Smoothing Troubled Waters
Integrated Water Management Looks at the Big Picture

also inside  Reinvigorating Old Technology  Major League Communications  Algae, Biofuel and CO₂ Capture
Protecting Our Water Supplies

The year 2009 may be remembered as the year the world economy survived near-collapse. Hopefully, it will also be remembered as the year we began to think seriously about how to best live within our financial and our environmental resources.

To date, the national discussion regarding the environment has centered on decreasing greenhouse gas emissions. We must also focus on an imminent challenge — how to protect and conserve increasingly scarce water resources. While not necessarily linked to warming trends, the current cycle of unprecedented drought in some areas and flooding in others, algae blooms that threaten marine life, and contaminated lakes and rivers are reminders of the need for water management that considers the full spectrum of issues.

At Burns & McDonnell, we’ve assembled top professionals in every facet of the water cycle, and we’re meeting the challenges our clients face with greener stormwater management, advanced wastewater treatment methods, and innovative approaches to protecting and distributing precious potable water supplies. We can’t make it rain — or stop raining — but we’re confident that we can still solve whatever water challenge you face.

Best Regards,

James L. Foil, PE
Senior Vice President
Infrastructure
What’s Sustainable?

Sustainability permeates everything we do today — at work, at home, on our commutes. At Burns & McDonnell, we understand that sustainability is important to you, our clients and partners. That’s why we’re making it easier for you to find how sustainability impacts every topic we write about in BenchMark. Look for the leaf icon throughout the publication to see how our work is contributing to sustainability on all fronts.

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Large-Scale Atrazine Removal

Before water diverted from the Little Arkansas River can be used to recharge the underground water reserves of Wichita, Kan., it must first be treated to drinking water standards. (See cover story, page 9.)

It sounds simple enough, but it involves removing atrazine, a commonly used herbicide that enters the river through local agricultural runoff. Few techniques exist to remove atrazine effectively on a large scale. Burns & McDonnell is using a proprietary advanced oxidation process (AOP) to remove the pesticide from up to 30 million gallons of water a day, producing effluent that meets Kansas Department of Health and Environment drinking water requirements.

In the final step before the water leaves the city’s surface water treatment plant, AOP begins with adding hydrogen peroxide and ozone to the water. The ozone oxidizes, or destroys, the atrazine.

But there are side effects. The ozone also reacts with the bromide found naturally in the water and creates bromate, a byproduct hazardous to humans. That’s where the hydrogen peroxide comes in. In addition to aiding in the oxidation of atrazine, the hydrogen peroxide controls bromate production.

“It’s the first and only application of this technology on this scale in the world,” says David Garrett, environmental engineer for Burns & McDonnell. “This AOP allows us to turn a high volume of low-quality water into a valuable water resource for Wichita. The need for a solution like this is great.”

For more information, contact David Garrett, 816-822-3139.
Safety Corner
Sustainability and Indoor Air Quality

According to the U.S. Environmental Protection Agency, indoor pollutants can be two to five times as high as outdoor levels — with most Americans spending an average of 90 percent of their time indoors.

“The Occupational Safety and Health Administration (OSHA) sets limits for many pollutants,” says Burns & McDonnell industrial hygienist Eric Wenger. “But some people can experience adverse effects on their health or productivity from airborne contaminants at levels far below the OSHA limits. And in some cases, such as molds or allergens, there are no federally regulated safe limits.”

Healthier Buildings
Leadership in Energy and Environmental Design (LEED®) guidelines address air quality in non-industrial environments such as office buildings, where pollutant levels are likely to fall below OSHA limits.

Because sealing buildings to reduce heating and cooling costs can trap gases released from materials and furnishings, LEED® criteria suggest low volatile organic compound (VOC) paints, adhesives and finishes. Guidelines also recommend monitoring carbon dioxide levels as a measure of effective ventilation with outside air and using high-efficiency filters to reduce particulates.

Balancing Priorities
While indoor air quality always has been part of LEED® standards, past environmental efforts have focused on increasing energy efficiency. Conversely, some of the measures that improve air quality can increase energy consumption.

But the U.S. Green Building Council reports that studies of workers in green buildings revealed another kind of payback — productivity gains of up to 16 percent.

“It’s a new concept to plan for air quality,” Wenger says. “As industrial hygienists, we can provide air testing as part of LEED® indoor air quality management plans or to investigate occupant complaints. The sampling can include measuring levels of VOCs, noise, molds, allergens and other contaminants of concern to help protect occupant health as well as improve comfort.”

