


Residential Site Development Standards For Pennsylvania

Promoting Low Impact, Sustainable Development

Scott A. Brown, PE
Pennoni Associates
sbrown@pennoni.com

Kelleann Foster, RLA
Landscape Architecture Dept.
Penn State University
Kxf15@psu.edu

Alex Duran, PhD, PE
Pa Housing Research Center
Penn State University
aduran@engr.psu.edu

PENNSTATE 1855

PHRC HAMER CENTER

Project Objective:

To develop guideline residential infrastructure design standards for Pennsylvania that meet today's need for affordable and sustainable communities.

Project Team

- Pennsylvania Housing Research Center (PSU)
- Hamer Center for Community Design (PSU)
- Oversight Committee

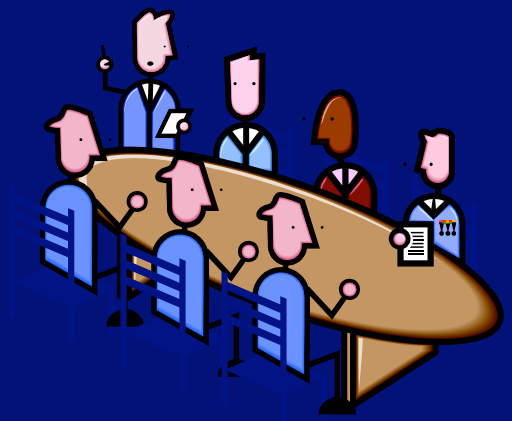
$ Funding $

- Pennsylvania Builders Association
- Pennsylvania Housing Research Center
- Pennsylvania Housing Finance Agency
- Water Environment Research Foundation

Voluntary Adoption

Must have concurrence from appropriate state regulatory agencies and other stakeholders

Oversight Committee



- **DEP**
- **PennDOT**
- **DCED**
- **Municipal Officials**
- **Engineering Community**
- **Planning and Landscape Architecture Community**
- **Surveying Community**
- **Emergency Services**
- **Builders / Developers**
- **Site Contractors**
- **Environmental Groups**

Underlying Sub-Objectives:

- **Embrace low impact, sustainable development concepts;**
- **Provide standards that can be easily understood and implemented by local municipalities;**
- **Are based on best science and engineering knowledge;**

Underlying Sub-Objectives:

- **Reduce standards inconsistency among municipalities;**
- **Improve opportunities for bicycle and pedestrian movements within subdivisions for health and safety reasons;**
- **Minimize infrastructure costs…initial costs and operation and maintenance costs.**

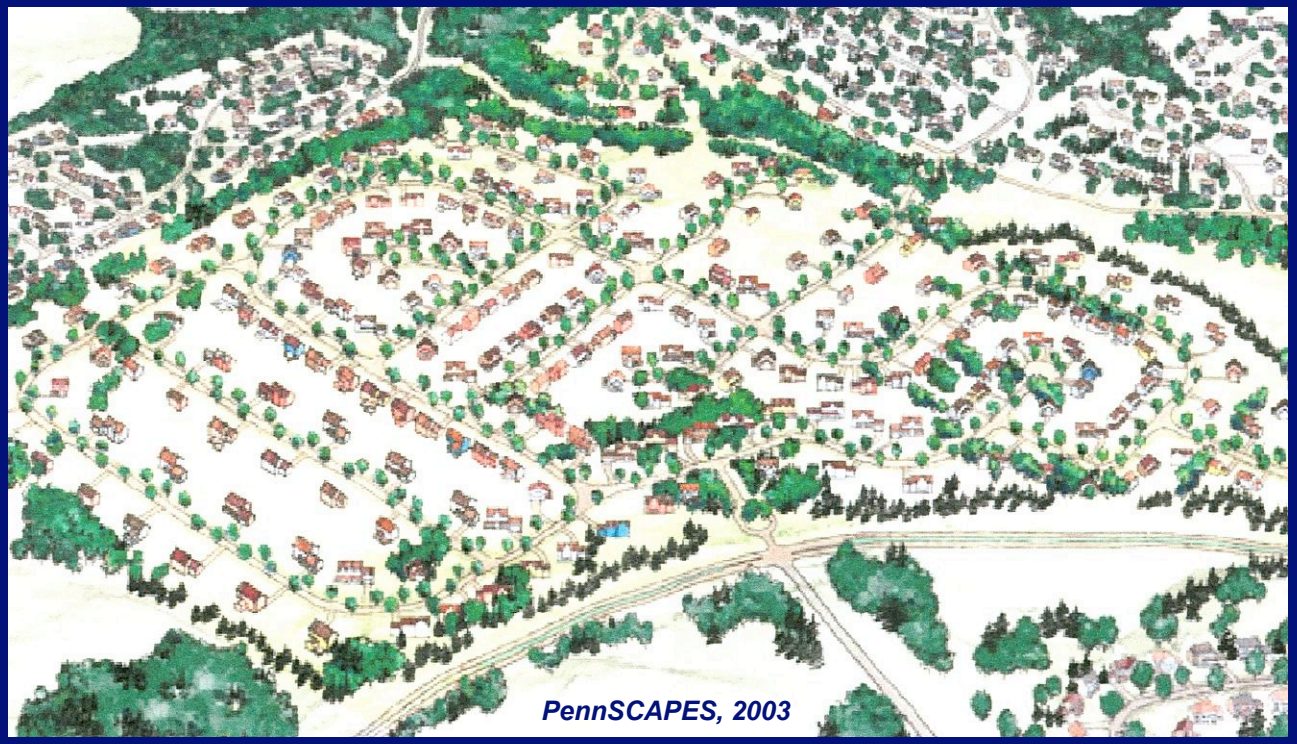
Voluntary Adoption

- **Oversight Committee**
- **Fit a wide range of community visions:**
  - **Traditional Suburban Subdivisions**
  - **Suburban Cluster Subdivisions**
  - **Traditional Mixed Use Subdivisions (PUD)**
  - **Traditional Neighborhood Development (TND)**
  - **Conventional Rural Subdivisions**
  - **Rural Cluster Subdivisions**

