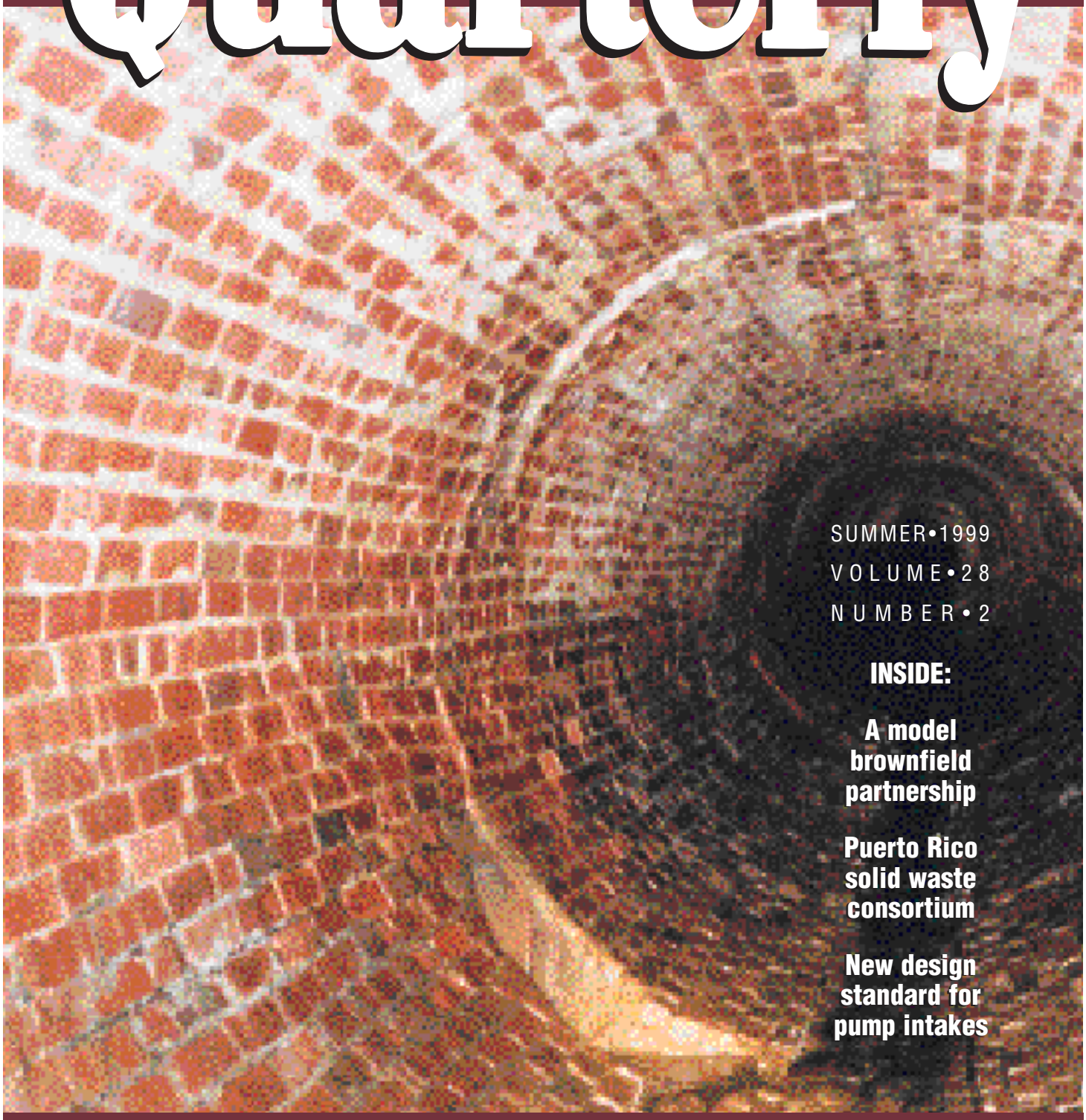
BROWN AND CALDWELL

Quarterly



SUMMER•1999
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INSIDE:

A model brownfield partnership

Puerto Rico solid waste consortium

New design standard for pump intakes

Featured this issue — Inspecting more than a million feet of Northeast Ohio sewers

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One of the more-than-100-year-old brick sewer pipes, this one in generally good condition, in the Northeast Ohio Regional Sewer District. Brown and Caldwell is inspecting and recommending rehabilitation of more than a million feet of pipeline and nearly 4,000 manholes in the system.

PHOTO BY SPECIALTY SEWER SERVICES, INC.

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To speak with a Brown and Caldwell representative, call us at (800) 727-2224 or visit our web site at www.brownandcaldwell.com.

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Quarternotes

New VPs

Seven new and longtime Brown and Caldwell employees were named vice president in recent months. Among them is **Charlie Joyce, P.E.,** who joined Brown and Caldwell in 1993 and whose career spans 20 years. Joyce specializes in the planning and design of infrastructure facilities, particularly sewer collection systems, and in automated mapping and geographic information systems. Based in Pleasant Hill, Calif., he currently leads the company's contract with the Livermore-Amador Valley Water Management Agency and manages design of 16 miles of new treated-effluent pipeline that will connect the agency's Pleasanton, Calif., pump station to final discharge in the San Francisco Bay…Also based in Pleasant Hill, newly named Vice President **Gary Volpe, P.E.,** has 33 years of design engineering experience, 26 of them focusing on design and construction of wastewater treatment plants throughout California, the West, the Midwest, and British Columbia. Among the projects he manages are three in Northern California: the $30 million Basin-D storage project at the Sacramento Regional Wastewater Treatment Plant; the $30 million expansion of the Dublin-San Ramon Services District Wastewater Treatment Plant; and the new $18 million Union Sanitary District Solids Dewatering Building…Vice President **Voytek Bajsarowicz,** private sector leader and manager of environmental services for the Western business unit, joined the firm last summer. He has more than 18 years of experience in civil, environmental, and sanitary engineering. From Pleasant Hill, he manages staff and projects relating to hazardous waste and materials, industrial water quality, site investigation and remediation, water


Gary Volpe


Charlie Joyce


Voytek Bajsarowicz

Continued on page 9

New Consortium Leads Solid Waste Improvement Project in Puerto Rico

A new consortium of private firms, the Puerto Rican Infrastructure Management Group (PRIME), was selected by the island's Solid Waste Management Authority (SWMA) to implement Puerto Rico's $700 million capital improvement program.

Brown and Caldwell is both a member of the consortium and a subcontractor providing technical support to PRIME in the aggressively paced program, which entails siting, permitting, design, and construction of 72 solid waste management facilities, including landfills, transfer stations, and plants for resource recovery, recycling, and composting.

