2006 Railroad Environmental Conference

October 24-26, 2006

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Energy, Emissions, and Air Quality

Railroad Air Emissions – It’s Not Just Locomotives
Mel Burda – BNSF Railway

The major focus of air emissions issues for the rail industry has been on locomotives. In many ways this is very logical as they consume the majority of diesel fuel purchased by the industry. But there are two other categories that can not be ignored. They are “On-Road and Off-Road” vehicles and equipment. This presentation will start the addressing of these questions: What are these emission sources and how do they affect railroad operations and how are they regulated? How significant are these emission source? What can be done to improve or reduce emissions from these sources?

Prospects for Dynamic Brake Energy Recovery on North American Freight Locomotives
Travis Painter – Hatch Mott MacDonald
Christopher Barkan – University of Illinois at Urbana-Champaign

As fuel costs and environmental impacts assume greater importance to railways, so does the importance of options for increased energy efficiency and emissions reduction. A study was conducted on the potential recovery of dynamic brake energy from diesel-electric locomotives in North American freight service. If feasible, such as system could conserve fuel and reduce the environmental impact of railway operations. Using computer simulations (Train Energy Model) and locomotive event recorder data, estimations were made of the energy that could be recovered from dynamic brake use. In addition, the differences between the results of the computer simulations with respect to the actual events recorded were examined in order to evaluate how well the model simulates an engineer’s operation of locomotives and provide guidance for future improvements to the simulation model. A case study of the energy recovery potential for a Class 1 railroad operating on an 81-mile route over a major mountain pass in North America was conducted. The route analyzed has two characteristics that make it a good candidate for studying energy recovery potential and possible pollution prevention benefits. First, there is an extended down grade longer than 25 miles, and second, it has heavy traffic with about 80 trains a day traversing it. Both of these factors enhance the likelihood that investment in energy recovery technology will be economically viable. It was found that the total dynamic brake energy potential was over 900 kilowatt-hours per train. Assuming a 30% efficiency in the energy recovery system, as much as 20 gallons of diesel fuel could be saved per train. This equates to 680 gallons of fuel per
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day if all eligible trains made use of the technology, and a corresponding reduction in emissions. Larger amounts could be achieved if more energy recovery vehicles were used, up to an estimated maximum of 60% efficiency. Nevertheless, fuel savings do not provide sufficient economic incentive to warrant implementation of dynamic brake energy recovery at current fuel prices. Even when the environmental benefits are accounted for, a likely return on investment is about five years, which is greater than is typically acceptable for railroad capital investment projects.

Reducing Air Emissions the Smart Way – Railroad Participation in EPA’s SmartWay® Transport Partnership

Anthony Erb – EPA

The SmartWaySM Transport Partnership is a collaboration between U.S. EPA and the freight industry designed to increase energy efficiency while significantly reducing greenhouse gases and air pollution. Launched February 9, 2004, SmartWay Transport Partners lead the way towards a cleaner, more efficient transportation future by adopting fuel-saving strategies that increase profits and reduce emissions. There are 5 major Smartway Transport components - corporate partnerships, national transportation idle-free corridors, rail/intermodal, innovative financing and marketing. By 2012 the Partnership aims to reduce between 33 and 66 million metric tons of CO2 emissions per year and as much as 200,000 tons of NOx emissions per year, and achieve fuel savings of up to 150 million barrels per year.

Railroad participation In SmartWay has always been viewed as essential to the overall success of the Partnership, as evidenced by the participation of CSX Transportation as one of the 15 Charter Partners that helped design and launch the Partnership. In May 2005, as a result of a collaborative effort with the Association of American Railroads (AAR) EPA was pleased to welcome six other Class 1 freight railroads into the Partnership. A Class 2 railroad has more recently been welcomed to the Partnership. In joining SmartWay, each railroad has committed to evaluate the environmental impacts of its operations and work jointly with EPA to develop and implement a plan to improve fuel efficiency and reduce emissions over the next several years.

This presentation will provide an overview of the SmartWay Transport Partnership, including background on its development, the first 2 ½ years of implementation and plans for the future. It will highlight the importance of rail industry participation to achieving the Partnership overall goals, and will describe the processes and technologies that are being employed and considered by these Partners to reduce fuel consumption and emissions. Finally, the presentation will provide information on how other railroads and interested groups can become involved in the Partnership.
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An Update on Diesel Particulate Issues in California
Jim Diel and Brock Nelson – Union Pacific Railroad

Diesel particulate emissions are an increasingly important focus of air regulatory agencies in California. This presentation will briefly outline the history of this issue then discuss how the class I railroads that operate in California have volunteered to engage the issue and the current status of those efforts.

Locomotive emissions credit trading in Ontario, Canada
Carl Gerhardstein – CSX Transportation

This presentation describes the Ontario Emissions trading system, Governed by Ontario Regulation 397/01, whereby uncapped emitters of Nitric Oxide (NOx) and Sulfur Dioxide (SO2), or capped emitters of Nitric Oxide and Sulfur Dioxide (whose emissions are below their cap) may earn credits for the reduction.

These credits can be then banked and subsequently sold at market rates to consumers of credits (i.e. someone that has surpassed their cap and needs to buy in order to be in compliance). Although there is pending legislation in Ontario to cap six additional industrial sectors, the only capped sector at present is the Ontario electrical power production sector. Many small producers of electrical power exist as capped emitters but over 90% of the production of power and thus the cap exists in the hands of Ontario Power Generation. These are the consumers of credits.

The Ontario regulation is one of the first in North America that recognizes credits from a mobile source. However, in order to earn credits, the credits earning device must have been within the Credits Eligibility Zone. Based on the fact that in excess of 50% of Ontario’s smog originates outside of Ontario due to prevailing winds, the zone includes Ontario and 11 U.S. states and the District of Columbia. The zone therefore includes: Ontario, New York, Pennsylvania, New Jersey, Delaware, D.C., Maryland, West Virginia, Ohio, Kentucky, Indiana, Illinois and Michigan.

Emissions Reduction Credits (ERC)’s are a commodity. The price rises and falls based on market conditions (supply and demand). Most recently, the most valuable (in terms of railroad interest) are the NOx
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ERC’s. CSXT has successfully generated and sold NOx credits generated from locomotives equipped with auxiliary power units operating in the eligibility zone.

Chicago Climate Exchange: Monetizing Greenhouse Gas Emission Reductions in the Rail Industry
Michael J. Walsh – Chicago Climate Exchange

Mr. Walsh will review progress of Chicago Climate Exchange (“CCX”), a voluntary, legally binding pilot greenhouse gas reduction and trading system for emission sources and offset projects in North America and beyond. CCX has over two hundred members, including major corporations such as American Electric Power, IBM, Rolls Royce, Ford, DuPont, Temple-Inland, Amtrak and International Paper, as well as Iowa Farm Bureau, Manitoba Hydro, trading firms and public sector participants, including the City of Chicago and four universities. Live trading of greenhouse gas reductions on CCX’s electronic trading platform began in 2003 and has included credits based on industrial emission reductions as well as independently verified projects. By participating in a real, audited market, CCX Members are now testing and refining market protocols, building management and trading skills, and identifying energy efficiencies. Potential design features that could recognize net benefits provided by rail transport will be included in discussion.

Storm Water and Waste Water

Denver Yard Industrial Wastewater Treatment Plant Evaluations and Remedies
Mark Ross – Union Pacific Railroad
Lisa Hennessy – Cameron-Cole, LLC

The Denver Yard industrial wastewater treatment plant (WWTP) was built in 1999. The WWTP is configured and constructed in accordance with the UPRR modular wastewater treatment system standard. At the time of construction, the design standard was appropriate for the hydraulic capacity of the effluent flow rate generated by yard operations. In the past several years operations at the Denver Yard have increased by over 100%. Improvements to the WWTP had not been performed to account for changes in the wastewater quality. Since operations began, the Denver Yard WWTP discharged under a general use POTW permit to the Denver Metro Wastewater Reclamation District (Metro). Due to an incident at the Metro headworks, Metro increased their scrutiny of the railyard discharge, and in January 2005, UPRR was issued a discharge
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permit as a significant industrial user. Due to a violation of the discharge permit limits, UPRR was issued an administrative order in February 2005, requiring the cessation of discharge until the treatment system is upgraded. This presentation details the Denver Yard WWTP evaluations and remedies that were performed on a rush basis in response to the Metro administrative order. The presentation topics include: Emergency measures, UPRR standard WWTP evaluation process, Non-standard evaluations, Findings and reporting, Options analysis of capital improvements, Remedies selected and costs, Current conditions and short-term operations, Planned upgrades and sustainable BMPs, Agency negotiations and permits, and Lessons learned. A goal at all UPRR facilities is to prevent discharges from occurring, and to ensure proactive and effective response measures. The process implemented at UPRR to achieve and maintain CWA compliance represents a practical approach that can be used at similar railroad facilities.

Delaware River PCB TMDL Process and Impacts to Amtrak
Craig Caldwell and Roy Deitchman – Amtrak

Regulatory Framework- Roy Deitchman
The Delaware River Basin Commission (DRBC) was formed 1961 as an interstate compact agency by the states of DE, NJ, PA, NY, and the federal government. Because the states of DE, NJ, and PA have sections of the Delaware River listed as “impaired by PCBs”, the Clean Water Act required a total maximum daily load (TMDL) be developed. The DRBC adopted EPA Proposed Method 1668A which can detect PCB congeners to the parts per quadrillion levels. This results in detection levels up to 1 million times lower than previous PCB analytical techniques. Amtrak joined a coalition of 11 other Delaware River Basin dischargers (municipalities and industry) to comment on the rules. An Amtrak representative has served on the DRBC PCB TMDL Implementation Advisory Board. The biggest issue facing the Board was whether or not to adopt a specific numeric PCB discharge concentration which was estimated to be on the order of 50 parts per quadrillion.

Impact to Amtrak - Craig Caldwell
The DRBC has decided not to set numeric standards for discharges in Phase II of the TMDL but has opted for an approach that incorporates data collection and pollutant minimization plans. Pollutant Minimization Plans (PMPs) require a facility to identify their approach to reduce its PCB discharges. These plans will vary for an industrial discharger to a storm water discharger. At Amtrak facilities in Wilmington DE, and Philadelphia PA, PMPs were required when NPDES Storm water permits were renewed. These two sites have PCB
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contaminated soils that erode and enter the storm water drainage system resulting in elevated PCB discharges. However, prior to use of the EPA Proposed Method 1668A, no PCBs had been detected in the Wilmington Maintenance Facility discharge. The Pollutant Minimization Plans for the Amtrak facilities in Wilmington DE and Philadelphia PA will be described. These PMPs call for various minimization activities which include: PCB track down, cleaning of drainage systems, capping of contaminated areas, soil stabilization and continued monitoring. Before and after data will be utilized to describe the effectiveness of the PCB minimization activities.

