of recreation, and some considered the environmental benefits to be the most important feature.

**DEFINITIONS**

CONSERVATION EASEMENT: Voluntary agreements that allow an individual to set aside private property to limit the type or amount of development on their property. Easements relieve property owners of the burden of managing these areas by shifting responsibility to a private organization or government agency better equipped to handle maintenance and monitoring issues.

NATURAL OPEN SPACE: The proportion of open space that is retained in an undisturbed vegetative state.

GREENWAY: A planning study that creates a linked and linear network of trails, accesses, passive and possibly active recreational facilities along an aquatic corridor.

OPEN SPACE: A portion of a development site which is permanently set aside for public or private use and will not be developed with homes. The space may be used for passive or active recreation, or may be reserved to protect or buffer natural areas.

OPEN SPACE DEVELOPMENT: The use of designs which incorporate open areas into a development site. These areas can be used for either passive or active recreational activity or preserved as naturally vegetated land.

OPEN SPACE MANAGEMENT: The legal and financial arrangements needed to manage open space according to its prescribed use (i.e., natural areas, recreation).


Fig. 11-1. *Open space: a regional storm water facility at Silver Stream*


Fig. 11-2. *Wildlife habitat at Silver Stream Pond*

## Roundtable Recommendations: Principle 11

1. Distinguish the type of open space desired—whether natural or manmade, passive or active (see figs. 11-1 and 11-2).
2. Need to map existing conservation easements to have more accurate information available allowing the plan review process to move more quickly.
3. Have New Hanover County adopt open space requirements with performance designs.
4. Encourage clustering when environmentally valuable areas would be impacted by residential or commercial development.

## Principle 12: Setbacks & Frontages

Relax side yard setbacks and allow narrower frontages to reduce total road length in the community and overall site imperviousness. Relax front setback requirements to minimize driveway lengths and reduce overall lot imperviousness.

***Better Site Design Handbook Recommended Practice***

The Handbook recommends that communities make changes to the Area & Height Tables typically found in Zoning Ordinances. This allows greater creativity by developers to make neighborhoods that address the street, conserve potential natural areas and provide a more efficient use of space. Much of the current setback standards are based upon parking requirements in the driveways, adequate sight distances and fire protection. These requirements have been challenged as to their legitimacy in every neighborhood design in recent years.

***Current Requirements***

The City Zoning Ordinance includes an Area & Height Table that specifies the setbacks and frontages by zoning district. Some exceptions are noted, but any deviation to the requirements must go through the Board of Adjustment quasi-judicial process for a hardship variance.

***Roundtable Discussion***

Setbacks in the City and County regulations are already minimal and do not need to be adjusted except in specifically designed compact communities. Frontages could be relaxed, especially in the more urban areas to keep the lots in character with older neighborhoods. But as a whole, the setbacks and frontages are functioning properly. There are alternative development methods in the City and County to allow more flexible setbacks. The Performance Residential regulations eliminate the setbacks of the traditional zoning districts for cluster developments. The same flexibility is also found in the CBD and the Mixed Use Zoning Districts.

**DEFINITIONS**

FRONTAGE REQUIREMENTS: A requirement in the subdivision code that mandates that each lot within a particular zoning category have a minimum length that fronts along the street.

OPEN SPACE DEVELOPMENT: The use of designs which incorporate open areas into a development site. These areas can be used for either passive or active recreational activity or preserved as naturally vegetated land.

## Roundtable Recommendation: Principle 12

The UDO Oversight Committee should consider adding more flexibility in the Area and Height Table as was done with the Performance Residential standards and the Mixed Use District by reducing the side setback requirements from 10 to 8 feet and by reducing the front setback from 30 to 20 feet in R-20 zoning districts.

## Principle 13: Sidewalks

Promote more flexible design standards for residential subdivision sidewalks. Where practical, consider locating sidewalks on only one side of the street and providing common walkways linking pedestrian areas.

***Better Site Design Handbook Recommended Practice***

The handbook recommends that communities make changes to the sidewalk requirements to eliminate nonessential sidewalks. The location of these sidewalks should be based upon pedestrian movement and diverted away from busy streets. A sidewalk on one side only is also recommended in some places. Reducing the width, location, and the direction in which the sidewalk drains often helps in stormwater management. The goal is to have practical, safe and attractive travel paths.

***Current Requirements***

The Technical Standards Manual and the Subdivision Ordinance currently regulate the location and construction of sidewalks. The City requires a 4 foot or 5 foot sidewalk on both sides in new developments depending on the classification of the street (see fig. 13-1).

