

NATURALISM
The Latest in Living Architecture



Paul Kephart
Rana Creek Living Architecture
January 21, 2010



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LIVING ARCHITECTURE
DESIGNERS

Lessons from Toronto



Green Roof Bylaw passed May, 2009 to require and govern the construction of green roofs on all new construction.

The bylaw applies to new building permit applications made after January 31, 2010 (residential, commercial and institutional) and January 31, 2011 for all new industrial development.

The new bylaw applies to all new development above 2,000m² of Gross Floor Area having a graduated coverage requirement ranging from 20-60%.



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Precedents

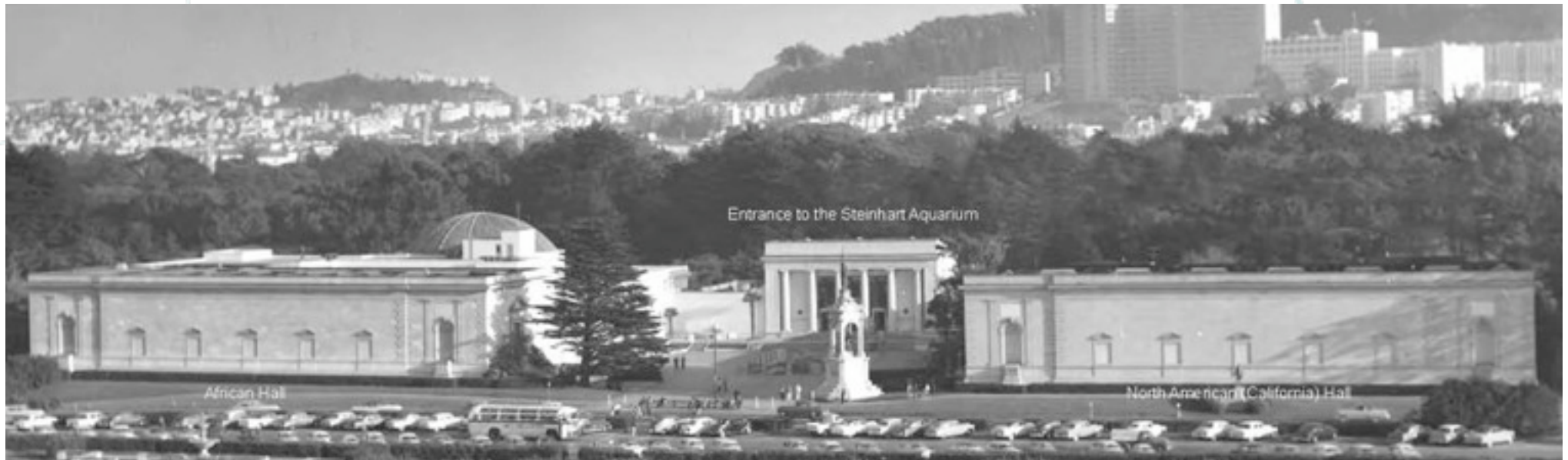


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California Academy of Sciences

"To explore, explain and protect the natural world"



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California Academy of Sciences - Sustainability Highlights



2.5 acres of living roof with 1.7 million native plants framed by photovoltaic canopy

Natural daylight provided to sunlight hungry coral reef and tropical rain forest

90,000 tons of concrete recycled

12,000 tons of steel recycled

Project Cost - \$ 485,000,000



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Monday, October 4, 2010



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California Academy of Sciences - The Team



Renzo Piano Building Workshop
Gordon Chong and Partners
Ove Arup and Partners
SWA Group
Rana Creek Habitat Restoration
Marty Dickson Irrigation
Webcor Builders
Jensen Corporation



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Hayward Mockup



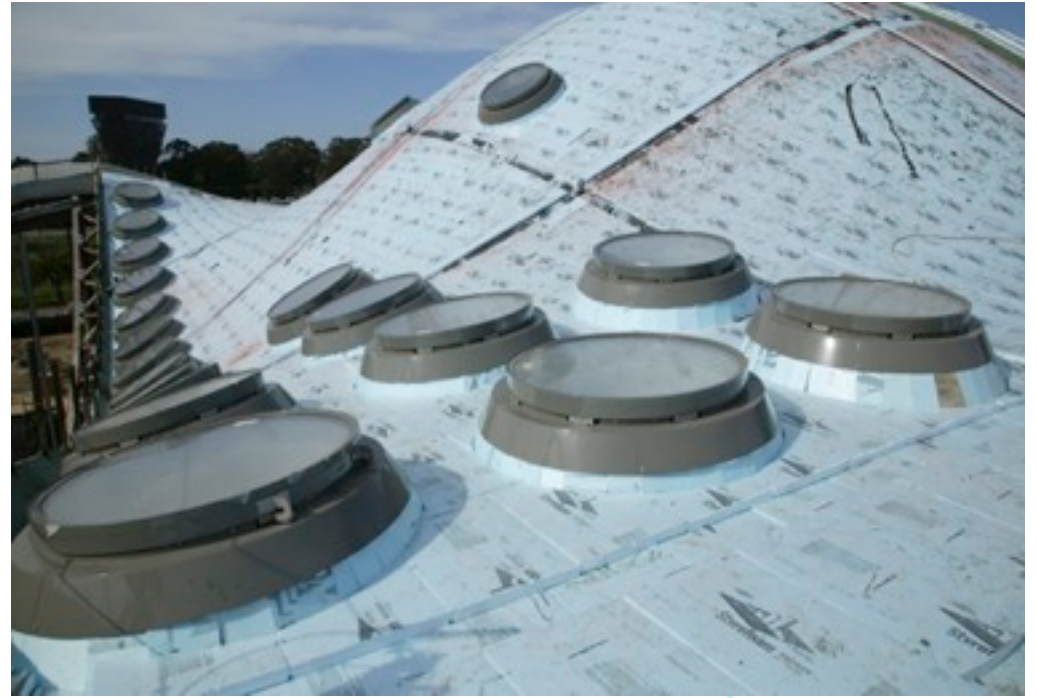
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Projects

