



Webcast Sponsored by EPA's Watershed Academy



Green Streets: From Gray Funnels to Green Sponges

July 23, 2008, 1:00pm-3:00pm EST

**Clark Wilson, U.S. EPA's Smart Growth and
Green Building Division
Ellen Greenberg, University of California-Davis**

Green Streets – From Grey Funnels to Green Sponges

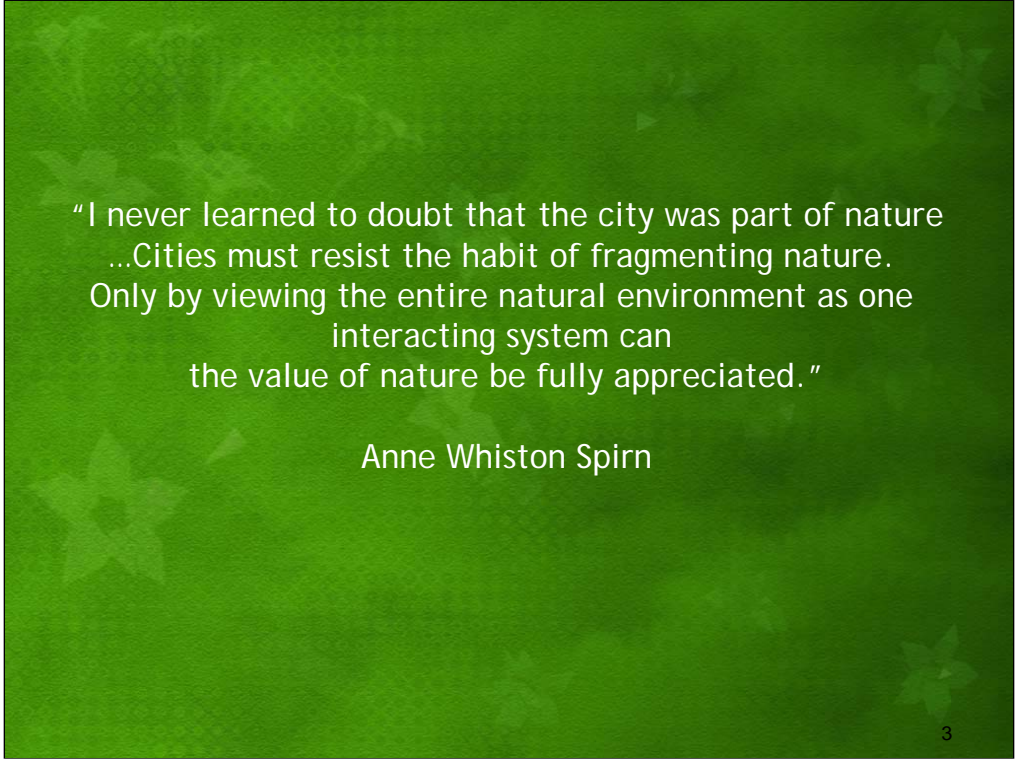


Clark Wilson, U.S. EPA Smart Growth and Green Building Division

2

SMART has a broad range of policy choices to make in determining their TOD/PeD goals and policies.

Today's presentation provides definitions of key terms, reviews some of the key issues of TOD and PeD, and outlines some key policy issues for SMART.



"I never learned to doubt that the city was part of nature
...Cities must resist the habit of fragmenting nature.
Only by viewing the entire natural environment as one
interacting system can
the value of nature be fully appreciated."

Anne Whiston Spirn

(No comment)



Flagstaff, AZ

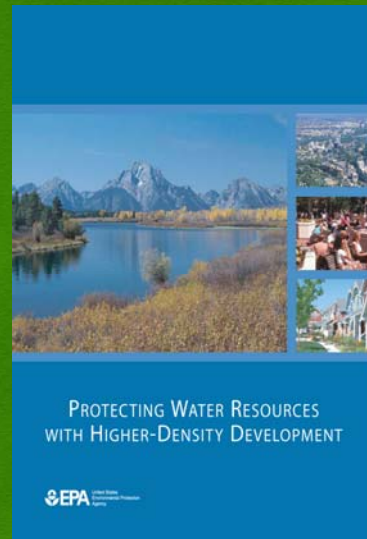
What Is A Green Street?

- Green Infrastructure
 - Non-mechanical treatment of storm water run-off
 - Embrace Natural Processes
 - Landscape for detention and retention
 - Maximizing water reuse
- Livability
 - Improve Water Quality
 - Use Land Efficiently
 - Provide Cost Effective Solutions
 - Create Unique and Attractive Communities and Neighborhoods



Green Streets as Part of Smart Growth Strategy

- Smart Growth Principles
 - Increased Density
 - Transit and Pedestrian Accessibility
 - Infill and Brownfield Development
 - Bridging Institutional Barriers



Think about it...



Housing like
this....



...is often served by
retail and roads like this

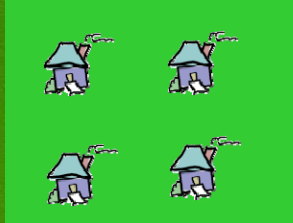
EPA Research on Smart Growth & Water

Scenario A:
1 unit/acre



Impervious cover = 20%
Runoff/acre = 18,700 ft³/yr
Runoff/unit = 18,700 ft³/yr

Scenario B:
4 units/acre



Impervious cover = 38%
Runoff/acre = 24,800 ft³/yr
Runoff/unit = 6,200 ft³/yr

Scenario C:
8 units/acre



Impervious cover = 65%
Runoff/acre = 39,600 ft³/yr
Runoff/unit = 4,950 ft³/yr

The table shows total SW Runoff PER ACRE for two communities
Community B, with more housing units, has a greater amount of IC and generates more SW runoff than Community A

The table shows total SW Runoff PER HOUSING UNIT for two communities
When examined at the individual housing unit, each house in Community B produces 33 percent less runoff than housing units in Community A.

Accommodating the same number of houses (8) at varying densities

Scenario A: 1 unit/acre



Impervious cover = 20%
Total runoff = 149,600 ft³/yr
Runoff/house = 18,700 ft³/yr

Scenario B: 4 units/acre



Impervious cover = 38%
Total runoff = 49,600 ft³/yr
Runoff/house = 6,200 ft³/yr

Scenario C: 8 units/acre



Impervious cover = 65%
Total runoff = 39,600 ft³/yr
Runoff/house = 4,950 ft³/yr

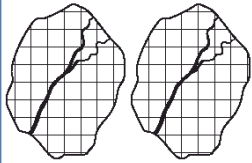


9

The table shows total SW Runoff PER ACRE for two communities
Community B, with more housing units, has a greater amount of IC and generates more SW runoff than Community A

The table shows total SW Runoff PER HOUSING UNIT for two communities
When examined at the individual housing unit, each house in Community B produces 33 percent less runoff than housing units in Community A.

In 20 years, they have doubled their populations...

So by **2020**, they might look like...

Scenario A	Scenario B	Scenario C
		
20,000 houses accommodated on 20,000 acres at a density of <i>1 house per acre</i> will consume 2 watersheds.	20,000 houses accommodated on 5,000 acres at a density of <i>4 houses per acre</i> will consume $\frac{1}{2}$ of 1 watershed.	20,000 houses accommodated on 2,500 acres at a density of <i>eight houses per acre</i> will consume $\frac{1}{4}$ of 1 watershed.

