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CONTENTS FALL 2004

ISSUES & IDEAS

Ed Ricci
Environmental Services
national practice leader

SMART STEPS

SAVE INVESTIGATION AND REMEDIATION COSTS

by Ed Ricci, Environmental Services national practice leader

We've all experienced the effects of tough economic conditions. Belt-tightening has led many private- and public-sector operations to test and put in place more efficient environmental services approaches. At BC, we've learned a lot about saving clients' environmental costs. Here are three of the most practical and successful approaches that we've used:

1. Know where you're going before you get there. Investigation and remediation of Superfund, RCRA (Resource Conservation and Recovery Act) and Voluntary Compliance sites can cost millions of dollars. The conventional phased approach, which hinges on previous and future actions, can be costly, inefficient and repetitive. The solution? Turn this equation around and base your environmental mitigation decisions on forward projections, not retrospective thinking.

Create an overall site business plan, including life-cycle costs. Look at each site cleanup as a business case. Your business plan should include projected life-cycle scope and costs, as well as a schedule and the ultimate intention for developing or disposing of your property. A site's life cycle can include various pathways and endpoints, depending on technical and regulatory variables. Develop your endpoint objectives early. Involve people who've dealt with similar sites, front to back, to get a better feel for what lies ahead. Life-cycle costs should include capital and O&M costs, cash flow considerations and alternative remedial scenarios.

Building a solid, realistic business plan requires that you know the site. Start by developing a detailed conceptual model of the site based on what you already know about it. The gaps will quickly be apparent, and you'll know what additional information may be needed. Also consider using mathematical modeling of the site and visualization of existing data.

Plan efficient field programs. Each site is different, and investigation is often phased to delineate what has previously been found. New field techniques, however, can minimize mobilization and remobilization costs by providing more real-time data, helping you decide where to go and when to stop while you're still in the field. Also consider the cost-benefit merits of innovative soil and groundwater remedial approaches.

Combining business planning, life-cycle costs, conceptual modeling and efficient field planning will produce a crisp game plan that keeps your goal in constant focus—shortening the process, increasing efficiency and minimizing total investment, with your preferred end use in mind.

2. Take the easy road whenever possible. With a solid business plan and clear objective, work through technical approaches that can save you the most time and money. This business-plan approach can be especially helpful with Superfund's cumbersome RI/FS (Remedial Investigation/Feasibility Study) protocols, helping you pinpoint minimal-action alternatives consistent with your operation's cash flow, equity plans and schedule targets.

Cost-efficient approaches like intrinsic or enhanced bioremediation and in situ remediation are practical and widely accepted. In fact, in situ approaches can be much quicker and more effective than traditional pump-and-treat technology. And depending on a site's equity plan, redevelopment use and

Continued on page 17

ADVANCED PLANNING HELPS CLIENTS NAVIGATE CONFUSING FEDERAL, STATE AND LOCAL REPORTING REQUIREMENTS

THE PATH TO COMPLIANCE

PHOTO: JEFF ALEXANDER

Recently, a small marine fueling company in San Diego accidentally spilled about 75 gallons of oil, which flowed into surrounding soil and shallow groundwater. The spill was relatively minor and should have cost about $1,000 to clean up. But because the company didn't have any spill reporting procedures in place, it missed a number of critical local and state reporting deadlines. The result? A $1,000 headache mushroomed into a costly $100,000 legal problem.

This situation is more common than many clients realize, says Brown and Caldwell Client Services Manager John Fields. "Local, state and federal spill-reporting regulations have evolved in a completely hodge-podge fashion," he explains. "As a result, environmental managers faced with contamination issues have the difficult task of navigating this maze of confusing and overlapping regulations."

That's a tall order, especially when some municipalities and states require spill reporting within 24 hours, and numerous agencies may each require notification. "Under pressure like that," Fields states, "it's far too easy to make costly mistakes and end up painfully second-guessing yourself after the fact."

To help clients respond, says Ed Ricci, BC's national practice leader for Environmental Services, BC has developed a state-by-state reporting protocol *(see chart on inside back cover)* based on its experience managing nationwide compliance projects.

"This key information guides clients when a spill, leak or release occurs," he adds, "and helps clients avoid future reporting problems."

Plan ahead for problems

If you are handling chemicals or petroleum products, he advises, the best strategy is to plan spill and contamination reporting policies and procedures well ahead of time. "Have your ducks lined up," he recommends, "before you're ever faced with an emergency."

"It's far too easy to make costly mistakes and end up painfully second-guessing yourself after the fact."

That, he acknowledges, can be a challenging task, especially for environmental managers responsible for multi state facilities. As the chart illustrates, every state and many localities have their own, individual requirements, and the path to compliance is usually far from clear. "Each situation needs to be evaluated individually," he says, "and there's not an easy answer in many cases."

Decisions about environmental reporting, moreover, are mainly legal in nature, not engineering or environmental, adds BC's Houston Office Manager Tom Marrou.

"As environmental consultants," he says, "we can quantify or estimate releases and provide examples of environmental issues and regulations. But, bottom line, it's the role of a client's legal counsel to decide what sorts of situations to report."

The same, Ricci says, is true when a client discovers preexisting contamination on a site. "A client may be digging the foundation for a new building and comes across some discolored soil. The question then," he says, "is 'what do I do?'"

In some states, such as Texas, new releases must be reported if there's any threat to surface water, groundwater or human health. But in many states, Marrou notes, "reporting of historical contamination is a horse of a different color compared to a new spill or release…and it's often gray."

Get legal counsel

In many cases, state, federal and local reporting requirements are unclear because:

- either the magnitude of the contaminant release is unknown

or it falls below various reporting thresholds

- the circumstances of the release are uncertain or unknown
- or responsibility for the release is unknown or unclear.

