
Cultivating Green Infrastructure
Growing a Resilent Phoenix



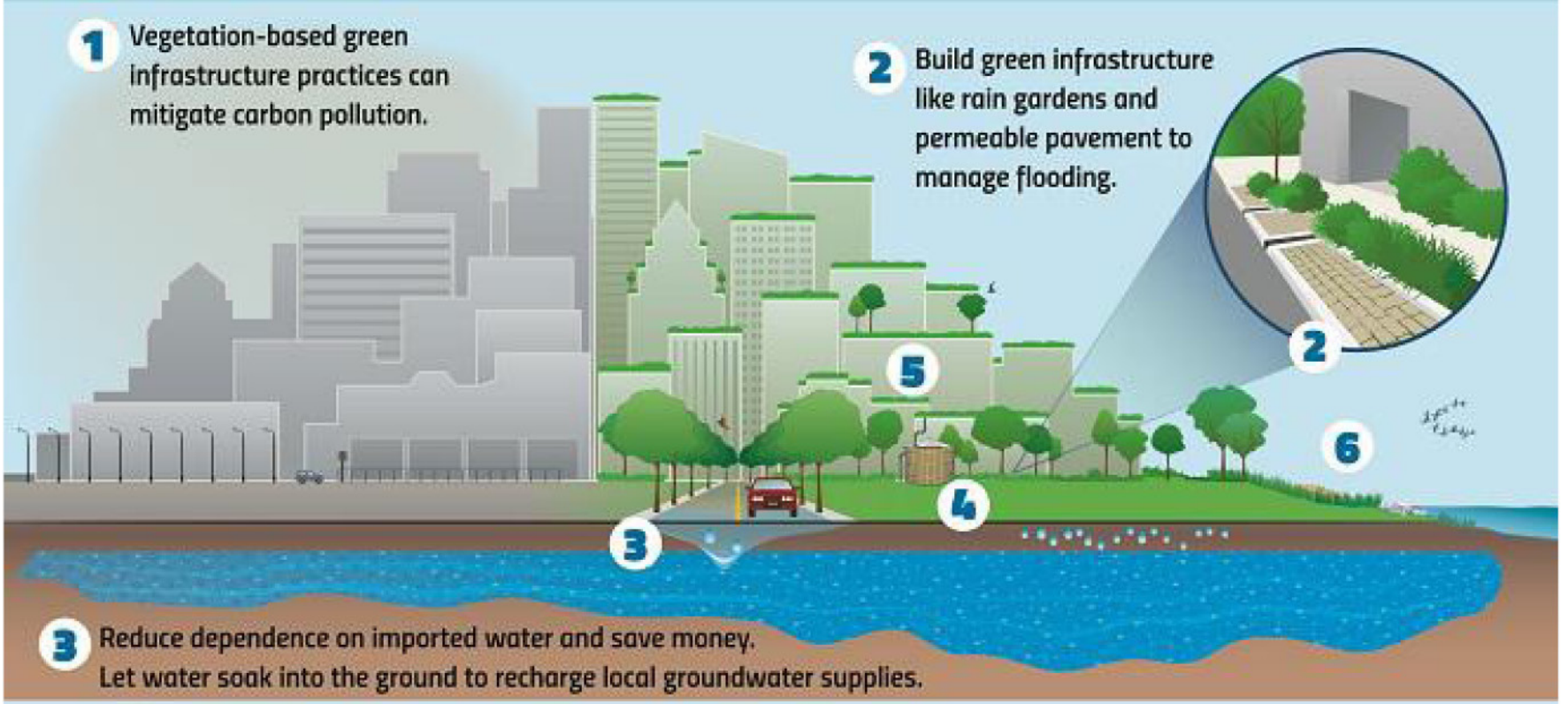




Green Infrastructure

A network of living spaces that range from a large mountain preserves to a small rain gardens. These network of spaces play a critical role in the health and wellbeing of a city. These green spaces provide a framework for the growth of a healthy, livable and prosperous city.

Green Infrastructure Builds Resiliency



3 Reduce dependence on imported water and save money.
Let water soak into the ground to recharge local groundwater supplies.

4 Keep water local. Capture runoff in cisterns and rain barrels to reduce municipal water use.

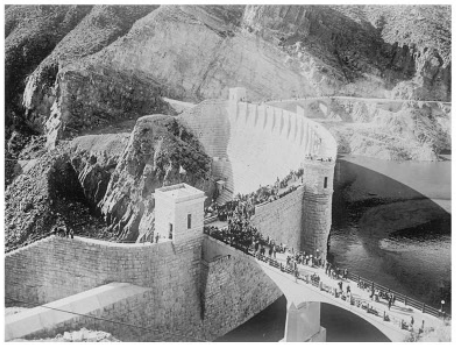
5 Plant trees and green roofs to mitigate the urban heat island effect.

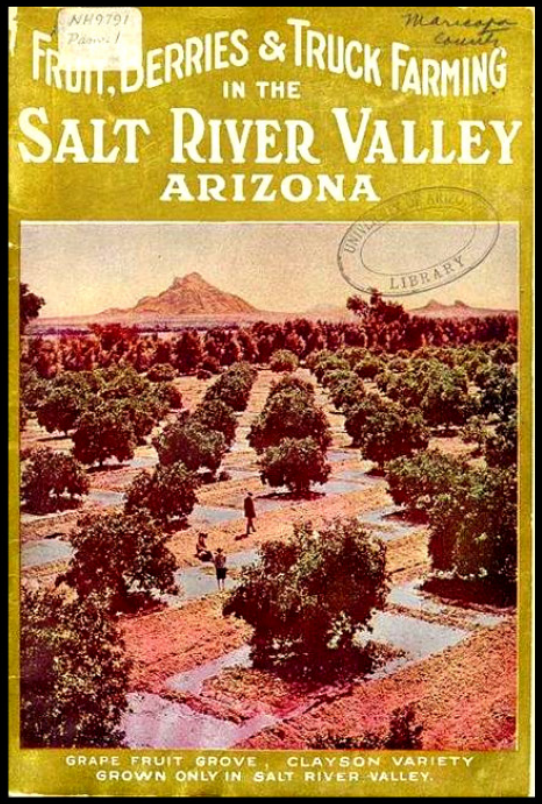
6 Use living shorelines, buffers, dunes and marsh restoration to reduce the impact of storm surges.

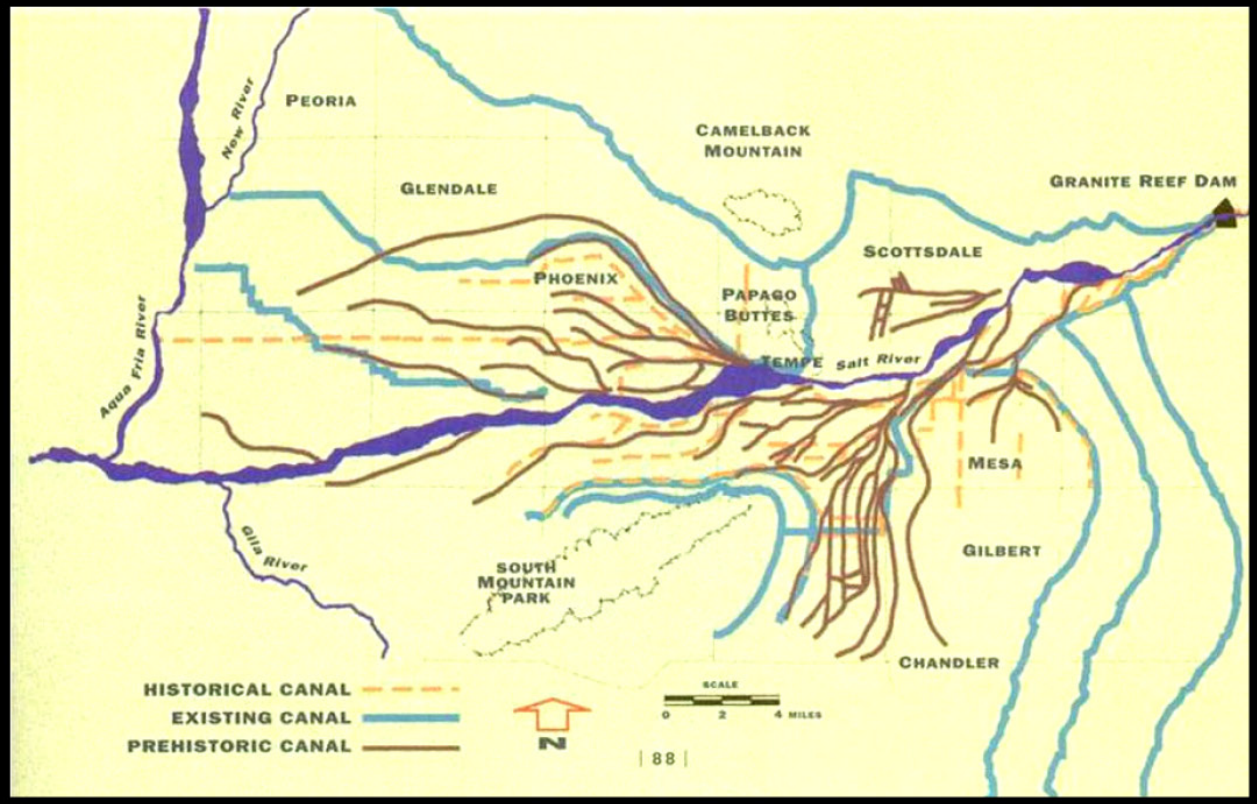
The Value of an Urban Tree

Fraxinus velutina 'Bonita', Bonita Ash	6" caliper | 30" caliper
Intercepted Stormwater	235 gallons | 1,833 gallons
Increased Property Value	$23 | $85
Conserved Energy	50 kilowatts | 320 kilowatts
Total Annual Benefits	$33 | $163


Learning from Nature







Phoenix, AZ
The City of Gardens & Trees

In 1902 the National Reclamation Act was signed and the rivers were damned. The City of Gardens and Trees was born. Phoenix became a place where canals and massive trees lined the streets.

