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## JOHN M. RICHARDS, PE

### Engineering Services Director, Northwest Region

#### Education

BS, Geological Engineering, University of Idaho, 1983

#### Professional Licenses

Professional Engineer, WA, OR, ID, AK, MT, UT, CA, AL, OK, SC

#### Professional Affiliations

American Society of Civil Engineers (ASCE)  
National Society of Professional Engineers (NSPE)  
Solid Waste Association of North America (SWANA)  
Chapter Board of Directors (2011 to Present)

#### Professional Experience

Mr. Richards joined SCS in 2007 and has over 30 years of project management, civil design, construction supervision, and construction quality assurance experience. His background includes the siting and design of landfill facilities, landfill closure design, leachate management and containment system design, and engineering design of passive and active landfill gas control systems. He is also proficient with subsurface investigations for hazardous, industrial, and municipal solid waste containment, and remedial actions for contaminated soil and drummed waste. He has performed RCRA facility investigations, and prepared RCRA facility closure plans and remedial action work plans. He is an ASCE, NSPE, and SWANA member. Mr. Richards leads the solid waste engineering practice in the Northwest. From 1986 through 2007, his previous employment included Parametrix, Fletcher Group, IT Corporation, and Shaw Environmental.

#### LANDFILL ENGINEERING

##### MSW Facilities

**Waste Management, Inc., Landfill Closure and Gas (LFG) System Upgrades, Capitol Disposal Landfill, Juneau, AK.** Project Director and Design Engineer of Record responsible for technical guidance, engineering design, project quality assurance (QA), and final document review of plans and specifications for the design of a 5-acre closure and upgrades to the LFG system in 2014 and 2015 for the Capitol Disposal Landfill near Juneau, AK

**Southern Idaho Solid Waste, Alternative Final Cover Closure Design and Construction Quality Assurance (CQA), Cell Nos. 1, 2, 3, Milner Butte Landfill, Burley, ID.** Project Manager and Engineer of Record responsible for technical direction, and engineering design for the provision of engineering services at the Milner Butte Landfill near Burley, ID. Tasks involved the design of an alternative final cover system (evapotranspiration [ET] cover) for the closure of Cells 1, 2, and 3, development of a construction quality assurance (CQA) plan, expansion design and permitting, landfill gas system design, negotiating with the Idaho Department of Environmental quality to obtain approval for the ET cover system design. Other services included preparing

revising cost estimates for the financial assurance plan and closure and post-closure trust fund. A review of the LFG developer contract was also performed.

**Southern Idaho Solid Waste, Landfill Liner System Construction Quality Assurance (CQA), Cells No. 4 and 5, Milner Butte Landfill, Burley, ID.** Project Director and Engineer of Record responsible for design, technical guidance, engineering review, and project quality assurance (QA) for the development of Landfill expansion into Cells No. 4 and 5 and construction quality assurance at the Milner Butte Landfill near Burley, ID. Tasks involved design of an alternative Subtitle D bottom Liner System. Drawings and specifications were also prepared for the construction of Cells 4 and 5 in addition to construction period services and CQA. A CQA report was prepared for IDEQ.

**Alternative Final Cover Closure Design and Construction Quality Assurance (CQA), Hub Butte Landfill, Twin Falls, ID.** Project Manager and Engineer of Record responsible for technical direction and engineering design for engineering services at the Hub Butte Landfill near Twin Falls, ID. Tasks involved the design of an evapotranspiration (ET) cover for the closure of the landfill, development of a construction quality assurance (CQA) plan, and negotiating with the Idaho Department of Environmental quality to obtain approval for the ET cover system design.

**Comox Valley Regional District, Landfill Closure and Landfill Gas System Design, Campbell River Waste Management Centre, Campbell River, BC, Canada.** Project Manager for engineering design and Construction Management services at the Campbell River Landfill for the phased closure of the landfill and installation of a gas collection and control system. Tasks include engineering and regulatory review of the current landfill closure and gas collection system, development of conceptual LFG collection system, design of the final cover system, and design of a MSE Wall to provide stability to the landfill, preparation of the tender and contract documents, construction management, and preparation of the project documentation report. Construction Management and CQA included observing and documenting construction of the MSE Wall and landfill closure construction, coordination and being the liaison between the Owner and the Contractor, and coordination of CQA Monitors.