Voluntary Adoption

***Must fit a variety of residential development styles and diverse community visions*.**

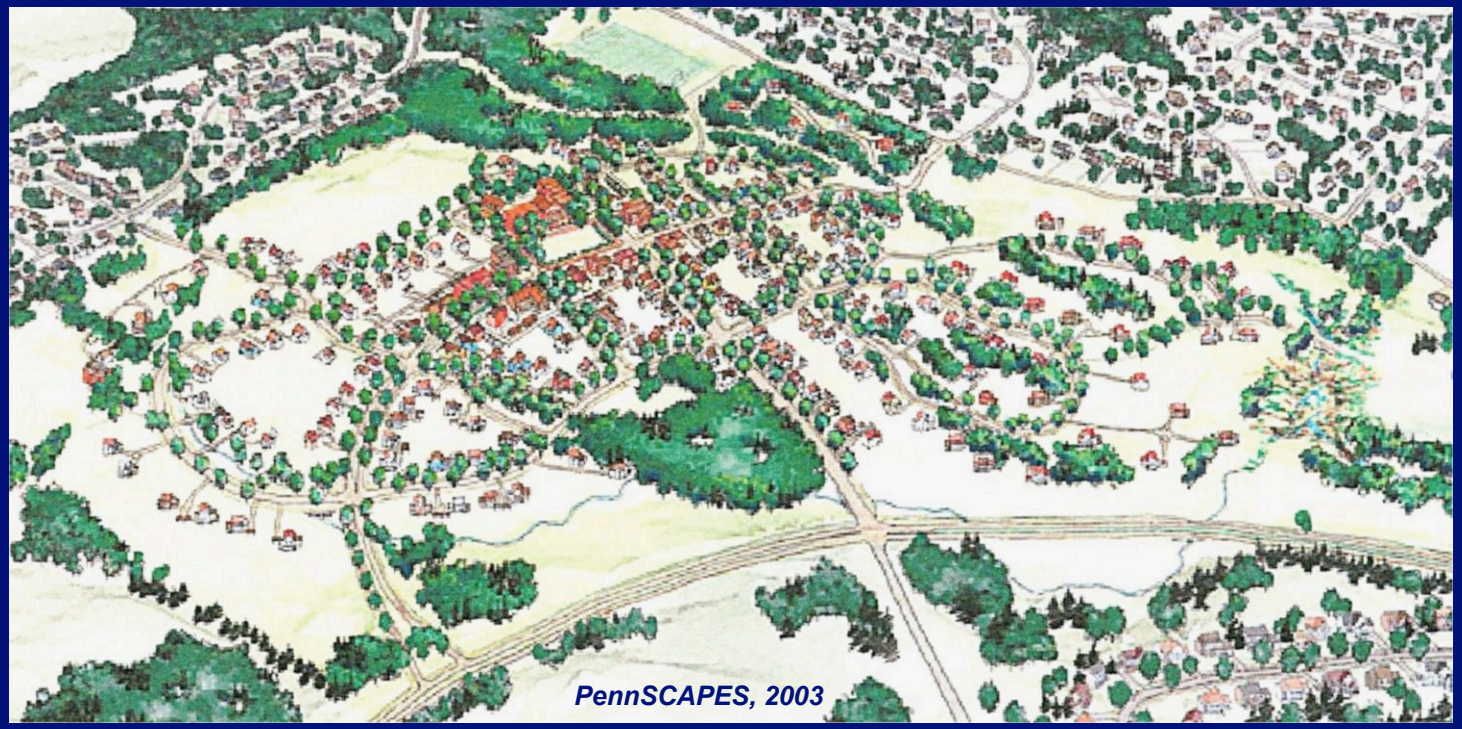
Traditional Suburban Subdivisions



Voluntary Adoption

***Must fit a variety of residential development styles and diverse community visions*.**

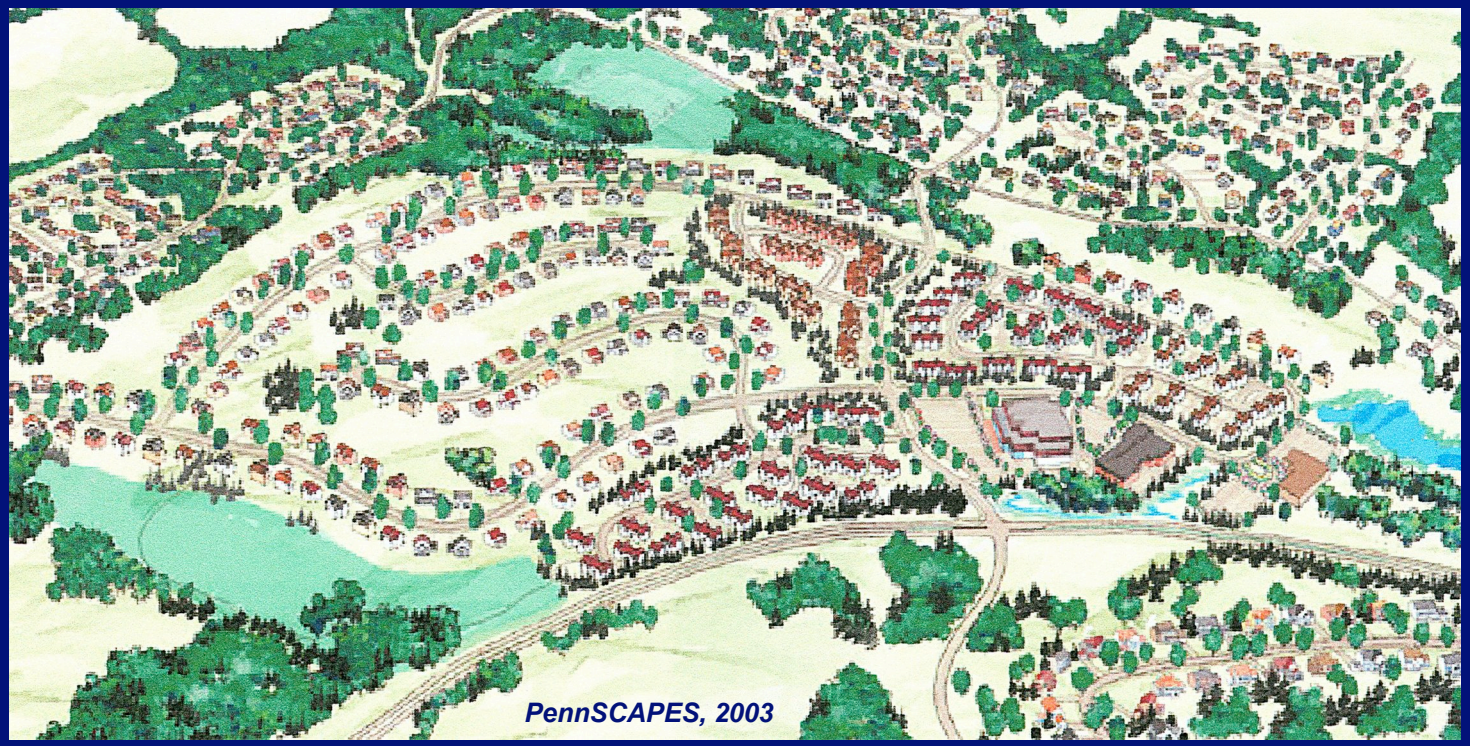
Suburban Cluster Subdivisions



Voluntary Adoption

***Must fit a variety of residential development styles and diverse community visions*.**

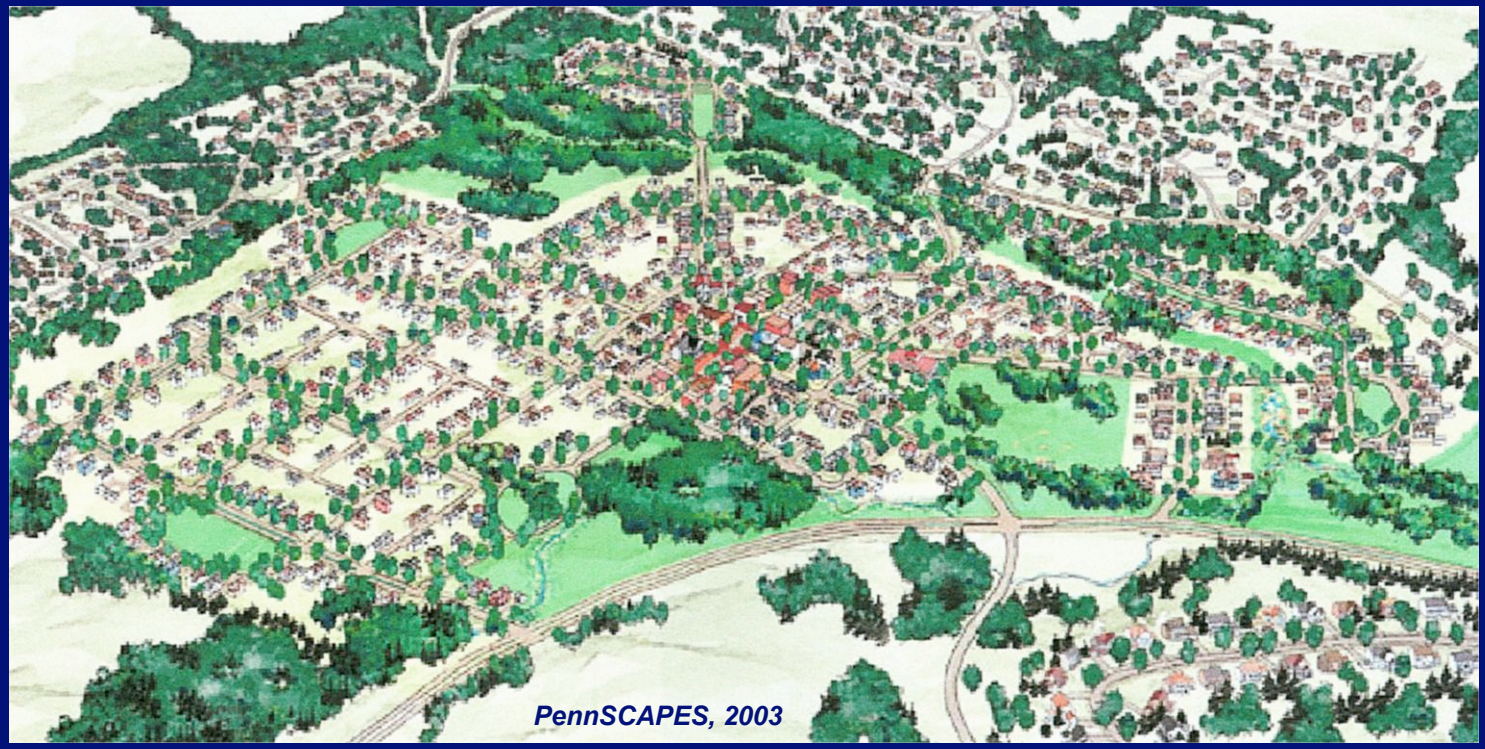
Traditional Mixed Use Subdivisions (PUD)



