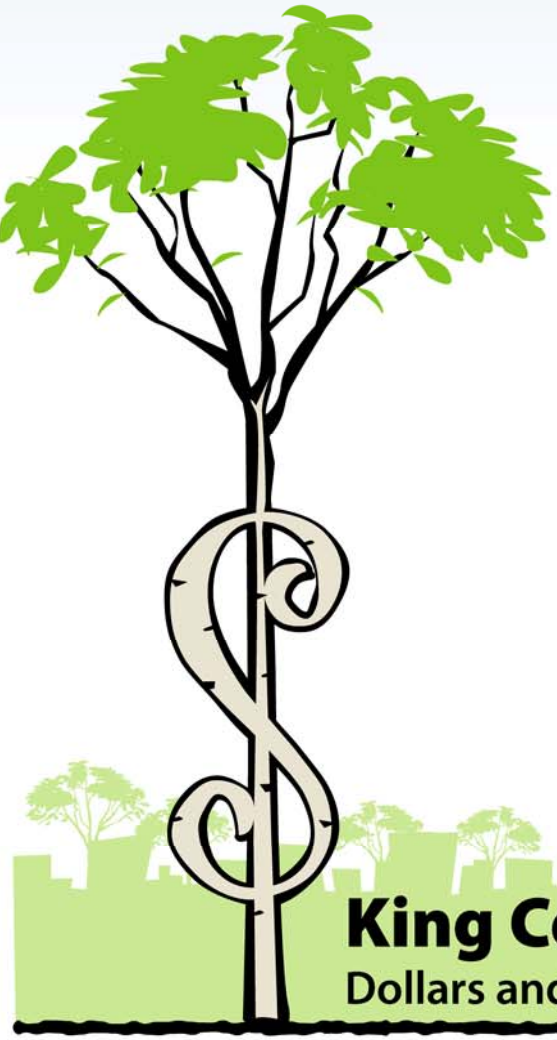
Life Cycle Cost Analysis (LCCA)



First NE Transfer/Recycling Transfer Station

Shoreline, WA

February 15, 2006

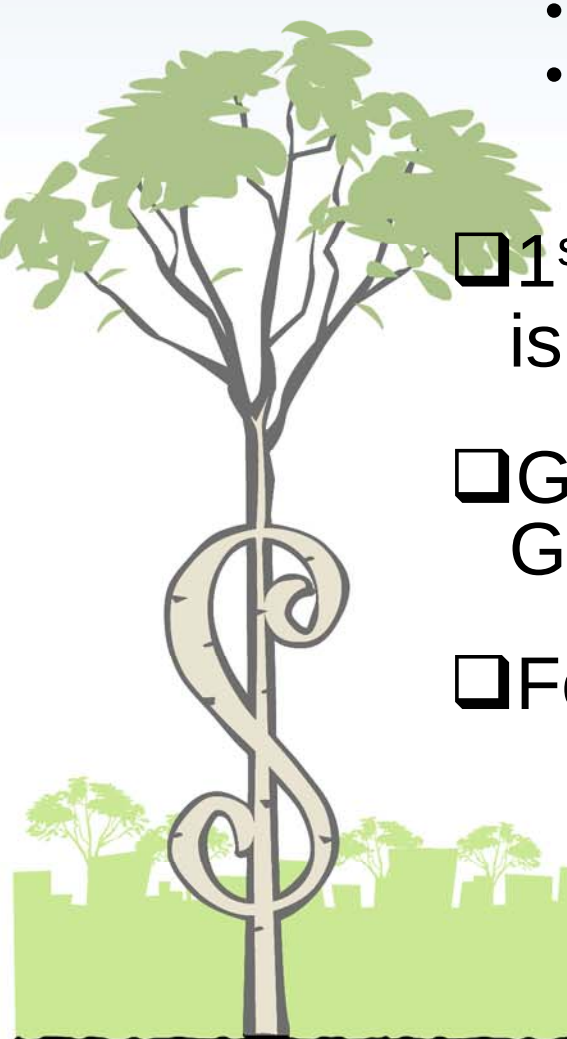
Lisa Williams, Solid Waste Division
Patrick Domres, Solid Waste Division