**Island County Solid Waste Dept., Closure and Post-Closure Plan Revision and Update, Coupeville Landfill, Coupeville, WA.** Project Director responsible for technical guidance, engineering design, project quality assurance (QA), and final document review of plans and specifications for the update of the landfill closure / post-closure plan for the Island County Solid Waste Facility in Coupeville, WA.

**Orange County Integrated Waste Management Department, Frank R. Bowerman Landfill Expansion Design, Orange County, CA.** Project manager for the design of a 60-acre landfill expansion at the Frank R. Bowerman Landfill in Orange County California. The design was staged for construction over two construction seasons and incorporated steep side slopes (1.5 H: 1 V) between benches, use of a GCL and HDPE geomembrane as the primary liner in the bottom area, and dendritic slope drains, synthetic blanket drains, toe drains and a subgrade drain to capture springs in the native soils. The leachate collection system was designed by evaluating the results from the H.E.L.P. model and actual leachate generation data from the operating portions of the landfill. Measures were taken to maintain a separate LCRS for the expansion area for

potential future monitoring but still tie it into the existing system for collection. This project was performed while employed by IT Corporation in San Diego, CA, between 1990 and 2001.

**Rabanco, Roosevelt Regional Landfill Design, Roosevelt, WA.** Project engineer for the design and preparation of construction specifications and construction quality assurance/quality control program for the Rabanco Regional Landfill Company's multi-phased 380-acre municipal waste landfill near Roosevelt, Washington. The Design included a composite bottom liner system, a final cover system verified with the use of the HELP Model, leachate and landfill gas collection systems, leachate equalization/holding pond, phase sizing and layout, scheduling of phasing for expansion, and layout of administrative facilities. Assistance in the preparation of the Environmental Impact Statement. This project was performed while employed by Parametrix in Bellevue, WA, between 1989 and 1990.

### **Industrial Waste Facilities**

**NRG, Industrial Waste Landfill Design, New Roads, LA.** Design engineer for a coal combustion residuals landfill at coal-fired power plant in Louisiana near the Mississippi River. The landfill was designed to contain fluorogypsum using a geosynthetic clay liner and a 2-foot clay liner. Internal drainage structures were design to meet a State mandated precipitation of 12 inches per 24 hours rather than the 9.3 inches resulting from a 24-hr, 25-year precipitation event. The perimeter dikes were designed to withstand a 100-year flood from the Mississippi River, including overtopping. This project was performed while employed by Shaw Environmental, Inc. in Greenville, SC, between 2006 and 2007.

**Alabama River Companies, Perdue Hill, AL.** Project Engineer and primary author of the Construction Certification Report for the construction of an industrial waste landfill. This landfill was constructed with a bottom clay liner overlain by an HDPE geomembrane, leachate collection and removal system, and an operations layer. The landfill will be used to contain industrial wastes from a pulp paper mill. This project was performed while employed by Fletcher Group, Inc. in Greenville, SC, between 2001 and 2006.

**MeadWestvaco, Mahrt Mill, Phenix City, Alabama.** Certifying Engineer and Project Engineer for the design and CQA of a leachate collection header expansion at an industrial waste landfill. Due to failing pumps in individual leachate collection sumps, a leachate header was designed to collect leachate from two active and four future cells of an eight-cell landfill, provide for expansion into the remaining four cells, and conveyance of leachate to an existing leachate pump vault. This project was performed while employed by Fletcher Group, Inc. in Greenville, SC, between 2001 and 2006.

**MeadWestvaco, Mahrt Mill, Phenix City, Alabama.** Certifying Engineer and Project Engineer for the closure of existing industrial waste landfill using an alternative final cover consisting of a fiber sludge cap. Using fiber sludge (a mill by-product) as capping material instead of compacted clay cover, the mill was able to reduce its closure accrual cost and meet regulatory permeability requirements of the final cover. Conducted quarterly quality assurance inspections of the closure activities. Mr. Richards also assisted mill staff with task planning and scheduling and provided regulatory reporting and closure certification. This project was performed while employed by Fletcher Group, Inc. in Greenville, SC, between 2001 and 2006.

**Georgia-Pacific, Muskogee Mill, Muskogee, Oklahoma.** Project Engineer for a stability analysis at the Georgia-Pacific Muskogee Mill landfill. The analysis was a requirement of the operating

permit issued by the Oklahoma Department of Environmental Quality (ODEQ) prior to implementing a conceptual vertical expansion and it evaluated several vertical expansion options other than the conceptual design presented in the permit. Conducted on-site geotechnical investigation of sludge fill, perimeter dikes, and ash that held potential as a construction material. Performed stability analysis on proposed 3:1 vertical expansion, and developed conceptual layouts for larger expansions at 4:1 and 5:1 slopes. Summarized stability analysis results, operating considerations, site life projections into a design report. Prepared focused report for submittal to ODEQ. This project was performed while employed by Fletcher Group, Inc. in Greenville, SC, between 2001 and 2006.