Because of a near-crisis need to improve the island's solid waste infrastructure, a December 2000 deadline has been set to begin construction of all 72 projects. Brown and Caldwell recommended design-build delivery, developed a design-build management program, and is administering it for a number of critical facilities.

Brown and Caldwell has established a new office in San Juan to support this and other work on the island. **Steve King, P.E.,** vice president and manager of Brown and Caldwell's Florida offices, heads the new office. Contact him at Hato Rey Tower, Suite 905, 258 Muñoz Rivera Avenue, Hato Rey, Puerto Rico 00919, (787) 250-0085 (telephone) and (787) 250-1886 (fax).

Environmental Forensics — Using Science in Environmental Litigation

James H. Clarke, Ph.D., discusses this multidisciplinary field's components and controversies.

Allocations of liability related to environmental site remediation are often based partly on a company's ability to pay or its perceived ability to contaminate. But scientific criteria are a much more accurate basis for allocations. And they can lead to significant savings: a reduction of just a few percentage points in total liability can save a company millions of dollars.

Environmental forensics is a credible, scientifically sound approach to determining fair and reasonable allocations to help resolve environmental claims and litigation. It consists of the application of scientific techniques to identify potential contaminant sources and migration pathways, perform contaminant dating, and do the range of activities that make up what we call "industrial paleontology." Environmental forensics also includes depositions and expert testimony.

Contaminant sources are determined using chemical analysis and interpretation. This part of the investigation gets challenging when more than one source could have released some or all of the contaminants discovered. The presence of signature chemicals — chemicals linked to a process or a waste — can be helpful. More recently emerging are "chemical fingerprinting" techniques, originally developed to identify complex mixtures such as petroleum hydrocarbons, polyaromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs).

Chemical fingerprinting has been controversial, because the composition of a complex mixture invariably changes due to environmental "weathering" processes such as biochemical degradation. Still, environmental forensics experts often can distinguish among different petroleum hydrocarbon products using pattern recognition techniques. And the fingerprinting techniques applied to PAHs have advanced in the wake of the Exxon Valdez spill in Prince Williams Sound.

Once a suspected source is identified, a pathway to transport the chemicals from source to current location must be confirmed. Here a good understanding of the particular environment is essential, be it a complex subsurface, dynamic surface-water system, or transporting atmosphere. Mathematical modeling can be used if data are sufficient.

Sometimes, environmental contamination can be dated if we know when a chemical became available and/or was banned. Isotope dating techniques, using tritium in groundwater and cesium 137 in sediments, have been effective in many environments, and the use of other isotope ratios is increasing.

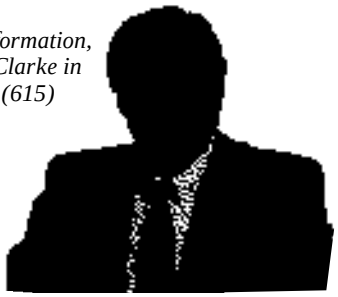
Rounding out the analysis is a range of activities to sort out the manufacturing history and waste management practices at complex sites, drawing upon Sanborn maps, historical aerial photographs, process flow diagrams, material balances, company records, and public documents.

When a case goes to trial, environmental forensics extends to depositions and the courtroom. It's not enough for a witness to have a good scientific and engineering understanding of what probably happened. The witness must communicate this understanding to a judge and/or a jury, usually under stressful conditions. This usually calls for the ability to simplify scientific arguments — but not too much. In my experience, facilitating understanding is valued, while a condescending or patronizing approach is seen for what it is. Computer graphics and demonstrations can carry the day.

While environmental experts have testified in trials since the first environmental regulations, the admissibility of their testimony has been controversial and the term "junk science" is still heard. Until a few years ago, an expert was considered to be anyone who, through their knowledge and experience, could assist the trier of fact (the judge), and his or her testimony was given wide latitude. During the 1980s, I knew of very few experts who were challenged or whose testimony was ruled inadmissible. In 1993, however, a now-famous Supreme Court decision, the Daubert decision, reaffirmed the role of the federal judge as the gatekeeper of scientific testimony and stressed that such testimony must be reliable. The Court outlined several factors to help determine this: whether the theory or technique could be (and had been) tested; whether it had been subjected to peer review and publication; its known or potential error rate; the existence and maintenance of standards controlling its operation; and whether it had attracted undisputed acceptance within a relevant scientific community. This decision has been used to uphold lower court rulings. Just this past March, in a case of alleged faulty tire design, the Supreme Court affirmed the Daubert decision, ruling that it applies to all expert testimony and that federal judges can exclude the testimony of questionable experts, including engineers.

These court decisions have been well received by many of our clients in the regulated community. They wisely reinforce our need to be sure that our expert testimony rests on a firm scientific foundation.

For more information, contact Jim Clarke in Nashville at (615) 255-2288.



Safeguarding Northeast Ohio's Sewers

The Northeast Ohio Regional Sewer District is completing the inspection and evaluation of more than a million feet of pipeline and thousands of manholes, using sophisticated data management to assess rehabilitation needs.

The Northeast Ohio Regional Sewer District has embarked on the third and final segment of a four-year assessment of more than 1.1 million feet of pipeline and nearly 4,000 manholes in its aging sewer system.

The project, led by Brown and Caldwell, is yielding complete rehabilitation recommendations that will guide the District's infrastructure improvement program for years to come. It also will provide valuable data for the District's combined sewer overflow (CSO) facility planning to reduce overflows to local waterways and Lake Erie.

"Instead of just being reactive to failures, the District is taking a comprehensive approach to assessing its infrastructure. That puts it ahead of its peers in maintaining the system and planning for improvements," says Brown and Caldwell project manager Randy Krizmanich. "As an engineer, as well as one of the District's customers, that has always impressed me."

The project boasts a sophisticated information system of integrated databases that will allow team members to report — and access — inspection and evaluation results for every sewer reach and manhole. The system will produce clear, usable, global information, including at-a-glance summaries and automatically generated maps and pictures in response to a wide range of queries.

Creating new standards and streamlining methods

One of the first tasks for the team was developing standards for identifying defects. Because the U.S. does not have widely recognized standards for brick sewer defect identification or condition assessment, the team modified the internationally recognized standards developed by the Water Research Centre in England, with the particular help of team member Graham Knott, an internationally recognized expert in sewer inspection and evaluation.

In 1996, Brown and Caldwell began the first segment of the assessment with the Westerly District interceptors inspection and evaluation project, completing it in January 1998. The $5 million Easterly District interceptors inspection and evaluation will be completed by June of this year. For the Southerly District interceptors inspection and evaluation, the team will assess more than 400,000 feet of pipeline and 1,250 manholes in less than 14 months, to complete work in early May 2000.