Transbay Terminal



CPMC Cathedral Hill Hospital



De Acero Headquarters



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The BIG IDEA behind the design



No potable water for irrigation



No potable water for non potable uses



No groundwater and storm water discharge

Treat waste water and storm water -as part of structure



Encourage bio logical diversity



Increase resource efficiencies - ROI



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Transbay Terminal

Architect: Pelli Clark Pelli

Landscape Architect: Peter Walker Partners

Engineering: Flack & Kurtz, Arup

Ecology: Rana Creek

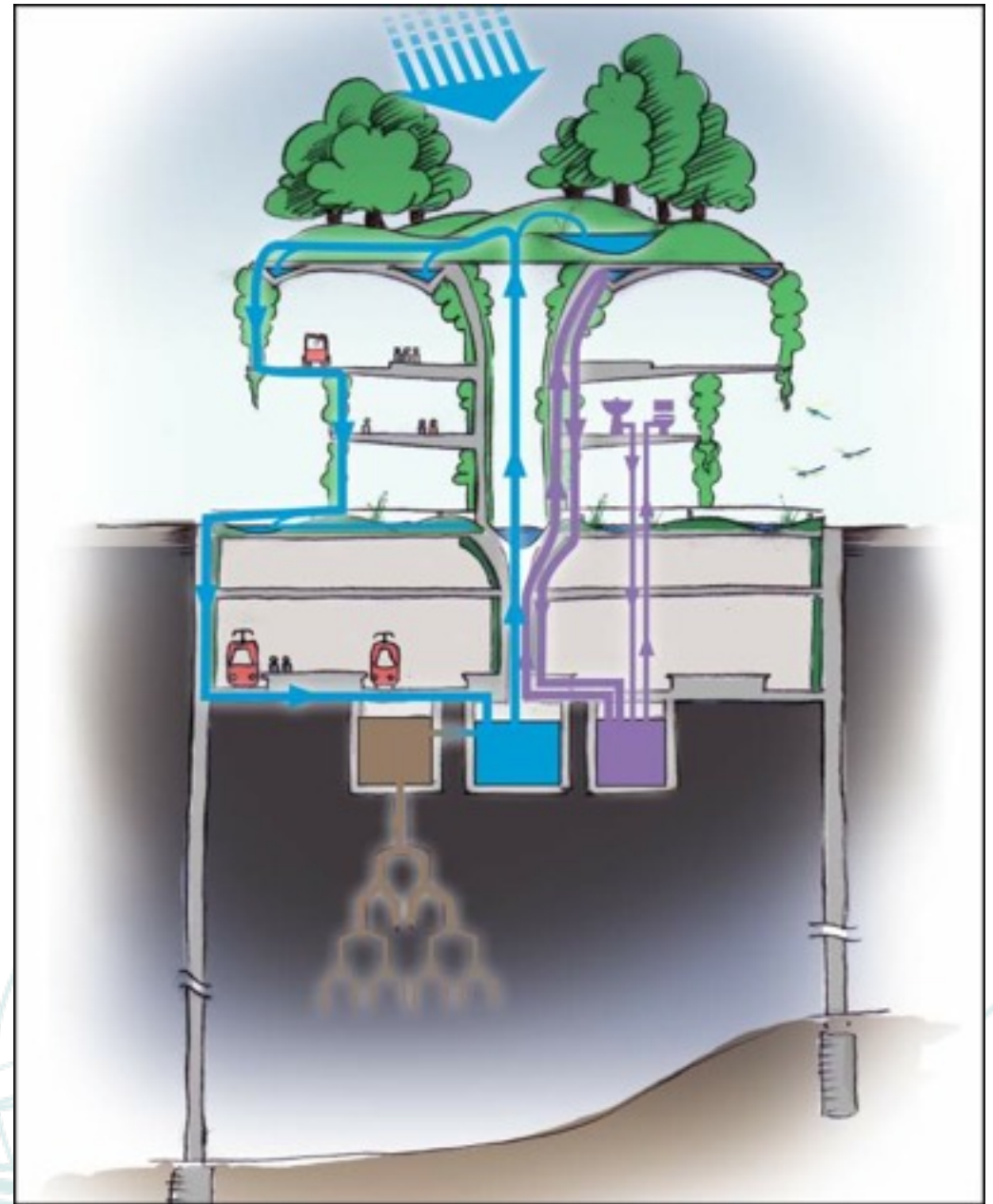


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Basis of Design

Water Concepts

- Stormwater capture and reuse for toilet flushing
- Graywater capture, treatment and reuse for irrigation
- Utilize all water for park amenities and habitat creation
- *Physical water treatment*
- *Biological treatment*
- *Mechanical treatment*
- *Chemical treatment*



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How it works

Learning from nature



Natural Systems

-Examples

- Creeks
- Pools
- Seeps
- Springs
- Estuaries
- Wetlands

Natural Analogues

-Attributes applied

- Topography
- Morphology
- Permeability
- Plant Structure & Form
- Capacity
- Scale