T1 - Natural

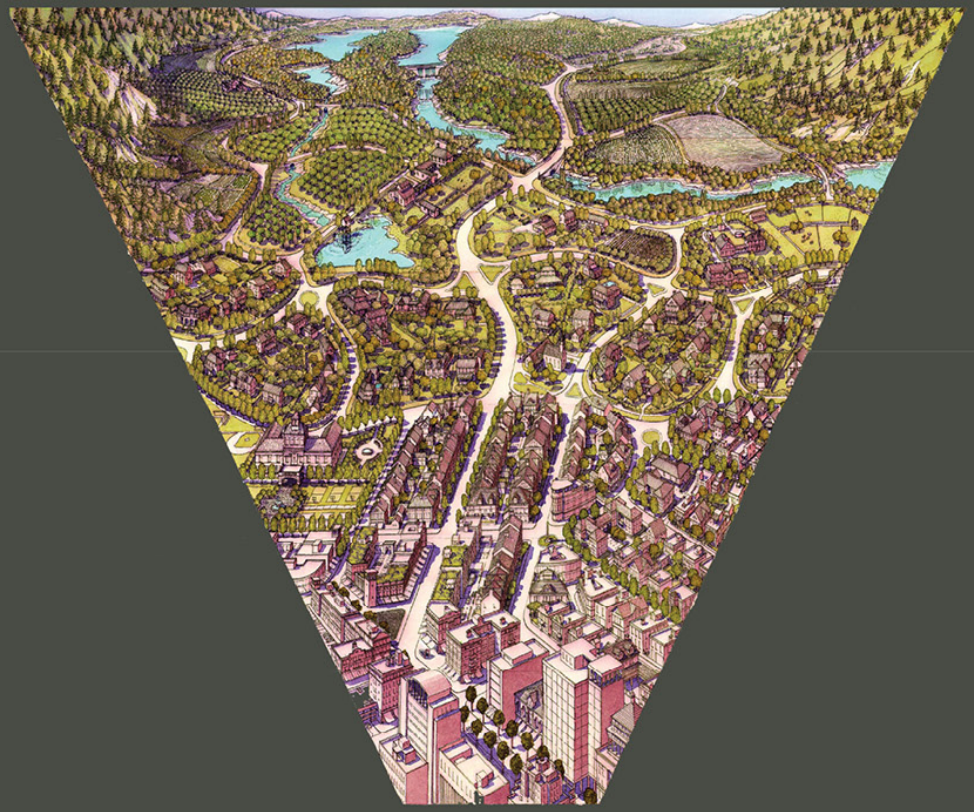
T2 - Rural

T3 - Suburban

T4 - General Urban

T5 - Town Center

T6 - Urban Core



DPZ

Ecological - T1

Agriculture - T2

Idyllic Woods - T3

Walkable Streets - T4

Shade and Artistry - T5

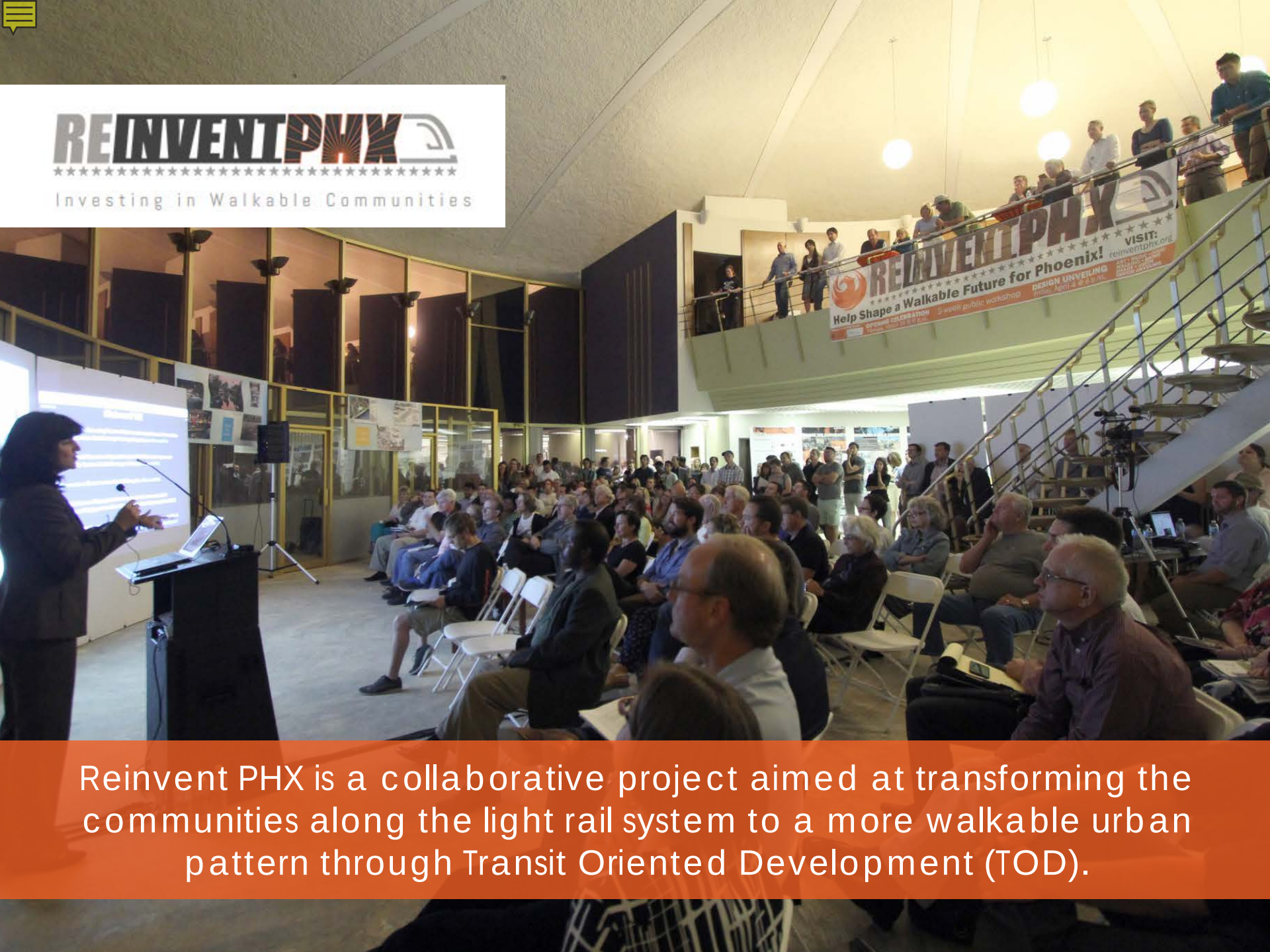
Human Delight - T6

Rural to Urban Transect

Urban Design tool that recognizes the variations in human habitat. This organizational system allows cities to develop regulations and standards that reflect the differences in human habitat.

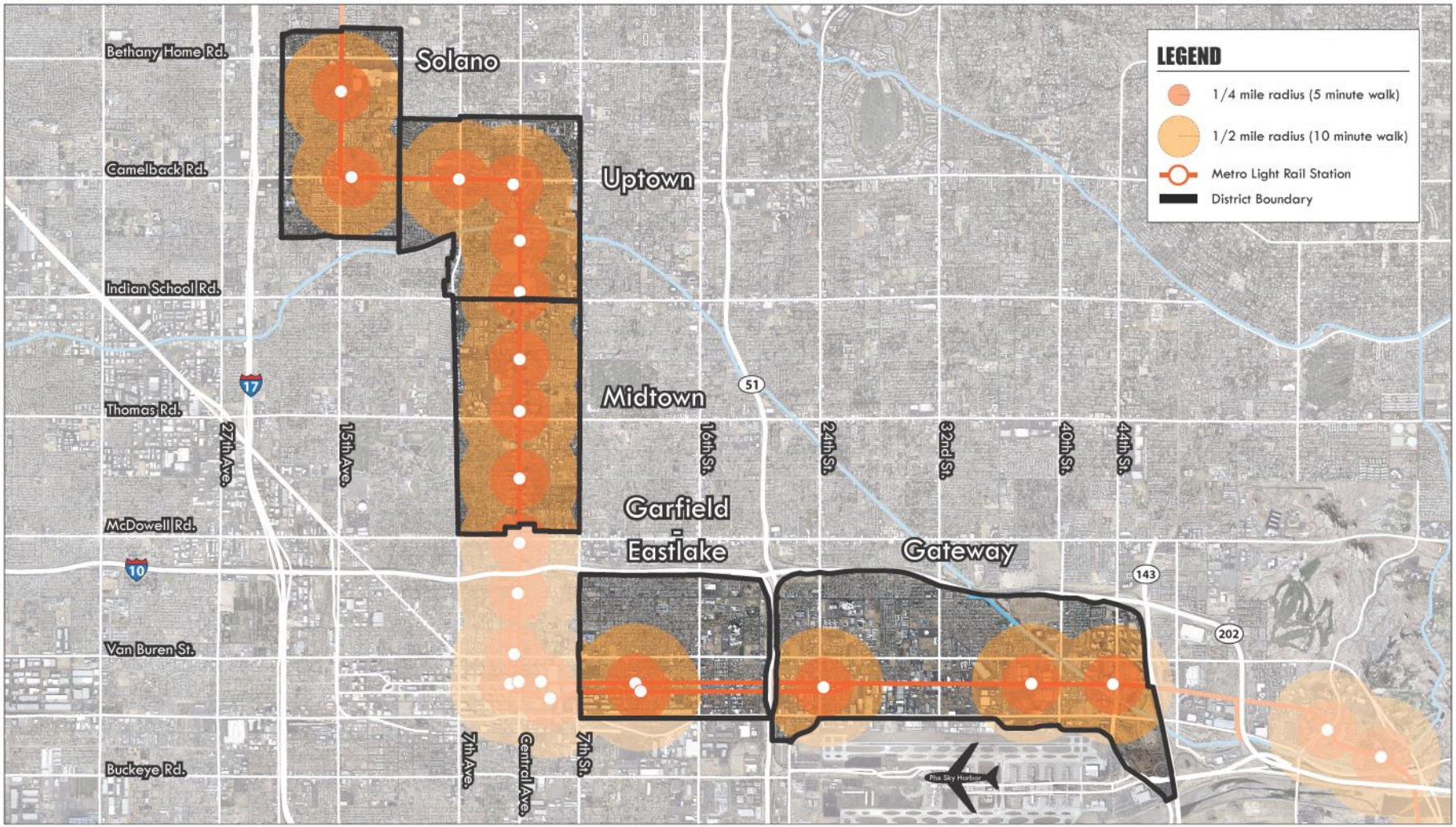
REINVENTPHX

TOD District Planning Program



Reinvent PHX is a collaborative project aimed at transforming the communities along the light rail system to a more walkable urban pattern through Transit Oriented Development (TOD).

