

Oakland's Urban Greening Program



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Watershed and Stormwater Management



What is Green Infrastructure?

Type of stormwater management system(s) that use natural processes to capture, detain, and filter runoff.

- ✓ Water Quality Treatment
- ✓ Collect and store for future use
- ✓ Hold for period of time to reduce peak flows



Photo : NACTO, Hoboken NJ

Disadvantages of Conventional (Grey) Infrastructure

- Water pollution
- Erosion and sedimentation
 - Increases peak flows = less capacity
 - No beautification potential
 - Urban heat island effect



Benefits of Green Infrastructure

“Co-Benefits”

- ✓ Water Quality
- ✓ Mitigate Peak Flows
- ✓ Water Conservation
- ✓ Biodiversity
- ✓ Climate Resiliency
- ✓ Pedestrian Friendly
- ✓ Community Health
- ✓ Reduce system impacts



Rain Garden, Photo: Wilsey Ham

Types of Green Infrastructure : Vegetated Strips, Bioretention, Pervious Pavers

Issues to Consider

- Volume Treated
- Location
- Engineered Soils
- Infiltration or Underdrain
- Size & Cost



Tool Box of Treatment Options, Photo : Wilsey Ham

Oakland's Urban Greening Initiative

Project Examples –

Multiple Types of Urban Greening
Primarily Grant Funded
Changing the Status Quo

Stormwater Retrofit Plan & Bay Area Green Plan (SFEI/ABAG)

GIS Analysis of Opportunities
Linkage with Bay Area Wide model

Priority Conservation Area /ABAG Process –

New “Urban Greening” PCA Category
Launched Cross-Departmental & Community Planning
Funding Opportunities Uncertain

COMING SOON

Street Typology Planning

Municipal Regional Permit 2.0



Tree Wells – Treating Pollutant of Concern

Tree Well Project -
Completed May 2014



Tree Well Site Pre-Project

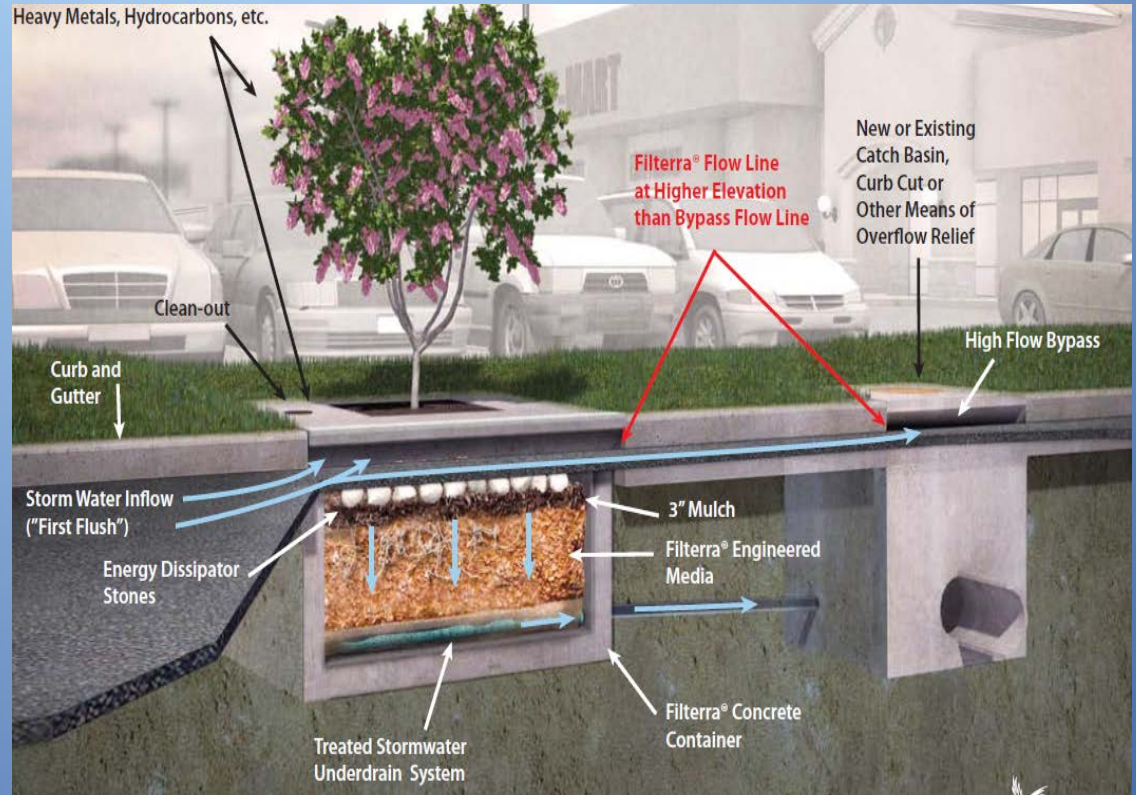


CITY OF OAKLAND

Oakland's Green Infrastructure

Tree Wells

- Treat runoff
- Air quality
- Public support
- Small space
- Modular
- Low Maintenance