**Holcim (US), Holly Hill Industrial Landfill Closure, Holly Hill, SC.** Project Engineer for the closure plan of an industrial landfill at the Holcim (US) Holly Hill facility. The landfill contains cement kiln dust (CKD) a waste byproduct of cement production. The CKD spoils area was designated as a RCRA Solid Waste Management Unit (SWMU) based on the reported presence of chromium brick in the pile. The closure plan developed that provides for usage of CKD spoils as daily cover. The CKD pile will be used until capacity is reached with closure phases being constructed as Interim Stabilization Measures. The final cover is designed to meet the RCRA requirements for CDK landfills. This project was performed while employed by Fletcher Group, Inc. in Greenville, SC, between 2001 and 2006.

#### **Industrial Waste Landfill Plans of Operation**

**Georgia-Pacific/International Paper/MeadWestvaco, Industrial Waste Landfill Annual Plans of Operation, AL, GA, OK.** Project manager for annual operations plans for several industrial waste landfills at paper mills in Alabama, Georgia, and Oklahoma. These plans include volume determinations and annual landfill maintenance requirements for regulatory compliance. Landfill airspace and life projections are determined based on waste receipts, waste consolidation, and the design final configuration. Using the results of the volume determinations and site inspections, a plan for site operations including, waste placement, construction of final cover, surface water management, and contact water management is produced for use by the site owners and landfill operators. These projects were performed while employed by Fletcher Group, Inc. in Greenville, SC, between 2001 and 2006.

#### **Hazardous Waste (TSD) Facilities**

**IT Corporation, Benson Ridge Class I Disposal Facility, Kelseyville, CA.** Project Engineer and Primary author of the Closure and Post-closure Plans. Plans included solidification/stabilization of surface impoundment sludges for disposal into a retrofitted landfill, design of the landfill closure with a composite cover (clay and geomembrane cover), the development of a dewatering system, and the design of double-celled, synthetically-lined groundwater evaporation basin. The closure cover was modeled using the HELP model to verify the volume of precipitation entering the cover drainage system. This project was performed while employed by IT Corporation in San Diego, CA, between 1990 and 2001.

**IT Corporation, Vine Hill Complex, Martinez, CA.** Project Engineer, Co-author, and coordinator of the Closure and Post-Closure Plans for the (Vine Hill facility and Baker facility) Class I (RCRA hazardous waste) disposal facilities near Martinez, California. Closure of both facilities included sludge solidification and disposal into on-site waste consolidation areas (landfills), the design of groundwater protection and containment systems, an evaporation basin for recovered groundwater, and final closure cover systems. Also included in the plans were the development

of closure construction specifications and quality assurance plans, post-closure inspection and maintenance, groundwater monitoring, soil sampling and analysis plans, and closure and post-closure cost estimates. Computer models, including the HELP model for the design of the closure cover and MODFLOW for the groundwater recovery system were used. This project was performed while employed by IT Corporation in San Diego, CA, between 1990 and 2001.

**IT Corporation Imperial Valley Hazardous Waste Disposal Facility, Westmorland, CA.** Project Engineer for the design of two Class I landfills, one Class II landfill and an asbestos monofill. The designs incorporated the use of onsite clay deposits, geosynthetic composite liner system and geocomposite drainage layers for the leachate collection and recovery system and leak detection system. These landfills were among the first to incorporate the use of textured geomembranes to increase veneer stability during construction and closure. Responsible for developing landfill layout to account for nearby Holocene faults, setbacks from the 100-year floodplain, and the probable maximum precipitation event. This project was performed while employed by IT Corporation in Irvine, CA, between 1986 and 1989.

**IT Corporation Imperial Valley Hazardous Waste Disposal Facility, Westmorland, CA.** Field Engineer for the investigation of a leaking hazardous waste surface impoundment (pond) and the design for remediation. The remedial design included a gravel-filled collection trench and sump to prevent the migration of liquid beyond the point of compliance of the unit. The surface impoundment was taken out of service and the wastes contained solidified under the site Toxic Pit Cleanup Act program. This project was performed while employed by IT Corporation in Irvine, CA, between 1986 and 1989.