***Discussion***

The Roundtable members had considerable discussion on this item. Sidewalks have been required by the City on both sides of the street in most instances. Deviation from this requirement would reduce impervious surface, but could weaken the sidewalk network. Examples of cul-de-sacs and looped streets were discussed. These types of streets may not need sidewalks on both sides due to the low traffic volume and limited number of units. The ability to make judgment decisions about when a sidewalk is or is not appropriate would be made by the technical review staff.


**Fig. 13-1.** ***Typical Sidewalk Requirement***

## Roundtable Recommendations: Principle 13

1. Develop criteria for streets that would require sidewalks on only one side (i.e. cul-de-sacs or looped streets).
2. Adjusting the width and location of sidewalks on a case-by-case basis.
3. Allowing lower density developments in the County to use pedestrian trails instead of sidewalks.

## Principle 14: Driveways

Reduce overall lot imperviousness by promoting alternative driveway surfaces and shared driveways that connect two or more homes together.

***Better Site Design Handbook Recommended Practice***

The handbook recommends that communities can reduce the imperviousness of a residential subdivision by 20% just by altering the driveway specifications. Narrower widths, a reduction in the length of driveways, shared driveways, and the use of permeable paving materials are ways to improve the impact of driveways on the storm water management system.

***Current Requirements***

The Technical Standards Manual only specifies construction requirements for the driveway aprons approaching the street. There is no specific requirement for materials but most new residential developments have paved driveways.

***Discussion***

A variety of opinions were shared by Roundtable members on this principle, including whether or not the driveway needed to be paved beyond the right-of-way line onto private property. Discussion was held over the alternate types of driveway materials and designs to reduce impervious surface. It appeared that the driveway with the grass median was preferred over natural ground cover such as pine straw. This grass median type of driveway design was used on a neotraditional subdivision featured on the Buffer Tour, April, 2000 (see fig. 14-1).


**Fig. 14-1.** ***Paved wheel lanes with grass median for driveway***

## Roundtable Recommendations: Principle 14

1. Consider alternate criteria for driveway surfacing options that would reduce the amount of impervious surface in a residential development and reduce cost.
2. A standard detail for a 9 foot driveway for residential properties be added to the Technical Standards Manual (pervious wheel path or turf stone).

## Principle 15:
## Open Space Management

Clearly specify how community open space will be managed and designate a sustainable legal entity responsible for managing both natural and recreational open space.

***Better Site Design Handbook Recommended Practice***

The handbook recommends that communities require to the extent possible that open space dedicated as a part of a private development project be left in a natural condition. Open space managed in this condition has minimal annual maintenance costs. Open space should also be consolidated whenever possible with other open space areas forming linkages that benefit the animal population as well as provide potential passive recreational opportunities. Community associations are identified as logical owners of these types of spaces. Another option is a third party ownership such as a land trust, conservation easement monitored by the local, state or federal government.

***Current Requirements***

The City currently requires that a homeowner's association be formed to manage an open space as part of the parkland dedication ordinance in the Subdivision Regulations. There are limited examples of an active maintenance of open space by such groups in the City.

***Discussion***

The Roundtable members discussed issues related to the big picture of open space management, including inventory needs and other state and regional assessment projects. Public education and community outreach were also mentioned as critical needs in making open space management successful in the area. The Committee also discussed a recent Open Space Bond Referendum that voters did not pass. Camilla Herlevich, Director of the Coastal Land Trust made a presentation to the group on the benefits of conducting a Natural Heritage resources inventory. This state program would provide base level information and a database on the existing conditions in New Hanover County of open spaces. This information would provide a starting point from which to prioritize the protection and/or acquisition of the remaining open areas.

**DEFINITIONS**

HIGH-INPUT LAWN: A heavily irrigated lawn subject to high usage of chemicals such as fertilizers, pesticides, fungicides and herbicides.

HYDROLOGIC SOIL GROUP (HSG): A Natural Resource Conservation Service classification system in which soils are categorized into four runoff potential groups. The groups range from A soils, with high permeability and little runoff production, to D soils, which have low permeability rates and produce much more runoff.

LOW-INPUT LAWN: A lawn that is regularly mowed but is not subjected to a high usage of chemicals and irrigation.

## Roundtable Recommendations: Principle 15

1. The Unified Development Ordinance Oversight Committee consider requiring a minimum percentage of open space to be left in natural condition when clustering and/or density bonuses are provided.
2. Conduct a joint City-County inventory of natural areas with the North Carolina Heritage Trust.
3. Require a minimum setback from significant open space or natural areas. Provide more information on the types of open spaces being protected.
4. Differentiate between open space and parkland dedication requirements (see figs. 15-1 and 15-2).
5. Educate the community on open space and protection of natural areas through outreach programs.
6. Explore transfer of development rights (TDRs) & purchase of development rights (PDRs) for protection of natural areas.
7. The city and County should explore alternative methods of protecting or acquiring open space.