EPA Technical Assistance Program

- California DOT (Caltrans) – Smart Mobility Screening Tool
- City of Denver – Living Streets Initiative
- Northern Kentucky Sanitation District #1 – Green Infrastructure Tool Box
- Sussex County, Delaware – Stormwater Design Guidebook

Small MS4 Permit Framework

- **Good Site/Street Design**
- **Good Neighborhood and Community Design**
- **Water Conservation & Reuse**
- **Mimic natural hydrologic cycle processes:**

Infiltration - Reuse - Evapotranspiration (IRE)

Small MS4 Permit Framework

- We are working directly in 3 states
- The approach of incorporating green infrastructure into state stormwater permits was just released nationally
- We've received numerous calls from other states who are interested and need additional information

Smart Growth and Emergency Response

Opportunities for collaboration exist:

- Performance measures
- Connectivity
- Setback requirements
- Construction techniques

School Siting and Safe Routes to School

- Creates safer conditions for walking and bicycling
- Where it's safe, get children walking and biking
- Where it's not safe, make changes



15

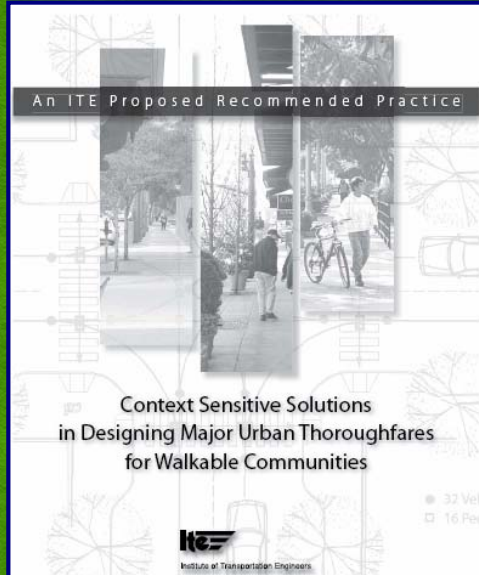
Message:

- Engineering deals with the built environment and projects that work to create safer places to walk or bike.
- The image here was taken at Monroe Elementary School in West Valley City, UT.

Image:

Monroe Elementary School, West Valley City, UT, provided by Mike Cynecki.

ITE “Context Sensitive Streets” Guidebook*



- Detailed design guidelines that....
 - are tailored to the urban context of a street
 - ensure design alternatives conform to AASHTO standards
 - provide detailed case study examples with street cross sections

*ITE = Institute of Transportation Engineers

Model Smart Growth Codes

Model Smart Growth Codes
and Regulations Work to
Create Complete
Neighborhoods and Corridors
Incorporating:

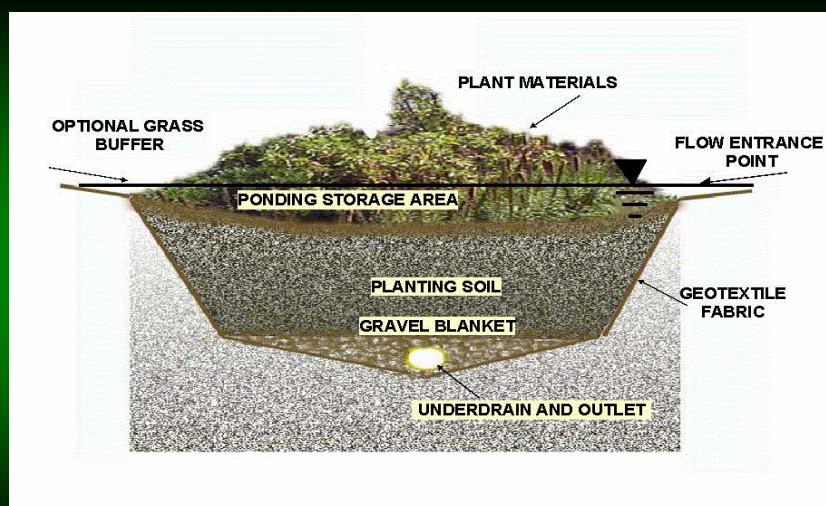
- Green Infrastructure
- Stormwater Boulevards
- 2-Lane Street Crossing over Habitat Corridors
- Short Blocks
- Proximity to Transit Corridors
- Walkability



LEED - ND

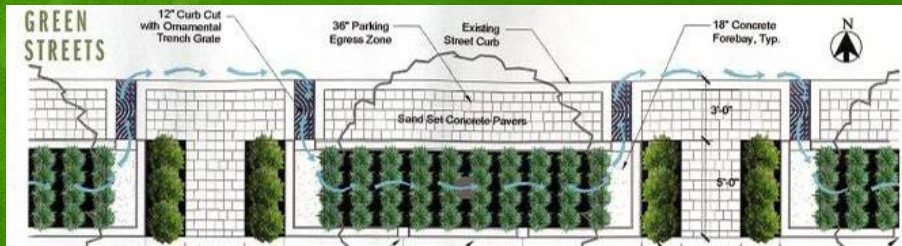
- A LEED rating system being developed through a partnership with
 - Natural Resources Defense Council (Smart Growth)
 - Congress for the New Urbanism
- A rating system that combines elements of smart growth, urbanism, and green building

Bio-Retention 101 – Rain Gardens



Infiltration Basin with Parking

SW 12th St, Portland, OR



Designer: Kevin Perry, City of Portland Bureau of Environmental Services

SW 12th St, Portland, OR



From this...

To this...



Designer: Kevin Perry, City of Portland Bureau of Environmental Services

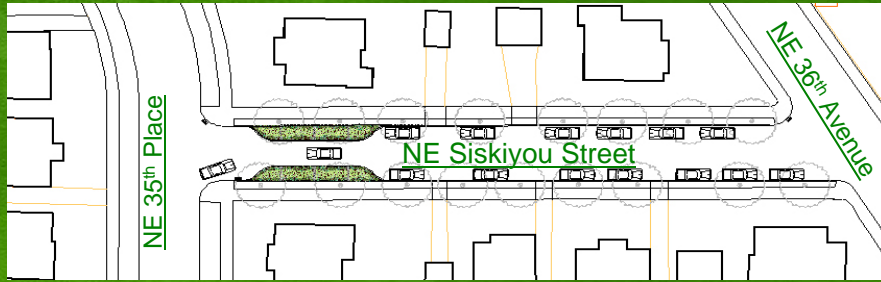
From other places....

- Street Planters, Shotwell Alley, San Francisco



Coordinator: Jane Martin, PlantSF

NE35th & Siskiyou, Portland, OR



Designer: Kevin Perry, City of Portland Bureau of Environmental Services

NE35th & Siskiyou, Portland, OR



Designer: Kevin Perry, City of Portland Bureau of Environmental Services

NE35th & Siskiyou, Portland, OR



Designer: Kevin Perry, City of Portland Bureau of Environmental Services

From other places....



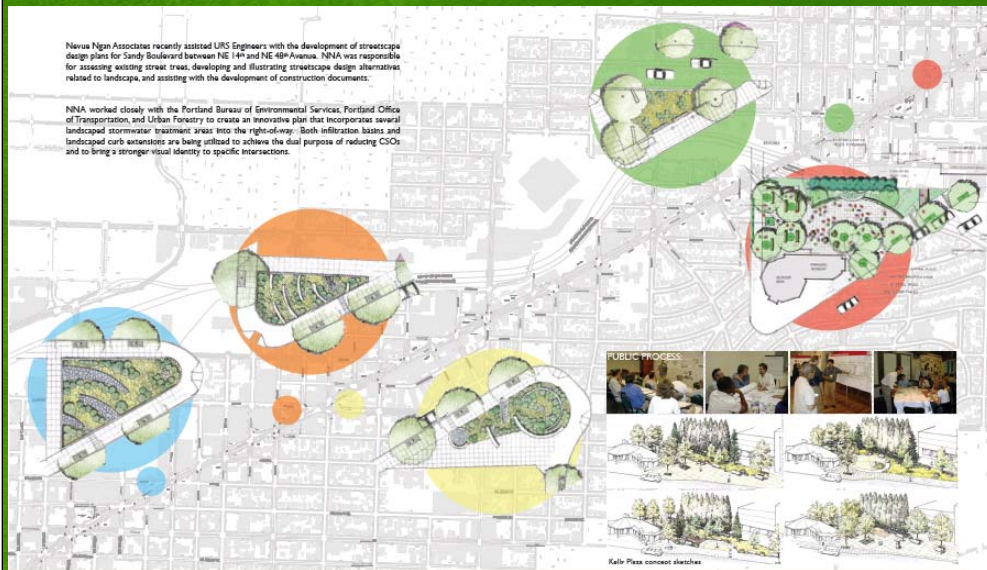
Pleasanton,
CA



Wells, MN



Sandy Boulevard, Portland, OR



Designer: Nevue Ngan & Associates with URS Engineers

Sandy Boulevard, Portland, OR



Designer: Nevue Ngan & Associates with URS Engineers

28

Sandy Boulevard, Portland, OR



Designer: Nevue Ngan & Associates with URS Engineers

New Columbia, Portland, OR

Highly connected street
grid (shown in dark
brown) replaced
street pattern
connecting to larger
community in 4
locations



*Image courtesy Marcy McNelly,
SERA-Urbsworks*

Image #2 From .pdf, copyright granted from Marcy McNelly

New Columbia, Portland, OR

- 101 pocket swales, 30 flow-through planter boxes and 41 public infiltration dry wells
- 98% of stormwater retained on-site



Image courtesy Marcy McInelly,
SERA-Urbsworks

31

Information from SERA-Urbsworks "Sustainable Streets Referral: New Columbia Street Plan" submitted date ???

