

“Green” Takes Root in the Phoenix Desert

A building’s form need not always follow the function.

Population growth in any large city brings with it an inevitable increase in residential solid waste. Both the waste management programs and facilities to handle it, including landfills, recycling, and newer generation transfer centers, demand long-range planning and creative responses to appease community concerns about the necessary infrastructure.

The foreseen closure of the 700-acre Skunk Creek Landfill led the public works department of Phoenix to embark on a program to construct replacement resources. The results of the seven-year effort not only led to successful solutions, but allayed any public objections to the new, two-part infrastructure that should support the municipally operated residential collection and disposal service far into the future.



Rooftop photovoltaic array that collects energy during the day helps to power parking area and other outside lights at night.

When the former landfill finally closed in 2005, it had accepted 19 million tons of solid waste during 34 years of operation. The city was prepared for a seamless continuance of service following extensive research, site evaluations, traffic, and cost/benefit analyses. These led to a new 2,652-acre landfill 60 miles away devel-

oped through an Intergovernmental Agreement with the Town of Buckeye. Because of the landfill’s distant location, the city needed to build the \$32-million North Gateway Transfer Station & Material Recovery Station (NTS/MRF) as a companion to an earlier facility already in operation on the south side. Lessons learned from operating that smaller facility significantly influenced the design of the NTS/MRF.

The NTS/MRF balances imaginative architecture, sustainable design, and cost-effective material solutions for a facility that supports both utilitarian and educational missions. Instead of an imposing box-like industrial structure, the asymmetrical design, spatial massing, and the use of color that plays off the desert context demonstrate that a building’s form need not always follow the function. The environmentally friendly character of this facility muted the all too frequent “NIMBY” objections to this vital infrastructure.

Service Center Cornerstone

Developed on 43 acres of a 450-acre municipally-owned site, the NTS/MRF facility is the cornerstone of a future municipal services campus and should even set the architectural standards for adjacent commercial development. Municipal officials selected Construction Manager-At Risk project delivery led by Arizona’s Layton Southwest (www.layton-const.com), with HDR, Inc. (www.hdrinc.com) as the prime consultant providing engineering services. J. R. Miller & Associates, Inc. (Brea, CA) provided the architectural/structural design; and Sure Steel, Inc., a Butler Builder® (Butler Manufacturing Company, www.butlermfg.com) based in Sandy,

UT, supplied and erected the structural steel and metal building systems. The resulting design embodies sustainability features that have since become the current design guidelines for subsequent building construction projects, noted Mark Leonard, director of public works.

“There is a policy in effect now that all new city structures must be designed and built to LEED criteria,” Leonard said. “This particular project was designed and built before enactment of that policy but we designed into it as many features as possible to reflect an environmentally friendly policy.”

The design development stage began in September 2002 and incorporated a major change in the building’s elevation that produced \$2 million in construction cost savings. As once envisioned, the building would have required a 20-ft deep excavation below grade to visually reduce the building profile without compromising enough inside clearance for collection trucks to tip their loads onto the work floor. Instead of the costly excavation to lower the work floor, the project team maintained a 52-ft height for the facility and used an architecturally varied configuration and detailing to reduce the visual scale of the complex. The resulting facility could easily be mistaken for a large office center or even an institutional building, such as a high school.

The building’s fully-enclosed operations prevent fugitive dust, odor, and noise emissions. The primary subdivisions consist of three elements. The 120,000-sq ft tipping area is designed to handle up to 4,000 tons per day of primarily residential solid waste. A 52,000-sq ft portion of the tipping area is reserved for “self-haulers,” public access that is served by 18 large overhead doors.



Attention to aesthetics at the North Gateway Transfer Station & Material Recovery Station appear to make the building glow from within during nighttime operation.