As a first step, Fields advises, clients should discuss the following questions with legal counsel:

- Is the release on land, water or both?
- Does the release violate applicable water quality standards?
- Do the circumstances of the contamination (setting, concentration, constituents, etc.) suggest that groundwater may be impacted? If so, does your state's groundwater statute include formal reporting requirements?
- Do you have reason to believe that there is an imminent threat to public safety as a result of the contamination? If it's not specifically laid out in your state's environmental law, general duty requirements of other statutes can usually be interpreted to imply a reporting obligation to safeguard public health.
- Does the spill threaten or adversely impact owners or occupants of property not owned by the client?

According to environmental attorney Greg Patterson, a partner with Musick Peeler & Garret in Los Angeles, it's often in a client's best interest to be proactive in the event of new or historical contamination.

"When in doubt, report," he recommends, especially in the case of a new spill, "and make sure that you report to every agency that may have jurisdiction and separate, often varying, reporting requirements.

"The likelihood is that you'll need to report it anyway, and you'll also need the agency's sign off on remediation plans. Even if the reporting wasn't necessary," he adds, "there are few negative repercussions, and there's very little down side to this approach–compared to your significant, potential liability if the agency asserts that you should have reported contamination, but didn't."

In the case of historical contamination, Patterson advises reporting if there's any chance of subsurface contamination posing a threat to groundwater, a potential health risk or ambiguity in statutory reporting obligations. "The risks of not reporting," he notes, "include high penalties and getting on an agency's bad side."

If the historical contamination poses no immediate or significant threat, however, clients should take advantage of the more relaxed reporting timeframe to develop a response and remediation plan.

"They can then present the response plan to the agency at the same time that they report the preexisting contamination," Patterson advises. "It's a proactive strategy that can help clients guide the process."

Be prepared

The best strategy of all, however, is to plan far ahead for these difficult, confusing situations. That way, Marrou notes, you'll have policies, decision trees and emergency procedures in place so you won't have to make complex, potentially costly decisions on the fly. He recommends following these basic steps to be prepared in both proactive and reactive situations:

Tips for planning a reporting strategy

1. Review your company's potential liabilities and exposure in relation to current chemical handling and past waste-handling practices.

2. Think through and plan ahead for potential spills and historical contamination.

3. Be aware of federal, state and local reporting regulations and have a clear reporting policy that all employees understand.

4. Have emergency spill procedures in place and routinely update training for on-site personnel who may be responsible for responding to the situation.

Tips for strategic reporting after a release

1. Immediately control the extent of the release.

2. Consult with science and engineering specialists to determine the chemical nature of the release, environmental effects, pathway analysis control technologies, the potential impact of the spill and ultimate cleanup scenarios.

3. Consult with an attorney about reporting requirements and regulatory interpretation.

4. File the necessary or prudent reports within the required reporting time period.

Put policies and procedures in place

"By being proactive," Marrou explains, "you can avoid violations and save money by being ahead of the game."

It's a big task, Fields acknowledges, but it can be a very savvy business decision long term. "It's hard to appreciate the wisdom of this approach," he notes, "unless you've already had your business disrupted as a result of underreporting or not reporting a release. The smartest move is to be prepared for the unexpected before it ever happens to you."

For more information, contact Ed Ricci at (602) 567-3917 or ericci@brwncald.com.

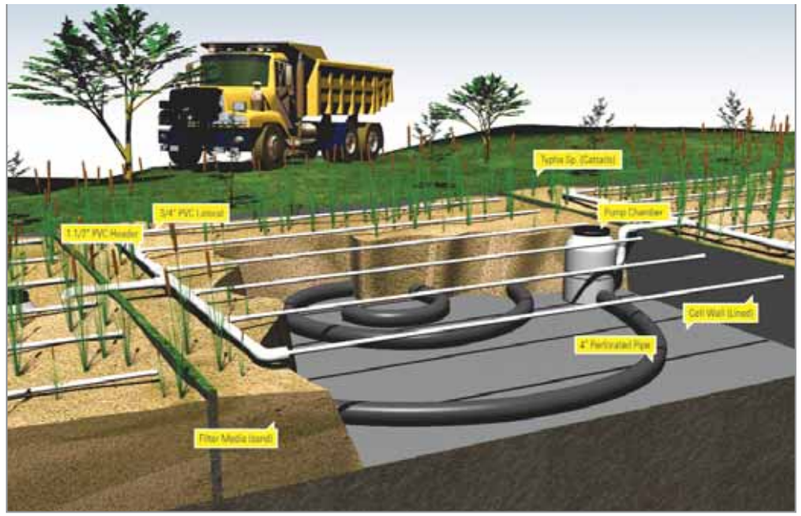
New advances improve leachate treatment and operations efficiency

Many landfill operators face the challenge of treating and disposing of leachate—a task that becomes especially costly and burdensome once a landfill closes and its revenue streams disappear.

The expense of tank trucking and treating leachate off-site, then discharging it into sanitary sewers, can add up to 20 percent of landfill operation and maintenance costs and last years beyond a landfill's useful life.

New technologies, however, are offering cost-saving alternatives to traditional leachate disposal. Other advances, adds Brown and Caldwell Design and Solid Waste Manager Bob Ash, can significantly extend the operating lifespan of a landfill, increasing owners' revenues and profits.

"By considering these cutting-edge approaches," he says, "clients can potentially enhance the cost- and operational efficiency of their landfills without making a huge capital investment. The savings go right to the bottom line."



Brown and Caldwell's vertical wetlands designs *(above)* allow leachate to be treated and discharged on-site, saving money for landfill owner/operators.

On-site leachate treatment

New vertical wetland systems, in particular, are promising methods for reducing the cost of treating leachate. Developed in Germany in 1974 and further refined in Finland in 1991, vertical-flow wetland designs have been extensively tested in Canada.