Voluntary Adoption

***Must fit a variety of residential development styles and diverse community visions*.**

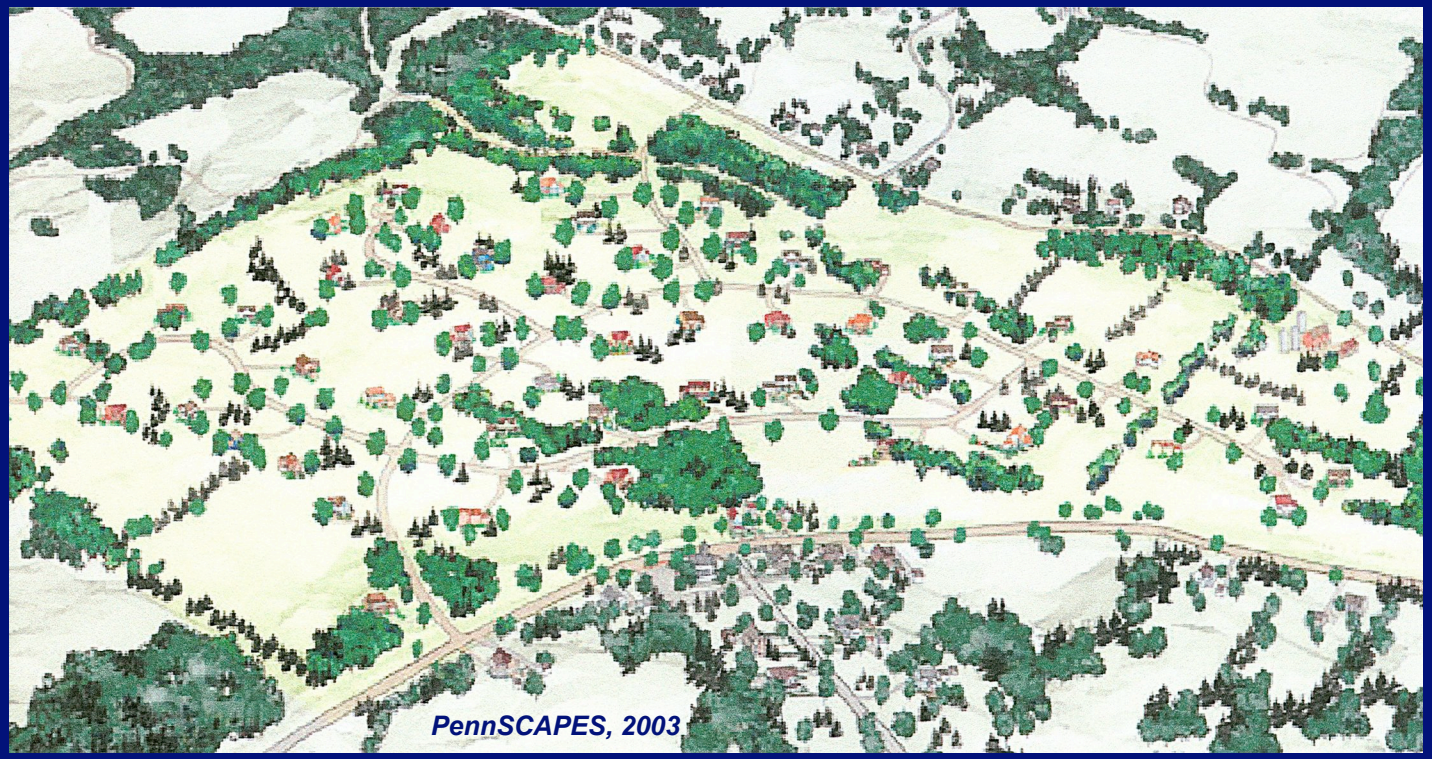
Traditional Neighborhood Development (TND)