**Fig. 15.1** ***Open space that serves drainage infrastructure needs***



**Fig. 15-2.** ***Open space that serves recreational needs***

## Principle 16: Rooftop Runoff

Direct rooftop runoff to pervious areas such as yards, open channels or vegetated areas and avoid routing rooftop runoff to the roadway and the stormwater conveyance system.

***Better Site Design Handbook Recommended Practice***

Routing runoff over a pervious surface before it reaches an impervious surface can reduce runoff volume by as much as 50%. The resulting pollutant load also drops. Conveying the runoff through swales rather than over hardened surfaces also reduces velocity and allows for more filtration.

***Current City Requirements***

Rooftop runoff is typically required to be directed to the on-site stormwater management facility, sometimes by piping. Treatment of runoff prior to reaching a retention pond is bypassed when this piping is used.

***Discussion***

Once water leaves a rooftop, it sometimes never leaves a pipe before being emptied into a pond (see fig. 16-1). In some cases it is preferred for rooftop runoff to drain into the yard or grassy area before entering the pond. This provides an opportunity for the runoff to be filtered.

**DEFINITION**

GREEN ROOF: A roof that has been designed to control runoff volume, improve air and water quality and promote energy conservation. These systems, called extensive roof gardens, typically include layers of drainage material and planting media on a waterproof membrane with lightweight soil mixture.

**Fig. 16-1.** ***Rooftop runoff should be conveyed through grassed swales***

## Roundtable Recommendations: Principle 16

1. Encourage designers to collect roof drainage through grassed swales prior to going into a standard retention pond.
2. Obtain more information on Green Roof designs.
3. Encourage BMPs such as rain barrels, cisterns and water bogs or gardens.

## Principle 17: Buffer Systems

Create a variable width, naturally vegetated buffer system along all perennial streams that also encompasses critical environmental features such as the 100-year flood plain, steep slopes and freshwater wetlands.

## Principle 18: Buffer Maintenance

The riparian stream buffer should be preserved or restored with native vegetation that can be maintained throughout the plan review, delineation, construction, and occupancy stages of development.

Initial discussions brought up a wide range of issues related to riparian buffers along water bodies. Several of the scientific members of the Watershed Protection Roundtable presented their knowledge of buffers and how they can protect water quality. Staff also scheduled a field trip where 3 locations were visited to see the differences between buffer types. Some photos from the field trip are included in this report (see fig. 17-1). **Three major questions were developed out of the initial discussions and they are described below:**

1. Where will buffers be located?
2. What can be located within the buffer?
3. What type and degree of vegetation will be allowed?

### 1. WHERE WILL BUFFERS BE LOCATED?

Possible locations identified for buffer requirements:

- 100 year floodplain, Conservation Overlay District (COD) areas, blueline creeks (USGS), steep slopes, are potential features to measure the buffer from.

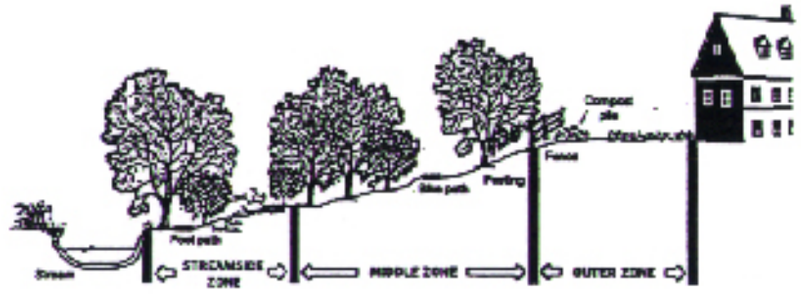
***Current Status of UDO Process***

The approved Comprehensive Plan policy stipulates a 35-foot vegetated buffer will be required. The plan language states "...a naturally vegetated buffer with an average width of 35 linear feet shall be established or maintained naturally." The buffer shall extend 35 feet horizontally and landward from the edge of a Conservation Resource.

***Better Site Design Handbook Recommended Practice***

Recommends a three zone stream buffer system delineated as follows:

- Streamside zone – Min. 25 ft width plus critical wetlands or habitats
- Middle zone – 50 to 100 ft depending on slopes and floodplain
- Outer zone – 25 ft minimum setback for structures




**The Three-Zone Urban Stream Buffer System**
**(Adapted from Welsch, 1991)**
**Center for Watershed Protection**

***Discussion***

The proposed requirement of buffers only being adjacent to COD areas was discussed. It was felt by some Committee members that buffers along USGS blueline creeks would provide benefit to the receiving water bodies. These creeks currently provide protection further up into the watershed in locations where the COD does not apply. Concern was expressed about property rights and the possible building constraints that a buffer requirement may put on

individual lots. The Committee also discussed existing developed lots, redevelopment following natural disasters and nonconforming issues. The members decided that this discussion was leading to specific rulemaking that should be left to the UDO Committee.