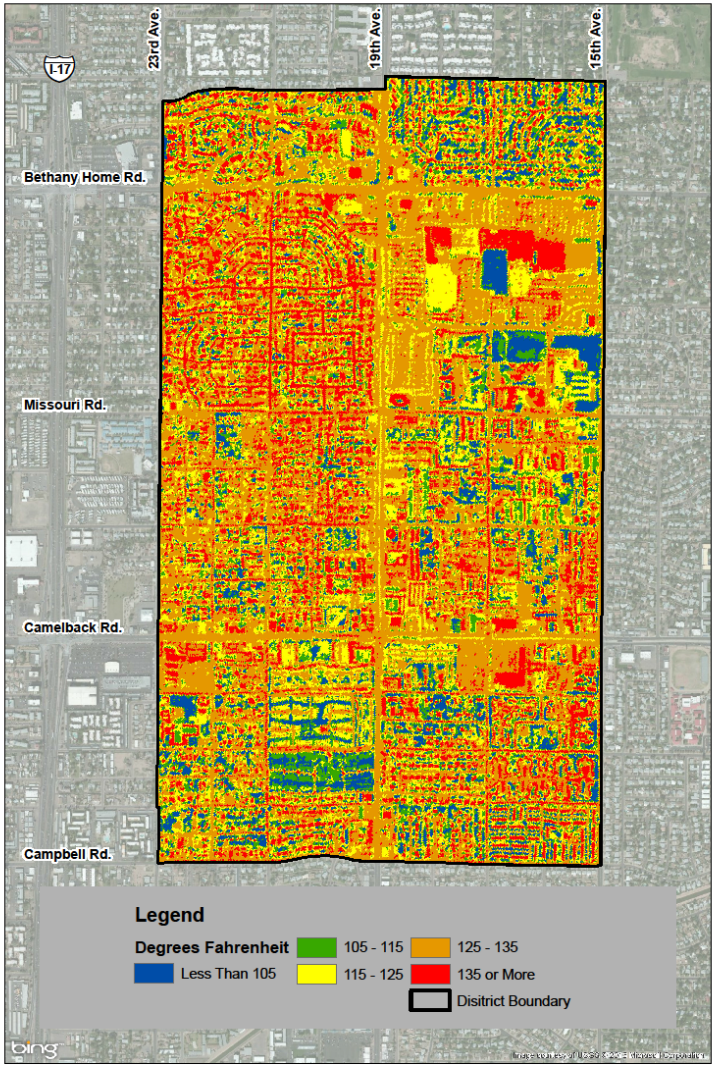
Phoenix TOD Districts



ReinventPHX
Project Map

0 2,000 4,000 8,000 Feet

Solano – Temperature

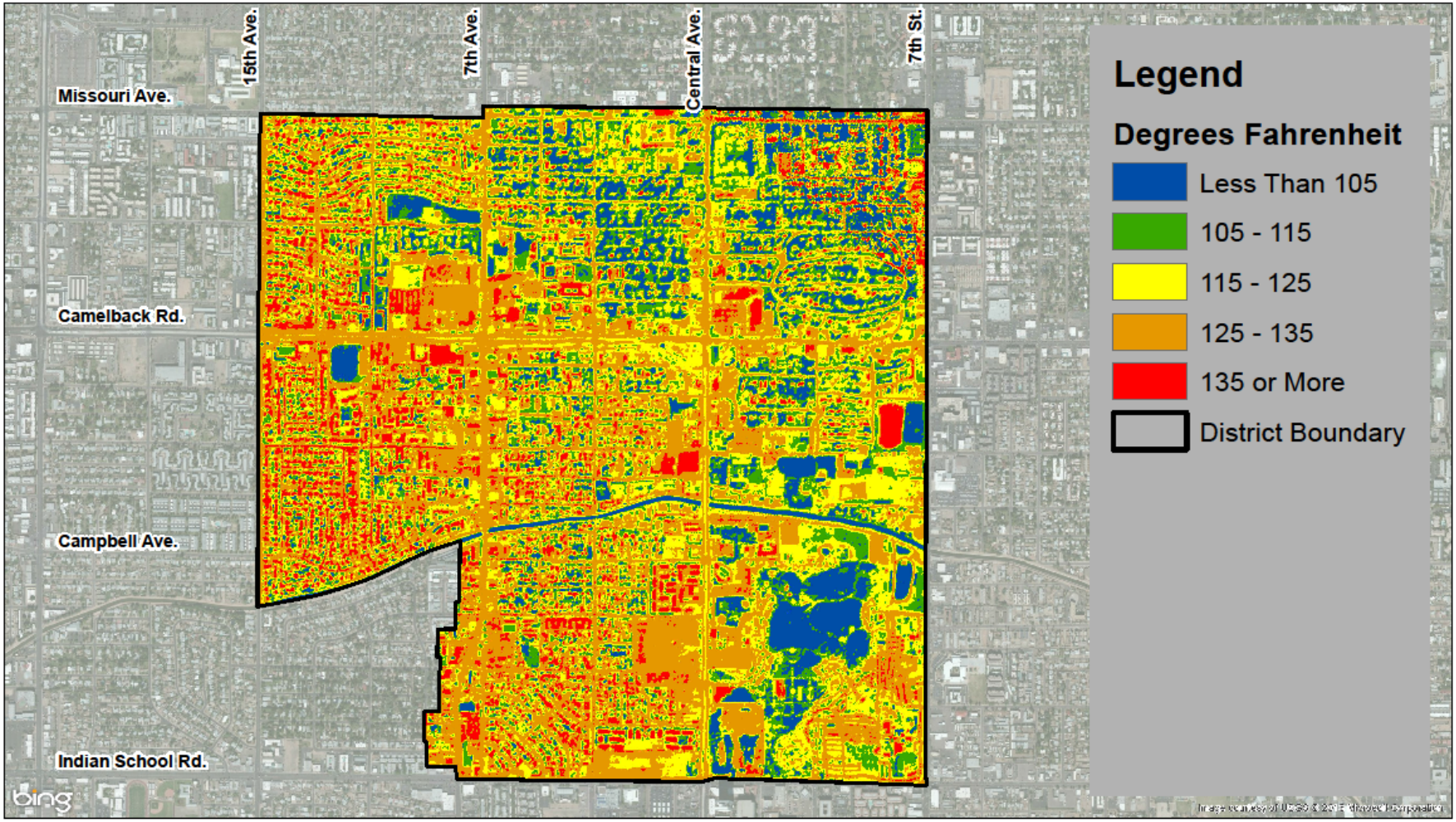


N W E S 2013

Reinvent PHX
Solano District
July 2012 Temperature

0 0.5 Miles
1 inch = 833 feet

Uptown – Temperature



N
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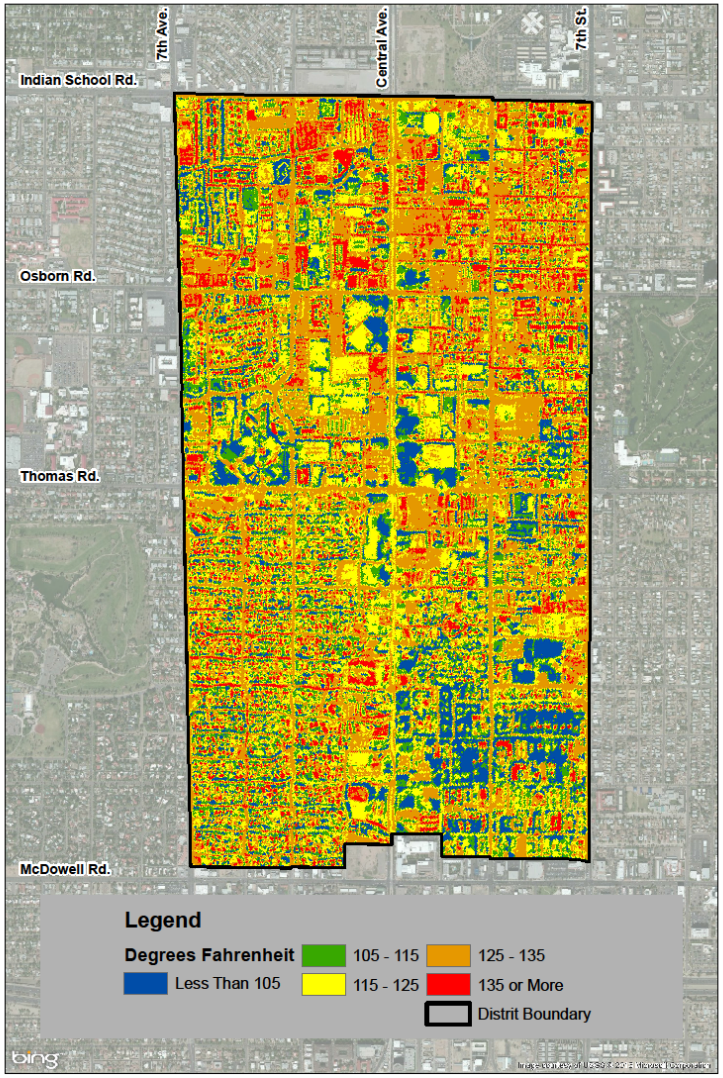
2013

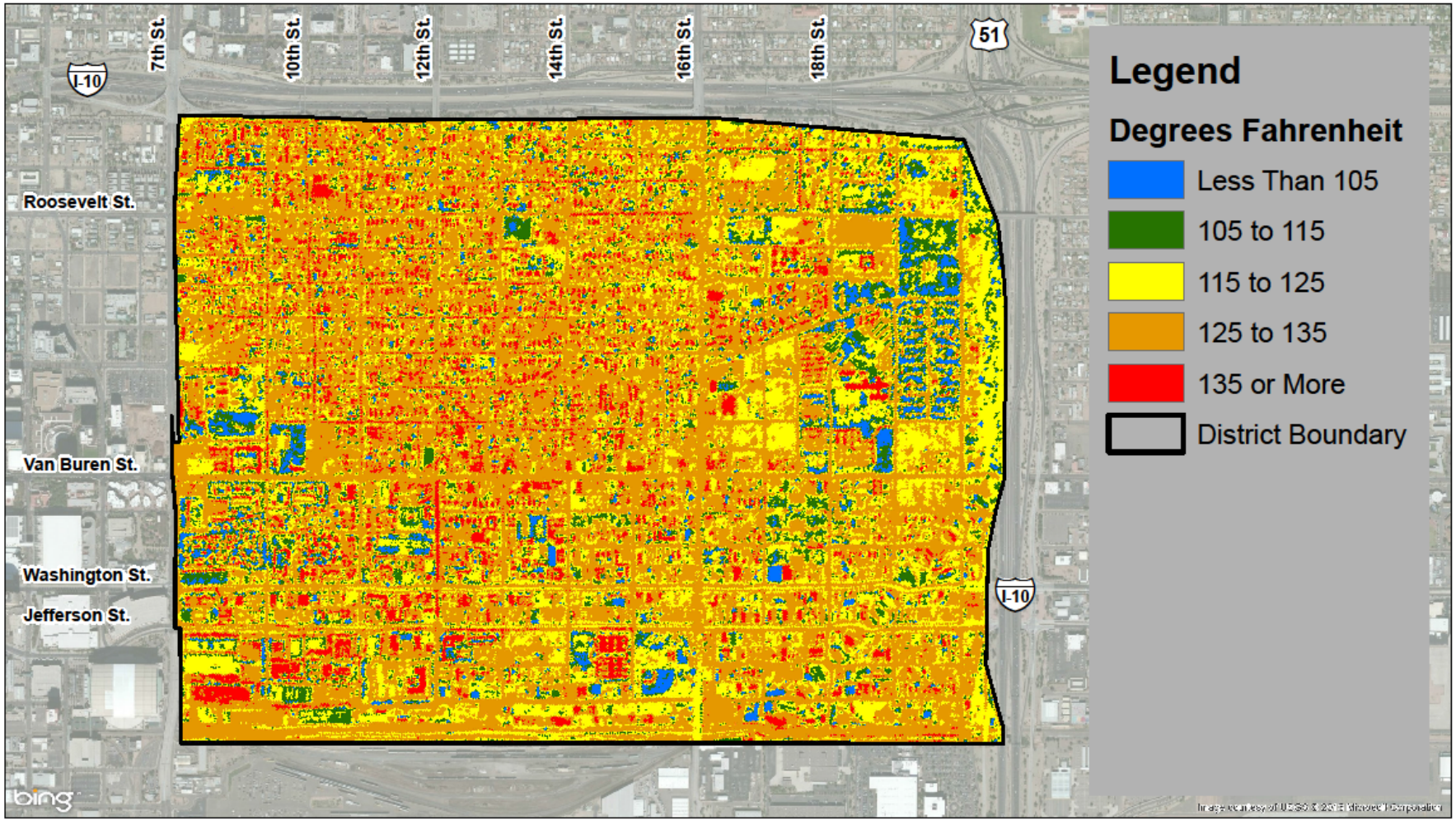
Reinvent PHX
Uptown District
July 2012 Temperature