*Note: Not C-3 Compliant

Tree Well Diagram

Oakland's Green Infrastructure

Implementation Issues

- Different O&M
- Siting Constraints
- Vandalism
- Treat Small Area



Proprietary Tree Well Installation

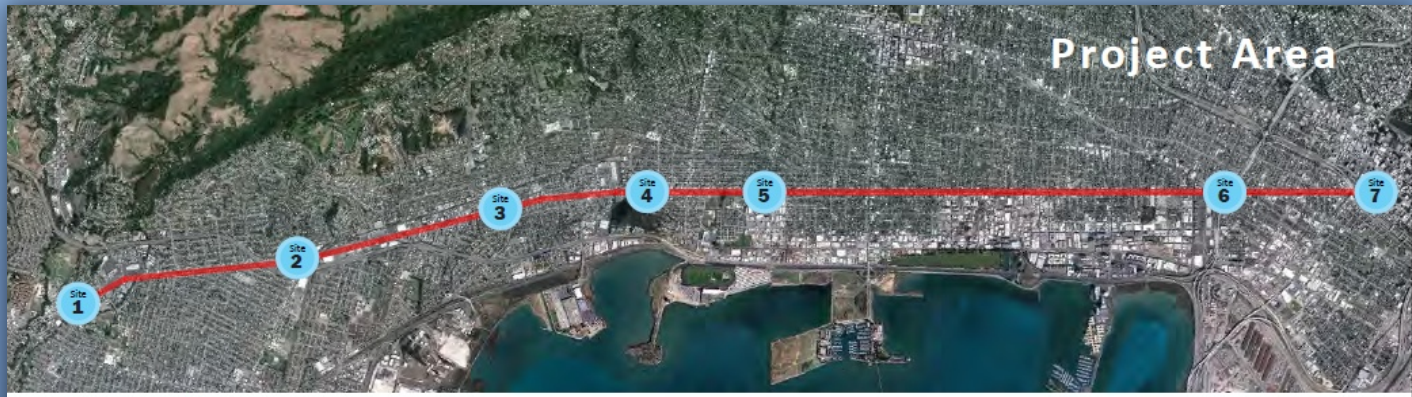


Proprietary Tree Well



Oakland's Green Infrastructure

San Pablo Avenue Spine Green Street Project



Oakland's Green Infrastructure



In Design
Construction Summer 2015

Oakland San Pablo Green Street, Pre-project - Photo: Wilsey-Ham



Oakland Site

Photo: Wilsey-Ham



Oakland's Green Infrastructure

- Curbless Design
- Bike Safety
- ADA Compliance
- Plant Selection
- Maintenance

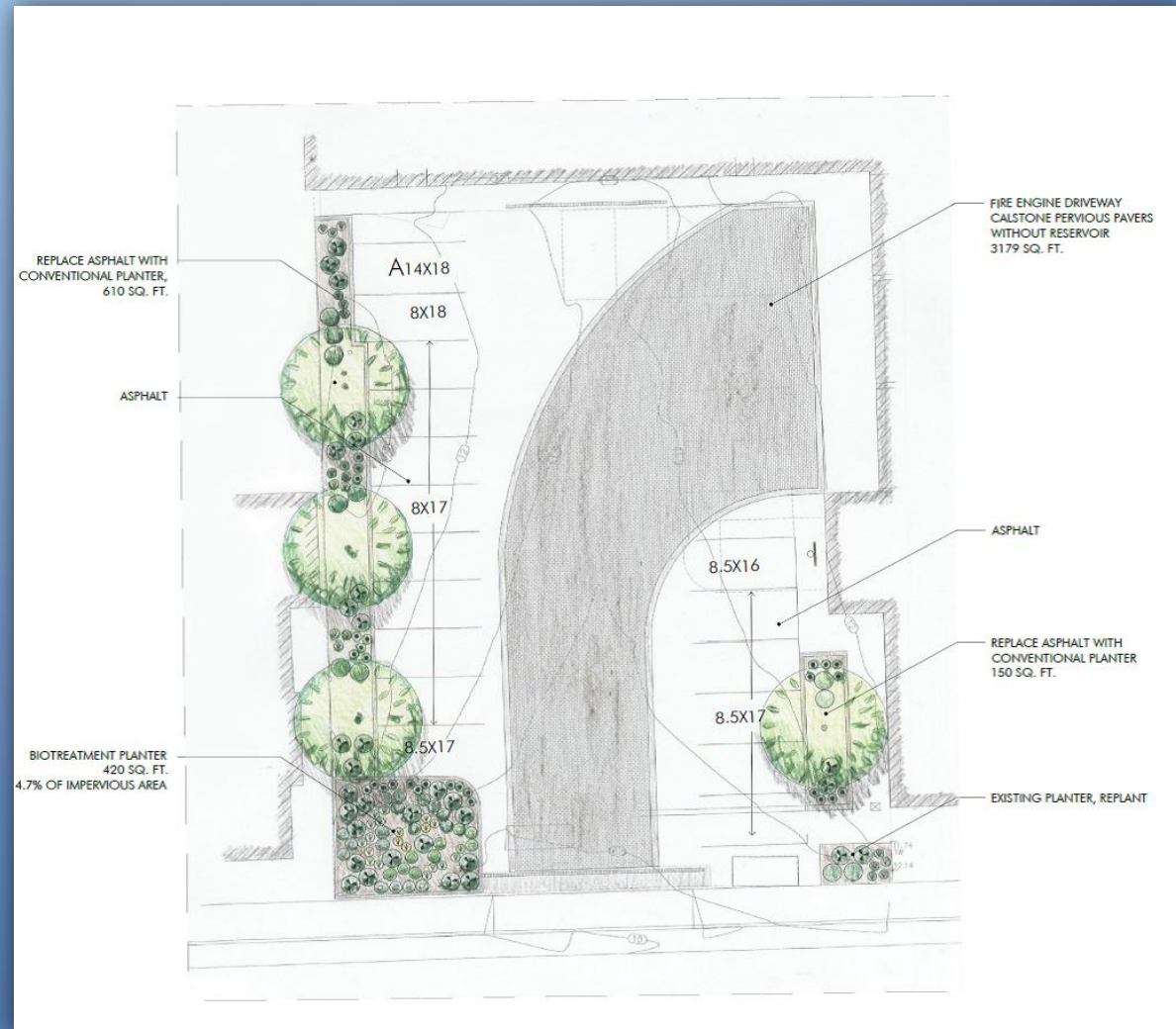


Proposed Oakland San Pablo Ave Retrofit – Rendering: Wilsey Ham

Oakland's Green Infrastructure

Fire Station 1 Parking Lot Biotreatment Retrofit

- Prevent stormwater runoff from parking lot
- Permeable pavers
- Bioretention area
- Vegetated planter strips
- Trees and trellis



Oakland's Green Infrastructure



Fire Station 1 Parking Lot Biotreatment Retrofit

Oakland's Green Infrastructure



Fire Station 1 Parking Lot Biotreatment Retrofit

Oakland's Green Infrastructure



Oakland's Green Infrastructure



Oakland's Fire Station 1 Parking Lot Improves Water Quality

When it rains, water runs off of paved surfaces into the nearest storm drain, carrying with it pollutants such as motor oil, litter, pesticides, and other chemicals. This stormwater flows *untreated* to our creeks, lakes, and the San Francisco Bay.