Continuity throughout the three project segments has allowed the District and the team to streamline and refine procedures. Often, improvement has translated into painstaking preparation — especially key to efficiency on the extensive Southerly segment. Before inspections, the team first collects and analyzes background data such as city maps, District videos of the infrastructure, and information on pipe and manhole configurations and slopes. Pre-inspection data-gathering is planned if needed, and preliminary maps filled with routing and numbering information about the interceptor branch to be inspected are distributed to field crews.

The inspection process itself is carefully designed to reveal all potential defects and eliminate discrepancies, with seamless data gathering and inputting using a variety of media. Field work entails internal walkthrough of large-diameter pipes, remote television

Brown and Caldwell's inspection revealed that a minority of the Northeast Ohio Regional Sewer District's pipes, such as the one shown, contained mineral deposits as a result of long-term water infiltration.

inspection of smaller-diameter pipes, and sonar inspection of surcharged pipes. This inspection is complemented by geotechnical investigation and geophysical examination using non-intrusive seismic imaging and other methods. All manholes are located from within the pipe during pipe inspections, verified from the top, and marked with proper identification. The survey team then visits each manhole, inspects it, and obtains coordinates and rim elevations. Inspection information is entered into the project database and represented in the geographic information system (GIS). To complete the record, pipes and manholes are photographed as well as videotaped, while the inspection field technician notes defects on written forms. The videos are ultimately converted to CD-ROM for easier data access and storage.

Methodical assessment and "grades" for rehabilitation

"We take a highly methodical approach to the assessments," says Krizmanich. Following inspection of every pipe or manhole, a Condition Assessment Form is generated with scores based on the defects logged. Each reach and manhole is then assigned structural and operational grades ranging from Grade 1 (excellent condition) to Grade 5 (immediate attention). The assessment form displays the grades as well as significant defects along with inventory and inspection information.

The team then can focus its review and evaluation on pipes and manholes with the most significant problems. Structural performance and deterioration are assessed on the basis of each pipe's hydraulic conditions, surrounding conditions, subsurface investigation results, groundwater levels, and construction and maintenance records. Videotapes, inspection records, and other available information are reviewed. Then each sewer reach and manhole is assigned a rehabilitation level ranging from 1 (continue monitoring) to 7 (provide immediate action). In assigning the rehabilitation levels, the team also considers how defects affect system performance and how repairs relate to construction limitations, costs, access, safety, traffic control, and surface conditions. The final Condition Assessment Form includes rehabilitation level, recommendations for repair, urgency, and engineers' comments.

Shown is a deteriorated sewer pipeline filled with collapsed material.

Graphical/text databases show up-to-date results

Brown and Caldwell has worked closely with the District to deliver a data management system that would provide confidence, accuracy, and completeness. The system comprises a flexible set of integrated, nonproprietary databases and a platform compatible with any information system.

The system supports three different types of data needs — collection; analysis and reporting; and access and management — through three integrated databases (manhole, pipeline, and condition assessment). It links to a web site for sharing inspection progress, documents, and schedules.

"Data management is part of everything we do on this project, especially integrating visual and written presentations of results," says Robert Knopf, project data manager. "But data integration is much more than digitally capturing the information on a map — we're applying comprehensive analysis procedures, quality control, and tracking to maintain integrity of the data."

Data management starts in the field, where inspection results are entered on forms using standardized defect typing and logging procedures to promote standardization among different site conditions and inspectors and to speed reporting of findings. "Once it's entered into the database," says Knopf, "we immediately validate the data for content and format."

Data entered into the pipe database automatically generate the corresponding manholes within the manhole database, which develops information on connectivity. GIS maps are generated from both the manhole and pipeline databases to accurately represent the information collected. "The maps automatically include identification numbers, connectivity, and physical attributes," says Knopf, "and integrate the photo and video logs."

Once a map is created, connectivity and locations are further analyzed. Maps are field checked by the inspectors, before undergoing a final Brown and Caldwell QA/QC process and reporting to the District.

District staff can query the system to generate virtually any kind of report needed, based on date, locations, defect type or severity, rehabilitation level or recommendation, infrastructure type, etc. Photos and maps can be printed independently of a specific report.

"The District is one of the very few major cities with similar infrastructures that is gaining such comprehensive data," says Pervez Jameel, Brown and Caldwell's principal in charge of the project and Cleveland office manager. "Maybe the result is knowing you don't need to do anything further. But to safeguard your assets, you need to inspect them."

For more information, contact Randy Krizmanich in the Cleveland office at (440) 826-4900.

The Chester Waterfront Redevelopment Project: A Brownfield Conversion in Progress

A large Pennsylvania industrial site transitions from RCRA-ordered cleanup to state-managed redevelopment, aided by a model partnership among regulators, industry, local government, and citizens.

The Chester waterfront redevelopment project, the largest industrial site in Pennsylvania, is one of the first to transition from federally mandated cleanup under the Resource Conservation and Recovery Act (RCRA) to redevelopment under the state's brownfield program (Act 2).

It's a living study in partnership. Owner PECO Energy Co. of Philadelphia, with the help of Eckenfelder/Brown and Caldwell (E/BC), is collaborating with the City of Chester, Delaware County, and state and federal regulators to clean up its 88-acre waterfront site and to create new uses that will benefit everyone involved.

"This dynamic project," says PECO Energy project manager Robin Hoy, "has evolved far beyond environmental remediation."

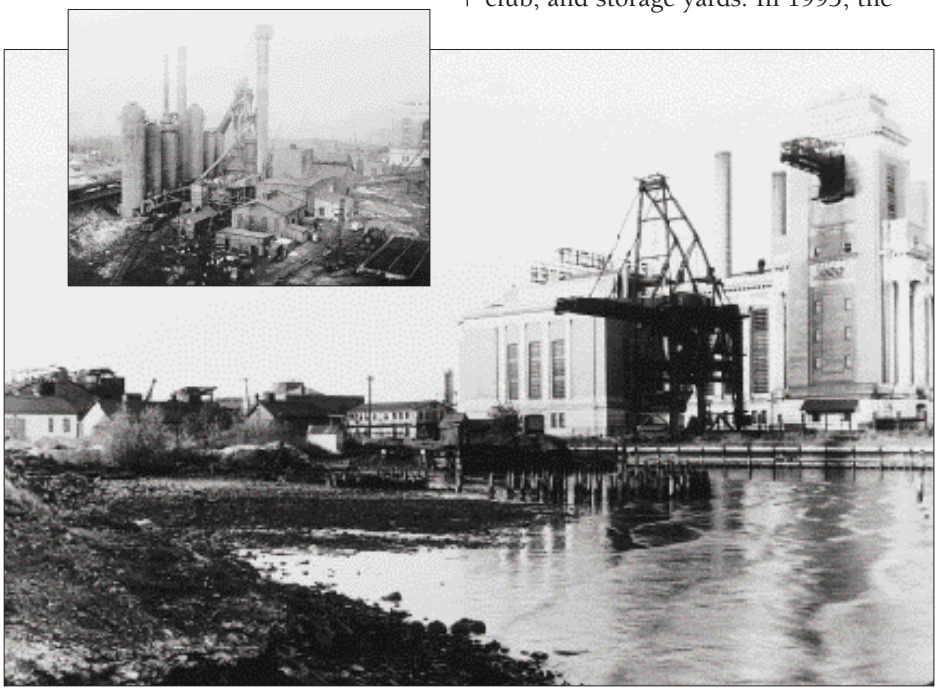
Starting with conflict and contamination