King County Building Summit:
Dollars and Sense Tools to Green Your Project

King County

Overview

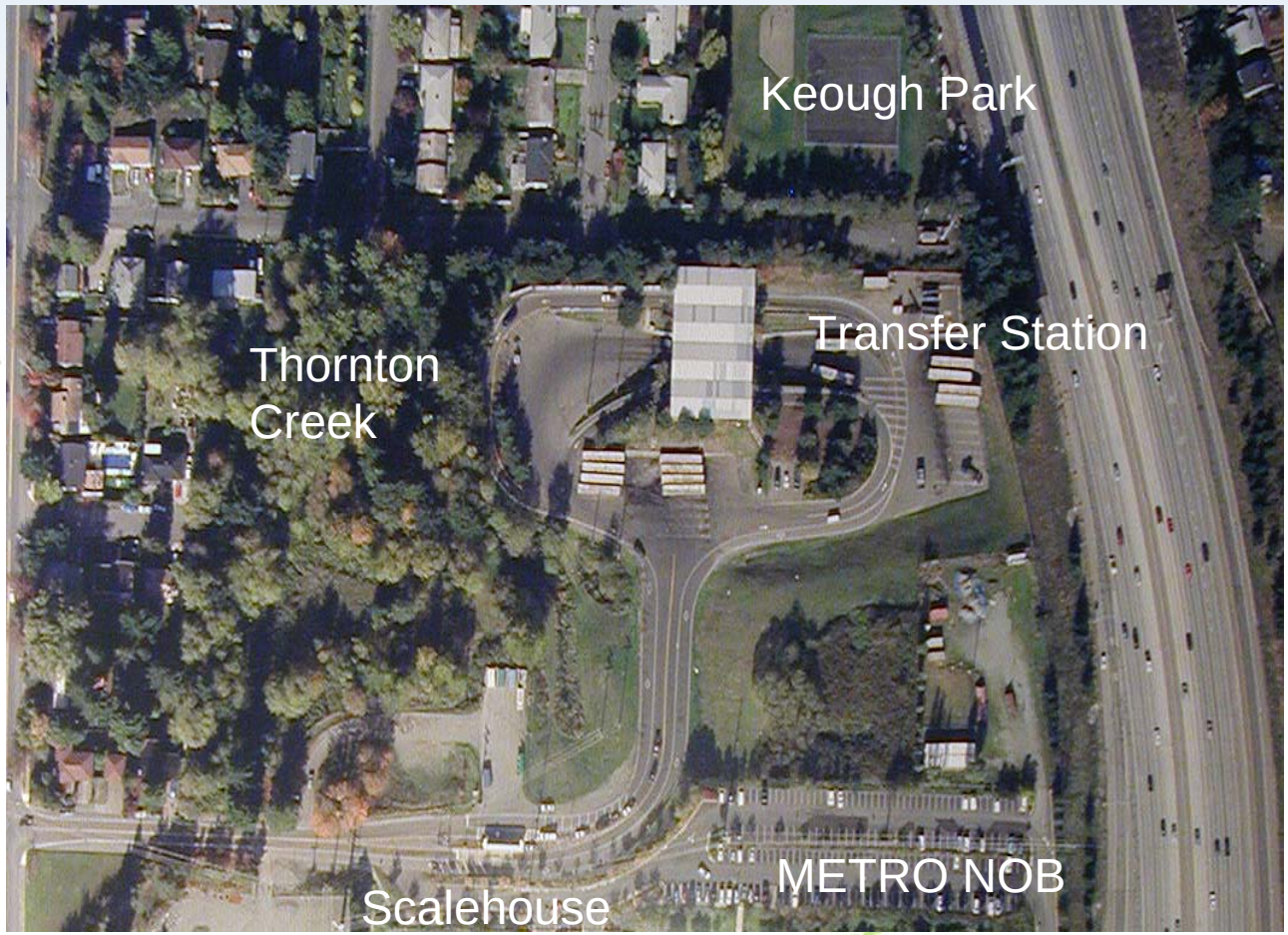
- Background
  - Budget: $30M (incl. design & construction)
  - Scope of Work: New Transfer/Recycling Station
  - Schedule: Begin Construction Summer 2006 (18-months)
- 1st LEED™ Certification Building that is a Transfer Station
- Goal: Silver Certification, will try for Gold
- Focus on Major LEED™ Components



Overview

- Incorporate as much LEED™ components during the design phase.
- Did not go over budget, the Design Team found ways to work smarter!
- What you can take away from this workshop.

