



Green Streets:

Combining LID with Street Infrastructure Past, Present, and Future

November 4, 2015

Kevin Robert Perry, ASLA

Urban Rain | Design

The Past

Green Street Pilot Projects



2003

Photo: Kevin Robert Perry, City of Portland

NE Siskiyou Green Street
Portland, Oregon



Photo: Kevin Robert Perry, City of Portland

NE Siskiyou Green Street

Portland, Oregon



Photo: Kevin Robert Perry, City of Portland

NE Siskiyou Green Street

Portland, Oregon



Photo: Kevin Robert Perry, City of Portland

NE Siskiyou Green Street

Portland, Oregon



Photo: Kevin Robert Perry, City of Portland

NE Siskiyou Green Street

Portland, Oregon

2004



Photo: Kevin Robert Perry, City of Portland

NE Fremont & 131st Green Street
Portland, Oregon



Photo: City of Portland Sustainable Stormwater Management Program

NE Fremont & 131st Green Street

Portland, Oregon



Photo: Kevin Robert Perry, City of Portland

NE Fremont & 131st Green Street

Portland, Oregon



2005

Photo: Kevin Robert Perry, City of Portland

SW 12th Avenue Green Street
Portland, Oregon



Photo: Kevin Robert Perry, City of Portland

SW 12th Avenue Green Street

Portland, Oregon



Photo: Kevin Robert Perry, City of Portland

SW 12th Avenue Green Street
Portland, Oregon



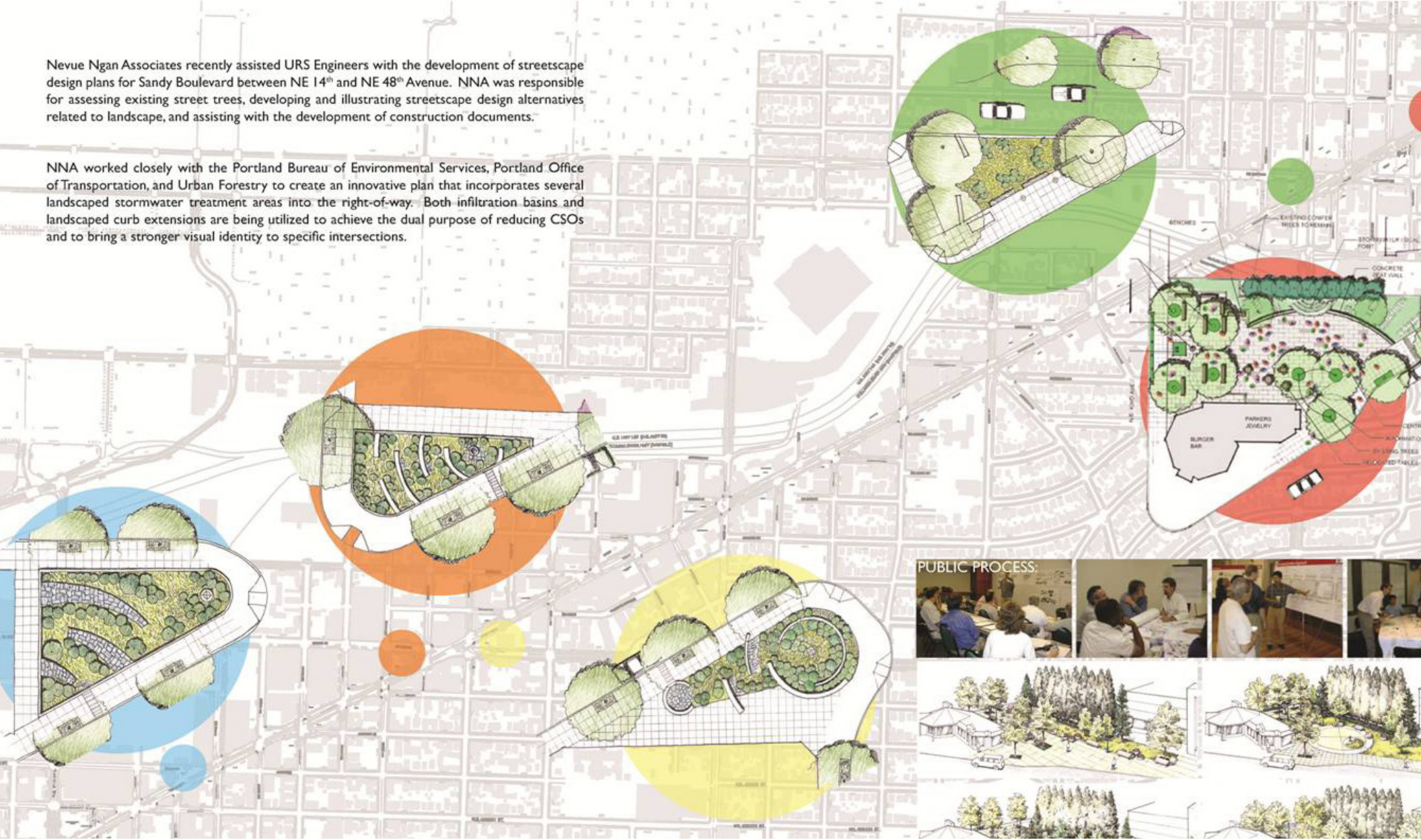
Photo: Kevin Robert Perry, City of Portland

SW 12th Avenue Green Street

Portland, Oregon

Nevue Ngan Associates recently assisted URS Engineers with the development of streetscape design plans for Sandy Boulevard between NE 14th and NE 48th Avenue. NNA was responsible for assessing existing street trees, developing and illustrating streetscape design alternatives related to landscape, and assisting with the development of construction documents.

NNA worked closely with the Portland Bureau of Environmental Services, Portland Office of Transportation, and Urban Forestry to create an innovative plan that incorporates several landscaped stormwater treatment areas into the right-of-way. Both infiltration basins and landscaped curb extensions are being utilized to achieve the dual purpose of reducing CSOs and to bring a stronger visual identity to specific intersections.