**IT Corporation Imperial Valley Hazardous Waste Disposal Facility, Westmorland, CA and IT Corporation, PWI (Petroleum Waste, Inc.) Disposal Facility, Buttonwillow, CA.** Project Engineer and Section author and design engineer for the preparation of Part B permit applications (Federal permit) and Reports of Waste Discharge (State Permit) for two, Class I hazardous waste facilities in California formerly owned and operated by IT Corporation. The design for the permits included the siting and design of 15 Class I landfills, 4 Class II landfills (2 geothermal waste and 2 designated waste), and a multi-celled asbestos monofill. The sites are located near Brawley (El Centro), California and Buttonwillow (Bakersfield), California. These projects were performed while employed by IT Corporation in Irvine, CA, between 1986 and 1989.

**IT Corporation, PWI (Petroleum Waste, Inc.) Disposal Facility, Buttonwillow, CA.** Project Engineer for the design of two Class I landfills, one Class 2 surface impoundment, and designs to close over twenty individual contiguous landfills into five closed landfill areas. The landfill designs incorporated the use of double composite liner system using local soils mixed with bentonite and HDPE geomembranes, geocomposite drainage layers for the leachate collection and recovery system and leak detection system. The surface impoundment design included the use of PVC-OR (oil-resistant) geomembranes. Responsible for the layout configuration of the landfills and surface impoundment to account for setbacks from private properties, the 100-year floodplain, and the probable maximum precipitation event; also included the design of a fence to prevent Kit Fox (a protected species) from entering the facility. This project was performed while employed by IT Corporation in Irvine, CA, between 1986 and 1989.



**IT Corporation, Montezuma Hills Hazardous Waste Disposal Facility, Rio Vista, CA.**

Construction Quality Control Inspector for the closure the TSD facility. Responsible for observing and documenting the solidification of surface impoundment waste, construction of compacted clay liners for an evaporation basin, installation of the flexible membrane liner (FML) over the solidified waste and compacted clay liner, installation of the leachate collection/groundwater recovery system, and monitoring the construction of the slurry wall surrounding the site. This project was performed while employed by IT Corporation in San Diego, CA, between 1990 and 2001.

**IT Corporation, Panoche Class I Disposal Facility Benicia, CA.** Project Engineer and Co-author of a RCRA Facility Investigation (RFI) and Corrective Measures Study (CMS). The facility consists of waste management units (WMUs) that have been used for the treatment, storage, disposal of hazardous liquids, sludges, and solids. The WMUs include a landfill, surface impoundments, treatment units for pH adjustment and metals precipitation, storage and drying areas, and ancillary systems for transfer between the various WMUs. This project was performed while employed by IT Corporation in San Diego, CA, between 1990 and 2001.

**U.S. Department of Energy, Sandia National Laboratory, Albuquerque, NM.** Project Engineer for design of a CAMU for the containment of chemical wastes from an unlined landfill. The design incorporates the use of geosynthetic clay liners, flexible membrane liners, and geonets for a 1,000,000 cubic foot disposal cell. The unit is designed to withstand seasonal winds up to 60 miles per hour as well as the run off commonly resulting in flash floods in the area. The bottom liner system will be constructed such that no liner penetrations are made. Leachate generation was modeled using the HELP model ver. 3.0. The vadose zone will be monitored through access tubes under the cell using a neutron probe. This project was performed while employed by IT Corporation in San Diego, CA, between 1990 and 2001.

**Rabanco, Dangerous Waste Landfill Facility Preliminary Design, Vantage, WA.** Project engineer for preliminary design and layout for a dangerous waste (hazardous waste) landfill facility in Central Washington. The landfill cells at this facility were designed to accommodate solidified waste (large "concrete-like" blocks) and ash from a hazardous waste incinerator. This project was performed while employed by Parametrix in Bellevue, WA, between 1989 and 1990.

**Leachate and Waste Water Engineering**

**MeadWestvaco, Mahrt Mill Leachate Collection Expansion, Phenix City, AL.** Certifying engineer and project engineer for the design and construction QA of a leachate collection header expansion in an industrial waste landfill at the MeadWestvaco Mahrt Mill near Phenix City, Alabama. Due to failing pumps in individual leachate collection sumps, a leachate header was designed to collect leachate from two active cells of an eight-cell landfill, provide for expansion into the remaining four cells, and convey the leachate to an existing leachate pump vault. This project was performed while employed by Fletcher Group, Inc. in Greenville, SC, between 2001 and 2006.