Though mostly vacant now, the Delaware River waterfront property has a history that usually complicates investigations and presents challenges for remediation and reuse. It was the site of many different industrial uses by previous owners and PECO Energy over the last 120 years: a coal-fired electric generation station, coke plant, chemical plant, steel plant, manufactured gas plant, hazardous chemical and nonhazardous waste treatment facility, boat club, and storage yards. In 1993, the USEPA mandated investigation and remediation under RCRA of the former waste treatment facility.

When E/BC environmental scientist Laura Mahoney first joined the project in 1993 — to do a risk assessment of the parcel as part of the RCRA corrective action — it was at a pivotal moment. The USEPA was considering expanding the RCRA-ordered cleanup to the entire 88-acre site. Meanwhile, concern over environmental issues was already heightened in this community because of the numerous waste treatment facilities in Chester and a regional risk study (unrelated to PECO Energy) conducted by the USEPA and the state Department of Environmental Protection (DEP) that found high levels of lead in local children's blood. And PECO Energy, in the throes of state utility deregulation, was re-evaluating its future uses of the largely inactive site.

With Laura Mahoney's expertise in federal and state regulatory programs for waste sites and experience with risk-based cleanup levels, she saw that a RCRA-regulated approach was not necessarily the best under the circumstances. After analyzing different options, PECO Energy, with the help of E/BC, concluded that cleanup under Pennsylvania's new, aggressive brownfields program, Act 2, would be the quickest way to protect citizen health and the environment and would save millions of dollars in remediation costs. Redevelopment would allow PECO Energy to bring badly needed jobs and services to the area while potentially benefiting from future uses.

PECO Energy and E/BC formulated a proposal to assess, remediate, and redevelop the entire site. The USEPA has agreed to roll the remainder of the investigation into Act 2.



The former Phoenix steel plant property and the Chester, Pa., electric generation station, on the Delaware River, are part of an 88-acre site undergoing remediation and redevelopment.

Shifting to partnership and profits

In brownfield programs, the end result is not just cleanup, but cleanup and productive site reuse. Compared to Superfund, brownfield programs are based mostly on voluntary activities. Litigation tends to be less frequent and remediation more rapid, spurred by state and federal tax incentives and the availability of public funds for redevelopment.

The Chester redevelopment project is marked by an especially strong ethos of partnership among its many stakeholders. PECO Energy may be one of the first industrial site owners in the country to validate and adopt the community's goal of environmental justice. It will take the unusual step of donating a portion of its land to the City, has formed a community advisory group, and is supporting City and County redevelopment efforts. The cooperation between the USEPA and the state DEP is also essential — especially for the transition from RCRA to Act 2.

"Instead of a typical adversarial cleanup situation, this one is a cooperative partnership in that everyone has the same objectives," says Mahoney, now E/BC's client service manager for PECO Energy. "It's a win-win."

Broad management and bioslurping

E/BC's close work with PECO Energy includes the big picture as well as the details. In addition to scientific assessments of historic land use, hydrogeology, and risk, and its remedial engineering efforts, the company helped develop the project concept, negotiated with regulators, and is working with PECO Energy's real estate consultant, North American Realty Advisory Services, to coordinate remediation with redevelopment options.

Crafting the details of the regulatory rollover — and managing it with PECO Energy — required scientific and technical familiarity not only with the regulations themselves, but with different ways to quantify contamination and its associated risk. Drawing on skills in human health and ecological risk assessment, Mahoney and her team are evaluating the use of both site-specific and statewide health-based cleanup standards, and a remediation approach based on contaminant fate and transport.

E/BC's work also included developing a project-tailored model of nonpoint-source groundwater discharge to tidally influenced surface water. Along with the results of groundwater modeling also performed by E/BC, the surface-water model was used to assess impacts to the nearby river and potential risks to health and the environment.

In addition, E/BC designed, constructed, and is managing operation of an interim system to extract and treat groundwater. The system uses 15 angled extraction wells to hydraulically contain the seepage of light, nonaqueous-phase liquids (LNAPLs) in groundwater along the riverbank. It also contains a "bioslurping" pretreatment component in which a vacuum is drawn through the wells to encourage biodegradation. More than 1,000 gallons of LNAPL have been recovered. As a result of system operation, most seeps have abated, and the extraction wells have been shut down. E/BC will evaluate possible further groundwater treatment for the permanent site remedy.

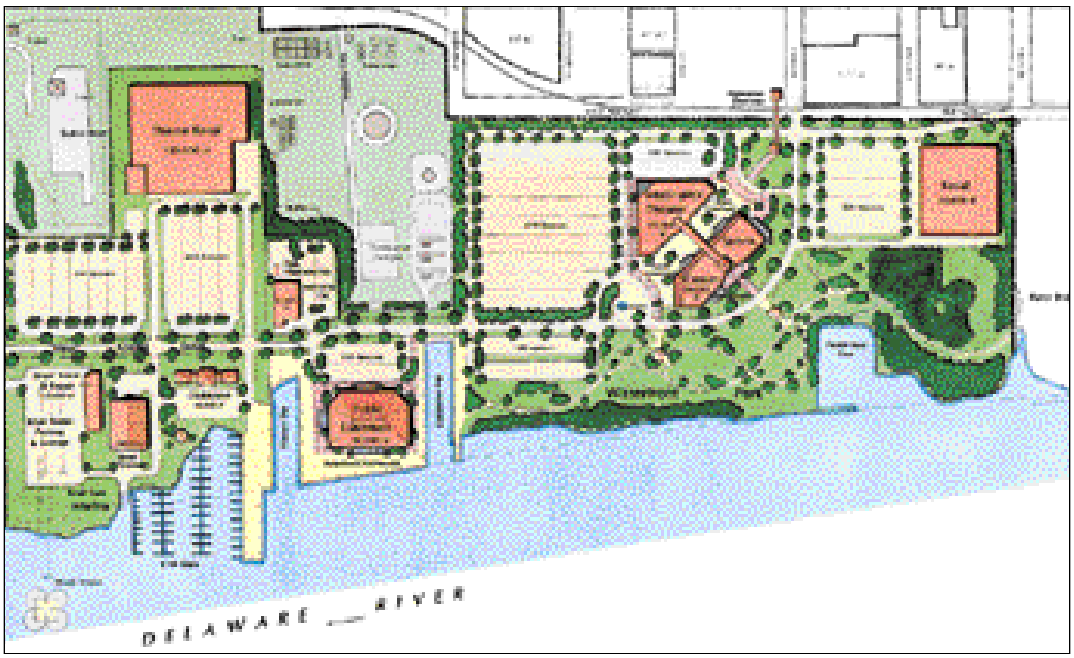
Environmental investigation, planning, remedial alternatives analysis, and remedial design for the project are expected to be completed by the end of 1999. Next will come site remediation and construction. Uses being considered include a waterfront park and marina, an urban entertainment center and exhibit hall, and retail establishments.