First NE Transfer / Recycling Station (Existing Site Plan)



First NE Transfer / Recycling Station (Southeast View)

SWDLWPD0206

First NE T/R Station Interior View (looking south)

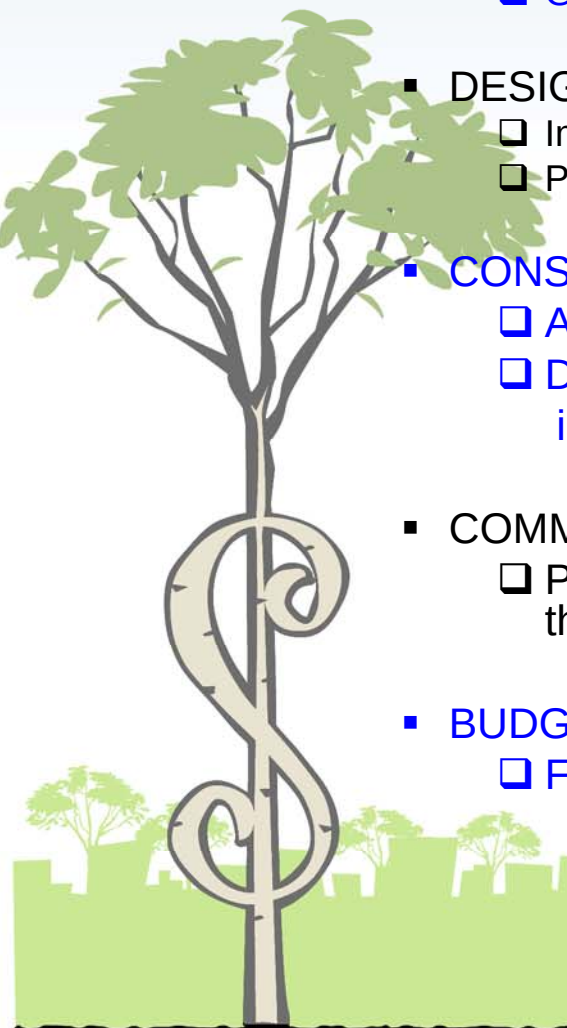
SWDLWPD0206

First NE Transfer / Recycling Station Interior View (North)

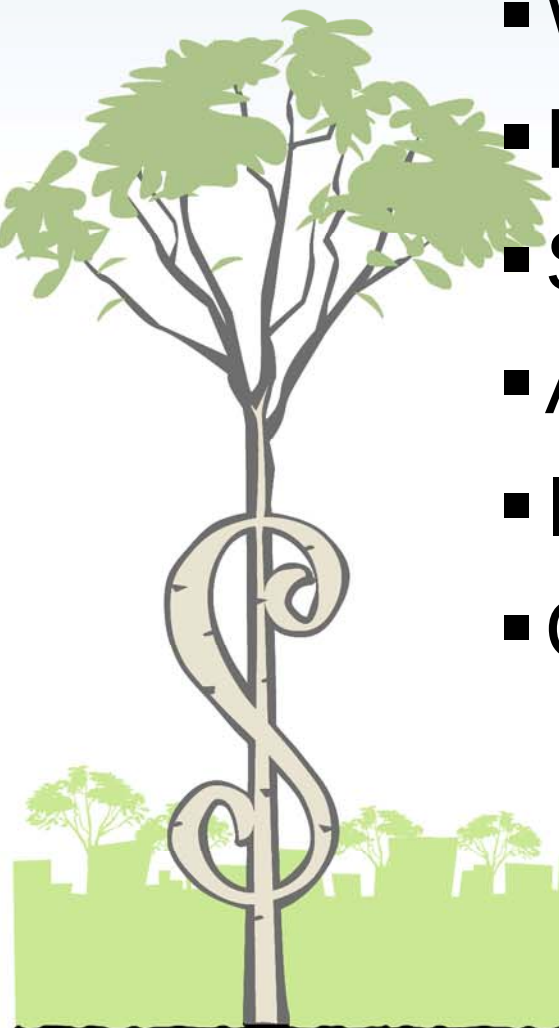
SWDLWPD0206

The Process for Designing a Green Building

- Eco Charrette
  - Sets the stage of the leed project, helps educate Team
  - Goal: what ways to maximize the greatest impact
- DESIGN PHASE
  - Implement results from Eco Charrette in the Specifications
  - Perform studies on the energy, water, and ventilation systems
- CONSTRUCTION
  - A lot of contractors are not aware of LEED™
  - Design Team coordinates with and educates the Contractors
    i.e. use low voc ---install carpart after walls have been painted.
- COMMISSIONING
  - Process required by LEED™ that includes, but not limited to all the building systems are tested by an independent consultant
- BUDGET (With LEED™ versus Without LEED™ products)
  - Figures are compared during the Design Phase

