Factoria Recycling and Transfer Station

**Title:** 2018 Excellence Award entry

**Category:** Transfer Station

**Entrant Organization:** King County Solid Waste Division

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**Entry Title:** Factoria Recycling and Transfer Station

**Jurisdiction:** Bellevue, Washington, United States

**Approximate Population of the Jurisdiction:** 1.5 Million

**Cost Per Household for the Project:** $180

**Approximate Budget:** $92.8 million
No Time to Waste

Twenty-five years after project launch, Factoria Recycling and Transfer Station offers customers more recycling and disposal options than ever before.

Executive Summary

Factoria Recycling and Transfer Station was built on the site of a 1960s facility. The old transfer station’s canopy design failed to control dust, odor and vectors, and the site had inadequate space for recycling and emergency waste storage. In addition, the canopy did not meet current structural codes and was susceptible to seismic event damage.

The state-of-the-art, 80,000-square-foot Factoria Recycling and Transfer Station can handle 225,000 tons of garbage, recycling, yard waste and household hazardous waste annually. King County’s first flat floor transfer station increases operational efficiency, minimizes operating and maintenance costs, improves safety, provides flexibility to meet future needs, such as increased waste tonnage and traffic.

The sustainability designed project uses natural light, rainwater harvesting, recycled-content building materials and native plants reducing environmental impact. The facility reduces energy use by 40 percent, curtails potable water use by 1.3 million gallons per year and eliminates 172.5 tons of emissions annually.
History

Serving both commercial and self-haul customers since the 1960s, Factoria Recycling and Transfer Station operates seven days a week and receives approximately 16 percent of King County’s solid waste. The original Transfer Station was one of eight similar facilities constructed for the King County Solid Waste Division (KCSWD).

More than 25 years ago, KCSWD solid waste planners knew they needed a new transfer station to serve the eastern portion of King County. An initial plan focused on improving the existing structure, but did not accommodate future growth or recycling. A second design looked to expand the facility by constructing on a more visible part of the property higher on the hillside, which caused the City of Bellevue to balk. With the purchase of adjacent property, increasing the site to 15.6-acres, and an innovative construction approach, a new engineering team presented a third design with a larger facility at a lower location on the property — which proved a charm.

In 2014, construction began on a replacement facility. The new Factoria Recycling and Transfer Station is a state-of-the-art, nearly 80,000-square-foot facility, capable of handling 225,000 tons of garbage, recycling, yard waste and household hazardous waste (HHW) annually.

HOW IS THE TRANSFER STATION INTEGRATED INTO THE COMMUNITY SOLID WASTE PROGRAM?

As part of King County’s continuing efforts to serve the community, Factoria Recycling and Transfer Station responds to KCSWD’s guidance documents — the 2013 Comprehensive Solid Waste Management Plan and 2006 Transfer and Waste Management Plan — prepared in accordance with Washington State law Revised Code of Washington (RCW) 70.95. Draft policies, recommendations, and goals are presented for solid waste management, including: system planning, waste prevention and recycling, waste collection and processing, the transfer system, landfill management and solid waste disposal, and system financing. The Transfer and Waste Management Plan provided recommendations to upgrade the division’s aging transfer system, strategies to extend the lifespan of the Cedar Hills Regional Landfill, and options to prepare the landfill for closure. Replacing the old transfer station with the Factoria Recycling and Transfer Station helps achieve KCSWD goals — one of which was to provide recycling to the eastern portion of King County.

Customers can drive through the HHW facility — adjacent to the transfer building — which provides residents an alternative to disposing moderate risk waste in the garbage, down drains or into the ground. The HHW facility receives all items free of charge, including:

- Acids and caustics
- Antifreeze
- Automotive products
- Batteries (car, button, household)
- Flammable liquids
- Fluorescent bulbs
- Gas and fuel
- Glues
- Household cleaners
- Hypodermic needles or syringes (sealed inside rigid container)
- Insecticides
- Mercury
- Thermometers/thermostats
- Motor oil
- Oil-based paints
- Pool chemicals
- Solvents
- Yard and garden chemicals
The new Factoria station offers a wide array of recycling services for appliances, yard waste, clean wood, scrap metal, commingled recyclables and textiles. Recycling operations began in October 2017 and is anticipated to recover approximately 5,000 tons of wood, metal, yard waste and other recyclables in its first year of operation. In the future, a processing line can be installed if sufficient quantities of recyclable materials are recoverable.

**Project design team:**
The design team was selected through a competitive request for qualifications selection process.

**Sustainable Design Elements**
The project includes several sustainable design elements, including reducing electrical usage for lighting, reusing captured rainwater, natural ventilation, using local and recycled materials, diverting construction waste from landfill disposal, and achieving LEED Gold certification.

**Operational Efficiency**
The new facility creates a more direct route in and out of the facility with a new south entrance for trailers, which separates customers and transfer vehicles. The tipping floor and unloading area allow vehicles to dump near the loadout ports without lifting, thus improving efficiency by reducing the time required to push waste into compactors.

**Improved Safety**
There are many ways the new facility improves safety, including separating public self-haul traffic from collection traffic, the flat floor eliminating a fall hazard that was a constant concern at the old facility, extensive daylighting, a full fire sprinkler system, and carbon dioxide and carbon monoxide sensors throughout.

**Reduced Maintenance**
The new facility replaced aging buildings and equipment, reducing the need for frequent maintenance. It also provides a high-strength concrete wearing floor and two new compactors that provide operational redundancy. Further, access to clean and maintain the compactors is provided in the design.