For more information, contact Eric Wenger, 816-822-3894.

News in Brief

Regional Offices Expand in Texas, New England

In 2009, Burns & McDonnell named two new regional offices offering a broad range of Burns & McDonnell services. In January, the office in Wallingford, Conn., became the New England regional office. Brett Williams leads the office, originally established to support the electrical transmission programs based in the area. Williams was the program manager for the Northeast Utilities $1 billion Middletown|Norwalk transmission project. In August, Leslie Duke was named to lead the Dallas-Fort Worth office, which already serves military and aerospace clients. Duke played a key role in growing the Burns & McDonnell Houston office over the past 10 years.

Burns & McDonnell to Design Washington Wind Development

Burns & McDonnell is providing project development, engineering design and construction management services to Puget Sound Energy for the Lower Snake River Wind Energy Project in southeast Washington. When complete, the project could produce up to 1,432 megawatts of electricity from 795 turbines, making it one of the largest wind energy resource areas in the United States. Construction of the first phase is scheduled to begin in late 2010 or early 2011.

Wyoming Water Project to Be Top in State

Burns & McDonnell has been selected to do preliminary design, final design and construction administration for the Gillette (Wyo.) Regional Water Supply Project, a water supply system for the city of Gillette and the surrounding region. Led by the Denver office, the project includes a 14,000 gallon-per-minute groundwater well field expansion, water booster stations, storage tanks, distribution system modifications, chlorination facilities and more than 40 miles of 42-inch diameter transmission pipeline. This raw water delivery system project has the potential to be the largest municipal water project in Wyoming history.

For more information about Burns & McDonnell, visit www.burnsmcd.com/news.
Early in his career, Scott Newland demonstrated poise and technical savvy, even when he was the youngest in the room by a decade. He quickly gained responsibility, managing underground transmission projects just four years after graduating from the University of Nebraska-Lincoln.

After witnessing Newland’s results- and deadline-driven project management of underground transmission for Northeast Utilities’ award-winning Middletown|Norwalk project, Burns & McDonnell leadership felt Newland was ready to step up to the position of program manager for Northeast Utilities’ $1.5 billion New England East-West Solution (NEEWS). Burns & McDonnell is responsible for three of the four NEEWS transmission reliability projects.

“The caliber of people needed to run a big program like this is hard to find,” says Mike Beehler, Burns & McDonnell associate vice president in the Transmission & Distribution Group. “Scott is a man of integrity and high character. That coupled with his unwavering work ethic and technical experience made him an excellent choice for this position.”


“When you’re in front of the pack there’s nowhere to hide,” says Brett Williams, Burns & McDonnell associate vice president and manager of the New England office. “Scott was the first person to jump in with both feet, issuing contracts proactively. He’s a guy who makes it happen.”
So it was no surprise that leadership in the Burns & McDonnell Transmission & Distribution Group nominated Newland for the honor of principal, which he received in July 2009 as a recognition of his outstanding performance — including a perfect safety record — leadership, ethics and technical knowledge.

"Scott definitely has an innate quality that suggests he will be a leader for a long time at Burns & McDonnell," says Gary Pence, Burns & McDonnell vice president in the Transmission & Distribution Group. "He has those natural leadership qualities that you can't develop — you either have them or you don't. He definitely has them. Someone like him rises to the occasion and accelerates his career."

Impressing the Client
When client Kathy Shea, Northeast Utilities project director for NEEWS, met Newland, she noticed his calm, confident composure.

"Nothing gets to Scott, and that doesn't always come easily to a lot of people," says Shea. "He is solid in stressful scenarios. He's even-tempered and measured in his approach. As far as I'm concerned, I would put him in front of public officials anytime."

With high-profile projects like NEES, community relations are an important aspect of a successful project delivery.

“Scott has those natural leadership qualities that you can’t develop — you either have them or you don’t. He definitely has them.”

“Scott is effective in public meetings, even when residents in opposition are very vocal,” Shea says. “He is good at offering potential solutions.”

Shea is confident that if Newland continues to carry out a forward-looking, integrated strategy through all stages of NEEWS, then the program will be a success.

Generating a Leader
Newland has developed a good rapport with clients like Northeast Utilities because he identifies and mitigates risks early in the project and manages expectations on a daily basis through the development of a thoroughly detailed schedule. His effective communication with the client along with continuously delivering results also contributes to positive client relationships.