Engineered Systems

-Applications

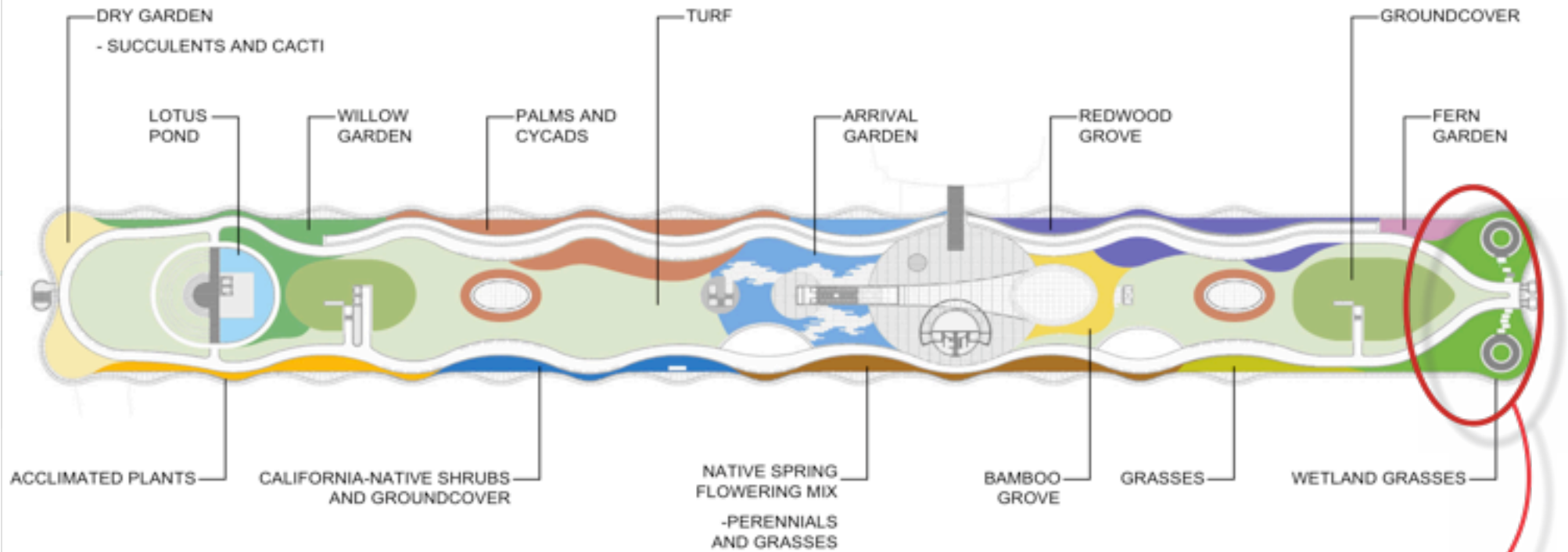
- Bioswales
- Raingardens
- Constructed Vernal Pools
- Constructed Wetlands
- Living Walls
- Living Pools