This fire station parking lot has been redesigned to detain and clean stormwater. Through the installation of pavers, a rain garden, planting strips, a living trellis, and trees, the project captures and infiltrates stormwater to remove pollutants, and reduces the amount of water flowing into the storm drain system to alleviate flooding and erosion problems.

This Fire Station parking lot protects Oakland's waterways by treating stormwater runoff.

Permeable Pavers

The center of this parking lot is installed with permeable pavers. Rain water infiltrates the spaces in between the pavers. It is then held in a layer of gravel before it penetrates into the soil below.

The sandy soil at this location allows the water to infiltrate quickly into the ground.

Allowing water to infiltrate into the soil removes pollutants, reduces groundwater, and reduces flooding by decreasing the volume of water in the storm drain system.

Rain Garden

The garden area located at the corner of the parking lot is called a **rain garden**. A rain garden is a shallow depression in the landscape that captures and infiltrates stormwater. Rain water that is not absorbed by pavement or asphalt flows into the garden through drains and pipes.

During a rainstorm, the rain garden captures a temporary pool of stormwater to infiltrate into the soil below. The plants also detain water and promote evaporation through their leaves.

Additional features on this site including trees, living walls, and other planted areas also detain and clean stormwater. These features are subject to local laws and require approval of the City of Oakland Public Works Agency.

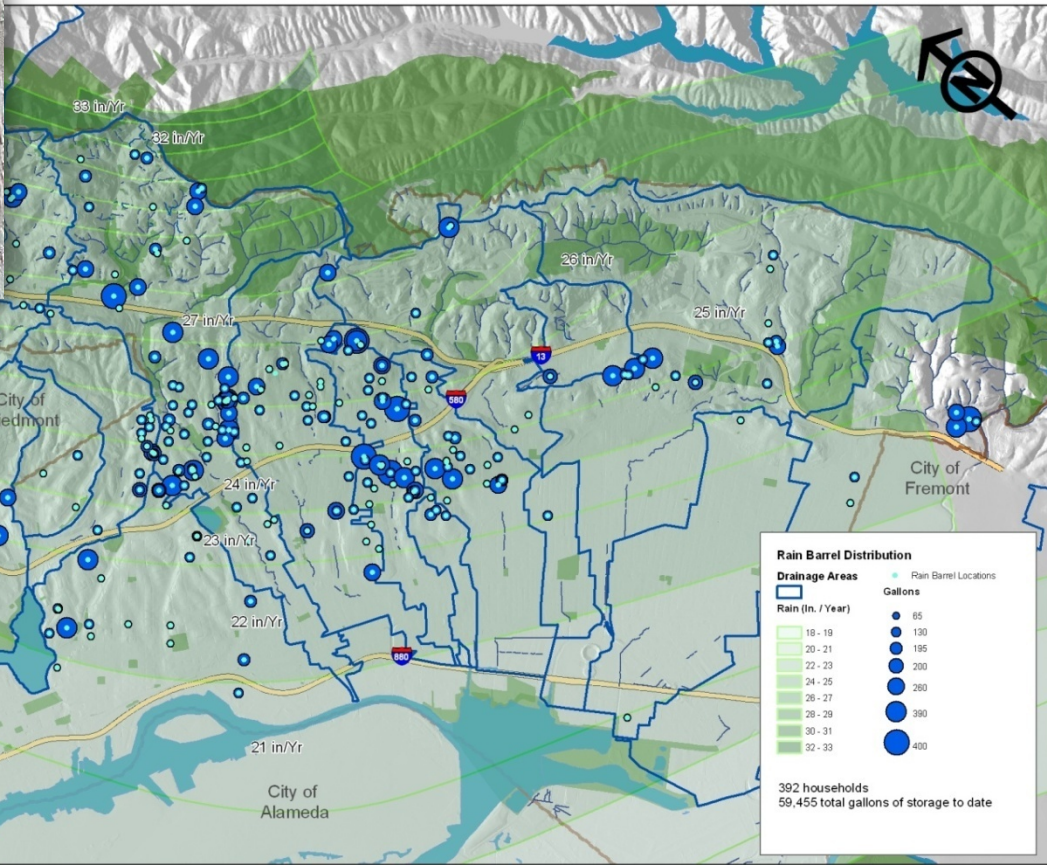
This rain garden and stormwater treatment project was designed and implemented by the City of Oakland Public Works Agency.

