Transportation’s Future Looks Green

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Seattle WA

Rail-Volution 2006
Transportation’s Future Looks Green!

Diana C. Mendes, AICP
Senior Vice President
November 7, 2006
Session Overview

- The Challenges
- Practical Opportunities
- Looking to the Future
The Challenges We Face

- Increasing congestion
- Limited transportation choices
- Segregated land uses
- Loss of open space and environmental resources
- Growth competing for resources
- Fiscal constraints
The Challenge for Sustainable Transportation

Why roads are crowded

From 1970 to 1996, the mileage people drive has grown four times as fast as the population, twice as fast as licensed drivers and 18 times as fast as new roads:

- Miles driven: 2.5 billion (+90%)
- Vehicles: 206.4 million (+61%)
- Drivers: 179.5 million (+30%)
- Population: 265.3 million (+7%)
- Miles of roads: 3.9 million

Growth since 1970

+123%

Source: Road Information Program analysis of December report by the Federal Highway Administration

Carey and Ward USA TODAY
Soccer Moms Become Cab Driver Moms

Suburban mothers spend 17 full days a year behind the wheel, more than the average parent spends dressing, bathing and feeding a child

Source: Surface Transportation Policy Project

Everything is a Drive Away
We are Driving Ourselves Crazy…
… But We Can’t Build Our Way Out

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of miles we drive</td>
<td>123% increase since 1970</td>
</tr>
<tr>
<td>Time we spend in congestion delays</td>
<td>62 hours each year</td>
</tr>
<tr>
<td>Money lost in time and fuel</td>
<td>$78 billion in 2000</td>
</tr>
</tbody>
</table>
Sustainability – A Definition
(U.N. World Conference on Economic Development)

Meets the needs of the present without compromising the ability of future generations to meet their own needs
Sustainable Transportation
(Canadian Centre for Sustainable Transportation)

- A sustainable transportation system is one that:

  • Allows the basic access needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health, and with equity within and between generations.

  • Is affordable, operates efficiently, offers choice of transport mode, and supports a vibrant economy.

  • Limits emissions and waste within the planet’s ability to absorb them, minimizes consumption of non-renewable resources, limits consumption of renewable resources to the sustainable yield level, reuses and recycles its components, and minimizes the use of land and the production of noise.
Public Interest in Transit Solutions is High

- 80% responded that increased investment in transit:
  - strengthens the economy
  - creates jobs
  - reduces traffic congestion
  - reduces air pollution
  - saves energy
Looking to the Future

- Maintain and strengthen local decision-making
- Encourage multi-modal choices
- Promote sound land use and transportation relationships to foster healthy communities
- Maximize environmental returns
- Ensure broad and diverse participation
- Continue financial accountability
Looking to the Future

Early microscope
Transportation’s Future Looks Green!

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Principal
Zimmer Gunsul Frasca Partnership
Los Angeles CA

Rail-Volution 2006
TRANSIT: A sustainable solution
ENERGY CONSUMPTION : USA

- Residential: 42%
- Industrial: 24%
- Transportation: 17%
- Agricultural: 4%
- Commercial: 12%
- Other: 1%
DESIGNING SUSTAINABLE FACILITIES
INTERNATIONAL MODELS
NATIONAL MODELS

LEED
Green Guide for Healthcare
LABS 21
# COSTS

## Building Form

<table>
<thead>
<tr>
<th>Living Building</th>
<th>Net SqFt</th>
<th>Wall Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEED® Platinum</td>
<td>80</td>
<td>Earth Chambers 100% Recycled Glass Windows</td>
</tr>
<tr>
<td>LEED® Gold</td>
<td>80</td>
<td>Earth Chambers 100% Recycled Glass Windows</td>
</tr>
<tr>
<td>LEED® Silver</td>
<td>80</td>
<td>Earth Chambers 100% Recycled Glass Windows</td>
</tr>
<tr>
<td>LEED® Certified</td>
<td>80</td>
<td>Earth Chambers 100% Recycled Glass Windows</td>
</tr>
<tr>
<td>Market</td>
<td>80</td>
<td>Earth Chambers 100% Recycled Glass Windows</td>
</tr>
</tbody>
</table>