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Transbay Terminal



Building graywater is brought up to the wetlands for treatment

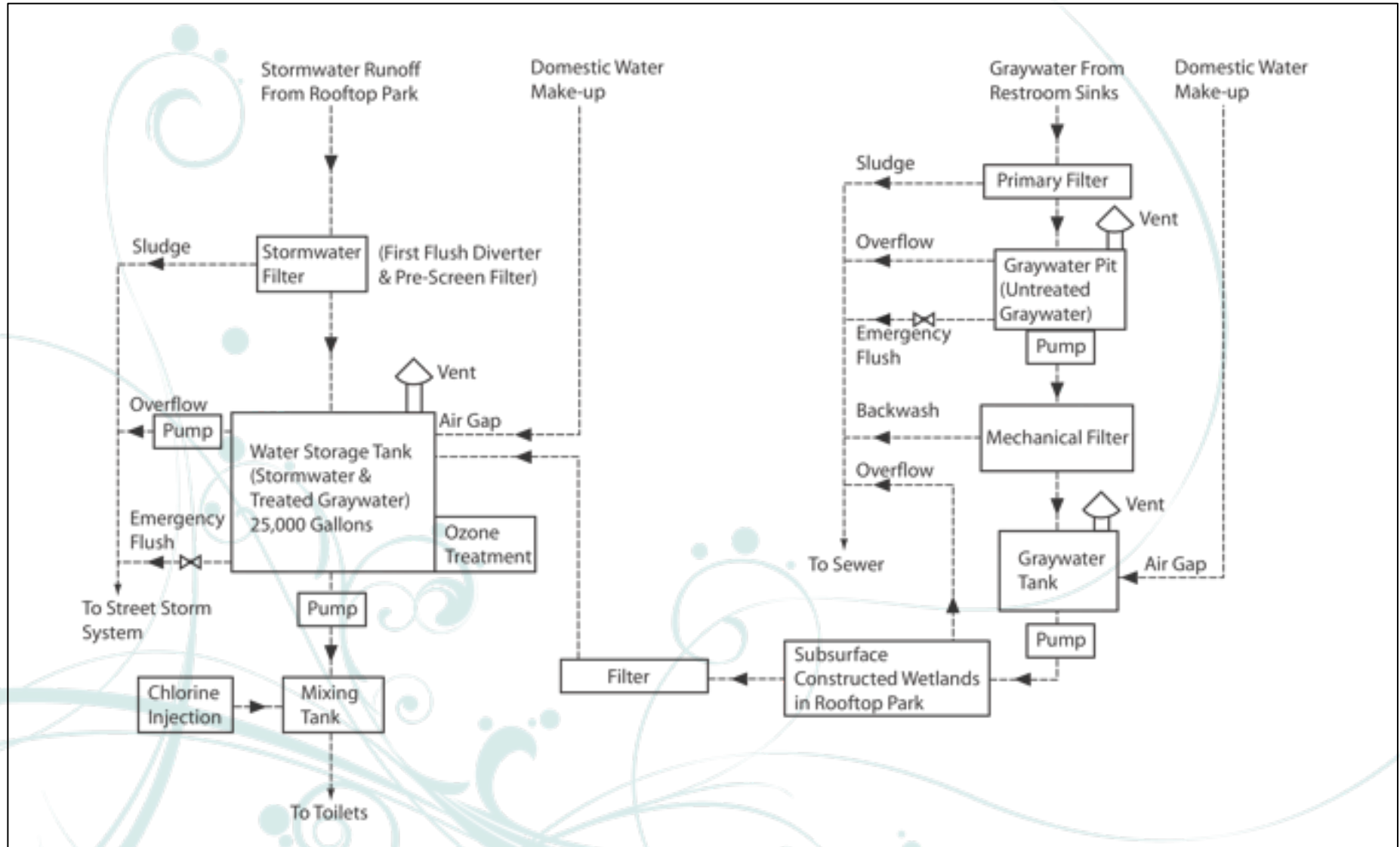


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Transbay Terminal

Water Flow Diagram



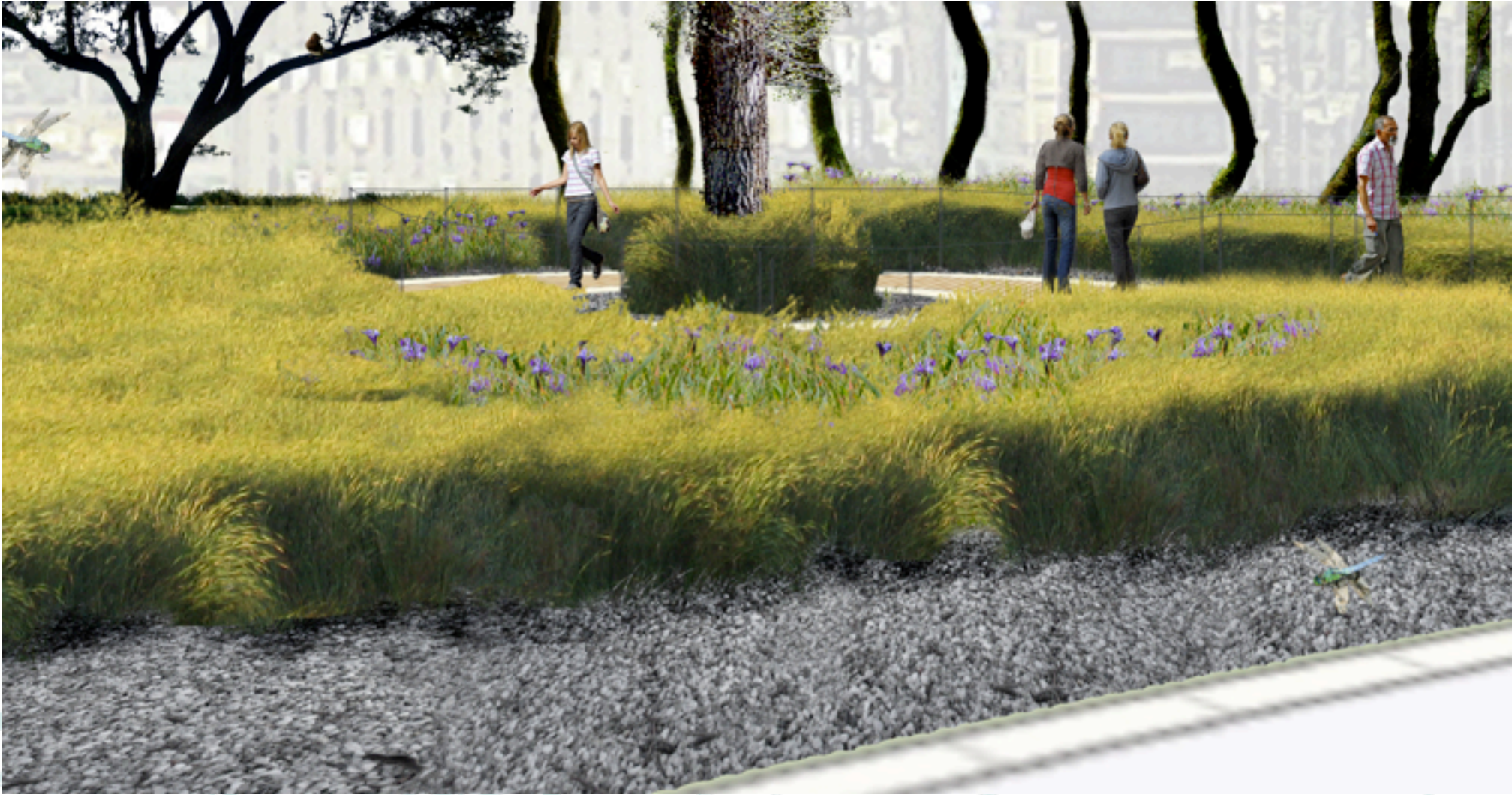
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Wetland



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Redwood Corridor



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Oak Woodland



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CPMC Cathedral Hill Hospital

