

Achieving Sustainability in Municipal Treatment Projects: Progressive Initiatives in Rational Design

1. Sustainability Defined
2. Applying the LEED™ Framework
3. Implementing Sustainable Strategies
4. Optimizing the Design Process
5. Public Awareness & Education



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Jeff McGraw has been with Michael Willis Architects since its inception in 1988 and has been the Principal-in-Charge of the Portland office for six years.

Jeff directs MWA's water and wastewater treatment facility projects in Oregon, California, and Washington which frequently include process buildings, water quality laboratories, control facilities, administrative, and touring facilities.

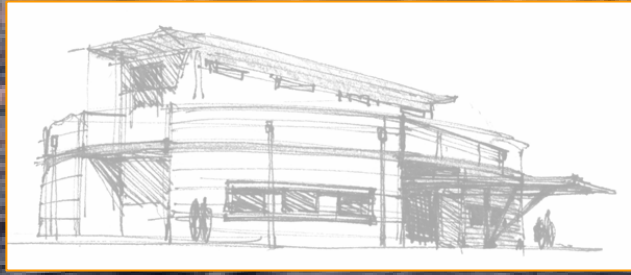
Michael Willis Architects



Portland | San Francisco | Oakland



Michael Willis Architects: Water Facility Projects



1. Sustainability Defined

Seven Generations

Meeting the needs of the present generation without compromising the ability of future generations to meet their own needs.

The Tripod of Sustainability



1. Sustainability Defined

What are we doing to promote sustainability in our public infrastructure?

- Are **plant processes optimized**
- Are we **harvesting** all available resources?
- Are **structures** designed with sustainable principles?
- Sustainable principles in **site design**?
- Are your **neighbors and rate payers** aware of your sustainable efforts?

1. Sustainability Defined

The average daily requirement for fresh water in the United States is about 40 billion gallons a day, with about 300 billion gallons used untreated for agriculture and commercial purposes.

Public water suppliers process 38 billion gallons of water per day for domestic and public use

Approximately 3 percent of total U.S. electricity is used in the municipal water and wastewater sector.

As much as one-quarter to one-half of the electricity used by most U.S. cities is consumed at municipal water and wastewater treatment facilities.

Sources: EPA and Lawton, OK WTP and WETT at Lawrence Berkley Lab

1. Sustainability Defined

The average household in the United States uses about 8,900 kilowatt-hours of electricity each year."

one 6' fume hood consumes approximately the same amount of energy as a small household.