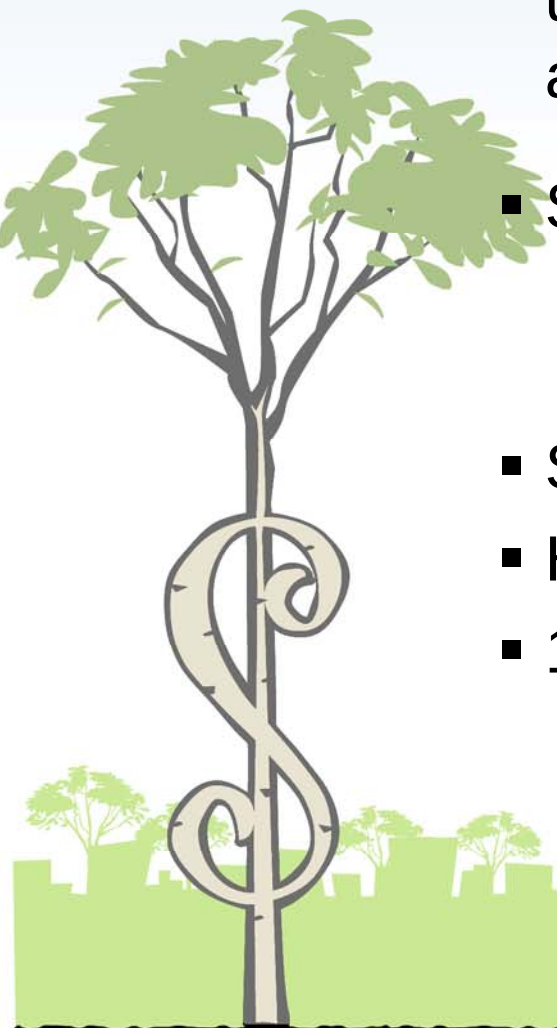


LEED™ COMPONENTS



- Water Harvesting Tank
- Daylighting
- Solar Photovoltaic
- Alternative Fuel
- Indoor Environmental Quality
- Outdoor Elements

Water Harvesting Tank

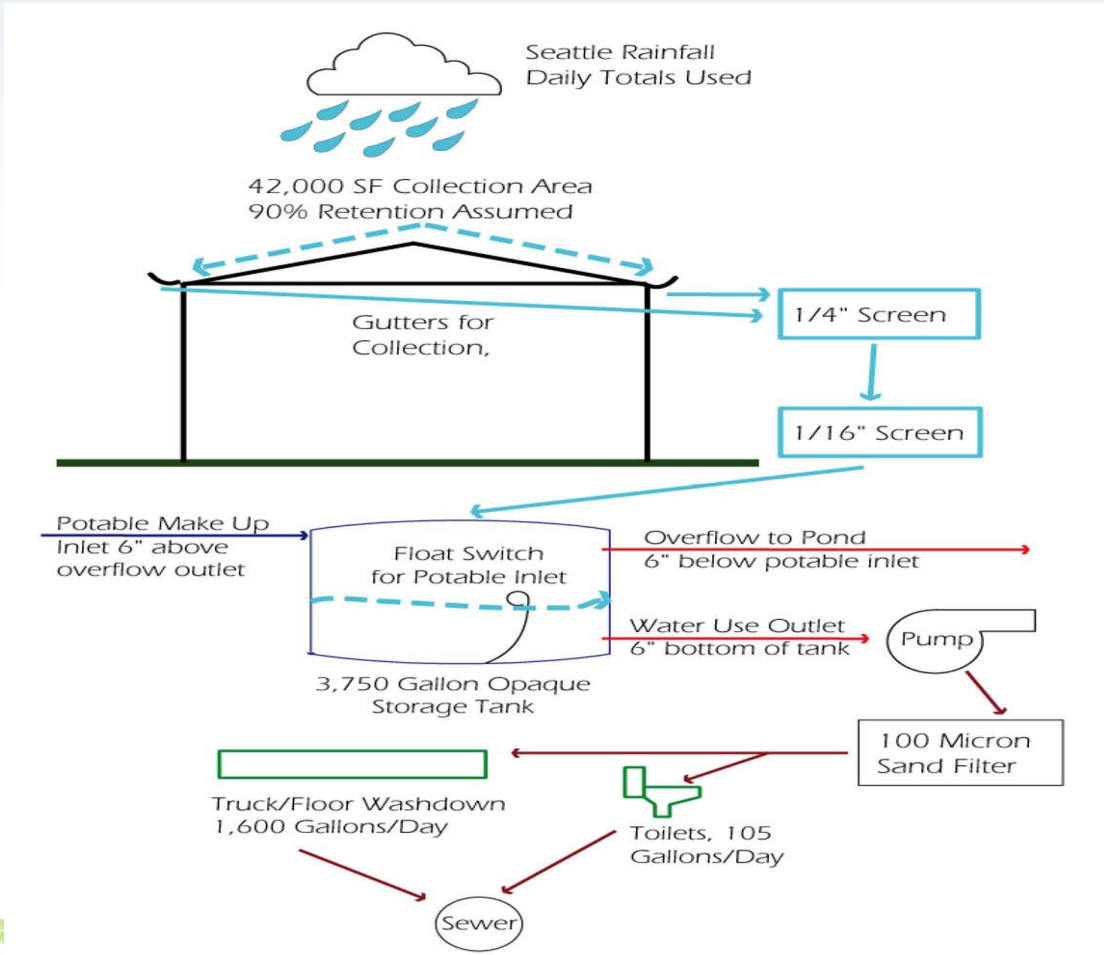


- Collects rainwater from roof (42K SF) and uses it to wash down transfer station floor and supplies water to the public restrooms.
- Saves funds by “Cost Shifting”