PUBLIC PROCESS:



Illustration: Nevue Ngan Associates

NE Sandy Boulevard Rain Gardens

Portland, Oregon



2006

Photo: Kevin Robert Perry, Nevue Ngan Associates

NE Sandy Boulevard Rain Gardens

Portland, Oregon



Photo: Kevin Robert Perry, Nevue Ngan Associates

NE Sandy Boulevard Rain Gardens

Portland, Oregon



Photo: Kevin Robert Perry, Nevue Ngan Associates

NE Sandy Boulevard Rain Gardens

Portland, Oregon



2006

Photo: Kevin Robert Perry, Nevue Ngan Associates

NE Sandy Boulevard Rain Gardens

Portland, Oregon



Photo: Kevin Robert Perry, Nevue Ngan Associates

NE Sandy Boulevard Rain Gardens

Portland, Oregon



2008

Photo: Kevin Robert Perry, Nevue Ngan Associates

San Bruno Stormwater Curb Extension

San Bruno, California



Photo: Kevin Robert Perry, Nevue Ngan Associates

San Bruno Stormwater Curb Extension

San Bruno, California



Photo: Kevin Robert Perry, Nevue Ngan Associates

Donnelly Avenue/Public Parking Lot

Burlingame, California



Photo: Kevin Robert Perry, ASLA

Donnelly Avenue/Public Parking Lot

Burlingame, California



Photo: Kevin Robert Perry, ASLA

Donnelly Avenue/Public Parking Lot

Burlingame, California



Photo: Kevin Robert Perry, ASLA

Donnelly Avenue/Public Parking Lot

Burlingame, California



Photo: Kevin Robert Perry, ASLA

Donnelly Avenue/Public Parking Lot

Burlingame, California



2011

Photo: Kevin Robert Perry, Nevue Ngan Associates

SE Clinton and 18th Green Street
Portland, Oregon



Photo: Kevin Robert Perry, Nevue Ngan Associates

SE Clinton and 18th Green Street

Portland, Oregon

Keys to Successful Green Street Pilot Projects:

1. Simple Design
2. Cost Effective
3. Prominent Location
4. Inspirational/Beautiful

The Present

Making Policy and Design Work Together



50+' of Impervious Area (IA)

Photo: Kevin Robert Perry, ASLA

Advocate for Efficient Site Design Policy
Reduction in Roadway Widths



Photo: Kevin Robert Perry, ASLA

Advocate for Efficient Site Design Policy

Reduction in Roadway Widths



Photo: Kevin Robert Perry, ASLA

Advocate for Efficient Site Design Policy

Reduction in Roadway Widths



←-----→
Wasted Space?

Photo: Kevin Robert Perry, ASLA

Advocate for Efficient Site Design Policy

Reduction in Roadway Widths



Photo: Kevin Robert Perry, ASLA

Advocate for Efficient Site Design Policy

Reduction in Roadway Widths



Photo: Kevin Robert Perry, ASLA

No more “Sending It To The Back Corner!”

Integration of Green Streets in New Construction



Photo: Kevin Robert Perry, ASLA

No more “Sending It To The Back Corner!”

Integration of Green Streets in New Construction



Photo: Kevin Robert Perry, ASLA

Integrated Green Streets: 40 years old!

Village Homes, Davis, CA



Photo: Kevin Robert Perry, ASLA

Integrated Green Streets: 40 years old!