Both tipping areas are served by a 300-ft long subterranean tunnel with three loadout floor ports for transfer of trash to outbound semi-tractor trailers. Sixteen to 20 tractor trailers, each sized to haul the volume of 2 1/2 curbside collection truckloads, make four roundtrips daily to and from the landfill located 60 miles away near Buckeye. The work floor areas of both this space and the recycling area are both significantly larger than the predecessor facility on the south side of the city and the interior walls are more abuse resistant.

Phoenix has for years practiced a policy of managed competition in which city crews are competitively bid against private residential collection companies. The approach offers a management tool for comparing direct costs versus outsourced suppliers. Only one of the residential service areas is currently served by a private operator because of lower cost. Residents pay \$24.45 per month for the municipal service. The city also contracts out the 60-mile hauls to and from the new landfill.

In the 60,000-sq ft materials recovery facility portion of the complex, contractor crews sort and bale 200 tpd of recyclable materials at the present rate, but the facility was designed for 400 tpd to accommodate future growth. The city retains 90 percent of the revenues, set as a guaranteed floor price, for the eight

materials recovered by the contractor, Hudson Baylor Corporation (www.hudsonbaylor.com).

The third component is the 12,000-sq ft administration and employee space that presents the face of the facility. It incorporates a viewing gallery inside that overlooks the work floors. This feature and a meeting room support public education tours during which school-age and other groups learn about the environmentally responsible stewardship of municipal recycling that Phoenix fully implemented in 2000. The gallery and public spaces supporting it are segregated from that for the workforce, an improvement over the earlier center on the city's south side. As many as 15 groups a month tour the center. The tilt-up concrete walls and interior push walls needed to protect them against front-loader operations prevented customary ventilation louvers at low levels in the walls. Therefore, the architects designed the wing walls and other areas skinned with bronze-colored perforated metal panels as air flow intakes that supply ventilation into the work zones.

Sustainable Features

Butler Manufacturing Company supplied the structural subsystems and standing seam metal roof system with a high-emissivity "cool roof" coating fitted

on the custom-fabricated steel framing. The custom-engineered structural steel for the primary framing was engineered for 24-ft bays and clear spans for the large column-free work areas within the building. Another inherent feature is the concrete wall construction whose high thermal mass presents an energy efficient barrier against high summer temperatures.

Beyond those features, a significant amount of recycled material applied to the project. The Butler and other metal building systems themselves have 90 percent recycled steel processed by minimills into new raw steel for refabrication. Another material, the concrete used in the project, contains recycled fly ash from power plants. The building's architectural and environmental aesthetics also have a practical side. Deep overhangs shade the translucent clerestories from midday sun and the perforated metal wall panel accents provide ventilation as well as additional natural light. During night-hour operations, the clerestory strips along the eave glow from within while the landscape and parking area lighting outside are powered by energy collected during the day by a rooftop photovoltaic array and pole-mounted collectors. Daylight-controlled night-hour illumination thus complements the natural daylighting contribution on the cavernous work floors.



The tipping floor where route trucks unload collections that are reloaded into semis for the 60-mile haul to the new landfill.

Site management by the project team reflected the environmental awareness at the highest level within the public works department. The asymmetrical design,

ground-hugging elevations, and bronze wall panels play off the colors of the valley's craggy mesas and immediate landscape. Native plants were inventoried and

salvaged for re-vegetation at the site, along with a carefully preserved, 90-ft wide natural arroyo. Future plans call for hiking and equestrian trails across the campus.

For safety, the traffic management scheme segregates large truck traffic access and egress from private vehicles that can self-haul and dispose of refuse for free. This required construction of three bridges on site. The vehicles also use separate areas of the work flow once inside the building.

Phoenix has been at the forefront of waste management and proactive environmental initiatives since the 1980s. In the near future, Phoenix will implement a contract with a company that will tap the methane off the closed landfill. More commonly flared at such sites, it will be enough to generate electricity for an estimated 3,000 homes. In November the city fleet began using 20 percent biodiesel as another added facet of practical environmentalism in municipal operations.

The North Gateway facility, the latest investment in waste management infrastructure, further underscores that ongoing commitment. 