"These biological treatment systems can enable landfill operators to treat and discharge leachate on-site," says Brown and Caldwell Senior Consultant John Baker. "Since they have very low operating costs and require only limited maintenance, they also reduce treatment costs."

Vertical-flow wetlands, he explains, are a major improvement on constructed wetland designs. Traditional systems are essentially open ponds filled with wastewater that flows horizontally through aquatic vegetation, removing suspended solids and ammonia while reducing biochemical oxygen demand. Some designs mimic natural wetlands, while others have subsurface flow and filter wastewater through gravel.

"The traditional systems can do a great job in warmer months," he explains, "but in winter, when the vegetation isn't as active, they're often ineffective in removing the ammonia to required levels."

The low-velocity flow of natural free water surface wetland designs also requires extensive surface area and can cause problems with odor and mosquitoes. Vertical-flow wetlands, however, avoid mosquito problems because water is not ponded on the surface. In these systems, Baker explains, leachate percolates downward through gravel, which lies below ground.

"Clients can potentially enhance the cost and operational efficiency of their landfills without making a huge capital investment."

The system also increases treatment effectiveness by evenly distributing the leachate and allowing oxygen to enter the full depth of the soil, creating enhanced aerobic zones. Bacteria in the root zone function well in the winter and keep the treatment processes going even when the wetland plants are dormant. The vertical-flow wetland design actually mimics a trickling-filter wastewater treatment system, Baker notes, with two treatment units and a polishing step.

"The end result," he says, "is high performance and low costs, since there's no need for off-site disposal and no need to heat the system for it to work effectively."

The vertical-flow wetland design has been extensively tested with swine manure, sanitary sewage, winery process wastewater and greenhouse leachate, and is an increasingly popular choice in Europe for municipal wastewater treatment, notes Ron Crites, BC's Natural Systems service leader.

"After the initial capital expenditure," he adds, "the system has minimal operating costs and can easily pay for itself over a relatively short period of time."

Left: A three-cell vertical wetland under construction, including pump chambers, perforated collection pipes and a 30-mill PVC liner that is flexible for easy installation and pliable in cold weather. *Center:* The vertical wetland components are covered with filtering media, which varies depending on treatment objectives and wastewater characteristics (i.e., particle size, porosity and aluminum, iron and calcium content) and treatment objectives. *Right:* The vertical wetland is planted with cattails (Typha sp.) or reed grass (Phragmites sp.), again depending on wastewater characteristics (Phragmites, for example are more tolerant of high ammonia concentrations).

Increasing landfill efficiency

Another advance, adds Brown and Caldwell Senior Associate Alan Kirschner, speeds up landfill degradation and gas production, increases densities, extends the length of operation and enhances revenues and profits.

"Because landfill space is getting scarcer," he explains, "it's often easier to extend a site's useful life than to get permits for constructing a new landfill."

One new approach uses nonhazardous liquid waste, in addition to leachate recirculation, to increase moisture levels in the landfill—significantly speeding biological decomposition.

"Landfill densities go up," he says, "allowing more waste in a given volume and increasing the profitable lifetime of the landfill."

The strategy takes advantage of a new EPA rule allowing permits for alternative landfill design and operating requirements. These alternative approaches include:

- improvements in liner system design and materials
- improvements in design and materials of leachate drainage and recirculation systems
- enhanced processes for more rapid degradation of waste
- flexibility for alternative caps
- new liquid distribution techniques

States implementing the new rule can allow operation of these new technologies in municipal solid waste landfills, so long as there is no increased risk to human health and the environment.

The new permits allow the addition of nonhazardous liquids to accelerate decomposition in landfills with appropriate liners. Owner/operators interested in this approach are required to demonstrate proper groundwater protection, landfill stability and enhanced landfill gas collection and control.

The new EPA rule limits the duration of initial permits to three years, so landfill operators can test and assess the performance of an innovative technology or process. The permit may be renewed for three years, up to three times, allowing for a maximum permit period of 12 years.

Boosting capacity

Other approaches include using low-profile liner systems to boost capacity and vertically expanding existing sites—increasing their volume with the thinner liner systems, heightened perimeter berms and steeper side slopes.

"Over time," Kirschner explains, "the 33 percent slope of a landfill will settle into a 20 to 25 percent grade, diminishing the facility's capacity. By building landfills with a 40 to 50 percent slope, we can design it to settle into a 33 percent grade, significantly increasing the long-term volume of waste that it can handle."

Brown and Caldwell, Ash adds, is well-positioned to help clients implement these promising new landfill strategies.

"With our extensive bench strength and experience in both solid waste management and water and wastewater treatment," he explains, "we can help clients successfully evaluate and employ the latest, most cost-effective methods for managing and operating their landfills. It's all about adding quantifiable, bottom-line value for our clients, and it's part of our 'best brains' approach at Brown and Caldwell."

For more information, contact Bob Ash at (615) 250-1206 or bash@brwncald.com.

QUARTER NOTES

NATIONAL NEPA NETWORK

Expert team eases compliance

The National Environmental Policy Act (NEPA) can be a compliance roller coaster, often driven by politics. Brown and Caldwell, however, has assembled a national team of experts to help smooth the ride.

Created in 1969 and enacted in 1970, NEPA requires federal agencies to consider a project's impacts on environmental values such as land use, geology, biology and cultural resources. NEPA documentation includes environmental impact statements, environmental assessments and categorical exclusions, and it is triggered by proposed federal actions, such as funding or permits. Examples of projects that could require NEPA compliance include transmission lines, gas pipelines, highways, power generation plants, communication towers and water treatment plants.

Regulatory experience

Brown and Caldwell's capabilities integrate NEPA, Endangered Species Act (ESA) and Clean Water Act documentation and environmental planning services with agency coordination and public involvement. "Our NEPA services are gaining ground in the competitive market of regulatory compliance," says BC NEPA Specialist Mike Strand.