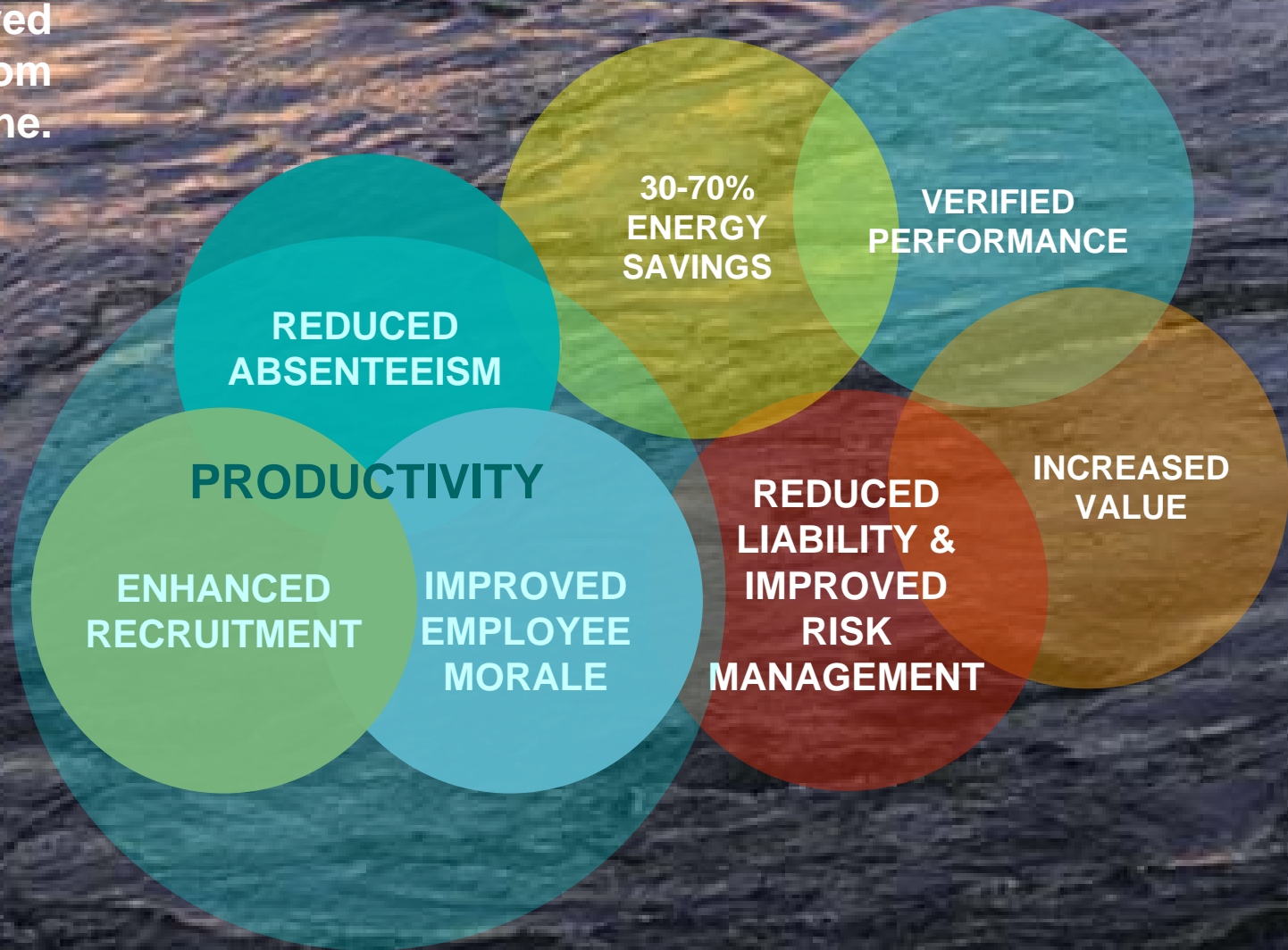
1. Sustainability – Defined

Improved
Bottom
Line.



2. Applying the LEED™ Framework

Improved
Bottom
Line.



2. Applying the LEED Framework



Leadership in Energy and Environmental Design

- A USGBC framework to measure and recognize sustainable design
- Point system quantifies level of certification
- Increased Initial costs depending on level of certification, ultimately resulting in lower life cycle costs

Certified

26-32 points

Silver

33-38 points

Gold

39-52 points

Platinum

52-69 points

2. Applying the LEED Framework— Who requires LEED™?

▪ COUNTIES, CITIES & TOWNS

ARLINGTON COUNTY, VA

KING COUNTY, WA

BABYLON, NY

SARASOTA COUNTY, FL

CINCINNATI, OH

SAN ANTONIO, TX

NASHVILLE, TN

SANTA MONICA, CA

SAN DIEGO, CA

WASHINGTON, DC

SEATTLE, WA

BAR HARBOR, ME

CRANFORD, NJ

PORTLAND, OR

HONOLULU, HI

OAKLAND, CA

SAN FRANCISCO, CA

WEST HOLLYWOOD, CA

ACTON, MA

PORTSMOUTH, NH

PASADENA, CA

MONROE COUNTY, NY

LOS ANGELES, CA

ISSAQUAH, WA

HOWARD COUNTY, MD

GAINESVILLE, FL

SUNNYVALE, CA

CALGARY, AB

BALTIMORE COUNTY, MD

CHATHAM COUNTY, GA

MIAMI LAKES, FL



2. Applying the LEED Framework – Who Requires LEED?

■ STATES

HAWAII

MINNESOTA

NEW YORK

MARYLAND

OREGON

PENNSYLVANIA



2. Applying the LEED Framework – Who requires LEED?

City of Portland

New Construction	
Development Type	Green Building Standard Required
<ul style="list-style-type: none"> Commercial / Mixed-Use 	LEED NC (“New Construction”) Silver Certification
<ul style="list-style-type: none"> Residential 	Greening Portland’s Affordable Housing (ALL)
<ul style="list-style-type: none"> < 5 stories of the structure 	Earth Advantage Green Certification
<ul style="list-style-type: none"> = 5 stories 	Earth Advantage Green or LEED NC Silver based on the particular configuration of entire building
<ul style="list-style-type: none"> > 5 stories 	LEED NC Silver Certification
<ul style="list-style-type: none"> City-Owned Buildings 	<ul style="list-style-type: none"> LEED NC Gold Certification “Ecoroof” or “Energy Star” approved roofing material Operations & maintenance according to guidelines established by the Bureau of General Services