"One of Scott's best leadership qualities is that he's extraordinarily honest," Williams says. "He gives clear direction with the ability to deliver both the good and the bad news.”

Pence agrees Newland’s integrity is one of his best qualities, noting that Newland learns from his mistakes and surrounds himself with those who are stronger in areas where he lacks experience.

"Scott is honest and firm, which builds trust with the client and our staff internally," Pence says. "He's not afraid to admit when he makes a mistake. He's also not afraid to ask for advice; he doesn't feel like he has to know everything."

Thus far, Newland has learned his management skills on the job through other great leaders at Burns & McDonnell. Beginning this fall, Newland started formally fine tuning these skills in a two-year executive MBA program at the University of Connecticut.

"My leadership style has developed by emulating the characteristics that distinguish the best leaders at Burns & McDonnell," Newland says. "I have learned that one key to success is surrounding myself with a talented team."

Contact Scott Newland at 203-284-8590.

Before becoming program manager for Northeast Utilities’ New England East-West Solution, Scott Newland served as project manager on the innovative, award-winning Northeast Utilities’ Middletown|Norwalk project.
Out with the New, In with the Old
Sunoco Reinvigorates Old Technology for Modern Use

While the idea of history repeating itself tends to have a negative connotation, that’s not the case for Philadelphia-based Sunoco’s newest hydrotreater plant. The plant uses older, but still viable, technology and existing resources for cost effectiveness and energy savings.

Burns & McDonnell provided engineer-procure-construct services to convert Sunoco’s 50-year-old hydrocracker unit to a hydrotreater unit to produce ultra low-sulfur diesel (ULSD). After sitting idle for nearly 10 years, the unit and its accompanying hydrogen plant needed extensive inspections and evaluations to determine which components, if any, were salvageable.

“Despite some irreparable equipment, some significant pieces of equipment in the hydrocracker were functional and restorable — including corrosion-free reactors,” says Ed Edmondson, Burns & McDonnell project manager. “But the hydrogen plant had to be demolished.”

After intense testing and systematic cleaning, including asbestos and lead paint removal, the refurbished and newly installed equipment, piping and instrumentation underwent process case studies to determine optimal restart configuration. That’s when Burns & McDonnell engineers discovered the hydraulic turbine, one of the refurbished pieces of equipment, could use the high-pressure energy coming off the treated diesel to power the motor that runs the feed pump. Typically, modern hydrotreaters use electricity to power the turbine and a pressure-release valve to relieve pressure off the gas.

“This was an unexpected cost savings because it eliminated the need for electricity to power the motor,” says Steve Gucciardi, Sunoco project manager. “Burns & McDonnell really took the time and made the effort to ensure a cost-effective solution for our needs.”

Still, the hydrotreater needed hydrogen. Because the original hydrogen plant had to be demolished, Sunoco could either scrap the entire unit or build a new plant at an extremely high cost. Burns & McDonnell performed a hydrogen study and determined enough hydrogen could be extracted from other sources within the refinery to sustain the new hydrotreater, saving the cost of a new plant.

“No matter what part of the project we were in, there was always an element of discovery,” Edmondson says. “We were able to put together a team that could work through each unique discovery — and we did it with zero recordables in more than 1 million hours worked.”

The hydrotreater construction was complete in July 2009 ahead of schedule and at a cost 50 percent less than that of a newly constructed unit. This project reduces overall air pollution and lessens the environmental impact of diesel-burning vehicles, and it serves as a benchmark for similar projects.

For more information, contact Ed Edmondson, 816-822-4244.

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**Hydrogen**
Hydrogen is the agent that reduces sulfur levels, making it critical to meeting the Environmental Protection Agency’s (EPA’s) new ULSD requirements. With Sunoco’s original hydrogen plant no longer operable, Burns & McDonnell’s study discovered enough hydrogen could be extracted from throughout the refinery to meet the new hydrotreater’s needs.

**Compressor**
The hydrogen pressure is increased by compressing the hydrogen before it is treated.

**Heater**
Hydrogen is heated to 600-900 degrees Fahrenheit, the temperature required for the desulfurization reaction to occur.
Following the Flow of Desulfurization

**Catalytic Reactor**
The hydrogen reacts with the diesel fuel to remove sulfur and other contaminants to create ULSD fuel.