While BC's national team is relatively new, the company's NEPA experience is extensive. In Arizona, for example, BC completed an environmental assessment for the City of Tempe's 212-acre Brownfield Redevelopment Project. In Idaho, team members performed NEPA documentation and coordinated biological survey efforts between a client and subcontractors for a 60-mile, 138kV transmission line (pictured). And in Colorado, BC helped the cities of Littleton and Englewood stay in compliance with NEPA regulations during a wastewater treatment plant expansion.

Multidisciplinary team

"In addition to our NEPA capabilities, our biological team includes experts in the ESA and associated documentation," Strand notes. BC specialists have also written biological assessments and conducted consultation and conferences with the U.S. Fish and Wildlife Service under the ESA Section 7.

"But what sets our team apart is national experience," he adds. Team members are well versed in NEPA compliance with a wide variety of federal agencies, including the Bureau of Land Management, U.S. Forest Service, Environmental Protection Agency and the U.S. Department of Housing and Urban Development.

"What's more," he says, "BC understands the relationship between and compliance with NEPA and various state environmental laws, such as the California Environmental Quality Act and the Montana Environmental Policy Act. We're familiar with all aspects of compliance and permits needed for successful completion of a project."

For more information, contact Mike Strand at (208) 336-1340 or mstrand@brwncald.com, or Katherine Beisel at (714) 689-4868 or kbeisel@brwncald.com.

HIGH HONORS FOR BC EXPERTS

There's nothing like being recognized for a job well done—especially when the honor marks your career and is bestowed by two of the most renowned agencies in the environmental industry. The American Water Works Association and the National Academy of Engineering recently took their hats off to two Brown and Caldwell specialists for their distinguished work in advancing the fields of engineering, wastewater and water supply management.

National Academy of Engineering taps Parker

Denny S. Parker, Ph.D., P.E., has been elected to the National Academy of Engineering, the profession's highest distinction, in honor of his "significant advances in the scientific understanding, engineering development, and process design of chemical, physical and biological processes for the treatment of wastewater." He joins 76 other new members and 11 foreign associates in the Class of 2004.

Parker has consulted on hundreds of wastewater-related investigation, design and planning projects in his 30 years in the industry, and he's built an unprecedented reputation for process innovation. His research helped develop the flocculator clarifier and the Trickling Filter/Solids Contact process, both of which are used in hundreds of plants across North America.

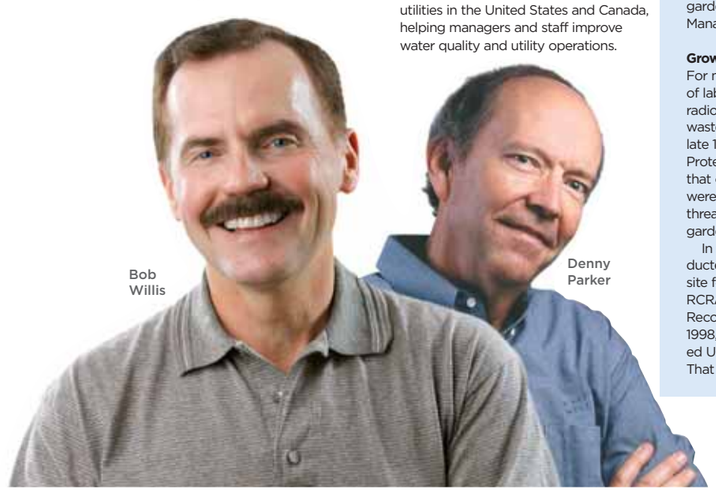
AWWA honors Willis

At its annual convention in June, the AWWA recognized Brown and Caldwell's Potable Water Leader Bob Willis for his knowledge, dedication and accomplishments in the field of water supply, presenting him with its Honorary Member Award.

"Few individuals in the Pacific Northwest have given more to our association and the water industry than Bob Willis during his 30-plus-year career," said AWWA Executive Director Jack Hoffbuhr.

Willis was nominated by the AWWA's Pacific Northwest Section, confirmed by a panel that included two past presidents and current president Marlay Price, and approved by the AWWA board of directors.

A past president and five-year officer of the American Water Works Association, Willis spent 28 years with the City of Portland Bureau of Water Works. He has worked with hundreds of utilities in the United States and Canada, helping managers and staff improve water quality and utility operations.



PLANT PROTECTION

Landfill remediation design safeguards Georgia's State Botanical Garden

When a former hazardous-waste landfill threatened the state Botanical Garden at the University of Georgia (UGA), Brown and Caldwell engineers developed an award-winning system to protect the preserve and its surface and groundwater from future chemical releases—at a cost savings of more than $20 million.

"The integrated remediation system has improved surface water quality, eliminated further landfill releases, controlled long-term groundwater risks and preserved the integrity of the botanical garden grounds," says BC Client Service Manager Jim Claffey, Ph.D.

Growing threat

For more than 20 years, UGA disposed of laboratory chemicals and low-level radiological isotopes at its hazardous-waste landfill on Milledge Avenue. In the late 1980s, the Georgia Environmental Protection Division (EPD) determined that chemicals from the one-acre site were seeping into groundwater and threatening a stream in the botanical garden.

In response, Brown and Caldwell conducted groundwater monitoring of the site for more than a decade as part of a RCRA (Resource Conservation and Recovery Act) investigation. Then, in 1998, ongoing plume migration prompted UGA to take more aggressive action. That year, BC began working with the university to develop and implement a comprehensive remedial design program. The $3 million system included a RCRA-compliant landfill cap, a first in the state of Georgia; a phytoremediation system that uses plants to absorb and break down hazardous chemicals; a surface-water collection and treatment system; and a groundwater recovery and treatment system to halt plume migration.