**Orange County Integrated Waste Management Department, Frank R. Bowerman Landfill Tank Farm Design and Construction Oversight, Orange County, CA.** Project manager/principal engineer for the design and construction oversight of a leachate and groundwater tank farm at the Frank R. Bowerman Landfill in Orange County California. The design was replaced four elevated 10,000-gallon horizontal steel tanks with six 12,750-gallon sloped-bottom, crossed-linked polyethylene (XLPE) tanks. Included in the design were two secondary containment pads

for the three groundwater and three leachate storage tanks. Each set of tanks is interconnected with overflow piping and gate valves. Each tank has a 4-inch diameter integrally molded flanged outlet (IMFO) to allow for complete drainage and an 8-inch side discharge outlet. This project was performed while employed by IT Corporation in San Diego, CA, between 1990 and 2001.

**Mobil Oil Corporation, Belridge Water Treatment Facility Emergency Holding Pond Design, Kern, CO.** Project manager for the design of a synthetically lined emergency holding pond and pump station for the containment of high temperature water at the Mobil Belridge Water Treatment Facility for Mobil Oil Corporation. Included in the scope of work were the pond siting and configuration, kit fox (a federally protected animal) barrier design, synthetic material selection to withstand 200°F water with low concentrations of petroleum hydrocarbons, construction specifications, and construction quality assurance program. This project was performed while employed by IT Corporation in Irvine, CA, between 1986 and 1989.

### **MSW Landfill Permitting**

**Landfill Solid Waste Permitting in Support of Permit Renewal Applications Capitol Disposal Landfill (WM), Juneau, Alaska.** Engineer of Record and lead engineer for preparing the solid waste permit application for the renewal of the landfill operating permits at the Capitol Disposal Landfill in 2010 and 2015. Work performed included the preparation of the closure and post-closure plans, financial assurance, closure design grading plans, and the filling and closure sequencing to be consistent with state and federal guidance and the site's operating permit. Coordinated with the owner and the project lead for the production and submittal of the permit application. The plans described procedures and methods for monitoring ground water, surface water, leachate and LFG at the landfill, and evaluating and reporting the results.

**City of Vancouver, Design and Operations, and Progressive Closure Plan, Vancouver Landfill, Delta BC.** Project Manager for the landfill gas aspects of the Design and Operations, and Progressive Closure Plan for the Vancouver Landfill, near Delta, BC. Tasks include design of the LFG system as it relates to continued development of the Vancouver Landfill and develop methods to achieve a recovery efficiency of 75 percent for the landfill gas collection and controls system.

**Grants Pass, City of, Landfill Gas (LFG) Flare Hazardous Air Pollutants (HAP) Emissions Calculation, Merlin Landfill, Grants Pass, OR.** Project Director responsible for technical guidance, engineering review, and project quality assurance (QA) for the performance of a landfill gas flare hazardous air pollutants (HAP) emissions calculation at the Merlin Landfill in Grants Pass, OR. The project encompassed reviewing the Client's application and available laboratory analyses of raw and combusted landfill gas, and performing HAP emissions calculations from the flare stack based on AP-42 default concentrations of raw landfill gas in the absence of site specific data. A flare destruction efficiency of 98 percent in the absence of specific flare data was used. A tabulated letter containing results of HAPs concentrations from the landfill flare was prepared.

### **LANDFILL GAS CONTROL**

**Municipality of Anchorage, Landfill Gas (LFG) Horizontal Well Design, Anchorage Regional Landfill (ARL), Anchorage, AK.** Project Director responsible for technical guidance, engineering design, project quality assurance (QA), and final document review of plans and specifications for

the engineering design of horizontal landfill gas wells at the Anchorage Regional Landfill in Anchorage, AK.

**Aero-Metric, Inc., Landfill Gas (LFG) Assessment, Merrill Field Landfill, Anchorage, AK.**

Project Director responsible for technical guidance, engineering review, and project quality assurance (QA) for the performance of a landfill gas assessment at the Merrill Field Landfill in Anchorage, AK. The assessment served to determine if a secondary soil vapor abatement system would be needed if pavement was installed adjacent to a neighboring building, or if the primary landfill gas extraction system located at the landfill became inoperable for an extended period of time.