***Proposed Recommendations:***

## ALTERNATIVE A

1. Buffers should be required along all blueline creeks measured landward from the top of the stream bank or any adjacent critical wetlands/habitats/shoreline components.
2. Buffers along marshes should begin along the marsh line (mean high water).
3. Buffer measurement should begin at the top of the bank of the base flow channel along creeks.
4. Buffer width of 35 feet should be the minimum. When feasible, wider buffers are preferred.
5. Buffer averaging" should be allowed for flexibility in site design.
6. A buffer transition zone should not apply outside of COD.
7. A map will be developed showing buffers and where buffers would be required.

### VEGETATED BUFFERS FOR "BLUE LINE" STREAMS

### THE ARGUMENTS IN FAVOR

There are three compelling reasons for including "blue line" streams in any watershed protection program.[1] They are:

[1] For this discussion, "blue line stream" means a live stream represented on U.S.D.I. Geological Survey Quadrangle [7.5 Minute Series (topographic)} Maps by blue lines.



Maintaining Landscape Character

Open water and slope are two basic elements in the landscape analysis systems advanced by Ian McHarg (University of Pennsylvania and author of *Design With Nature*) and Phillip Lewis (University of Wisconsin – Madison). Professor Lewis has noted that, on the basis of his work to define "corridors of environmental quality" in many parts of the United States, when open water and slope are plotted, each region displays a pattern as distinct as a fingerprint.

Many observers claim that the coastal plain in general, and New Hanover County in particular, are flat and characterless. But this is relative. Each of the blue line streams has a well-defined course complete with slope and changes in vegetation. When plotted, there is a distinct pattern that is unique to this portion of the coastal plain let alone North Carolina in general. When recognized and used as a basis for the design and location of development on the land, the developments themselves become more pleasant and possessive of distinctive character.[2]

It is this characteristic that serves as the basis for the clustering that came into prominence during the early 1960's based largely on the work of William Whyte. Similarly, the blue line stream system in New Hanover County can be the basis for a system of clustering that affords developers adequate areas of desirable land for residential and commercial units while defining the preferred open space.

Role in the Health of the Tidal Portions of the Creeks

The creeks as they meander through the landscape serve at least two fundamental functions.

First, the low gradient causes water to spread to adjacent areas during most heavy rain events. During that time, the "flood water" accumulates detritus

[2] Clear Run and its relation to the original development along Clear Run Drive and the relation of the stream system to development proposed on what is the Duck Haven golf course is an interesting case in point.

(loose organic material resulting from disintegration on the forest floor), which is then carried to the tidal portion of the creek when the water recedes. The detritus is an important part of the stew of material that supports juvenile fish maturing the estuarine portion of the creeks.

Second, the stream systems stabilize the flow of fresh water into the estuaries. Typically, the normal stream flow characteristics during rain events are represented on a hydrograph [showing flow in cubic feet per second (cfs) over time] as a smooth rise and fall. Disturbed and channelized streams have hydrographs showing abrupt peaking and falling. The flush of fresh water flow has a measurable impact on the species composition of the flora (and probably fauna) in the estuary.

Following from the second point, there are two detrimental effects on the estuaries from severe denuding of the flood zone and/or making parts of the streams impervious.

First, the streams become conduits that transmit pollutants from headwaters and adjacent areas into the estuarine portions of the creeks.

Second, flash flows of water in the streambeds accelerates scouring of the bed and the transmission of additional silt loads to the estuary. Obviously, without vegetated buffers and meanders, the streams become conduits that facilitate rather than impede the transmittal of silt washed from impervious surfaces into the estuaries.

## Important Complementary Functions

N.C. State engineering professor Rooney Malcolm, while briefing the New Hanover County Board of Commissioners during the presentation of the W. K. Dickson Company report on drainage for Page's Creek, said that the backbone of any drainage program is the stream system. There is very little question that the stream system of the county is a dominant part of the surface water regime that includes wetlands (including pocosins), flood plains, tidal estuaries, surficial aquifers, ordinary rains, storms, and evaporation and evapotranspiration. There are enormous complementarities in considering the characteristics and role of the blue line streams when planning for sustainable development; that is, development that will not be prone to routine damage from flooding. Pay modest costs up front in considering the drainage role of the blue line streams or pay large scale drainage costs later on.

Since the blue line streams represent the character of the landscape, they are major factors in any open space initiative for the county. If special consideration is given to the streams and the adjacent floodways, there will be established a hierarchical structure for the designation of non-recreation demand driven open space in the approval process for subdivision review. It would give additional substance to the preference system granting bonus "density" contained in the mixed-use overlay district (MX) ordinance adopted by the City of Wilmington. There is possible the direct application of this principle to the emerging open space provisions of the subdivision ordinance in the Unified Development Ordinance now being drafted.