"New columbia's street plan introduced an innovative stormwater management system to the site. The plan called for "Green Street" bioswales within the right-of-way. These planted swales contain slotted curbs, which allow water to flow from the street surface into the planter. The water is then allowed to seep naturally into the ground while it is filtered of pollutants by specially selected plants. The City's Bureau of Environmental Services calls New Columbia "the ultimate green streets development." With 101 pocket swales, 31 flow-through planter boxes, and 40 public infiltration dry wells, New Columbia is Portland's largest green streets site. The project ultimately helped to change public policy. Working with public agencies during the planning process helped to convince City representatives fo the benefits of Green Streets, and they are now encouraged and celebrated throughout the city."

Plenty of Other Opportunities...



Before

Covington, KN
Northern KN SD1 Technical Assistance
(Kevin Perry, Nevue Ngan and
Associates)



After

Like here...



Before

Covington, KN
Northern KN SD1 Technical Assistance
(Kevin Perry, Nevue Ngan and
Associates)



After

and here...



Before

Covington, KN
Northern KN SD1 Technical Assistance
(Kevin Perry, Nevue Ngan and
Associates)



After

and here...



Before

Covington, KN
Northern KN SD1 Technical Assistance
(Kevin Perry, Nevue Ngan and
Associates)



After

and here...



Before

Covington, KN
Northern KN SD1 Technical Assistance
(Kevin Perry, Nevue Ngan and
Associates)



After

and here...



Before

Covington, KN
Northern KN SD1 Technical Assistance
(Kevin Perry, Nevue Ngan and
Associates)



After

And, finally, here...



Before

Covington, KN
Northern KN SD1 Technical Assistance
(Kevin Perry, Nevue Ngan and
Associates)



After

“Stormwater is not a mechanical system. It is an environmental process, joining the atmosphere, the soil, vegetation, land use, and streams, and sustaining landscapes.”

Bruce K. Ferguson



39

The range from transit-oriented development to pedestrian-oriented design and applicability to the SMART system.

Questions?



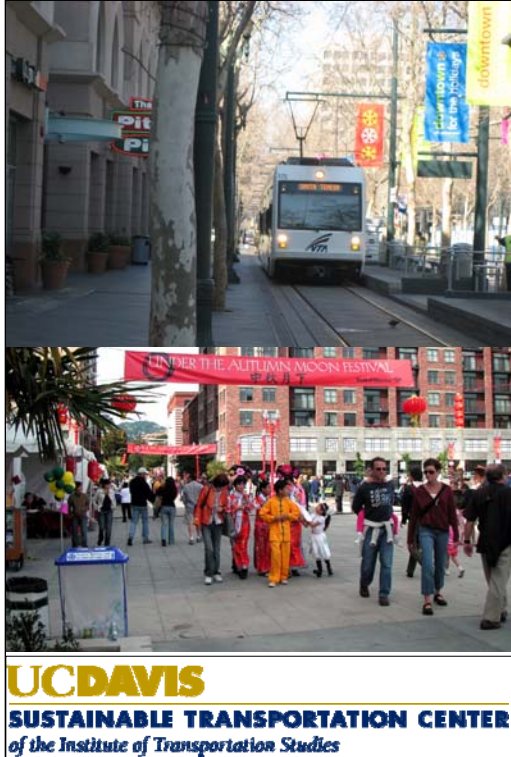
Clark Wilson



**The Watershed Academy Webcast Team is Taking a Much
Welcomed Vacation!**

Don't worry! We'll be back in September 2008!

**Please visit: epa.gov/watershedwebcasts
for more information on future Webcasts!**



Sustainable Streets

Emerging Priorities,
Emerging Practices

Ellen Greenberg

EPA Watershed Academy
July 23, 2008

42

Top photo: Ellen Greenberg
Bottom photo: City of Portland

The Sustainable Streets project is sponsored by the UC Davis Sustainable Transportation Center through its Visiting Practitioner Program. The Sustainable Streets project has benefited from contributions from many representatives of public and private organizations. We thank each of these individuals for their assistance.

The project is:

- Highlighting the connections between urban street design and sustainability
- Introducing a definition of Sustainable Streets
- Documenting projects built and under construction
- Assessing the State of the Practice



Photo: Marcy McInelly, SERA/Urbsworks

Sustainable Streets

are rights of way designed and operated to create benefits relating to movement, ecology and community.

43

Sustainable Streets: Opportunities to Pursue Sustainability Objectives
Planning, Policy and Institutional Activities
Construction
Operations & Management
Maintenance, Restoration & Repair

Movement



The movement of people and goods by all on-street modes and for all trip purposes and types.

Sustainable streets can create settings and facilities for improved travel performance with respect to movement and ecological objectives.

44

Photo credits: left: Sera-Urbworks; right top: City of San Jose; right bottom: Ellen Vanderslice, Portland Dept of Transportation

The street as part of its place – a place that supports a certain type of travel performance. Arlington VA

1. Reliable movement network with multimodal capacity consistent with area activity
2. Reduced VMT through increased transit and non-motorized mode share and shorter average trip length
3. Vehicle speeds compatible with context, community objectives, and energy efficient operations
4. Independent mobility for non-drivers
5. Improved overall accessibility
6. Necessary access by emergency vehicles
7. Reduced portion of the average household budget spent on travel
8. Significantly reduced travel-related injuries and fatalities

Movement

Objectives

- Reliability and convenience
- Reduced Vehicle Miles Traveled (VMT)
- Independent mobility
- High level of accessibility
- Emergency vehicle access

Features

- Highly connected multimodal network
- Supporting land use pattern with diverse activity in close proximity
- Compatible vehicle speeds
- Facilities for transit, bikes and walking

45

Movement Objectives

Reliability and convenience for movement of goods and people

Reduced VMT through increased transit and non-motorized mode share and shorter average trip length

Independent mobility for non-drivers

High level of overall accessibility

Necessary access by emergency vehicles

Movement Features

Highly connected multimodal network

Supporting land use pattern with diverse activity in close proximity and connected by multimodal system

Vehicle speeds compatible with context, community objectives, and energy efficient operations

Facilities for transit operations, safe and convenient bicycling and walking

Storage and re-fueling of lower-polluting vehicles in public right of way

Parking? alignment? # of lanes? Lane width?

Ecology



Sustainable streets protect and enhance natural resources and processes.

46

1. The resource value of landscape and natural elements within the right of way.
2. The ecological processes affected by the movement system supported by the street – including as the air, water and climate impacts of motor vehicle emissions.

Photo credits: left: Sera-Urbsworks; right top: City of San Jose; right bottom: Ellen Vanderslice, Portland Dept of Transportation

Ecology: The resource value of landscape and natural elements within the right of way as well as the much broader set of ecological processes that are affected by the movement system supported by the street – such as the air, water and climate impacts of motor vehicle emissions. Sustainable streets protect and enhance natural resources and processes

Community: Social, economic, public health, cultural and aesthetic considerations as well as environmental justice. Consistent with the principles of Context Sensitive Solutions, sustainable streets reflect community values and support urban development patterns that reinforce movement goals.