ARCHITECT: SMITH GROUP

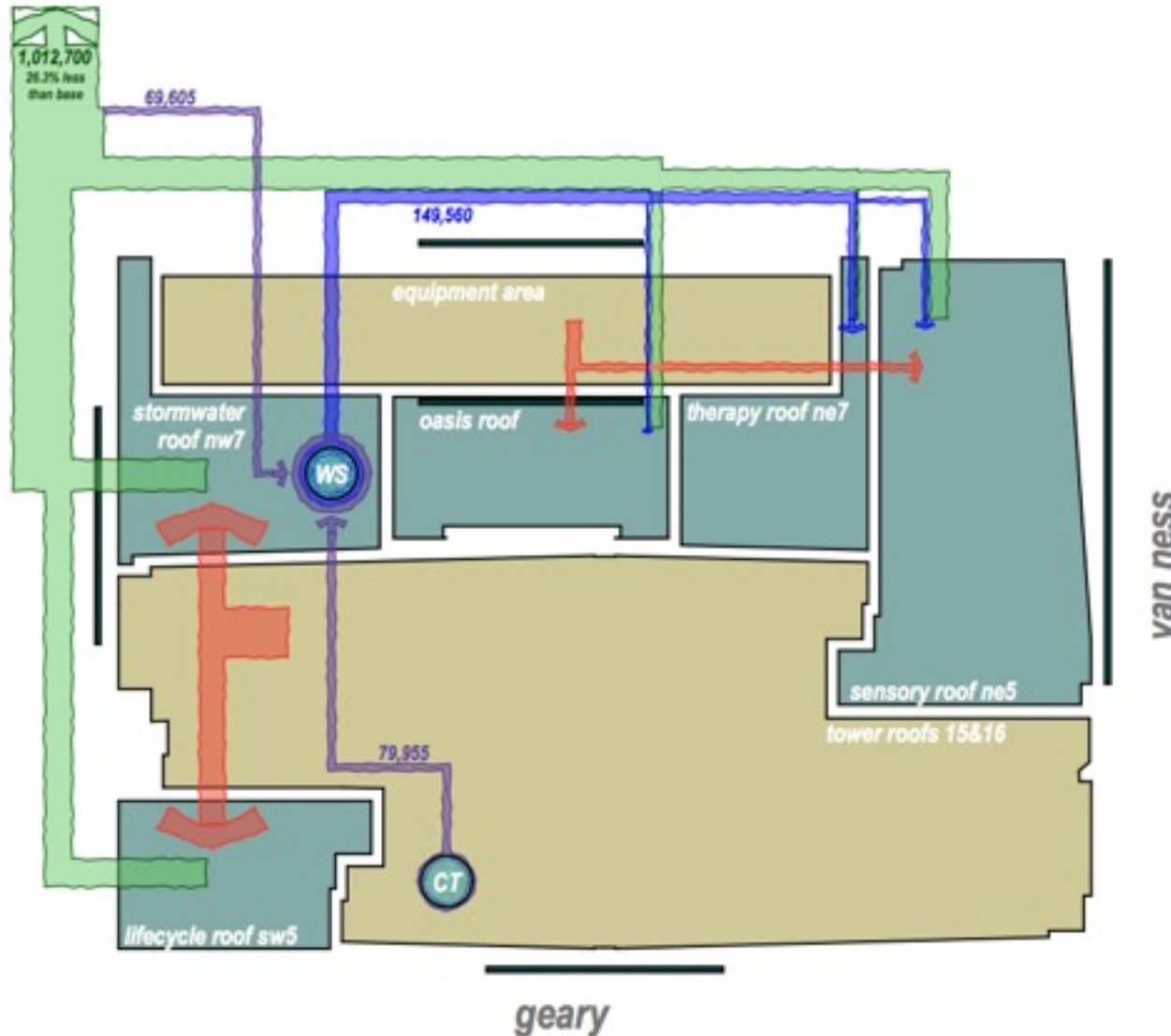
ECOLOGY AND LANDSCAPE: RANA CREEK



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Water Process Flow



Currently investigating:

- Five living roofs to detain and filter stormwater
- All stormwater captured via gravity flow and utilized on-site
- 300,000 gallons of rainwater catchment to supply irrigation and back-up water for cooling tower
- Potential to save over 1,000,000 gallons of water annually and reduce run-off by 75-100%