**State-of-the-Art Design**
The facility includes a misting system for dust control. Netting and spikes discourage birds from roosting on the building and scavenging from the waste.

**Sized for Increased Capacity**
The facility was sized based on projections of population and economic growth over 30 years and took into account the number of unloading stalls required at peak volumes, as well as the volume required to provide a week of emergency storage.

**Flexibility**
The large, flat, open tipping floor offers design flexibility, allowing the facility to be reconfigured based on traffic patterns, seasonal volume or future stream changes. Future sorting lines or technologies can be incorporated onto the tipping floor, thanks to the flexible design.

**HOW DID YOU PLAN THE INITIAL CREATION OF THE TRANSFER STATION?**
The approach for completing the programming/planning phase of the project involved two steps. First, King County and members of the design team toured several transfer stations and recycling facilities throughout the Pacific Northwest. KCSWD staff members were able to gain insights from different operators of which features they liked and which features they disliked. The second step was a series of workshops to develop alternate layouts. Notes from the tours were summarized and used in the workshops.

The project incorporated many design concepts that were designed to meet King County Solid Waste Division’s project goals:
During workshops with project stakeholders, the team developed several conceptual designs using tour information and user feedback in conjunction with project goals. They reviewed, refined and ranked the preferred design options based on how effective each option fulfilled project goals, construction cost and the phasing feasibility. Each option was depicted on a site plan, showing the building orientation, traffic routing, floor plan sketches, and operational configurations for the tipping floor and load-out of trailers. The team developed a conceptual-level cost estimate for comparison purposes.

The workshop process proved to be an effective tool to develop the new facility’s planning and programming for multiple reasons:

- It gave KCSWD the opportunity to evaluate several possibilities for facility size and traffic routing.
- Stakeholders were provided opportunities for input and ideas during conceptual design development.
- The selected conceptual design contained several elements from previous concepts that may not have been discovered without the iterative review process.

The planning phase began in January 2010 and was completed eleven months later in November 2010. The planning phase culmination was developing a Facility Master Plan that included detailed scoping; functional requirements and design criteria; phasing and scheduling analyses and cost estimates. This document was used as a reminder of the project intent and to keep the design consistent with the project goals.

The design phase — including Preliminary; 30-, 60-, 90- and 100- percent design review submittals — was completed in two and a half years, with bid drawings issued in July 2013. The design phase included a value engineering study at 30 percent design, extensive peer review and constructability reviews at both 60 and 90 percent design, and completion of the building permit and environmental permit review.

KCSWD employed a “best value” selection process authorized under RCW 36.58.090 to select the construction contractor. This process allowed extensive opportunities for three shortlisted general contractors to interact with the owner and the design team during the selection process. The process provided assurance for cost, schedule, quality assurance procedures, minimal impacts to operations and the public, and environmental protection measures. PCL Construction Services, Inc. (PCL) was selected as the general contractor through this process.

**Provide a timeline for facility construction and opening**

The project was designed to be completed in four milestones with a transition period between Milestones 2 and 3.

**Milestone 1**

Preconstruction phase for the general contractor to work plan, schedule and perform preparatory and administrative activities prior to mobilizing.

**July 11, 2014** – Contractor’s Notice to Proceed 1 for preconstruction activities which include scheduling; submittals; submittal processing for and procurement of materials, products, and equipment; and preparatory and administrative activities.

**Milestone 2**

Demolished buildings conflicting with the new transfer station. Construct the transfer station, administration building, fueling facility.

**November 22, 2014** – Contractor’s Notice to Proceed 2 for Milestone 2 activities which included the following:

- Remove and recycle existing warehouse buildings.
- Demolish pavement, stormwater, water and sewer utilities.
- Relocate power lines and natural gas lines.
- Demolish portion of Eastgate Parking Lot, including curb, utility conduit and illumination.
- Clear, grub and remove structures and obstructions.
- Earthwork
- Construct transfer station, administration building and fueling facility, install equipment.
- Install and test pre-load stationary waste compactors.
- Coordinate delivery, pickup and installation of windows.
- Install artwork in Administration Building lobby.
- Install standby engine generator, stormwater detention vault, and retaining walls.
- Site utility systems so that the transfer station, administration building, and fueling facility are functional.
○ Install north entrance road, west road and temporary access roads. Transfer trailer parking yard, related signs.
○ Improve Eastgate property.
○ Commission Milestone 2, Phase 2 building systems and install equipment.
○ Plan Transition Period.
○ Issue Temporary Certificate of Occupancy by the City of Bellevue for Transfer Station and Administration Building.
○ Acquire regulatory approvals for fueling facility.

## Transition Period

### Forty-five days, allowing KCSWD to relocate, startup and begin operating at the new station.

- May 3, 2016 – Substantial Completion of Milestone 2 and start of Transition Period which includes allowing King County to relocate, startup and establish operations in the new transfer station and administration building.

## Milestone 3

### Demolish the old facility. Construct the new HHW building and associated site work, utilities and landscaping.

- June 17, 2016 - Contractor’s Notice to Proceed 3 for Milestone 3 activities which included the following:
  ○ Remove and recycle existing transfer station.
  ○ Demolish pavement, stormwater, water and sewer utilities.
  ○ Clear, grub, and remove structures and obstructions.
  ○ Earthwork and site work.
  ○ Construct HHW Building and Canopy and install equipment.
  ○ Install permanent stormwater controls including cisterns and other utility systems so the HHW building is functional.
  ○ Remove temporary access roads and shoring.
  ○ Install south entrance and east roads and parking areas.
  ○ Construct retaining walls 1B and 4.
  ○ Reconstruct Eastgate parking lot.
  ○ Install site illumination.
  ○ Improve scalehouse.
  ○ Install wayfinding and informational signage.
  ○ Landscape.
  ○ Coordinate with artist.
  ○ Salvage existing HHW storage lockers.
  ○ Install waste oil tank, propane tank cage and waste antifreeze tank in HHW Building.
  ○ Commission Milestone 3 systems and installed equipment.
  ○ Acquire Temporary Certificate of Occupancy by the City of Bellevue for the HHW Building.