Waste Water Treatment Facility Improvements

Kevin Hauschildt – Norfolk Southern

The intent of this project was to address several issues relating to the performance of an existing industrial wastewater treatment facility located in North Kansas City. The existing facility received contact storm water from a fueling pad. The plant had problems handling the volume of water coming from the fueling pad and would overflow at manholes upgradient of the treatment facility. Also, the plant had difficulty meeting effluent limits required by the permit for discharge to the city sewer system. The hydraulic issues were addressed by reviewing the hydraulic profile of the collection system and the treatment facility. All of the flow equalization capacity in the treatment facility is above the invert of the influent sewer pipe. Therefore, in order to store any of the incoming flow, the liquid level in the equalization tanks would rise above the level of the influent sewer and surcharge the sewer system. A surge pumping system was designed to address this problem. The surge pump will be controlled by the liquid level in the influent wet well, and will pump influent flow in excess of the process treatment rate up to the equalization basin, thereby preventing surcharging of the influent sewer. As the influent flow rate subsides, any liquid in the equalization basin will flow back to the influent wet well by gravity to be pumped through the treatment process. The existing treatment process consists of a small wet well with a belt skimmer for oil removal, and a 200 gallon per minute oil water separator. The existing system provided very little quiescent flow volume for effective separation of oil and sediment by floatation and sedimentation, respectively. The design addresses these issues in multiple ways. First, a new grit chamber was designed as near as possible to the fueling pad, the source of the wastewater. This grit chamber was designed to provide a 2 to 3 minute hydraulic residence time at peak flow to allow sediment to settle out of the waste stream as early as possible to limit the formation of emulsions
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due to interactions between sediment and oil. The baffle system in the grit chamber was designed to allow oil to pass through to the treatment facility. At the treatment facility, the design utilizes the smaller of the two existing basins for additional separation volume, and the existing oil water separator as a final treatment step. The oil water separator will be moved to a shallow basement at the end of the smaller basin to permit gravity flow through both treatment units and to the outfall.

Hopper Car Wash Wastewater Treatment Plant Upgrades to Meet Stringent Ammonia Standards

Kevin Hauschildt – Norfolk Southern
Stephanie Knight – The RETEC Group, Inc.

The Norfolk Southern Railway Company (NSRC) operates a wastewater treatment facility at the Brosnan Yard in Macon, Georgia. The facility receives wastewater generated from intermittent car wash operations, as well as storm water and domestic sewage from on-site sources. The wastewater treatment facility is subject to discharge guidelines specified in the industrial pretreatment permit administered by the local publicly owned treatment works (POTW). Several years ago, the POTW established stricter limits for ammonia, reducing the discharge criterion to 20 mg/L as nitrogen. This stricter standard is most important in regards to wastewater generated from the washing of fertilizer hopper cars, which can contain ammonia at concentrations of up to 500 mg/L as nitrogen. In response to this new standard, NSRC retrofitted the existing facility with an additional aeration system and alkalinity controls. Due to the intermittent nature of car washing procedures, however, these processes alone were not sufficient to adequately reduce ammonia concentrations to below the discharge criterion. Nitrifying bacteria are slow-growers and are very susceptible to fluctuations in operating parameters such as ammonia/hydraulic loading, pH, and temperature. As such, fluctuations in these parameters must be controlled to provide proper growth conditions for nitrifying bacteria. The wastewater treatment system design has been subsequently modified to address this issue. Specifically, an equalization tank and an algorithm for metering ammonia wastewater have been designed to achieve a more consistent loading of car washing wastewater to the treatment system. The equalization tank will allow the development and continued growth of nitrifying bacteria within the wastewater treatment system, allowing for the pretreatment permit criterion to be met throughout the fertilizer car washing season. This presentation will discuss the design calculations and specific retrofit features of these processes in the Brosnan Yard wastewater treatment facility.
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Industrial Wastewater Drain Line Gaskets – Pitfalls to Avoid
John Hasterlo – Union Pacific Railroad

“Industrial wastewater drain line integrity is becoming an issue of concern for Facility Designers and Environmental Managers. There have been cases where incompatible gasketing material was either improperly specified, or the incorrect material was supplied and installed. The potential ramifications can become very significant. The purpose of this presentation is to: 1) Address the choices of gasketing materials and methods of gasket material identification. 2) Stress the importance of diligent oversight during installation. 3) Identify options for repairing industrial waste lines where the existing gasketing material has failed. “

Compliance

Evaluating Total Lifecycle Environmental Costs in Compliance With the Federal Environmental Accounting Standards - FIN 47 of FASB 143
Christopher Harvey and David Miller – TRC

Environmental managers are facing increased scrutiny from upper management and other stakeholders to estimate total lifecycle environmental costs, and are often asked to help set environmental reserves. The methods and considerations for developing these environmental estimates may not comply with the new federal environmental accounting standards. In fact, in some cases the environmental reserves have been established at levels far lower than the site’s total lifecycle cost. The new Financial Accounting Standards Board (FASB) Interpretation No. 47 (FIN 47) of FASB 143 clarifies requirements for booking environmental liability. FIN 47, now in effect for companies that had fiscal years ending after December 15, 2005, stipulates that environmental liabilities are Asset Retirement Obligations (AROs) and, therefore, must be recognized at their present fair value. This means that companies are required to provide a more thorough and transparent accounting of their total lifecycle environmental costs. The American Society for Testing of Materials (ASTM) E-2137, Standard Guide for Estimating Monetary Costs and Liabilities for Environmental Matters, provides guidance for measuring environmental costs and liability to estimate the fair value of AROs. An overview is provided of how to estimate total lifecycle environmental costs in accordance with the ASTM E-2137. To illustrate the Expected Value Method, the most robust ASTM E-2137 methodology, a typical small railroad site was used as an example in evaluating its total lifecycle environmental costs. The results indicated that data gaps caused an overestimation of the appropriate degree of costs. Subsequently, potential solutions were realized to interpret and drive out uncertainty in the
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estimating process. The results of the analysis provide the basis upon which professionals can set the total lifecycle environmental costs in compliance with the new federal environmental accounting standards.

Environmental Issues Confronting the Association of American Railroads and North American Rail Industry

Robert Fronczak – Association of American Railroads

The Association of American Railroads (AAR) represents the freight railroads in North America. AAR members include the railroads that operate 77 percent of the line-haul mileage, employ 93 percent of the workers, and account for 95 percent of the freight revenue of all railroads in the United States; and passenger railroads that operate intercity passenger trains and provide commuter rail service. AAR also represents the Canadian railroads through the Railway Association of Canada, and two Mexican railroads including Ferromex, and TFM. This presentation will discuss current regulatory, legislative, environmental awareness, and pollution prevention initiatives at AAR. Regulatory activities include off-road diesel exhaust regulation, developments in the area of spill prevention control and countermeasure plans, changes in the group multi-sector stormwater permit, creosote re-registration, and an effort by EPA to publish a risk assessment on naphthalene. AAR is interested in how EPA and DOE plan to appropriate funds in last years energy bill in the way of reducing emissions and improving fuel efficiency. Environmental awareness activities include the John H. Chafee North American Railroad Employee Environmental Excellence Award, and the award for professional railroad employees. Voluntary programs include the SmartWay program, a voluntary program designed to improve fuel efficiency and reduce emissions.

SPEED: The Environmental Strategy for the Chicago CREATE Program

Paul Schneider – Federal Highway Administration

The National Environmental Policy Act of 1969 (NEPA) established a national environmental policy intentionally focused on Federal activities and the desire for a sustainable environment balanced with other essential needs of present and future generations of Americans.
NEPA requires and the US DOT is committed to the examination and avoidance of potential impacts to the social and natural environment when considering approval of proposed transportation projects. In addition to evaluating the potential environmental effects, US DOT takes into account the transportation needs of the public in reaching a decision that is in the best overall public interest. The US DOT NEPA project development process is an approach to balanced transportation decision-making that takes into account the potential impacts on the human and natural environment and the public’s need for safe and efficient transportation.
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The CREATE Program received federal funding to assist in implementing this Project of National and Regional Significance. The US DOT, in cooperation with the Illinois Department of Transportation, has the responsibility to prepare appropriate environmental documents for this program of projects. The SPEED Strategy was developed for this unique program to fulfill the intent of NEPA while at the same time meeting the needs of the CREATE partners to expedite project implementation.

Transportation planning and project development must reflect the desires of communities, and take into account the impacts on both the natural and human environments. Transportation projects are closely looked at to see how they might impact the community, the natural environment, and our health and welfare. Before any project can move forward to construction, the FHWA must address and comply with laws related to the environment. These laws cover social, economic, and environmental concerns ranging from community cohesion to threatened and endangered species. To get through this detailed process, FHWA uses the National Environmental Policy Act (NEPA) process to evaluate impacts associated with each individual project. The National Environmental Policy Act of 1969 and the regulation of the Council on Environmental Quality, 40 CFR parts 1500 through 1508.

Railroad History and the Environment

Marshall Williams – Environmental Risk Solutions

The presentation charts the history of the railroads starting with the B&O Railroad and how the railroads replaced the wagons, riverboats and Indian trails. The paper also charts some of the major acquisition and mergers of the five Class I railroads in the United States today. The country was young when the railroads started and they were in the business of building a country, populating the Midwest and connecting the East coast with the West coast. The paper points out that there was very little thought to environmental regulation to industry in general, until the Rivers and Harbors Act of 1899 and then the Oil Pollution Act of 1924. In 1970 the Nixon White House formed the Environmental Protection Agency, which while it started out strong no one expected it to be where it is today. A timeline of the EPA brings into focus that the industrial movement has been active in this country for nearly 200 years and the EPA has only been present for the past 36 years. If there is any doubt about the need, staying power or future relevance of the EPA, it is pointed out in the accomplishments of the EPA as shown in the timeline.
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EMS

Efficiency Gains and Technology Employed in System-Wide Environmental Programs
Ken Rose – Cameron-Cole, LLC
Mike Grant – Union Pacific Railroad
Bill Campbell – Farragut Systems, Inc.

The Union Pacific Railroad Environmental Management Group has increased efficiencies and produced cost savings by: 1) combining individual compliance and remediation projects into system-wide environmental programs, and 2) leveraging technology to support these new larger Programs. This presentation will discuss some of the management issues that we faced, as well as present the technologies that have been implemented. Environmental programs are initiated using a formal business plan. As a first step, concise procedure and regulation summary documents are developed to provide easy access to the governing regulations and Program objectives. Next, consulting managers estimate resource needs based upon a well-defined Program scope and schedule. Finally, analysis is performed on the environmental Program costs and benefits as defined in the business plan. The results of the analysis are then compared with baseline objectives and pre-established metrics in order to quantify and benchmark Program progress and success. Throughout the Program, we attempt to apply and leverage technology in order to increase Program efficiencies. The following types of technology have proven to be of particular importance, and will be presented in detail in this paper: The use of mobile hand-held devices for collecting information in the field, Implementation of GIS applications for managing both spatial and non-spatial data, Utilizing document management systems in conjunction with GIS technology, Implementation of browser-based applications for distributing information to key stakeholders In addition, we will also detail the strategies that we used in deploying the technologies, challenges that we faced, and lessons that we learned.

Web Database Application for CSX Transportation, Inc.’s Environmental Compliance Assurance Review (ECAR) Program
Richard Nath – CSX Transportation
Rebecca Heilman – Golder Associates, Inc.