Plan for everything — including change

PECO Energy's project leaders vowed to be proactive from the start, but they quickly found that it was a challenge to create a program that's both inclusive and flexible. Some of the lessons learned about brownfield conversion:

- View the project as a comprehensive corporate undertaking.
- Do early, collaborative, multidisciplinary planning to establish philosophy and define milestones to gain focus and credibility.
- Integrate remediation with redevelopment goals.
- Recognize community concerns and city partnering early in the process.
- Proceed with the assumption that regulators from different programs can work together.
- Within the holistic framework you've made, be flexible. Expect regulations, socioeconomic conditions, and personnel to change throughout the project life.

Contact Laura Mahoney in E/BC's Nashville office at (615) 255-2288 for more information.



Potential future uses in the Chester waterfront redevelopment project include a waterfront park and marina, an urban entertainment center and exhibit hall, and retail establishments.

Integrated Characterization Approach Wins Closure at Nevada Mining Facility

Using Brown and Caldwell's unique approach, Placer Dome's Bald Mountain Mine recently gained approval for regulatory closure of the Casino/Winrock heap leach gold-extraction facility in White Pine County, Nev. — one of fewer than a dozen such facilities in the state that have gained closure permits from the Nevada Division of Environmental Protection (NDEP). **Billy Lassetter** and **Chuck Zimmerman** of the company's Carson City office led the effort.

While its elements are familiar, the project was unusual in three crucial ways. First, the team recognized the sensitive environmental issues of the site, just 12 miles south of the Ruby Lake National Wildlife Refuge, and designed the geochemical and hydrologic characterization program in response. Second, to help demonstrate the low potential for degradation of groundwater beneath and downgradient of the facility, field investigations were integrated with static and kinetic geochemical test results and computer modeling of unsaturated water flow. And third, unlike closure plans for similar Nevada operations, this one did not rely on time-consuming fresh-water rinsing programs, which often produce results inconclusive for predicting future impacts.

Heap leach facilities are used at mine sites to extract metals from the rock ore. The technique, adopted by the precious metals industry during the 1960s, provides a low-cost means of metal extraction from low-grade ores. Extracting solution is distributed on the surface of the heap rock pile and percolates downward, picking up metals along the way to a liner-and-process-pond collection system for processing.

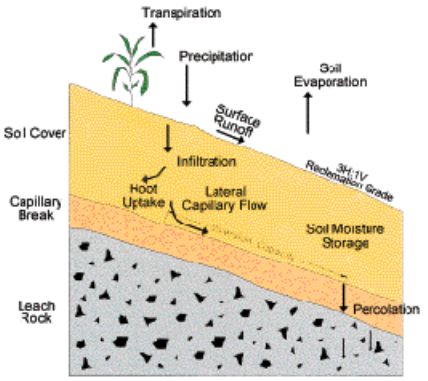
Over the period of operation, a significant volume of extracting water may be retained within the heap rock. To formally close the facility, the mining operator must provide evidence that this effluent will not degrade groundwater or the surface environment. At some sites, an ancillary closure concern is how to dispose of the large volumes of the heap effluent stored in the process ponds and periodically recycled to the top of the heap. Therefore, a fluid management system must be developed to reduce unacceptable levels of certain constituents in the effluent while reducing its volume.

The closure plan at Casino/Winrock includes a revegetated native soil cover designed by Brown and Caldwell as a storage layer for incoming rain and snow water (Figure A). The soil cover will prevent infiltration into the heap rock and gradually reduce the amount of effluent draining from the heap. The effluent will be diverted to an engineered, low-maintenance infiltration system in the nearby native soils. The team's detailed investigation of the natural attenuation capabilities of these soils, coupled with calculation of the rate of recharge, showed that groundwater quality will be protected for the long term. This will be ensured by the closure monitoring plan.

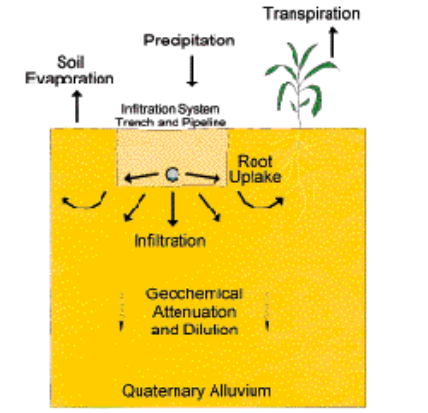
To address the unacceptable levels of certain constituents in the heap effluent, Lassetter and Zimmerman performed geochemical column percolation tests to assess the attenuation and release characteristics of the native alluvial profile. The results indicate that nearly all constituents of concern will be attenuated to concentrations below the NDEP drinking water standards when the volume of effluent is reduced below a specific level. The team designed the infiltration system to meet these criteria (Figure B).

The team used rigorous, two-dimensional numerical modeling to analyze the water balance and transport properties of the native soils and heap material for different cover and reclamation alternatives over a 100-year period, including analysis of lateral flow diversion along the contact of the soil cover with the underlying heap material (Figure C). The results indicate that the steady-state volume of heap effluent will be reduced substantially, largely as a result of water removal by the re-established vegetation through evapotranspiration.