**Stripper**
Hydrogen sulfide is removed from the ULSD before it is sent to the storage tank.

**Feed Pump**
While modern designs of hydrotreater plants call for a pressure release valve to alleviate the high pressure from heated diesel fuel, Burns & McDonnell used older technology to recycle the pressure as energy to run the feed pump.

**Product Storage**

**Transportation**
Sunoco's new hydrotreater plant provides an additional source of product in an under-served region while meeting the stringent EPA requirements for ULSD fuel. A potentially useless group of equipment found new life, creating a new revenue source at half the cost of building new.

The hydrotreater was brought online ahead of schedule and at a cost 50 percent less than that of a newly constructed unit.
There’s an old story about a young boy who, years ago, was visiting a dairy farm. “Why,” he asked the old farmer, “does milk come in quart bottles?”

“For a very simple reason,” the farmer replied. “That’s all the cow gave.”

The dairy industry took a giant step forward when it started packaging milk based on the needs of the consumer, rather than the limitations of the cows that produced it. A similar change is taking place in the U.S. water industry today as its leaders rethink their approach to water management, basing decisions more on balancing the needs of their customers and the needs of the environment, rather than on the limitations of traditional technologies.

The implications of that simple shift in thinking are profound.

“Until a few years ago, clean water standards were driven by the limitations of technologies available for treatment. Clean was as clean as the technologies of yesterday allowed. Today, clean water standards are driven by maintaining water quality,” explains John Mitchell, Burns & McDonnell wastewater practice director. “Lagoons, trickling filters and other technologies don’t necessarily maintain water quality.

“The dead zone that now exists in the Gulf of Mexico is a result of the large amount of phosphorus and other nutrients from a variety of sources flowing into rivers that empty into the gulf,” Mitchell says. “Much has been done under the National Pollutant Discharge Elimination System to reduce those pollutants, but a balanced approach between point sources and non-point sources will be necessary to correct the problem.”

The dead zone is just one example. Water problems vary from one region to the next. But dwindling fresh water sources, contamination and rising costs are jeopardizing many communities’ ability to ensure a safe, adequate and sustainable water supply.

To address these complex issues, Mitchell says, it takes an integrated view of all the factors that contribute to water quality.

“We as an industry can no longer ignore the interconnectedness of stormwater, wastewater and drinking water,” says Darin Brickman, water practice manager for the Northwest, working out of the Burns & McDonnell Denver office. “It’s like a three-legged stool. If one leg is broken, the entire stool collapses.

“Increasingly, our job is to understand and manage the movement of water from the moment it falls from the sky, to the pollutants it collects as it runs off surfaces on the ground, to how it’s collected, treated, distributed, consumed and treated again before repeating the cycle,” Brickman says. “We’re being called on by municipalities to look at their entire watershed and take a global approach to addressing their water supply or quality problems.”
Sustainability Is the Word
Tougher regulatory requirements may be driving many of the current projects to protect the environment and improve the quality of our nations water supply. But many municipalities and industrial companies are ahead of the regulatory curve in seeking sustainable solutions.

"Across the board, water and wastewater utilities are demanding solutions that are both environmentally and financially sustainable," says Dennis Haag, an environmental engineer who specializes in green solutions for Burns & McDonnell. "They want to leverage what they have to replenish their water resources."

That means things like selling the solids generated in the treatment process as fertilizer or using the biogas produced during treatment to generate heat or electricity.

It also means looking for new ways to finance construction projects. "Raising rates is always difficult," notes Mitchell. "When our engineers identify improvements that reduce energy consumption, increase efficiency and reduce operating costs, a utility may forgo conventional financing and pay for the improvement using the savings it generates.

"Municipalities also are increasingly looking at treated wastewater not as a used product that must be disposed of but as a resource to be taken advantage of."

"Communities are asking, 'If we cleanse the water to high standards, why are we just releasing it back into the ecosystem? Can we use it for irrigation? To replenish our aquifers? To reduce demand on our other water resources?" Mitchell says.

A CASE IN POINT
Combined Sewer Overflow Program
Kansas City Looks Beyond Sewers, Thinks Green

The Issue:
As in many larger cities, older neighborhoods in Kansas City, Mo., combine stormwater and sanitary waste flows in a single collection system. When it rains, the volume of water frequently exceeds the capacity of the pipe that is carrying it to the plant for treatment, causing overflows of raw sewage into the environment.