## Energy, Pollution and External Cost to Society

<table>
<thead>
<tr>
<th>Energy to Operate Building</th>
<th>Grid Efficiency</th>
<th>Pollution from Building (g/year)</th>
<th>External Cost to Society ($/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEED® Platinum</td>
<td>80</td>
<td>$0</td>
<td>$12.9 m</td>
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<tr>
<td>LEED® Gold</td>
<td>80</td>
<td>$0.7 m</td>
<td>$17.1 m</td>
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<tr>
<td>LEED® Silver</td>
<td>80</td>
<td>$0.8 m</td>
<td>$18.5 m</td>
</tr>
<tr>
<td>LEED® Certified</td>
<td>80</td>
<td>$0.9 m</td>
<td>$19.7 m</td>
</tr>
<tr>
<td>Market</td>
<td>80</td>
<td>$1.1 m</td>
<td>$21.8 m</td>
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</tbody>
</table>

## Schedules

<table>
<thead>
<tr>
<th>Schedule</th>
<th>Additional/Removal</th>
<th>1 Year</th>
<th>5 Year</th>
<th>10 Year</th>
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</thead>
<tbody>
<tr>
<td>LEED® Platinum</td>
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<td>$18.7 m</td>
<td>$16.6 m</td>
<td>$14.3 m</td>
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<tr>
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<td>$19.8 m</td>
<td>$17.9 m</td>
<td>$15.7 m</td>
</tr>
<tr>
<td>LEED® Silver</td>
<td></td>
<td>$20.4 m</td>
<td>$18.8 m</td>
<td>$16.9 m</td>
</tr>
<tr>
<td>LEED® Certified</td>
<td></td>
<td>$21.4 m</td>
<td>$19.8 m</td>
<td>$17.9 m</td>
</tr>
<tr>
<td>Market</td>
<td></td>
<td>$22.5 m</td>
<td>$21.0 m</td>
<td>$19.1 m</td>
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</tbody>
</table>

## Short and Long Term Costs

<table>
<thead>
<tr>
<th>Design and Management</th>
<th>Net Present Value</th>
<th>Living Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEED® Platinum</td>
<td></td>
<td>$18.7 m</td>
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<td>Market</td>
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<td>$22.5 m</td>
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STRATEGIES

- Drainage swales
- Solar/alternative energy
- Green roofs
- High efficiency lighting
- Permeable parking lots
SITE DESIGN

Quantify stormwater available
Match with water use needs
Detain and treat onsite
SITE DESIGN

Local products
Recycled materials
Renewable products
FACILITIES DESIGN

On site energy production
Photovaltaics
High performance luminaires
FACILITIES DESIGN

Green Roofs
DESIGN PROCESS
As project progresses…
Reduced ability to affect savings

<table>
<thead>
<tr>
<th>Pre-Design</th>
<th>Schematic Design</th>
<th>Design Development</th>
<th>Construction Documents</th>
<th>Construction</th>
<th>Occupancy</th>
</tr>
</thead>
</table>

CUMULATIVE LEVEL OF DESIGN EFFORT
POTENTIAL COST-EFFECTIVE ENERGY SAVINGS
Benefits of early decision making

VALUE OF DECISIONS

COST OF DECISIONS

DESIGN PROCESS

programming | design | construction documents | construction

$$$$ | $$ | $ | $

Time
Exposition Transit Parkway
Exposition Transit Parkway
Station Design
Aerial Structures
The future looks green
What’s Happening in Tempe?

Bonnie Richardson, AIA, LEED AP
Tempe Transportation Center
City of Tempe Transit Center
integrating land use, transit, and public art pedestrian facilities, serving the community and encouraging citizen participation
Transit-oriented ground floor retail
deli, coffee shop, flower shop, dry cleaning pick-up, magazine/news stand
Bikestation is working to change the way people travel.

Bikestation offers secure bicycle parking. Park your bike at Bikestation and you can be assured that your vehicle is safe, secure and covered.

Whether you ride your bike to public transportation, to work, or you simply need a safe place to store your bike for the day, Bikestation is available to serve you. It’s simple, convenient and affordable.

Each Bikestation location provides unique services and amenities; but every Bikestation provides:

- A secure parking spot;
- Shared-use bicycle rentals;
- Access to public transportation;
- Convenient operating hours;
- Friendly and helpful staff;
- Information to plan your commute trips.