  i.e. -- reduces water bill

  -- combines downspouts into one pipe.
- Saves approx. 254,000 gallons/year or 57%
- Harvesting Tank stores 3,700 gallons.
- 1/10 inch of rain fills the tank

Water Harvesting Tank (Diagram)



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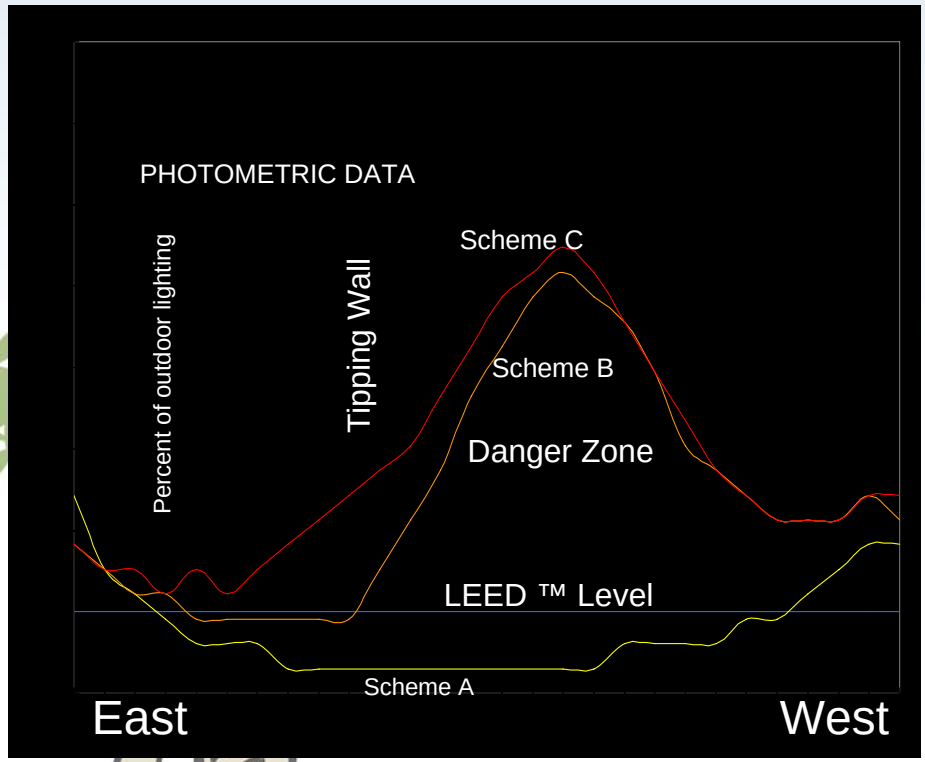
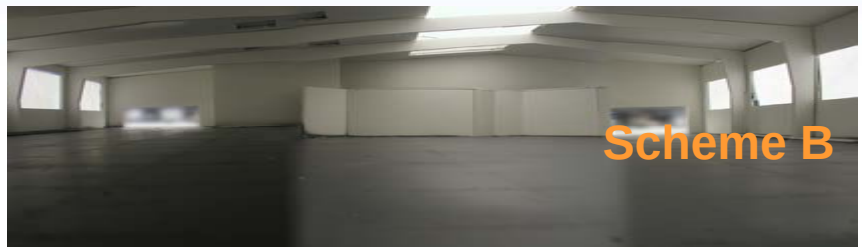
Daylighting Design





Lighting Cost per Year Under Code Design = $16,538
Lighting Cost per Year Using Daylight Augmentation = $1,792
Savings Year to Year, approx. 89% during the 1st year