Burns & McDonnell’s Role:
Since 2002, Burns & McDonnell has worked with the city’s Water Services Department to help it understand the scope of its combined sewer overflow problem and to develop a long-term plan for meeting water quality standards, achieving regulatory compliance and implementing green solutions on an unprecedented scale.

The Solution:
Burns & McDonnell proposed a range of options that collectively address the city’s combined sewer overflow problem. Solutions might involve reducing the quantity of water that enters the stormwater system. Many of these are green solutions, such as rain gardens, retention basins and pervious pavement parking areas that reduce the volume and slow the flow of runoff reaching the sewer system. Still others are designed to separate the stormwater and sanitary flow or store it temporarily during heavy rainfall.

Status:
Several demonstration projects of treatment technologies and green infrastructure solutions have been completed while the city and Environmental Protection Agency negotiate the consent order required to execute the plan. Burns & McDonnell is working on a project to separate sanitary and stormwater sewers in some Kansas City neighborhoods. Recently, Burns & McDonnell was selected to perform a similar project for the city of Omaha, Neb. — design of a $6.5 million stormwater and sanitary sewer separation project in the historic Country Club District in central Omaha. Burns & McDonnell recently opened an office in Omaha to coordinate project activities, including a public involvement process to inform residents and solicit their input about proposed project details, including opportunities for green solutions.

Managing green space to reduce stormwater runoff is one green solution proposed as part of Kansas City’s overflow control plan.
The Good News
We can all live without a lot of things. But water is not one of them. Without a safe, adequate supply, we are all in trouble.

But the problems the water industry faces today can’t be solved by treatment alone. "Regulations have traditionally focused on the contributions of water-discharging entities such as municipalities and industrial facilities. Today, the need to deal with contributions across entire watersheds — be it runoff from urban roadways, rooftops and parking lots or rural agricultural activities — is recognized," Brickman says.

"Technology is making many more things possible," Brickman says. "It used to be a challenge to get one’s arms around stormwater issues. But with GPS, GIS and other technologies, it’s becoming easier for us to study impacts to entire watersheds relative to both water quantity and quality."

Technology also is making treatment plants more efficient and less expensive to operate. "Increasingly, clients use technology to streamline operations such as monitoring a plant’s performance from a laptop and making process changes without mobilizing workers at the site," Mitchell says.

Treatment solutions are growing more effective as well. Reverse osmosis, membrane processes, chemical oxidation and other advanced technologies provide much higher levels of treatment and are growing more common as regulations get tighter and prices come down.

"If we’re going to truly solve these problems, we’re going to have to work together," Mitchell says. "That means partnerships among industrial, municipal and agricultural interests, along with communities, to develop integrated solutions. And it means looking downstream at the impacts your actions are having elsewhere."

After all, we’re all downstream.

For more information, contact Jim Foil, 816-822-3180.
A CASE IN POINT
Northwest Arkansas Conservation Authority
Communities Take a Regional Approach to Protecting Water Quality

The Issue:
The cities in northwest Arkansas are growing rapidly and need more wastewater treatment capacity. Downstream neighbors in Oklahoma are concerned about the effects of phosphorus discharges into rivers that flow from Arkansas into their recreational and water supply lakes. A regional wastewater solution was sought to economically provide the needed capacity and meet stringent effluent phosphorus standards.

Burns & McDonnell’s Role:
Burns & McDonnell serves as an engineering consultant for the Northwest Arkansas Conservation Authority, an agency formed by communities that chose to band together and take a regional approach to environmental protection. One of the authority’s first initiatives is implementing a regional wastewater treatment plan.

The Solution:
After assisting the authority with putting in place the necessary intergovernmental agreements for forming a regional wastewater authority, Burns & McDonnell designed a treatment plant to remove the phosphorus to a 1 milligram-per-liter (mg/l) concentration before releasing the water into the ecosystem. Later, the permitted level was reduced to just 0.1 mg/l — one of the lowest phosphorus limits in the country. Burns & McDonnell accommodated the change through process redesign.

Status:
The first phase of the treatment plant and interceptors is under construction.
**A Private/Public Affair**

The first privately funded, commercial-use airport in the United States, the new Branson, Mo., airport has a unique edge on the aviation market. Privately owned and operated, the facility was built without public funds or grants and therefore without need to meet specific Federal Aviation Administration (FAA) standards. Regardless, the airport meets FAA standards, allowing commercial service while still earning a profit.