Ecology

Objectives

- Improved air quality
- Water conservation; improved water quality
- Enhanced ecological health and productivity
- Reduced urban heat island effect
- Efficient overall use of energy and other resources
- Reduced greenhouse gas emissions

Features

- Urban forest; other vegetation
- Biofiltration (variety of features)
- Permeable paving
- Use of energy efficient traffic signals and lighting
- Preserve natural features and landscapes

Community



(1) Contribute to social, economic, public health, cultural and aesthetic needs as well as environmental justice.

(2) Support for urban development patterns that reinforce movement and ecological goals.

48

Photo credits: left: Sera-Urbsworks; right top: City of San Jose; right bottom: Ellen Vanderslice, Portland Dept of Transportation

Community: Social, economic, public health, cultural and aesthetic considerations as well as environmental justice. Consistent with the principles of Context Sensitive Solutions, sustainable streets reflect community values and support urban development patterns that reinforce movement goals.

1. Positive public health outcomes related to safety, reduced pollutant exposure and physical activity
2. Travel benefits of compact development patterns
3. Quality accessibility to destinations regardless of age, ability or income
4. Community Engagement
6. Adaptability over time
7. Placemaking: Identity, distinction, and beauty through natural and built features
8. Support for infill and compact development
9. Local priorities, traditions, resources and features reflected in design and function
10. Promote sociability and public life
11. Create value for adjoining properties

Community

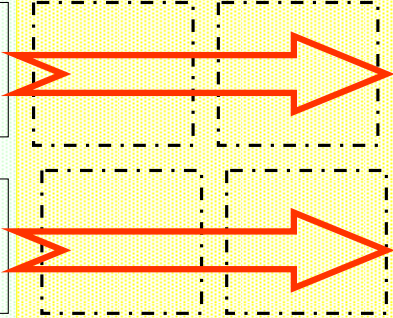
Objectives

- Placemaking: identity, distinction and beauty
- Support for compact and infill development
- Positive public health outcomes
- Promote sociability and community life
- Create value for adjoining properties
- Significantly reduce travel-related injuries and fatalities

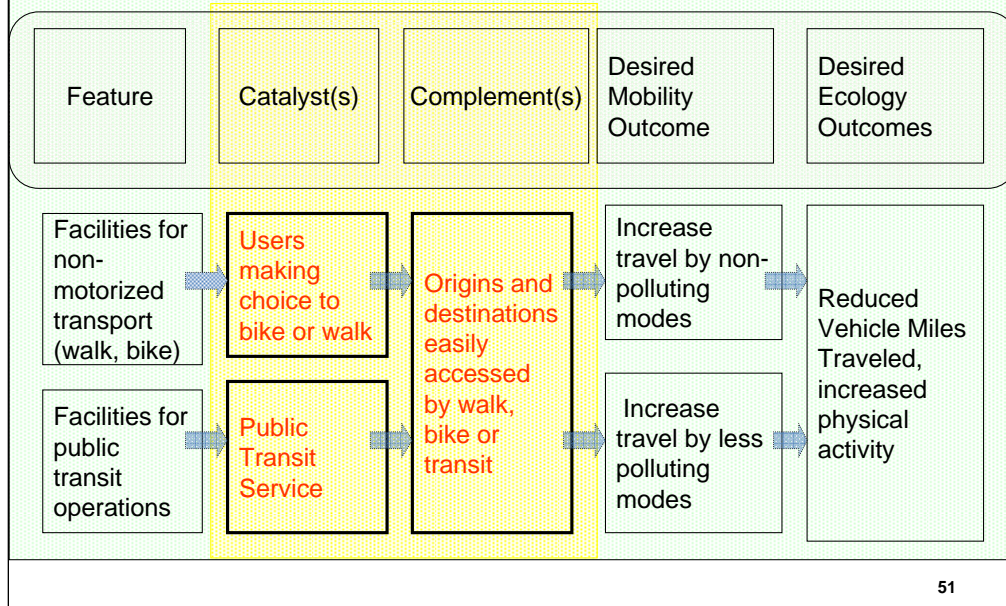
Features

- Distinctive landscape design, street furnishings, lighting etc.
- Comfortable pedestrian realm buffered from moving traffic
- Easily crossed streets
- Safe and secure places for transit waits and transfers
- Public gathering places within and linked to public right of way
- Right-sized roads in relation to appropriate operating speeds and pedestrian environment overall

Design Features and Desired Outcomes: Examples: Ecology

Feature	Catalyst(s)	Complement(s)	Desired Intermediate Effect(s)	Desired Outcomes
Pervious Paving			Infiltrate runoff and stormwater on site	Reduced Pollutant load, erosion, turbulence and temperature impacts of urban runoff
Biofiltration swales			Slow runoff rate; remove sediment from stormwater	

Design Features and Desired Outcomes: Examples: Movement / Ecology



Sustainable Streets Album: Themes

Stormwater Plus: Projects with implementation of stormwater management features as a primary design objective

Movement Plus: Higher volume streets (15,000+ ADT) re-designed to meet sustainability goals ranging from improving bicycle facilities to supporting high-density residential infill

Downtown Revitalization Plus: Projects in mature communities that are using street design as a tool to spur economic activity and support compact and infill development downtown.

Neighborhood Plus: Redesigned and new neighborhoods that seek to foster community values, reduce transportation impacts, and preserve natural resources.

52

Movement Plus: Higher volume streets (15,000+ ADT) re-designed to meet sustainability goals ranging from improving bike parking to supporting high-density residential infill (NOTE ADT question)

Neighborhood Plus: Two redesigned neighborhoods that seek to foster community values, reduce transportation impacts, and preserve natural resources.

Downtown Revitalization Plus: Projects in older communities that are using street design as a tool to spur economic activity and support compact and infill development downtown.

Stormwater Plus: Projects designed with implementation of stormwater management features as a primary design objective

Album Close-Ups

Stormwater Plus

- Holladay Green Street, Portland, OR
- Taylor Avenue, Seattle, WA
- 12th Street, Kansas City MO
- Josey Heights, Milwaukee, WI

Movement Plus: Big Streets

- Aurora Avenue, Shoreline, WA
- Sandy Boulevard, Portland OR
- Pacific Boulevard, Vancouver, BC

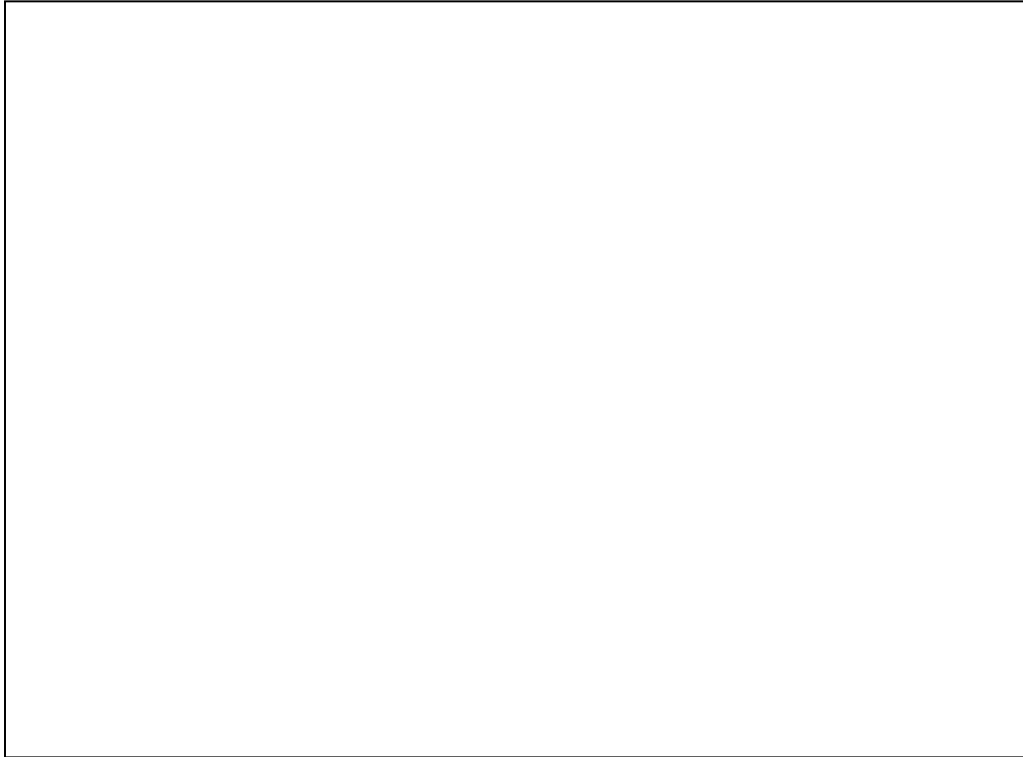
Revitalization Plus

- Riverfront Parkway and Downtown Streets, Chattanooga, TN
- 1st Street, Livermore, CA
- South 1st Street, San Jose, CA

Neighborhood Plus

- New Columbia, Portland, OR
- Pringle Creek, Salem, Oregon
- Garrison Woods, Calgary Alberta

Not looking at all of these today; data on all of these is available at the UCD sustainable streets project website.