## Case For Vegetated Buffers

The members of both the Watershed Protection Roundtable and the Unified Development Ordinance Oversight Committee have been exposed to the benefits of having a strip of thrifty, well managed vegetation border bodies of water. The literature has shown that maintaining or improving the quality of water is the dominant benefit to be realized from vegetative buffers.

This is true for the blue line streams in New Hanover County. But not only from the standpoint of direct runoff to the water body as is the case for the strips along the tidal portions of the creeks. In the case of the streams, the quality of the water flowing downstream has a direct effect on the quality of the water in the estuaries. As with the tidal reaches, the buffers will protect water in the channels from pollution emanating from the land alongside. But equally or more

important, the buffer strips will act to trap pollutants and sediments originating upstream.

The vegetation will also contribute detritus and shade the water in the stream thus lowering surface temperatures. The vegetated state of the streams will enhance the aesthetics of the streams in the landscape.

Additional Discussion

The ideas of McHarg and Whyte have been field tested in the Upper Brandywine watershed of Chester County Pennsylvania. A multi-disciplinary team, led by a lawyer specializing in planning law, Ann Louise Strong, worked with the government of the county and involved townships in shaping an overall land use development scheme based on the hydrology of the landscape. It was clustering; it was maintaining open space based on natural resources; it was optimizing returns on both public and private investments.

These are the same principles articulated by Elizabeth Brabec in the regional planning conference sponsored by Cape Fear Tomorrow and the N.C. Coastal Federation here in Wilmington in October 1997. She presented evidence of the financial rewards to developers as well as economic benefits to society that result from designing with natural systems.

Therefore, the Watershed Protection Roundtable should:

Recommend that the blue line streams be afforded a flexible or averaged 35 foot vegetated buffers on both sides of the stream measured from the top of the natural channel;
Recommend to the Unified Development Ordinance Oversight Committee that the blue line streams be included in the definitions of natural resources qualifying for inclusion in the Conservation Overlay District.

***Proposed Recommendations:***

## ALTERNATIVE B

1. Buffers shall extend 35 feet measured horizontally from the edge of the conservation resource and on a line perpendicular to and landward of the conservation resource. (Current COD regulations require measurement from this point and this recommendation is consistent with the proposed UDO recommendation).
   *Note: On August 1, 2000, the NC Division of Coastal Management adopted a 30' buffer requirement along all rivers, creeks, streams, tributaries, and drainage ditches that "can float a canoe within the 20 CAMA counties. Therefore, adopting a local ordinance as recommended in Alternative A, would merely extend the CAMA buffer, depriving the individual property owner of the use of an additional 5' of his property while producing no proven, verifiable scientific water quality benefit.*

*ADDITIONAL COMMENTS FOR ALTERNATIVE B:*

- Designation criteria proposed in *Alternative A*, is based on existing USGS blueline creek designations. In order to provide baseline, accurate designations, FEMA is currently performing a complete analysis and evaluation of the base floodplain levels for the entire county. Any use of subjective topography such as that referenced above would be at best, inaccurate, incorrect and premature.
- *Alternative A* above expands the use of buffers to "any adjacent critical wetlands/habitats/shoreline components." This extends the use of buffers into areas far beyond those even identified by the NC Division of Coastal Management. This extension into critical habitats and endangered species (e.g. rookeries, woodpeckers, venus fly trap, etc.) would be a further erosion of private property rights and a duplication of already existing federal and state regulation.

- Basing buffer measurement, as proposed in *Alternative A*, "at the top of the bank of the base of flow channel along creeks" rather than at "mean high water" as adopted by the NC Division of Coastal Management would in most instances increase the size of the buffer, further erode the lot's size and may impact the property owner's use of the land.
- *Alternative A* above recommends "Buffer width of 35 feet should be the minimum. When feasible, wider buffers are preferred." The CAMA buffer rule requires a 30' maximum buffer and contains no "wider buffers are preferred" language. What circumstances would justify New Hanover County residents having to meet more stringent requirements then property owners in the other 19 CAMA counties?
- The NC Division of Coastal Management currently has a 30' buffer requirement for New Hanover County in place. (2)The NC EMC is proposing a 50' buffer be established later this year in the Cape Fear River Basin. (3)The UDO has proposed a 35' buffer within the COD. (4)The Coastal Resources Commission's own Shoreline Protection Task Force identified 101 federal and state agencies that oversee water quality in CAMA's 20 coastal counties.