In 2004, CSX Transportation, Inc. (CSXT) Public Safety and Environment (PS&E) Department (PS&E) initiated a four-tiered facility review program as an element of their Environmental Management System (EMS). Initial reviews were conducted by a CSX or third party consultants. The findings were tracked in Excel spreadsheets. Regular conference calls were required to determine the status of each finding from field personnel. Continual
Spoken Presentation Summaries

correspondence between consultants and employees was necessary to ensure the findings were completed in a timely manner and properly documented. This process proved to be labor intensive and inefficient. With an increase in the number of findings assigned to CSXT PS&E employees, it became apparent that an efficient tracking system was needed.

The Environmental Compliance Assurance Review (ECAR) program was developed by the PS&E Department to facilitate the facility review tracking process. The PS&E Department manages approximately 150 fixed facilities located throughout CSXT’s 23 state operating system. In mid-2005, CSXT engaged Golder Associates Inc. to develop a web-based tool to manage the results of internal and external facility reviews. The results of the reviews, or findings, mandate what must be completed and documented for closure. Business practices were already in place at CSXT, and the automatic tracking system needed to reduce the required labor effort. The new system tracks thousands of tasks, issues email reminders, allows for review and confirmation of actions taken, allows managers to review and approve progress, and provides one location where data is stored and accessed by both CSXT employees and third party consultants. The ECAR program has been successfully implemented within CSXT’s technology environment providing the level of security mandated by the CSX Legal Department.

The ECAR system has been expanded with additional compliance components to become the PS&E Electronic Environmental Management System.

Risk Management

Skeletons in the Closet: What You Don’t Know CAN Hurt You

Richard Mohlenhoff – Amtrak

“Operation of a vermiculite processing plant operated by a former tenant on Amtrak property resulted in tons of vermiculite ore and waste being deposited on the site. According to a 1995 assessment report prepared by a consultant for the tenant of the site, the Material Safety Data Sheets (MSDS) for vermiculite indicated the presence of asbestos
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at concentrations ranging from 0.3 to 1 percent. The report concluded that based on the potential concentration of asbestos, the vermiculite was not an asbestos-containing material (ACM). As a result the New Jersey Department of Environmental Protection (NJDEP) issued a No Further Action determination (NFA) for the site. The key point being that the data indicated the potential presence of asbestos. In response to a nationwide investigation of vermiculite containing asbestos from a mine in Libby, Montana, the United States Environmental Protection Agency (EPA) in 2000 and 2001 sampled soil at the Amtrak site and detected asbestos concentrations upwards of 40 percent. In 2004 Amtrak initiated a removal action under a Consent Order with the EPA for removal and off-site disposal of soil containing asbestos (note: not considered an ACM though the soil was disposed as an ACM). When completed the removal action will dispose of 15,000 tons of soil in landfills at a total remediation cost of $2.5 MM dollars. The EPA estimate to implement the removal action was approximately 30 to 40 percent higher. Once considered an emergency removal action in the CERCLA program, mitigation options were limited. If the asbestos in soil was identified early on the site could have been closed under a program other than CERCLA and the site remediation could have been accomplished more quickly and less costly using engineering and institutional controls (e.g., capping and deed restriction), likely on the order of $0.5 MM to $1.0 MM dollars. The risk management lessons learned from this experience include:

Review the operations of tenants and routinely inspect the premises for the presence of hazardous substances and hazardous material handling practices, Require tenants to provide the owner with an inventory of all materials on site and the MSDS, Include in leases provisions for copying the owner on any and all correspondence (e.g., permits, reports, Tier II reporting) with environmental regulatory agencies, Perform a baseline assessment before the tenant vacates the property despite regulatory clearance, Reserve the right to collect samples, and Review regulatory programs for opportunities to address impacts under more favorable terms (e.g., voluntary or Brownfields programs).

Management of Third Party Access for Environmental Assessment or Remediation

Michael Feamster – CTEH
Keith Brinker – CSX Transportation
Neil Ferrone – Conrail
Kevin Boland – River Rock Environmental, Inc.

Railroads represent the largest private property owners in the United States. Every major railroad operates track and facilities in industrial areas, bordering properties with serious environmental issues. In a
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large number of cases these properties have environmental impact which has spread to railroad property. This means that your railroad must then allow outside parties to come onto your property to conduct environmental assessment and/or remediation. These groups include consultants, with a vested interest in reducing the liability of their clients, as well as State and Federal regulatory authorities. These activities bring numerous risks for your railroad in environmental liability, employee safety, and operations. CSX Transportation, Inc. (CSXT) recognized the importance of controlling access for these issues, performing a technical review of the information generated by the outside parties, and recovering the cost of the process. The Environmental Right-of-Entry Program currently in use with CSXT and Consolidated Rail Corporation, Inc. (CONRAIL) was designed specifically to protect the railroad’s interests by reducing their exposure to these events while the cost is offset in fee recovery from licensees. This program continues to successfully reduce their exposure to liability while protecting their property and ensuring that activities proposed by applicants do not interfere with the safe and timely operation of the railroad. This program operates by closely regulating and monitoring the outside parties that inevitably need to come onto railroad property to conduct environmental assessment or remediation. The program establishes a licensing procedure allowing outside parties access to the property under specific guidelines and with the payment of application and annual fees designed to recover the cost of administering the program. The Program is administered by an environmental consultant group that works closely with the Railroad.

Efficient Risk Management for Site Investigation and Remediation

Shalene Thomas – AMEC Earth and Environmental

Environmental managers consistently face growing managerial responsibilities and frequent changes in internal management personnel. As a result, it is imperative that project and site environmental information is managed efficiently and intelligent tools are available for risk management and informed decision-making. This allows managers to not only quickly understand current site conditions at their facilities but also easily draw from historical institutional knowledge. AMEC Earth & Environmental created an environmental data management system containing over 20 years of environmental data derived from subsurface investigations at Amtrak’s Redondo Junction Facility to assist with quick and efficient data analyses and subsequent risk management. Once created, the management system served as an intelligent tool for several purposes including but not limited to data analysis, reduction, and presentation as well as site strategy development. The purpose of
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this presentation is to describe the implementation of the management system as well as illustrate its use and function in day-to-day operations for the environmental manager, their staff, and his/her successors. An example is presented describing how the management system was used to evaluate State Agency recommendations and develop associated quantitative responses and 3-D visualizations. Without the data management system in place, the same exercise would have been qualitative at best and would have been executed only by tedious review of hard-copy site investigation reports, not only consuming the environmental manager’s valuable time and energy, but also diminishing the value and quality of the responses.

Voluntary Evaluation, Risk Assessment, and Closure of an Active Locomotive Fueling Facility

Gibson Barbee and Forrest Stevenson – Norfolk Southern

The Norfolk Southern Railway Company (NSRC) operates a locomotive fueling and maintenance facility near St. Louis, Missouri (Site). The Site was enrolled in the Missouri Voluntary Cleanup Program (VCP) in 1999 to address petroleum hydrocarbon impacted media resulting from historical and ongoing locomotive fueling and maintenance, as well as petroleum storage and underground conveyance. A Tier I Site Assessment (SA) was conducted in 1999 to evaluate soil and ground water impacts at the following locations: the fueling platform, fuel unloading pad, former used oil storage area, and along the underground fuel pipeline. The field sampling activities, data evaluation, and report preparation were conducted in accordance with the Tier I Analysis specified in the Cleanup Levels for Missouri (CALM) guidance document developed by the Missouri Department of Natural Resources (MDNR, September, 1998).

Land use at the Site is industrial and consists of rail yard operations including locomotive refueling, lubrication, and light maintenance. Properties surrounding the Site are used for a combination of industrial and commercial purposes, with the nearest residential areas beginning two blocks to the southwest. Analytical results were compared to the Tier I Scenario C (non-residential land use with restricted access) soil and ground water target concentrations (STARC and GTARC, respectively) in MDNR’s CALM guidance document. Only total petroleum hydrocarbons (TPH) diesel range organics (DRO) results for some surface soil samples exceeded the Tier I Scenario C STARC (1000 milligrams per kilogram [mg/kg]). This occurred in surface soil samples (0-2 feet below grade) collected from three locations, which were flanked
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by locations where soil sample results indicated lower or similar TPH results. TPH results that exceeded the STARC ranged from 1200 to 15000 mg/kg.

The CALM guidance document describes the Scenario C STARC for TPH as an “alternatively derived cleanup level” based on aesthetics and other considerations. A toxicity value for TPH is not provided by CALM. Therefore, a conservative site-specific STARC for TPH was developed for the residual, weathered product using the Scenario C equations and variables in CALM along with composite toxicity values and the current USEPA default exposure values. This methodology allowed the unfractionated 1999 TPH data to be used to develop the site-specific STARC, eliminating the need to collect additional data. After negotiations with MDNR and the Missouri Department of Health (MDOH), the proposed methodology was accepted. In 2004, a Tier 3 evaluation was conducted to develop a site-specific STARC for TPH of 15200 mg/kg. MDNR approved the Tier 3 site-specific STARC for TPH in 2005. A restrictive covenant and Certificate of Completion were recorded in the St. Louis Record of Deeds office in January 2006.

Beyond Asbestos: The “Other” Environmental Issues Associated with Demolition

Don Girard – BNSF Railway
Paul Dial – Environmental Works, Inc.

The current economy and projected growth has greatly increased the demand for additional capacity and infrastructure within the rail industry. A component of expanding service capability and managing long-term liability is removal of old, outdated, and abandoned buildings. The most common environmental issue associated with building demolition is inspection / removal of asbestos. However, the “other” environmental issues associated with building or structure demolition should not be overlooked. Lead paint, transformers, fluorescent lights, mercury ballasts, air conditioning systems, contaminated materials / subsurface soils, and pathways for future releases should be addressed within each demolition project. Demolition methods, approaches to demolition management, assessment of environmental concerns, and a demolition case study of a 100,000 square foot diesel shop will be presented.
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An Expanded Role for AR020(1) to Include High-Speed, Freight, and Commuter Rail

*Marilyn Duffey – The Duffey Company*

An Expanded Role for TRB AR020(1) to Include High-Speed, Freight and Commuter Rail AR020(1) is the Environmental Subcommittee of the Guided Intercity Passenger Transportation Committee of the Transportation Research Board (TRB). For the past ten years the focus of this subcommittee has been to address research topics relevant to high-speed rail projects in the United States. Topics of particular interest have included rail noise and vibration, wildlife crossings, tiered environmental documents, environmental issues for shared passenger rail corridors with highway and freight rail, cumulative impacts, land use and growth impacts, and air quality. It has become clear that topics of interest to the high-speed rail research community are also of interest to the freight rail and commuter rail community, as evidenced by overlapping topics for papers and presentations at the TRB annual meeting. The AR020(1) Environmental Subcommittee has proposed to change its title to “Railroad Environmental Research Issues” and to expand its membership to include all heavy-rail interests (freight rail and commuter rail) to better coordinate the research agenda shared by each. The subcommittee is in the process of preparing a Mission Statement and prioritized research ideas for submittal to the full AR020 Committee of TRB. Research ideas would then be submitted for funding, and topics for TRB sessions and papers would be presented for the annual conference. This presentation at the 2006 Railroad Environmental Conference is to discuss the newly formed joint heavy rail subcommittee and to invite participation and feedback from conference attendees.