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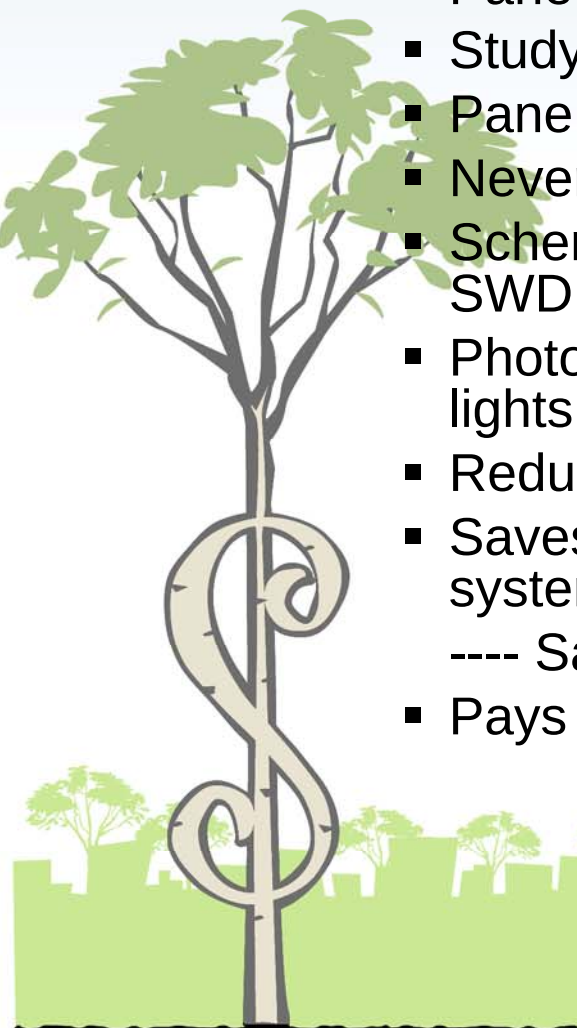
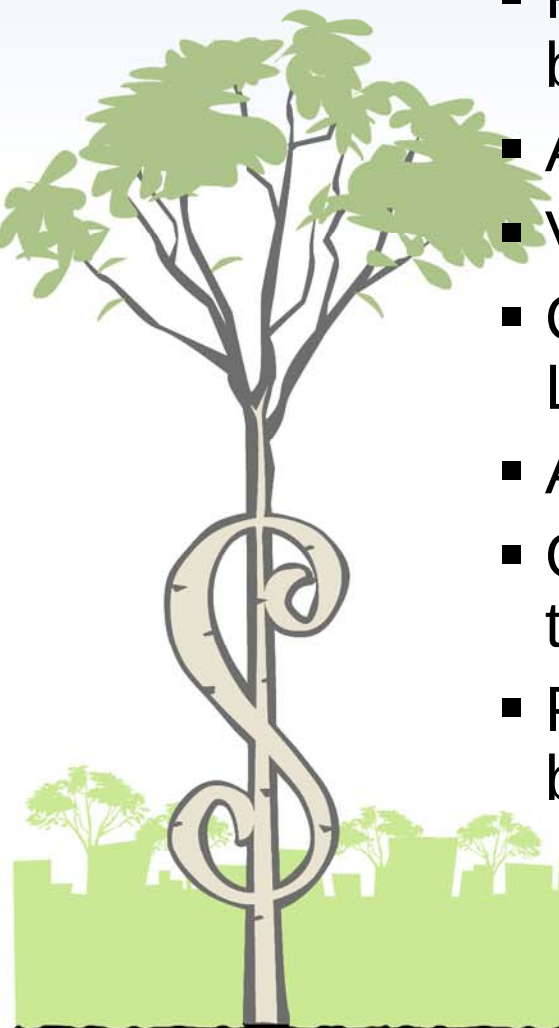
Daylighting

- Panels absorbs sunlight and illuminates transfer station.
- Study based on Cloudy Day.
- Panels are translucent and produces a soft light.
- Never falls below the LEED™ Level.
- Scheme A, B, C (A- Not enough light, B & C- Meets SWD standards).
- Photo cell senses daylight and automatically dims station lights.
- Reduces energy usage.
- Saves funds by: combining the panels and ventilation system into one unit.

  ---- Saves approx. 89% per/year light bill
- Pays for itself with approx. 3 years.