balanced strategy

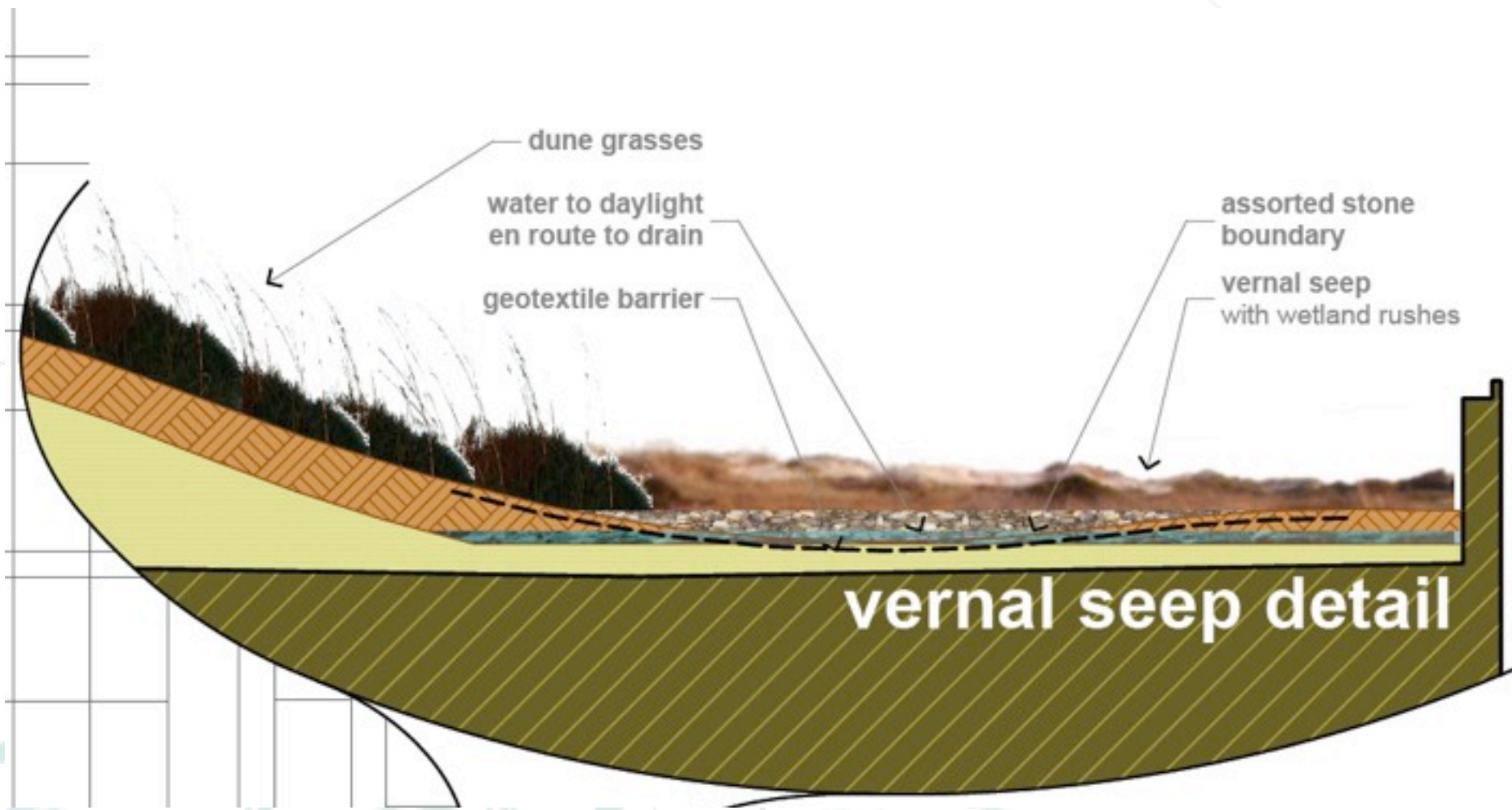


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Stormwater Detention through Natural Systems



Next Question: How is this building curative to patients and the environment?



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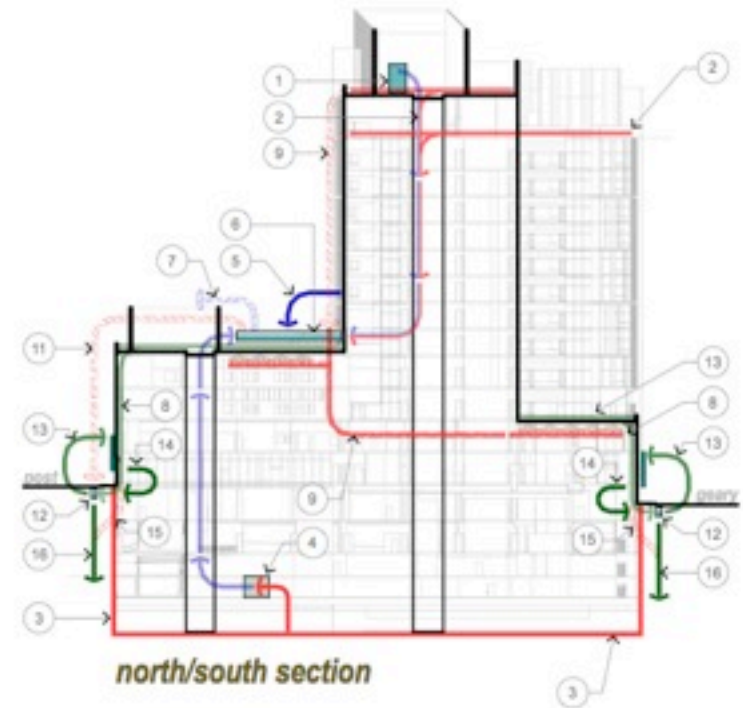
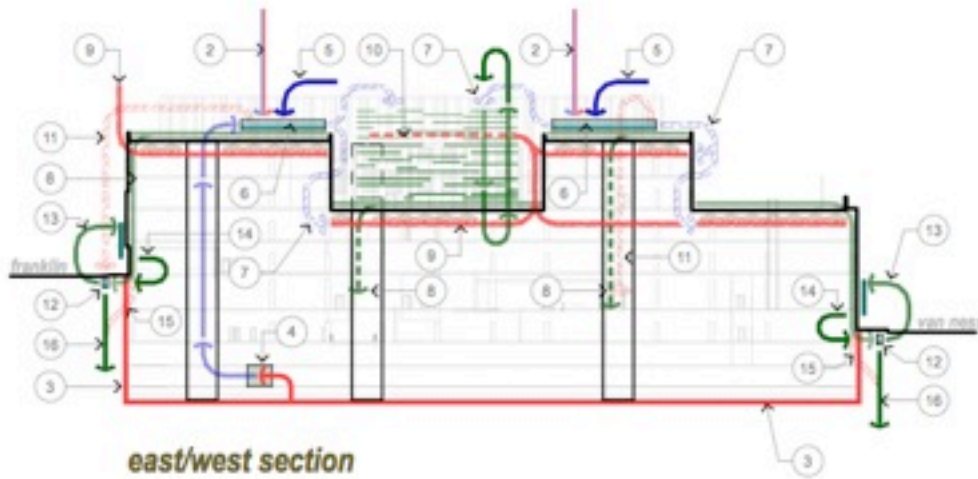
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Living Wall



SOURCES OF WATER

1. cooling tower
2. collect and store stormwater & cooling tower blow down to irrigate intensive roofs
3. capture seepage from foundation de-watering process (verify water quality)
4. treat seepage from foundation de-watering process as required
5. municipal water supply (back-up source)

USE OF WATER

6. rooftop storage, primary irrigation supply for intensive roofs (NES, CoS, NE7)
7. irrigate intensive living roofs and living walls from storage tank
8. drain to ground plane storage





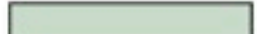



USE OF WATER Cont...