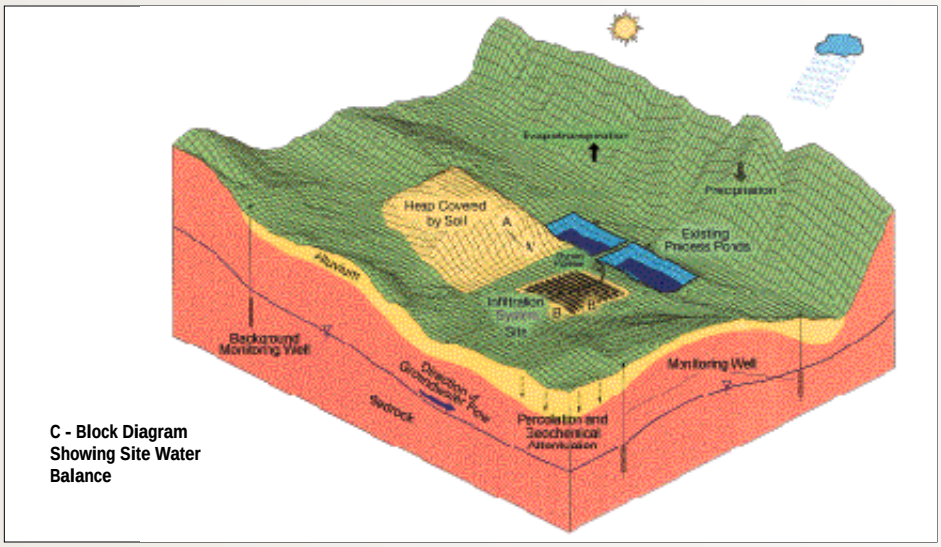
Although typical closure investigations rarely use such exacting simulations, Brown and Caldwell's approach made its characterization and predictions for this environmentally sensitive area much more defensible — and ultimately led to closure approval.



A - Cross Section of Heap Covered by Soil



B - Cross Section of Infiltration System Site



C - Block Diagram Showing Site Water Balance

Brown and Caldwell's closure design for the Casino/Winrock heap leach gold-extraction facility, in White Pine County, Nev., employs a revegetated soil cover and an infiltration system to reduce heap effluent volume and protect groundwater from effluent constituents. The team used exacting geochemical and hydrogeologic simulations to demonstrate the closure plan's effectiveness in this environmentally sensitive area.

Challenging Milestone Met in Atlanta's Utoy Creek Wastewater Plant Upgrade

On March 31, 1999, the City of Atlanta met its first major milestone in the upgrade and expansion of the Utoy Creek Water Reclamation Center (WRC), completing $65 million of the $108 million in total construction in a record 18 months.

Because of the Georgia Legislature's mandate to meet state regulatory guidelines for completed construction of the phosphorus removal facilities, the City would have been fined at least $25,000 per day had the milestone been missed, and $100,000 per day if more than 6 months late.

Brown and Caldwell and its joint venture partner Williams-Russell and Johnson are performing engineering and construction management with the City's Construction Management Group for the project, scheduled for completion at the end of 2000. The team includes joint-venture contractor Western Summit/TIC/Granite. Marcia Hurd-Wade, program manager for the City, gives high marks to the "high-performance team" for "improving the environment and meeting the state's schedule." Brown and Caldwell project manager **Rod Pope** led the company's teamwork-intensive effort.

More than nine years ago, the state Department of Natural Resources Environmental Protection Division mandated that the City reduce effluent phosphorus loadings from its three water reclamation centers discharging to the Chattahoochee River. But citizen opposition to the original plan and private legal actions combined to delay design and construction until 1995. Nevertheless, the City was charged with meeting the original compliance schedule.

The Utoy Creek WRC will treat 44 million gallons per day, up from 36 mgd, after the expansion. The upgrade includes:

- New coarse and fine screening and grit removal systems in the preliminary treatment system
- Conversion of secondary treatment to a biological nutrient removal system, newly patented by the City, with new biological reactors and flocculator-clarifiers
- A tertiary treatment system employing deep-bed effluent filters
- Replacement of the chlorine disinfection system with medium-pressure ultraviolet disinfection
- An expanded solids processing system including new thickening centrifuges

Utoy Creek's phosphorus removal process is an innovative method developed, pilot-tested, and patented by the City of Atlanta, with assistance from Brown and Caldwell. Called the volatile fatty acid induced phosphorus removal (VIPR) activated sludge process, it biologically removes phosphorus.

The Utoy Creek Water Reclamation Center, Atlanta, recently began operating 5 new flocculator-clarifiers, 10 new deep-bed sand filters, and 6 ultraviolet units, all of which were constructed in 18 months. The $108 million upgrade and expansion, to be completed by the end of 2000, will include headworks, thickening centrifuges, biological phosphorus removal tanks, and a blower building.

PHOTO BY AERIAL INNOVATIONS OF GEORGIA

Joining Brown and Caldwell…

David Marple joined the Miami office as business development manager, with 34 years of experience in environmental operations and management…**Jeffrey Johnston, P.E.,** joined the Atlanta office as a principal engineer, contributing eight years of engineering experience and expertise in industrial wastewater, storm water, and air permitting and treatment…**Scott Bash** comes to Atlanta as director of information technology, with 13 years of experience in information systems design, quality control, strategic planning, systems integration, and change management… Also joining the Atlanta team is **Rocco Palazzolo, P.E.** He has more than 19 years of domestic and international experience with industrial wastewater and hazardous waste management facilities…**Peter Schuler, P.E.,** joined the Charlotte, N.C., office as a principal engineer. He has more than 10 years of experience in all aspects of environmental process engineering and design…**Russell Kimble** is senior client service manager in the Austin, Texas, office, with more than 22 years of environmental management for industrial clients…**Javier Arriaga, P.E.,** a managing engineer in the El Paso, Texas, office, has more than 32 years of experience in water and wastewater engineering and construction contract administration…Senior Technical Advisor **James Nichols, P.E.,** comes to the Phoenix office with more than 28 years of experience as a project manager, project engineer, and resident engineer for major water resources projects…**Stephen Rakowski, P.E.,** is a Phoenix project manager with more than 14 years of environmental engineering experience…**Noel Herrera,** principal engineer in Phoenix, has more than eight years of experience developing contract plans and specifications for water and wastewater projects and computer modeling and hydraulics…A principal engineer in the Salt Lake City office, **David Kinnear, P.E.,** has 13 years of design and project management experience with large engineering consulting firms, specializing in wastewater facility troubleshooting, operations, and systems modeling…**David Myers, P.E.,** is now the water and wastewater projects manager in the Denver office. For 28 years, he has provided engineering services for public and private water and wastewater projects…**John Martini, P.E.,** is a civil and geotechnical principal engineer based in the Carson City, Nev., office. He has 14 years of experience in design, surface hydrology, materials testing, and project quality control…**Mike Sailor, P.E.,** joined the Corvallis, Ore., office as a managing engineer with more than 28 years of experience in the design and construction of water and wastewater projects…**Tom Nevins, P.E.,** rejoined the Eugene, Ore., office as a project manager, with almost 25 years of experience with master plans for water systems, planning and design of water system components, and wastewater projects…**Richard Bain, P.E.,** rejoined Brown and Caldwell after a 15-year absence, during which time he ran his own consulting practice. Bain is now the Seattle office's watershed planning manager… Joining the San Diego office, **Jeffrey Heden, P.E.,** is executive engineer and infrastructure leader for Southern California. Heden has more

Continued on page 8

Quarternotes

New Standard Reflects Innovations in Pump Intake Design

After years of effort, the Hydraulic Institute has published the new "Pump Intake Design Standard." Brown and Caldwell was a major force in providing the ideas and information that led to the revisions — in particular, **Dave Caldwell,** who originated the trench-type and self-cleaning wet wells, and **Garr Jones,** who applied these concepts to constant-speed pumping stations.