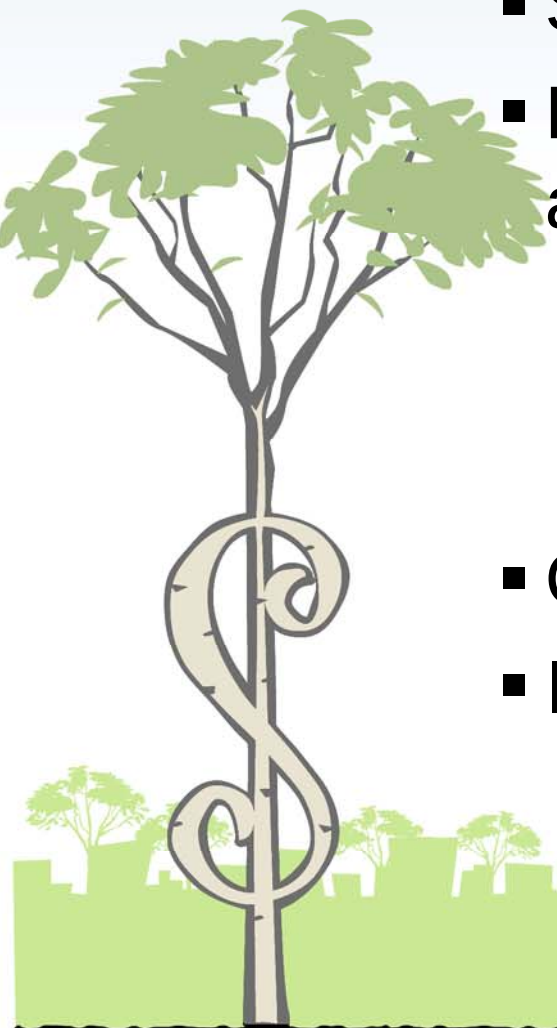
Solar Photovoltaic



- Panels located on the southside of the building's roof.
- Absorbs sunlight and converts it to energy.
- Visible feature.
- Cost of the panels would not pay for itself. Looked for other funding sources.
- Applied for a grant with the City of Seattle
- Grant requires SWD to educate public about the solar panels i.e. Kiosks, tours
- Projected to provide a savings of 5% of the buildings energy cost

Alternative Fuel

- 5% Bio diesel
- Standard policy by SWD
- LEED™ will recognize alternative fuel as either one of the following:
  - --- Alternative to Credit SS 4.3
    (Sustainable Site 4.3 – Alternative Transportation/Fuel Vehicles)
  - --- An “innovation in design” credit
- Creative thought process
- Integrate into project

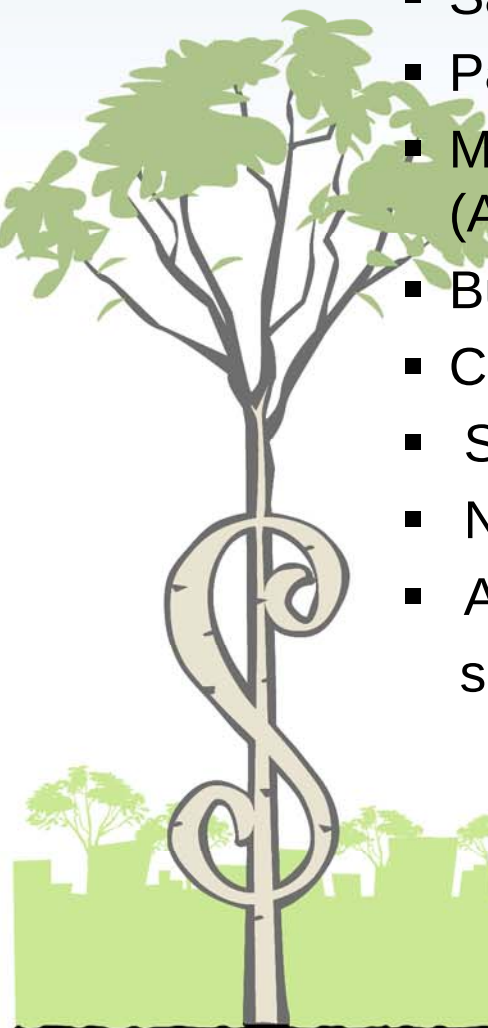


Indoor Environmental Quality

- Carbon Monoxide Monitoring on tipping floor
  - No credit
  - Right thing “to do”
  - Health of the Operator
- Carbon Dioxide Monitoring within Operators office
- No Smoking Policy (incl. in the specs)
  - During construction, Contractor will be required to smoke in “smoking only” designate areas.
  - SWD Staff will be only allowed to smoke in Smoking Designated Areas outside of the new building
- Low Emitting Materials – Carpet, Paints, Adhesives
- Pushes LEED™ Envelope

Increase Ventilation Effectiveness

- Saves 50% of Fan Energy
- Passive system is more effective than mechanical fans
- Mechanical Design: produces 5 Air Changes per Hour (ACPH)
- Building Design (with no power): produces 6 ACPH
- Cross Ventilation: 8 ACPH
- SW wind 11 month
- NW wind 1 month
- Average nominal wind speed at 30 feet above ground surface is 7 MPH