Special thanks to the Oakland Fire Department for funding and maintaining.

The project was a collaboration of staff of the Oakland Fire Department and the City of Oakland Public Works Agency.

For more information about Oakland's creeks and waterways visit oaklandcreeks.org

Rain Barrel Program - Over 400,000 gallons stored



Rain Barrel Locations, Storage Capacity, and Average Rainfall



Oakland's Urban Greening

Lake Merritt Municipal Boathouse



Oakland's Green Infrastructure



← Green roof after installation



Green roof after a couple years growth →



Oakland's Urban Greening

Bioswale captures parking lot runoff



Oakland's Green Infrastructure

Bioretention at Lake Merritt



Bioretention at Lake Merritt – May 2013

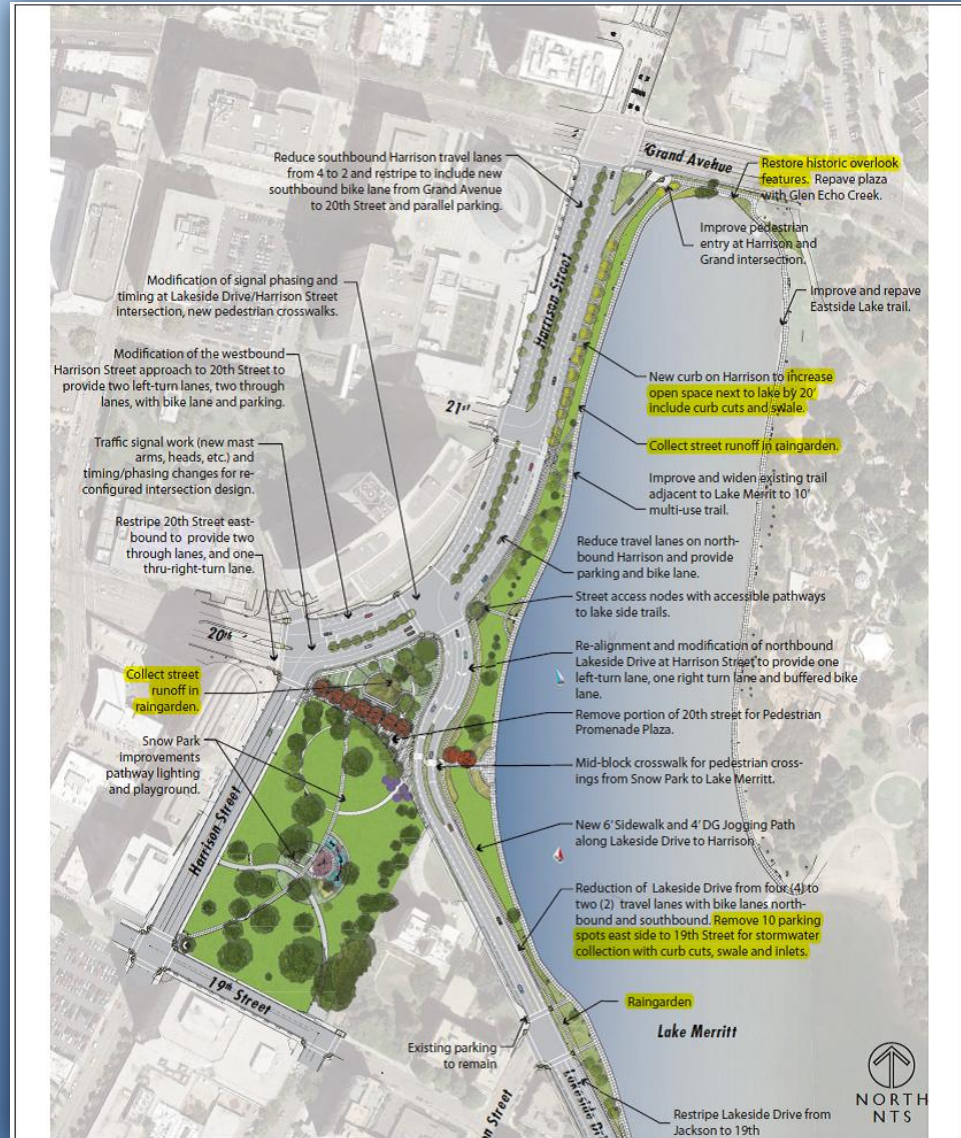


Bioretention at Lake Merritt – October 2014

Oakland's Green Infrastructure

Lakeside Green Streets

- Native landscaping
- Multiple stormwater detention areas
- Co-benefits: pedestrian and bike-friendly; traffic calming; improved air quality; safety