## Milestone 4

**Final acceptance required PCL to complete various contractual requirements along with final submittals, such as operation and maintenance manuals and drawings.**

- August 21, 2017 - Substantial completion of Milestone 3 and start of Milestone 4
- October 21, 2017 – Complete landscaping.
- October 23, 2017 – Grand opening event.

### Describe Challenges and How You Overcame Them

**Complex Phasing and Temporary Shoring Wall Maintain Operations Throughout Construction**

Previous attempts to modernize the Factoria would have required closing for construction — not an option for the facility, considering it handles more than 16 percent of King County’s solid waste. Only through a complex construction phasing effort did construct the new facility while maintaining operations. The team used a 40-foot high, 300-foot long temporary retaining wall to maintain operations. The effort required four traffic patterns and considerable earthwork. The topographical change — about 80 feet — required moving approximately 400,000 tons of soil.

Running through the existing transfer station trailer parking area, the temporary wall required King County staff to be creative — parking trailers in locations typically used for other activities. Challenging the team throughout construction, the shoring wall location, required a temporary guard rail on the exit road and structural monitoring of the existing structure to maintain operations. By constructing the wall at night, daytime operations were not hindered. Further, PCL had to consider access for equipment and materials for the new facility since the temporary wall was only approximately 20 feet from the new transfer station.

*A representation of a larger sustainability effort by the community. The ribbon at the grand opening was, fittingly, not a ribbon at all but a string of garbage and recyclable materials.*
With traffic moving around the site in various patterns, safety was a constant consideration to keep customers, staff and construction teams safe. King County worked with team members to design and implement additional temporary roads during the phased construction, providing better separation of public and commercial traffic.

**WHAT CHANGES HAVE BEEN MADE SINCE THE TRANSFER STATION’S OPENING?**

To establish roots, the landscaping required a temporary irrigation system. Placed next to curbs in several places, the piping was susceptible to being driven over, which wasted water and needed frequent repairing. Where possible, the pipes were placed further into landscaped areas or protected with concrete barriers. When the temporary piping is removed after the establishment period, the barriers will be removed as well.

Two electrical handhole lids needed to be replaced when the tipping floor loader was required to drive over them to access the fueling facility. Upgraded to handle the loader’s 20-ton operating weight, the handholes are now safe to be driven over.

**Facility Design and Construction**

**WHAT ARE THE KEY ELEMENTS OF YOUR TRANSFER STATION DESIGN?**

The facility utilized pre-engineered joists spanning the tipping floor, eliminating the need for columns in the tipping floor. This allows unimpeded vehicle maneuvering within the building, maximizes operational space, and expands operator visibility.

**HOW DOES STATION APPEARANCE CONFORM TO COMMUNITY STANDARDS?**

Factoria Recycling and Transfer Station’s architectural approach was to emphasize modulating sections of the building to break up the facility’s large mass. The color selections include natural hues of browns and grays intended to complement the surrounding slopes’ natural treescape. For example, a dark charcoal gray is used to highlight and contrast the façade features, including main steel columns, secondary framing, and window framing. Carefully located color accents suggesting wood tones of cedar it add vitality to the color scheme.

**WHAT EQUIPMENT OR OPERATIONS ARE INNOVATIVE OR STATE-OF-THE-ART?**

**First Flat-Floor Design Increases Safety While Maintaining Operations**

King County’s first flat floor transfer station allows for easier garbage unloading, better traffic flow and reduces customer wait times. It also offers a safer environment by reducing opportunities for people to fall over walls or into floor openings above the waste load out level.

Throughout the three year construction project — including demolition and removal of the old facility — garbage disposal and household hazardous waste collection services remained uninterrupted. Even though the site dropped 80 feet, requiring excavation of about 300,000 tons of soil and use of a large, temporary retaining wall, services remained operational. Project completion also required constant communications with operations staff, who kept customers notified of changes at the facility.

**New Station Provides Flexibility for King County’s Future Needs**

The new transfer station is designed with flexibility to fit future needs. In fact, if KCSWD determines that major operational changes are needed within the next 50 years — the design life of the new transfer station building — it can change nearly the entire operation.
of the transfer station. The building was constructed with five large doors allowing for traffic flow and direction to be flexible. Extra electrical hookups are provided within the transfer station in case King County wants to incorporate yet to be determined equipment into its operations.

The one certainty about solid waste transfer operations is that they will change. KCSWD knows it must innovate to reduce waste sent to the landfill. When new waste streams are identified, diversion can occur at the curbside or on the transfer station tipping floor. These tactics to increase diversion from the landfill can require operational changes, such as traffic routing in the building, waste stream segregation on the tipping floor, or adding sorting lines or other technology. To allow for the ever-changing nature of waste streams and how they are handled, KCSWD’s team sought a facility with as much flexibility as possible.