Pollution Prevention

Locomotive Fueling Interface Standard (LFIS) Pilot Test

*John Hasterlo – Union Pacific Railroad
Ken Rose – Cameron-Cole, LLC
Frank Bozeman – Bozeman Engineering*

The Locomotive Fueling Interface Standard (LFIS)(1) is a new locomotive fueling system developed by the Association of American Railroads (AAR). The LFIS design is an open, non-proprietary standard that incorporates modern refueling equipment technologies currently in use in many other industries (e.g. petroleum transfer, airline refueling), and adapted for use in the railroad environment. The LFIS was developed with extensive oversight and involvement by a multi-
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disciplinary task force composed of railroad and industry experts.(2) The LFIS standard was adopted as a recommended practice by AAR, and the standard has been successfully tested by many North American railroads. In addition, LFIS has been adopted and has been in use on a Short Line railroad for five years. Union Pacific Railroad (UPRR) has contributed to the development and testing of the LFIS since its inception. UPRR recognizes the LFIS for both its primary benefits (e.g. minimal spillage, excellent performance, safety and reliability), and its ancillary benefits (hydraulic design efficiencies, fueling data collection, and confidence from use of best available technology). Initial field-testing began at the UPRR Council Bluffs, IA facility in 1998. The majority of LFIS testing has been performed with locomotives that were been specifically adapted for LFIS fueling and are used in a captured service environment. In 2006, LFIS fueling equipment was installed in a Chicago area yard, and locomotive fueling pilot testing was expanded to include the fueling of locomotives that have not been specifically adapted for LFIS. The pilot testing includes use of both standard and non-standard LFIS equipment, including multiple sensor configurations for high level detection and automatic shut off. This presentation details the LFIS pilot test and will include discussion on the compatibility of LFIS with existing fueling systems, standard and adapted sensor characteristics, failure analysis, and performance and reliability findings. If successful this could make the conversion of locomotives easier and more effective.(1) AAR, LFIS Ninth Draft, May 5, 2000(2) Barkan, Christopher, The AAR Standard for a Spill Proof Locomotive Fueling System, 2001

Industrial Redevelopment

Municipal Setting Designations (MSD) – A Rational Way to Encourage Clean-up and Redevelopment
Tim Wippold – ARCADIS

“In 2003, the Texas Legislature enacted House Bill 3152, establishing municipal setting designations (MSDs). The law creates a means by which the scope of investigations and response actions addressing groundwater contamination may be limited, if the groundwater is prohibited for use as a potable water source by municipal ordinance or restrictive covenant. In essence, MSDs remove the groundwater consumption pathway. From the perspective of the municipality, MSDs can be good because it will promote Brownfields redevelopment. From the perspective of the railroad, it means that for many sites with
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contaminated groundwater, an MSD will significantly reduce the cost, time and uncertainty associated with obtaining closure. As a result, this program has the potential to become a truly win-win situation. TRC has been involved in a number of MSD applications. In 2005, TRC submitted and obtained approval of an MSD on behalf of Kansas City Southern Railway (KCSR). This was only the third application approved in the State. We are currently working with another major railway on an MSD application. This presentation will provide: An overview of the law, The municipality's perspective, The railroad's perspective, Obstacles to obtaining an MSD and, Progress of similar legislation in other States."

Working Cooperatively with Railroads
Paul Connor - NALGEP
David Koch – Terracon

To provide a direct communication between railroad companies and municipal governments nationwide. Through conference interaction, provide the rail industry with a current picture of municipal help
municipal governments better understand railroad business as it relates to economic redevelopment and Brownfields restoration. NALGEP was created to assist those at the local government levels (county, city, town, village or other municipal entity, or regional association of local government entities) responsible for dealing with environmental concerns. Most, if not all, local government entities are required to or voluntarily undertake environmental activities. NALGEP formed the Railfields Working Group (RWG) to identify and overcome obstacles to local governments’ attempts to redevelop abandoned or unused railroad and thereafter work better work with railroad companies in considering Brownfields restoration that involve rail properties, both active and surplus. NALGEP is a not-for-profit organization that represents local government personnel responsible for ensuring environmental compliance and developing and implementing environmental policies and programs. NALGEP's membership includes more than 140 local government entities located throughout the United States, ranging in size from the largest cities to much smaller local communities.

Description: A 30-45 minute (scalable to time slot) panel presentation by 3 NALGEP Railfields Working Group members as an update on current Railfields efforts. The ~15 minute update will include a Top 10 Obstacles summary of community perceptions in dealing with railroads. The summary could be distributed through UIUC conference organizers ahead of time to facilitate interaction. The remaining time will be to solicit from conference attendees suggestions on how communities might adjust their approach to better understand the railroads’ perceptions on these same items and how to overcome their real and perceived obstacles. Members of the committee would solicit examples of successful case histories at an exhibitor’s booth throughout
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the conference for inclusion in Results of the interactive session and case histories will be used to update Railfields Working Group reports to NALGEP members and the Brownfields industry at large.

Not The End of the Line: Communities Working Cooperatively with Railroads on Brownfields
David Koch – Terracon

Concept: Short to moderate length case history presentation to demonstrate a successful joint project for a Midwestern Missouri Brownfields project between BNSF and St. Joseph, MO (population 74,000). The presentation is intended to highlight by example that if communities work to understand rail business, they can successfully explore rail properties for economic redevelopment through a cooperative, not antagonistic, effort. Description: A 20-30 minute (scalable to time slot) case history presentation. Originally developed by request for BNSF’s Annual Environmental meeting, the presentation was later presented at Brownfields 2004 in St. Louis. It has been updated with other cooperative Brownfields examples in Missouri. Overview of Case History: This is the case study of the Industrial Riverfront Redevelopment, an EPA Brownfields grant project, and how a 15-month stalemate for assessment was broken with the local railroad by using a fresh cooperative approach to assess key target properties. Key elements of the case history:- Understanding the needs and business of the railroad to promote cooperation- Differences between City and Railroad perceptions on the stabilizing vs. destabilizing effects of EPA Brownfields money on property transactions- How alternate access was uniquely agreed after more than a year of trying to negotiate an access agreement- Leveraging of $10.2MIL in HUD Brownfields Economic Development grants and loans- Addressing the issues of All Appropriate Inquiry as part of Phase II scope development, including regional EPA counsel assistance on terms regarding Contiguous Properties in Missouri- Railroad participation in the cost of assessment and Brownfields analyses to evaluate environmental data toward mutual risk-based goals.- Evaluations of risk-based cost-to-remedy analyses for reasonable City risk assumption.

Construction of New York City Subway South Ferry Terminal Station - An Approach to Risk Management and Archeological Findings
Sankar Chakraborty, Shawn Kildare, and George Blank
Metropolitan Transportation Authority

MTA Capital Construction (MTA CC) is a subsidiary agency of the Metropolitan Transportation Authority and is responsible for the
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management of all system expansion projects for the New York subway system and two suburban rail systems. One of those projects is the construction of the South Ferry Terminal Station (SFTS).

SFTS is funded through the Lower Manhattan Recovery program made available by the Federal Transit Administration (FTA). The aim is to revitalize the infrastructure of Lower Manhattan after the 9/11 terrorist attack.

The SFTS project will build a new underground terminal station in Lower Manhattan at the entrance of the Staten Island Ferry Terminal. This will be adjacent to the existing South Ferry Subway Station. It will replace the old single track “loop” terminal with a straight two track station.

The new station in turn provides major advantages for rail operations while meeting the needs of larger passenger loads. The existing South Ferry loop station and approach tunnels were constructed at the southern tip of Manhattan at different times during the early 20th Century.

The new South Ferry Terminal Station Project is located adjacent to historic Battery Park. This area was the site of the original Dutch Colony of New Amsterdam and has seen continual development since then.

The new approach tunnel to the station proceeds in a southerly direction through a portion of Battery Park. In addition, the new approach tunnel and the station will pass under two existing subway tunnels and the loop station. All have 24 hour/7 day passenger service.

**Risk Management**

Risk Management for SFTS was implemented at the start of Preliminary Design in 2003. This entails identifying project risks, assessing their cost and schedule impacts, investigating mitigation actions and tracking implementation of those mitigations in order to reduce project risks. As part of this effort, MTA CC hired an independent Risk Consultant to facilitate risk identification sessions and provide Risk Assessment reports.

Since this project is financed with federal funding, the FTA hired a Project Management Oversight Consultant (PMOC) to monitor the project and perform risk assessments at different stages of the project. The MTA CC Project Team also participated in these Risk Assessments.

MTA CC Risk Assessments as well as those performed by the PMOC consistently identified archeological findings and undiscovered subsurface field conditions to be among the top risks to the project. Both risks could lead to extra cost as well as time delays if they occurred.

A mitigation strategy was developed that called for researching maps and records during the design phase to determine the likelihood of encountering the remnants of historical structures in Battery Park.
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A detailed excavation procedure was also developed requiring an archeologist to monitor construction activities.

In addition, a large number of borings were performed to accurately map the underground topology of the construction site. A Geological Baseline Report was produced that provided bedrock information and rock characteristics of the site.

During the procurement phase, an excavation procedure and the detailed Geological Baseline Report were included in the contract documents.

Construction Experience to Date

The project was divided into three main packages. These were: the Design Build Structural Box package which included excavation and construction of the station enclosure, a Signal Equipment package for design and furnishing of railroad signal equipment and a Station Finishes and System package (In-house design).

The Structural Box package was awarded in February 2005 and is currently progressing with excavation work. Although, mitigation strategies reduced the risks associated with archeological findings and subsurface conditions, they could not eliminate them.

During excavation, the contractor found several minor items, such as 18th century coins, and some major findings. The major items included three sections of an old footing wall that historians are now trying to ascertain their connection with an original 17th century military battery.

As per contract work procedures and the Archeological Resource Management Plan, the contractor was required to briefly halt activities in the vicinity of those findings to facilitate their archeological documentation. Ultimately, the contractor was permitted to deconstruct them sequentially for examination and future exhibition.

As for the subsurface conditions, the contractor initially used mechanical means to excavate the site. However, the rock hardness impeded the contractor’s ability to meet the project schedule.

This led the contractor to switch from mechanical excavation in some areas to controlled blasting. Given the proximity of the job site to active subway tunnels and surrounding structures, blasting was the choice of last resort. However, the contractor developed a comprehensive controlled blasting, safety and monitoring plan. He then obtained the necessary approvals for blasting to proceed.

Conclusion

Mega-projects contain a large number of risks under any circumstances. SFTS was no exception. The task of building an underground subway station in a densely developed business center
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presents unique challenges as well as risks. This is especially true if the job site is in the middle of an historical area with existing transportation infrastructure.

However, if risks are identified early, the Project Team can take actions which will either eliminate them or largely reduce their impact. This presentation details MTA Capital Construction’s experience with Risk Management on a transit mega-project in New York City.