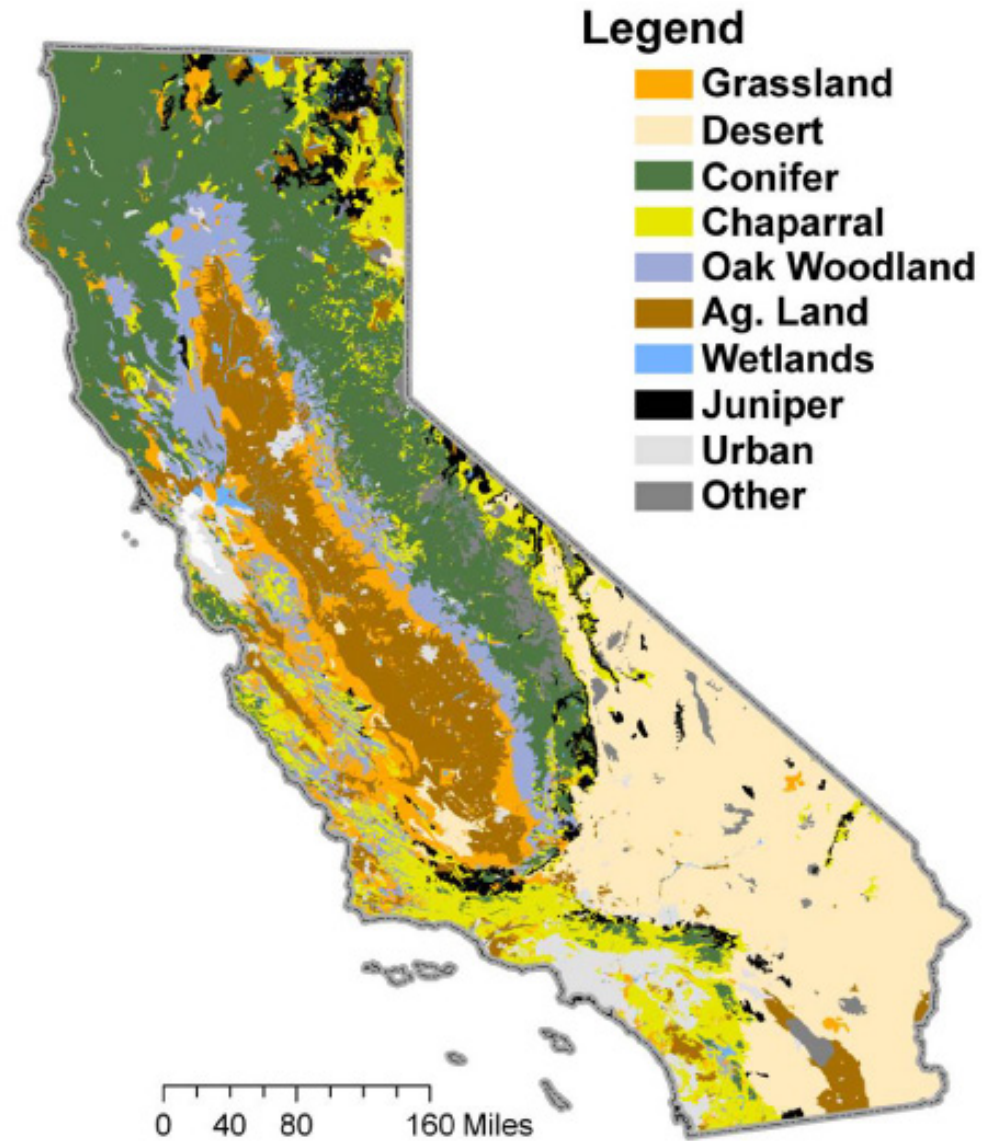
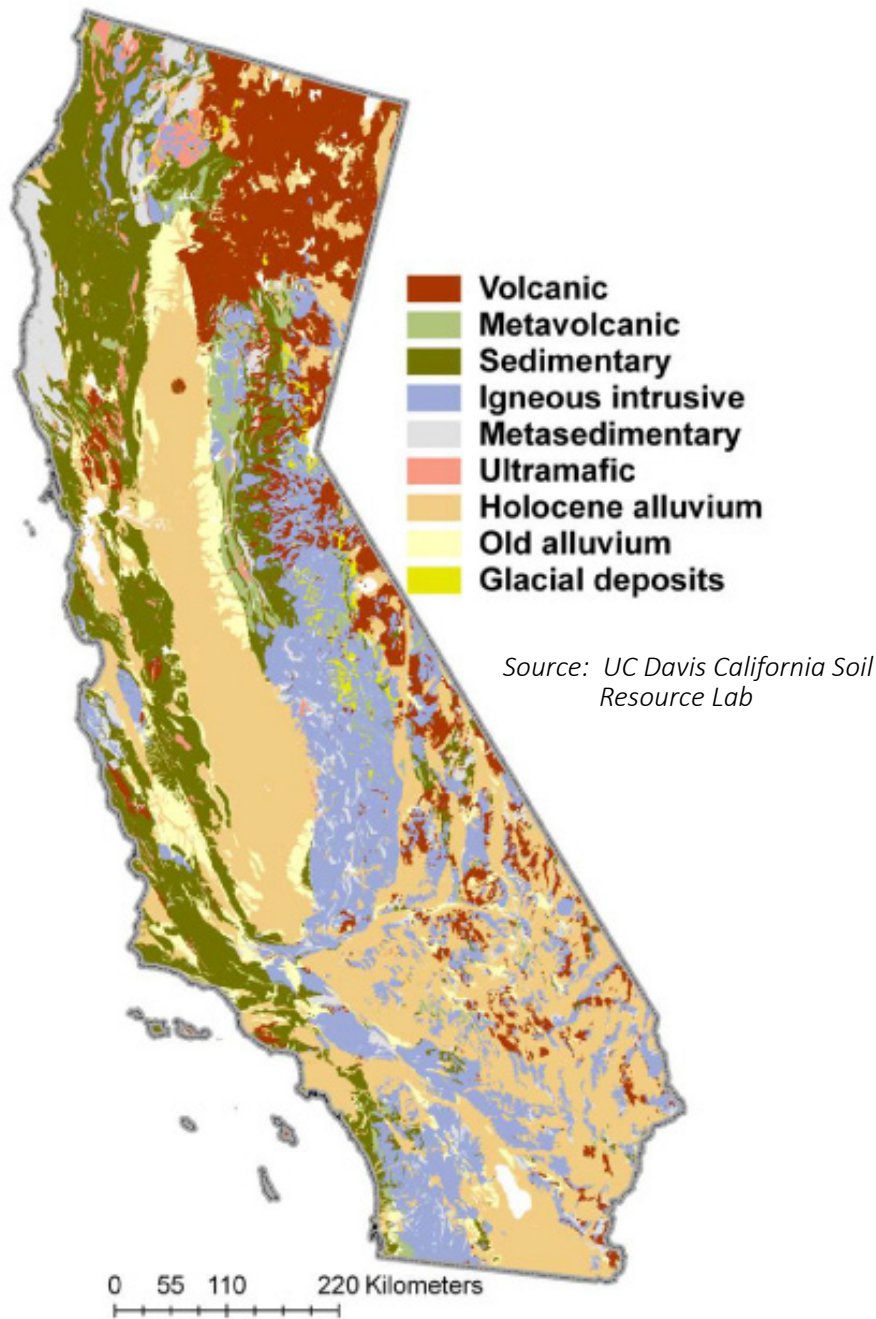
Village Homes, Davis, CA



Photo: Kevin Robert Perry, ASLA

Integrated Green Streets: 40 years old!

Village Homes, Davis, CA



Flexible Stormwater Goals for Site Conditions

A focus on “Landscaped Stormwater Approach”



Water Quality

Stormwater facilities, such as flow through planters and green gutters, filter and remove excess sediments and other pollutants from runoff. By allowing water to interact with plants and soil, water quality improvements are achieved through a variety of natural physical and chemical processes. Even if soils are not conducive to infiltration, water quality is still enhanced through pollutant settling, absorption into the soil, and uptake by plants.



Flow-Reduction

Stormwater facilities, both infiltrative and flow-through, slow the velocity of runoff by detaining stormwater in the landscape. Flow rate reduction can often be achieved by integrating design strategies (such as pervious paving, planter boxes, swales, and rain gardens) that provide stormwater detention. Conveying runoff through a system of naturalized surface features mimics the natural hydrological cycle and minimizes the need for underground drainage infrastructure.