Voluntary Adoption

***Must fit a variety of residential development styles and diverse community visions*.**

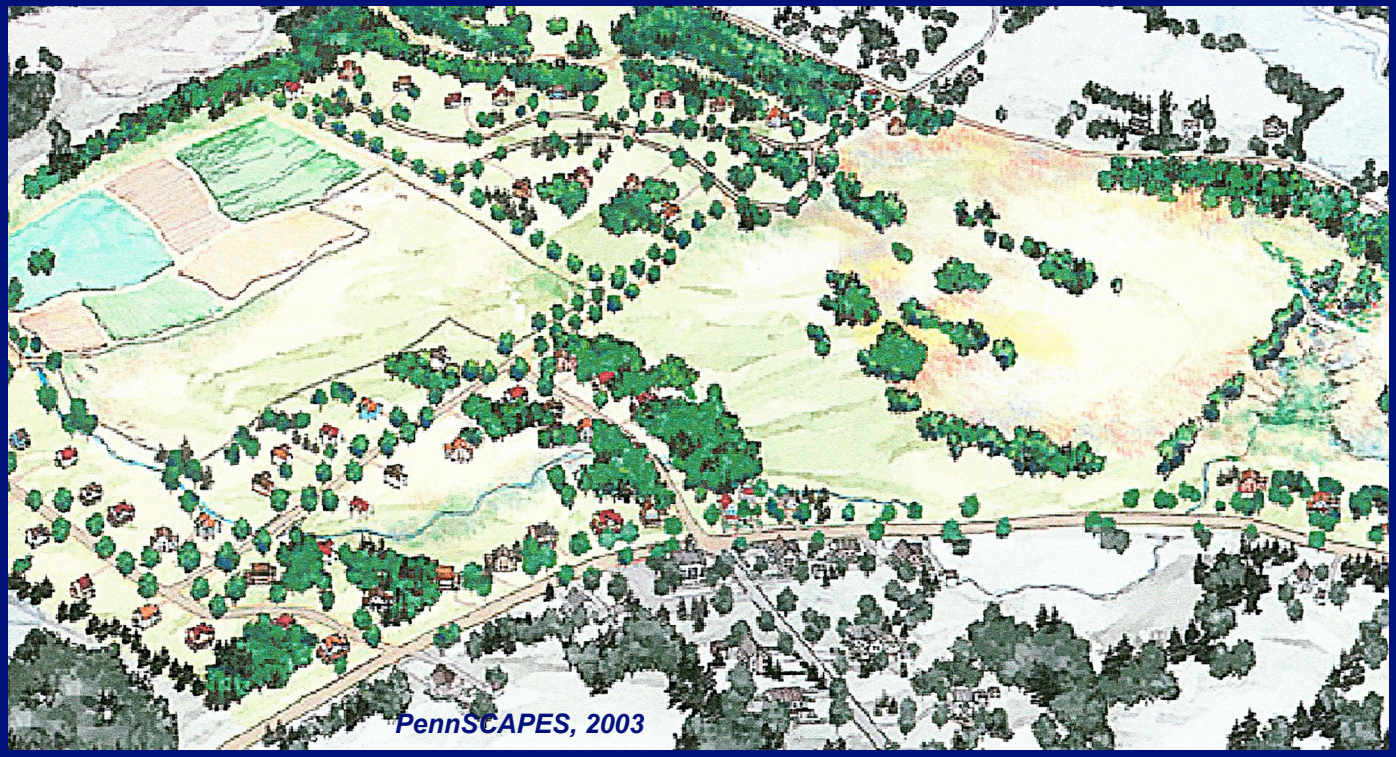
Conventional Rural Subdivisions



Voluntary Adoption

***Must fit a variety of residential development styles and diverse community visions*.**

Rural Cluster Subdivisions



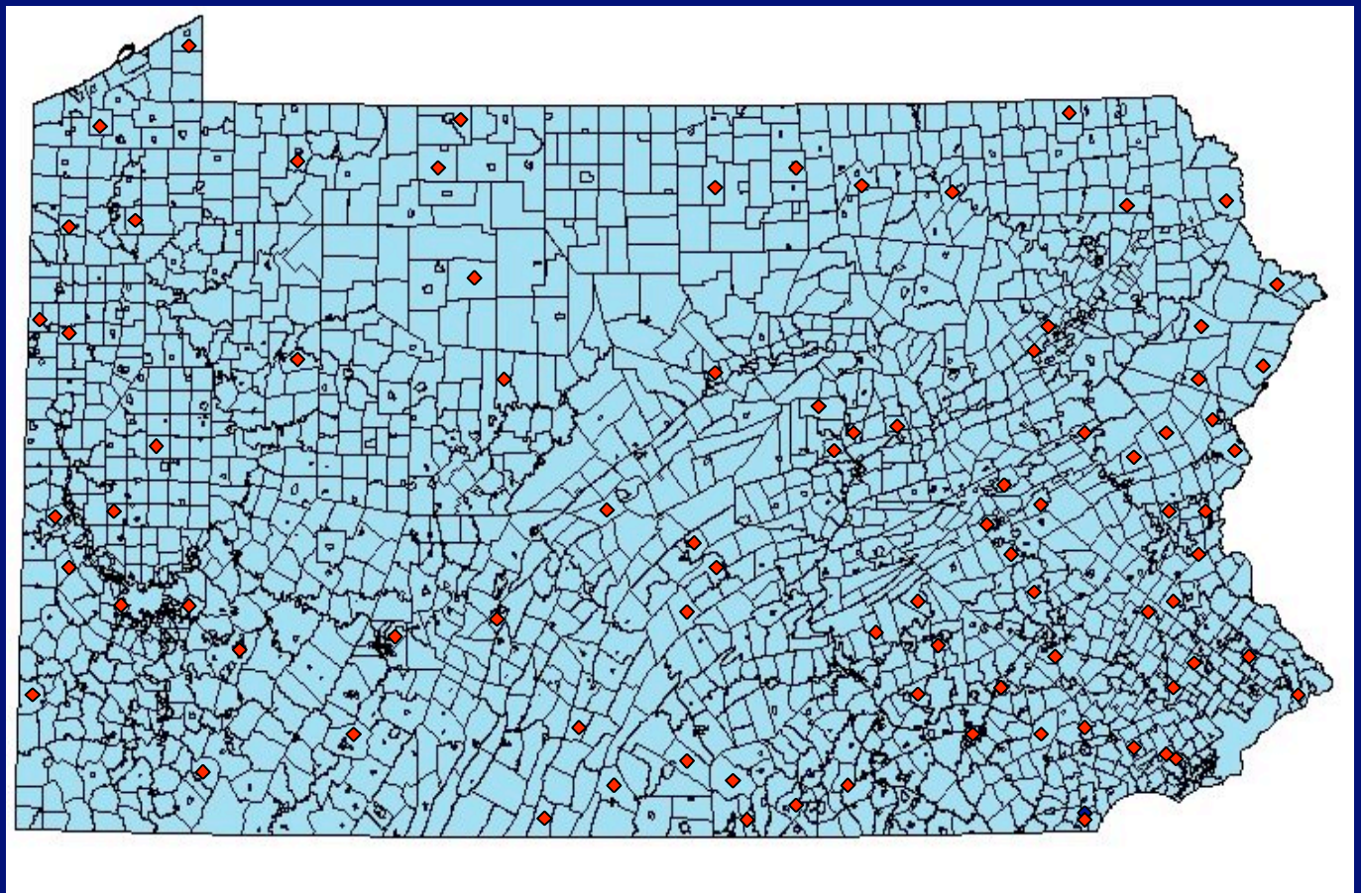
Content:

- Site Design Considerations
- Street Standards
- Pedestrian and Bicycle Circulation
- Parking Standards
- Storm water Management & Conveyance Facilities
- Wastewater Facilities
- Potable Water Supply Standards
- Other Utilities

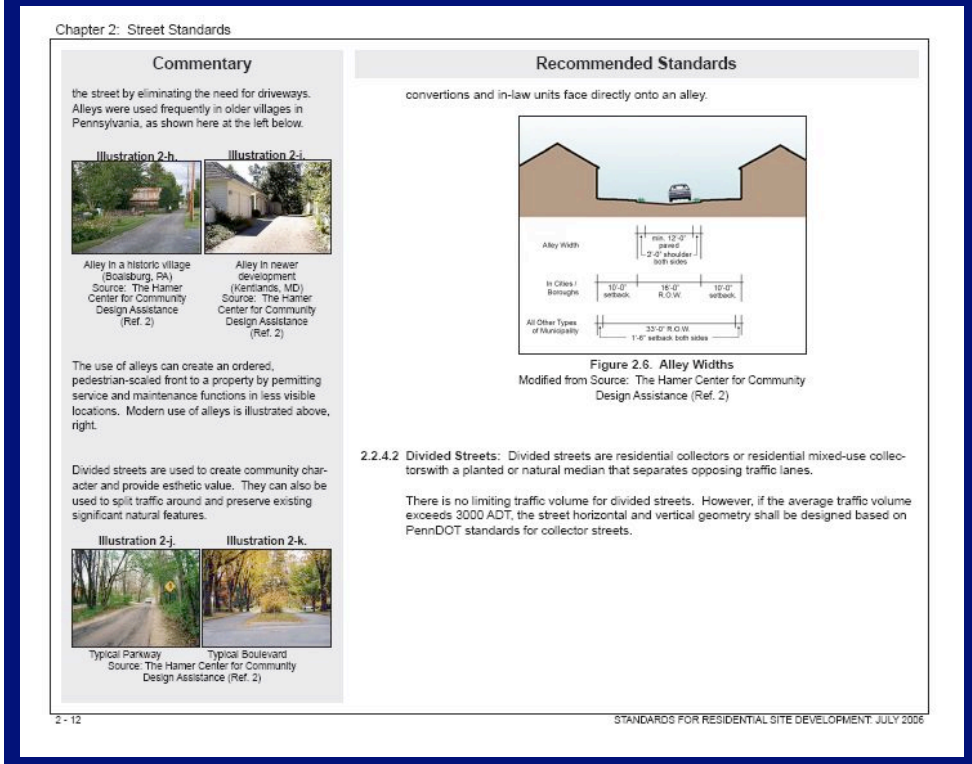
Approach

- **Review Existing Ordinances**
- **Review of Current Research and Literature**

… Best Science



Document Format:



Chapter 2: Street Standards

Commentary

the street by eliminating the need for driveways. Alleys were used frequently in older villages in Pennsylvania, as shown here at the left below.

Illustration 2-h. Illustration 2-i.

Alley in a historic village (Boalsburg, PA) Source: The Hamer Center for Community Design Assistance (Ref. 2)

Alley in newer development (Kentlands, MD) Source: The Hamer Center for Community Design Assistance (Ref. 2)

The use of alleys can create an ordered, pedestrian-scaled front to a property by permitting service and maintenance functions in less visible locations. Modern use of alleys is illustrated above, right.

Divided streets are used to create community character and provide esthetic value. They can also be used to split traffic around and preserve existing significant natural features.

Illustration 2-j. Illustration 2-k.