**The Municipal Setting Designation**

**A Tool For Stressed Property (Railyard) Redevelopment**

*Fred Closmann – The RETEC Group, Inc.*

*David Cowen – McLeod, Alexander, Powel & Apffel*

Consider a railyard in an urban industrial setting where groundwater is not currently used as a potable source, and an alternative supply of drinking water is well established. If that same railyard has seen a lifetime of fueling and maintenance operations resulting in contaminated groundwater, the responsible party could realize significant cleanup cost savings from a Municipal Setting Designation (MSD) at the site. The technical and legal issues related to the MSD tool will be discussed in this presentation. The MSD, also known as the Urban Setting Designation (Ohio), is an institutional control tool for regulated entities to use in reducing corrective action requirements and costs at sites where impacted groundwater is not usable for potable purposes. The designation is typically established by the passing of a law (e.g., House Bill 3152 in the Texas Legislature), and substitutes an ordinance or restrictive covenant for regulations protecting the public against exposure to contaminated groundwater. Suitability for an MSD typically requires three elements: (1) Urban Setting - the corrective action site is located within the city limits or extra-territorial jurisdiction (ETJ) of a municipality, (2) Public Water Supply - a public drinking water supply is presently provided or could be provided in the site vicinity, and (3) Groundwater Use Restriction - potable use of groundwater within the proposed MSD will be restricted subject to an ordinance issued by the local municipality, or a restrictive covenant that has local municipal support. Why would an MSD be of benefit at a contaminated railyard like the one mentioned above? In many circumstances, the impacted railyard is located in an urban setting and groundwater has been impacted. In these circumstances, the responsible party is likely to get in protracted discussions with a state agency regarding risk-based clean-up criteria, questions of “how clean is clean”, and appropriate methods for reaching groundwater remedial goals. Utilizing the MSD, protection of the public is realized through a municipally supported potable water use prohibition as opposed to remediation, potentially saving the responsible
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party significant remedial costs. The designation is not applicable to sites where groundwater has not already been impacted. As such, the MSD tool is not a shield from future contamination.

Environmental Response

Wabamun: A Large Scale Oil Spill Response in a Prairie Lake
Luanne Patterson and Brian Pimblett – CN

A derailment of 46 cars on August 3, 2005 released approximately 712,000L of heavy fuel oil and 88,000L of ‘pole treating oil’ on the ground and into the waters of adjacent Lake Wabamun, near Edmonton, Alberta. The size of the spill was unprecedented in freshwater lakes in Western Canada. Although initial response efforts succeeded in containing much of the oil on land, a major marine oil spill response effort was required, resulting in the largest oil spill response effort in Canadian history.

Lake Wabamun is the largest lake in the Edmonton area, and therefore is subjected to a variety of different stakeholder uses. These include a First Nations reserve, a municipal water intake, two coal-fired power plants, marinas and yacht clubs, a recreational fishery, a provincial park, youth camps, and a large number of waterfront cottage owners. The interests of these stakeholder groups were sometime at odds, resulting in differing cleanup objectives and recommendations, sometimes hampering the response effort.

A variety of techniques typically utilized in marine oil spills were used at Wabamun. The prairie lake environment is in many ways more sensitive than an ocean environment. This environment – and the differing views of various stakeholders – presented unique challenges to the responders.

To approach the spill response objectively, a Shoreline Cleanup Assessment Technique (SCAT) team consisting of regulatory and stakeholder representatives was used to assess shoreline oiling and recommend treatment methods. Equipment and expertise typically deployed on spills on the Great Lakes or Atlantic Canada complemented locally available spill response resources.

Strong winds on the lake spread oil into marshes and reedbeds around a large part of the lake. Twenty six species, particularly waterfowl and waterbirds began appearing shortly thereafter and the oiled wildlife response became a major part of the response within the first few days.
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Field crews made up of environmental agencies and CN’s response contractor, Focus Wildlife were responsible for oiled wildlife collection, population prediction, migration surveillance, and hazing. A serious concern for surveillance and hazing crews was the imminent arrival of tens of thousands of migratory birds.

To enable proper treatment of oiled wildlife, the wildlife recovery centre required the coordination of over a thousand people including Focus Wildlife, veterinarians, animal health technicians, trade contractors and volunteers. A large warehouse facility was located that could provide the high water, electrical, heating, air flow, wastewater, and biohazard demands necessary. Specialized equipment, materials and supplies had to be sourced in large volumes from across North America on very short notice. The duration of the response required planned scheduling, staff support services and training.

The spill at Wabamun was unprecedented in its size and the response necessary, both on the lake and at the oiled wildlife response operation. Organizations should consider the potential and understand the significance of undertaking all aspect of a response of this size, including wildlife recovery.

It’s just grain...Non-Environmental Spills and Derailments

*Dillon Magers – BNSF Railway*

*Paul Dial – Environmental Works, Inc.*

Conventional thought regarding spills and derailments has focused on the environmental concerns with petroleum products and hazardous materials. Correspondingly, spill and derailment response and responders have been focused on these issues. However, in today’s regulatory and public relations climate, spills of non-petroleum and non-hazardous materials are becoming increasingly problematic. The industry constraints of capacity, pressure for velocity, and “incidental” activities corresponding to derailments can create environmental concerns on traditionally non-environmental events. Potential hazards, regulatory requirements, response approaches, and public relations related to common commodities such as coal, plastic pellets, food grade products, and autos will be presented along with unique video clips of spill and derailment activities.

Eunice, LA - Derailment Response

*Geoff Reeder and Tim O’Brien – Union Pacific Railroad*
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On Saturday, May 27, 2000 34 cars of an Union Pacific train derailed on a bridge west of Eunice, Louisiana. Chemicals were released into a drainage canal. Fire and explosions caused golfers to be evacuated from the adjacent country club and closure of the nearby city lake. This presentation is an overview of the two weeks of around the clock emergency response and the six years of environmental remediation that followed.

CSXT Building Assessment and Restoration Activities in the Aftermath of Hurricane Katrina

Rick Nath – CSX Transportation
Pat Harrison – AMEC Earth and Environmental

The aftermath of Hurricane Katrina presented a number of great challenges to CSX Transportation, Inc (CSXT). The assessment and restoration of buildings was a critical step in restoring operations. Over 35 buildings, some with managed asbestos containing materials, sustained impacts from water intrusion. Work had to be performed in difficult conditions due to loss of power, water, sewer, communications, and very limited housing availability. This presentation covers the methodology of setting up a process to assess, control, mitigate, repair, and restore the affected properties.

Remediation

Use of Solar Powered Technology at Remote Remediation Sites: Example from a Free-Phase Petroleum Product Recovery System in Mobile, Alabama

Jennifer Hurley – BNSF Railway
Ben Francka – Environmental Works, Inc.

With the exception of passive devices, groundwater remediation systems typically require the use of electricity for operation of pumps, air compressors, air strippers, etc. Use of such equipment can be both difficult and impractical in remote areas and at small sites. This was the case at a former locomotive fueling station owned by BNSF Railway Company in Mobile, Alabama; therefore, use of a solar-powered system was investigated. Initial remedial measures included bailing of product and installation of passive skimmer systems. At the request of the Alabama Department of Environmental Management, an automated, and more aggressive, product recovery system was installed. This system is called a Solar Sipper and was supplied by Geotech, Inc. The system utilizes a vacuum pressure canister pump to recover hydrocarbons.
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through a floating oleophilic/hydrophobic intake filter. The canister is
filled under a vacuum and pushed to the surface into a storage vessel.
The system has been in operation for several months, and is providing a
cost-effective and relatively simple method of product recovery.

Lessons Learned from Application of Remediation
Amendments to Railroad Sites
Jack Sheldon, Tim Ahrens, Marie Dowd, and Jeff LaRock
AMEC Earth & Environmental
Paul Kurzanski – CSX Transportation

This presentation describes three remediation amendments used
by CSX Transportation, Inc (CSXT) to treat Diesel Range Organics,
Dichloromethane (DCM or methylene chloride), and acetone in
dissolved, adsorbed, or residual phases in soil or groundwater.
Subsurface injection and surface application of amendments is rapidly
becoming the trend for remediation in a move away from hardware
based systems that require costly O&M. These amendments have
achieved success at other industrial sites and their emergence into the
railroad industry is relatively recent.

This presentation will describe the following remediation amendments:

- Sodium percarbonate (for shallow soil treatment)
- Calcium peroxide (for application to the walls and floor of
  excavations)
- EHC™ (an in situ chemical reduction product for soil, sediment,
  and groundwater treatment).

Each amendment, while different in its mechanism of treatment, has
focused on reducing cost and treatment duration as well as minimizing
disruption at railroad sites. These amendments offer flexibility in
treatment of various contaminant types and there is a growing database
showing their effect on adsorbed phase and dissolved phase constituents
as well as their effect on Light Non-Aqueous Phase Liquid (LNAPL) and
Dense Non-Aqueous Phase Liquid (DNAPL).

A case study for each amendment will be used to explain the pros
and cons (lessons learned) of the application and actual field photos will be
provided from the sites. Application techniques, performance results,
and cost data will be provided to give a full profile of each amendment.
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Comparison of Ultraviolet Optical Screening Methods at Hydrocarbon Contaminated Sites
Mike Woolridge – BNSF Railway
Jason Kirwin – WCEC

The rapidly expanding industry of real time delineation of hydrocarbon contamination is changing the way investigations are focused. The most common methods detect the fluorescence produced by aromatic hydrocarbons when excited by a downhole ultraviolet (UV) light source. This technology also allows differentiation between lighter fuels and heavier fuels, which fluoresce differently when exposed to ultraviolet light. Two different methods which use ultraviolet light to fluoresce aromatic hydrocarbons are the Fuel Fluorescence Detector (FFD) and the Laser Induced Fluorescence (LIF) detector. WCEC in conjunction with BNSF completed an evaluation to compare these two methods. A total of four hydrocarbon contaminated site were selected for evaluation with the two technologies. One site contained #6 fuel oil, one site contained #2 fuel oil, and the remaining two sites contained gasoline contamination. Sites were in both clayey and sandy deposits with varying depths to the water table. Borings were completed with both the FFD and LIF technologies at each of the sites. At least four borings were completed directly adjacent to each other. Continuous measurements were taken in both the vadose and saturated zones. All data was compared for positive response locations, signal strength, wavelength locations, extents possible interference in the saturated zone, and ect.

Cost Effectiveness of Horizontal Biospargel Well Application for Aerobic Co-Metabolic Groundwater Remediation
Mark Mejac, Jeane Tarvin, and Hal Taylor
STS Consultants, Ltd.