Volume-Reduction

Infiltration stormwater facilities provide the greatest stormwater management benefit by achieving water quality and flow-reduction but also collect and absorb stormwater to reduce the overall volume of runoff. Retention facilities offer long-term stormwater collection and storage for reuse or groundwater recharge. Plants contribute to retention capacity by intercepting rainfall, taking up water from the soil, and assisting infiltration by maintaining soil porosity.

Poor Soils (Class C & D)

Good Soils (Class A & B)

Flexible Stormwater Goals for Site Conditions

A focus on “Landscaped Stormwater Approach”



Photo: Kevin Robert Perry, ASLA

Lessons Learned from Standard Details

Overbuilt and Completely Out of Context



Photo: Kevin Robert Perry, ASLA

Lessons Learned from Standard Details

Overbuilt and Completely Out of Context

2015



Photo: Kevin Robert Perry, ASLA

Simple Green Street Retrofit

Cost Effective UC Davis Student Built Project



Photo: Kevin Robert Perry, ASLA

Simple Green Street Retrofit

Cost Effective UC Davis Student Built Project



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2015



Photo: Kevin Robert Perry, ASLA

Simple Green Street Retrofit

Russell Boulevard (In front of Davis City Hall)



Photo: Kevin Robert Perry, ASLA

Simple Green Street Retrofit

Russell Boulevard (In front of Davis City Hall)

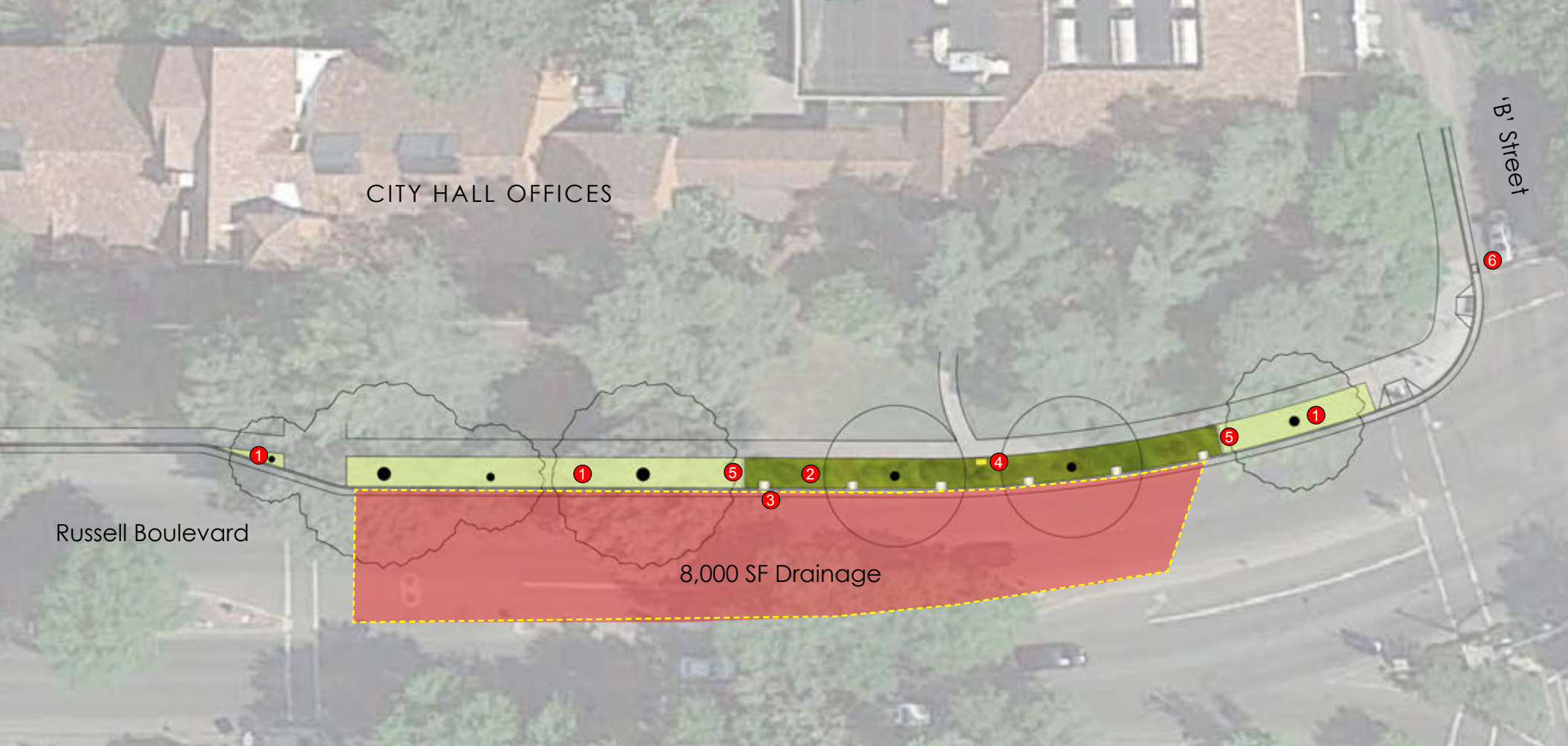
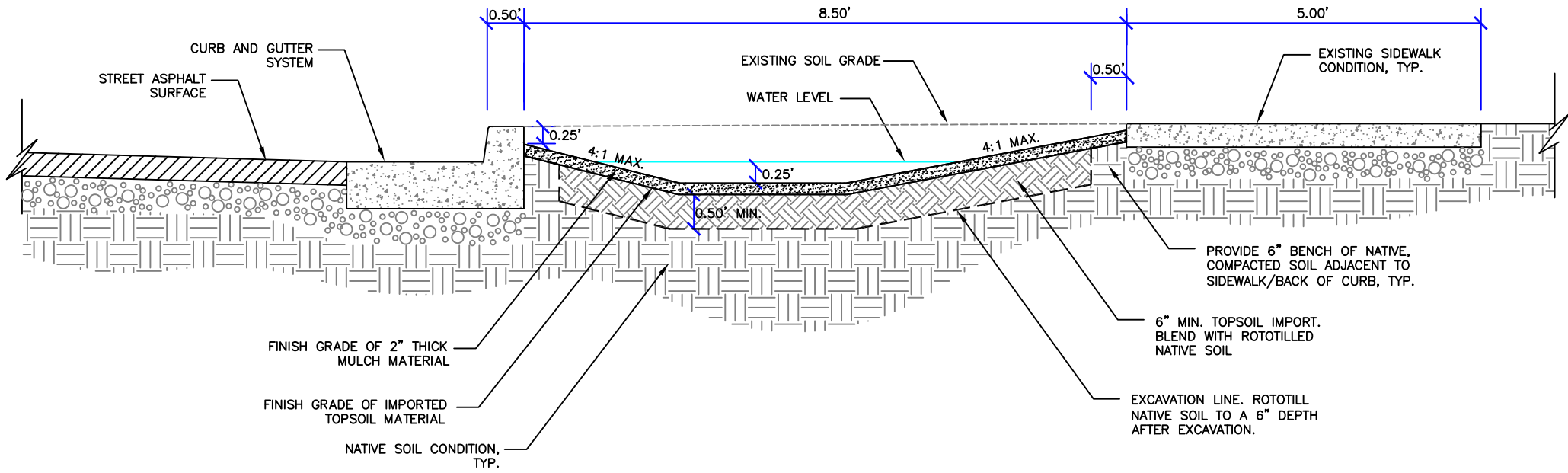