The airport, which serves Branson and the Tri-Lakes Region of southwestern Missouri, features a 16-gate, 58,000-square-foot terminal, a 9,000-foot runway with full parallel taxiway, and expanded parking and utility systems. It includes a three-mile access road with two bridges, a 500-vehicle parking lot with terminal roadways, a wastewater treatment plant, underground water wells with a pumping station, a utility distribution network and stormwater management infrastructure. The airport also includes a rental car facility with a ready/return lot and vehicle maintenance facility.

Burns & McDonnell provided design and construction administration services for the airport and secured all construction permits, including land disturbance, Corps of Engineers 404 permit and utility permits. “The entire facility was built with considerations for future expansion, including construction needs and technology systems that can be upgraded easily as the airport grows,” says Renita Mollman, project manager for the Branson Airport and manager of the Burns & McDonnell San Diego office. “Working with the owner and the FAA to develop a timeline of critical activities, Burns & McDonnell acquired an aeronautical survey to comply with FAA standards for developing instrument approaches into the airport.”

Among the more difficult aspects of this project were the terrain and relocation of 161-kv transmission line. More than 9 million cubic yards of earth and rock were excavated and placed on the airfield and 800,000 cubic yards of rock needed to be blasted on the access road. In addition, a 100-foot right-of-way had to be cleared and graded, as well as the three-mile route for the relocated transmission line.

The airport held a grand opening and welcomed its first commercial flight at 9 a.m. on May 11, 2009. “Burns & McDonnell was challenged by the terrain of this region to engineer and design a facility and runway to fit our needs within the budget and time frame we needed,” says Jeff Bourk, executive director of Branson Airport. “They did an excellent job of accomplishing the goals we set for this project.”

For more information, contact Renita Mollman, 858-547-9869.
Building the Future of Solar Power

The Midwest Research Institute (MRI), along with five additional solar energy organizations, is leading the way to realizing solar energy’s impact with the Solar Technology Acceleration Center (SolarTAC) under construction in Aurora, Colo. Burns & McDonnell is providing comprehensive planning, design and implementation strategies for the project. SolarTAC is the initial development of the larger Aurora Campus for Renewable Energy project. It is being constructed on a 78-acre, greenfield site on which installation and testing of photovoltaic and concentrated solar power systems will take place. The site requires flexibility for a variety of users while still using shared buildings and infrastructure to control costs. Facilities to support solar equipment testing at SolarTAC will include manufacturing and assembly buildings, exhibition and meeting space, and interties with Xcel Energy and required utilities. “The challenge has been anticipating future users, as well as the environmental requirements of this site, and positioning infrastructure to ensure adaptability for anyone who sets up testing facilities,” says Dennis Whitney, Burns & McDonnell project manager.

For more information, contact Dennis Whitney, 303-474-2223.

Change in the Midst of Business

A busy tourist shopping district is no place for frequent flooding. Nor is it the place to impede traffic flow with construction obstacles. The Virgin Islands Public Works Department must address these competing concerns in creating a new streetscape for a one-mile segment known as Main Street in Charlotte Amalie, St. Thomas. The street typically floods with 2 inches of rain, pouring water into the high-end jewelry shops and alley malls that line the route. The 22- to 24-foot-wide asphalt concrete pavement, one-lane road with side parking has irregular 2- to 4-foot concrete sidewalks with limited curb and gutters. As a subconsultant to Jaredian Design Group, a local A/E firm, Burns & McDonnell is providing engineering design, preparation of plans and specifications, and cost estimates for stormwater improvements and traffic maintenance. Design is scheduled to be complete in 2010. “Preliminary plans include evaluating night construction to preserve day hours for business and sightseers,” says Ron Colas, manager of the Burns & McDonnell Miami office. “Aesthetic solutions will include local materials, wider pedestrian walkways and pavers, and sustainable features that maintain and enhance the Caribbean flavor of the island.”

For more information, contact Ron Colas, 305-476-5820.
Arrowhead Stadium and Kauffman Stadium were built side by side in the early 1970s and had become significantly outdated. Fans of the Kansas City Chiefs and Kansas City Royals frequently encountered traffic jams in the too-narrow concourses, while the stadiums lacked enough restrooms, concession stands, premium seating, suites and restaurants.

Replacing both Jackson County, Mo.-owned stadiums was too costly. In 2006, Jackson County voters approved a 3/8-cent sales tax to renovate the stadiums, providing $475 million toward the $650 million renovation project. In addition to the public funds, the Chiefs pledged $150 million and the Royals $25 million to cover certain costs, and the teams took responsibility for any cost overruns.