Portland 12th Avenue image: SW+12th+Avenue+Stormwater+Planter.jpg

Permission not obtained. Need to contact Kevin Perry and Andrea Carlassare for permissions

a) Recipients of the project's email request for referrals of "sustainable streets" seem to be most frequently associating the phrase with stormwater management projects, most commonly including landscaping for bioretention/biofiltration, and pervious paving. Of the web of issues relevant to street design and sustainability, these and associated techniques appear to be the most clearly identified and developed as contributing clearly to sustainability goals. That is, design approaches focused on use of the street's movement and placemaking functions appear to be receiving less attention as contributors to sustainability than are approaches focused on the street's natural resources and natural processes.

b) Most of the literature explicitly addressing "sustainable streets" is likewise concerned about infrastructure performance w/respect to drainage, use of materials, etc – as opposed to mobility functions or urban structure functions. There are some noteworthy exceptions, such as the Portland Green Streets document, which sets out an integrated set of objectives while focusing on drainage solutions and landscape values.

c) There seems to be a need for a "map" of the different dimensions of street design relevant to sustainability in relation to movement functions, place functions and natural resources/processes. I'm working now on creating such a map and will welcome any suggestions of relevant work.

Innovation in Practice

a) There are a small number of cities and regions that have implemented very innovative work in numerous projects. In many more cities and regions innovation is occurring in small steps. It will come as no surprise that the Pacific Northwest stands out as the #1 region with respect to innovation with regard to stormwater and street design, as well as having a relatively well-established integration of these issues with mobility objectives.

b) There are many more localities in planning and design phases of sustainable designs than there are places with designs built or under construction. In some of the places in the early stages there are pilot projects built but they haven't integrated sustainable design into their practices.

Facility Types and Sustainability

a) There are many more localities in planning and design phases of sustainable designs than there are places with designs built or under construction

b) On bigger streets, two threads emerge from the projects we're seeing:

(i) Work addressing fundamental provisions for non-motorized transport and transit including provision of continuous sidewalks, sometimes bike lanes, often bus shelters/waiting areas, and/or on-street parking, and usually some level of landscaping. These projects provide a baseline condition that provides essential accommodation and safety improvements supporting low-impact, healthy travel. However, their near-term impact on use of walk and bike as travel modes is likely to be limited by dominant land use patterns that are characterized by low densities, long distances between origins and destinations, and auto-scale design.

(ii) More comprehensive efforts that are using street design as one element in efforts at revitalization of corridor right of way and adjoining properties or districts. Components of these efforts usually include introduction of street fronting land uses (or land use and design regulations establishing an expectation of them). The multiway boulevard is emerging as a dominant technique for the higher volume street with fronting land uses. We've seen just one example these being integrated with stormwater solutions in cases built or under construction (Sandy Boulevard in Portland), though we're hearing about these solutions being considered in projects underway.

Comment re MS4s

Holladay Green Street

Gresham, Oregon

**Contributors: City of Gresham
Department of Environmental Services**

55

City of Gresham Dept. of Environmental Services Green Street Pilot Project:
Stormwater management features retro-fitted on three blocks of suburban street
Porous paving in parking strip on north side of street
Three rain gardens on south side of street
Erosion and sedimentation control measures

Holladay Green Street, Gresham, OR Contributors' Perspective

"This project enabled us to demonstrate and compare two different approaches to Green Street design through the use of porous materials and landscaping to manage stormwater runoff in a more sustainable fashion. We can learn by experience which design 1) is more cost effective (short and long-term), 2) better protects the environment, and 3) is more desired by the neighborhood citizens. The design factors that make this street more sustainable than standard streets are applicable to either new construction or for retrofitting existing streets."

56

Quote from referral form,

This project combines a deliberate learning exercise with implemented stormwater management techniques

The design of the cross section highlights the question of whether low-volume streets should have sidewalks; the darker permeable paving material intended as a parking strip might easily be perceived as a sidewalk.

The four cars seen in a driveway in the photo background are a good reminder of the complexity of broader sustainability issues as they relates to transportation

12th Street, Kansas City, Missouri

Contributor: BNIM Architects

“We sold it by saying you need a sidewalk bulb out to solve the safety issues, and while we're doing that, let's solve these water issues, and as long as you're spending this amount of money, let's do it with a green solution.”

Image: Jim Schuessler, BNIM Architects

This seven-block streetscape project on Kansas City's main east-west corridor goes through the downtown financial district to the government district. The project includes stormwater management and urban forest features as well as re-design of the roadway to reduce the number of travel lanes from four to three and add on-street parking.

12th Street, Kansas City, MO

- Construction and planting of trees, tree trenches, lighting and raingardens was completed in October 2007.



Images: Jim Schuessler, BNIM Architects

Josey Heights Street Plan Milwaukee, Wisconsin

Contributors:

Conservation Design Forum

The more traditional way of managing stormwater to comply with the City's release rate requirements – using surface detention -- would have caused a reduction in the number of units constructed that was unacceptable from the financial perspective.

The outcome of the techniques implemented instead provided additional housing sites, is cost-effective from the revenue side and offers the aesthetic quality and visual benefits of distributed stormwater system.

Image: Conservation Design Forum, www.cdfinc.com

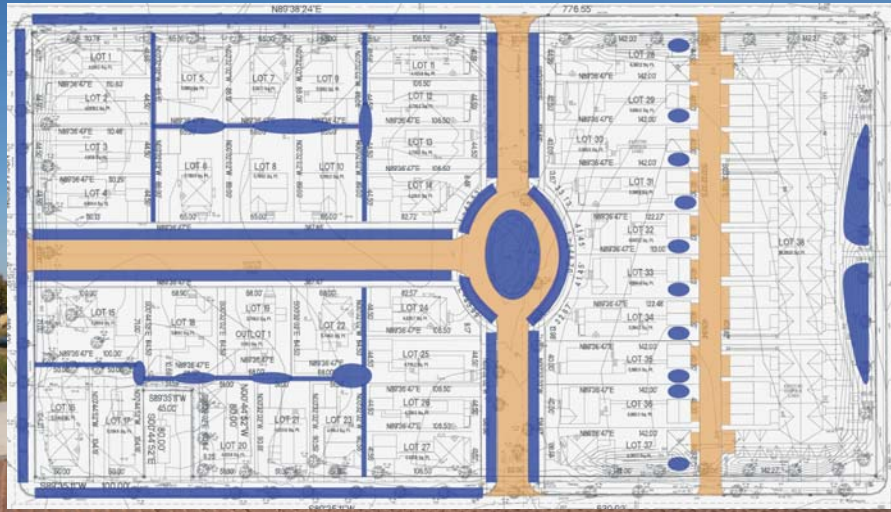
This image shows completed streets with permeable paving and a model unit. The project is under construction in 2007; slow buildout an apparent consequence of the nationwide housing slump.

Integrating sustainable stormwater management with affordable housing is a goal of the Josey Heights Development, under construction in Milwaukee, Wisconsin.