The large, open tipping floor allows operations to accommodate several waste streams. With no grade separations or permanent walls separating traffic from equipment, the operation of the floor can be configured differently to accommodate traffic changes from weekdays to weekends, or to manage seasonal changes in the yard waste volumes. The floor is large enough to allow areas to be designated to segregate certain load types, or to add a small sort line or other processing operations. The tipping floor size also allows KCSWD to add sorting equipment to recover recyclable materials.

The tipping building has large hangar doors on the east side and oversized roll-up doors on the south and northeast sides. Coupled with the open floor, these doors allow traffic to be routed in a variety of configurations.

Finally, the facility has three load-out ports. Two compactors and a gravity top-load trailer bay are spaced along the north push wall. The multiple load-out bays provide flexibility to send various waste streams to different destinations concurrently. The top-load option can handle materials not suitable for the compactors, such as yard waste and clean wood. The top load opening also allows for tailers to be loaded during a power outage.

With the ease of drop-off, variable traffic flow, improved safety and future flexibility, KCSWD anticipates its future new transfer stations to be flat floor designs as well.

**Shortens Commutes for Customers**

King County ordinances dictate that the public should not have to travel more than 30 minutes to drop off waste — thus making transfer stations a key part of its solid waste strategy. Prior to the redesigned station, eastern county customers drove approximately 16 miles, one way, to properly dispose of recycling, yard waste, clean wood, tires and appliances. While customers could drop these items off at the previous Factoria site, they would be mixed with garbage and sent to the landfill for disposal. King County anticipates collecting approximately 5,000 tons of recyclable or compostable materials during the first year these services are offered at the new Factoria Recycling and Transfer Station.

With careful attention being paid to each project phase, and new, innovative improvements made while staying rooted in the project’s goals, the new station is a long-term, flexible solution to increase diversion throughout King County.

**HAVE YOU REPLACED ANY EQUIPMENT OR MADE OPERATIONAL CHANGES? IF SO, WHAT PROMPTED THE REPLACEMENT OR CHANGES AND HOW DID YOU DECIDE ON THEM?**

No equipment or operational changes have been made at the facility.
Environmental Controls and Regulatory Compliance

HOW HAS THE NEW EQUIPMENT OR OPERATIONAL CHANGES IMPROVED THE TRANSFER STATION?
Not applicable.

WHAT DESIGN FEATURES AND CONTROLS ENSURE THE TRANSFER STATION MINIMIZES OR MITIGATES ENVIRONMENTAL IMPACT?
Stewardship of the environment is a core KCSWD value. The Factoria Recycling and Transfer Station demonstrates their commitment to the environment in many ways. Every aspect of the facility is designed to provide improved, ongoing environmental protection beyond a traditional transfer station. From LEED Certification, through regulatory agency monitoring, and safe approaches to handling municipal solid waste, Factoria exemplifies a modern, environmentally conscious facility. Examples of environmental protection include:

- leachate separation from stormwater, reduced quantity of water needing treatment, reduced trips to the landfill due to compactor use, and reduced annual energy and water use.

Transfer stations are traditionally associated with noise, dust, odor, litter and, of course, garbage. These unwanted characteristics were addressed by enclosing the new facility. The design minimized surfaces where dust and litter accumulate — finished surfaces were selected for their ease to maintain and clean. The transfer station building also contains a misting system to assist with dust and odor control.

King County Solid Waste Division targeted the project for LEED Gold certification. The application, submitted to the U.S. Green Building Council in April 2018, noted:

- 40 percent energy cost savings, with an improved thermal envelope, reduced lighting power density, and daylighting controls.
- 33 percent of building materials were manufactured with recycled materials.
- 34 percent of materials were locally sourced.
- 95 percent of construction waste diverted from the landfill.
- 94 percent of lumber used in the structure was U.S. Forest Stewardship Council certified.
- 64 percent reduction of water use by collecting and reusing rainwater, using low-flow plumbing fixtures and water-efficient landscaping.
- Indoor environmental quality using increased ventilation of occupied spaces and low-emitting adhesives, sealants, paints, coating, and composite wood materials.

New Plants are Native and Drought Resistant
The landscape design uses a sustainable approach, eliminating the need for a permanent irrigation system. Plants consist of a mix of drought-tolerant and native-adapted shrubs and groundcover. In restoration zones, native forest is being re-established using an accelerated succession planting approach. A temporary, above-ground irrigation system is currently being used around the building to establish plants during the first year. After the first year, it will be removed and reused by King County on future projects. The landscape design also enhances visual quality of the site for visitors and neighbors, while promoting safety by applying crime prevention through environmental design principles.

Careful Approach Minimizes Wetlands Impacts
The construction and design teams took a careful approach to avoid impacting wetlands. While the project filled less than a half-acre of low class wetlands, they avoided impacting the larger Class III Wetland and stream — which are critical to wildlife and hydrologic functions. The team documented the environmentally sensitive areas, their functions and values, and the construction impacts, allowing mitigation efforts to be set forth.

Improving Stormwater
The permanent stormwater management plan includes multiple practices to meet local, state and federal regulatory requirements. Pervious pavement, which allows stormwater to seep through the concrete and into the ground, was utilized wherever possible to minimize runoff. Stormwater bioretention filtration systems were utilized in City of Bellevue right-of-ways to treat roadway runoff. Onsite, the largest stormwater management feature is the combined detention/wet vault.