9. stormwater overflows from tower bio-filtered through extensive roofs (SWS, NW 7)
10. stormwater overflows from level 7 bio-filtered through intensive roofs (SE5, NE7 & Co5)
11. overflow to ground plane storage

RE-USE OF WATER

12. ground plane storage, connected series of tanks below sidewalk
13. irrigation from ground plane storage
14. bio-filter water through podium level greening, returned to ground plane storage
15. overflow bypass of ground plane storage
16. bio-filtered water released to combined sewer/storm overflow (CSO)

LEGEND

-  untreated source water
-  irrigation source water
-  high flow event overflow
-  bio-filtered water to recirculate/discharge
-  packaged treatment
-  utility chase
-  water storage
-  irrigation zone/ biofiltration supplied from storage & stormwater overflow



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Natural Analogues



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Deacero Headquarters

Project Architect: Grimshaw Architects

Ecology and Landscape: Rana Creek



Image courtesy of Grimshaw Architects

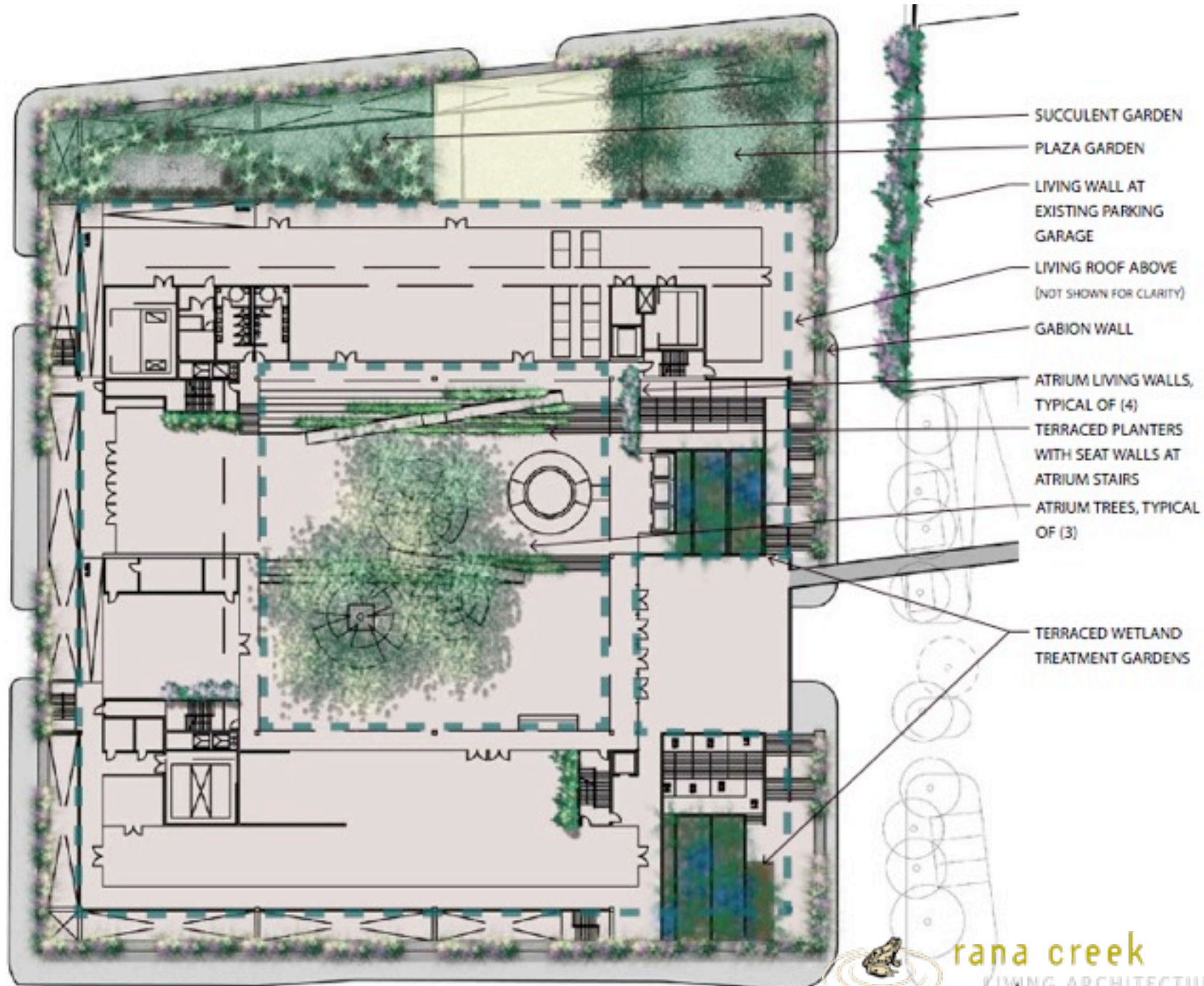


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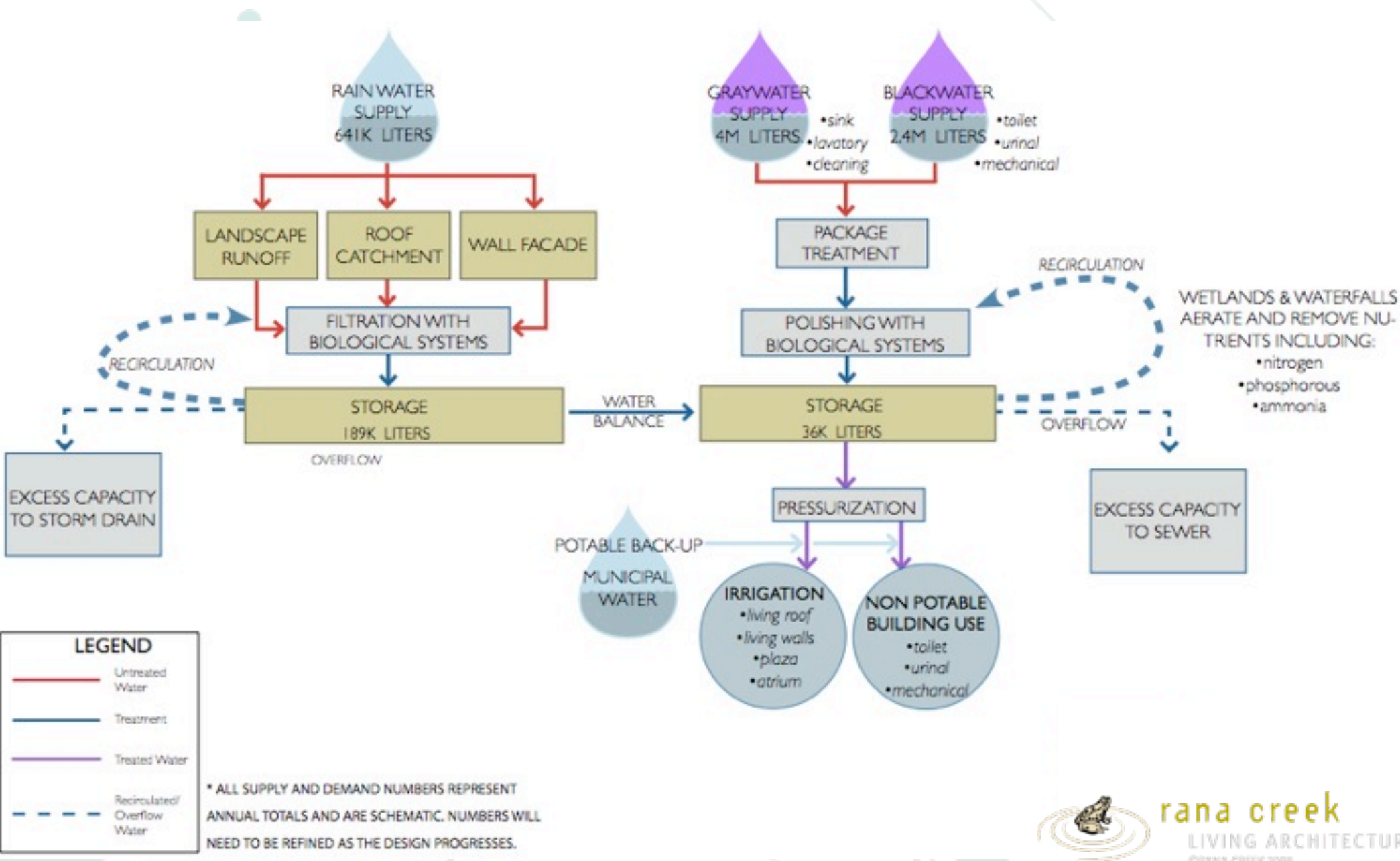
Site Overview

- Landscape function completely integrated with building systems
- Occupant immersion in natural setting



Water Process Flow

100% of building wastewater and stormwater is treated on-site for non-potable uses. This water is captured, filtered and stored to be used for irrigation, flushing toilets and to supply mechanical equipment. Excess water will be sent to the adjacent property for irrigation.