Arizona’s first bikestation
Community Room & Transportation Offices

city of Tempe transportation offices

support bar

community/conference room
a facility for citizens
For-Lease Office & Traffic Management Center
Fifth Street & College Ave.
Completion: Spring, 2008
Budget: $24.5 million
What does it mean to be “green”?

Goals for Tempe Transportation Center:

• 60% reduction in energy use
• 70-90% reduction in water use
• reduce construction waste by 90%
• encourage alternate modes of transportation
• improve working environment
  • better health = fewer sick days
  • happy employees = increased productivity
STRATEGIES
LIFE-CYCLE COSTS

CAPITAL COSTS

OPERATIONS & MAINTENANCE
THE TRIPLE BOTTOM LINE

design & planning

quality of life

balance

NATURAL ECOLOGY

ECONOMICS

SOCIAL

Built Environment
LEED Checklist

**Sustainable Sites**
- Site Selection – Density
- Alternative Transportation
- Reduce Heat Island
- Reduce Light Pollution
- Stormwater Management
- Landscape

**Water Efficiency**
- Water Efficient Landscape
- Innovative Wastewater Technologies
- Water Use Reduction – 30%

**Energy & Atmosphere**
- Reduce Heat Gain
- Efficient HVAC System
- Utilize Renewable Energies
- Perform Additional Commissioning
- Shading Components

**Materials & Resources**
- Construction Waste Management
- Recycled Content
- Local/Regional Materials
- Rapidly Renewable Materials

**Indoor Environmental Air Quality**
- Low Emitting Materials
- Daylighting & Views
- Systems Controls

**Innovative & Design Process**
- LEED Accredited Personnel
- Education & Community Outreach
- Instructional, Recycled Signage
- Water Use Reduction – 40%
- Site Operations
ENERGY ANALYSIS

Shading Strategy Analysis
Integrated Energy Design Strategies
Advanced Energy Efficiency Performance
Solar Responses
Load reduction strategies
Efficient system strategies

Annual energy savings: $48,000
52% reduction from ASHRAE 90.1-99
Savings: over 20 million gallons of potable water over 20 years
first living roof on a civic building in Arizona
Site Water System

- Sheet flow
- Water collected from green roof
- Trench drain
- 48" stormwater pipes
- Potable irrigation landscape metered water line
- Underground cistern
- Inline stormwater treatment unit-sand, water/oil separator
- Filtration
- Re-use to irrigation

SITE WATER SYSTEM
Graywater System

1. Back up potable water from building meter
2. Re-use tank
3. Chlorinator
4. Recirculating sand filter
5. Filtration
6. Gray water from building

Re-use to water closets, urinals, and trap primes
Green Cleaning for health

- Provides better working environment for employees
- Reduces health risks for janitorial staff
- Establishes product evaluation program
- Prevents pollution
- Supports waste reduction
- Encourages recycling
Increase retail sales with daylighting

Improve occupant performance
Estimated $29–168 billion in national productivity losses per year

Reduce absenteeism & turnover
Providing a healthy workplace improves employee satisfaction

Increase retail sales with daylighting

Studies have show ~40% improvement

GREEN BUILDINGS
include everyone in the planning process
The Team

Otak + Architekton
A. Dye Design
Thinking Caps
Akali Lighting
Natural Logic
Knipp Design
Natural Systems
Lorna Jordan Studio
Adolfson & Peterson
Michael Baker Jr. Inc.
BDA Structural
LSW Engineers
3DI
• Documentary Film “Greening the City”
• Green Touchscreen interactive education program
• “Reuse & Recycle” signage program

Informing Citizens
How do communities use change as opportunity?
Northwest Placemaking

Brewpubs for Trolleys

Pioneer Square
Seattle, Washington
George Benson
Seattle Area Rail

- Heavy Rail
- Light Rail
- Future Light Rail
- Monorail
- Ferry Routes

Map showing rail routes and future developments in the Seattle area.
Waterfront Streetcar

Began operation on May 29, 1982

Image courtesy of Mithun, Inc.
Waterfront Streetcar

Image courtesy of Mithun, Inc.
Nisqually Earthquake

- 10:54 am, Feb 28, 2001
- Magnitude of 6.8
- Depth of 52 km
- 17.8 km NE of Olympia
Nisqually Earthquake