Because Factoria Recycling and Transfer Station is an industrial site, enhanced water quality treatment is required for all...
new and replaced pollution-generating impervious surfaces. Basic treatment facilities seek to remove 80 percent of total suspended solids from the site's stormwater runoff. Enhanced treatment facilities — such as Factoria — provide a higher rate of dissolved metal removal. The enhanced water quality treatment is provided by a two-facility treatment train with a combined detention/wet vault and a water quality vault. The combined detention/wet vault includes 4-feet of dead storage depth — settling space above the sediment volume — to provide a wetpool for water quality treatment via settling, and an oil-retaining upper baffle wall and lower baffle wall that divides the vault into two equal-sized cells. As part of the enhanced water quality treatment train, a water quality vault housing media filter cartridges is located inside the detention/wet vault. Runoff discharges from the wet vault after suspended solids have settled through an 18-inch pipe into the 6-foot-by-8-foot water quality vault. Here, further filtration occurs via the filter cartridges.

Stormwater discharge from the vault matches a pre-developed condition of forested land cover. The 161-foot-long, 64-foot-wide, 13-foot-deep cast-in-place underground combined detention/wet vault provides 44,810 cubic feet of wetpool volume for the 6.4 acres contributing flow. The vault meets the pre-developed condition via its flow control structure, which consists of an 18-inch-diameter riser with a low flow circular orifice and a vertical rectangular notch orifice.

**WHAT IS THE OVERALL IMPACT OF THE FACILITY ON HUMAN HEALTH, ENVIRONMENTAL QUALITY AND RESOURCE CONSERVATION?**

**Transfer Station Features Best of Sustainable Design**

The new facility is a monument to sustainable design. Featuring skylights and translucent wall panels to allow natural light into the building, as well as rainwater harvesting, recycled-content building materials, locally sourced materials, and 50,000 drought-tolerant, native plants, the new facility will improve energy efficiency and reduce King County's environmental impact.

The building is designed with ample translucent wall panels and domed roof skylights to provide extensive daylighting. The lighting on the tipping floor area is controlled by a light sensor that allows the three-level lighting system to be adjusted down when adequate natural light is present. The use of natural light not only saves energy, but also is shown to be safer and a better work atmosphere for employees.

Studies optimized the high-efficiency dimmable lighting system to coordinate with skylights and translucent wall panels covering the tipping floor and the household hazardous waste canopy and facility. The skylights and translucent wall panels allow natural light into the building, eliminating glare, augmenting electric lighting, and reducing energy consumption in a controlled manner. Combined with all energy saving strategies, these will allow the facility to use 40 percent less energy than the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standard for energy-efficient buildings. The measures are estimated to reduce carbon dioxide emissions by 172.5 metric tons per year.

The building is highly energy-efficient, achieving 40 percent less energy use than a similar building built to the requirements of the standard energy code. Energy efficiency is achieved with a natural ventilation mode that automatically turns on based on wind speed and direction. Efficient heat pumps serve the conditioned spaces. The entire 52,800-square-foot transfer station roof has been designed to accommodate additional weight from a future photo-voltaic system.

The addition of two compactors also allows for consistently compacted 26-ton loads, minimizing vehicle trips to and from the facility. One stationary compactor can compact approximately 1,100 tons during a 10-hour shift, while the other handles approximately 825 tons.

 Constructed with material containing high recycled content — such as fly ash and slag in the concrete to prevent CO2 from being introduced into the atmosphere, asphalt with recycled roofing content, and recycled steel, aluminum, gypsum board, insulation and glazing — the facility offers a standard for future station design. Employee areas were constructed with durable materials not containing formaldehyde or volatile organic compounds (VOCs). Construction materials used have a 33 percent post-industrial or post-consumer recycled content. Additionally, 34
percent of the materials used to construct the new facility were sourced from within 500 miles of the project site and more than 90 percent of wood used is certified as sustainably harvested by the FSC. A comprehensive construction waste management plan also resulted in approximately 95 percent of the demolition and construction waste being diverted from the landfill.

Water conservation was a key consideration. The new facility uses three underground water tanks to collect up to 42,500 gallons of rainwater for reuse in toilets, tipping floor and equipment washdown. In addition, low-flow water fixtures were installed in the locker rooms and restrooms. These efforts will offset more than 1.3 million gallons of potable water annually — a 59 percent reduction over traditional design. Further, slope changes minimize water contact with refuse, reducing the production of leachate directed into the sanitary sewer treatment system and, along with trench drains, prevent contaminated water from reaching the storm drainage system.

Low VOC sealants, adhesives and paint provided a cleaner, healthier environment for employees. In addition, air quality in the building is monitored by multiple carbon dioxide and carbon monoxide monitors, which activate an alarm in the event of high-level readings.

**Expanded Collection and Recycling Options Reduces Landfilled Materials**

An indoor area for collecting and sorting clean wood, scrap metal, paper, glass and yard waste creates a safe space for self-haul customers. In addition to standard curbside collected material, the recycling area is also dedicated for appliances, carpet, tires, asphalt shingles and mattresses. There is also a separate dedicated building to safely collect HHW, including oil-based paints, propane or other flammable gas tanks, oil and antifreeze, batteries, lightbulbs, aerosols, cleaners, adhesives, solvents and gasoline.

As a result of this project, King County further reduces solid waste collection and tonnage delivered to their landfill. However, when the landfill eventually reaches capacity, waste will be exported by rail to more distant landfills. With this in mind, Factoria is equipped with preload compactors which can fill lightweight intermodal containers quickly and efficiently, positioning King County well into the future.

**HOW CAN YOU DEMONSTRATE COMPLIANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS?**

In addition to the sustainable design elements, the building and site provide environmental controls — enclosed building, minimized noise and odor — to mitigate the impacts from handling solid waste. The enclosed building also contains the litter and debris. A six-zone misting system above the tipping floor diffuses ambient dust.