In the 1950s, Dave Caldwell devised what was then a radical approach to wet well design. Using fundamental engineering principles — a hallmark of all his innovations — Caldwell reasoned that with variable-speed pumping equipment, little or no wet well volume would be required if pump capacity was adjusted to match the rate of inflow to the wet well. All that was needed was a suitable configuration for the pump intakes. Caldwell saw that the wet well could be set up as a trench and the pump inlets could be recessed below the elevation of the influent sewer, providing a much better environment for the pump inlets. This new trench-type wet well could be modified for use with solids-bearing liquids by the addition of a ramp to connect the invert of the sewer with the floor of the trench, so wastewater pumping stations could easily be cleaned of trapped solids using the pumping equipment to periodically lower the wet well level. This concept became the original Brown and Caldwell self-cleaning wet well.

Caldwell's innovation was criticized and questioned by many, because it didn't conform to the day's conventions for good design. But over the years, it proved to work well in water and wastewater treatment plants and pumping stations. The design was adapted to all types of variable-speed pumps and was found to improve pump performance. Clients found it was easier to clean and build and it cost less than the traditional approach.

Caldwell's self-cleaning wet well design attracted the interest of industry experts, and Garr Jones expanded the concept to apply it to constant-speed pumping stations. Funding for a model study was obtained from the USEPA, with participation from Fairbanks Morse Pump Company, Flygt Pump Company, and Gorman Rupp Pump Company. Brown and Caldwell helped plan the study, provide technical guidance, and evaluate test results. The study was a success. The self-cleaning wet well proved feasible with a range of constant-speed pumping stations; improvements to the original variable-speed design were identified; and pump intakes were shown to work better with the trench-type well than with more commonly used designs.

The Kirkland pumping station, built in the 1960s as part of Brown and Caldwell's Seattle, Wash., Metro wastewater project, was one of the first to use Caldwell's self-cleaning wet well design. The station building was designed to be at least as visually appealing as its immediate environment. Also shown is the wet well, which is underneath the grate, and the well's ventilation exhaust system. The wet well's small size means lower capital and operating costs. The Kirkland pumping station was the prototype for the modeling in the recent study that led to the improved self-cleaning wet well and the Hydraulic Institute's new pump intake design standard.

So Garr Jones, along with Professor Robert Sanks, chief editor of "Pumping Station Design" and the major participant in the model study, proposed to the Hydraulic Institute in 1994 that pump intake design be re-evaluated and new standards developed. The committee charged with doing so included representatives of the Institute, private industry, academia, the U.S. Army Corps of Engineers, two commercial hydraulics laboratories, and consulting engineers, with Jones as Brown and Caldwell's representative.

The committee reviewed intake designs for both large and small installations and standards from other countries, then produced three drafts of the new standard for public comment in accordance with the procedures of the American National Standards Institute (ANSI). Finally published last December, the standard (ANSI/HI 9.8) incorporates a number of features:

- A decision tree for selection of the appropriate intake design from a number of recommended configurations
- Discussion of unique considerations associated with design of intakes for solids-bearing liquids
- Recommendation of the Brown and Caldwell trench-type wet well and self-cleaning wet wells for clear and solids-bearing liquids, respectively
- First-ever formal criteria for design of manifolded intakes, intakes from pressurized and atmospheric tanks, and pumps installed in barrel-type intakes
- The first nationally recognized standard for physical model studies for pump intakes

Joining Brown and Caldwell… (continued)

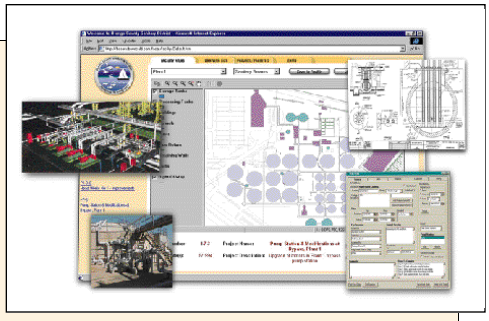
than 21 years of experience in the planning, design, and management of multimillion-dollar pipeline, water storage and treatment, pump station, potable water, well, and water reclamation projects…**Eassie Miller, P.E.,** manages the Honolulu office. He was formerly chief of the County of Maui Wastewater Reclamation Division.

Office News and Moves

Roger Jacobsen, P.E., is leading Brown and Caldwell's new office in Columbus, Ohio. Jacobsen, who received a bachelor's degree in civil engineering from Ohio State University, has worked in the Columbus area for the past 14 years. He recently managed a large infiltration/inflow remediation project for the City of Columbus Department of Public Utilities. Contact him at 445 Hutchinson Avenue, Suite 800, Columbus, Ohio 43235, (614) 785-6447 (voice) and (614) 785-6483 (faxes).

The Olympia, Wash., office has a new suite number. Its current address is 606 Columbia Street NW, Suite 217, Olympia, Washington, 98501.

Another "e-" in Environmental



According to a recent Wall Street Journal article, "information technology outlays now account for more than one-quarter of all U.S. investment and more than half of business spending on new machines." The Journal observes, "it is hard to find a corner of American business that isn't using technology to improve efficiency" and notes that U.S. enterprises expect continued payoffs from information technology (IT). Chevron, Merck, General Motors, Caterpillar, McDonald's, International Paper, and Wal-Mart are cited as Dow Jones industrial companies with aggressive IT strategies aimed at better performance.

A current snapshot of Brown and Caldwell projects reveals that our clients have a pervasive commitment to deploy IT for performance gains. With public and private enterprises across the country, we are applying and integrating IT solutions.

And clear benefits are the driver — in decision making, asset management, work-flow processes, operations and maintenance systems, training, and, of course, communication. Our intimate knowledge of the overall environmental business and its assets is both the edge and the bridge that helps us apply technology to technical, engineering, operations, and management functions. Here are just a few examples.