Renovations at Kauffman Stadium, home of the Royals, were completed in July 2009. The Chiefs’ Arrowhead Stadium will be complete by August 2010.

Challenges
All major building projects place a lot of responsibility — even pressure — on the design and construction teams. But the stadium renovations had especially high visibility because taxes pay the majority of the bill. Further, the Chiefs and Royals draw nearly 4 million fans each year, all of whom would judge whether the facelifts were worth the money.
“One goal was to do a $650 million public project with only positive press,” says Blake Ellis, project manager for Burns & McDonnell. “While the long-term challenge was to deliver on the promise of two great sports venues, the immediate task was to balance the concerns of the Chiefs and Royals as construction got under way.”

Over the years, the teams had not always seen eye-to-eye. As next-door neighbors sharing loading docks, parking, stadium access roads and utility systems, the Chiefs and Royals were bound to see operations impacted by the other team’s construction projects.

**Solutions**
Communication paved a smooth path to successful completion of Kauffman Stadium renovations. From the outset, biweekly meetings with Burns & McDonnell, the JCSCA and team representatives covered minority- and women-owned hiring and workforce participation, project financials, construction progress and, most importantly, work on one project that might impact the other team. For example, spring construction at Arrowhead was causing dust to blow into Kauffman during early-season baseball action.

“The Chiefs volunteered to water down the Arrowhead site before each Royals game. The teams also had to work out access to loading docks, delivery gates, parking lots and other areas,” Ellis says. “It was little things, but it made a big difference to get them resolved.”

**Results**
Close contact among the team representatives, the JCSCA and Burns & McDonnell helped alleviate disputes, project delays, change orders and cost increases to the public.

“We didn’t have the level of surprises one would think in a project of this size,” says Jim Rowland, executive director for the JCSCA. Tom Beckenbaugh of The Konrath Group, owner’s representative for the Chiefs, and John Loyd of the Owner’s Perspective, owner’s representative for the Royals, both said Ellis was instrumental in keeping the county and the teams true to their development agreements.

“The sports authority and Burns & McDonnell in the background identified issues and assisted both teams to resolve conflicts in a non-controversial way,” Beckenbaugh says.

The authority and Ellis also have helped the project meet goals of placing 22 percent of contract dollars with firms owned by minorities and 8 percent with firms owned by women.

*For more information, contact Blake Ellis, 816-822-3332.*

As owner’s representative for the Jackson County Sports Complex Authority, Burns & McDonnell represented the public interest and held all parties accountable to their development agreements for both stadiums’ renovations. Renovations at Kauffman Stadium, home to the Kansas City Royals, (at left) were completed in July 2009 and feature a new scoreboard, additional suites and ticket windows, an expanded concourse with additional concession areas and restrooms, and a party deck. Similar renovations are under way at the Kansas City Chiefs’ Arrowhead Stadium (above) and will be completed in August 2010.
Algae wouldn’t make most lists of high-value crops. But certain algae present an opportunity for sequestering carbon dioxide (CO₂) emissions while producing biofuel. In light of possible greenhouse gas (GHG) legislation, that could be pure gold.

“The idea of producing fuel from algae isn’t new,” says Robert Healy, manager of renewable energy development for Burns & McDonnell. “The U.S. government began financing research into oil-producing algae in the 1970s. But in the last two years there has been rapid development of systems designed to use algae to produce biofuels.”

Why Algae?
The renewed interest in algae is partially a response to criticism of the use of food crops for alternative fuels. Such use, critics say, raises commodity prices and exacerbates water shortages. Unlike the corn used to make ethanol, or canola that becomes biodiesel, algae growth systems don’t require land suitable for food crops. But to be technically and economically feasible, algae-to-biofuel systems, called bioreactors, have had to overcome several challenges.

Growing enough algae to produce substantial amounts of fuel requires large amounts of surface area. While some proposed systems use open ponds, newer algae bioreactors use plastic tubes or thin sheets of plastic in vertical frames. These closed systems take up less space, use less water and allow carefully metered application of nutrients, but they are more expensive than open ponds.

Putting CO₂ Emissions to Work
Another challenge lies in separating the oil from the algae and growth medium — an energy-intensive process. Depending on the availability and price of alternatives such as conventional diesel, it has been difficult to produce a competitively priced product, and one that doesn’t lose its environmental advantage due to the amount of energy required to make it.