Horizontal well technology has been applied in recent years as an in-situ remedial alternative to treat impacted soil and groundwater through methods that include vacuum extraction, groundwater extraction, soil flushing, air sparging and biosparging. A horizontal biospargel well was applied to remediate groundwater heavily impacted with chlorinated volatile organic compounds (CVOCs) at an industrial site in southeastern Wisconsin. This technology, which is considerably less costly than other applicable technologies for the contaminants of concern and the site conditions, is relatively new and was in all likelihood the first such application in Wisconsin. This technology is also effective for remediation of petroleum hydrocarbons. A site investigation conducted during 2001 and 2002 revealed an area of CVOC-impacted groundwater with horizontal dimensions of approximately 400 feet by 70 feet. A
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stream traverses just west (hydraulically downgradient) of the western property boundary and is a receptor of concern, based on detected concentrations of CVOCs in surface water samples collected as part of the site investigation. In addition, a municipal potable water supply well is located approximately 200 feet southwest of the subject site, and is also a potential receptor of concern. Other than the implemented horizontal biosparge well system, active groundwater remediation technologies that were evaluated for the subject site included in-situ chemical oxidation through sparging of ozone/air, in-situ chemical oxidation through injection of Fenton’s reagent, in-situ chemical oxidation through injection of potassium permanganate, and in-situ chemical reduction through installation of an iron permeable reactive barrier. The objective of the application of the horizontal biosparge well at this site was to create aerobic, co-metabolic conditions in the subsurface to biodegrade the chlorinated VOs. Advantages of horizontal biosparge well technology include efficient contaminant plume contact, large area of influence with minimal treatment gaps, no vapor or liquid phase treatment, relatively low blower and waste handling costs, and minimal site disruption. Implementation of the horizontal biosparge well system was completed at a capital cost of $287,000. The other evaluated remedial technologies ranged in capital cost between $460,000 and $1,100,000. The implemented horizontal well has a total length of 610 feet with an average horizontal screen depth of 18 feet below ground surface. At the subject site, maximum concentrations of CVOCs in groundwater decreased by 98.1 percent after one month of horizontal biosparge well system startup in January 2004, and have continued to decrease. Prior to system start-up, the anticipated remediation timeframe was 4 to 6 years. Based on recent communication with the Wisconsin Department of Natural Resources (WDNR) regarding the rapid progress of groundwater remediation, it is WDNR’s position that regulatory case closure may be achieved substantially sooner.

Remediation of VOC Impact at a Former Surface Impoundment Pond
Brent Puck and Kevin Miller
Delta Environmental Consultants, Inc.
Jeffrey McDermott – Union Pacific Railroad

A Surface Impoundment Pond (SIP) was historically utilized for treatment and disposal of wastewater treatment sludge generated from railroad shop facilities. This practice ceased in 1984. Assessment activities were conducted by systematically collecting samples from the sludge and underlying clay liner of the former SIP. The assessment determined that elevated concentrations of volatile organic compounds
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(VOCs), metals, and total extractable hydrocarbons were present in the sludge and underlying clay liner. Vinyl chloride was identified as the primary constituent of concern (COC), reporting Toxicity Characteristic Leaching Potential (TCLP) concentrations in excess of the EPA regulatory standards as stated in 40 CFR 261.24. A limited number of samples also exceeded the TCLP standards for tetrachloroethene, trichloroethene, 1,1-dichloroethene, lead, and selenium. A Remedial Technology Assessment was performed to evaluate various alternatives for remediation. Remedial alternatives considered included direct excavation and disposal at a Subtitle C and/or Subtitle D landfill, thermal treatment, chemical oxidation, and bioremediation. The assessment recommended the amendment and stabilization of the impacted material followed by excavation and disposal at an appropriate Subtitle C and/or Subtitle D landfill. Following the recommendation of the RTA, a treatability study was developed to determine if amendment and stabilization would successfully remediate the impacted material. The treatability study indicated that lime was an effective amendment for the impacted material, reducing the VOC concentrations while also improving the handling characteristics. The addition of lime initiates an exothermic reaction, increasing the temperature of the material and enhancing volatilization of VOCs. A bench scale emission study was conducted in conjunction with the treatability study. The study indicated that airborne concentrations of vinyl chloride may exceed the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) of 1 part per million (ppm) Time Weighted Average (TWA) for an 8-hour day, and the 5 ppm Ceiling limit for a 15-minute exposure. To reduce the potential for exposure to fugitive VOC emissions, a track-mounted crane and drilling attachment with a large diameter mixing tool was utilized for incorporation of the reagent in situ. The drilling attachment was fitted with a vapor collection hood around the mixing tool to collect fugitive emissions. The collected vapor stream was transferred to a treatment vessel that incorporated potassium permanganate-impregnated carbon to oxidize the vinyl chloride. Following amendment with lime, the sludge and clay liner material was analyzed and found to be acceptable for disposal in a Subtitle D landfill. Cost savings were realized by eliminating more costly disposal fees at a Subtitle C landfill. Residual impact remaining in the SIP excavation basin was reported below state regulatory risk-based soil standards. This presentation will summarize the activities associated with the assessment and successful remediation of the former Surface Impoundment Pond.

In-Situ Ozonation to Remediate Pentachlorophenol at a Former Railroad Facility
Jay Dablow and Bruce Neuschefer – ERM
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In situ chemical oxidation has been used successfully to remediate groundwater contamination at numerous industrial facilities. This paper discusses a full-scale in situ ozonation system (ISOS) at the former Kalispell Pole and Timber (KPT) facility in Kalispell, Montana. The site contains vadose and saturated zone soils impacted by wood preserving residuals. The wood preserving residuals have impacted a sand and gravel fluvial formation, with some lenses of silty sand and clay. Groundwater is encountered at a depth of 10 to 25 feet below grade. The primary constituent in the saturated zone is pentachlorophenol (PCP). Other constituents in groundwater include naphthalene, xylene, diesel range organics, motor oil and dioxins. Both dissolved phase and separate phase (free floating product) impacts have been observed in groundwater. In 1996, an air sparging system was installed as an interim measure to reduce off-site migration of dissolved phase PCP and diesel fuel. In mid-1999, an ozonation system comprised of 5 ozone injection wells and 5 C-Sparger™ wells was added and activated. Together the systems were intended to remediate impacted groundwater and act as a barrier to further off-site migration. Beginning in May 2004, ERM incorporated the existing ozone and air sparging systems into a more capable, integrated system. The full-scale ISOS is comprised of portions of the existing system, refurbished ozonation equipment, and new injection wells. Seven of the existing air sparging wells were converted to ozone injection points by inserting a stainless steel well screen and conductor tube assembly into each of the wells. Three existing pilot-scale C Sparger™ wells were converted to full-scale ISOS wells to allow higher-volume ozone, similar to the conversion of the air sparging wells. An array of ten ozone injection wells was installed to form a barrier injection well network. In addition, ten ozone injection points were installed in the source area to enhance the removal of light, non-aqueous phase liquid (LNAPL). These ozone injection wells are intended to accelerate in situ oxidation removal of relatively thin accumulations of LNAPL. Ozone is generated on site using 2 portable O3 generators, which are fed by oxygen generated on site, and pulsed into injection wells. The in situ ozonation system was activated on 18 September 2004. Approximately 13,500 lbs of ozone were pulsed into the 30 injection points during the initial operating period from start up through 01 January 2006 to promote direct ozonation and enhanced aerobic biodegradation of the contaminants in the treatment area. After initial increases of groundwater concentrations due to desorption and stripping of adsorbed contaminants, groundwater monitoring indicates that ozone sparging and injection has reduced PCP concentrations in many wells in excess of 95%. The thickness of LNAPL in wells has also decreased significantly in many wells. The ozone system upgrades, groundwater analytical results and ozone production rates will be discussed as they relate to the remedial strategy.
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Hurricane Rita Produced Coastal Erosion and Historical Hydrocarbon Release
Geoffrey Reeder – Union Pacific Railroad
Roy Hurta – TRC

Coastal erosion produced by Hurricane Rita (October 2005) uncovered a historical Bunker fuel spill on the north side of Galveston Island that resulted in a continuous hydrocarbon release to Galveston Bay. Aerial photographs and historical records confirmed that a tank farm was operated at this location from 1912 to 1934. This site poses several unique problems that include: This site is located in a sensitive coastal environment; Impacted material is located in sediment below sea level; Access is extremely limited; and Coordination and compliance with representatives from the Texas General Land Office (TGLO), the United States Coast Guard (USCG), the National Oceanic and Atmospheric Administration (NOAA), the Texas Parks and Wildlife Department (TPWD), the Texas Health Department (THD) and the Texas Commission on Environmental Quality (TCEQ) was required. The remedial strategy was to identify hydrocarbon-impact extent, excavate that material and transport off-site to eliminate further release of Bunker fuel to the Lower Galveston Bay ecosystem. UPRR delineated subsurface hydrocarbon impacts using hand-augers, and borings that were advanced onshore, and at underwater locations. Sediments containing Bunker fuel were identified in submerged areas of Galveston Bay. Excavation of soils above the water level was completed using standard procedures, however soil excavation in submerged areas was coordinated with low tides to minimize potential hydrocarbon release. Silt fence, hard boom and absorbent boom were also utilized to contain hydrocarbon during excavation. The site is approximately 2-feet above annual mean sea level and access is limited. Highway lane closures were necessary to load trucks and for importing backfill. Rising tides prevented excavation and extended the project. Approximately 4500-tons of hydrocarbon impacted material was removed and transported off-site for recycling. An Assessment and Completion Report were filed with the TCEQ, concluding that the source area was completely removed, eliminating all environmental threats to the Galveston Bay System.

Remediation of Lead-Impacted Soil Using Real Time
XRF Data, a Case Study
Bob Raber – Norfolk Southern

Norfolk Southern Railway Company’s Environmental Protection
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Department, with support from Marshall Miller & Associates, Inc., used real time XRF data to assess and remediate a former rail yard. The success of this approach hinges on 3 critical factors: Entry of the Site into the appropriate regulatory program; A detailed, regulatory-approved Sampling and Analysis Plan; Proper field protocol and documentation. The inactive yard was the subject of a Phase I/II ESA due to a potential real estate transaction. The Phase II ESA identified lead impacts in surface and subsurface soil using conventional sampling procedures and laboratory analysis. The Site was entered into the IDEM Voluntary Remediation Program and, in a subsequent site investigation, MM&A utilized an XRF spectrometer to delineate surface and subsurface lead impacts in one mobilization. This was accomplished in a much more timely and cost effective manner than relying on laboratory analysis. MM&A worked closely with the IDEM VRP project manager to develop a Sampling and Analysis Plan and Quality Assurance Project Plan that incorporated the requirements of the VRP for confirmation sampling and EPA Method 6200. Communication is the key to regulatory approval of this approach. The regulatory project manager may be biased against the technology based on past experience. In this case, even if the agency as a whole accepts the technology, the bias of the project manager, as the primary regulatory overseer, must be overcome. Proper field protocol and documentation is crucial to achieve closure. At the Indianapolis Site, MM&A established an extensive sampling grid and confirmation sampling protocol that minimized the volume of soil that had to be removed.