Photo: Kevin Robert Perry, ASLA

Simple Green Street Retrofit

Russell Boulevard (In front of Davis City Hall)



Simple Green Street Retrofit

Russell Boulevard (In front of Davis City Hall)

Keys to Successful Green Street Policy:

1. Advocate for Efficient Street Design
2. Provide Flexible Stormwater Goals
3. Adjust Standard Details, Repeat
4. Encourage Simple Retrofits

The Future

Widespread “Level 4” Green Streets

“Multiple Shades of Green”

Level 1

Maximize landscaped areas along the street and minimize overall impervious area.



Level 2

Significant tree canopy is added to the urban streetscape.



Level 3

Stormwater runoff is fully managed from the street, sidewalk, and driveway areas within a landscaped system. Design solutions are park-like, provide direct environmental benefits, and are aesthetically pleasing.



Level 4

Green street provides a direct focus on alternative modes of transportation including mass transit, biking, and walking.



Level 5

The building, site, and street frontage become one integrated space for stormwater management. The entire green street “envelope” manages both public and private runoff.





Photo: Kevin Robert Perry

Level 1- Maximize Landscape Space
Multiple Shades of Green



Photo: Kevin Robert Perry

Level 1- Maximize Landscape Space
Multiple Shades of Green



Photo: Ben Ngan

Level 2- Add Significant Street Tree Canopy **Multiple Shades of Green**



Photo: Kevin Robert Perry

Level 2- Add Significant Street Tree Canopy **Multiple Shades of Green**



Photo: Kevin Robert Perry

Level 2- Add Significant Street Tree Canopy **Multiple Shades of Green**



Photo: Kevin Robert Perry

Level 3- Landscape Actively Manages Water **Multiple Shades of Green**



Photo: Kevin Robert Perry

Level 3- Landscape Actively Manages Water **Multiple Shades of Green**



Photo: Kevin Robert Perry

Level 4- Focus on Alternative Transportation
Multiple Shades of Green



Photo: Kevin Robert Perry

Level 4- Focus on Alternative Transportation

Multiple Shades of Green



Photo: Kevin Robert Perry

Level 4- Focus on Alternative Transportation

Multiple Shades of Green



Photo: Nevue Ngan Associates/Kevin Robert Perry

Level 4- Focus on Alternative Transportation

Multiple Shades of Green



Before

Photo: Kevin Robert Perry, ASLA

Level 4- Focus on Alternative Transportation

Multiple Shades of Green



Illustration: Kevin Robert Perry/Jason Hirst, Nevue Ngan Associates

Level 4- Focus on Alternative Transportation

Multiple Shades of Green



Before

Photo: Kevin Robert Perry, ASLA

Level 4- Focus on Alternative Transportation

Multiple Shades of Green



Illustration: Kevin Robert Perry/Ray Papa

Level 4- Focus on Alternative Transportation

Multiple Shades of Green

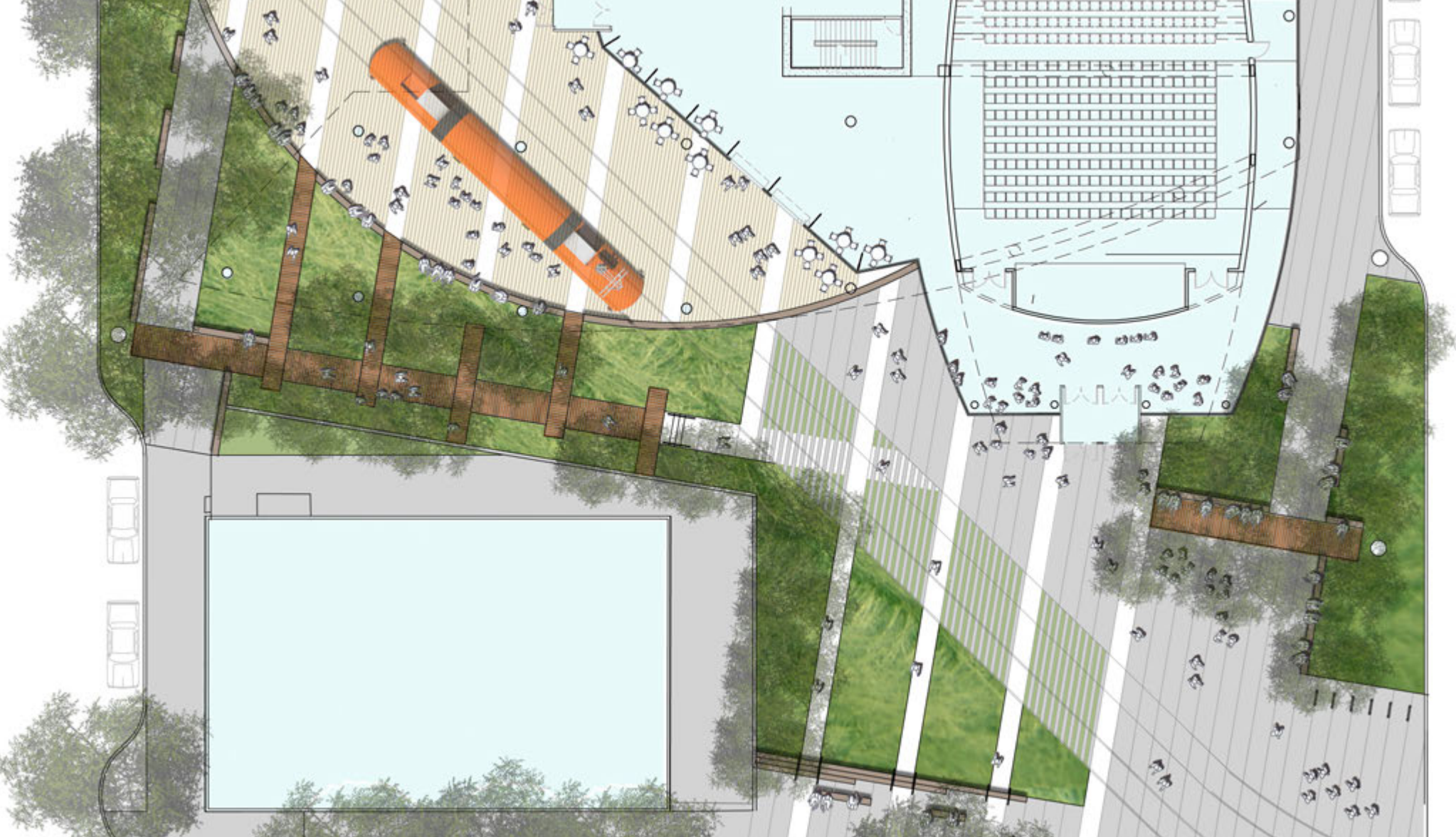


Image: Nevue Ngan Associates/Kevin Robert Perry

Level 5- Integrate the Building, Site, and Street

Multiple Shades of Green



Image: Nevue Ngan Associates/Kevin Robert Perry

Level 5- Integrate the Building, Site, and Street

Multiple Shades of Green



Image: Google Earth

Level 5- Integrate the Building, Site, and Street
Multiple Shades of Green

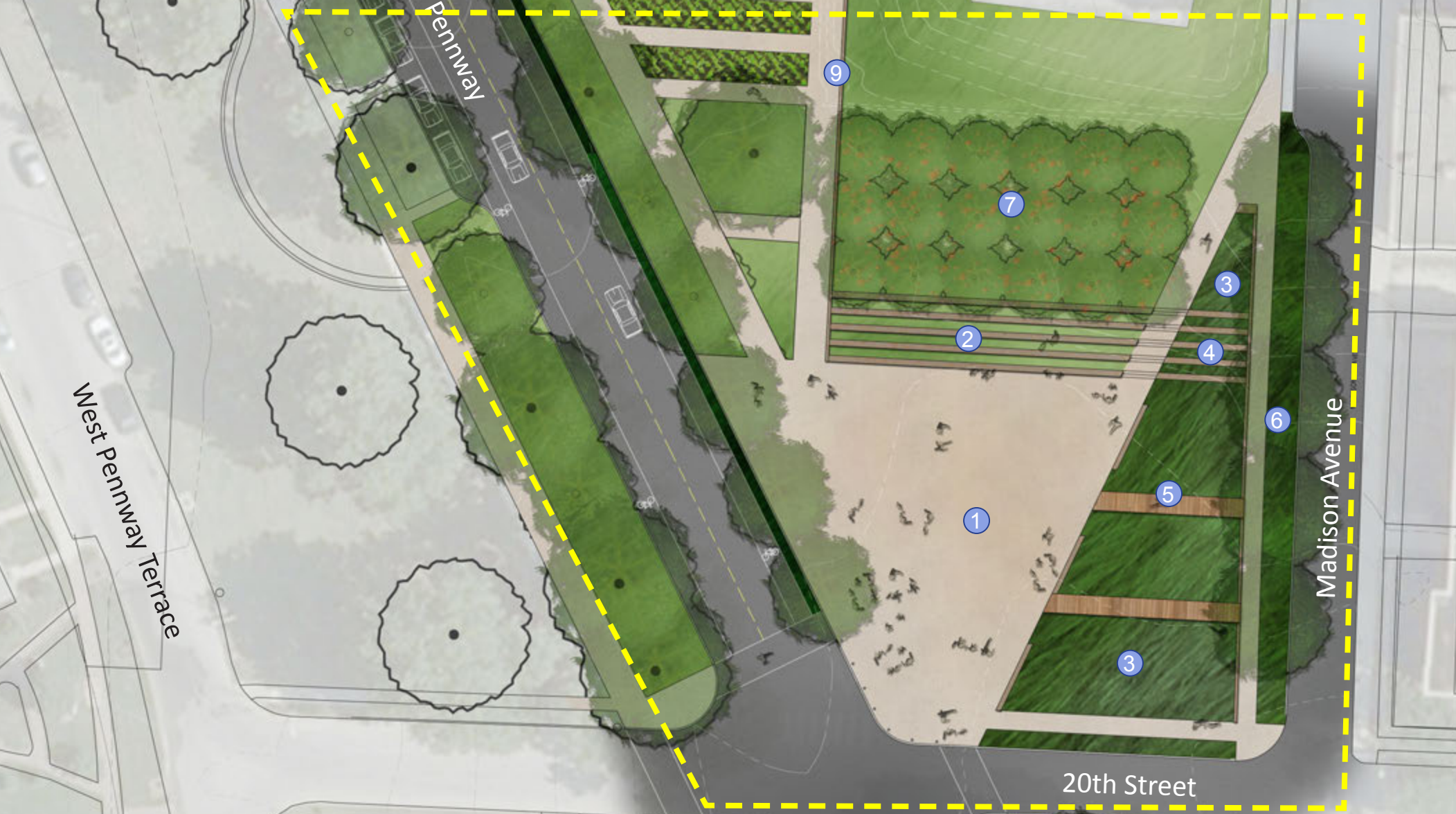


Image: Nevue Ngan Associates/Kevin Robert Perry

Level 5- Integrate the Building, Site, and Street

Multiple Shades of Green



Illustration: Kevin Robert Perry/Ray Papa