0 0.5 Miles
1 inch = 1,083 feet

Midtown – Temperature



Eastlake-Garfield – Temperature



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2013

Reinvent PHX

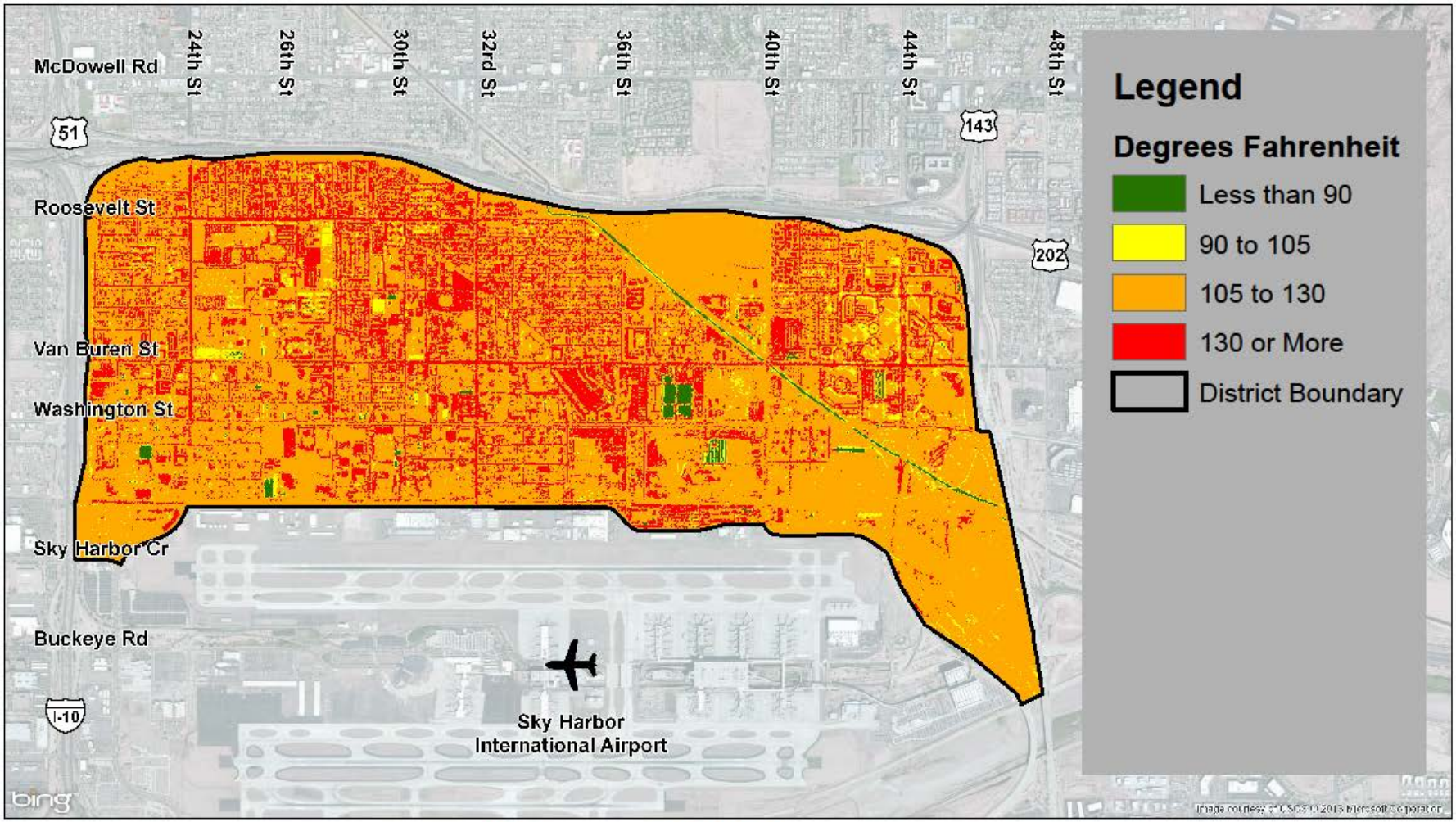
Eastlake - Garfield District

July 2012 Temperature

0 0.5 Miles

1 inch = 917 feet

Gateway – Temperature



N
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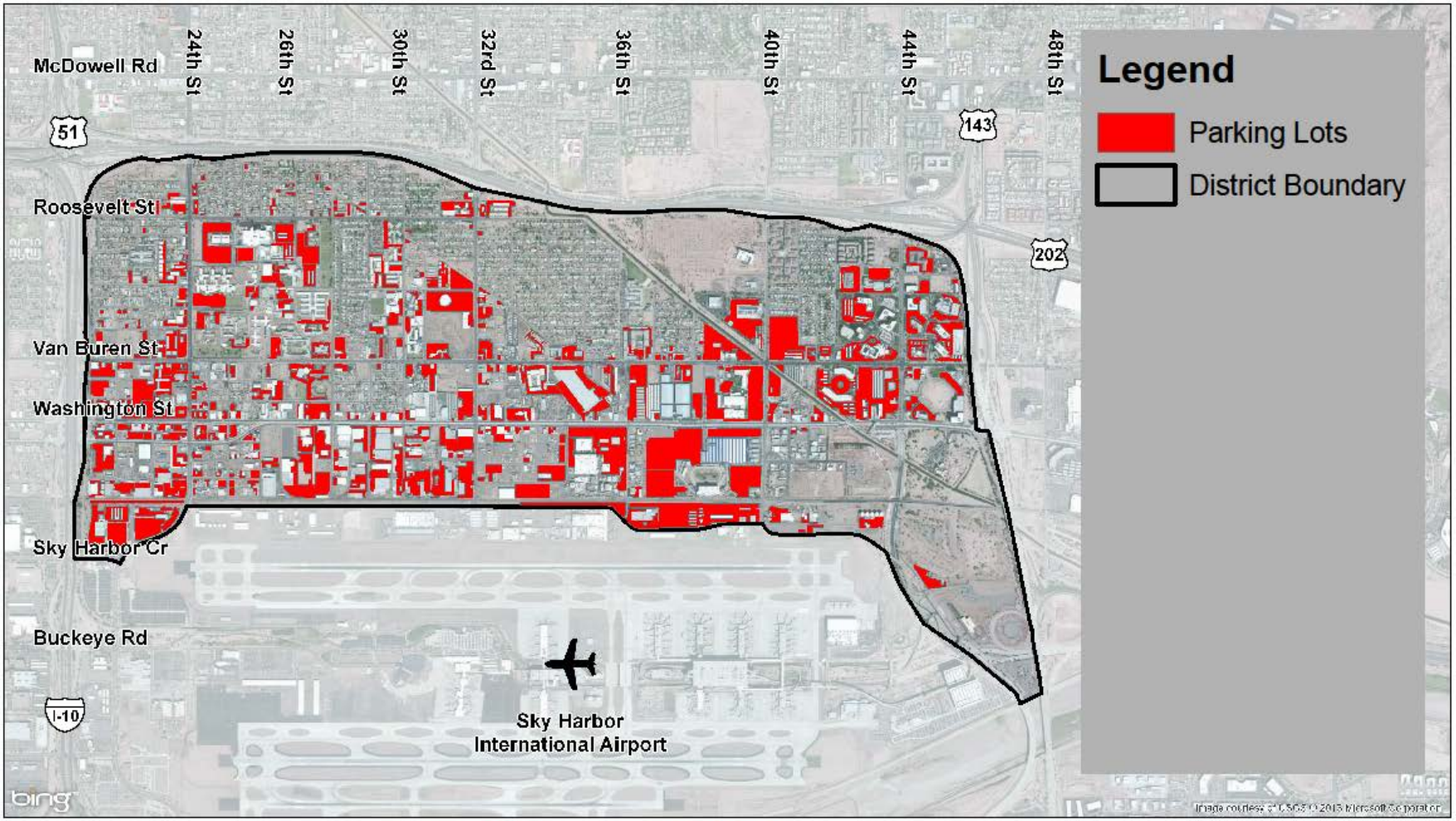
2013

Reinvent PHX
Gateway District
July 2012 Temperature

0 1 Miles
1 inch = 1,667 feet

Gateway – Parking Lots



N
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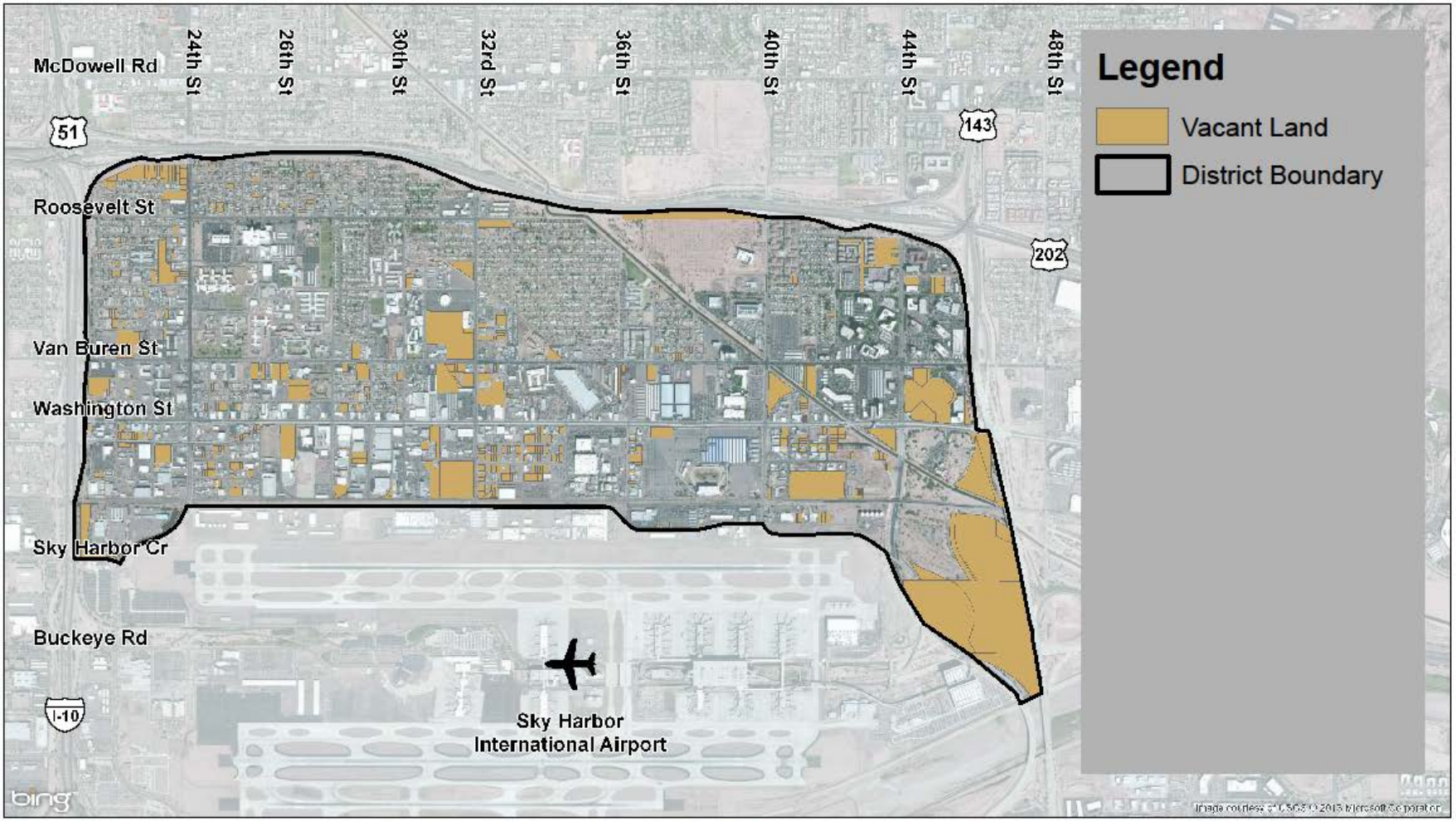
2013

Reinvent PHX
Gateway District
Parking Lots

0 1 Miles

1 inch = 1,667 feet

Gateway – Vacant Land



N
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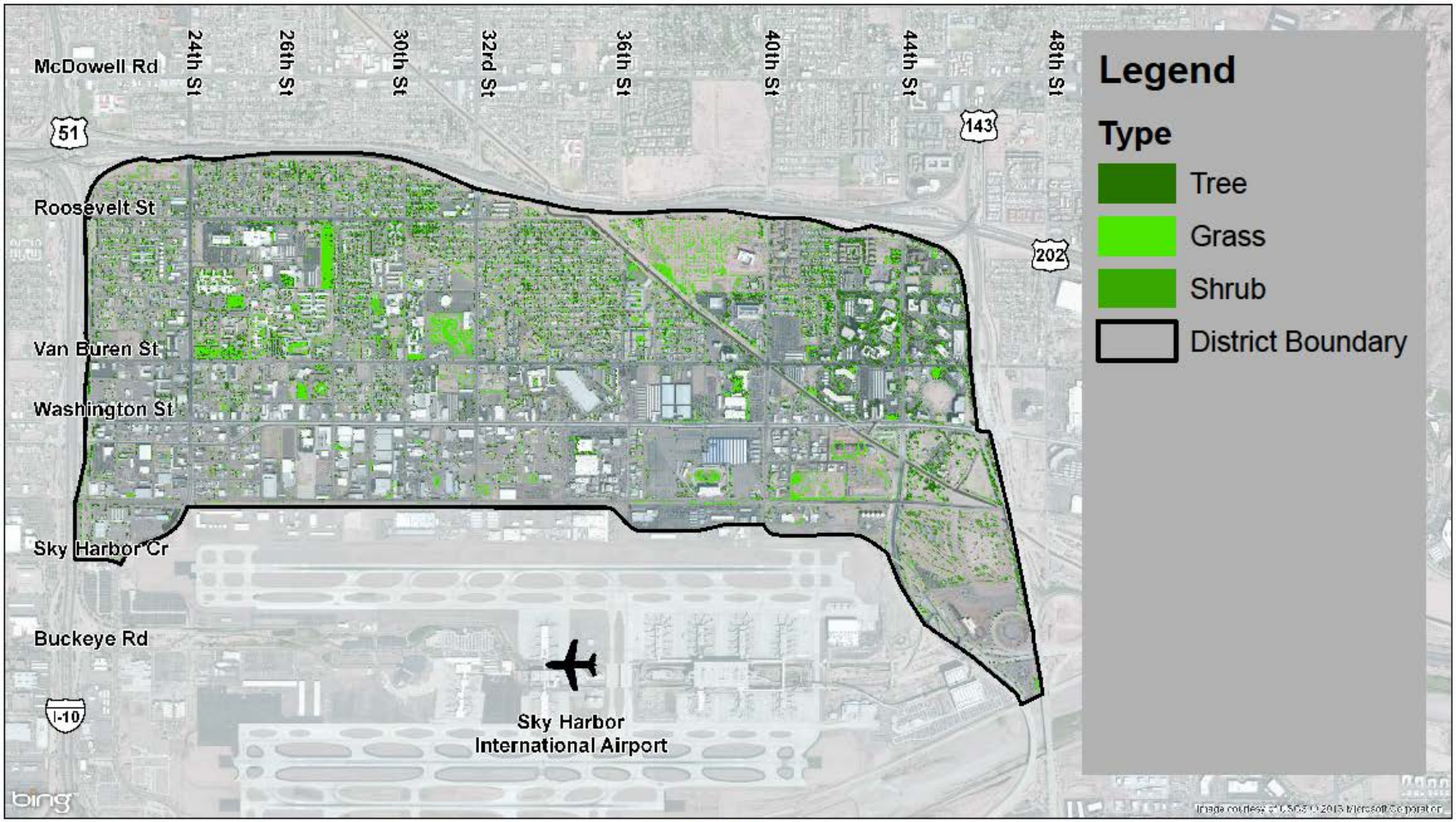
2013