Rehabilitation	
Development Type	Green Building Standard Required
<ul style="list-style-type: none"> Commercial / Mixed-Use 	
<ul style="list-style-type: none"> o Full-building 	LEED NC Silver Certification
<ul style="list-style-type: none"> o Partial-building o Tenant improvements 	LEED CI (“Commercial Interiors”) Silver and/or G-Rated Tenant Improvement Guide Certification
<ul style="list-style-type: none"> Residential 	Greening Portland’s Affordable Housing (ALL)
<ul style="list-style-type: none"> < 5 stories of the structure 	Earth Advantage Green Certification
<ul style="list-style-type: none"> = 5 stories 	Earth Advantage Green or LEED NC Silver based on the particular configuration of entire building
<ul style="list-style-type: none"> > 5 stories 	LEED NC Silver Certification
<ul style="list-style-type: none"> City-Owned Buildings 	<ul style="list-style-type: none"> LEED Commercial Interiors (CI) Silver Certification; OR G/Rated Tenant Improvement Guide Certification

2. Applying the LEED Framework – Results 2003

Energy Use

Reduced Energy Use in Green Buildings as Compared with Conventional Buildings

	Certified	Silver	Gold	Average
Energy Efficiency (above standard code)	18%	30%	37%	28%
On-Site Renewable Energy	0%	0%	4%	2%
Green Power	10%	0%	7%	6%
Total	28%	30%	48%	36%

Source: USGBC, Capital E Analysis



2. Applying the LEED Framework – Results 2003

Financial Benefits of Green Buildings Summary of Findings (per ft²)

Benefits / SF

	Category 20-year Net Present Value
Energy Savings	\$5.80
Emissions Savings	\$1.20
Water Savings	\$0.50
Operations and Maintenance Savings	\$8.50
Productivity and Health Benefits	\$36.90 to \$55.30
Subtotal	\$52.90 to \$71.30
Average Extra Cost of Building Green	(-3.00 to -\$5.00)
Total 20-year Net Benefit	\$50

Source: USGBC, Capital E Analysis

3. Implementing Sustainable Strategies – Building Design

Designing for a Healthy Work Environment

- Natural Daylight
- Indoor Air Quality
- Thermal Comfort Control
- Logical Program Organization
- Strong connections to outdoors

Materiality

- Low / No Maintenance
- Regional / local materials
- FSC Certified Woods
- Recycled / recyclable
- Waste Minimization
- Rapidly Renewable Materials
- Low Embodied Energy
- Minimized Off-gassing



Energy / Resources / Atmosphere

- Maximize Alternative / Renewable Energy
- Maximize Plant Generated Energy
- Optimize Mechanical Systems/ “Commissioning”
- Minimize Dependency on fossil fuels
- Water Use Reduction
- Innovation in Water Use / Reuse
- Vegetation Helps Break down CO₂
- Open Volumes are more efficient to Heat / Cool

Innovation in Design

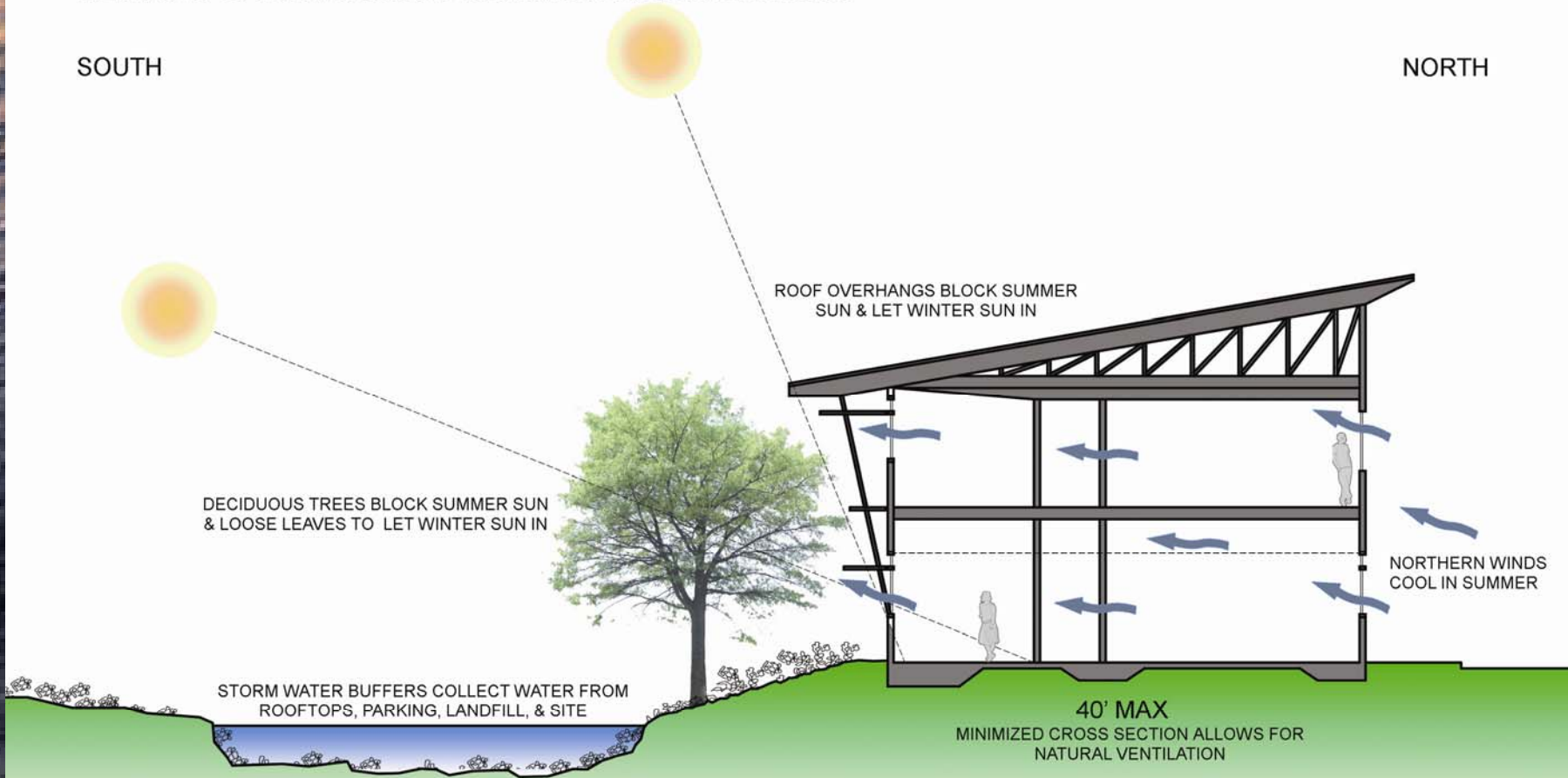
- The Project must hold value to it's workers as well as the public
- Let these projects help define a better relationship with our rivers
- Contextual* design, responding to climate

