City of Phoenix Green Infrastructure

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Project Description

Objective: Alleviate the issue of stormwater runoff in Phoenix with the implementation of green infrastructure.

Scope of work: Focus on short and long term costs, maintenance requirements and benefits/challenges of specific GI features.

Current problem of stormwater runoff:

- Impermeable surfaces significantly reducing the rate of infiltration thus increasing the amount of stormwater
- Stormwater runoff pollutes surface waters, causing significant degradation to ecosystems and is harmful to local citizens
- Flooding from storms has the ability to cause substantial amounts in monetary damages

Stormwater Green Infrastructure

The method of controlling and mitigating stormwater impacts while following sustainable practices far into the future. Green infrastructure strives to treat stormwater runoff before it reaches waterways.

Challenge: Arid climates are challenging when implementing green infrastructure because temperature can cause a strain on maintenance and vegetation.

GI features
- Permeable Pavement
- Reduce/Disconnect Paved Surfaces
- Traffic Chicanes or bump outs
- Curb Cuts
- Bioretention Basins
- Vegetative Swales

Methods: Case Studies

Permeable Pavements

Location: Denver, Colorado

Site Selection:
- Most often used in parking lots or alleyways.
- 1,840 sq feet site at the entrance of the public works building.

Maintenance:
- Vegetation on the pavement blocks may require mowing.
- Vacuum twice a year in order to remove debris and and maintain infiltration.

Benefits:
- In the long term, the initial cost of installation outweighs the cost of replacing conventional concrete.
- Maintenance is low cost.
- Denver study found that dissolved phosphorous, chloride, and potassium was greater at the permeable site compared to conventional concrete.

Challenges:
- Arid climate makes it challenging when mixing and installing the pavement.
- Soil type can also make installation challenging.

Reduce/disconnect Paved Surfaces

Location: No specific Case Study

Typical Cost: relatively low

Site Selection:
- Walkways
- Driveways
- Gutters

Maintenance:
- Removal of detritus, dirt, and weeding
- Care for landscape: water vegetation

Benefits:
- Treats stormwater at the source
- Decreases runoff in communities
- Low maintenance cost
- Reduces amount of pooling due to high rate of infiltration

Challenges:
- Limited information
- Aimed towards private residential areas and not so much on commercial areas

Traffic Chicanes or “Bump Outs”

Location: Tucson, Arizona

Typical Cost including vegetation (set of three):

- $10,000 (asphalt)
- $30,000 (concrete)

Site Selection:

- Best for asphalt crowned streets
- Best for neighborhoods and slow streets with at min 8” of extra width
- Ideal Location: neighborhoods

Maintenance:

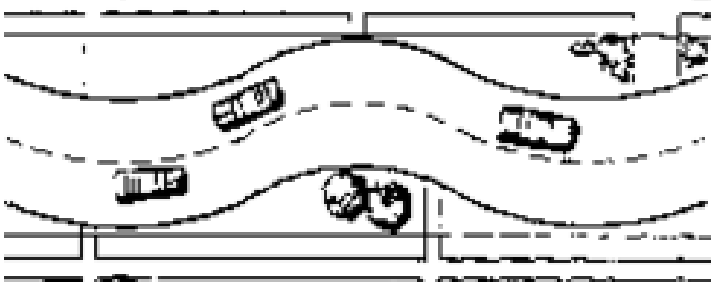
- Clear curb cuts 1-2 times annually
- Care for landscape: water vegetation, cut back overgrowth, maintain slopes into basin

Benefits:

- Treats stormwater at the source
- Slows vehicles, increasing road safety
- Natural Beauty

Challenges:

- Reduce street parking
- Not effective everywhere



Curb Cuts/Curb Cores

Location: Portland, Oregon

Cost: $20,400 (NE Fremont Street Green Street Project)
Unit Cost: $3.64 per ft^2 of impervious area managed

Site Selection
- 2% street slope
- Internal Storage Volume: 150 cubic feet

Maintenance
- Weeding
- Plant trimming / replacement
- Sediment and debris removal

Benefits
- Relatively inexpensive
- Captures runoff from 4,500 square feet of paved surfaces

Challenges
- Bump outs are required to infiltrate water
- Loss of parking space

Before

After.

Bioretention Basin

Location:Duluth, Minnesota
Site chosen for large amounts of rainfall and experienced implementation

Cost: $5,000-$10,000 per Acre

Site Selection
- Best for large area with natural depression of land
- Deserted Industrial Parks in Southern Phoenix

Maintenance
- Erosion mitigation
- Plant care; Supplemental irrigation for two growing seasons
- Debris and invasive species removal

Benefits
- Most cost effective, for large scale project, versus water diverted
- Natural filtration of pollutants
- Nitrogen load removal from bioretention is high, typically meeting or exceeding 40 percent (NCSU)

Challenges
- Space available for implementation
- Recurring maintenance

Vegetative Swales

Location: Duluth, Minnesota

Cost: Strictly depends on the size of the swale and vegetation used.
$0.50 per square foot; a suggested value of $5.50 per square foot of storage provided

Site Selection
- Best used in parking lots, sidewalk configuration, and street corners

Maintenance
- Plant care; Supplemental irrigation for two growing seasons
- Removal of debris and invasive species

Benefits
- Takes stress off traditional curb and gutter systems
- Reduction target pollutants can be achieved with specific vegetation and design

Challenges
- Space available for implementation
- Incentivising new builders through tax breaks or mandates

Recommendations

Use them all, where they work best

Disperse different GI features for maximum permeable surface coverage.