The building is located in the northwest portion of a large site, providing several hundred feet of buffer space between the operations and surrounding neighbors. Trees were planted around the property to minimize views for the industrial and commercial neighbors to the west and north.

**New Station Meets Insurance Risk Standards**

The design was complete so that the building envelope meets FM Global, King County’s insurance carrier, risk management standards. The fire suppression system was completed per FM Global requirements for minimum sprinkler head flow. The structural design and joist spacing complies with FM Global recommendations and received approval prior to installation.
Red-Tailed Hawks Found Near Project Site
From 2010 through 2011, the team observed an active red-tailed hawk nest approximately 220 feet from the scalehouse. Working alongside the Washington Department of Fish and Wildlife, the Factoria team noted a lack of suitable nesting and foraging opportunities in the immediate project vicinity — concluding that mitigation was not necessary. However, the team made efforts to limit disturbances in the vicinity of the hawk nest.

To keep scavenger birds away from the site, netting protects the transfer station floor ceiling, draped below the roof joists. Barely visible to the naked eye, it provides chemical-free deterrence for birds attracted to solid waste. Further, spikes were installed at perch locations to minimize nesting, while the landscaping was specifically selected so they do not generate food for rodents or birds.

New Facility Designed for LEED Certification
The new Factoria Station is the third King County transfer station designed for LEED certification. During its first year of operation, Factoria is expected to collect 5,000 tons of recyclable material. By 2030, operational staff expects to collect 67,000 tons of organic material. Factoria is a model for sustainable transfer station design. A representation of a larger sustainability effort by the community, the ribbon at the grand opening was, fittingly, not a ribbon at all but a string of garbage and recyclable materials. Offering more recycling and disposal options than ever before — and completed on budget — the new transfer station has been heralded by the community.

Performance, Economics and Cost Effectiveness
WHAT METHODS DO YOU USE TO ANALYZE HOW WELL YOUR TRANSFER STATION IS PERFORMING?
The transfer station design included multiple meters to monitor operational performance.

Energy — 15 energy feeders are metered and five meters track energy consumption. The advance energy metering system can provide reports for each meters or a customized report can be prepared by selecting dates.

Water — Flow meters monitor rainwater collection, potable water use and irrigation.

Wastewater — A flow meter monitors the effluent and can provide flow, level and velocity.

Stormwater — A level sensor is included in the stormwater vault outlet that provides flow information. Water quality is measured quarterly, assuming there is flow.

WHAT RESULTS ARE YOU OBTAINING FROM YOUR ANALYSIS?
The facility has only been fully functional since October 2017 and performance results are not yet available.

HOW DO YOU USE THESE RESULTS FOR CONTINUOUS IMPROVEMENT OF YOUR FACILITY?
Because little data is available to date, the information has been reviewed for unanticipated results. As an example, staff noted a peak in wastewater flow following rainfall events, determining that they empty trailer parking area was routed to wastewater instead of the stormwater vault. In the event that full trailers ever needed to be parked in the trailer area, valves can change the drainage from the stormwater vault to wastewater. By monitoring results, the drainage direction was corrected, so no additional stormwater was routed to wastewater.

DO YOUR RESULTS MEET OR EXCEED THE GOALS ESTABLISHED IN YOUR PLANNING PROCESS?
The facility has only been fully functional since October 2017 and performance results are not yet available.

HOW DO YOU DETERMINE WHETHER YOUR FACILITY OPERATION IS COST EFFECTIVE?
New Station Improves Efficiency
The new facility, after separating recycling and other non-refuse items, compacts the waste using two stationary compacters. The old transfer station utilized top load containers, whereby customers dumped waste directly into openings above trailers and a tamping crane compacted the waste. The stationary compactor design improves the previous top-loaded container system by allowing consistent
26-ton loads to leave the facility and reducing vehicle trips from 25 to approximately 17 per day.

Further, the more efficiently the transfer station operates, the less time, money and fuel is wasted on queuing trash vehicles. With standard commercial collection trucks averaging about 3.5 miles per gallon of gas, it is important that they move in and out of the station quickly. The new transfer station is designed to allow commercial customers to enter the building, unload waste, and exit within 5 minutes.

The flexible tipping floor provides 11 self-haul unloading stalls during weekday operations. During weekends, when self-haul traffic increases and commercial traffic decreases, the tipping floor operations may be orientated to use the commercial tipping area, thereby better serving KCSWD customers.

**WHAT ARE YOUR CURRENT COST-EFFECTIVENESS RESULTS?**
As a publicly owned facility, the tipping fees collected at Factoria Recycling and Transfer Station is combined with revenues of the other solid waste facilities operated by KCSWD, revenue specific to Factoria is unavailable. However, the new, fully operational facility was designed and completed on budget, handling anticipated tonnages at rates set by King County.

**DESCRIBE YOUR MAINTENANCE SCHEDULE.**
The facility undergoes regular inspection (weekly, monthly checklists), and solid waste operating permit inspections by Seattle-King County Public Health. In addition, the constructed elements have a long design life and require minimal maintenance. The facility includes durable finishes throughout, such as the wear-resistant and easy to clean sealed concrete flooring.

**DO YOU HAVE A RECOVERY PLAN FOR INTERRUPTIONS DUE TO EQUIPMENT MALFUNCTION OR NATURAL DISASTER? IF SO, DESCRIBE THE PLAN AND HOW OFTEN IT IS UPDATED.**
Staff have the authority to close the transfer station due to unsafe conditions, such as fire, earthquake or strong wind. If prolonged closure is expected, commercial garbage haulers and redirected.