Reinvent PHX
Gateway District
Vacant Land

0 1 Miles
1 inch = 1,667 feet

Gateway – Vegetation Cover



N
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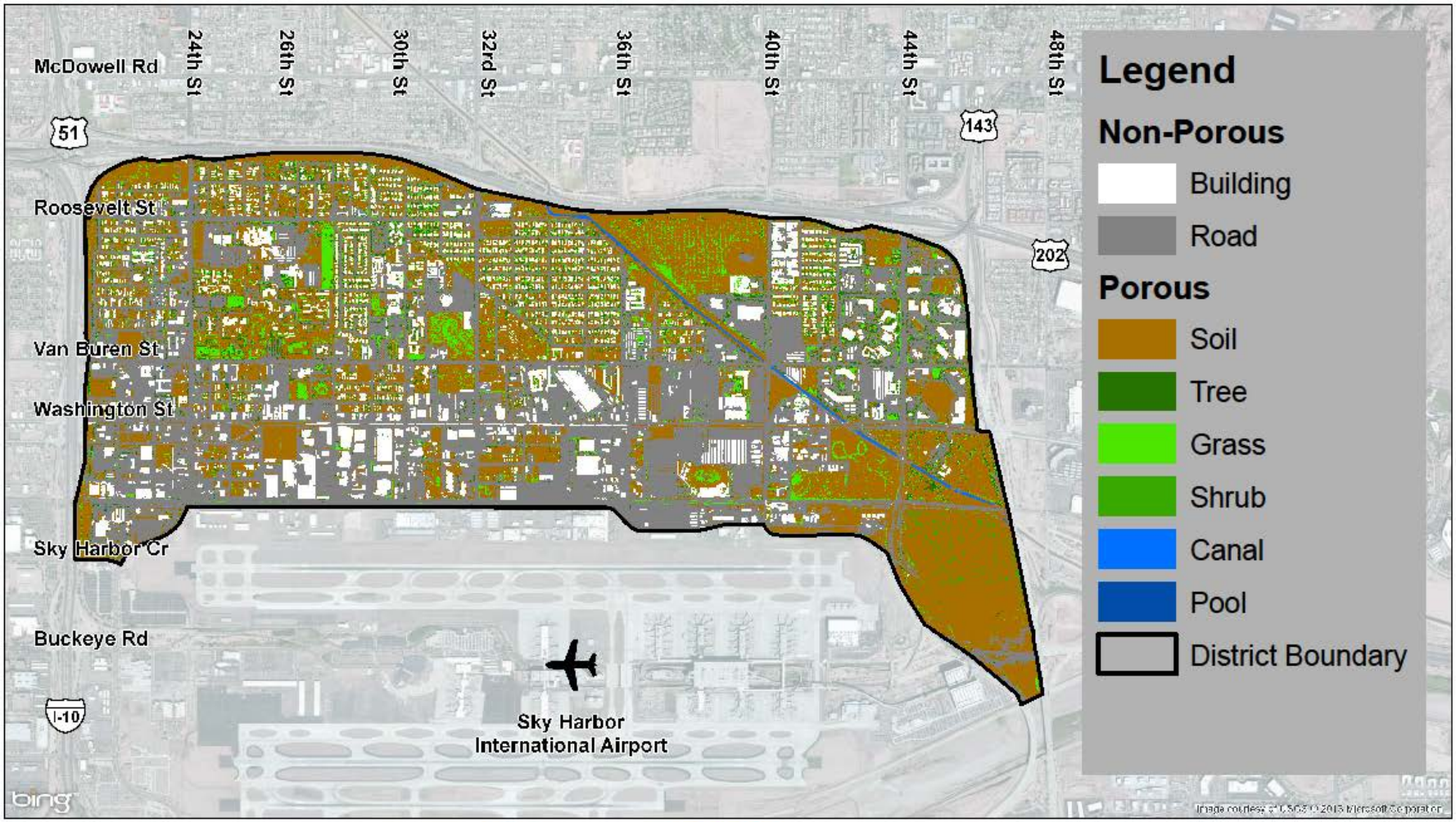
2013

Reinvent PHX
Gateway District
Greenery

0 1 Miles
1 inch = 1,667 feet

Gateway – Porosity



N
W E
S
2013

Reinvent PHX
Gateway District
Material Porosity

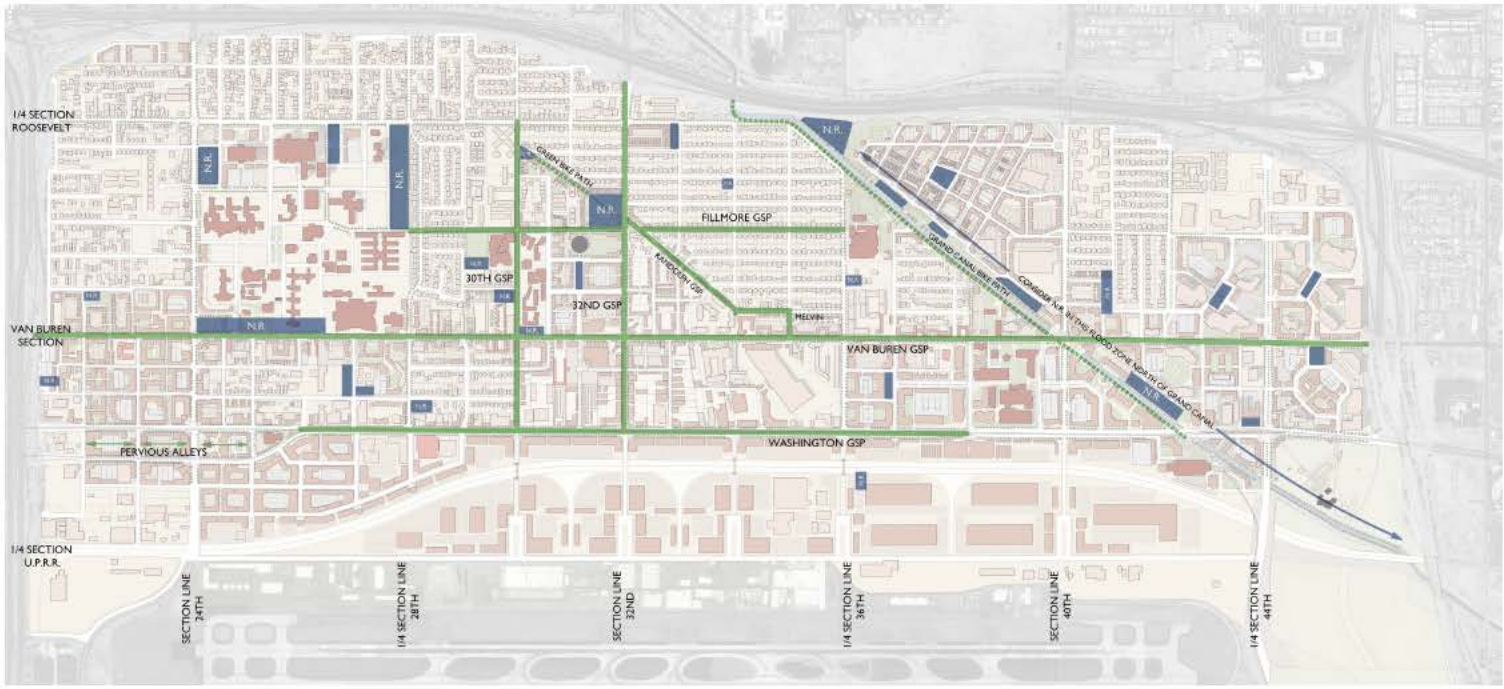
0 1 Miles
1 inch = 1,667 feet

Gateway - Green Improvements

GREEN IMPROVEMENT LOCATIONS

During the design charrette, the team surveyed the existing green infrastructure opportunities, and developed a series of strategies for implementation:

1. The Gateway District Green Infrastructure Map was used as a starting point.
2. A lot of field reviews, policy reviews, and feedback loops are ongoing to understand the local context.
3. Decades of on-site retention have mitigated the street flooding problems of the 60's.
4. It is quite possible that those resources could be re-allocated to green streets and joint use neighborhood parks/ retention.
5. Neighborhood park designs attempted to locate the parks where they could also optimize retention potential, and were added to the Green Infrastructure Map.
6. A Bicycle and Pedestrian Priority Map was designed and integrated with the Green Infrastructure Map, so that priority parks and green linkages aligned with Bike and Pedestrian Priorities.
7. Many patterns of Green Street Retrofits were designed for the Bike and Pedestrian Priority linkages to incorporate trees for shade, pedestrian propulsion, reduction of heat island effect, rainwater harvesting, and aesthetics, making them true complete streets.
8. The street retrofits avoided moving of curb lines in almost all cases, due to cost implications.



Green Street Priority

Neighborhood Retention/Joint-Use Park

Bike Path Priority

GREEN INFRASTRUCTURE REQUIREMENT	T3	T4	T5	T6
POST-DEVEL RUNOFF PEAK AND VOLUME ≤ PRE-DEVEL	■			
POST-DEVEL RUNOFF VOLUME ≤ PRE-DEVEL		■		
POST-DEVEL RUNOFF PEAK ≤ PRE-DEVEL			■	■
TREATMENT OF FIRST FLUSH EVENT	■	■	■	■
SIMPLE GREEN STREET AT FRONTAGE	■	■		
ALTERNATIVE COMPLIANCE: OFFSITE OR $2/SF FEE IN LIEU	□	□	□	□
REQUIRED ■ ALLOWED □				