  There is no rationale for another duplicative, inconsistent regulation to be established within New Hanover County, particularly when there is no scientific documentation to support the premise that an extra five feet of buffer would produce any significant water quality improvement; and an additional five feet of buffer on very small or oddly shaped lots will only further restrict and impede the individual property owner's use of that lot.

## 2. WHAT CAN BE LOCATED WITHIN THE BUFFER?

***Current Status of UDO Process***

Language being discussed for UDO allows development activities within the buffer that are limited to water dependent structures (i.e.- docks, piers, stabilization, etc.). Excavation, grading, filling and ditching are permitted on a limited as needed basis for permitted encroachments. Recreational facilities such as pervious trails may be permitted. Buffers may be encroached by public roads, bridges and utilities where no practical alternative exists.

***Better Site Design Handbook***

Recommends a three zone stream buffer system delineated as follows:

- Streamside zone – flood control, utility right of way, footpaths
- Middle zone – some recreational uses, some storm water BMPs, bike paths
- Outer zone – residential uses including lawn, garden, compost, storm water BMPs

***Discussion***

The Committee acknowledged the need to allow certain uses and encroachments within buffer areas as long as disturbance of land and removal of vegetation is minimized. Water dependent uses and recreational uses should be allowed within the buffer. Staff agrees with the proposed UDO language for encroachments of streets, bridges and utilities. Structures or improvements with other use designations should not be allowed.

***Proposed Recommendation based on discussion at the Buffer Field Trip***

1. Allow uses as proposed by the UDO process.
2. Recommend against allowing any other types of improvements with other use designations.

***Proposed Recommendation based on discussion at the Buffer Field Trip (cont'd)***

3. Allow limited encroachment of storm water BMP facilities.
4. Minimize encroachment of utilities within the buffer. Instead, utilities that normally run parallel to the creek should be moved out of the buffer zone wherever possible.
5. Where encroachments do occur, the maximum amount of vegetative cover should be reestablished.

## 3. WHAT TYPE AND DEGREE OF VEGETATION WILL BE ALLOWED?

***Current Status of UDO Process***

The local office of the NC Cooperative Extension has worked on language to address vegetation within buffers (Technical Appendix A: Reference Lists for Guidance in the Selection of Vegetated Buffer Plants). As stated in the intent section, buffers are essential to filter and biologically process pollutants from runoff before it enters surface waters. Buffers also moderate water temperature, provide stability to the soils adjacent to water bodies and have other beneficial functions. Plants that are native and naturalized are desirable within the buffer while plants that require intense or routine maintenance are not. Plants are to be retained in their natural or minimally disturbed state. If restoration is required, then references are provided for selection of appropriate plant types. Selective tree removal and pruning will be allowed for sight lines, plant health and vistas.

***Better Site Design Handbook***

Recommends a three zone stream buffer system delineated as follows:

- Streamside zone – Undisturbed mature forest, reforest if necessary
- Middle zone – Managed forest, some clearing allowed
- Outer zone – Forest encouraged but usually turf grass

***Staff Comments***

The language being proposed through the UDO process seems to allow flexibility to property owners for management of buffers. Staff agrees with the intent of the requirements as they are proposed. The goals of maintaining the existing vegetation along the buffer areas, minimizing disturbance and clearing and providing means of restoration when necessary, all coincide with the intent outlined in the Better Site Design Handbook.

***Proposed Recommendations***

1. Recommend agreement with proposed language from the UDO process.
2. Recommend targeted outreach effort focusing on buffers, their function and management.
3. Recommend use of restoration efforts/programs in areas that are already substantially developed or subdivided (Ref. Tidal Creeks Board costshare for buffer restoration and stream restoration opportunities; see fig. 17-2).
4. Selective clearing and pruning of existing vegetation for the purpose of providing sight vistas of the water body shall be permitted. Only vegetation that is necessary for this purpose should be removed.
5. Existing developed lots with structures would be exempt unless redeveloped. Developed lots can implement buffers on a voluntary basis.

***Incentives for Commercial and Residential Properties***

- Cost Share Program – for residential and commercial properties – cash, free technical assistance
- Buffer Averaging
- Conservation Easement – tax deduction; landowner retains property ownership
- Mature trees add to property value

**Fig. 17-1. Buffer Field Trip**

*Heavily vegetated buffer on Pezolt Branch in Smith Creek Watershed*

*Buffers along marsh of Futch Creek*

*Buffers on marsh of Futch Creek*

**Fig. 17-2. Pine Valley Stream Restoration Project**

***Before***


***After***

**NOTE:** ***Stream restoration is a potential option for restoring natural dimension, pattern and profile to degraded streams.***

## Principle 19: Clearing & Grading

Clearing and grading of forests and native vegetation at a site should be limited to the minimum amount needed to build lots, allow access and provide fire protection, a fixed portion of any community open space should be managed as protected green space.