Typical Parkway Typical Boulevard
Source: The Hamer Center for Community Design Assistance (Ref. 2)

Recommended Standards

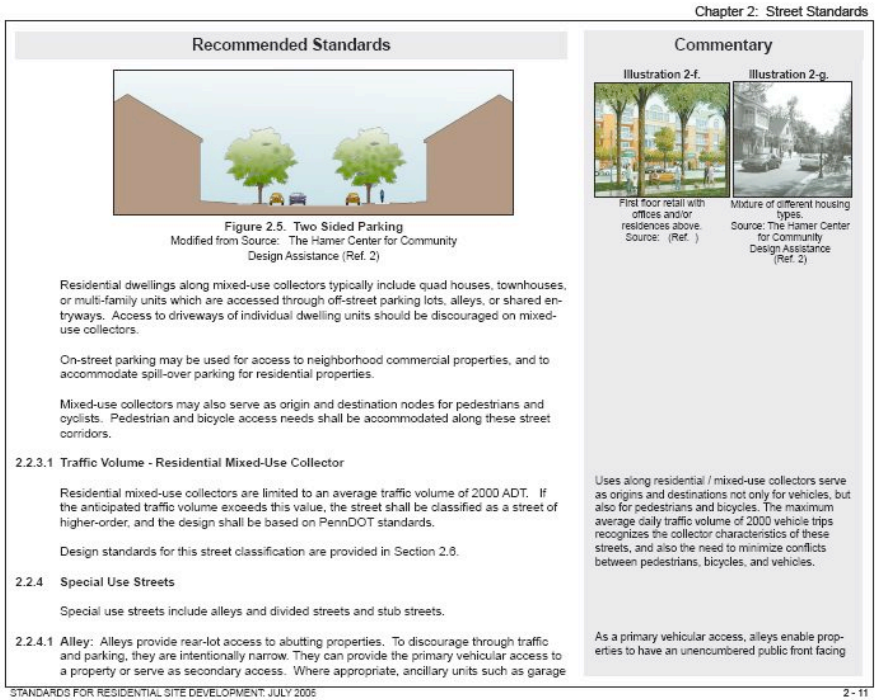
convertions and in-law units face directly onto an alley.

Figure 2.6. Alley Widths
Modified from Source: The Hamer Center for Community Design Assistance (Ref. 2)

2.2.4.2 **Divided Streets:** Divided streets are residential collectors or residential mixed-use collectorswith a planted or natural median that separates opposing traffic lanes.

There is no limiting traffic volume for divided streets. However, if the average traffic volume exceeds 3000 ADT, the street horizontal and vertical geometry shall be designed based on PennDOT standards for collector streets.

2 - 12 STANDARDS FOR RESIDENTIAL SITE DEVELOPMENT: JULY 2006



Chapter 2: Street Standards

Recommended Standards

Figure 2.5. Two Sided Parking
Modified from Source: The Hamer Center for Community Design Assistance (Ref. 2)

Residential dwellings along mixed-use collectors typically include quad houses, townhouses, or multi-family units which are accessed through off-street parking lots, alleys, or shared entryways. Access to driveways of individual dwelling units should be discouraged on mixed-use collectors.

On-street parking may be used for access to neighborhood commercial properties, and to accommodate spill-over parking for residential properties.

Mixed-use collectors may also serve as origin and destination nodes for pedestrians and cyclists. Pedestrian and bicycle access needs shall be accommodated along these street corridors.

2.2.3.1 **Traffic Volume - Residential Mixed-Use Collector**

Residential mixed-use collectors are limited to an average traffic volume of 2000 ADT. If the anticipated traffic volume exceeds this value, the street shall be classified as a street of higher-order, and the design shall be based on PennDOT standards.

Design standards for this street classification are provided in Section 2.8.

2.2.4 **Special Use Streets**

Special use streets include alleys and divided streets and stub streets.

2.2.4.1 **Alley:** Alleys provide rear-lot access to abutting properties. To discourage through traffic and parking, they are intentionally narrow. They can provide the primary vehicular access to a property or serve as secondary access. Where appropriate, ancillary units such as garage

Commentary

Illustration 2-f. Illustration 2-g.

First floor retail with offices and/or residences above. Source: (Ref.)

Mixture of different housing types. Source: The Hamer Center for Community Design Assistance (Ref. 2)

Uses along residential / mixed-use collectors serve as origins and destinations not only for vehicles, but also for pedestrians and bicycles. The maximum average daily traffic volume of 2000 vehicle trips recognizes the collector characteristics of these streets, and also the need to minimize conflicts between pedestrians, bicycles, and vehicles.

As a primary vehicular access, alleys enable properties to have an unencumbered public front facing

STANDARDS FOR RESIDENTIAL SITE DEVELOPMENT: JULY 2006 2 - 11

Commentary ← **Standards** → **Commentary**

Document Format: Illustrations and photographs used throughout

Commentary

the street by eliminating the need for driveways. Alleys were used frequently in older villages in Pennsylvania, as shown here at the left below.

Illustration 2-h.

Alley in a historic village (Boalsburg, PA) Source: The Hamer Center for Community Design Assistance (Ref. 2)

Illustration 2-i.

Alley in newer development (Kentlands, MD) Source: The Hamer Center for Community Design Assistance (Ref. 2)

The use of alleys can create an ordered, pedestrian-scaled front to a property by permitting service and maintenance functions in less visible locations. Modern use of alleys is illustrated above, right.

Divided streets are used to create community character and provide esthetic value. They can also be used to split traffic around and preserve existing significant natural features.

Illustration 2-j.

Typical Parkway

Illustration 2-k.

Typical Boulevard

Source: The Hamer Center for Community Design Assistance (Ref. 2)

Recommended Standards

convertions and in-law units face directly onto an alley.

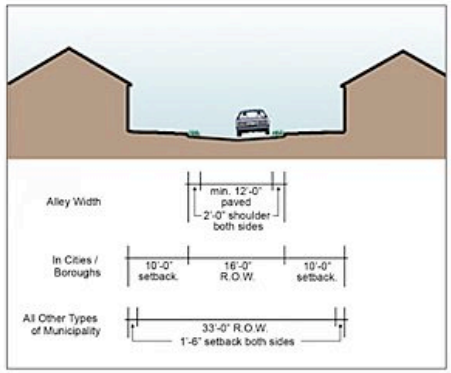


Figure 2.6. Alley Widths
Modified from Source: The Hamer Center for Community Design Assistance (Ref. 2)

2.2.4.2 Divided Streets: Divided streets are residential collectors or residential mixed-use collectors with a planted or natural median that separates opposing traffic lanes.

There is no limiting traffic volume for divided streets. However, if the average traffic volume exceeds 3,000 ADT, the street horizontal and vertical geometry shall be designed based on PennDOT standards for collector streets.

Highlights: Chapter 1 – Site Design Considerations

- ✓ Regulations
- ✓ Interconnections
- ✓ Recreation
- ✓ Environment
- ✓ Community Character
- ✓ Building Placement
- ✓ Housing
- ✓ Flexibility
- ✓ Infrastructure and Maintenance Costs

- Using Case Study Profiles -

Highlights: Chapter 2 - Streets

1. Functional Classification System

2. General Design Standards

- ✓ Intersection design
- ✓ Driveway entrances
- ✓ Easements
- ✓ Rights of way
- ✓ Traffic calming
- ✓ Landscaping
- ✓ Lighting
- ✓ Signage
- ✓ etc.