Stabilization of Lead-Contaminated Soil and Debris from a Former Scrap Yard

Christopher Lauzon and Paul Lear
Shaw Environmental and Infrastructure
Paul Kurzanski – CSX Transportation

CSX Transportation, Inc. (CSXT) is completing the remediation of a former leased property used as salvage yard, which is located adjacent to their Benton Harbor, Michigan rail yard. A predecessor railroad leased a portion of the Benton Harbor property to a salvage company that recycled automobile batteries on site, from approximately 1959 to the mid 1980’s. This recycling operation generated approximately 72,000 cubic yards of soil/battery casing debris that was left on-site. CSXT acquired the property and the environmental liability from the previous owners in the late 1980’s. Urban redevelopment in the Benton Harbor area attracted the attention of the Michigan Department of Environmental Quality (MDEQ) and United States Environmental Protection Agency (U.S. EPA) to the site. After an investigation, the U.S.
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EPA required CSXT to remove all the impacted materials (approx. 72,000 CY) as ‘hazardous waste’, which would have potentially cost CSXT more than $14,000,000. CSXT retained the services of Shaw Environmental, Inc. (Shaw), which developed a plan to stabilize the materials and dispose of the treated material off-site as non-hazardous waste at a cost of $6,000,000 - $7,000,000. The stabilization plan developed by Shaw reduced CSXT’s long-term liability and groundwater monitoring requirements. The remediation consisted of excavating and stabilizing lead-impacted soil and debris, proper disposal of stabilized material at an off-site disposal facility as a non-hazardous waste, and site restoration. The remedial approach for the site was to excavate the lead-impacted soil and debris and stockpile the material in approximately 400 cubic yard stockpiles. The impacted material was then stabilized on-site to reduce leachable lead concentrations to below the RCRA Toxicity Characteristic for lead (5.0 mg/L). Following treatment, the stabilized material was transported off-site for disposal as a non-hazardous waste. After all of the treated material was removed from the property, the site was backfilled and graded to allow drainage from the eastern side of the property to the nearby Paw Paw River on the far west of the property. Challenges to the remedial approach included the site groundwater level being linked to the level of the Paw Paw River (necessitating carefully sequenced excavation below the water table); variable amounts of soil and debris in each stockpile (requiring additional technical support for the stabilization activity); poles carrying high voltage power and gas lines located with the area to be excavated (requiring coordination with utilities); and a narrow and long parcel shape (complicating material movement). Despite these challenges, CSXT completed the remedial action in a timely manner and to the satisfaction of the U.S. EPA Region V and the Michigan Department of Environmental Quality.

**Poster Presentations**

**Compliance**

**SPCC Plans - Special Considerations for Railroad Yards**  
*Kyle Russell – ERM*

Oil storage and handling activities at rail yards often require facilities to prepare and implement Spill Prevention, Control, and Countermeasure (SPCC) Plans. Since 2002, regulatory changes have occurred that require facilities to modify their plans. This presentation will discuss the common oil storage and handling activities at rail yards that require special considerations when preparing or reviewing SPCC Plans. This
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presentation will include such topics as oil-filled operational equipment, motive power containers, wastewater treatment exemptions, mobile re-fueling, tank integrity testing, security, P.E. or self-certification, loading and unloading racks, and typical opportunities for improvement that are observed during compliance audits. After the presentation, individuals responsible for preparing or reviewing SPCC Plans will have gained information that can be used to ensure that topics of special interest at rail yards have been addressed in their plans.

**EMS**

**Shortline Railroad Lessee - Environmental Review Program**  
*Stephen Blair – AMEC Earth and Environmental, Inc.*  
*Keith Brinker – CSX Transportation*

CSXT developed a Shortline Environmental Review Program (SERP) to better manage property currently leased to shortline railroad operators. This program seeks to identify whether or not a shortline railroad lessee has historically exercised and is currently exercising proper environmental management and due care in its use and stewardship of CSXT property. The review focuses on activities likely to occur on properties typically associated with railway operations and maintenance. CSXT reviewers determine the need for further evaluation and/or corrective actions by the lessee.

The environmental review focuses on the lessee’s property use in three general areas:

1. Railroad Operations - fueling, petroleum storage, railcar maintenance/repair, spill control/reporting;
2. Material & Waste Management - knowledge of environmental effects of chemicals used; lessee (and it’s contractors) knowledge of proper waste management activities; battery storage; prohibited chemicals (chlorinated solvents); and,
3. Property Management - housekeeping; removal and proper disposal of debris, crossties, containers, etc.; and awareness of illegal dumping.

The environmental review consists of an initial review of available information including an environmental database search and a questionnaire completed by the lessee. A site visit with the lessee is conducted to observe property conditions. The site visit is a key component that focuses on both historical and current property usage with the goal of ensuring, to the extent practicable, acceptable environmental management practices are being followed. In one instance, a review discovered the use of trichloroethylene (TCE) on
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CSXT property by a lessee's contractor. TCE is a chlorinated solvent the use of which is prohibited by CSXT on its property due to environmental and safety concerns. Identification allowed a subsequent environmental investigation to be conducted by the lessee.

The SERP provides a flexible manageable approach for identifying current and historical shortline lessee practices that have had, or are having a negative impact to CSXT property. An audit that would address every conceivable environmental condition or potential concern would be inordinately burdensome, complex, and to some extent cost prohibitive. The SERP focuses on rapid and cost effective acquisition of environmental database knowledge, key lessee operations, and site characteristics. As needed additional evaluation, investigation, and corrective action can be conducted to meet individual leased property needs.

Railpower’s RP-series Road Switcher Locomotives – Ultra Clean Power

Jeff Wood and Karen Dzienkowski
Railpower Hybrid Technologies Corp.

Railpower proposes to present energy, emissions and air quality benefits of advanced technology locomotives such as its multi-generator set road switchers. These road switcher locomotives reduce NOx and PM2.5 emissions by up to 90% from uncontrolled levels, they use 25-35% less fuel, and they are less expensive to maintain. Able to perform both yard and local service these advanced-technology locomotives are very well-suited to short line and Class I railroad operations. Leveraging technology advances in the small engine market, Railpower Road Switchers are more than twice as clean as EPA Tier 2 locomotive standards, and they offer a long-term environmental solution for an aging switcher fleet. The presentation will explore the modular design of the locomotive, its maintenance advantages, and its overall lower operating costs compared to conventional switcher locomotives. Finally, the presentation will discuss emissions reductions and cost-effectiveness estimates for potential projects as well as identify possible funding sources.

Good Data, Better Understanding, Best Decisions: How Data Management Improves Site Solutions

Rob Smith and Tonya Kavki – GeoEngineers, Inc.
Bruce Sheppard – BNSF Railway

The Tacoma Railyard is planning for construction and related activities for its facilities and railroads. As the uses and demands for the Tacoma Railyard change, so has our need for improving data management at the
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site. GeoEngineers implemented a combination of mobile and desktop geographic information system (GIS) technologies to collect, store and analyze spatial and chemical analytical data collected at the site to more efficiently characterize the nature and extent of possible contamination. Once stored in databases and GIS this information can also be used to aid in investigations, clean-up management and implementation of remedial activities. The system allows for complete digital management of the information from GPS field technology, to electronic reporting from analytical laboratories, and mapping the results within GIS. The final step is communicating the results to the project team and client using GIS and web technology tools. The GIS/database system ensures consistent data collection, maintains a comprehensive database of spatial and chemical data and support data from many matrices (e.g. soil and groundwater) and multiple sampling events. We anticipate that after the initial testing, this system will be applicable to other portions of the railyard while saving time and money.

Environmental Response

Cost Saving Approaches For Environmental Spill Response and Cleanup

James Godwin – ARCADIS
Keith Brinker – CSX Transportation

The costs associated with environmental response and cleanup caused by releases of petroleum and or hazardous materials are of growing concern to the railroad industry. Large quantities of these materials are stored at railroad facilities, transported by railcar, and utilized by the engines and refrigerated boxcars. Releases may occur as the result of mechanical failures, collisions, overfills, punctures from debris along the rail lines, and/or vandalism. These releases can vary from a few gallons to several thousand gallons. The resulting area affected by these releases can range from a few square feet surrounding the release area to hundreds of feet in length. The impacted materials included the ballast, sub-base, soil, and groundwater in these areas. Additionally, surface features such as surface water bodies, asphalt and concrete roadways, buildings and building foundations may be impacted. Addressing the cause and approach to cleanup of these releases with the goal of reducing the cost to the railroad is of primary concern (after human health and safety) to railroad personnel, initial response contractors, and environmental consultants. In order to reduce the overall short-term and lifecycle cost of the remediation of the impacts caused by such releases, operational causes should be investigated and mitigated, an effective response plan should be developed that includes all the phases of the response, and initial response action should be timely and technically thorough.
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Industrial Redevelopment
Cultural Resources and Railroad Planning
John Vogel – Heritage Research, Ltd.

Section 106 of the 1966 National Historic Preservation Act, as subsequently amended, has wide applications in the transportation industry. The act requires that efforts be made to identify and evaluate for potential significance any historical and archaeological sites within a project’s Area of Potential Effect. The impacts of Section 106 are most often associated with roadway projects. But it applies to any project that receives federal funding, permitting or licensing and that includes railroad efforts.

The Use of Historic Preservation in the Redevelopment of Railroad Legacy Properties
Tom Cornillie – University of Illinois at Urbana-Champaign

This paper will examine the use of historic preservation as a means to spur the redevelopment of railroad legacy sites. Typically, facility closure has been closely followed by the removal of all existing buildings and structures. While this approach has helped to facilitate new construction in some cases, it has also created thousands of vacant clean up sites that are bypassed by developers in favor of greenfield sites. Historic preservation can make these sites attractive through combining the rehabilitation of well constructed, visually distinctive buildings with government incentives for both brownfield redevelopment and historic preservation. This approach has been applied to legacy sites in Kansas City, Kansas, San Fransisco, California and Parkersburg West Virginia. Additionally, several other projects are currently in the planning stages. This paper builds on research gathered in creating an on-line tool kit that examines this topic in the context of the current legal and policy treatment of brownfield liability and remediation, risk based remediation, and perceptions of the developers, property owners and the general public.

Pollution Prevention

New Technologies for Oil Spill Prevention, Response and Remediation at Railroad Facilities
Phyl Kimball – Ultratech International

This presentation explores the latest methods and technologies used in containing, preventing and the remediation of hydrocarbon spills at railroad facilities. This information will assist in developing a robust spill prevention and response plan and will aid in maintaining
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compliance with Stormwater and SPCC regulations. These promising new methods for remediating/removing hydrocarbons found in soil, water, stormwater catch basins and conveyances will be addressed in detail. Case studies, including the history, development and potential applications for these new technologies will also be explored with supportive field test data and photos.

Remediation

Introduction to Geophysical Methods and Their Application to Environmental Site Characterization of Railroad and Other Industrial Sites

Douglas Laymon – MFG, Inc.

Geophysical surveys are remote sensing techniques that allow the acquisition of detailed subsurface information. These surveys can be used in several applications for environmental site characterization at railroad and other industrial sites. These applications may include: contaminant boundary delineation; detection of buried objects; hydrogeologic mapping; and several others. In many cases it is possible to map desired targets with higher sampling density, greater resolution, and potentially at a lower cost by incorporating geophysics into the site investigation process. Geophysical surveys can also be completed to assist in assessing ballast and track conditions and the potential presence of buried utilities. This work can be used to support engineering and construction activities so as to better define subsurface conditions to limit surprises and unexpected costs during construction and or remediation. The geophysical data is usually ground truthed with a smaller number of smarter borings and/or test pits and can also be used to provide higher confidence in mapping when interpolating between borings or mapping vertical interfaces. This presentation includes a discussion of key geophysical methods and several case histories which illustrate how geophysics has and can be used to maximize site characterization efforts.

