

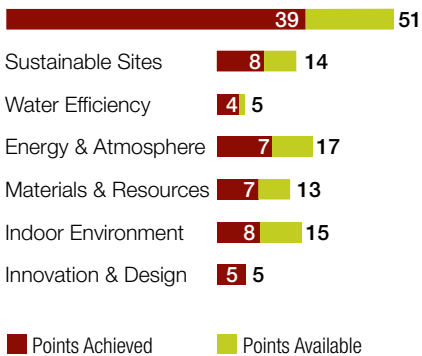
# Cedar Water Treatment Facility Operations Building Seattle Public Utilities



Photo by Lara Swimmer

**Square Feet:** 5,480, 1 story  
**Site:** 16 acres  
**Location:** Natural area near Renton  
**Construction Cost:** \$200/square feet (shell and core)  
**Completed:** Summer 2004

## LEED Facts - NC Gold



## Benefits

- 61% reduction in energy use
- 33% less water use inside building, and 42% including site
- 80% sediment removed from stormwater
- 90% of building naturally daylit, with views
- 75% of construction waste diverted from landfills
- 5,300 gallons of potable water savings annually
- 107,450,000 less BTUs of energy (gas and electric combined)

## Project Overview

The Cedar Water Treatment Facility Operations Building stands among several buildings and installations dedicated to drinking water treatment and supply in the Lake Youngs Reservation southeast of Renton, in unincorporated King County. It houses the main treatment plant control room, an analytical laboratory, offices, a

meeting room, mechanical/electrical room, restrooms and personnel lockers.

Located in a heavily wooded preserve, sustainability strategies hinge upon extremely low-impact site design backed by constructed wetlands to offset impacts to the natural environment from other project components.



Photo left by Ralph Naess, middle and right by Lara Swimmer

The unique design-build-operate procurement contract used for the delivery of the overall Cedar Water Treatment Facility called for a different approach to LEED certification, one that was flexible and incentive-based. It allowed CH2M HILL, the designer, builder and operator, to find its own cost-cutting opportunities while meeting high standards for sustainability.

The owner, Seattle Public Utilities, required that each of the proposals for the components of the project include a Sustainable Design Strategies Report. Then, upon acceptance of the proposal, SPU required the project attain LEED Silver certification, and also placed an incentive upon achieving LEED Gold certification. The Operations Building was one such project that fit this Design-Build strategy which resulted in a LEED Gold certification achievement.

The design for the full-scale water treatment facility also included important energy saving measures. It integrates the existing bypass pipelines at the site into the treatment facilities so that when water quality and supply constraints allow, water can be delivered to the treatment process by gravity instead of pumping the water out of Lake Youngs.

In the operations building, a system of clerestories combined with thermal mass in the floor provides integrated natural lighting, heating and cooling inside the building.

The Cedar Water Treatment Facility Operations Building is staffed 24 hours a day by at least one person. Day-to-day occupancy consists of 3-6 operations personnel. The meeting room has a capacity for 40.

## Sustainable Sites

The well-protected site has been a part of the City of Seattle's Cedar River water supply system for nearly a century. The Cedar River watershed provides 70 percent of all drinking water used by the Seattle metropolitan area, about 1.3 million people. The Operations Building is surrounded by second growth forest and wetland habitat on a 2,482-acre reservation that includes a 721-acre lake.

The pristine site does not include farmland, parklands or endangered species habitat. The Operations Building footprint does not encroach upon any of the wetlands on the reservation, and is held to at least five feet above the 100-year flood level.

One goal of the overall project was to improve the existing water supply and treatment process, all without interrupting the supply of drinking water for the people served by the system. Additions include an intake pump station, ozone and ultraviolet light primary disinfection, chlorination and corrosion control, treated water reservoirs and flow control stations. All these facilities

are either in or near Lake Youngs, and the new system treats up to 180 million gallons per day. Much of the control system for this operation is located in the Operations Building.

Owned by the City of Seattle, the Cedar Water Treatment Facility was built according to a unique design-build-operate bidding and contracting process that included stipulations and incentives for sustainable building design. Winning bidder, designer and contractor CH2M HILL will operate the facility for up to 25 years, including a 15-year base term and extensions at the option of the City.

Since the primary purpose of the entire facility is to improve water quality for the Seattle area, making the project a model of environmentally sensitive design and construction was a primary goal.

CH2M HILL conducted a sustainable design charrette at the beginning of the design process for the entire treatment facility, and conducted a performance modeling and life cycle cost analysis for all of its components.