Project designers, the developer and the City worked together to design a model residential neighborhood that features an integrated stormwater system and moderate-income custom manufactured housing.

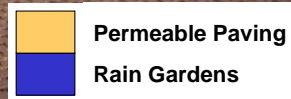
When completed, the development will include 37 single family and 14 townhome units.

Josey Heights, Milwaukee, WI



Stormwater Management Features

Image: Conservation Design Forum, www.cdfinc.com



Josey Heights, Milwaukee, WI

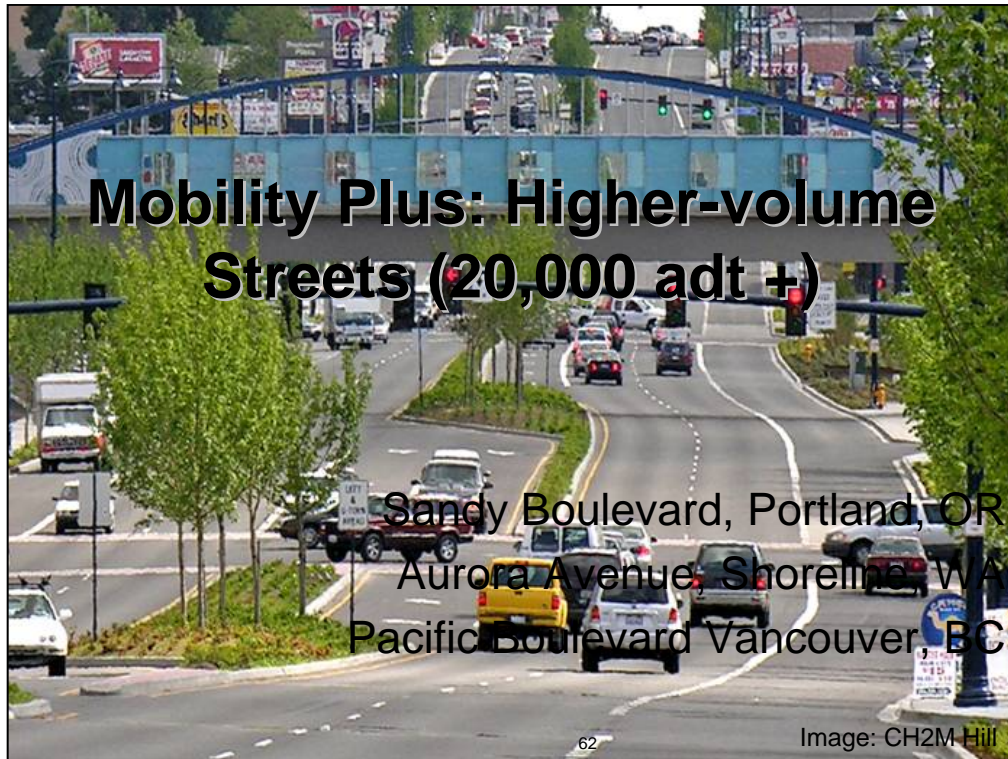
The more traditional way of managing stormwater to comply with the City's release rate requirements – using surface detention -- would have caused a reduction in the number of units constructed that was unacceptable from the financial perspective.

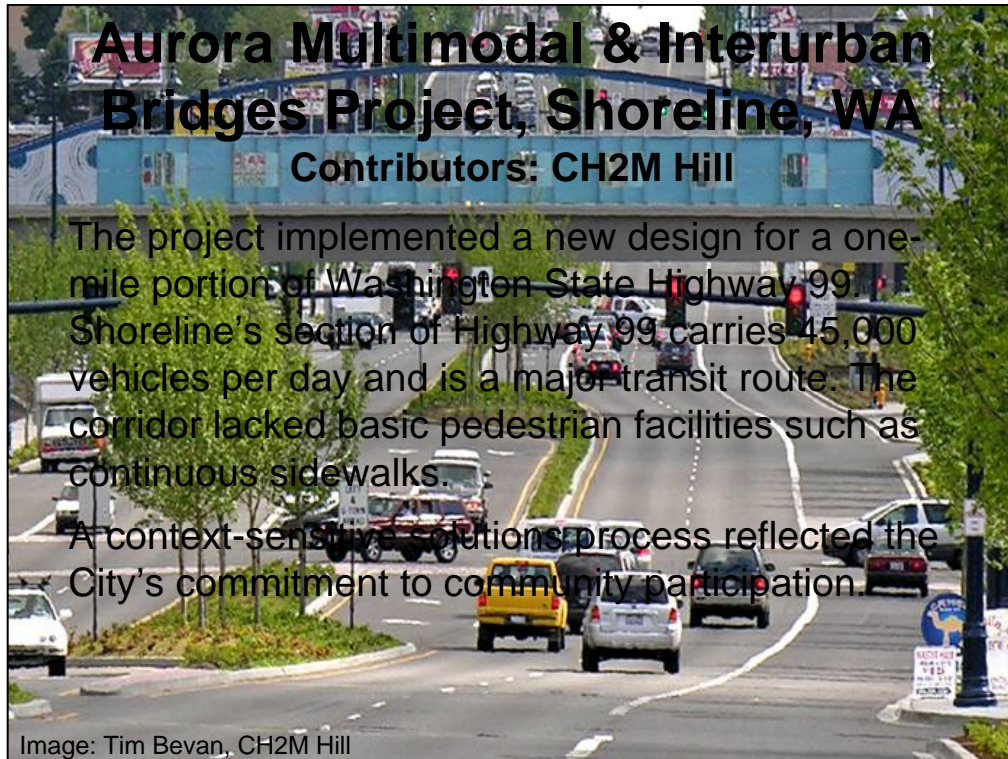
The outcome of the techniques implemented instead provided additional housing sites, is cost effective from the revenue side and offers the aesthetic quality and visual benefits of distributed stormwater system.

Image: Conservation Design Forum, www.cdfinc.com

The integration of stormwater management with platting and stormwater stands out in this example, as do the project designers' and sponsors' commitments to gaining multiple benefits from stormwater management techniques.

The project's slow buildout is a reminder of the fact that real estate economics always play a part in project implementation, even when the project includes innovative features that are widely viewed as adding value.





The Aurora Multimodal and Interurban Bridges Project implemented a new design for a one-mile portion of Washington State Highway 99. The City's commitment to community participation was reflected in a context-sensitive solutions process led by consultants CH2M Hill. Shoreline's section of Highway 99 carries 45,000 vehicles per day and is a major transit route. Aurora Avenue is described by the project designers as having been among the most hazardous stretches of urban arterial highway in Washington. The corridor lacked basic pedestrian facilities such as continuous sidewalks. Project purposes included improved pedestrian and vehicle safety, pedestrian and disabled access, vehicular capacity, traffic flow, transit speed and reliability, nighttime visibility and safety, storm water quality, economic investment potential, and streetscape amenities. The project included intersection capacity improvements, transit lanes, two new pedestrian/bicycle bridges, sidewalks, access management treatments, utility undergrounding, landscaping, illumination, and stormwater management features. The first mile of the re-built Aurora Avenue was opened on June 16, 2007.

Project Features as identified by contributor:

- Two through-lanes and a business access/transit lane in each direction. The business access and transit lane provides a dedicated lane for transit to improve transit speed and reliability in the corridor. This auxiliary lane also improves the capacity in the through lanes by providing for right turning vehicles into businesses and reducing friction in the through lanes.
- Seven-foot sidewalks with 4.5-foot landscaped amenity zone between pedestrians and traffic for utilities, bus stops, hydrants, and landscaping improves pedestrian safety and walkability and provides access to transit.
- Street and sidewalk lighting improves safety and aesthetics in the corridor and provides uniform lighting levels.
- All new utility infrastructure including underground power lines improves the aesthetics and improves the economic development potential in the corridor.
- Landscaped medians with left and U-turn pockets provide safe and convenient access to businesses.
- New signals, lighted street signs and specially paved crosswalks and bus pads strengthen the area's urban identity and clearly mark pedestrian and transit zones which improves safety and walkability
- New stormwater system with underground water quality treatment systems combined with landscaped areas for increases pervious areas improves water quality for stormwater runoff.
- Two pedestrian bridges providing safe crossing of Aurora Avenue and 155th Street for Interurban Trail users.