E. Van Buren Street at N. 37th Street

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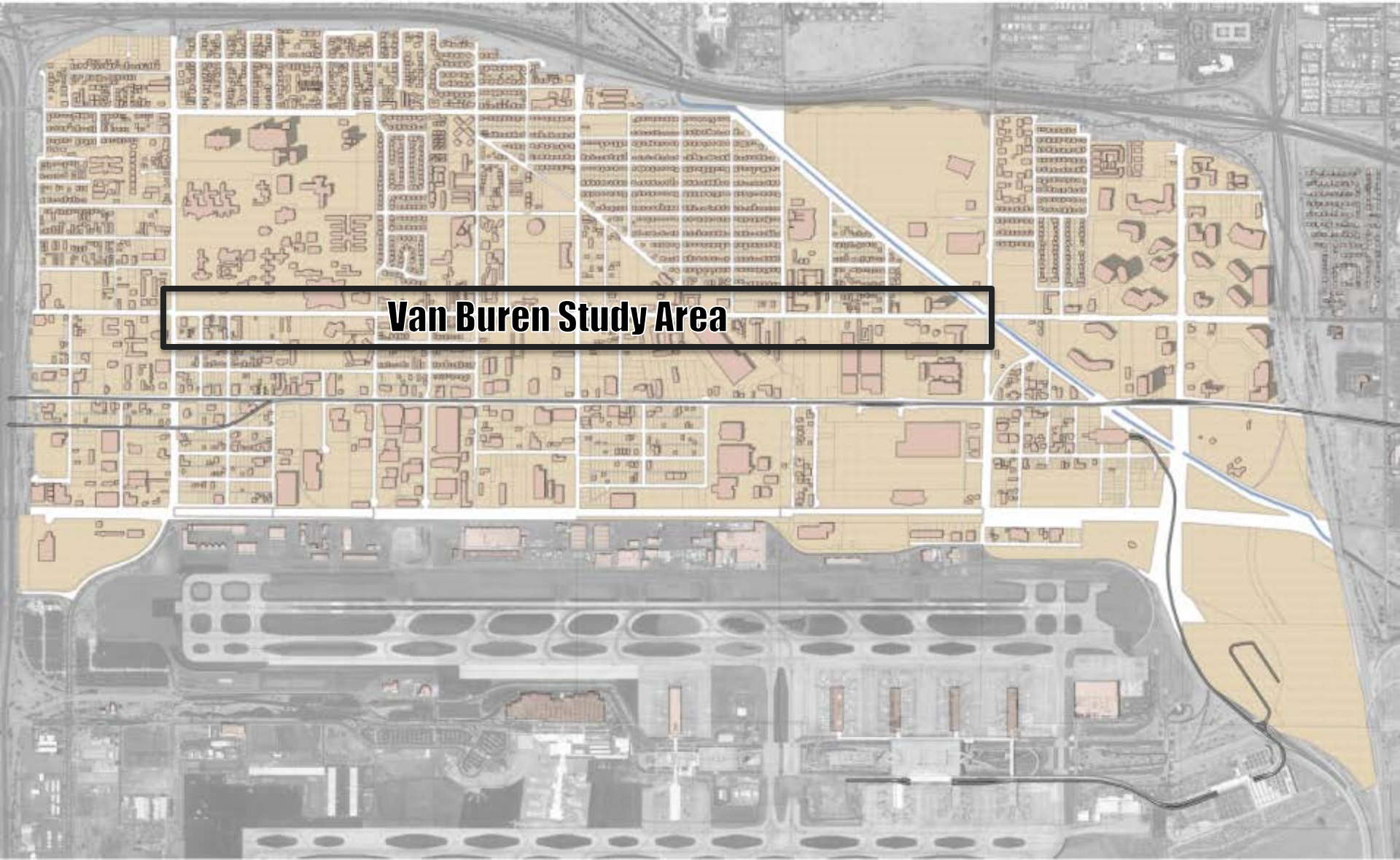
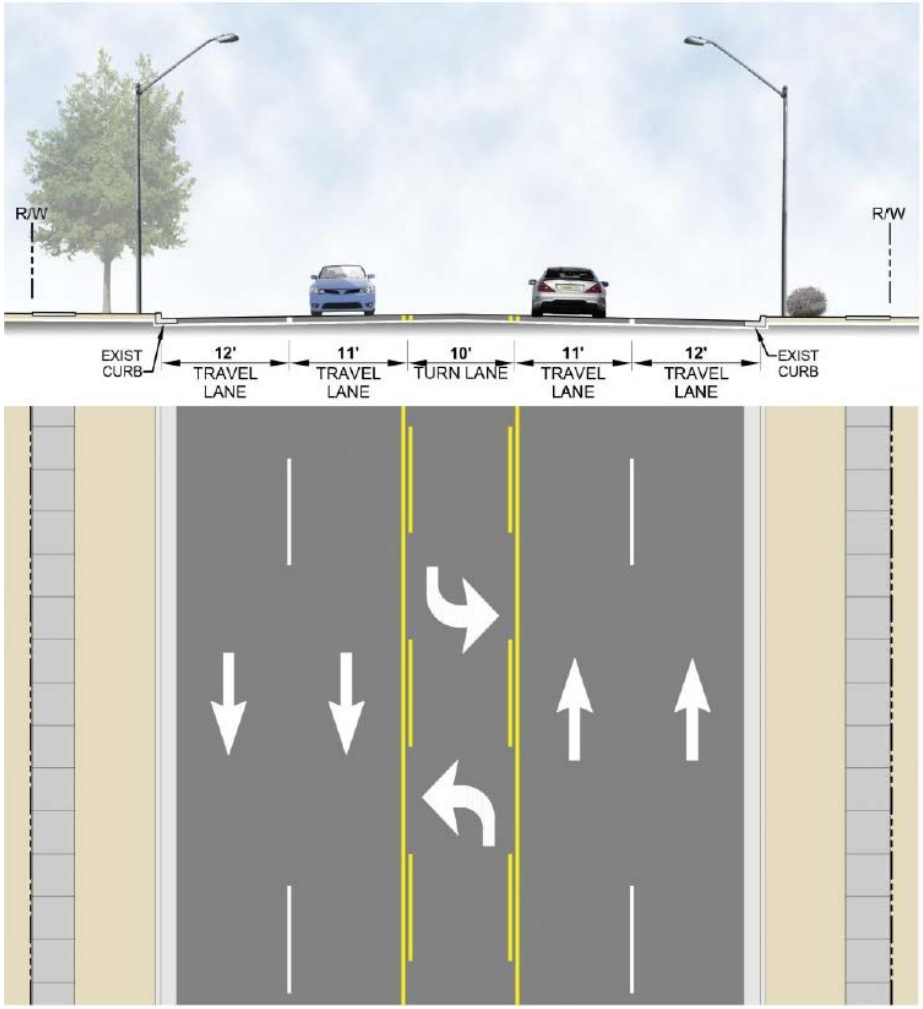
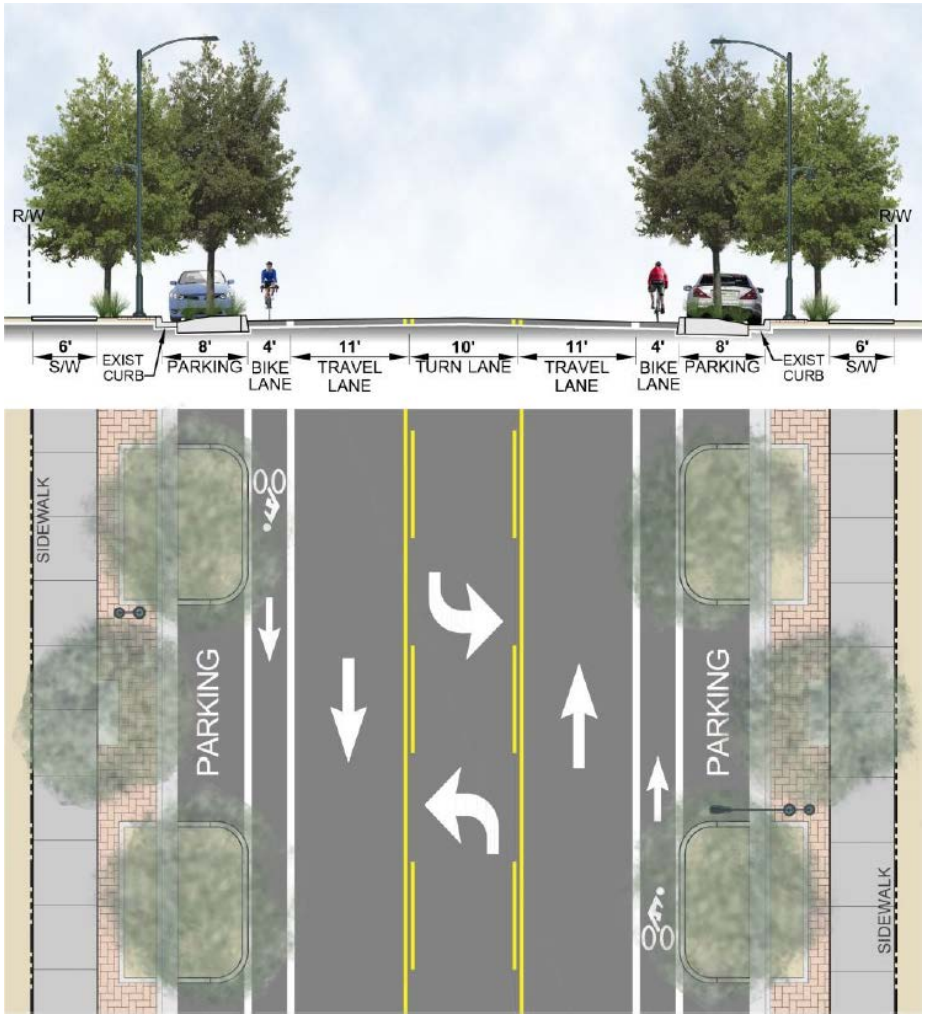
Gateway Existing



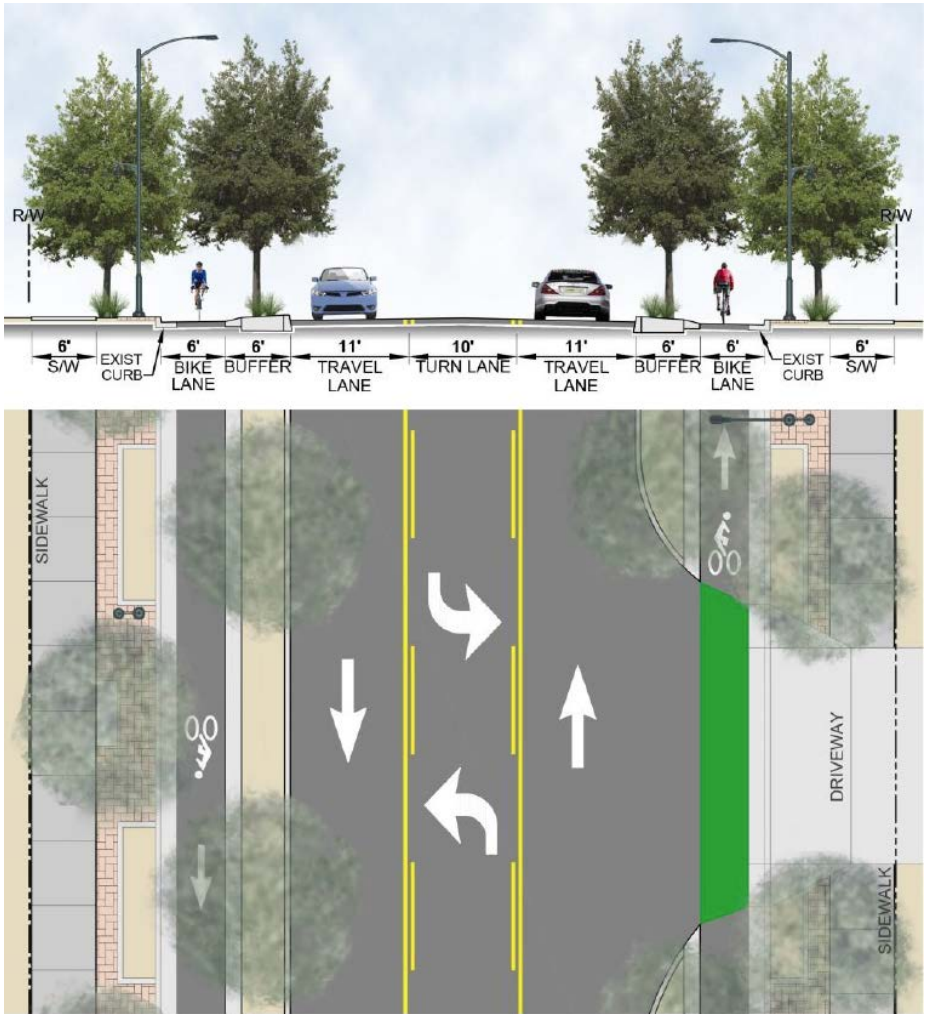
Existing Street Section



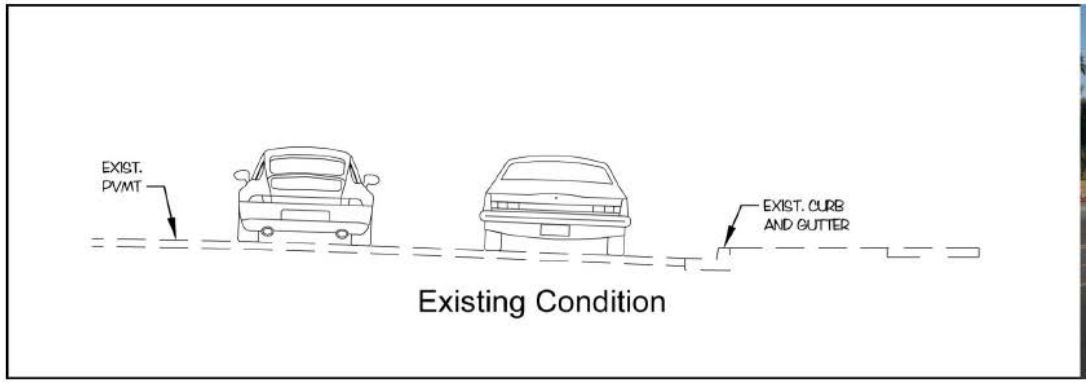
Tree Pocket Concept



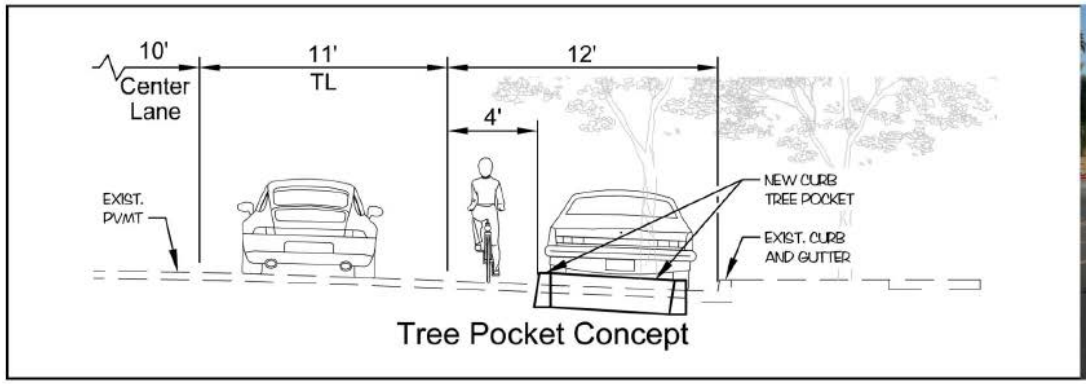
Buffered Bike Lane Concept



Concept Comparisons



Existing Condition



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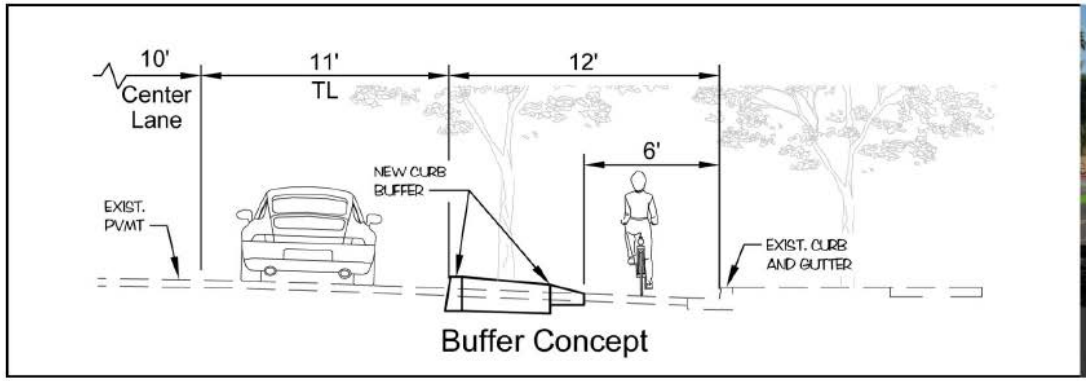