Level 5- Integrate the Building, Site, and Street **Multiple Shades of Green**



Illustration: Kevin Robert Perry/Ray Papa

Level 5- Integrate the Building, Site, and Street **Multiple Shades of Green**



Phase 3 Full Build-Out Scenario: Site and Stormwater Improvements

Scale: 1"=30'
February 2014



Urban Rain Design

The Office of Kevin Robert Perry, ASLA

- 1 Stormwater curb extensions with new trees, shrubs, and groundcovers captures stormwater runoff.
- 2 Stormwater curb extensions captures stormwater runoff but in order to protect the existing tree(s), the existing curb remains and the grade is only altered between the new curb location and existing curb. The landscape under the new tree is switched from lawn to shrubs and groundcovers.
- 3 New conventional curb extensions do not accept stormwater but are planted with trees, shrubs, and groundcovers.
- 4 Brick pavers at cross walk zones help demarcate pedestrian zones.
- 5 Brick pavers at sidewalk strips.
- 10 College Street is re-paved with colored concrete and is striped with bike sharrows.
- 11 Private parking lot is re-configured with 9'x16' parking stalls and a 24' wide parking aisle.
- 12 A new rain garden accepts stormwater runoff from parking lot and potentially adjacent building rooftops.
- 13 Existing private sign is preserved.
- 14 Sidewalk zone at intersection is expanded to allow for better pedestrian movement at bus stop location.
- 15 A 2' wide trench drains allows stormwater to flow from the Pine Street stormwater curb extension into the College Street stormwater curb extension.
- 16 A shallow, 2' wide green gutter is placed at the existing street curb to collect stormwater runoff from Bank Street.
- 20 Three small rain gardens placed between existing street trees help manage addition stormwater runoff from the green gutter.
- 21 Existing lawn areas are replaced with new shrubs and groundcovers.
- 22 Existing lawn areas are replaced with new shrubs and groundcovers. Brick paver walkways are installed to accommodate pedestrians traveling from the sidewalk zone to the parking zone.
- 23 New stormwater planter accepts runoff from private yards.
- 28 Walkway allows for building maintenance to occur.
- 29 New shrubs and groundcovers along building wall.
- 30 New rock energy dissipation strips are placed along alley walkways to control flow and erosion.
- 31 New 3' high, above-grade stormwater planters are placed on parking structure deck to accept stormwater from upper roof areas.
- 32 Existing landscape median is re-graded to daylight piped stormwater runoff from parking structure. Median is replanted with shrubs and groundcovers.
- 33 Private parking lot is re-configured with 9'x16' parking stalls and a 22' wide parking aisle.
- 37 New 5' wide stormwater planters planted with shrubs and groundcovers accept stormwater runoff from Battery Street.
- 38 A 3' wide trench drain allows for stormwater to flow from the College Street north stormwater curb extension to the south stormwater curb extension.
- 39 8' wide boardwalks allow pedestrians to cross over rain garden landscape and allows water to move between landscape spaces.
- 40 Large rain gardens with new plaza space accepts surface runoff from College Street and also daylights piped stormwater from the upstream stormwater system.
- 41 Snow storage area at upper plaza section.