Oakland's Urban Greening

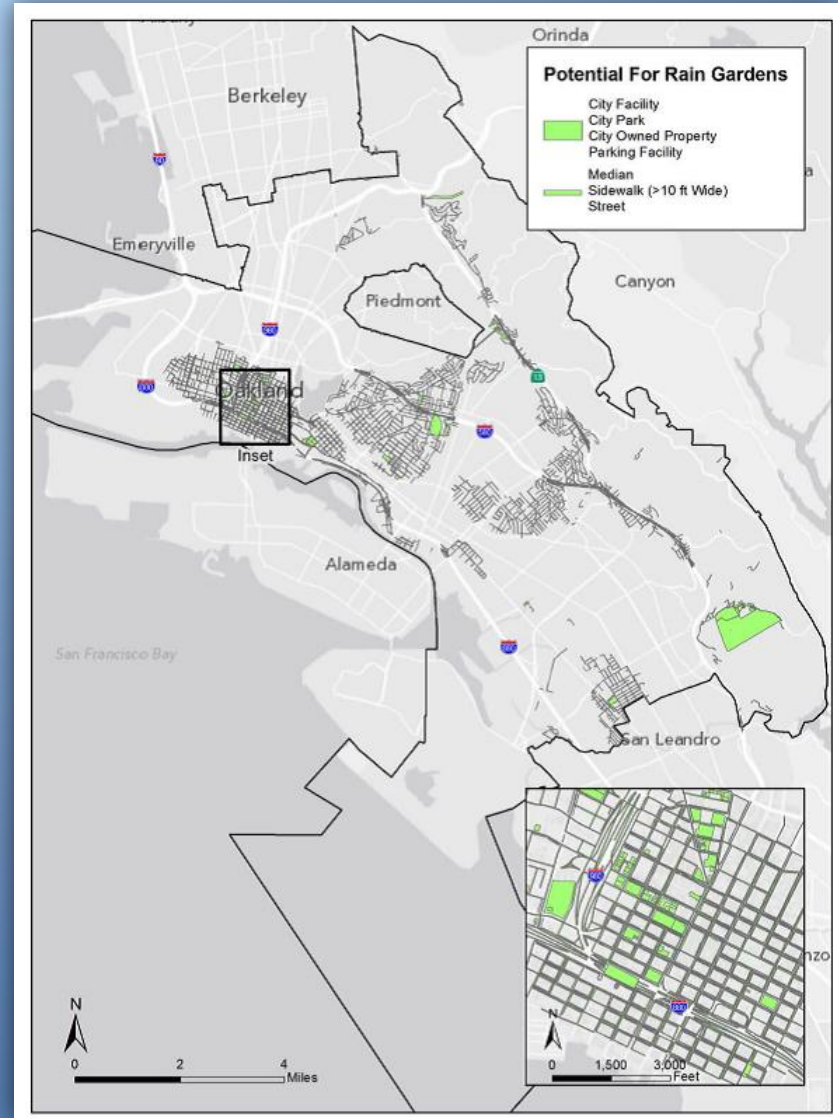
Bioswale at Sail Boat House

- Treats Parking Lot Runoff
- Completion - April 2015



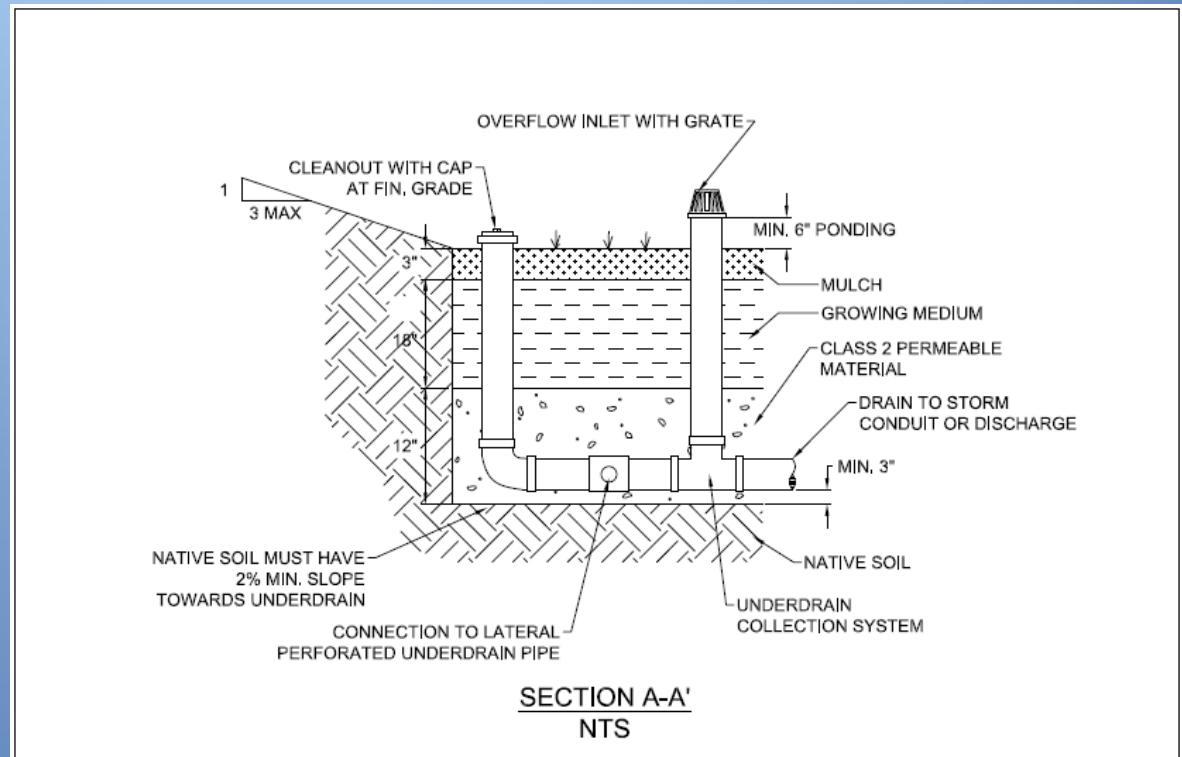
Oakland's Stormwater Retrofit Plan

- Opportunities and feasibility of green infrastructure retrofit projects
- GIS-based screening application
- Focus is City-Owned Land
- Standard Details/Plant



Technical Guidance

- Standard details facilitate inclusion in capital improvement projects
- Create familiarity with new systems
- Construction as important as design



PRIORITY CONSERVATION AREAS-



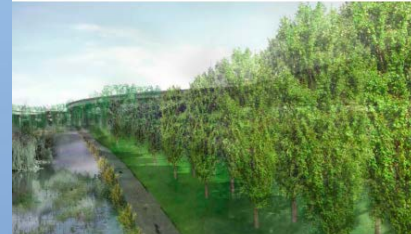
Purposes of Priority Conservation Areas

1. Uses for Urban Greening

Potential "edible park" sites (park + community garden)