- Traffic Chicanes: Crowned asphalt neighborhood streets
- Permeable pavements: Alleyways and parking lots and new developments
- Reduce/Disconnect Paved Surfaces: Private investment of property owners
- Bioretention Basins :Deserted or undeveloped space
- Vegetative Swales: Parking lots and walking paths
- Curb Cuts: Into swales and traffic chicanes

Modular GI System (Safe to Fail)

- Systems with many components are far less likely to fail because they are not reliant on one component.
- Different GI features can be more effective during different storms

Investing in Green Infrastructure will both improve the functionality and image of Phoenix.

Path to Success

Stakeholder Engagement

- City of Phoenix
  - Design, implement and encourage to transition
- Tax paying citizens
  - Attend communal meetings and voice opinions on best sought practices

Competitive Pricing

- Create and stabilize competitive pricing through pilot programs in multiple cit demographics and locations.

Grants

- The EPA gives grants to cities for implementing green infrastructure.
- Requesting funding from federal, state, or local municipalities that are subsidized through tax payer dollars.

Rebates

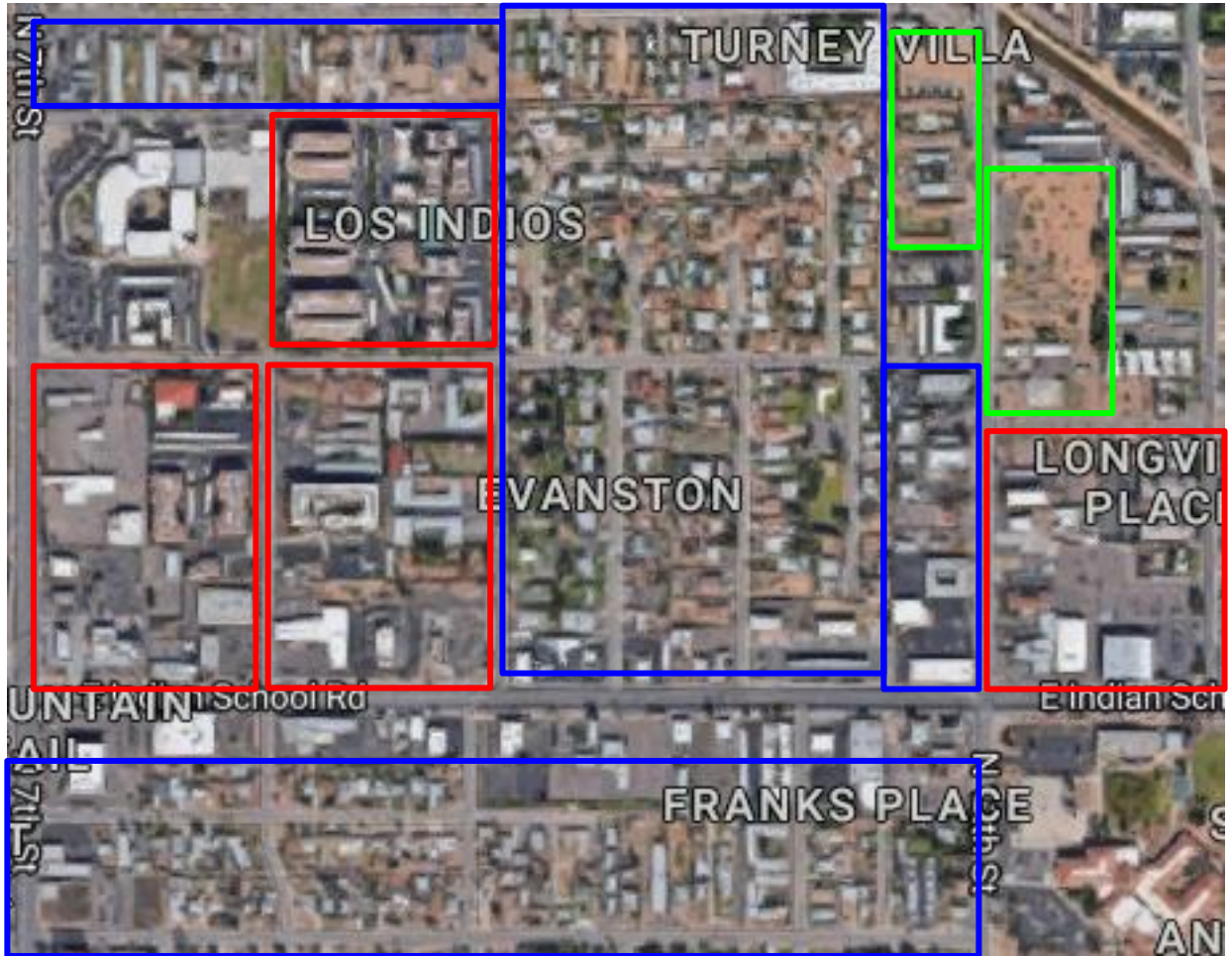
- Repaying a portion of initial costs of the projects as an incentive to transition to Green Infrastructure projects.

Pilot #1

Legend:

- Permeable Pavements/Reduced Pavement
- Curb cuts/Bump Outs
- Bioretention Basins/ Vegetative Swales

Pilot #2



Legend:

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Questions?

References

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