Widespread and Interconnected Green Streets

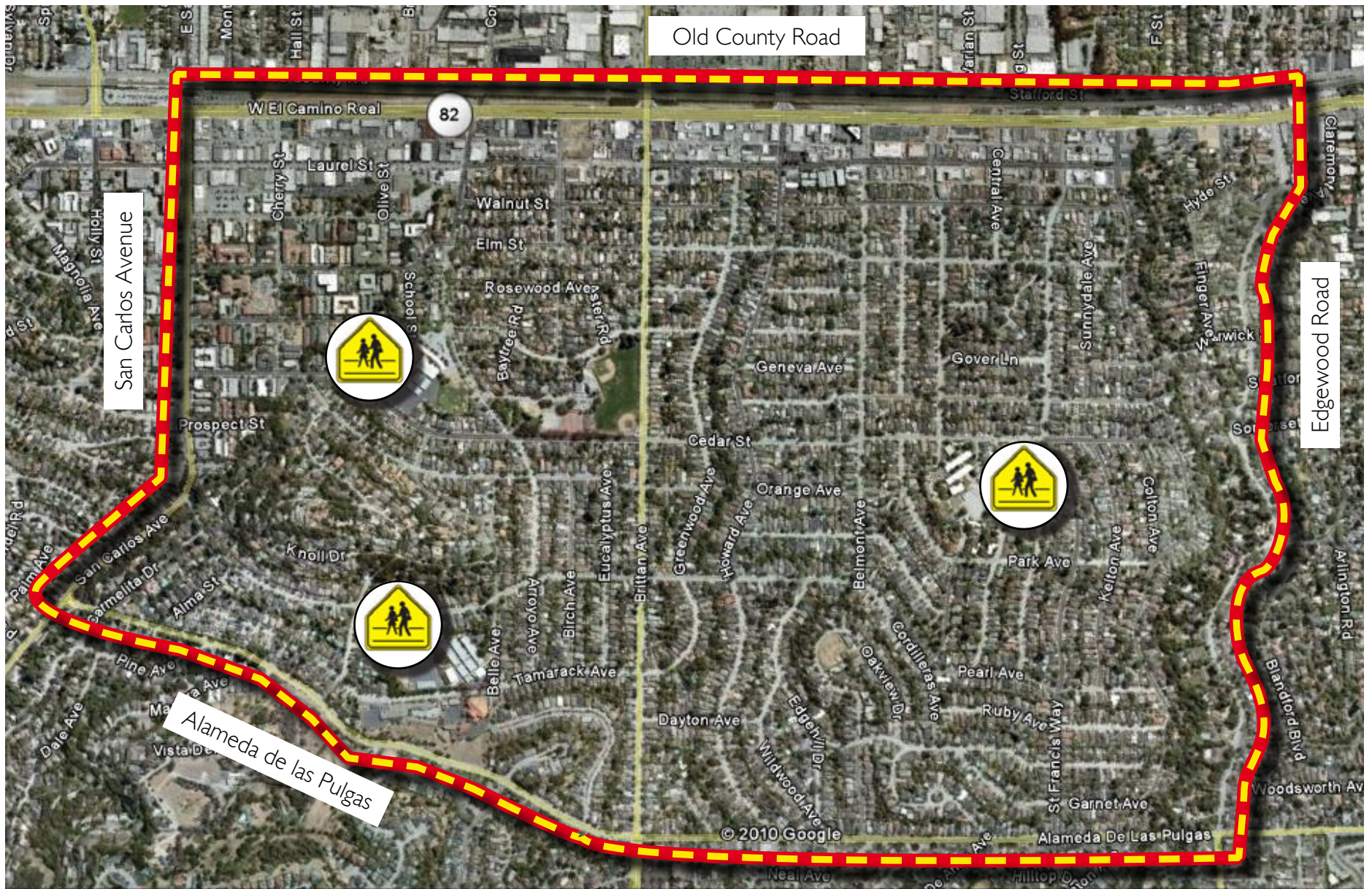


Illustration: Nevue Ngan Associates

Widespread and Interconnected Green Streets

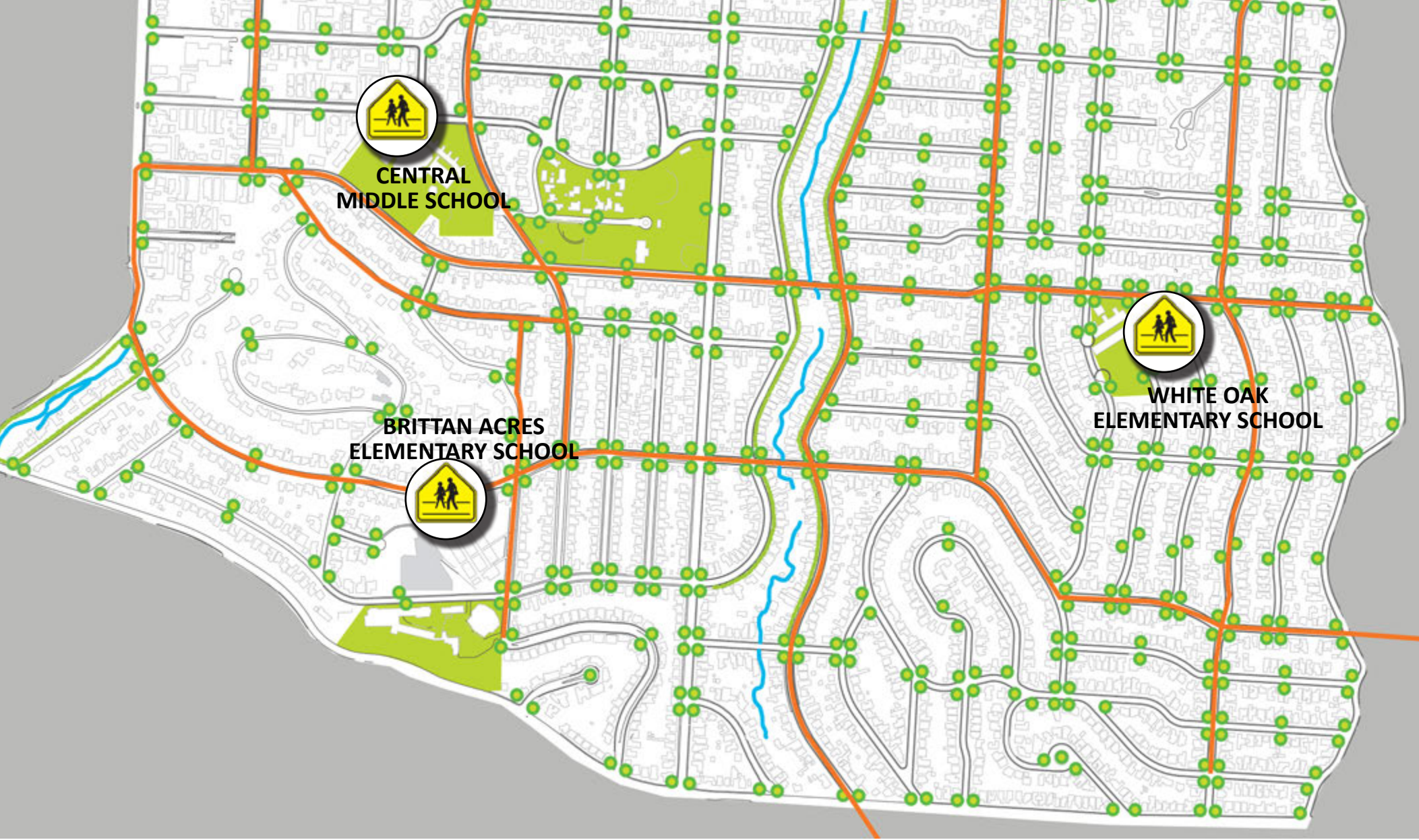


Illustration: Nevue Ngan Associates

Widespread and Interconnected Green Streets



Photo: www.parknpool.com

“Green Routes To School”



Urban Rain | Design

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