Aurora Multimodal & Interurban Bridges Project

- Typical “before” conditions along Aurora Avenue in Shoreline
- These conditions persist outside of the project boundaries in both Shoreline and Seattle



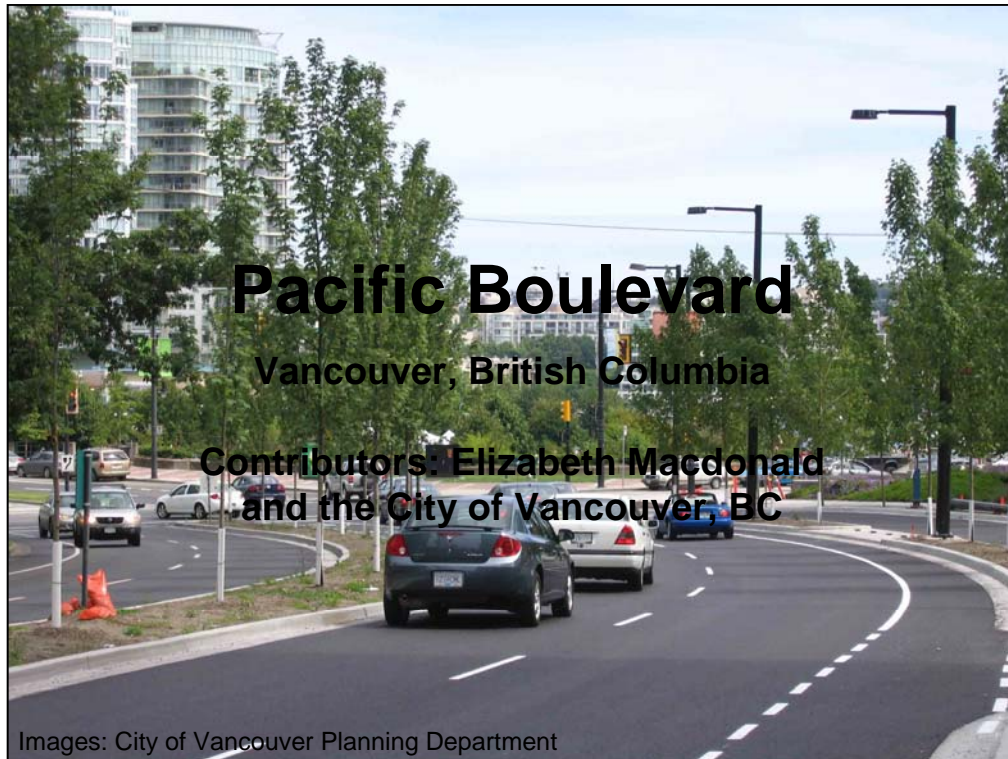
Images: Tim Bevan, CH2M Hill

64

Aurora Multimodal & Interurban Bridges Project

- Bike/Ped Bridge
- Continuous Sidewalk
- Landscape buffer and lighting





Pacific Boulevard's reconstruction, underway in 2008, is intended to activate and green the street while improving facilities and conditions for bicyclists and walkers. This project stands out as having the highest density development context of any in the Sustainable Streets Album.



Construction and final design for one of the segments was funded by a private developer in exchange for a reduction of 50 "staium Parking aPay-in-Lieu spaces attributed to its 900 Beatty development site. The value of the reduction is \$534,550



The revitalization projects are focused on Smart Growth principles – in particular, facilitating successful infill development. Each treats street design as a key element of intensification and creation of walkable urbanism.

While none of the downtown revitalization projects focus explicitly on ecological objectives, two –Riverfront Parkway and Livermore First Street - include significant new plantings and reduction in impervious surfaces, while also supporting non-motorized travel.

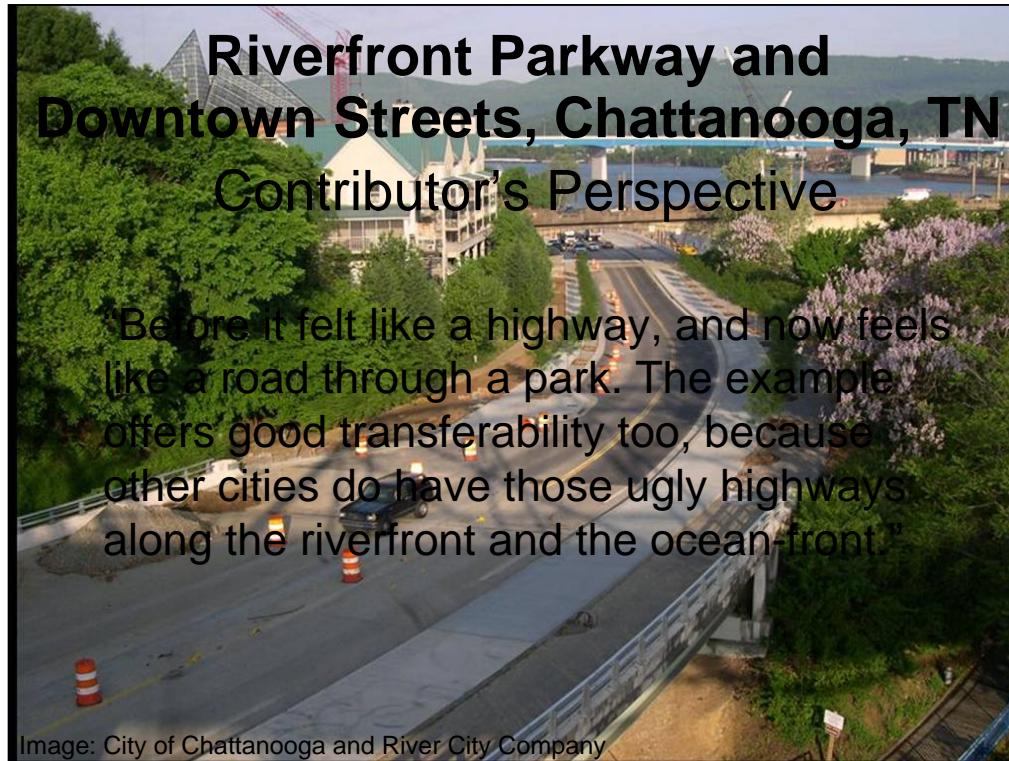
Riverfront Parkway and Downtown Streets

Chattanooga, Tennessee

**Contributors: City of Chattanooga
and River City Company**

Image: City of Chattanooga and River City Company

69



An example of a major civic and business effort to revitalize downtown using street design as a key element. Ecological sustainability took a back seat compared to the demands of community and mobility. Conventional ideas about mobility “solutions” were dismissed in favor of choices that were more responsive to natural and community context.

A photograph of a city street, likely in San Jose, California, showing trees and buildings in the background. The image is overlaid with text.

South 1st St. / Downtown Transit Mall

San Jose, California
Contributor: City of San Jose

Image: Ellen Greenberg





First Street, Livermore, CA

Contributor's Perspective

“The First Street Streetscape demonstrates that a major sustainability challenge for much of America is to achieve successful relationships between people, cars, and our built and natural environments – in the face of development industry sprawl formulas.

Wild and agricultural land conservation is made possible when built-out urban environments and places are densely and multiply used, made highly livable and human-scaled, and are vital places to be. In particular, opportunities can be found on most existing urban streets to re-allocate space from cars to people.”

73 Image: Freedman Tung & Bottomley

Project overview: Paragraph or overview bullet points w/images behind. Image credit on all slides. For some projects more than one overview slide is needed, especially if there is important history or context information. If possible, include ADT information

The re-designed First Street is particularly innovative in its allocation of right of way space and in the construction of architectural objects (trellises) within the curb-to-curb space. The design is suggestive of “shared space” approaches but retains a separation between through movement and social space.

The design offers flexibility of space in sharp contrast to conventional roadway design – slow speeds are an essential part of the success of the street.