Healy is working with a large power producer in the southeastern United States to develop a pilot project that will test an integrated, algae-to-biodiesel system using CO₂ emissions from a power plant to support algae growth. CO₂-rich gas from smokestack emissions will be added to the tubular network of an algae bioreactor, where it will speed production of special high-lipid algae — which absorb the CO₂ in the process. An on-site biorefinery will extract the algae oil and convert it to biodiesel, glycerin and other products from the dewatered algae.

Meeting a Need
Fossil-fueled power plants are one of the largest single, stationary sources of CO₂ emissions. Despite efforts to add wind, solar and additional nuclear power plants to the mix, fossil-fueled power plants still produce the bulk of electrical power required to meet U.S. utility customers’ demand.

The Environmental Protection Agency’s recently published Mandatory Reporting of Greenhouse Gases Rule requires facilities emitting 25,000 metric tons or more of GHG to report CO₂ emissions. Additional regulation imposing a penalty for GHG emissions — or providing incentives to reduce them — is widely expected.

“When there’s a need, new technology comes in to fill that need,” Healy says. “With the threat of carbon regulation, utilities are looking at all options to reduce their carbon output.”

A side business in algae may be one of those options — and a possible energy solution for the future.
The Matter of Things

Scientists Exploring Subatomic Particles for Clues About Our World

Understanding the metamorphosis of neutrinos — neutral subatomic particles — as they pass through the earth could be the key that unlocks many of the mysteries of our world and solar system.

Fermilab National Accelerator Laboratory in Batavia, Ill., is home to the Tevatron, the world’s most powerful operating particle accelerator, which produces a neutrino beam for analysis. Fermilab and the University of Minnesota are collaborating to build the NOvA Far Detector Building to house a neutrino detector for studying these elusive pieces of matter.

Burns & McDonnell was initially hired by Fermilab to design and construct a three-mile access road to the detector site in Ash River, Minn. Successfully maneuvering through various historical preservation and environmentally sensitive areas, Burns & McDonnell earned the job as engineer and architectural design firm for the remainder of the project.

The NOvA Far Detector will detect neutrino interactions with matter utilizing the neutrino beam from Fermilab approximately 500 miles away. The nature of neutrinos makes them difficult to detect. Traveling at nearly the speed of light, they mostly pass through the 500 miles of the earth’s crust between Fermilab and Ash River with ease. Consequently, the neutrino detector must be very large — 14,000 tons — to see a small fraction of the neutrinos interact. “The distance increases the detector’s sensitivity to the neutrino mass ordering, so the farther from Fermilab, the better,” says Steve Dixon, Fermilab Level 2 manager for sites and buildings.

To alleviate confusion with other particles misidentified as neutrinos, the detector needs to be built underground, and the rocky terrain of northern Minnesota, dense with granite, makes shielding it challenging. “We are using a combination of concrete and barite aggregate. Barite is denser than granite, so we could use less of it while still accomplishing the same amount of shielding,” says Jack Steenken, Burns & McDonnell project manager. “Still, the span and weight of the shielding precluded conventional reinforced concrete design, so the final design incorporates a composite roof consisting of pre-stressed beams tied to a reinforced concrete deck.”

Adding to the complexity, various air exchanges are needed to cool, heat and pressurize the space around the detector equipment, making strict temperature and moisture control critical. “Outside air temperatures could go as low as minus-40 degrees Fahrenheit, while the detector could reach 105 degrees,” Steenken says. To meet heating and cooling needs, Burns & McDonnell recommended using a unit with multiple refrigeration circuits, multiple-speed scroll compressors and modulating hot gas reheat.

As the first Department of Energy project using American Recovery and Reinvestment Act funds, Steenken says extra care was taken in all aspects of the design and architecture to meet federal requirements.

For more information, contact Jack Steenken, 630-724-3200.

The smallest known piece of matter, neutrinos could be the key that unlocks many of the mysteries of our world and solar system.

The NOvA Far Detector building will feature a full-glass entrance, an observation area, and a computing center and control room complex. The detector is expected to begin gathering data when the NOvA Far Detector building is at 20 percent build out.
Water Solutions

Today, protecting water quality means looking at the big picture.

At Burns & McDonnell, we help clients protect water quality at every turn — from green stormwater infrastructure to better water treatment to secure water supplies for the future.

Clean water is everyone’s concern. We help our clients find cost-effective ways to do their part.

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