Award-winning, cost-saving design

"Technical information and site monitoring data prove that the landfill cap is already effective and will provide protection of human health and the surrounding habitat for many, many years to come," says Ken Scott, UGA associate VP and director of the Environmental Safety Division. "Environmentally speaking," he adds, "we made the right move."

The design also proved to be a far less costly alternative to the EPD's recommended approach of excavation and disposal, which was estimated to cost as much as $28 million.

The project was honored by the Georgia Chapter of the American Water Resources Association as the 2003 Water Resources Project of the Year. It also won the 2004 Engineering Excellence Award presented by the state chapter of the American Council of Engineering Companies (ACEC) and an Honor Award from ACEC's national chapter.

For more information, contact Jim Claffey at (770) 673-3663 or jclaffey@brwncald.com.

CORPS CLEANUP

The U.S. Army Corps of Engineers is restoring the environment of historic Benicia Arsenal

Established in 1849, the 2,700-acre Benicia Arsenal—the first U.S. Army arsenal on the Pacific Coast—is now a mixed-use commercial and residential site in the San Francisco Bay Area. Since 1997, the U.S. Army Corps of Engineers (USACE) has been working to eliminate risks to human health and the environment on the property as quickly and economically as possible. Brown and Caldwell has been the primary consultant for the project, partnering with Forsgren Associates.

"The site and remediation investigation has been a very careful process," explains Project Manager Wendy Linck. "We've been working closely with all stakeholders, including the Army Corps of Engineers, landowners, the community and regulatory agencies."

Quality and cost-efficiency

As part of the remedial investigation, BC assessed the nature and extent of chemicals linked to past Department of Defense activities, analyzed subsurface conditions and the movement of groundwater and contaminants, developed health, safety and quality assurance plans and evaluated some 300 sites within the arsenal for field investigation, ultimately assessing about 60. BC also developed an environmental data management system for the project, as well as an interactive database/GIS web site, and is providing extensive outreach to the local community.

"We have a most competent and capable consultant on board in FA/BC [Forsgren Associates/Brown and Caldwell]," states Michael Mitchener, manager of the USACE Benicia Arsenal project. "They have a long history of involvement at the Benicia Arsenal and a history of exceptional performance with us."

For more information, contact Wendy Linck at (916) 853-5325 or wlinck@brwncald.com.

COMMUNICATING COMPLIANCE

Poster and planning packages help clients meet new SPCC requirements

Since July 2002, when the U.S. Environmental Protection Agency (EPA) amended the oil pollution Spill Prevention Control and Countermeasure (SPCC) Plan regulations, many companies have been unsure how these rule changes apply to their facilities.

Those subject to the rules have to review and make changes, if needed, to their SPCC plans by August 17, 2005, and implement those plans by February 18, 2006. The plans outline each facility's policies and procedures for preventing spills and controlling any that occur.

"The new regulations set requirements and procedures for preventing oil discharges," explains Tekla King, Environmental Services manager for Brown and Caldwell. "Permitting and compliance issues, however, can be confusing, complex and expensive."

Compliance help

Many facilities, she notes, are subject to the SPCC regulations, including those with:

- a total aboveground storage tank capacity of 1,320 gallons or more, counting only containers with 55-gallon or more capacity
- a total underground storage tank (UST) capacity of 42,000 gallons or more—excluding most gas stations and other USTs regulated under 40CFR Parts 280 or 281 or equivalent state programs

Brown and Caldwell, she says, can help clients comply with the new SPCC rules. BC, for example, has developed and copyrighted a simple-to-use and easily updatable poster format for SPCC plans, along with a record-keeping package and training module that meets SPCC requirements.

"To be useful," King explains, "spill prevention and cleanup information should be posted and visible in any situation. The SPCC Poster Plan makes this key information easily accessible in a cost-efficient way, especially for companies that have multiple sites."

For more information, contact Tekla King at tking@brwncald.com or (602) 567-3848.

STRATEGICALLY MANAGING SEDIMENT SITES

Some consider sediment the fourth environmental medium after soil, water and air. The reason is that, in aquatic environments, chemicals from upland sources—such as direct discharges, spills, surface runoff, air pollution and affected groundwater—can adhere to sediment particles. These chemicals in sediment can then contaminate fish, potentially endangering any humans and wildlife that eat them.

As a result, the need to successfully managing sediment sites is a growing concern. It can be a complex process, however, since it often means dealing with unsteady hydrodynamic conditions, sensitive ecosystems and multiple stakeholders.

Saving money

"Brown and Caldwell," says BC's Lead Sediment Expert Kendrick Jaglal, "has exceptional expertise that can help clients successfully limit their liabilities at sediment sites, even those with the most complex and challenging issues."

BC's sediment team, he adds, comprises an oceanographer, civil and environmental engineers, hydrogeologists and scientists, including toxicologists, modelers and hydrologists.

"We work with clients across the country," he says, "to develop and implement strategic sediment investigation programs and cost-effective remedial designs. We also assist with other issues, such as cost allocation, consent order negotiation, litigation support and natural resource damage."

Brown and Caldwell, for example, has used innovative risk assessment techniques to significantly reduce the scope of remediation at the Long Beach Naval Complex (pictured), saving the Navy millions of dollars in cleanup costs. BC has also helped the U.S. Army Corps of Engineers, as well as several utilities, private manufacturers, ports and law firms, address sediment issues.

"We've dealt with a wide range of chemicals at inland and coastal sites across the country," he says. "We also conduct research on new approaches, such as sediment capping, that can save clients money while meeting the challenge of managing sediment sites."

For more information, contact Kendrick Jaglal, P.E., at (315) 449-3010 ext. 113 or kjaglal@brwncald.com.