**Aero-Metric, Inc., Additional Engineering and Preliminary Cost Estimate, Merrill Field Landfill, Anchorage, AK.**

Project Director responsible for technical guidance, engineering design, project quality assurance (QA), and final document review of plans and specifications for the performance of engineering services and the development of a cost estimate for an active secondary landfill gas abatement system at the Merrill Field Landfill in Anchorage, AK. The project served to satisfy a Municipality of Anchorage requirement.

**Waste Management, Inc., Landfill Gas (LFG) System Upgrades, Capitol Disposal Landfill, Juneau, AK.**

Project Director responsible for technical guidance, engineering design, project quality assurance (QA), construction quality assurance (CQA), and final document review of plans and specifications for the design of LFG system upgrades and expansion in 2014 for the Capitol Disposal Landfill near Juneau, AK

**Waste Management, Inc., Landfill Closure Design, Capitol Disposal Landfill, Juneau, AK.**

Project Director responsible for technical guidance, engineering design, project quality assurance (QA), and final document review of plans and specifications for the 2014 design of a 5-acre landfill area closure. The closure design includes integration of the LFG system into the final cover system to maintain the headers and laterals above the geomembrane cover, but also below the frost depth for for the Capitol Disposal Landfill near Juneau, AK

**City of Vancouver, BC, 2011 Gas System Expansion, Phase 1 & 2, Vancouver Landfill, Delta BC.**

Project Manager for the design and construction management of the LFG system upgrades expansion and upgrades in Phase 1 and Phase 2 at the Landfill. The design included installation of 32 vertical gas wells in Phase 2 and replacement of 22 vertical gas wells in Phase 1 along with associated gas conveyance piping and condensate disposal system. Tasks included preparing preliminary design report, final construction drawings and specifications (for tender), construction cost estimate, construction management, and final construction report.

**City of Vancouver, BC, Phase 2 Closure Construction and Gas System Upgrades, Vancouver Landfill, Delta BC.**

Project Manager of the design team for the Phase 2 Closure and site-wide LFG system upgrades. Responsible for oversight of the evaluation of the existing landfill gas collection system and preparing a landfill gas assessment report with recommendations for improvements, design of the gas system expansion and upgrades. The design included installation of 89 vertical gas wells and 12 horizontal gas wells located in areas Phase 1, Phase 2, Phase 3 and Western 40, along with associated gas conveyance piping and condensate disposal system. Tasks included preparing preliminary design report, final construction drawings and specifications (for tender), construction cost estimate, construction management, and final



construction report. Responsibilities also included review of tenders and overseeing construction quality assurance activities.

**City of Vancouver, BC, Phase 3W Closure Construction and Gas System Upgrades, Vancouver Landfill, Delta BC.** Project Manager for the design of the LFG system as it relates to the Phase 3 West Closure and site wide gas system upgrades. Responsible for technical guidance, engineering design, project quality assurance (QA) for the design of the gas system expansion and upgrades. In 2013 the design included installation of 17 vertical gas wells located in areas Phase 1 and Phase 3 along with associated gas conveyance piping and condensate disposal system and in 2014 the design included the installation of an additional seven vertical gas wells, a new LFG header on the north, two LFG header replacements around Phase 1 and on the south side of the landfill. The design also included the installation of six horizontal LFG collectors in Phase 3. Tasks included preparing preliminary design report, final construction drawings and specifications (for tender), construction cost estimate, construction management, and final construction report. Responsibilities also included review of tenders and overseeing construction quality assurance activities.

**Waste Management, Inc., Landfill Gas (LFG) System Upgrades, Riverbend Landfill, McMinnville, OR.** Project Director responsible for technical guidance, engineering design, project quality assurance (QA), construction quality assurance (CQA), and final document review of plans and specifications for the design of LFG system upgrades and expansion since 2007 and also for the purchase of additional landfill gas system equipment (dual-chambered flare) for the Riverbend Landfill near McMinnville, Oregon. Tasks involved purchasing equipment required to verify plant flow readings and verify readings, replace non-Waste Management well heads with WM-style/approved well heads, and provide a landfill gas well field evaluation. Also included in the scope of services was an evaluation of the blower capacity, review the current control system that operates condensate pump stations 2 and 3 (North and South condensate pump stations) with EPG pumps, and review maintenance procedures for the flame arrestor.

**Waste Management, Inc., Landfill Gas (LFG), Greater Wenatchee Regional Landfill (GWRL) Well Field Layout, East Wenatchee, WA.** Project Director responsible for technical guidance, engineering design, project quality assurance (QA), and final document review of plans and specifications for the evaluation of the landfill gas collection and control system well field layout at the Greater Wenatchee Regional Landfill and Recycling Facility in East Wenatchee, WA.