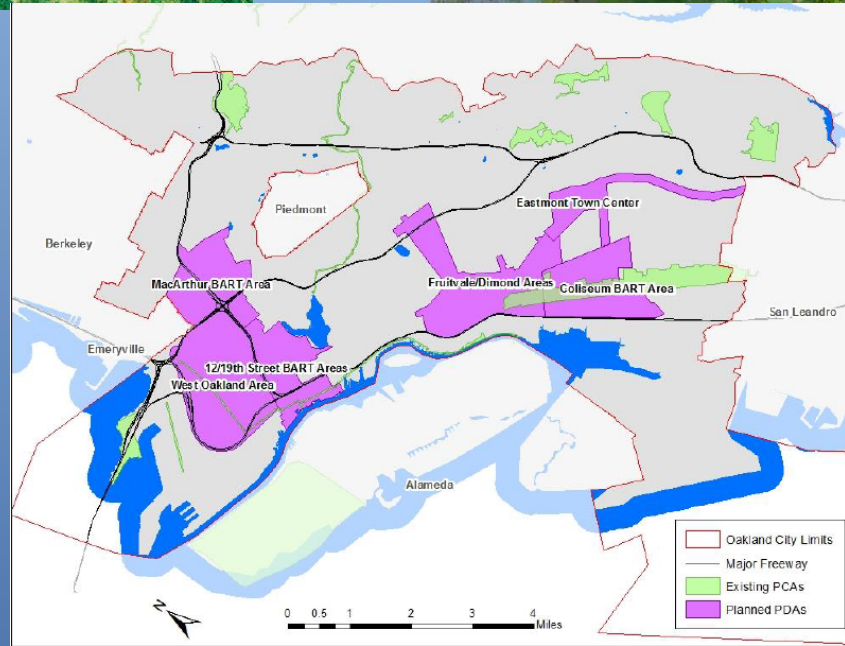
Urban forest areas

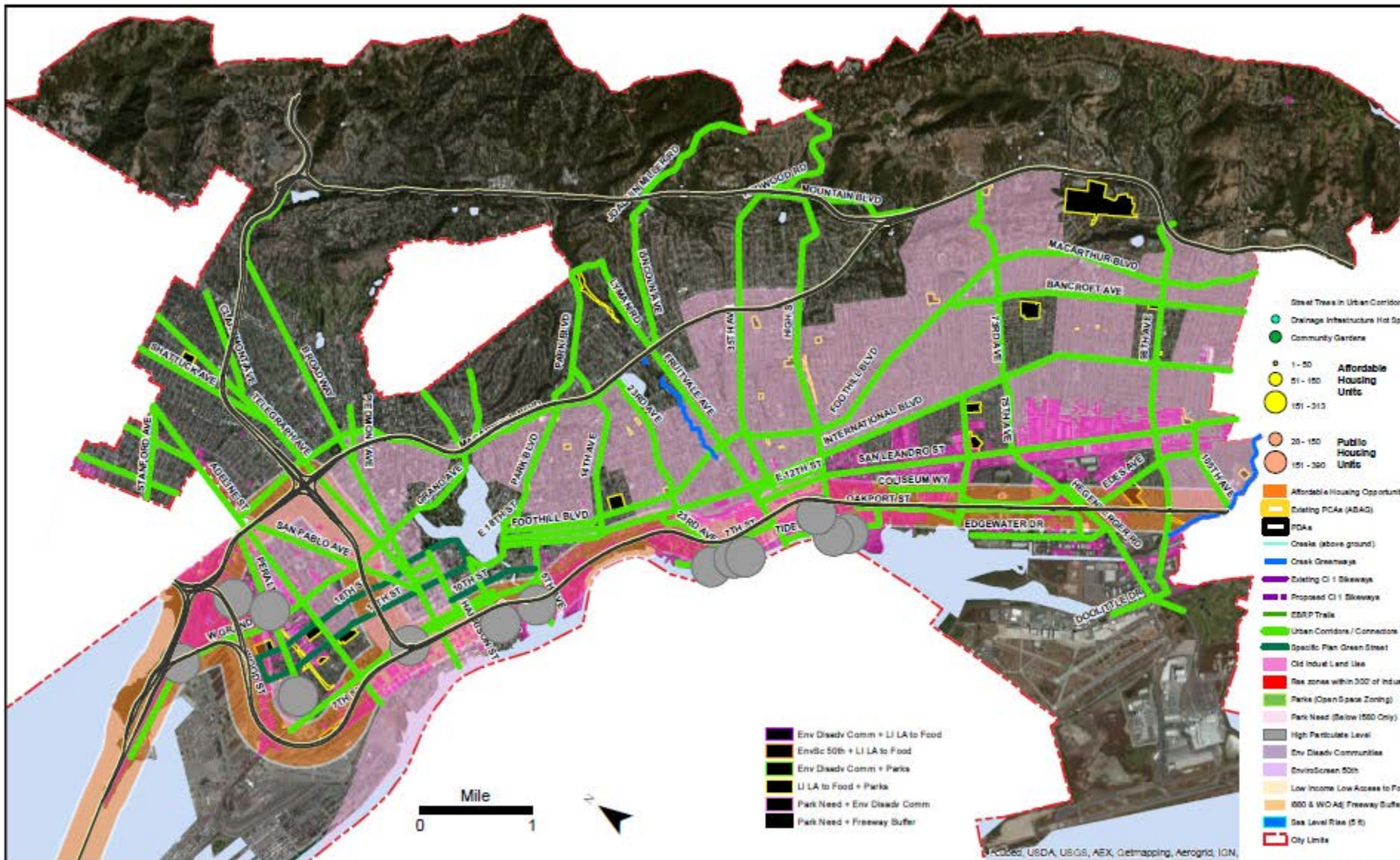
Vegetation near city streams, creek, and lakes



Potential Benefits

- Community Health
- Recreation
- Climate and Resilience
- Wildlife Habitat
- Water Supply and Quality





Urban Greening

Transportation & “Complete” Streets?

Complete Streets

Safe, comfortable & convenient for travel via automobile, foot, bicycle, & transit



Downtown Intersection, Photo : Complete Streets

Need to Include Stormwater Treatment !!!!

Developing Street Typology
Requires Council Adoption
City-Wide Planning



Green Infrastructure - Future

Stormwater Regulatory Requirements

- Evaluation and inclusion of green infrastructure components in private and public development projects
- New pathway towards compliance

California Regional Water Quality Control Board
San Francisco Bay Region
Municipal Regional Stormwater NPDES Permit

Order R2-2009-0074
NPDES Permit No. CAS612008
October 14, 2009



Questions?



Photo: Alameda Countywide
Clean Water Program

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Challenges

- Operations and Maintenance (O&M)
- Limited funding mechanisms
- Lack of familiarity among designers, project managers, and contractors
- Communication & Understanding
- Incorporating into design timelines