3. Implementing Sustainable Strategies – Building Design

CLIMATIC ORIENTATION AT ADMINISTRATION BUILDING

SOUTH

NORTH



3. Implementing Sustainable Strategies – Building Design



Client: EBMUD **Location:** El Sobrante, CA **Size:** 60 MGD **Year:** 1991

3. Implementing Sustainable Strategies– Building Design



SHADING & DAYLIGHTING

Client: MWD **Location:** Granada Hills, CA **Size:** 750 MGD **Year:** 2005

3. Implementing Sustainable Strategies – Building Design



This project was supported by the 2006 Van Evera Bailey Fellowship, which is funded by the Van Evera and Janet M. Bailey Fund of The Oregon Community Foundation and awarded in partnership with the Architecture Foundation of Oregon

The 22@ District: New ideas for neighborhood infrastructure

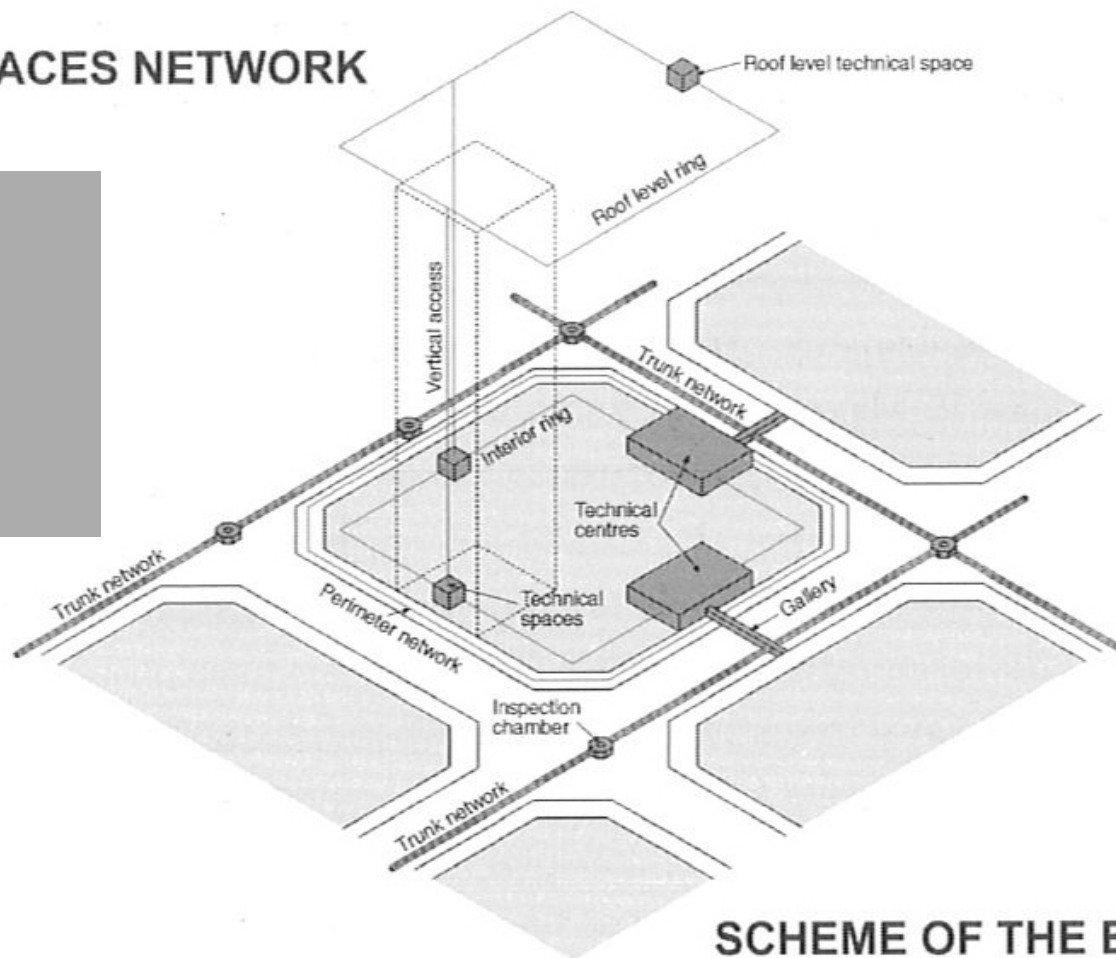


The infrastructure model:

Rational
Efficient
Sustainable

37 km of trunk network

SPACES NETWORK



Implementation – Site Design

Functionality in Landscape Architecture

Buffer: odor / sight / noise

Enhance Recreation / Open Spaces

Exemplary Storm Water Management

Harness / Utilize Runoff

Recharge Groundwater

Utilize Pervious Pavement

Mitigate / Eliminate Erosion

Site Preservation / Restoration

Restore / Redevelop Brownfield Sites

Restore / Redevelop Demolition Sites

Avoid Building on Previously
Undisturbed Areas

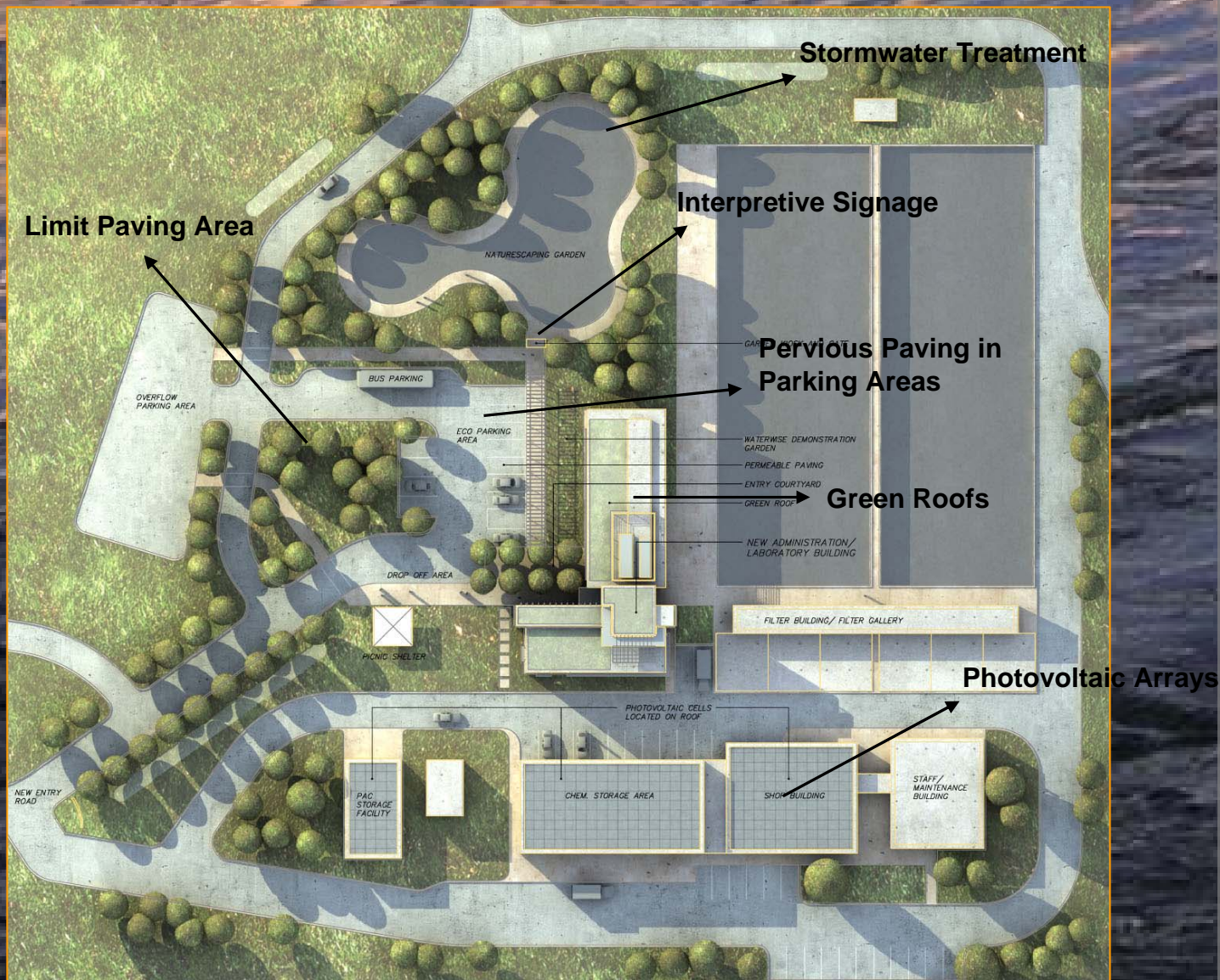
Building Footprint

Maximize / preserve open space

Orient to advantage natural energy
resources

Match natural grade where possible

3. Implementing Sustainable Strategies – Site Design



Client: City of Goleta **Location:** Santa Barbara, CA **Size:** 35 MGD

3. Implementing Sustainable Strategies— Site Design



Site Design

Watsonville Recycled Water Treatment Facility

Raines, Melton & Carella, Inc., Engineers
Michael Willis Architects
GreenWorks, P.C., Landscape Architecture · Environmental Design

October 14, 2004