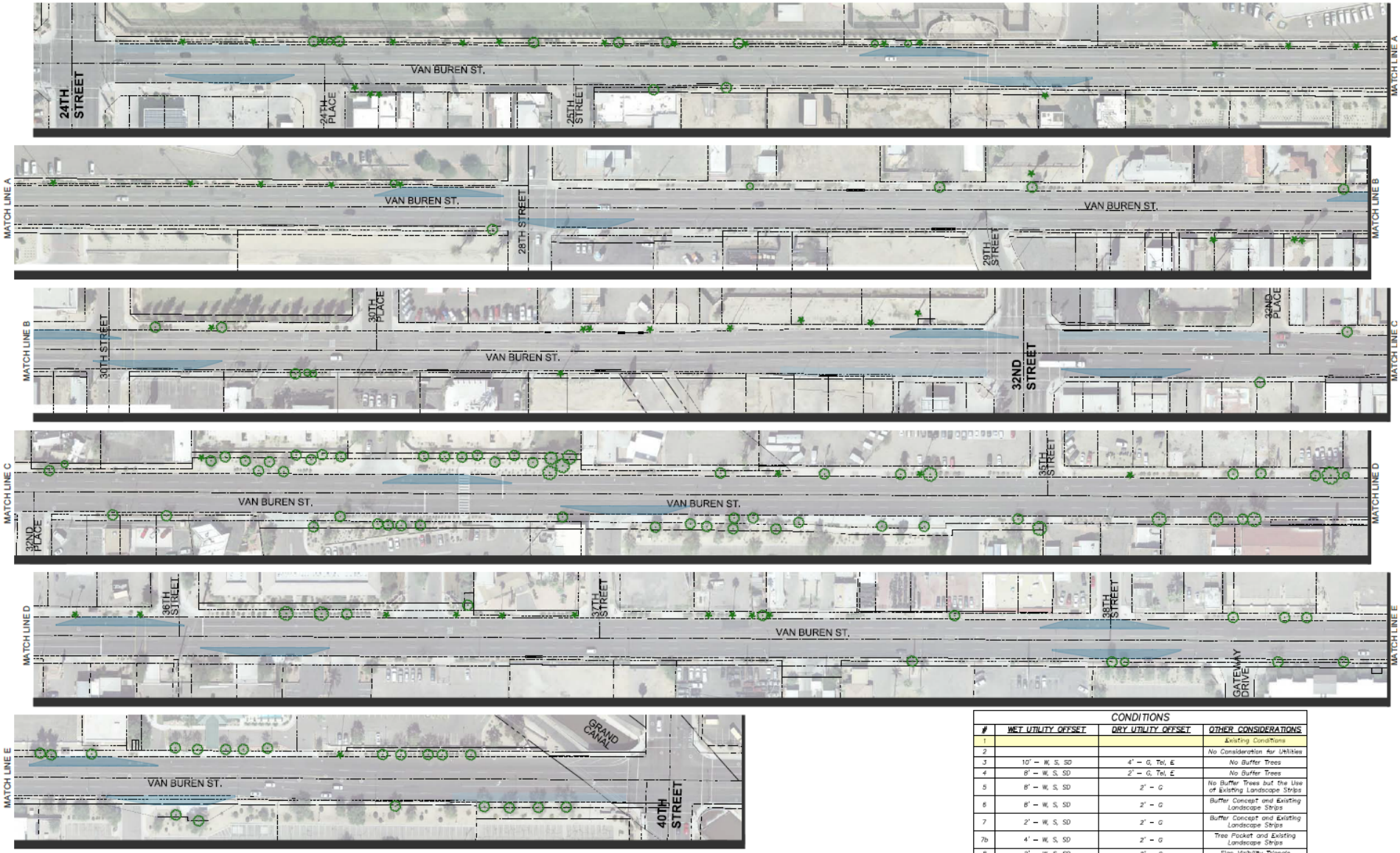
Buffer Concept

BIKE LANE CONCEPTS

Tree Pocket Concept

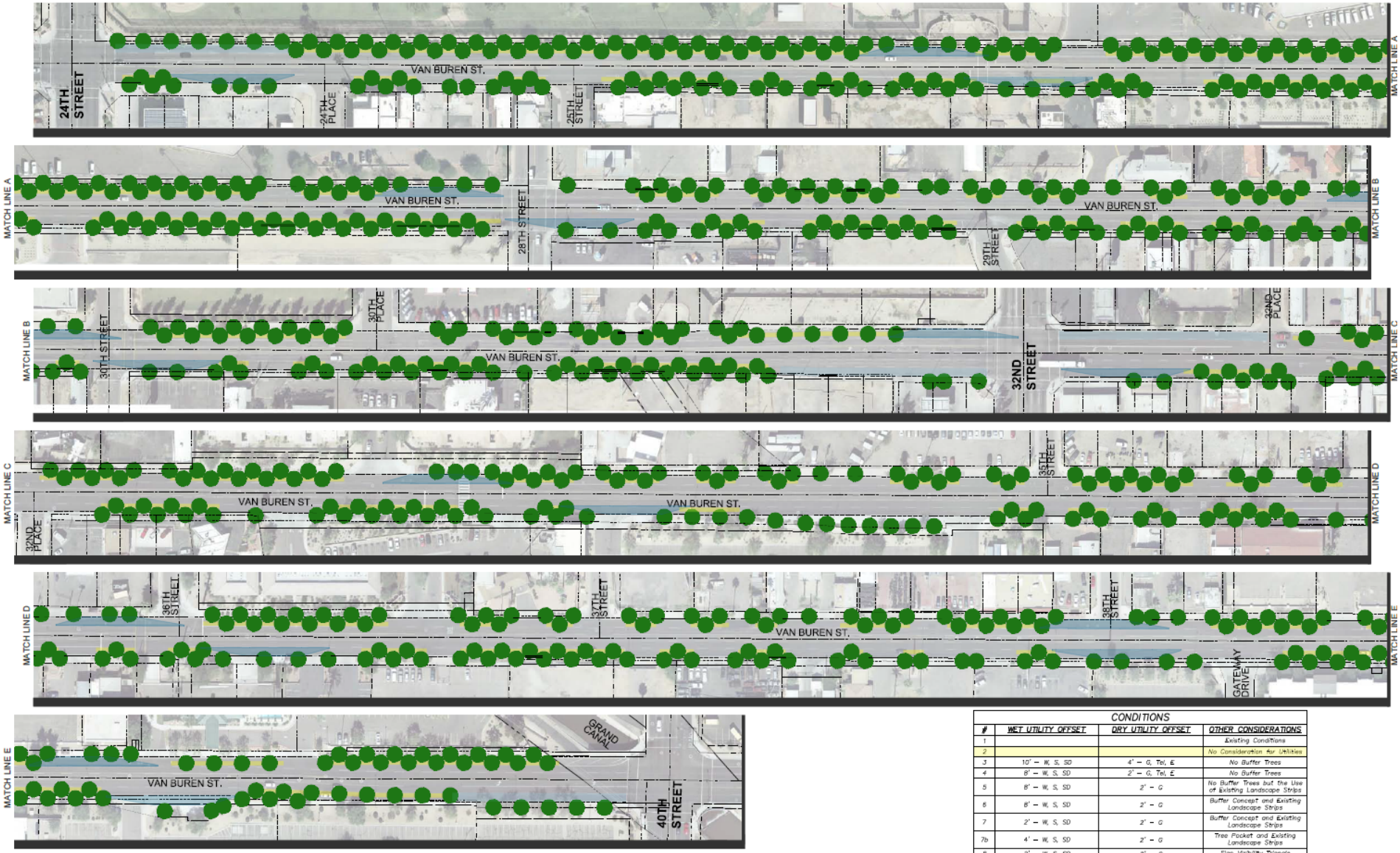
Buffered Bike Lane Concept

Existing Conditions



CONDITIONS			
#	WET UTILITY OFFSET	DRY UTILITY OFFSET	OTHER CONSIDERATIONS
1			Existing Conditions
2			No Consideration for Utilities
3	10' – W, S, SD	4' – G, Tel, E	No Buffer Trees
4	8' – W, S, SD	2' – G, Tel, E	No Buffer Trees
5	8' – W, S, SD	2' – G	No Buffer Trees but the Use of Existing Landscape Strips
6	8' – W, S, SD	2' – G	Buffer Concept and Existing Landscape Strips
7	2' – W, S, SD	2' – G	Buffer Concept and Existing Landscape Strips
7b	4' – W, S, SD	2' – G	Tree Pocket and Existing Landscape Strips
8	2' – W, S, SD	2' – G	Sign Visibility Triangle

No Utility Clearances



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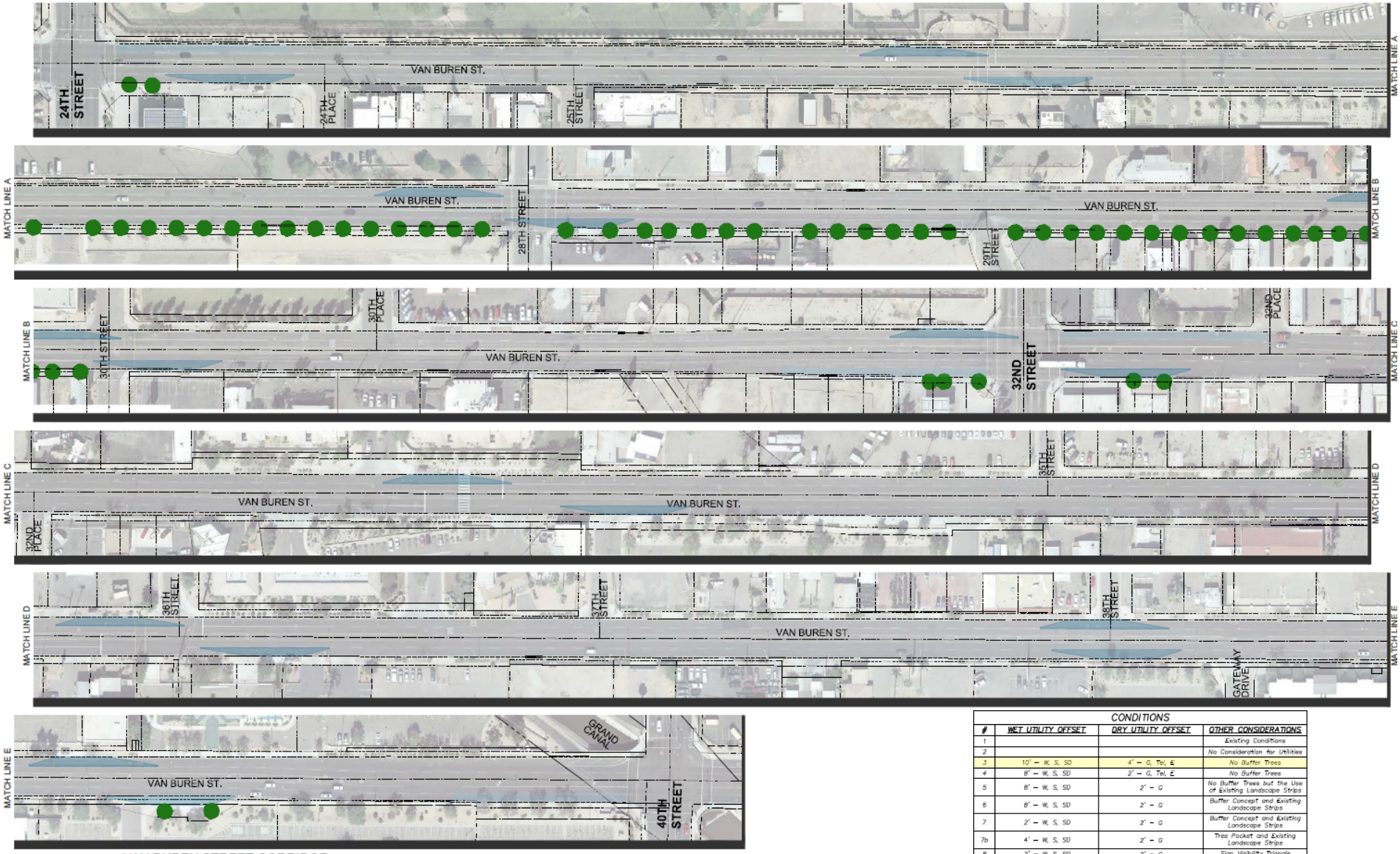
Required 10’ Utility Clearances