What a Ditch!

Hadley Stamm – ARCADIS

The site is a major classification yard and locomotive fueling center for all CSX Transportation Inc. (CSXT) trains traveling between New York City and Chicago. The locomotive fueling and service center has been in operation for over 40 years (previously as the New York Central RR and later Consolidated Rail Corp.) and currently uses around 72 million gallons of diesel fuel a year. All drainage from the main fuel pad historically was released to the two retention ponds that drained into a
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ditch. The ditch drained (through a permitted outfall) into the City of Cleveland, Ohio's (City) combined sewer outfall (CSO). Over the years upgrades were made to treat the fuel pad drainage prior to its release to the retention ponds. The upgrades include the construction of an underground oil/water separator and underground storage tank (1980’s) where diesel fuel recovered from the oil/water separator was stored for eventual off-site recycling. However, increased use of the fueling operations, overtaxed the system, which resulted in capacity and maintenance issues, with periodic accidental releases of diesel fuel into the ponds and drainage ditch.

In 2004 the underground collection system was removed by CSXT and upgraded with a more efficient mechanical separation system that includes an oil/water belt skimmer and an aboveground storage tank. This new system, coupled with routine maintenance, will prevent future waste oil releases to the ditch. However, the two retention ponds and 500 linear feet of drainage ditch remained impacted from historical releases and presented a continuing source to surface-water discharges. To begin the elimination of this on-going concern, the ditch's sediment and surface water were first sampled for petroleum constituents. Laboratory analytical results indicated a potential risk to human and ecological health, when compared to conservative screening-level benchmarks. Furthermore, over the years of operations, railroad personnel used sand bags and rebar to block the flow in the ditch to prevent accidental releases from reaching the CSO during storm events. These man-made dams and materials were never removed and greatly reduced the ditch’s down gradient flow. Down gradient flow was further limited by neighboring property owners who discarded household waste, such as a auto parts, scrap tires, appliances and furniture into the drainage ditch.

With upgradient engineering controls in place to prevent future releases to the retention ponds and drainage ditch, it was now time to remediate the ditch. Over 1,800 tons of impacted material from the ditch and retention ponds were removed, dewatered, sampled, and sent off-site for proper disposal. The ditch was regraded to engineered design specifications, and the accumulated debris was removed; and a culvert running along the ditch was cleaned out to ensure down gradient flow on the CSXT property, and eventually to the CSO outfall. To prevent any potential impacts from off-site migration, the pond was lined with a geo-synthetic material, and the ditch was lined with a fabric-formed concrete erosion control and chemically resistant liner system. The liner systems will provide a chemical resistant barrier should a catastrophic release occur at the fuel pad, that would ultimately overflow the current oil/water belt skimmer system. A new chain-link fence was installed along the property line to prevent further illegal dumping into the drainage ditch.
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The actions taken by CSXT will help to ensure proper working conditions for site workers and a healthier outfall to the City.

Closure Strategy for a Highly-Weathered LNAPL Site
Rich Russell – Norfolk Southern
James Oosterhoudt and Stephanie Knight – The RETEC Group, Inc.

A historically leased property (Site) owned by the Norfolk Southern Railway Company (NSRC) is impacted with petroleum hydrocarbons. The source of these impacts originated from bulk petroleum storage operations performed by the tenant who occupied the site from the 1900s to the 1960s. Although recent groundwater monitoring events demonstrate that dissolved hydrocarbons are below regulatory standards, the migration of light, non-aqueous phase liquids (LNAPL) is of primary concern as the Site is upgradient of a small creek that discharges into a commercial waterway. LNAPL transport to the creek is currently controlled by a bulkhead and collection trench system. This collection system currently removes less than 0.1 gallons of NAPL per day.

Assessing and Mitigating Petroleum Hydrocarbon Seeps
Keith Miller – Norfolk Southern
Chuck Cline – Marshall Miller and Associates

Norfolk Southern Railway Company is dedicated to effectively and economically mitigating several petroleum hydrocarbon seeps that threaten an area’s major drainage feature at a former locomotive maintenance and fueling facility.

Prior mitigation attempts have included the use of vacuum-enhanced pump and treat recovery wells. However, over 20 feet of heterogenic fill material has limited the effectiveness of this commonly applied technology.

Initial remedial approaches explored included:

Excavating approximately 600 feet of riverbank and the installation of a sheet piling wall to direct on site ground water and free phase petroleum hydrocarbon to a collection sump; or,
Encapsulating the riverbank with concrete and applying the same sheet piling wall to direct on site ground water and free phase petroleum hydrocarbon to a collection sump.

Each of these recommendations would have initial construction costs between one and two million dollars.
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Instead NSRC opted to go directly to the seeps and contracted MM&A to conduct an aggressive riverbank seep and remedial effort. The river was protected during construction activities, which included progressive excavation of the riverbank slope at the locations of the seeps, (seep chasing) and installation of a seep collection system, pre-cast concrete petroleum seep collectors. Submersible pumps installed in the inner chambers of the seep collectors discharge free product and ground water to the Site’s newly reconfigured water treatment system. The remedial conceptual model proposed by NSRC and MM&A also consists of the installation of several LNAPL recovery trenches, which are much more effective in capturing ground water from a larger area within heterogenic soils, which can easily be tied into the seep collectors.

Accelerated Remediation Technologies Integrated Remediation System

Marco Odah and Blane Wood
Accelerated Remediation Technologies, LLC

Numerous remediation technologies have demonstrated mixed results at reducing BTEX, MTBE and VOCs contamination in soil and groundwater. A remediation technology that can comprehensively address MTBE as well as typical, associated contamination including BTEX and TPH, is necessary. Accelerated Remediation Technologies, LLC (ART) developed a robust, broad-based, field-flexible technology that exhibits effective remediation of VOC and recalcitrant compounds.

The ART technology is based on verified and established concepts and combines in situ air stripping, air sparging, soil vapor extraction, enhanced bioremediation/oxidation and subsurface circulation in an innovative wellhead system. The multiple remediation concepts employed by the ART Technology are well suited for recalcitrant compounds because the synergistic systems are attacking contamination on a number of fronts. The multiple, in-well stripping passes and high air to water ratio achieved in the well (via stripping and sparging) are integral to the physical removal of MTBE. Concurrently, the subsurface circulation process is actively flushes residual contamination from the soil matrix and mobilizes it back to the well for further treatment. The circulation and extraction processes also actively and continuously provide significant dissolved oxygen (DO) boost throughout the radius of influence, enhancing bioremediation/oxidation of the hydrocarbon compounds. In summary, as the physical technologies are flushing and moving the contaminants contamination back to the well for stripping, the DO boost is enhancing the bioactivity and oxidizing the BTEX and MTBE. The system is designed to accommodate a four-inch well and is cost effective.
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when compared with other remediation technologies, both as a retrofit of new or existing remediation systems. Additionally, based on typical ART removal rates, long-term costs are expected to be significantly reduced.

The in well air-sparging component results in decreased water density, mounding of the water table and a net negative gradient back towards the well and creates the in-well packer component between the lower and upper parts of the screen. Vacuum pressure (the vapor extraction component) is applied atop of the well point to extract vapor from the unsaturated zone and the well annulus. The negative pressure from the vacuum extraction results in water suction that creates additional water mounding (lifting) and compounds the net negative gradient towards the well. A submersible pump is placed at the bottom of the well to recirculate water to the top for downward discharge through a spray head. The stripped water cascades down the interior of the well and over the “mounded” water back in to the aquifer. Enhanced stripping via air sparging near the bottom of the well occurs simultaneously. The ART technology has been implemented at numerous sites nationwide including industrial laundry facilities, manufacturing plants and gasoline station sites. Dramatic, immediate reduction of contaminant concentrations has occurred at each installation where other, state-of-the-art remediation technologies had fallen short of desired results. Specifically, at a former gas station site, significant concentrations (ranging in the thousands of micrograms per liter) of MTBE, BTEX and TPH decreased by 99% over a 78 day operating period. Another ART MTBE site in California resulted in reducing contamination from over 40,000 µg/l to below the cleanup standard of 13 µg/l in a matter of months. Other VOC sites utilizing the ART technology have exhibited similar reduction trends in complex, subsurface environments including fractured bedrock, non-homogeneous strata and high-gradient flow regimes.

**Horizontal Airsparging Under Active Rail Yard**

*James Doesburg – Directed Technologies Drilling*

Soil and groundwater contamination under rail yards are particularly difficult to remediate. Most yards are busy with trains moving through often at great speed. Because many sites have been used for decades, contaminated groundwater can often be found over large areas, further complicating the problem. There have been few cost-effective solutions to this type of problem until now.

Horizontal directional drilling can be used to install remediation systems under rail yards. Soil vapor extraction (SVE), air sparging (AS), nutrient injection (NI) and groundwater extraction (GWE) are the most common
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installations. These systems can be used to contain or limit plume migration as well as clean up the contamination.

Two AS wells were recently installed under a large rail yard in western Nebraska. The paper will discuss the lessons learned during installation and the results to date with the remediation.

Risk Management

The Vapor Intrusion Pathway: Investigation and Mitigation Considerations?

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Vapor intrusion is the release of volatile chemicals via from subsurface soil and groundwater contamination and subsequent migration of vapors into an overlying building. In the 2002 OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), the U.S. EPA identified the vapor intrusion pathway as a significant exposure pathway. Since then, seventeen states (and the list is growing) have issued their own guidance and/or requirements for investigating soil vapor intrusion. The identification of this “new” exposure pathway is prompting state and federal agencies to require additional site investigation and corrective action at some railroad sites. For example, vapor intrusion is being evaluated at railroad sites where diesel LNAPL (which contains naphthalene, a volatile chemical) and/or volatile chlorinated solvents (e.g., 1,1,1-TCA, PCE, TCE, and carbon tetrachloride) could potentially migrate underneath residences or other structures.

This paper presents an overview of the current status of agency guidance and the science of investigating and mitigating soil vapor impacts. Topics covered include an initial screening process to determine if volatile compounds are present above conservative soil and/or groundwater levels; key assumptions, applicability, and limitations of the Johnson-Ettinger (J-E) model; and the current focus on collection of soil and sub-slab vapor samples. Screening data for the constituents-of-concern most commonly encountered at railroad sites are presented.

The general consensus is that indoor air sampling is not recommended because it is difficult to distinguish between VOCs from environmental contamination sources and those from household products (e.g., carpets/fabrics, cleaning products, and even cooking compounds). Instead, environmental professionals are installing soil vapor monitoring probes at multiple depths adjacent to or below a building foundation. Recently issued American Petroleum Institute guidance on sample collection and interpretation is reviewed and compared with the authors’ experiences.
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and lessons learned during development of the investigation approach and execution of field sampling. For example, it is important during work planning to focus on the volatile constituents that have been detected in the soil and groundwater; this helps ensure that the data are used to assess the specific concern related to the site.

Cost effective risk management solutions have been successfully implemented when warranted. Standard radon venting systems can achieve remedial objectives in most existing buildings with full basement, crawl space, and slab on grade construction. For new construction, risk can be mitigated by employing common construction techniques for the prevention of water vapor damage to flooring systems.