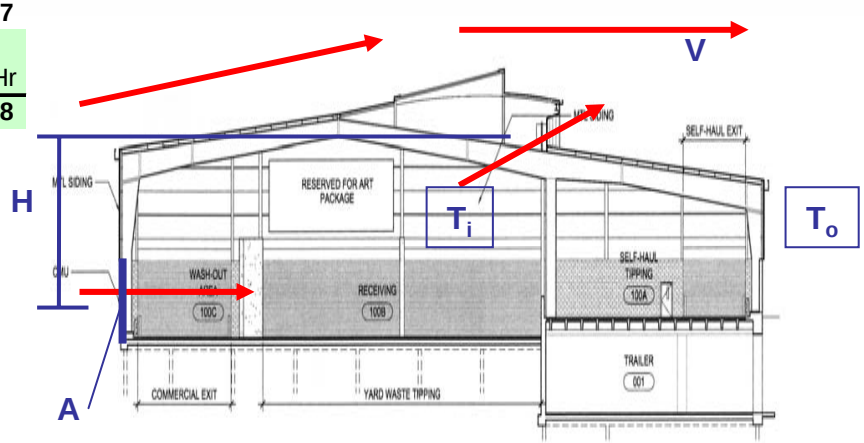


Natural Ventilation

Natural Ventilation - Cross

Cross Ventilation		Q= v * A * Cv * S				
Southwest Winds						
Velocity-MPH	v	Inlet Area	Cv	S	CFM/Hr	Air Changes/Hr
8.8	774.4	1486	0.25	0.8	13,809,101	**8.37**
Northwest Winds						
Velocity-MPH	v	Inlet Area	Cv	S	CFM/Hr	Air Changes/Hr
7	616	2718	0.25	0.8	20,091,456	**12.18**

Source: Mechanical and Electrical Equipment for Buildings, 9th Edition

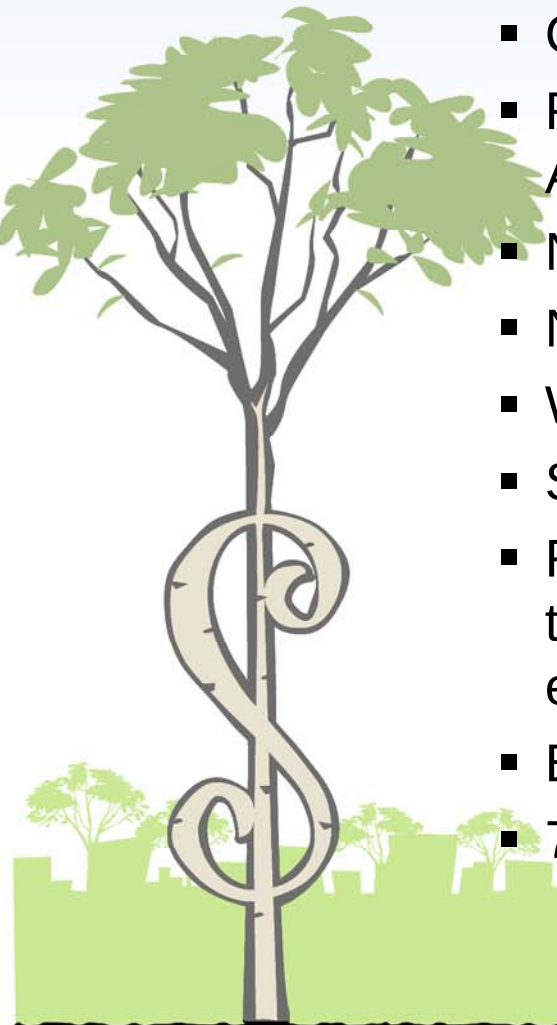


Natural Ventilation - Stack

Stack Ventilation			Q= 60* K* A* SQRT g* H* (Ti-To/ Ti)					
H, height	Area	k	g	Ti	To	CFM/Hr	Air Changes/Hr	Season
25	912	0.65	32.2	85	75	8,204,307	**4.97**	Summer
				63	53	8,375,193	**5.08**	Fall/Spring
				45	35	8,523,243	**5.17**	Winter

Source: Mechanical and Electrical Equipment for Buildings, 9th Edition

Outdoor Elements



- Design revolves around Thornton Creek
- Demonstrate 3rd party commitment
- Call on community
- Received Community Award from Thornton Creek Alliance
- Native Plants used
- No irrigation system installed; saves on water
- Water Efficient Landscaping
- Storm Drainage Vault with special filters
- Runoff from roadway → Filter → Pond →Released to the Thornton Creek at a rate that will enhance the ecology instead of hurt it.
- Bio Swale –natural system has plants and grasses.
- 75’ Buffer

LEED PAYBACK?

Hard Cost

- 57% water savings
- 89% light savings
- 50% fan energy via natural ventilation

Soft Cost

- Thornton Creek Community
- Great PR for SWD
- Employee Production increases

QUESTIONS ?

Thank you!

Lisa Williams, Solid Waste Div
Patrick Domres, Solid Waste Div