For power outage or other external electrical emergencies the electricity service provider is contacted. Emergency power is available from the onsite generator, which automatically turns on during a power outage. A standby diesel engine generator can power most of the facility, aside from the pre-load compactors, the box compactors in the recycling area and the yard waste tamping crane. This generator allows Factoria to be operable even after natural disasters.

For water and sewer emergencies, the Site Engineer will contact the appropriate utility. Potable water, storm drainage and sanitary sewer services are provided by the City of Bellevue.

**Ability to Recover From Natural Disasters**
Considered essential public facilities in Washington, transfer stations provide a critical function in the community, especially during natural disaster recoveries. As such, the building was designed for immediate occupancy following a natural disaster including a major seismic event.

KCSWD prepared an operating plan for the new facility which includes a section regarding emergency plans. Safety and emergency response procedures are detailed in the First Response Quick Reference Guides, an appendix to the operating plan. In addition, the operating plan includes an Emergency Evacuation Site Map which includes routes and pre-assigned meeting areas. The operating plan is typically updated every other year.

The locations of safety and emergency response equipment such as fire hydrants, first aid kits, eye wash stations and telephones are posted at various locations.

**Worker and Customer Health and Safety**

**HOW DID YOU ADDRESS SAFETY ISSUES IN PLANNING AND DESIGNING THE FACILITY, AS WELL AS IN CURRENT PRACTICE?**
Once past the scale house, commercial and self-haul customers are separated through dedicated traffic lanes and separate entrances and exits. This minimizes traffic conflicts and avoids situations where commercial customers maneuver near self-haul customers who often stand outside their vehicles at the facility. Further traffic conflict reduction efforts include separate site entrances for long-haul trailer deliver and pick-up. Because of pre-compacted, weighed loading, long-haul transfer vehicles do not use the onsite scale and, thus, do not use the same entrance or exit as customers.

Long-term, the fully contained facility maximizes employee safety. The tipping area uses natural ventilation and a misting system for dust and odor control, providing cleaner air for employees and energy savings by not continuously using ventilation equipment. The misting system also reduces dust while an odor neutralizer eliminates foul smells. Metal grates, boot brushes, and walk-off mats are provided at each entrance to further improve air quality and reduce interior dust.

The Administration Building is pressurized to minimize dust and odors from entering the building. The locations of the compactor openings are away from the Administration Building so that distance from garbage to offices, break rooms, and electrical rooms is maximized.
The tipping floor and HHW facilities have multiple hazardous gas detectors and alarms. These automatically operate exhaust fans if lower levels of carbon monoxide, nitrogen dioxide or other contaminants are detected. If higher levels are detected, systems will alarm to notify staff of conditions.

A panoramic, elevated view of the tipping floor is accessible from the supervisor’s office, employee break room and multi-purpose space, allowing transfer station operators to maintain command while being separate from equipment and separate from vehicle fumes, dust and other contaminants.

**How often do you train employees?**
Training starts with initial training for all new operators. Thereafter, operators receive training annually, which is also followed up with quarterly operator meetings to discuss station issues and potential safety items. These meetings provide the basis for review of operating and safety procedures. KCSWD also holds annual training sessions focused on proper standard operating procedures for spills within the facility and hazardous materials handling.

**What type of training do you provide?**
Safety training courses are available free of charge to all King County employees and are taught by qualified Occupational Education and Training Program Administrators. Following is a list of training provided to KCSWD staff:
- **Basic First Aid, CPR, and AED**
- **Active Shooter**
- **Confined Space Awareness**
- **Defensive Driving**
- **Flagging/Work Zone Traffic Control**
- **Lifting Safely**
- **Powered Industrial Trucks and Forklifts**
- **Workplace Violence Prevention**

King County also offers free online learning opportunities for employees through eLearning, providing continuous access to multiple safety and health training courses and videos.

Specific to Factoria, training is completed for equipment both stationary and mobile systems, and the compactors.

**What is your injury rate, and what are you doing to improve it?**
KCSWD does not track an injury rate separately for Factoria Recycling and Transfer Station. Instead, injuries are tracked for the overall division. KCSWD’s Days Away Restricted or Transferred rate for 2017 is 3.66, which represents injuries that required days away from work, restricted duty or job transfer.

KCSWD’s Accident Prevention Program helps maintain a safe and healthful working environment. Supervisory planning, including safe work procedures reviews and providing protective equipment, helps to ensure a safe work place. KCSWD is required to ensure that facilities, equipment, supplies, practices and procedures meet or exceed applicable federal, state and local safety and health standards. KCSWD has developed a comprehensive health and safety plan, and specific basic safety rules for its transfer stations. This, along with procedures for personal protective equipment use, lockout tag-out, cold and hot weather, equipment safety, blood borne pathogens, chemical safety, fire safety and asbestos awareness help employees prevent injuries.

**Do customers come into your facility? If so, how do you ensure their safety?**
After passing through the scale plaza, vehicles enter the transfer building through separate entrances, one for the public and one for commercial haulers. When commercial haulers are not present, staff may direct self-haul customers to use the commercial entrance.

When the loader needs to push garbage on the tipping floor’s east side, staff hold self-haul customers at the door until work is complete in the area.

For safety reasons, customers are instructed to keep children and pets inside the vehicle, and not to smoke or use mobile phones. Signage instructs customers about safe practices inside the transfer building.
The yard waste collection area has an open top loadout. Because customers can get close to this opening, safety cables are installed as a precautionary measure to keep customers and staff from falling into the trailer below.