Client: City of Watsonville **Location:** Watsonville, CA **Size:** 15,000 sf **Year:** 2007

3. Implementing Sustainable Strategies– Site Design



Operations & Headworks Building

Client: LOTT Wastewater Alliance **Location:** Lacey, WA **Size:** 5 MGD **Year:** 2005

3. Implementing Sustainable Strategies – Site Design



Client: LOTT Wastewater Alliance **Location:** Olympia, WA **Size:** 5 MGD **Year:** 2006

3. Implementing Sustainable Strategies– Site Design



3. Implementing Sustainable Strategies– Site Design



3. Implementing Sustainable Strategies– Site Design



3. Implementing Sustainable Strategies - Buildings



Designed to
LEED™
Platinum



**BUILDINGS ARE MACHINES:
OPTIMIZE THEM**

Client: City of Goleta **Location:** Santa Barbara, CA **Size:** 35 MGD

3. Implementing Sustainable Strategies– Green Roofs



3. Implementing Sustainable Strategies– Green Roofs

GREEN ROOFS:

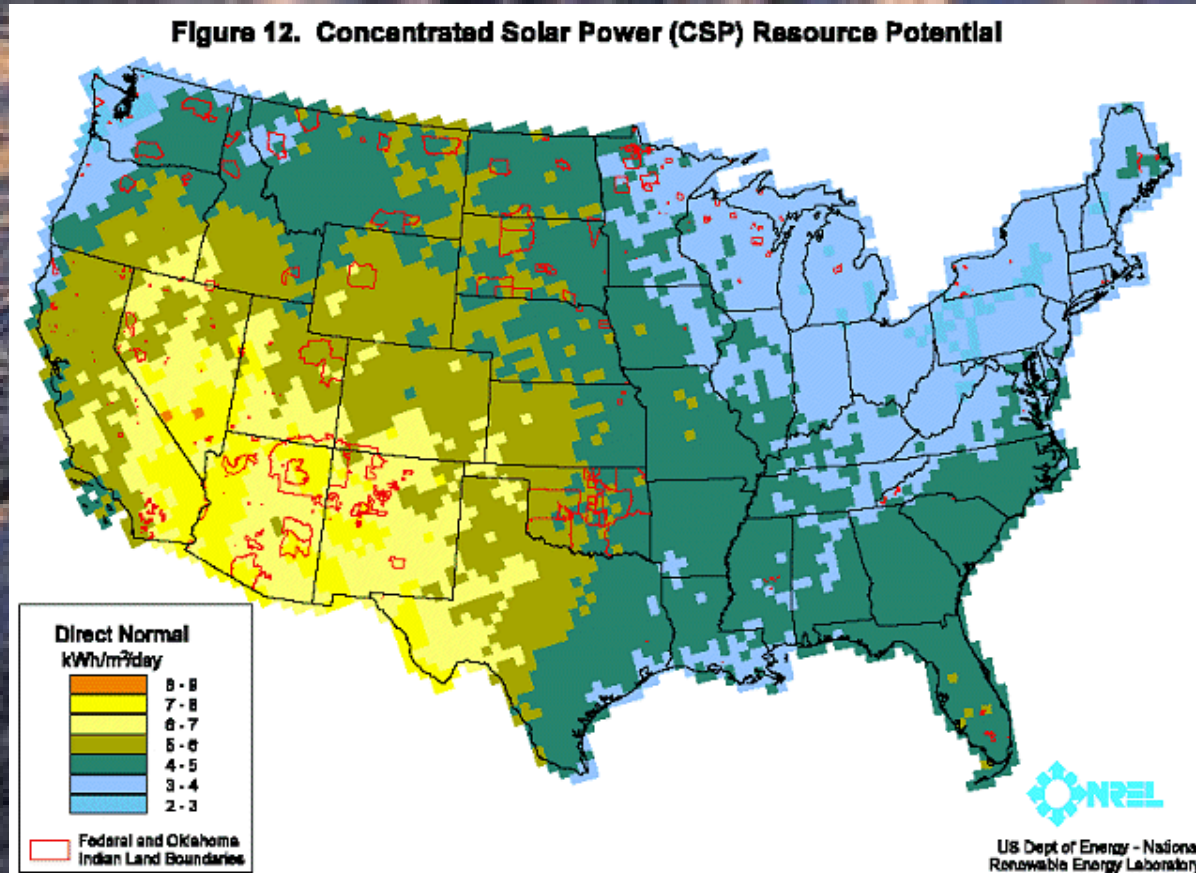
- **Double Life of Roof Membranes**
- **Provide Sound Insulation**
- **Reduce HVAC Size**
- **Improve Air Quality**
- **Reduce Heat Island Effect**
- **Stormwater Transpiration and Reduction of 25-40%**
-