Although the meeting room has a capacity for 40, parking spaces are minimized to 9, and the site includes designated carpool, vanpool and bus spaces. Accommodations for treatment facility staff include bicycle racks, shower facilities and lockers.

Landscaping with native plants is designed to eliminate irrigation over the long term. Temporary irrigation serves the site as the new plants become established.



Photos by Lara Swimmer

CH2M HILL has made the project a part of the continuing education of design professionals by participating in sustainable design exhibits and competitions. A brochure and website are dedicated to the sustainable aspects of the project.

## Water Efficiency

Erosion control was a high priority for the Operations Building site due to its sensitive location. It is a part of a larger development area for the entire treatment facility and next to wetlands that are part of the well-protected Lake Youngs Reservoir watershed.

An extra large constructed wetland detention pond or wetpond was built for on-site stormwater treatment to meet the stringent level set by King County's standards for sensitive stream protection. This large pond has over three times the volume of the basic pond required to remove 80 percent of stormwater sediment for the site. It also meets criteria for removing 50 percent of the phosphorus in the water, a function important for the protection of Lake Youngs.

Water quality is very closely monitored on the site. Sediment ponds and traps have been sized for a 10-year storm instead of the requisite 2-year storm. Even though there was no requirement for detention during construction, the project provided full stormwater detention on site at that stage if needed. After construction, receiving waters at three wetlands are

being maintained and monitored for elevated turbidity.

Water-saving measures inside the facility include flow restricted and low-flow fixtures, sensory fixtures and waterless urinals. These measures save an estimate 5,300 gallons of water annually, enough to take a frugal shower every day for a year.

## Energy & Atmosphere

In winter, captured heat from clerestory windows heat interior corridors. Much of the Operations Building receives natural daylight from clerestories and translucent skylights.

The dark concrete floor in the meeting room captures radiant heat through thermal mass, and a heat recovery duct with an in-line fan transfers that heat to receiving spaces. Fans are automatically activated when there is excess heat in the conference room (closed in winter months) and heat is called for in other areas. The fans then activate and move warm air to areas requiring heat.

In the summer time, meeting room doors are open to promote natural air flow. Clerestory windows linked to thermostats open automatically to purge warm air. Passive solar shading mitigates heat gain in the summer and thermal mass in the concrete floor also works to regulate temperature in the warm months.

The mechanical system consists of a water source heat pump with electric reheat, connected to a City of Seattle underground water supply pipe that runs through the

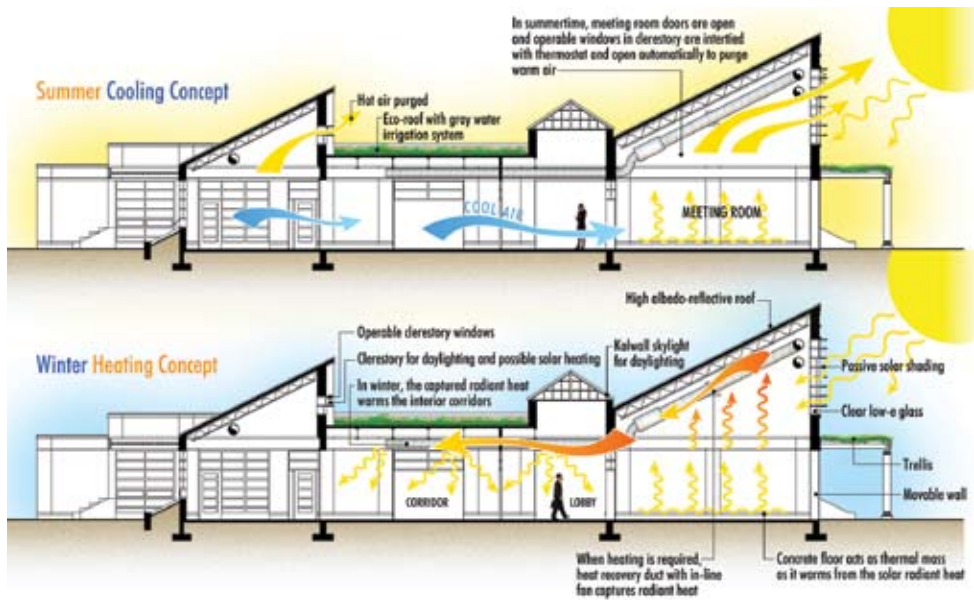
treatment plant. In this way, tempered water is provided to the heat pump, similar to a ground-source heat pump. Heat exchangers also temper incoming ventilation air and capture waste heat from the exhaust stream.