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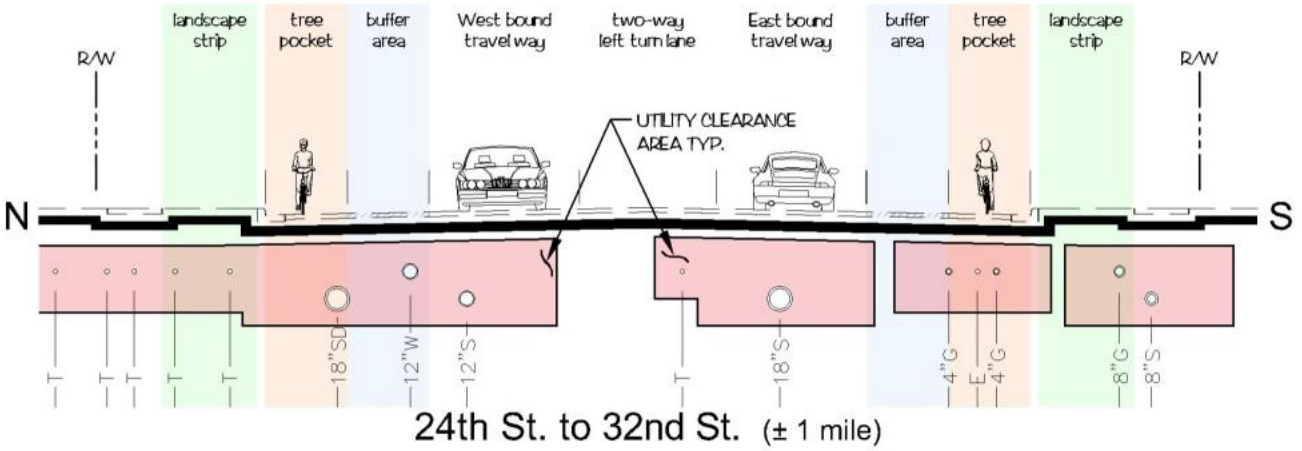
VAN BUREN STREET CORRIDOR
24th Street to 40th Street

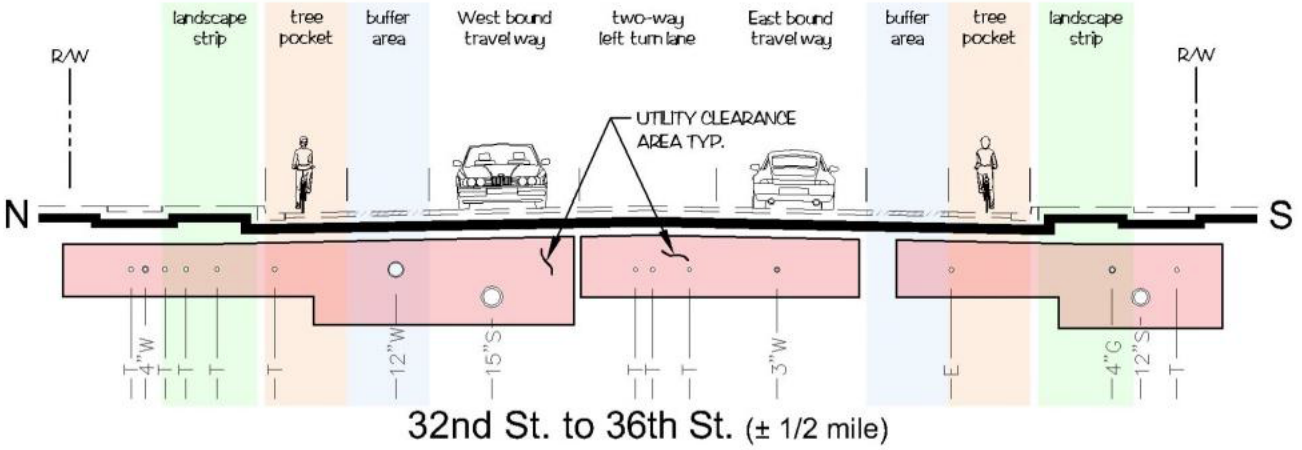
TREE LOCATION STUDY
ACCORDING TO UTILITY CLEARANCES

CONDITION 3

Utility Conflicts impact on Tree placement



24th St. to 32nd St. (± 1 mile)



32nd St. to 36th St. (± 1/2 mile)

planPHX

2015 GENERAL PLAN

City Council Adopted Version

March 4, 2015


City of Gardens
and Trees

The four primary parts of the General Plan

1 Vision

- Prosperity
- Health
- Environment

3 Community Benefits

- Connect People & Places
- Build The Sustainable Desert City
- Strengthen Our Local Economy
- Celebrate Our Diverse Communities & Neighborhoods
- Create an Even More Vibrant Downtown

5 Core Values

- Plans
- Codes
- Operations
- Financing
- Partnerships
- Knowledge
- I PlanPHX

7 Strategic tools

North Mountain

BUILD THE SUSTAINABLE **DESERT CITY**

The city of Phoenix is a pioneer in environmental stewardship. Flagship projects including the Tres Rios Wetlands, Energize Phoenix program, the Rio Salado riparian restoration project and numerous water conservation efforts have won the city many awards.

Residents want to see Phoenix expand its role as an environmental leader including more neighborhoods, businesses and facilities that are designed and built using environmentally progressive planning and building practices along with locally produced and lasting materials.

Residents envision strategic uses of natural and man-made elements to increase the shade cover in our city and the widespread use of solar energy in everything from homes to streetlights. Through the wise use of zoning and other tools, residents want to be able to individually harness and enhance these environmental resources to uplift their businesses, neighborhoods and families. This includes the creation of safe, clean, sustainable neighborhoods free of pollution. Phoenix is renowned for its beautiful Sonoran Desert setting. Our world-class parks, desert recreation areas and mountain preserves are a testament to decades of forward-thinking citizens working to conserve this precious resource. Residents envision continuing this legacy by enhancing and expanding our existing parks and preserves and cementing their place as our city's most iconic features.

Residents also want to add another element to our city's landscape – urban farming. Residents see a robust network of community gardens and urban farms activating underutilized properties and resulting in greater access to healthy foods, neighborhood revitalization, reduced pollution and improved opportunity for economic development.

The big ideas for Building THE Sustainable Desert City are interlaced throughout the General Plan. Sustainability is an element that runs its course throughout the efforts of the document to add value and create a truly Connected Oasis.

This Core Value focuses on the following Growth/ Preservation and Infrastructure areas.

Growth / Preservation Areas

- Desert Landscape
- Rivers, Washes and Waterways
- Redeveloped Brownfields

Infrastructure

- Green Buildings
- Trees and Shade
- Healthy Food System
- Energy Infrastructure
- Waste Infrastructure
- Water Infrastructure
  - Water Supply
  - Stormwater
  - Wastewater

STORMWATER

Proper stormwater management can reduce flooding and prevent pollutants from entering our surface waters. With over 100 years of experience in managing our water resources, Phoenix is dedicated to providing efficient and economical management of our stormwater. Living in a desert necessitates sensitivity and long-range planning for the use, conservation and protection of the water supply. Only through the efforts of the entire community can this be accomplished.

THE GOAL

Manage our stormwater efficiently and economically, **while minimizing** stormwater pollution.

MEASURE FOR SUCCESS

Ensure that all applicable National Pollutant Discharge Elimination System (NPDES) or Arizona Pollutant Discharge Elimination System (AZPDES) permits have been obtained **prior to discharging stormwater.**

Land Use and Design Principles

DESIGN Pursue creative, innovative, and environmentally-sound methods to capture and use stormwater and urban runoff for beneficial purposes.

DESIGN Minimize the impact of urban activities on the quality of stormwater and surface water.

DESIGN Encourage stormwater management through innovative solutions such as the use of permeable surfaces, protecting vegetative surfaces, and implementing surface water buffers.

DESIGN Encourage construction plans that reflect a systematic and integrated approach to building design, civil engineering, and landscape architecture in order to maximize the potential for rainwater harvesting and stormwater retention for landscape watering.

Policy Documents and Maps

Stormwater Policies and Standards Manual

Tools: Policies and Actions

OPERATIONS Provide a safe, reliable, and efficient stormwater management system that protects both human health and the environment.

OPERATIONS Provide a comprehensive public outreach program to educate residents and local businesses about the importance of stormwater pollution prevention.

OPERATIONS Pursue creative, innovative, and environmentally-sound methods to capture and use stormwater and urban runoff for beneficial purposes.

OPERATIONS Provide an active inspection and enforcement program to ensure that private and publicly-owned industrial facilities are adhering to the city's Stormwater Quality Protection Ordinance.

OPERATIONS Maintain the authority to protect the city's stormwater quality.

OPERATIONS Provide technical assistance that supports and encourages the use of green infrastructure for stormwater management.

Taylor Mall

This project implemented a variety of innovative Green Infrastructure techniques, such as permeable parking spaces, curb cuts, and vegetative swales to manage stormwater onsite. The project also provides an opportunity to evaluate the long-term effectiveness of these stormwater management techniques in our unique arid environment.

WASTEWATER

Phoenix is dedicated to providing safe, efficient and economical treatment and management of our wastewater for a healthy community. Water reclaimed through wastewater treatment is an important non-potable supply that conserves and protects potable supplies and resources for customer needs.

THE GOAL

Treat, manage and use our wastewater and related infrastructure **efficiently and economically.**

MEASURE FOR SUCCESS

Collect, treat and discharge wastewater that meets or exceeds all federal and state standards and in a manner which **protects public health.**

Maximize beneficial use of **reclaimed water** in order to reduce potable treatment costs and preserve water supplies for higher uses.

Develop new infrastructure that efficiently and cost-effectively **accommodates** the **needs** of the community.

Land Use and Design Principles

LAND USE Develop land parcels in impact fee areas consistent with infrastructure availability and needs as specified in wastewater system master plans.

LAND USE Partner with the private sector to responsibly develop new infrastructure that accommodates growth in a fiscally prudent and sensible manner.

LAND USE Maximize use of existing infrastructure and carrying capacity by encouraging redevelopment and infill.

LAND USE Encourage water efficient building design in growth areas in order to reduce sewer capacity requirements and operating costs.

DESIGN Encourage the use of innovative industrial design, development and processes for new uses that collectively act to reduce point source pollution beyond regulatory requirements without harming economic vitality.

DESIGN Pursue creative, innovative, and environmentally-sound methods to use reclaimed water for beneficial purposes when and where available.

Policy Documents and Maps

2011 Water Resources Plan

Industrial Pretreatment Program

Infrastructure Financing Plan

MAG 208 Plan

Tools: Policies and Actions

PLANS Continue jurisdiction-wide management plans for both water consumption and disposal that provides a clean and secure water supply for all local uses.

OPERATIONS Adequately and reliably collect and treat wastewater to produce high quality reclaimed water for reuse at a reasonable cost while balancing social, economic, and environmental impacts.

OPERATIONS Maximize efficient direct and indirect use of reclaimed water, giving due consideration to water quality, public acceptability, cost, and reliability of service.

OPERATIONS Public infrastructure services and facilities should serve the present population and future growth reasonably, efficiently and reliably.

FINANCING Continue implementing cost-effective water conservation programs to reduce capital investment in wastewater collection systems and treatment plants through reduction in wastewater generation.

PARTNERSHIPS Continue to collaborate with a regional wastewater management group that includes other jurisdictions that share treatment facilities.

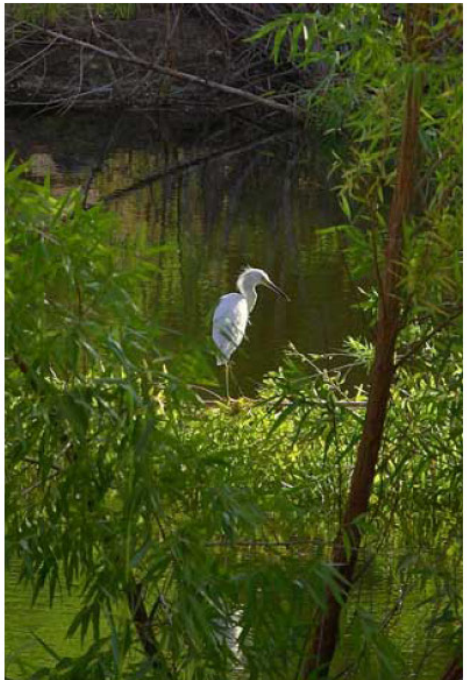
Tres Rios Wetlands

The primary goals of this project are water quality improvement, wildlife habitat, and recreational and educational opportunities. A unique benefit of the wetlands is its ability to provide a superior level of natural treatment for secondary effluent water from the 91st Avenue Wastewater Treatment Plant, avoiding expensive supplemental treatment technologies, which saved taxpayers an estimated $300,000,000.

Rio Salado & Tres Rios Projects

play

learn



Taylor Mall and Taylor Street


Greening Wilson School


Community Built & Maintained