PHARMACEUTICAL PHENOM

BC treatment system helps client win highest EPA award

Engineers at Brown and Caldwell had to smile when they learned that Puerto Rico-based IPR Pharmaceuticals Inc.-Canovanas won the prestigious EPA Region 2 Environmental Quality Award, the agency's highest honor for environmental protection. After all, it was a BC-designed treatment system that helped the company earn the award for reducing pharmaceutical active ingredients (PAI) in its effluent and the environment.

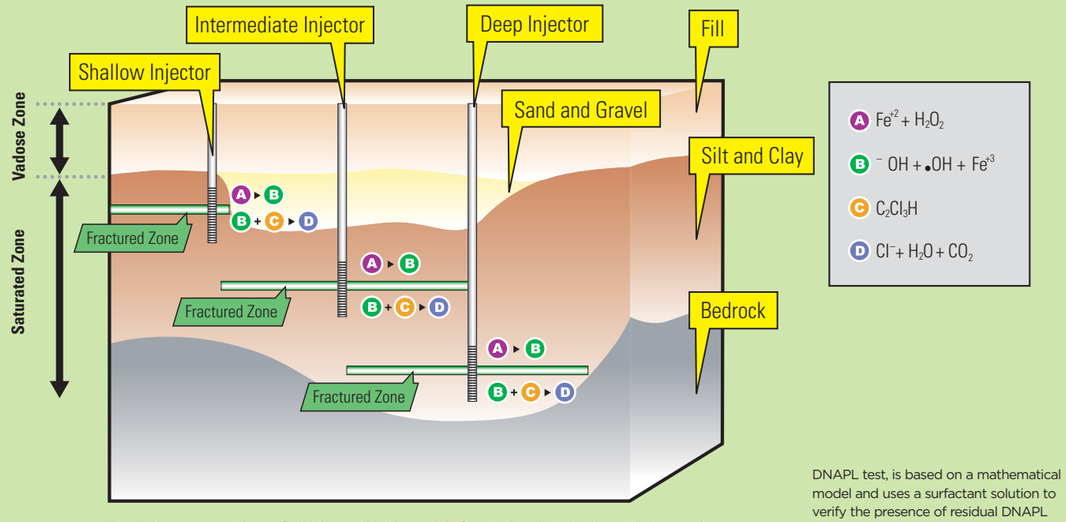
The official honor, however, belonged to IPR, a subsidiary of AstraZeneca. The firm created the Pharmaceuticals-in-the-Environment initiative, under which pharmaceutical companies determine acceptable levels of unregulated PAIs in process waste material. They comply with these voluntary standards using analytical models to detect and monitor waste materials and treatment processes that reduce the concentrations and environmental impacts of PAI.

Brown and Caldwell played a key role in developing the treatment system at IPR's manufacturing facilities, including treatability testing, process design and preliminary engineering design. The system segregates specific waste streams for equalization and controls their release to the publicly owned treatment works to ensure acceptable PAI concentrations in the ocean.

For more information, contact Joe Cleary at (201) 574-4721.

THE LEADING EDGE

Brown and Caldwell personnel pioneer efficient new remediation techniques and tools



Typical cross-section of ISCO application with fracturing in trichloroethylene plume

When a small East Coast municipality needed to remediate a former industrial site before redeveloping it as affordable senior housing, Brown and Caldwell personnel used quick, cost-effective ISCO in situ chemical oxidation technology to clean up its chlorinated solvent-contaminated groundwater.

The result? The site was remediated within a year—the state's first successful site closure using an ISCO process. Thanks to the success and speed of the remediation, notes Jerry Vorbach, P.E., CHMM, BC's manager of In Situ Remediation Services, "the municipality obtained hundreds of affordable housing units for its low-income senior citizens. The developer qualified for tax credits and a low-income loan. And the chlorinated solvent contamination was destroyed, with no need for ongoing groundwater monitoring."

Chemical oxidation is a process that removes electrons from contaminants and helps break them down into harmless minerals, water and carbon dioxide. New techniques, developed by Vorbach, make the process even more efficient and less costly by pumping liquid oxidants directly into the source areas of contaminated soil and groundwater, controlling their flow rates and ensuring the most uniform distribution.

"With these new techniques," Vorbach explains, "we can remediate every type of organic contamination in any geographic setting, even underneath buildings where you can't dig out the soil. It's the fastest in situ remediation technology, and it's lower in cost than other methods. It's a win-win innovation for our clients—both municipalities and developers—as well as for regulatory agencies."

Detecting DNAPL

BC experts have also developed a new method for locating DNAPLs (dense non-aqueous phase liquids) in subsurface contamination. The approach, called a single-well surfactant push-pull DNAPL test, is based on a mathematical model and uses a surfactant solution to verify the presence of residual DNAPL at radiuses potentially up to 10 feet from a test well.

"Until now," says BC Principal Geologist Greg Christians, "it's been difficult to determine the actual presence and location of residual DNAPL in the saturated subsurface, even though it's the primary source of groundwater contamination at many, if not most, DNAPL sites.

"With this test," he explains, "clients can positively identify the presence of residual DNAPL and, in some cases, even potentially estimate the quantity of residual DNAPL on their property."

For more information, contact Jerry Vorbach at (201) 574-4744 or jvorbach@brwncald.com, or Greg Christians at (615) 250-1216 or gchristians@brwncald.com.

FIRM ANSWER

The Fixed-price Remediation Method (FIRM) offers solutions, guarantees and no surprises

Recently, a manufacturing facility in Los Angeles discovered PCE (perchloroethylene) contamination on property it leased from a local landowner. The PCE had also migrated into soil and groundwater on an adjacent property, and before too long, lawyers for all three parties were deadlocked in complex litigation.