***Better Site Design Handbook Recommended Practice***

The *Better Site Design Handbook* recommends limiting land disturbance to the amount required for building footprints, construction access and safety setbacks. Areas that are left undisturbed are less likely to erode during construction and will retain their natural hydrology. Several tools that are available to limit clearing include erosion and sediment control ordinances, forest conservation ordinances and open space development.

***Current Requirements***

New Hanover County Engineering Department administers an erosion and sediment control ordinance that applies to all private development within the County (see fig. 19-1). This ordinance requires new development that will disturb more than 1 acre of land to obtain a grading permit. The City requires a tree preservation permit in addition to the County grading permit prior to land disturbing activity. For sites that disturb less than 1 acre of land, erosion control practices are still required, but without a permit. Review timeframes for grading permits submittals and re-submittals must be followed or permits can activate themselves.

***Discussion***

The Sedimentation Erosion Control Officer with the New Hanover County Engineering Department spoke to the Committee about her responsibilities in administering the erosion control ordinance. Limited staff makes effective review of plans and site visits challenging. The main goal during construction is to stabilize areas that have been cleared and control the discharge of sediment.


**Fig. 19-1.** ***Erosion control measures at construction site***

## Roundtable Recommendations: Principle 19

1. Support providing adequate staffing to the New Hanover County Engineering for effective administration of the ordinance.
2. Require pre-construction meeting with site inspector prior to any land disturbing activity for commercial and subdivision development.
3. Require that limits of disturbance line be shown on the approved plan and flagged in the field prior to any land disturbing activity.
4. Provide training to City inspectors on erosion control measures and establish line of communication for reporting.
5. Preserve natural vegetation in existing land use buffers when practical.

## Principle 20: Tree Conservation

Conserve trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of "native" plants. Wherever practical, manage community open space, street rights-of-way, parking lot islands, and other landscaped areas.

***Better Site Design Handbook Recommended Practice***

The handbook recommends that communities promote the use of "native" vegetation and preservation of existing trees. Tree surveys, clearing and grading plans which protect existing stands of trees not in the essential site improvements area of the development, and planting vegetation in the street right-of-way are several ways that a natural environment can be encouraged within new development projects.

***Current City Requirements***

The City currently has provisions for requiring a tree survey of all new construction. The tree removal permit is also a tool used to prevent existing property owners from randomly cutting down significant trees from already developed sites. The Zoning Ordinance has limited capabilities of saving trees located inside "essential" site improvement limits.

***Discussion***

The Roundtable members took considerable interest in this principle and the current ordinances. The need for a professional arborist and for technical support from the County Extension Service were mentioned as ways to fill in the gaps in the current ordinances. The language has been modified in the Unified Development Ordinance subcommittee on landscaping, but the staff expertise is still lacking. Additional training and education for staff, contractors, developers, and area citizens was cited as a significant need toward preserving the natural areas and saving significant trees. Mature tree preservation is an effective means of reducing flooding and air pollution in the coastal plain.

## Roundtable Recommendations: Principle 20

1. The limits of disturbance line be shown on the site plan as a Technical Review Committee submittal requirement.
2. Encourage New Hanover County to require a tree preservation or land disturbance permit as a requirement for the release of plans for construction.
3. Increase the caliper of required plantings.
4. Encourage preservation of natural stands of trees to give incentive to reduce landscaping requirements.

## Principle 21: Conservation Incentives

Incentives and flexibility in the form of density compensation, buffer averaging, property tax reduction, stormwater credits, and by-right open space development should be encouraged to promote conservation of stream buffers, forests, meadows, and other areas of environmental value. In addition, off-site mitigation consistent with locally adopted watershed plans should be encouraged.

***Better Site Design Handbook Recommended Practice***

The handbook recommends that communities consider several different broad ways to promote conservation in new developments (see fig. 21-1). This principle is a summary of several of the other more specific recommendations for other principles in the handbook. The topic areas are:

1. By-right open space development
2. Density compensation
3. Stormwater credits
4. Buffer averaging
5. Property tax credits
6. Density bonuses
7. Transferable Development Rights (TDRs)
8. Off-site Mitigation

***Current City Requirements***

The City currently has provisions for all of the above except: stormwater credits, property tax credits, and transferable development rights. As explained in Principle 11, the Performance Residential Requirements in the Zoning Ordinance provide a tool to do by-right open space development. Density compensation is also achieved with this regulation. Buffer averaging is being proposed in the landscaping regulations recently approved by the Unified Development Ordinance Oversight Committee. Density bonuses were presented as a tool for development in the Mixed Use Ordinance adopted by City Council on July 18, 2000. An example of off-site mitigation is being accomplished through the Wetlands Restoration Program sponsored by the City of Wilmington Stormwater Services.