PRIORITY CONSERVATION AREAS-



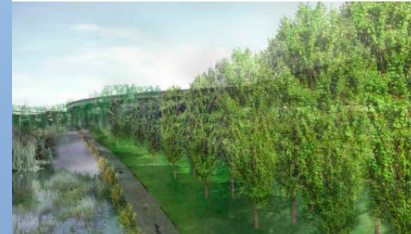
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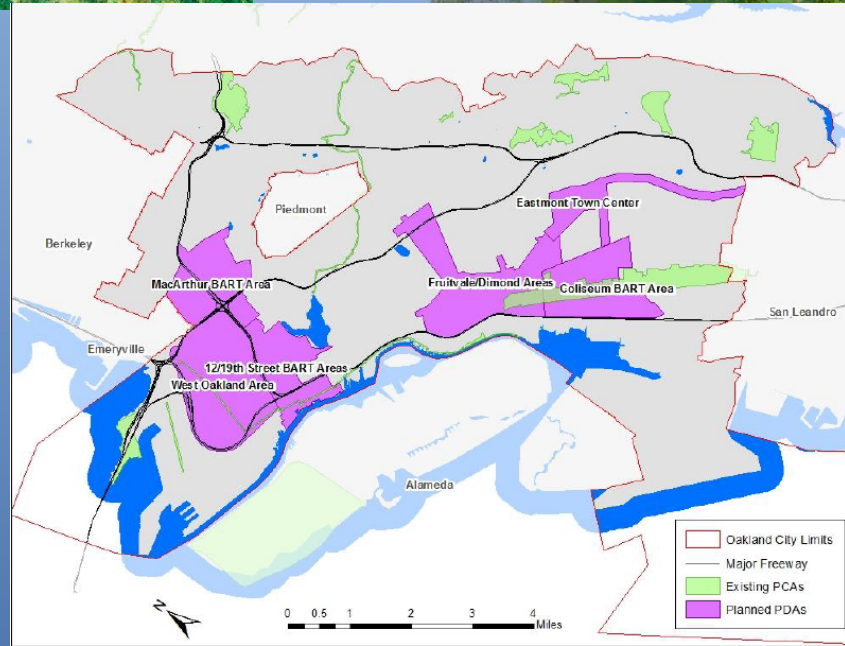
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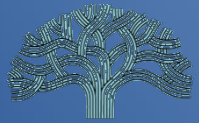
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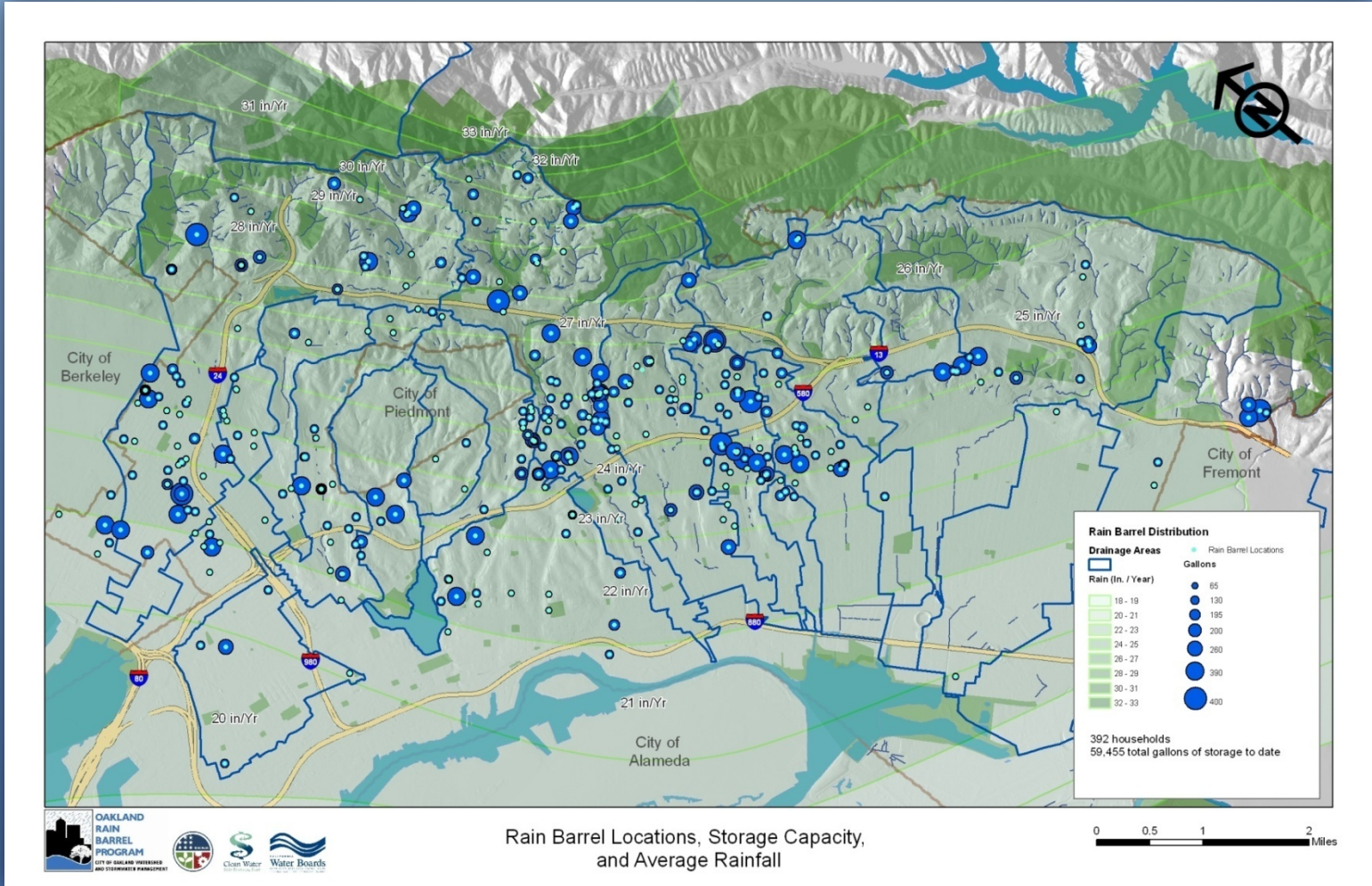
Opportunities

- Cost savings: CIP, maintenance, operational
- Air and water quality improvement
- Flood control
- Neighborhood beautification
- Health and safety improvements
- Traffic calming
- Bike and pedestrian friendly
- Climate change resiliency
- Habitat
- Create more livable city



Oakland's Green Infrastructure

Rain Barrel Program - Over 400,000 gallons stored



Green Streets!

Incorporates green infrastructure to manage stormwater
and

- ✓ Pedestrian friendly
- ✓ Aesthetically pleasing
- ✓ Bicycle Friendly



Arterial Green Street - Photo : San Mateo Countywide Water Pollution Prevention Program

Green
Slow it
Spread it
Sink it



Photo: City of Portland, OR Bureau Environmental Services

Conventional (grey)
Contain
Transport



Photo: San Mateo Co Green Streets Workgroup

Types of Green Infrastructure

Bioswales



BioRetention in Seattle – Photo from NACTO



Green Infrastructure Guidance

- Extensive guidance manuals
- Tools and resources
- Position for funding