Image courtesy of Seattle Times
Nisqually Earthquake

Image courtesy of Seattle Times
Seawall / Viaduct Damage

Images courtesy of Seattle Times
Sculpture Park

Street Car

Images courtesy of Charles Anderson Landscape Architecture Weiss/Manfredi Architects SAM

MITHUN
Sculpture Park

Image courtesy Mithun, Inc.
Sculpture Park

Image courtesy Mithun, Inc.
Old Trolley Barn

Image courtesy of Mithun, Inc.
Old Trolley Barn

Image courtesy of Mithun, Inc.
Old Trolley Barn

Demolished December 2005

Image courtesy of Belltown.typepad.com
Painted Trolley Bus

Image courtesy of Mithun, Inc.
New Bus Route

Waterfront Bus

Ferry Routes
Trolley Extensions

- Waterfront Streetcar
- Lake Union Streetcar
- Monorail
- Ferry Routes
Lake Union Streetcar

1.3 mile route (each way) connects South Lake Union, the new waterfront park, the Denny Triangle and the Downtown Retail Core/Westlake.

Images courtesy of Seattle Department of Transportation.
New Barn Site

Waterfront Streetcar

Image courtesy of Google Earth
Pioneer Square

Image courtesy of Mithun, Inc.
Pioneer Square

Image courtesy of Mithun, Inc.
Pioneer Square

Image courtesy of Mithun, Inc.
Occidental Park

Image courtesy of Mithun, Inc.
Possible Timeline

- Nisqually Earthquake (2001)
- Trolley Barn Closes (2005)
- Olympic Sculpture Park Opens (2007)
- Trolley Barn Complete, Pioneer Square Trolley Returns (2010)
- Tunnel Complete (2017)
- Waterfront Trolley Returns (2019)
Trolley Barn Plan

Statistics

- Trolley Barn: 14,000 gsf
- Retail: 7,000 gsf
- Parking: 150 stalls
Trolley Barn
Office Energy

Raised Floor Ventilation
Trolley Barn
Office Energy

Fixed Solar Shading
Trolley Barn
Green Power
Trolley Barn Water Strategy

- Water Table
- Stormwater Catchment

Deck
Mech
Office

Trolley Barn

MITHÛN
Secant Piles

Secant piles are two piles placed side-by-side. One pile cuts into the second forming a wall. The wall holds back the soil for excavation.

Images courtesy of Filter Project
Condo vs Office
Materials & Labor Costs

18% Increase

3-5% is average
Green Lofts
(Parking Down)

Issues & Opportunities

- Vibration
- Excavation Costs
Green Lofts
(Parking Up)

Issues & Opportunities

• Reduced unit count
• Lower cost parking
• Helps to distance vibration
Green Office
(Parking Down)

Issues & Opportunities

• Vibration
• Excavation Costs
Green Office
(Parking Up)

Issues & Opportunities

• Reduced office square footage
• Lower cost parking
• Helps to distance vibration
Relative Parking Costs

- Parking Above: $X
- Parking Below: $2X
- $3X

MITHŪN
LEED NC Gold for Housing
42 Points

- Sustainable Sites: 14
- Water Efficiency: 5
- Energy & Atmosphere: 2
- Materials & Resources: 17
- Indoor Env. Quality: 13
- Innovation & Design: 13

MITHUN
LEED SC Gold for Office
41 Points

- Sustainable Sites: 14
- Water Efficiency: 11
- Energy & Atmosphere: 17
- Materials & Resources: 13
- Indoor Env. Quality: 15
- Innovation & Design: 10
- Total Points: 41
LEED CI Gold for Trolley TI
37 Points

- Sustainable Sites: 7
- Water Efficiency: 2
- Energy & Atmosphere: 8
- Materials & Resources: 14
- Indoor Env. Quality: 15
- Innovation & Design: 5

MITHUN
LEED CI Gold for Trolley TI
37 Points

- Urban site
- Commissioning
- HVAC Performance
- CO2 Monitoring
- Humidity Control
- Green Power
- Low Emitting Materials
- Indoor Air Quality through Construction Management
- Innovation
  - Education
  - Monitoring
  - Green Housekeeping
Vision