Water Treatment System



LIVING ROOF RETAINS AND PURIFIES STORMWATER

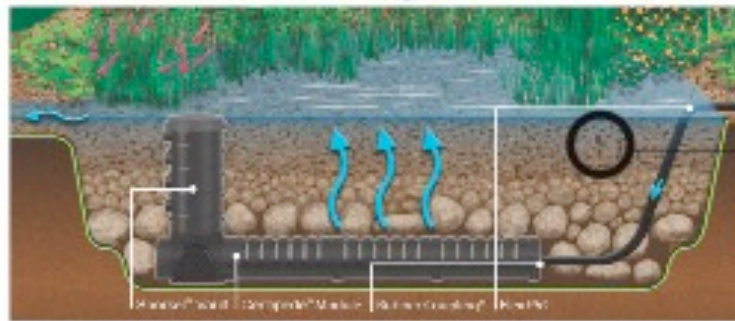
BUILDING COLLECTION & DISTRIBUTION

LIVING WALLS PROVIDE AERATION & TREATMENT

STORAGE TANKS

TREATMENT AND RECIRCULATION CORE

| LEGEND | |
|--------|----------------------------|
| | Untreated Water |
| | Treatment |
| | Treated Water Distribution |



TYPICAL SECTION OF WETLAND TREATMENT CELL



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Water Analysis

WATER BALANCE (annual):

Total Non-potable Demand: 1,060,000 gal.

Total Supply: 1,800,000 gal. (from water treated on-site)

*Excess Water: 740,000 gal.

*Excess treated water will be used at the adjacent property for landscape irrigation.

TOTAL ANNUAL WATER SAVINGS:

1,060,000 gal.

WATER FEES (monthly):

Conventional System: \$2,101

Proposed System: \$455

Annual Savings: \$19,752

RETURN ON INVESTMENT:

The treatment system will **pay for itself in 3-5 years through annual savings in water fees.**

Next Questions:

What is the system life cycle?

What is the financial comparison between conventional municipal and ecological designed systems ?



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Bigger vision - Restorative Architecture

The integration of:

ART:

Contextual
Interpretive
Regional

SCIENCE:

Architecture, Landscape Arch, Environmental Engineering,
Biotechnology, Horticultural, Land-Use Planning...

SUSTAINABILITY:

Minimizing population effect
Nutrient/energy balance
Hydro logics
Energy conservation
Spiritual and psychological well being
Maintaining and encouraging biodiversity



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