Public Acceptance, Appearance and Aesthetics

DESCRIBE CONCERNS OF YOUR COMMUNITY AND HOW YOU RESPONDED TO THEM.

Public Art Ties the Transfer Station to a Greener Idea

The new transfer station’s 432 stainless steel wheels on the main retaining wall convey a sense of motion. “Still Spinning” abstractly ties into the recycling theme with its 75-80 percent recycled steel while promoting greater public awareness for recycling issues and tying into Puget Sound’s passionate local bicycling community.

Another piece of art at the entrance to the administration building offers another nod to recycling and motion. The poem, etched into the lobby’s glass panels, was originally included in a 1990s Factoria design that was put on hold. Repurposed for this project, the poem highlights human cycles and loops found both around the new transfer station and in nature. Shadows from the etched words change as the sun crosses the sky, creating a sense of motion.

WHAT ARE YOUR COMMUNITY OUTREACH AND ENGAGEMENT EFFORTS?

Being a Good Neighbor

To minimize disturbances to the surrounding community, the team drilled the retaining wall piles instead of driving them, which minimized noise production. Further, sewer work on neighboring streets was complete at night, so as to not disturb traffic flow during the day.

To minimize traffic impacts, the station’s new stationary compactors, which are oversize loads, were hauled 12 miles from the rail yard to the site from 2-5 a.m. on a Monday morning. Because the smaller compactor weighs approximately 84 tons and the larger one approximately 112 tons, routes were limited to roadways designed for heavy loads and special permits had to be acquired.

Introductions to the Neighborhood

The team worked with local businesses and residents before, during and after construction. King County held a robust public outreach campaign to gather feedback regarding the new Factoria Recycling and Transfer Station.

King County held community open house events at a facility near the existing transfer station. Residents and businesses near the site, along with commercial haulers were invited to review draft site layouts. In addition, these meetings were used to host an open dialog early in the design phase so the project was developed to satisfy customer needs while minimizing negative impacts during construction.

As construction progressed, King County continued outreach with quarterly newsletters and visiting companies in the surrounding business park to keep all informed of current and upcoming construction activities.

During 2014, prior to onsite construction work, the team made door-to-door visits to surrounding companies that might be affected by construction. The visits were completed by PCL’s project manager and superintendent and Parametrix’s lead construction manager. PCL and Parametrix discussed the upcoming construction and related concerns with each business. Each person provided a business card so business’s could call with problems and to allow issues to be handled promptly.

Another part of the outreach were quarterly newsletters to describe work accomplished and, more importantly, let nearby residents and businesses know what work was coming up. King County created the newsletters in English, Spanish, Chinese and Korean — the four most prominent languages in the area — and provided contact information for additional information.

Open to the Public

The new Factoria Recycling and Transfer Station will also teach the public about transfer stations and solid waste handling. The facility has hosted multiple facility tours,
PCL allowed a portion of the staging area to be used by Seattle Humane — a private, nonprofit dedicated to saving and serving pets in need. As a gesture of goodwill, PCL paid for a paved portion of the staging area to be striped and upgraded the access gates for use by the humane society. In 2018, Humane Seattle opened its new shelter designed to serve 10,000 orphaned pets every year. As a thank you to PCL, Seattle Humane included PCL on the list of donors to the new facility included in the entry of the adoption center. Seattle Humane acknowledged PCL on the $10,000 level of donation in appreciation of its goodwill towards a nearby construction project desperately in need of additional space.

WHAT IS YOUR CUSTOMER SERVICE APPROACH AND HOW IS IT MEASURED?

PCL’s Customer Service Unit (CSU) fields customer inquiries that come by telephone and through the website. CSU responds to more than 34,000 telephone inquiries and 1,300 website e-mail requests annually.

WHAT RESULTS HAVE YOU ACHIEVED WITH YOUR COMMUNITY RELATIONS PROGRAMS?

Helping a Local Nonprofit Organization

Founded in 1897, Seattle Humane was the first humane organization to serve King County. After the city and county created their own animal control divisions, Seattle Humane became a non-profit — not affiliated with city or county shelters — dedicated to saving and serving pets in need. They offer adoption, owner education, a food bank, and spay/neuter services to low-income pet owners.

While constructing a new shelter near Factoria, Seattle Humane lacked sufficient parking. They reached out to PCL, asking if a section of the staging area could be used for parking. The idea was enthusiastically met by the contractor as a gesture of goodwill — PCL even stripped a portion of the lot and upgraded the access gates for Seattle Humane. Seattle Humane’s staff and volunteers were able to safely and securely park in PCL’s staging area. This allowed what little parking space was available on Seattle Humane’s site during construction to be utilized by their customers.

On December 9, 2017, Humane Seattle celebrated the grand opening of its new shelter designed to serve 10,000 orphaned pets every year. As a thank you to PCL, Seattle Humane included PCL on the list of donors to the new facility included in the entry of the adoption center. Seattle Humane acknowledged PCL on the $10,000 level of donation in appreciation of its goodwill towards a nearby construction project desperately in need of additional space.

HAVE YOU RECEIVED ANY AWARDS? WHAT?

American Council of Engineering Companies
Engineering Excellence Awards
National Recognition Award

American Council of Engineering Companies of Washington
Engineering Excellence Awards
Silver Award

American Academy of Environmental Engineers & Scientists
2018 Excellence in Environmental Engineering & Science Award

Industrial Waste Practice

Northwest Construction Consumer Council
2017 Environmental Project of the Year