3. Implementation – When and where should we use PV's



100 hp from PV's in Seattle,
WA requires = two acres of
PV's

3. Implementation – When and where should we use PV's



Estimated Solar Energy For The Contiguous United States Kilowatt Hours Per Region

Technology is improving quickly but payback is still 12-20 years on PV systems

3. Implementation – PV's and other renewable energy sources

Business Energy Tax Credit: The tax credit is 35 - 50 percent of the eligible project costs for:

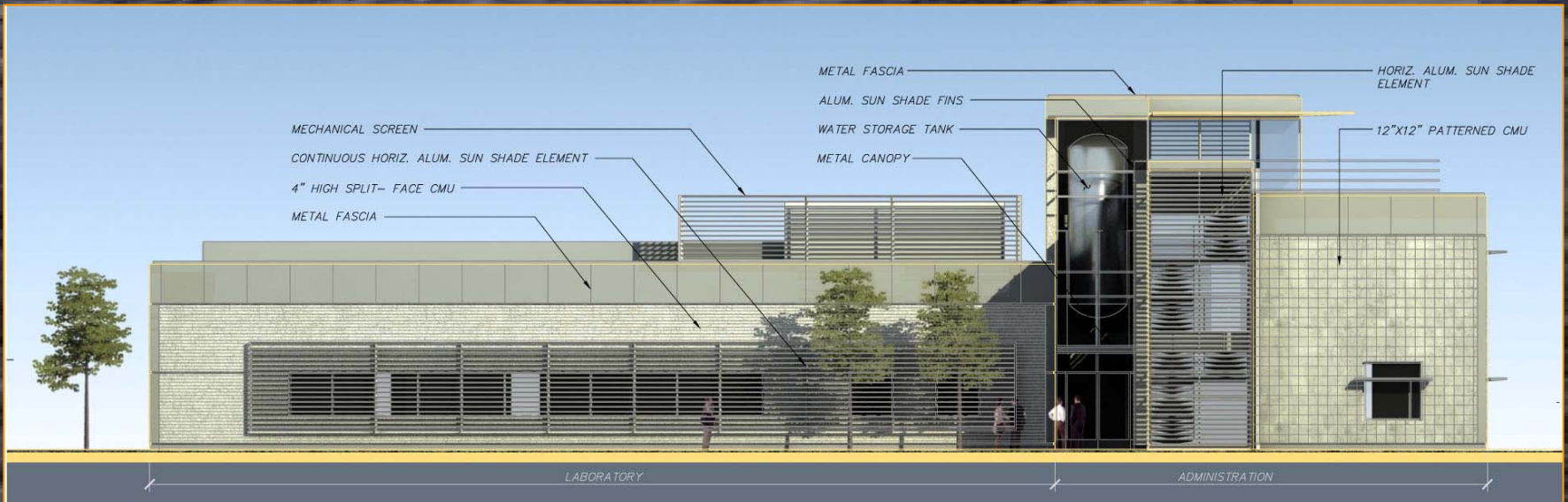
- **High Efficiency Combined Heat and Power**
- **Renewable Energy Resource Generation**
- **Renewable Energy Resource Equipment Manufacturing Facilities**