**Fig. 21-1.** ***Incentives can promote conservation of natural features adjacent to water resources***

***Discussion***

The Roundtable noted that much had been done to improve City regulations for conservation during the past several years. Adding the Conservation Overlay District, the Performance Residential development design, and the open space requirements of the Mixed Use Zoning District have helped strengthen the rules while providing alternative development patterns that are successful for the developer.

Bonnie Duncan of the NC Wetlands Restoration Program (NCWRP), spoke to the Committee about this Division of Water Quality program. NCWRP provides a means of restoring wetlands or streams through use of mitigation money. For example, NCWRP is providing the mitigation requirements to NCDOT for their impacts in New Hanover County.

## Roundtable Recommendations: Principle 21

1. The City and County work with the State on trying to "credit" stormwater designs or requirements by use of natural wetland features or pervious pavement, for example.
2. City of Wilmington and New Hanover County Technical Standards Manual should be more flexible to encourage best management practices.
3. Require landscaping to enhance water quality by planting trees and other "native" vegetation around wet detention ponds.
4. Design performance standards for stormwater by considering other level of pollutant loading than State BMP requirements.
5. Propose a study of Transferable Development Rights and Purchase of Development Rights.
6. Encourage residential and commercial clustering.

## Principle 22: Stormwater Outfalls

New stormwater outfalls should not discharge unmanaged stormwater into jurisdictional wetlands, sole-source aquifers, or other water bodies.

***Better Site Design Handbook Recommended Practice***

To have an effective stormwater management program, the fundamental importance of site design must be recognized. Utilizing green space for treatment of runoff and reducing impervious cover are ways to sharply reduce the volume of runoff that needs to be treated. The principles of minimizing impervious area, open space development, vegetated open channels, bioretention, filter strips, buffers, disconnecting impervious areas and natural area preservation can all help reduce the volume and pollutant loading from runoff by as much as 20% to 60%. Other key factors to consider include:

- Clear guidance on selection, design and location of BMPs.
- Establish appropriate sizing criteria to ensure that objectives are met.
- Establish standards that address maintenance, aesthetics and safety.
- Strong local commitment for maintenance, enforcement and funding (see fig. 22-1).
- Incentives for developers that apply runoff reducing principles.
- Floodplain regulations that limit development in flood prone areas.

***Current City Requirements***

The City has a Technical Standards Manual that establishes design criteria for stormwater management facilities. Maintenance and safety are addressed in the standards manual and along with aesthetics are considered in each review of a site plan. The City Stormwater Utility provides funding and commitment to stormwater management. The recently passed MX zoning ordinance included several incentives for developers to use runoff reducing principles.

**Fig. 22.1.** ***Long Leaf Creek soil bioengineering project***

***Discussion***

Generally, the Committee felt that difficulties in permitting led to "cookbook" designs that were not the best for water quality. More flexibility in design should be encouraged to promote better site design principles. The County should also adopt standards for better site design. Standards for maintenance of ponds could be improved.

## Roundtable Recommendations: Principle 22

1. Recommend that flexibility be pursued at local and state level to promote use of better site design principles for the improvement of water quality.
2. Recommend similar incentives to MX ordinance for other land uses (i.e. residential and commercial).
3. Best management practices should be implemented on redeveloping sites and retrofitting stormwater infrastructure to the extent practicable.

## CONCLUSION

The Watershed Roundtable Committee recognizes that the implementation of the recommendations within this report is an important part of the protection of Wilmington's water resources. The pollution problems within our creeks cannot be resolved solely through regulation, but will require infrastructure improvements, regional storm water best management practices, public outreach and more. This report should be made available to developers, engineers, architects, surveyors and other interested parties and used as a guide for developing property and making improvements for redevelopment. The City and County should comprehensively review this document annually and report on the implementation of these recommendations to the Board of Commissioners and City Council.

The pending NPDES Phase II regulations that deal with urban runoff pollution will require the City of Wilmington to obtain a permit in the next several years. Part of that permit will require public outreach efforts geared towards reducing pollution from urban runoff. This document can serve to direct the City's outreach efforts and give the public a broad understanding of how development impacts on water quality can be reduced through better site design.

The City should continue to pursue cooperative efforts with groups such as the Cape Fear River Watch, the New Hanover County Tidal Creeks Program and the North Carolina Wetlands Restoration Program. These efforts can create invaluable partnerships for public awareness and funding of water quality improvement projects.

This Committee concludes that the City and County should lead the way toward improving regulations through innovation, conservation and incentives using the local knowledge that we have about our water resources, while maintaining a healthy economy. We should strive to cooperate and communicate with other agencies about regulations that affect our local environment, our property and our quality of life.