Design Standards for Specific Street Classifications

- ✓ Design speed
- ✓ Width
- ✓ On-street parking
- ✓ R-O-W width
- ✓ Longitudinal slope
- ✓ Horizontal curvature
- ✓ cul de sacs

Construction Standards (Details)

- ✓ Street section
- ✓ Pavement structure
- ✓ Curb detail
- ✓ shoulder structure
- ✓ Pavement Structure
- ✓ Driveway curb-cuts

Highlights: Chapter 2 - Streets

1. Uniform Street Classification System

Arterials	Rural / Urban	PennDOT Classifications
Collectors	Rural / Urban	
Local	Rural / Urban	

Residential Access (A&B)	RESIDENTIAL	Proposed Municipal Street Classifications
Residential Collectors		
Mixed Use / Collector		
Special Use Streets		
Alley		
Divided Streets		
Commercial / Industrial Access	OTHER	
Municipal Collector		
Municipal Arterial		

Municipal Street Classifications a subset of PennDOT Classifications
Based on type of use and character of roadway

Highlights: Chapter 2 - Streets

2. Street Width

Table 2-9. Residential Access Type A - Curbed

Traffic Pattern	Parking Type	(a) Travelway Width* (ft.)	(b) Parking Lane Width (ft.)	(c) Street Width (curb to curb)
Yield **	One Side or Alternating Sides	10	8	18
Slow	Alternating Sides	18	8	26
Free	No Parking	18	n/a	18
Free	One Side	18	8	26

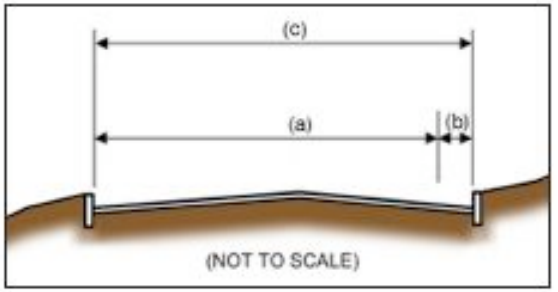
* All travelway widths are for two-way streets; for one-way use ½ of travelway width except for "yield" traffic pattern.

** Use only when ADT less than or equal to 300.

Table 2-10. Residential Access Type B - Curbed

Traffic Pattern	Parking Type	(a) Travelway Width* (ft.)	(b) Parking Lane Width (ft.)	(c) Street Width (curb to curb)
Slow	Alternating Sides	20	8	28
Free	No Parking	20	n/a	20
Free	One Side	20	8	28
Free	Two Sides	20	8 each side	36

* All travelway widths are for two-way streets; for one-way use ½ of travelway width



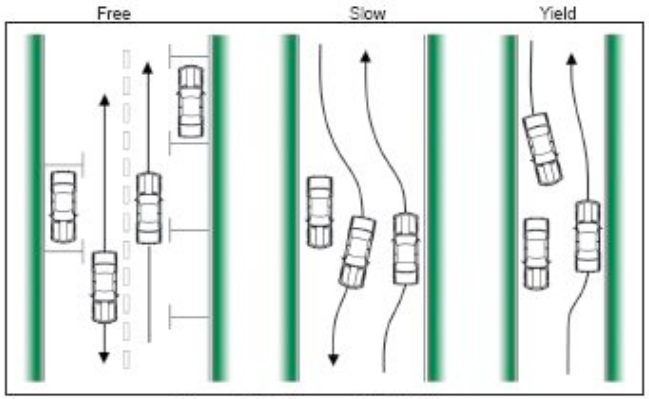
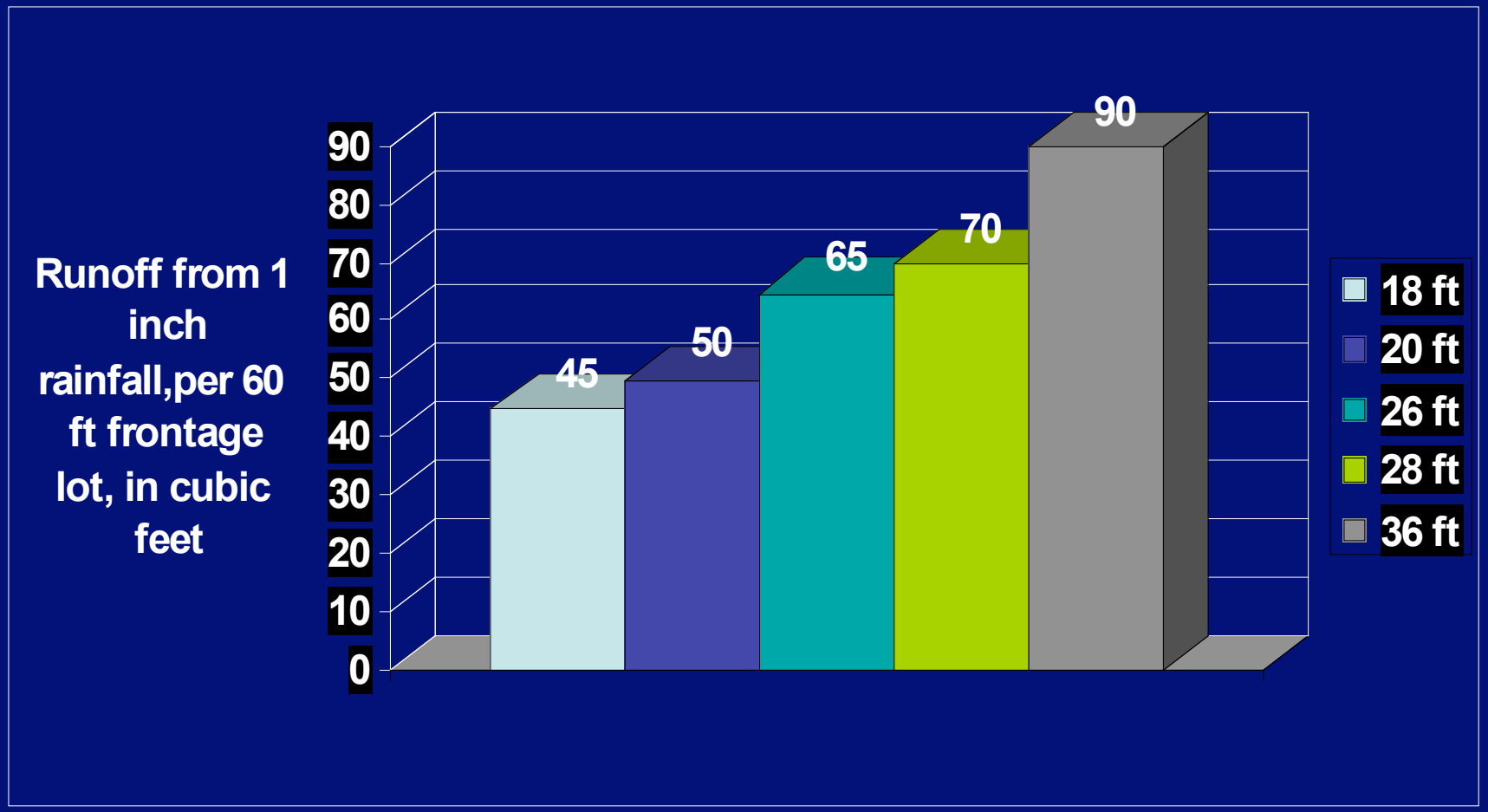


Figure 2.8. Types of Traffic Flow.

Highlights: Chapter 2 - Streets

Stormwater runoff volume as a function of street width



Highlights: Chapter 2 - Streets

3. Maximum Longitudinal Slope

Residential Access A	12%
Residential Access B	12%
Residential Collector	10%
Mixed use Collector	8%

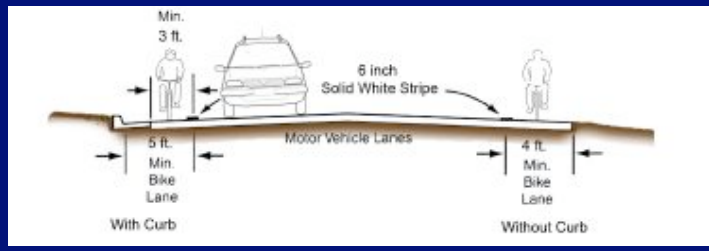
Highlights: Chapter 3 – Pedestrian and Bicycle Circulation

Sidewalks

Minimum Impact Trails

Circulation Trails

Bike Lanes



Highlights: Chapter 3 – Pedestrian and Bicycle Circulation

Sidewalks:

- ✓ Location
- ✓ Buffering
- ✓ Width
- ✓ Cross Slope
- ✓ Driveway Crossings
- ✓ Curb Ramps
- ✓ Surface Material
- ✓ Details

Highlights: Chapter 3 – Pedestrian and Bicycle Circulation

Core Circulation Trails:

- ✓ Location
- ✓ Buffering
- ✓ Width
- ✓ Horizontal Alignment
- ✓ Vertical Alignment
- ✓ Surface Material
- ✓ Rest Areas
- ✓ Cross Slope and Drainage
- ✓ Intersections
- ✓ Signage
- ✓ Details

Highlights: Chapter 3 – Pedestrian and Bicycle Circulation

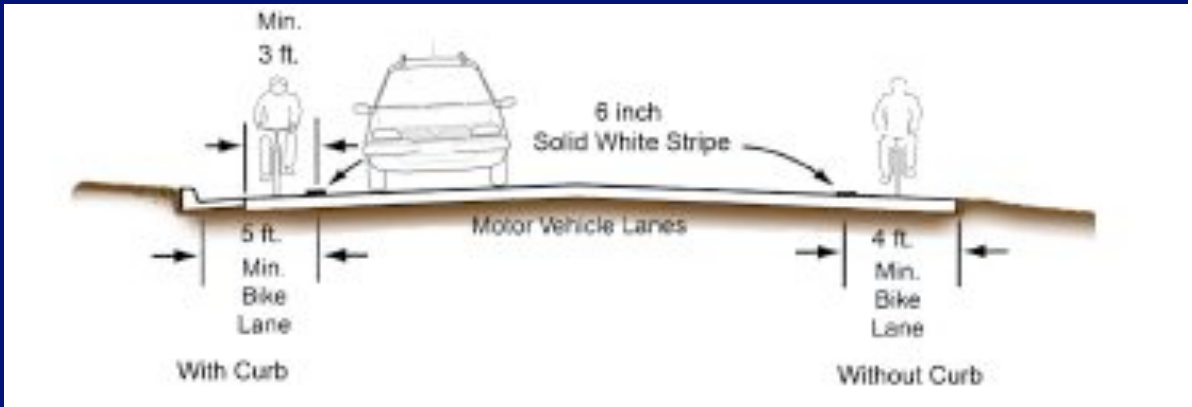
Minimum Disturbance Trails:

- ✓ Location
- ✓ Surface Materials
- ✓ Design Standards
- ✓ Intersections and Signage
- ✓ Rest Areas

Highlights: Chapter 3 – Pedestrian and Bicycle Circulation

Bike Lanes:

- ✓ Width
- ✓ Pavement markings



Chapter 4 – Parking

Chapter 4: Parking

Highlights: Chapter 4 – Parking

- Parking Rates
- Off-Street Lot Geometry
- Landscaping
- Shared Parking
- Pavement Sections
  - Light
  - Moderate
  - Moderately Heavy

Table 4-1. Parking for Residential Dwellings

Housing Unit Type / Size	Parking Spaces (per dwelling unit)
Single-Family Detached	2.0
Townhouse, Duplex, Quad	1.7
Apartments / Condos	
3 or more bedrooms	1.4
1 or 2 bedrooms	1.2
Efficiency	1.0

(1) Rates independent of ownership

Source: McCourt, Ref. 1

Table 4-4. Base Parking for Neighborhood Commercial and Business Uses

Business Type	Total Parking Spaces
Office	0.9 per employee
Medical-Dental Clinic	3.5 per 1,000 sq. ft. GFA*
Retail	4.5 per 1,000 sq. ft. GLA**
Convenience Store	3.4 per 1,000 sq. ft. GFA*
Restaurant (no bar / lounge)	0.35 per seat
Restaurant (with bar / lounge)	0.47 per seat
Fast Food (drive-thru)	9.9 per 1,000 sq. ft. GFA*
Fast Food (no drive-thru)	12.4 per 1,000 sq. ft. GFA*
Drugstore	1.8 per 1000 sq. ft. GFA*
Bank, Walk-In	2.5 per 1,000 sq. ft. GFA*
Bank, Drive-In	3.5 per 1,000 sq. ft. GFA*
Church	0.16 per seat

Source: McCourt, Ref. 1.

*GFA = Gross Floor Area

**GLA = Gross Leasable Area

Highlights: Chapter 5 – Stormwater Management and Conveyance

Stormwater Management

… Heavy reference to PA SW BMP Manual

Conveyance

… Pipes and open swales / channels

… Standards and computational techniques.

Highlights: Chapter 5 – Stormwater Management

➔ **Encourages use of natural systems**

Highlights: Chapter 5 – Stormwater Management

Runoff Volume: (implementation)

Residential Development Standards

Infiltration, capture and re-use, vegetative systems, *extended detention*.

- **Existing non-forested pervious area to be modeled as meadow.**
- ***Existing impervious to be modeled as impervious.***
- ***Extended detention practices permitted when it is documented that infiltration of 2-yr volume diff. problematic.***

  … not cost effective or environmentally sound, and for EV streams … demonstrate discharge will maintain and protect quality.

  [Title 25, Chap. 93.4c (b) (1) (i & iii)].

- ***Minimum recharge requirement defined.***
- ***Extended detention standards provided.***

Chapters 6, 7 and 8:

Chapter 6: Wastewater Facilities

Chapter 7: Potable Water Supply

Chapter 8: Other Utilities

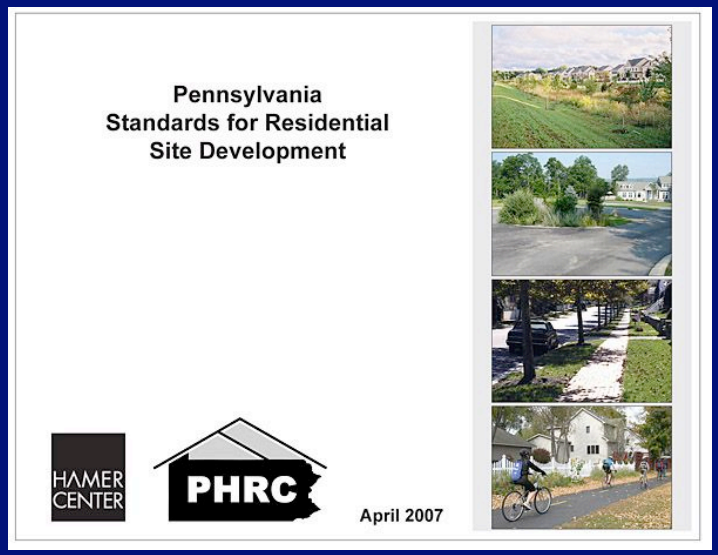
SUMMARY:

Adopting the recommended standards in this document will help:

- Create more uniformity among the many municipal standards for residential subdivisions and site improvement that currently exist in Pennsylvania.
- Eliminate unnecessary construction and maintenance costs, and provide site improvement standards that are scientifically sound.
- Minimize impervious coverage to the extent practical, consistent with the Commonwealth's stormwater management policy.
- Ensure predictability in the site improvement standards applicable to residential construction.
- Provide design freedom and promote diversity through performance-oriented site improvement standards.
- Separate the policy-making aspects of development review from the making of technical determinations.

PDFs of each chapter available at:

www.engr.psu.edu/phrc/ (select “land development” or “publications”)

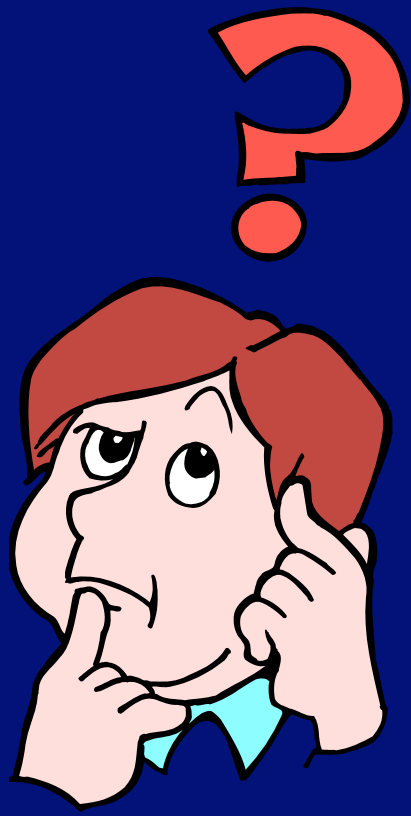


Pennsylvania Standards for Residential Site Development, April 2007

Please note, this publication has been formatted and optimized for two-sided printing.
All files below are PDFs.
Cover and Preamble file will be available soon