Fortunately, they were all able to agree on a solution—a fixed-price remediation method that guarantees performance milestones and complete cleanup of the site at a fixed cost.

"FIRM was an ideal solution, because it guarantees no change orders and no extra expenses," says Steve Figgins, BC's Western Business Unit Environmental Services practice leader. Brown and Caldwell proposed the fixed-price remediation approach and will complete the work.

"We will be paid when we meet set performance milestones throughout the project. The final milestone," he adds, "will be a closure letter from the regional water quality control board stating that no further action will be needed."

Transferable guarantee

The remediation plan includes dual phase, vacuum-enhanced soil vapor extraction, injection of Hydrogen Release Compound™ into groundwater injection wells, monitoring and restoration of the site. The cleanup process, Figgins adds, should take approximately seven years.

"An added benefit of the FIRM approach," he explains, "is that it's transferable from seller to buyer. If the landowner sells the property at any time during the remediation project, the new owner will enjoy the same fixed price and guarantees."

For more information, contact Steve Figgins at (714) 689-4863 or sfiggins@brwncald.com.

SILICA SAFETY

Reducing exposure to dust

One of the most common geologic materials on earth, silica is the main natural ingredient found in more than 75 percent of soil and rock materials. Any process that digs, drills or crushes rock, sand or soil—or that uses silica-based compounds in grinding or sanding—can produce fine particles of silica dust. And prolonged, unprotected exposure to high concentrations of crystalline silica dust can cause silicosis, an occupational illness that inhibits the lungs ability to absorb oxygen.

"This isn't a new issue," notes Steve Trussell, Community Relations director of the Arizona Rock Products Association (ARPA). The federal government, he adds, has been regulating occupational exposure to silica dust since the 1970s.

Many years ago, however, "employers didn't always take appropriate action," says Corporate Attorney Luke Narducci of Bryan Cave. "As a result, we're noting increased occupational health claims from previous silica dust exposure."

High priority

Today, explains Trussell, protecting workers and the surrounding communities from exposure to silica dust is a top priority.

"The mining industry," he says, "is fully aware of the potential health effects and is taking every precaution to reduce silica dust emissions and exposure. These include the most up-to-date suppression methods and a great deal of employee training."

A lot of controls are already in place, says Eric Mears, BC's national mining manager. "But with all the new case law and litigation, we need to help companies focus more effectively on a wide range of solutions—monitoring air emissions, designing engineering controls and creating targeted outreach and training programs."

Companies, he says, can minimize or eliminate dust sources by employing low-cost control methods like wet suppression, as well as more modern dust-control methods like filters and dry collection enclosures. Other steps include thorough maintenance and housekeeping practices, regular education of employees and mandatory use of personal protection equipment.

Brown and Caldwell, adds Trussell, has already helped ARPA create educational materials, as well as training and outreach programs, for members and the public on the silica dust issue.

"By employing aggressive dust-control practices and working cooperatively with federal, state and county agencies," he says, "we're working to ensure compliance and meet all government emissions and exposure standards."

For more information, contact Eric Mears at (602) 567-3859 or emears@brwncald.com.

MANAGING AIR QUALITY DATA

BC's Environmental Management Information System (EMIS) makes it fast and simple

For many large manufacturing and other compliance-driven organizations, managing Title V air-quality data is a major challenge. Manufacturing plants typically have multiple emission sources, and each requires varying degrees of monitoring, record keeping and reporting.

Brown and Caldwell is helping clients speed and simplify this task with the newest version of its air emission tracking and reporting software. Originally developed four years ago for PCS Nitrogen, a chemical processing plant in Augusta, Ga., the program allows clients to manage air emission data required for Title V monitoring. It also enables them to track their compliance status against limits defined by their Title V air permits.

"The EMIS system," notes BC Client Service Manager Jim Claffey, "can save clients up to one man-year of work, so their return on investment is relatively quick. PCS Nitrogen has already realized a great deal of value from the program."

Speed and efficiency

To use the system, plant operators simply enter information relating to emission points. The software then automatically checks the data against the plant's Title V air permit limits. If the data is out of compliance, the operator can enter a cause and take corrective action to bring the reading back within permit boundaries. Automated data entry options are also available to further boost operating efficiency.

"Supervisors can also use the system to monitor plant performance, conduct trend analysis, assess compliance capability, identify operations issues, generate reports and validate data entries," explains Dennis Mulacek, development and technical support leader for the program.

In addition, the system's data-entry module communicates directly with its reporting module to produce the Annual Title V Compliance Certification Form for submission to the U.S. Environmental Protection Agency, as well as state-specific agency reporting forms.

"EMIS is an attractive alternative for managing compliance," Claffey says, "and has the flexibility to adjust to changing operating and permit conditions."

For more information, contact Jim Claffey at jclaffey@brwncald.com or (770) 673-3663.

THE NEW MON

Meeting new air emission control requirements for wastewater systems

Many smaller organic chemical manufacturing plants, including batch producers of specialty chemicals, will face new wastewater system compliance issues as a result of the MON—Miscellaneous Organic NESHAP (National Emission Standards for Hazardous Air Pollutants).

The MON is a new Maximum Achievable Control Technology (MACT) regulation addressing hazardous air pollutant (HAP) emissions. Although previous rules regulated HAPs at chemical manufacturing facilities, there were gaps in emission sources that were covered. The MON is intended to address those regulatory gaps.

As a result, many affected chemical plants will face compliance issues new to them. They must make precise determinations regarding how the MON's concepts of a "process unit" apply to their specific operations. Then, for the MON's wastewater provisions, they need to establish characteristics of the waste stream leaving the process unit to determine whether air emission controls are required.

Expert assistance

According to BC's Industrial Water Quality Practice Leader Joe Cleary, P.E., D.E.E., each one of these decisions will have costs and may significantly impact the profitability of particular products.