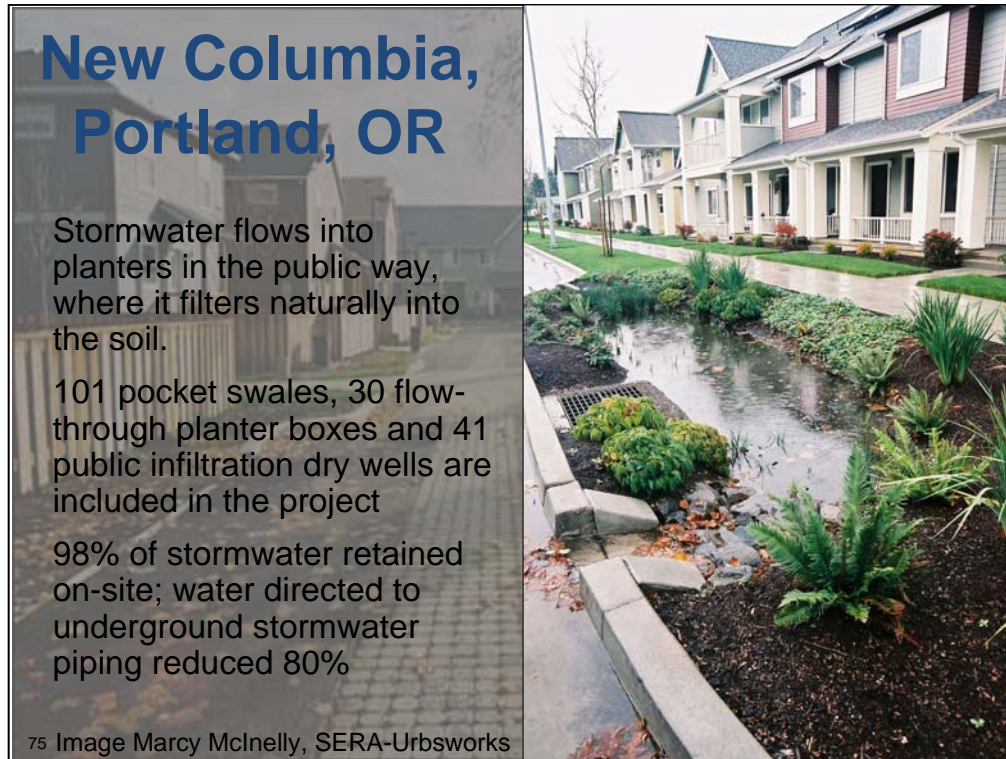
While the emphasis of the design is not on ecological sustainability, the introduction of additional trees and a lush tree cover, as well as ground planter, offers environmental benefits.



2' of permeable paving installed at center of alley (dimensions in subsequent slides)

This Section of the album highlights projects at the neighborhood scale. Each was designed and implemented to emphasize multiple objectives, from a tripling of density on an Alberta, Calgary infill site in Garrison Woods, to fully embracing low impact development principles at Pringle Creek in Salem, Oregon.

New Columbia, a Portland Housing Authority project in Portland, Oregon, is perhaps the most comprehensive with respect to sustainability, integrating stormwater management BMPs into a mixed-income, mixed use redevelopment of an older public housing project.



Information from SERA-Urbsworks "Sustainable Streets Referral: New Columbia Street Plan" submitted date ???

"New Columbia's street plan introduced an innovative stormwater management system to the site. The plan called for "Green Street" bioswales within the right-of-way. These planted swales contain slotted curbs, which allow water to flow from the street surface into the planter. The water is then allowed to seep naturally into the ground while it is filtered of pollutants by specially selected plants. The City's Bureau of Environmental Services calls New Columbia "the ultimate green streets development." With 101 pocket swales, 31 flow-through planter boxes, and 40 public infiltration dry wells, New Columbia is Portland's largest green streets site. The project ultimately helped to change public policy. Working with public agencies during the planning process helped to convince City representatives of the benefits of Green Streets, and they are now encouraged and celebrated throughout the city."

The New Columbia project transformed an 82-acre public housing site into a mixed-use, mixed-income, sustainable community with 400 housing units, public park, and elementary school. The street plan was designed for social and economic integration of the site into the greater community. The plan maximizes connectivity and community by welcoming for pedestrians and cyclists, and manages the area's stormwater on-site.



Pringle Creek Community Salem, Oregon

**Contributors:
Sustainable Development, Inc.
and Opsis Architecture**

Images: Sustainable Development, Inc.

76

Low impact subdivision with variety of housing products and a mixed use center

Under construction in 2008

Typical street section has single 13' travel channel with 7' parking lanes

No curb and gutter

Porous asphalt and concrete used



Pringle Creek, Salem, OR Contributor's Perspective

"The streets at Pringle Creek Community combine multiple concepts of sustainable design... and the end result is a highly desirable neighborhood to live in, one that is safe for walkers and bicyclists, shaded and comfortable, beautiful to look at, easy for traffic to flow through and with ample parking. Best of all, not only are our streets functional, but they enhance the entire watershed, effectively managing stormwater while at the same time recharging the aquifer and significantly reducing our footprint on the environment."

Don Myers, Sustainable Development, Inc.

Images: Sustainable Development, Inc.

77

"The streets at Pringle Creek Community combine multiple concepts of sustainable design – narrow intersections, dedicated pedestrian spaces, sidewalks buffered by street trees, trails through 12 acres of open space, existing trees saved, garages tucked down alleys, an all-porous street system – and the end result is a highly desirable neighborhood to live in, one that is safe for walkers and bicyclists, shaded and comfortable, beautiful to look at, easy for traffic to flow through and with ample parking. Best of all, not only are our streets functional, but they enhance the entire watershed, effectively managing stormwater while at the same time recharging the aquifer and significantly reducing our footprint on the environment."

When fully built-out, Pringle Creek will include a variety of housing types that match the design of project roads.

The project offers an example of an holistic approach to sustainability in a lower-density context than many other examples.

Pringle Creek's sustainability features are actively marketed by the developer, and may allow future observation of market response to this carefully designed low impact development.



Open space... but maybe not relevant to roads or road network?

Garrison Woods, Calgary, AB Contributor's Perspective

Most communities across Canada have design “standards” which are specified to be followed by developers operating in those communities. The end result has been that suburban development has become very “standardized”. There are often negative results of this standardization...An alternative approach to urban design is to ignore suburban standards, and to customize the design of all elements of the development to meet the requirements of each individual situation.

Image: Tony Druett, Canada Lands Company

From the Contributor, Tony Druett of Canada Lands Corporation:

Garrison Woods embodies a number of smart growth principles, from sensitive doubling of density in an inner-ring suburb to preservation of heritage trees in park strips, medians and private yards.

The project also illustrates of how a site's history can be celebrated and used to enhance the community identity of a contemporary infill project – in this case through emphasis on the military history of the property and of Canada as a whole.



Sustainable Streets: Moving Ahead

New design
techniques

Improved knowledge
base

New planning tools

80

New design techniques are the focus of the seminar series and of the case studies, so I am going to briefly address the other two topics.

Sustainable Streets

Emerging Priorities, Emerging Practice

Ellen Greenberg

egreenberg@ucdavis.edu

<http://stc.ucdavis.edu/outreach/ssp.php>

Photo: Marcy McInelly, SERA/Urbsworks

81

Top photo: Ellen Greenberg
Bottom photo: City of Portland

Photo credits: left: Sera-Urbsworks; right top: City of San Jose; right bottom: Ellen Vanderslice, Portland Dept of Transportation

An **opportunity** to transform the public rights of way in our cities and towns in order to create **Harmony** among

the **Goals of Community**,

the **Demands of Mobility**, and

the **Mandate for Environmental Stewardship**

Questions?



Ellen Greenberg

**Interested in Finding Out More? Check Out Our List of
Additional Resources!**

<http://www.clu-in.org/conf/tio/owgreens/resource.cfm>

**What Did You Think of This Webcast? Let Us Know
Your Thoughts...**

<http://www.clu-in.org/conf/tio/owgreens/feedback.cfm>