The highly insulated building envelope places rigid insulation between the exterior moisture barrier and the structural roof. In addition to the high performance mechanical heating, other measures include: natural ventilation and high-efficiency air conditioning systems, water source heat pumps reverse cycle for cooling, low-e glazing; shaded, double windows; high-reflectance roofing, high performance lighting, and Energy Star®-rated appliances. The energy saved, over 107 million BTUs, is more than enough to power three household water heaters for a year at a cost of over \$2,000.

## Materials & Resources

Special emphasis was placed upon locally sourced materials with recycled content. 63 percent of the materials used in construction of the Operations Building have recycled or renewable content, including: plastic toilet partitions, gypsum wall board, concrete, rebar, carpet, various metals, roofing, rubber flooring, ceramic tile, and ceiling tiles.

50 percent of the materials used in the project were manufactured or harvested locally. They include: concrete block, certified wood, metal doors and windows, and flyash in concrete.



Drawing above by CH2M HILL

## Indoor Environment

The combination of clerestory window, skylight, windows and translucent panels in interior walls brings natural light deep into the Operations Building interior.

Air was filtered and ducts protected during construction to limit toxic materials in the indoor environment, and ductwork was sealed during construction. The building was flushed before occupancy, and air filters changed.

There are operable windows in occupied spaces to allow manual temperature adjustments suited to occupant needs. The standards for building ventilation followed the 2000 edition of the Washington Energy Code. Results are substantially more energy efficient than those of the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) 90.1, 1999.

To make sure that temperature and thermal comfort environments are maintained over time, permanent air monitoring equipment checks for compliance with ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) standards.

Low volatile compound-emitting paints, adhesives, sealants, and composite wood products were used throughout.

## Innovation & Design

- Education program
- Process energy savings
- Exemplary performance
- Building process energy integration
- LEED accredited professional

## Lessons Learned

A commitment to attaining a USGBC LEED Silver rating was required by the City of Seattle in all eligible bids for the design-build-operate project, and there was a \$50,000 incentive for attaining the higher LEED Gold rating. This condition was sufficient to support the efforts of the winning bidder, CH2M HILL, to attain very high standards of sustainable design.

With the incentive, the contractor and operator was motivated to attain the high LEED rating through the design-build-operate project delivery method, which encourages a least-cost scenario based on functional requirements. The rating was attained despite the unusual building type, which is a specialized facility in a remote natural location with few occupants.

## Rating & Awards

U.S. Green Building Council LEED® for New Construction Gold Rating

For Cedar Water Treatment Facility, including Operations Building:

- Occupational Health and Safety Administration (OSHA) "Star" Safety Award (first one in state of Washington)
- The American Council of Engineering Companies' National Finalist Award American Academy of Environmental Engineers' Honor Award / Design
- Design-Build Institute of America (DBIA) National Design-Build Award: Design-Build Excellence for Water (in "over \$15 million" category)
- National Council for Public-Private Partnership Infrastructure Award

## The Team

### Owner

Seattle Public Utilities  
www.seattle.gov/util

### Architect

CH2M HILL  
www.ch2m.com

### Landscape Architect

Susan Black & Associates  
www.sbassociates.com

### Mechanical Engineer

University Mechanical Contractors  
www.umci.com

### Sustainability Consultant

Paladino & Company  
www.paladinoandco.com

### Incentive Programs

Green Energy Certificates through Seattle City Light [www.seattle.gov/light/green/greenpower](http://www.seattle.gov/light/green/greenpower)

## To Learn More

**City Green Building** promotes green building through education, technical assistance and incentives. [www.seattle.gov/dpd/greenbuilding](http://www.seattle.gov/dpd/greenbuilding)

**Seattle City Light** provides stable, competitively priced and environmentally sound electricity to customers. [www.seattle.gov/light](http://www.seattle.gov/light)

**Seattle Public Utilities** provides customers with reliable and cost-effective water, sewer, drainage and solid waste services, while protecting public health and balancing social and environmental responsibilities to the community. [www.seattle.gov/util/service](http://www.seattle.gov/util/service)

**US Environmental Protection Agency and US Department of Energy ENERGY STAR® Program** helps citizens and businesses save money and protect the environment through energy efficient products and practices. [www.energystar.gov](http://www.energystar.gov)



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