"In-process wastewater management is crucial to cost-effective MON compliance," he explains. "The MON defines the 'process' in such a way that includes actions sometimes considered to be wastewater management or treatment. As a result, strategies for MON compliance require fresh looks at the whole manufacturing system.

"Brown and Caldwell," Cleary adds, "has successfully navigated MACT compliance pathways to the benefit of clients in the organic, chemical, refinery and pharmaceutical industries. With our familiarity with chemical processes and expertise in wastewater conveyance and treatment, we're able to deliver innovative designs and operational support to clients as they begin planning their new strategies for MON compliance."

For more information, contact Joe Cleary at (201) 574-4721.

FOCUS ON REMEDIATION

Battelle Conference spotlights BC experts

In May, 20 Brown and Caldwell Environmental Services staff took center stage in Monterey at the prestigious Fourth International Battelle Conference on Remediation of Chlorinated and Recalcitrant Compounds.

BC's participation in the three-day conference included five podium presentations, 11 posters and four session co-chairs. BC also sponsored a technical breakfast highlighting innovations in site investigation and remediation. Several BC papers demonstrated the application of innovative technologies developed by BC personnel.

Leader in remediation

"The conference demonstrated our capabilities and further branded BC as a leader in the environmental services industry," says Vice President Steve Figgins, who coordinated BC's participation with Principal Engineer Jim Claffey and Senior Technical Coordinator/Analyst Maria Albert.

"It was a great opportunity," he adds, "to show our major and potential clients that Brown and Caldwell is exceptionally solutions-oriented and on the cutting edge of remediation technologies."

For more information, contact Steve Figgins at (714) 689-4863 or sfiggins@brwncald.com.

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configuration, these methods may be the best technical and most pragmatic options.

So, what if the regulatory agency doesn't accept your proposed minimal-action alternative? Answer: negotiate, negotiate, negotiate. And be sure to do a little "selling" along the way. Many regulators today are driven to get "business deals done." In some states, priority projects are those involving property transactions that fuel the "business engine."

Bring regulatory agency decision makers into discussions early and often. Sell them on your conceptual model and corrective action plan early, and provide instructive materials on the successes of the remediation method you're proposing. Their goal is to clean up the site—so show them how you're going to get them there, even if your proposed methods don't match their concepts or experience. In short, use the regulatory process to your best advantage, always keeping the site's end use in mind.

3. Be proactive.

The largest environmental costs are often those that are reactive and unplanned. Since many Superfund-type discoveries are behind us, hopefully fewer operations will fall into this trap. Nevertheless, many spills, leaks, discharges and communication breakdowns can be prevented with a structured environmental program.

Instituting an environmental program, or beefing up a current one, can be costly. Therefore, it is critical to establish metrics and a measurement program to clearly quantify the costs and benefits. Cost aversion and liability reduction can be tricky to quantify. Key cost metrics for an operation, however, can be reflected in fines assessed and paid, worker compensation claims, waste disposal and remediation costs and historical trends in the number of Notices of Violation issued.

A structured environmental program can positively affect these trends. One important strategy is to conduct annual, active compliance audits of your facilities—considering air, soil and water matrices—with a focus on waste generation and product life cycle. The program might also include more due diligence and risk assessment of property transactions, including acquisition, divestment or leasing scenarios.

Programs pay off

Brown and Caldwell has been working closely, for example, with Rental Service Corporation (RSC)—a large tool and equipment provider—to put environmental programs in place at its 500 rental locations throughout the United States, Canada and Mexico.

As RSC's Risk, Safety and Environmental Director Pricilla Oehlert recently stated, "The costs for these environmental programs clearly show dividends by reducing your activity on the radar screens of the regulators. We are avoiding future remediation costs because we are advancing environmental policies and procedures that create a heightened culture of awareness."

Adopting a strategic environmental management system can also align your entire organization, from suppliers to consumers, with your operation's environmental policies and procedures *(see sidebar)*. In every case, a more structured environmental program can help you make incremental programmatic changes that bring bottom-line value to your operation.

At BC, our seasoned technology and business leaders deliver services nationally, regionally and locally, using our teamwide expertise to provide clients with the best, most efficient technical solutions. Feel free to contact any of our regional Environmental Services practice leaders. They'll show you what we can do to help lower your environmental costs.

Steve Figgins
Western Environmental Services practice leader,
(714) 689-4863

Phil Lagas
Southwest Environmental Services practice leader,
(602) 567-4000

Jeff Pintenich
Eastern Environmental Services practice leader,
(615) 255-2288

The Benefits of Strategic Environmental Management

A wide range of operations, in both the public and private sectors, are reaping the benefits of strategic environmental management. It's a way of capturing your environmental information, planning your environmental strategies and linking your environmental programs to your overall operation.

Many enterprises, including international businesses like Ford Motor Co., have adopted formal environmental management systems such as ISO 14001, a standard that was developed in Europe. Others have opted for less formal, more tailored approaches that incorporate the key concepts and processes of strategic environmental management.

Direct cost savings

In all cases—whether the operation is in the federal, municipal or private sector—it's an approach that deals proactively with environmental issues, problems and challenges. The result? Significant direct cost savings by:

- avoiding liability
- reducing insurance costs
- eliminating fines
- avoiding spills and cleanups
- lowering worker's compensation costs
- reducing lost-time incidents

Benefits also include improved productivity, community and public relations and an internal culture of environmental awareness and responsibility.

Brown and Caldwell's team of environmental experts can help you plan, implement, measure and monitor a strategic environmental management system that's tailored for your operation. It's a cost-effective solution that can minimize reactive, expensive incidents, employ the best information technology approaches and link your environmental decision making to other strategic aspects of your enterprise.

For more information, contact Ed Ricci at (602) 567-3917 or ericci@brwncald.com.