**Capital Regional District, Landfill Gas (LFG) Assessment, Optimization, and Collection System Enhancement, Hartland Landfill, Victoria, BC, Canada.** Project Manager responsible for technical guidance, engineering design, project quality assurance (QA), and final document review of plans performance of a study to address landfill gas management at the Hartland Landfill in Victoria, BC, Canada. Tasks involved reviewing current practices and operations, in addition to developing a long-term management strategy for the duration of the life of the landfill post-closure. The project assessed key areas of landfill gas management, including landfill gas generation, collection, and operational practices. Additional tasks included evaluating options for improvement, making recommendations complete with a cost-benefit analysis, and developing a long-term management plan.

**Metro Vancouver, Comprehensive Landfill Engineering Services, Coquitlam Landfill, Coquitlam, BC, Canada.** Project Engineer responsible for engineering review for the completion of a multiple stage scope of work at the closed Metro Vancouver Coquitlam Landfill in Vancouver, BC. The landfill is situated between Canada Highway 1 and the Fraser River to the South. The site has commercial operations including a nine-hole golf course, a driving range, and a waste recycling facility. Tasks included groundwater and surface water monitoring, landfill gas system maintenance, landfill gas system evaluation, landfill gas generation and recovery study, and update of the landfill closure plan, long term monitoring plans, and design and installation of landfill gas system improvements. SCS also conducted a due diligence review of existing building intrusion system and methane monitoring systems.

**Southern Idaho Solid Waste, Landfill Gas (LFG) Collection System Design-Build, Milner Butte Landfill, Burley, ID.** Project Manager responsible for technical direction, engineering design, project estimates, plans and specifications, budget management, scheduling, staffing, subcontractor management, and reporting for the design and construction of a landfill gas control and collection system (GCCS) at the Milner Butte Landfill in Burley, ID. Tasks included the preliminary and final design, GCCS plan, permitting and agency correspondence, during construction services, preparation of the O&M manual, development of the SSM plan, start-up and operations assistance, and flare source testing. The design-build approach was executed internally by SCS Engineers and SCS Field Services.

**Island County Solid Waste Dept., Landfill Gas (LFG) Data Monthly Review and Well Field Adjustment, Coupeville Solid Waste Facility (CSWF), Coupeville, WA.** Project Director responsible for technical guidance, engineering review, and project quality assurance (QA) for the review of landfill gas data collected by another consultant and the Island County Health Department (ICHHD) at the Coupeville Solid Waste Facility in Coupeville, WA. Tasks included the provision of recommendations for landfill gas system adjustments.

**Boeing, Landfill Gas (LFG) System Modifications and Site Redevelopment, Boeing Eastgate Landfill, Bellevue, WA.** Project Director responsible for technical guidance, engineering design, project quality assurance (QA), and final document review of plans and specifications for the delivery of design services for modifying environmental controls at the closed Boeing Eastgate Landfill in Bellevue, WA. Tasks were associated with the encroachment of the Schnitzer West Advanta Office Park Development project. Design services included modifying portions of landfill gas control system, storm water drainage system, groundwater monitoring network, and landfill gas monitoring network. The gas system had to take into account the high water levels in the waste mass while providing gas extraction recovery of offsite migration and monitoring capabilities. In 2002 SCS was contracted by JGM Landscape Architects to provide an analysis of the site in support of the initial feasibility study. SCS was also responsible for constructing the original landfill gas system under contract to Boeing in 1986. The landfill facility was formerly owned by Boeing and is now owned by Schnitzer West and the City of Bellevue. Boeing owns the gas extraction system.

**Waste Connections (dba LRI), Landfill Gas (LFG) Monitoring (2010), Purdy Landfill, Purdy, WA.** Project Director responsible for technical guidance, project quality assurance (QA) and final document review for the performance of quarterly landfill gas reporting at the Purdy Landfill in Purdy, WA. Tasks included monitoring probes around the facility's perimeter and preparing data reports.

**Waste Connections (dba LRI), Landfill Gas (LFG) Monitoring (2010), LRI Landfill, Graham, WA.** Project Director responsible for technical guidance, project quality assurance (QA) and final document review for the performance of routine landfill gas monitoring at the LRI Landfill in Graham, WA. Tasks included the monthly monitoring of seven gas probes and quarterly monitoring of on-site buildings. Monitoring results were reported to Ecology and the local health district.