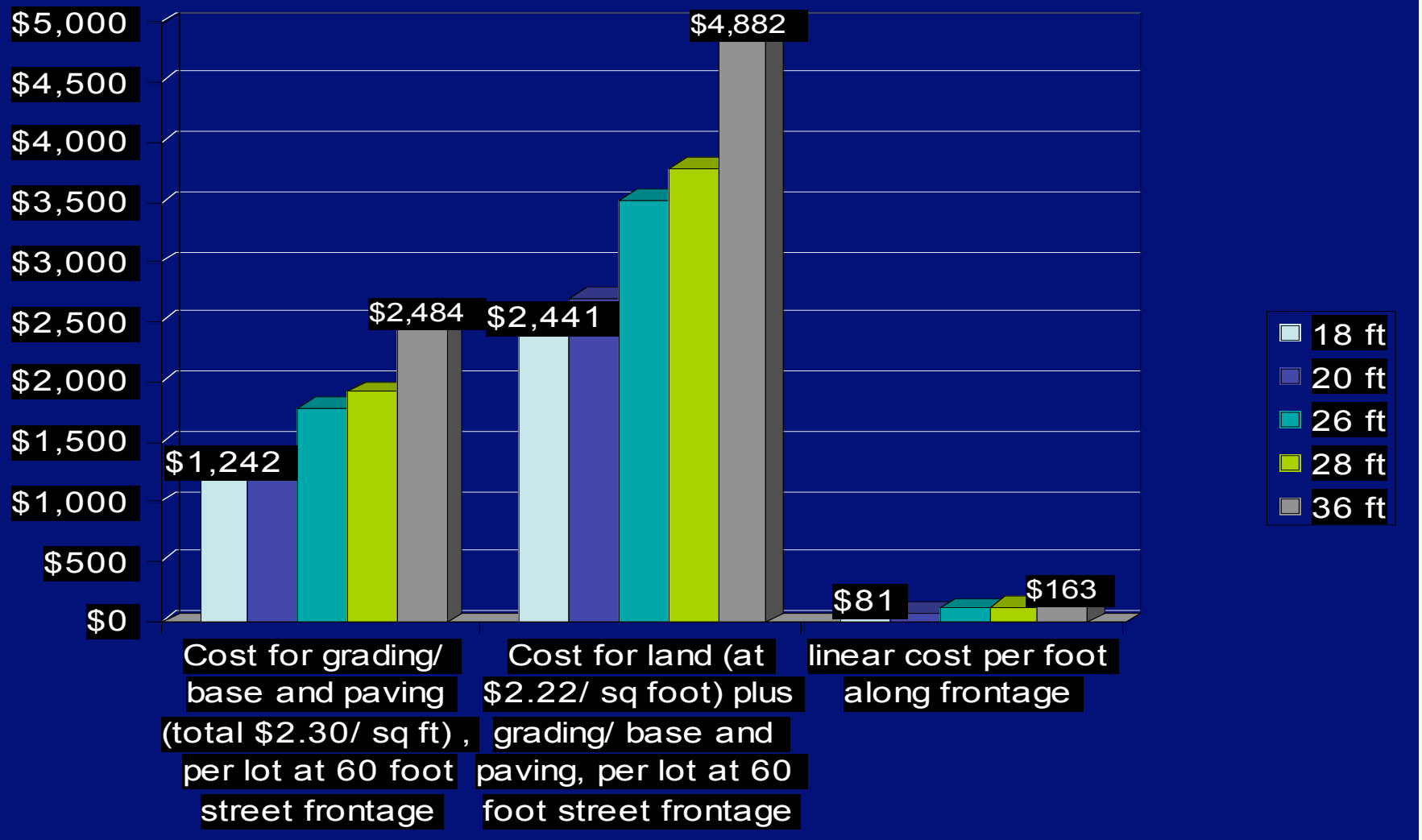
Chapter 1: Site Design Considerations, 27 pages.
Chapter 2: Street Standards, 78 pages.
Chapter 3: Pedestrian and Bicycle Circulation, 30 pages.
Chapter 4: Parking Standards, 25 pages.
Chapter 5: Stormwater Management and Conveyance Facilities, 51 pages.
Chapter 6: Wastewater Facilities, 49 pages.
Chapter 7: Potable Water Supply Standards, 26 pages.
Chapter 8: Other Utilities, 10 pages

Questions



Highlights: Chapter 2 - Streets

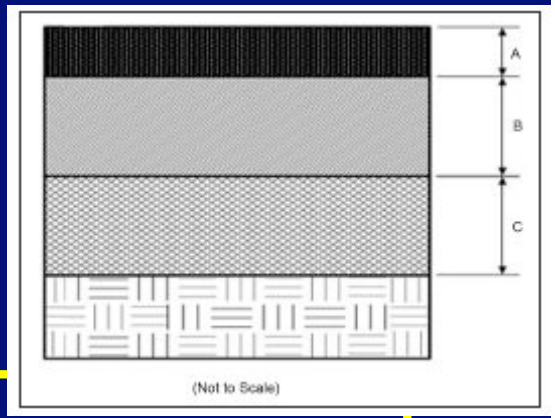
Costs for land and paving as a function of street width



Highlights: Chapter 2 - Streets

4. Pavement Structure

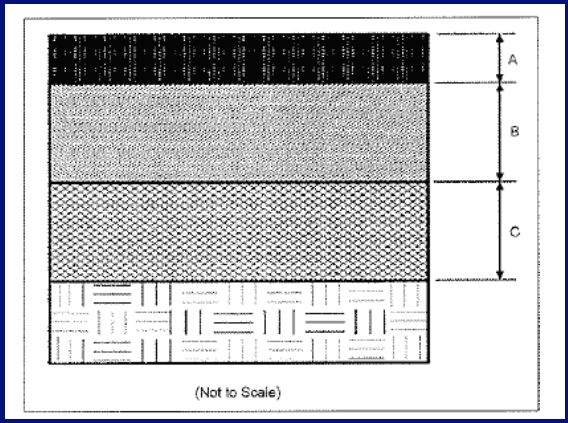
- Assumes CBR = 3
- Equivalent vs. Alternate Sections permitted



Course Designation		Street Classification			
		Residential and Residential Mixed Use Collectors	Residential Access, Residential Collector, and Mixed Use Collector	Residential Access	
		ADT < 3000* ESAL's** < 130,000	ADT < 2000 ESAL's** < 75,000	ADT < 1000 ESAL's** < 50,000	ADT < 300 ESAL's** < 30,000
A	Bituminous Wearing Course	1.5 inches	1.5 inches	1.5 inches	1.5 inches
B	Bituminous Concrete Base Course	6.0 inches	5.0 inches	3.5 inches	3.0 inches
C	Sub base	6.0 inches	6.0 inches	6.0 inches	6.0 inches
Section Design Structural Number		3.7	3.3	2.7	2.5

Highlights: Chapter 4 – Parking

- **Parking Rates** (Basis for Parking Rates described in Commentary)
- **Off-Street Lot Geometry**
- **Landscaping**
- **Shared Parking**
- **Pavement Sections**
  - ❖ **Light**
  - ❖ **Moderate**
  - ❖ **Moderately Heavy**



Layer Designation	Layer Description	Light Load	Moderate Load	Moderately Heavy Loads
A	Bituminous Wearing Course	2.5	1.5	1.5
B	Bituminous Concrete Base Course	none	3.0	3.5
C	Granular Base	4.0	4.0	6.0
Minimum Structure Number		1.5	2.0	2.5

Highlights: Chapter 4 – Parking

Parking Rates for Residential Dwellings

Housing Unit Type/ size	Resident Parking spaces per dwelling unit	Spillover parking spaces per unit
Single Family Detached	2.0	1.5
Townhouse, duplex, quad	1.7	0.25
3+ bedroom apts & condos	1.4	0.2 per bdrm
1-2 bedrooms	1.2	0.2 per bdrm
Efficiency	1.0	0.2 per bdrm