Interactive facility atlas. The Orange County Sanitation District is developing a computerized atlas integrating facility engineering records, drawings, and work flow processes. The atlas is a geographical information system (GIS)-based map of the District's two major facilities that provides access to more than 100,000 project documents and drawings. Shifting from a paper-based to an electronic environment, users will be able to search for a specific apparatus or area of interest and view, redline, revise, and print what they need. The atlas integrates many IT applications in addition to GIS, including document management, automated data collection, and project web sites.

Computerized operations management systems. There is no turning back for operations and maintenance (O&M) manuals in the e-business era. Among the many computerized O&M projects I could describe is the on-line system we are developing with the Santa Clara Valley Water District for three of its water treatment plants. District and Brown and Caldwell staff are jointly developing the web-based manuals through on-line interaction. Users will soon have a current, dynamic, visually appealing, and readily accessible tool for day-to-day operations and training.

On-line project collaboration. A collaborative project web site brought together a virtual design team for the Western Lake Superior Sanitary District's design program for beneficial biosolids reuse. Team members at seven different locations and three companies, plus the client, used web-based technology in real time to store, review, develop, and comment on drawings, specifications, technical documents, and project communications.

Integrated business infrastructure. A bottoms-up information system is under development to manage and support the Water Reclamation Center Business Division of the City of Atlanta. Integration here means not only the integration of several IT components, but also a new, integrated approach to doing business. The resulting systems infrastructure will link and enhance laboratory procedures, industrial pretreatment methods, operations, maintenance, safety, training, and risk management.

IT at its best, making business better, safer, faster.

This issue's feature story on the condition assessment of three interceptor systems for the Northeast Ohio Regional Sanitation District highlights the value of IT as a critical tool for asset management. Knowing where you stand (with comprehensive, visualized data at your fingertips) and having a clear set of priorities (where and what to maintain) defines proactive utility management.

The fastest-growing part of our business is delivering information-technology solutions to the public agencies and private industries we understand so well. We expect to be helping many more of our clients boost performance with IT.

— CRAIG GOEHRING, P.E., CEO

New VPs (continued)


William Hunter

resources, property transactions, and regulatory negotiations and compliance…Providing technical oversight on a range of projects and leading business development throughout the Western U.S. is new Vice President **William Hunter, P.E.,** who works from the company's Southern California offices. Before joining Brown and Caldwell, Hunter was director of reclamation for a public agency serving a population of a quarter of million people. He currently manages a comprehensive wastewater master plan for the City of Oxnard, Calif., and is program manager for the engineering, health and safety, and water quality services the company provides to private water companies in California and Montana…Vice President **Craig Smith, Ph.D., P.E.,** joined Brown and Caldwell in Atlanta. Known as one of the top air-quality consultants in the country, Smith has more than 21 years of environmental consulting experience and an extensive background in the development and use of optical-sensing instrumentation for measuring atmospheric pollutants. He has served as liaison to the USEPA for the development of rule-making involving Title I, III, and V permitting and emission standards development. He now directs several national projects involving permitting, risk management, and technology development…**Philip J. Lagas,** who joined the firm last fall, is vice president and manager of environmental services in Phoenix. An environmental consultant for 15 years, he manages multidisciplinary waste management and environmental projects for commercial and industrial clients throughout the Southwest. He has developed and implemented contingency, pollution prevention, and closure/post-closure plans; prepared a wide range of permit applications; directed remedial investigations/feasibility studies; and created and audited regulatory compliance programs for private clients…


Philip Lagas

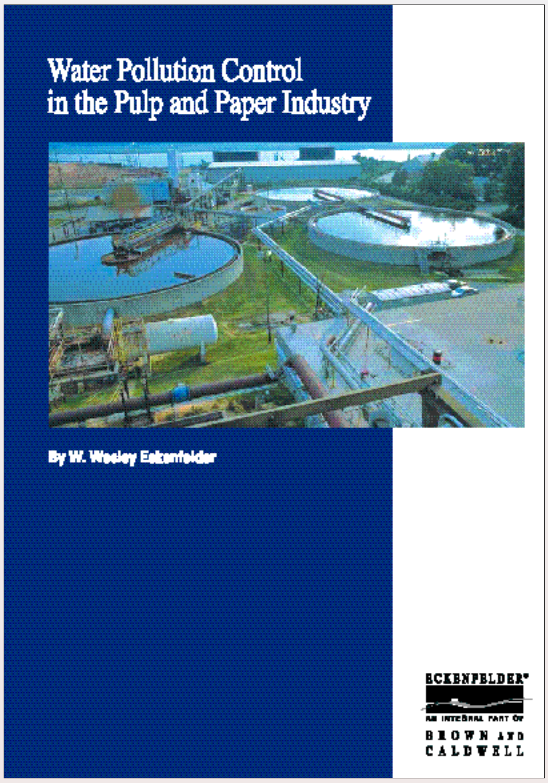

Craig Smith


Stuart Oppenheim

Newly named Vice President **Stuart Oppenheim, P.E.,** joined Brown and Caldwell in the Seattle office in 1986, relocated to the El Paso, Texas, office in 1993, and became office manager in 1996. With an engineering career spanning nearly 25 years, Oppenheim designs and manages wastewater collection and treatment system projects, including treatment plants, secondary treatment facilities, water reclamation, and odor control projects, as well as managing facility and master plans.

NEW BOOK ON WASTEWATER TREATMENT AT PULP AND PAPER PLANTS

"Water Pollution Control in the Pulp and Paper Industry," by W. Wesley Eckenfelder, has been published by Eckenfelder/Brown and Caldwell. Managers and engineers for pulp and paper plants will find in this new volume complete information on the theory and practice of wastewater treatment.



In addition to covering the fundamentals, the book addresses waste minimization, process optimization, and capacity analysis. The authors review every unit process in a typical treatment plant, offering insights on design and operation. To illustrate the application of the book's concepts, case histories and examples accompany the theoretical principles and mathematical equations.

Topics include:

- Effluent control regulations
- Sources and characteristics of wastewaters
- In-plant waste control and water reuse
- Pre- and primary treatment
- Principles of biological oxidation
- Sludge quality considerations
- The effect of bleaching on effluent quality
- Toxicity
- Modeling the fate of methanol
- Lagoons and stabilization basins
- Activated sludge processes
- Secondary clarification
- Sludge handling and disposal

"Water Pollution Control in the Pulp and Paper Industry" includes contributions by Jeff Allen, Victor Boero, Ph.D., Mark Cashman, Houston Flippin, Paul Klopping, Dawn Lesley, Henryk Melcer, Ph.D., Kar Munirathinam, Ph.D., Denny Parker, Ph.D., and Eric Wahlberg, Ph.D. To order it, contact Jeannie Mackey in the Nashville office at (615) 255-2288.

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