4. Optimize the Design Process – Regionalism



Client: City of Crescent City **Location:** Crescent City, CA **Size:** 15 MGD **Year:** 2005

4. Optimize the Design Process – Regionalism



Client: City of Goleta **Location:** Santa Barbara, CA **Size:** 35 MGD

5. Public Education & Awareness



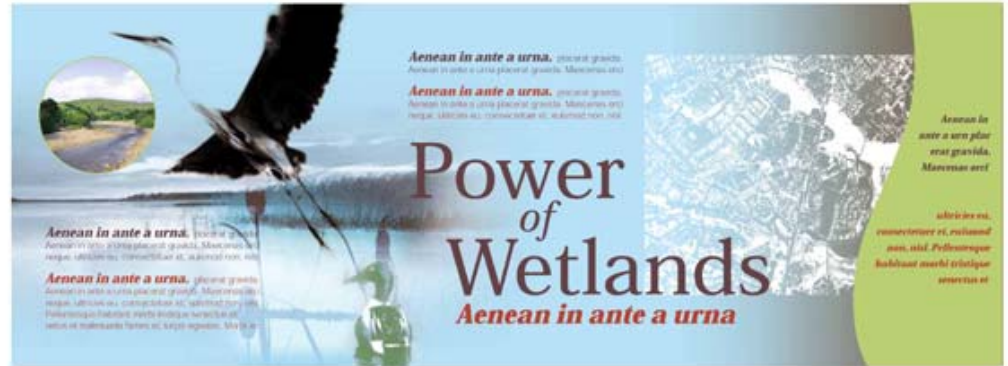
5. Public Awareness & Education

Watsonville Water Resources Center

INTERPRETIVE PROGRAM



Logo options



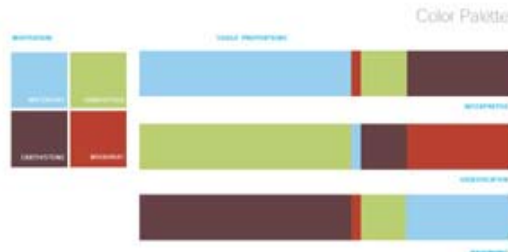
Interpretive signage



Wayfinding signage



Identification signage



Type usage

Safeguarding the Sanctuary

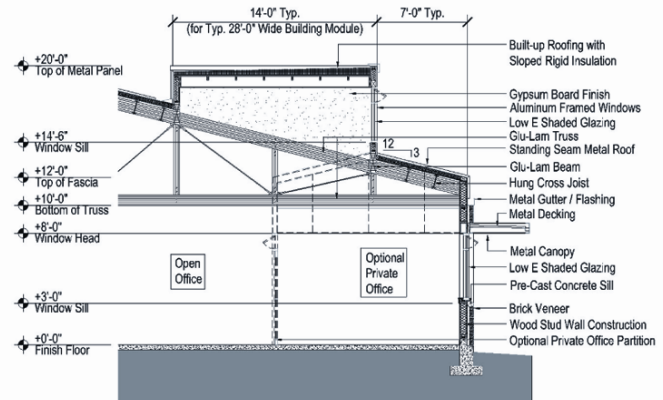
Aenean in ante a urna placerat gravida. Aenean in ante a urna placerat gravida. Maecenas nisi neque, ultricies eu, convallis et, sed nunc non, nisi. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Morbi ac eros. Aenean gravida. Aenean rutrum massa a nisi. Aliquam vel magna. Suscipit scelerisque pede ut, nisi. In convallis eget ante. Phasellus nulla lectus, interdum quis, placerat eget, semper ac, tortor. Nunc ac, dui in sem tempus fames.

5. Public Awareness & Education



Non-Process Buildings

- m. NP-12 Daylight Lantern - Wall Section
Daylight lanterns are used over open office, lunch room, or private office spaces with a parallel tertiary hallway where a large quantity of indirect natural light is helpful to the space's activities. If smaller scaled lanterns are used in repetition, placing them over larger individual offices is appropriate with open office areas adjacent. This is illustrated with dashed-line office enclosure shown below. Where large lanterns occur the truss structure can easily be exposed at the flank of each lantern. Lanterns should be no larger than one truss module.



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Summary

- **Sustainability is our responsibility as designers and administrators**
- **LEED is still a good place to start for the municipal environment**
- **Optimizing the Design Process, include planners and architects early**
- **We need to improve the public image of our infrastructure and environmental education will help**