**American Property Development, Landfill Gas (LFG) Migration Assessment and Gas Collection and Control System (GCCS) Plan, Addison Greens and River Trail Apartments, Puyallup, WA.** Project Engineer responsible for engineering review for the delivery of engineering services related to a closed landfill adjacent to an apartment complex in Puyallup, WA. Activities involved a review of the existing landfill gas migration and gas control system and performance of a landfill gas migration investigation for the owners of the adjacent apartments. The full scope of design services included document review, soil gas monitoring, assessment of landfill gas conditions, preliminary landfill gas system design, final design, construction, operations and maintenance manual development, startup and initial operations, routine operations, and maintenance. The gas migration investigation and assessment identified landfill gas in soils on the property occupied by the apartments and subsequent building monitoring was conducted to determine the presence of landfill gas in the structures. Options and recommendations for landfill gas mitigation were prepared along with a design upgrade for the existing landfill gas extraction system.

### **LANDFILL GAS TO ENERGY (LFGE) AND GREENHOUSE GAS (GHG)**

**Klickitat County PUD (WA), Landfill-to-Gas Energy (LFGE) Bid Consultation, Roosevelt Regional Landfill, Roosevelt, WA.** Project Manager responsible for technical guidance, engineering design, project quality assurance (QA), and final document review of plans provision of client support in soliciting and comparing vendor qualifications for an LFGE facility at the Roosevelt Regional Landfill in Roosevelt, WA. Tasks included preparing final bid documents, providing support during the bidding process, responding to contractor queries, reviewing contractor submittals, observing construction, performing inspections, reviewing the startup and commissioning plan, observing startup, reviewing startup and commissioning results, and advising the client on acceptance. The client was also assisted with resolving warranty issues and conducting inspections to develop a warranty punch list.

**PNC Bank, Construction Quality Assurance, Ingenco Distributed Energy/Bio Energy Washington Facility at Cedar Hills Landfill, Maple Valley, WA.** Project Manager for review of equipment installation during construction of the landfill gas processing facility. The facility accepts landfill gas from the landfill and processes it to meet pipeline quality standards prior to injection into the nearby Puget Sound Energy natural gas system.

**Mercantile Bank & Trust, Landfill Gas (LFG) Estimate Update, Cedar Hills Landfill, Maple Valley, WA.** Project Director responsible for technical guidance, engineering review, and project quality assurance (QA) for the preparation of a landfill gas estimate update for the Cedar Hills Landfill in Maple Valley, WA. The update was based on a 2006 report prepared by SCS for an energy development client, and included 2006-2007 waste input and flow data.

## TRANSFER STATIONS

**North Lincoln Sanitary Service, Solid Waste Transfer Station Expansion Engineering Design, Schooner Creek Facility, Lincoln City, OR.** Project Engineer responsible for technical direction, engineering design and project estimates for the development of conceptual, preliminary and final designs for the expansion of the Schooner Creek solid waste transfer station in Lincoln City, OR. The project serves to expand the existing facility to accommodate self haul customers and improved waste water handling. Conceptual, preliminary and final designs for a new shop building were also prepared to expand the existing hauling company's shop complex. The shop building includes maintenance spaces, as well as, offices for the hauling company.

**Kittitas County Solid Waste Dept., Solid Waste Transfer Station Repair, Upper County Facility, Cle Elum, WA.** Project Manager responsible for technical direction, project estimates, budget management, scheduling, staffing, subcontractor management, and reporting for the evaluation of a solid waste transfer station repair at the Upper County facility in Cle Elum, WA. The building's internal framing was structurally damaged when a backhoe was driven through the facility's easterly wall. Tasks included a site inspection, construction repair cost estimate, general contractor search, and construction repair documentation.

**Island County Solid Waste Dept., Solid Waste Transfer Station Expansion and Drain Assessment, Island County Solid Waste Complex (ICSWC), Coupeville, WA.** Project Director responsible for technical guidance, engineering design, project quality assurance (QA), and final document review of plans and specifications for the preliminary design of a transfer station expansion at the Coupeville Solid Waste Facility in Coupeville, WA. Tasks included preparing a conceptual layout refinement and a design for the tie-in to the existing transfer station. Additionally, design modifications were prepared for the existing floor drain. Conceptual plans for the transfer station expansion were also prepared.

**Adams County Public Works Dept., Solid Waste Transfer Station Planning and Design, Ritzville and Bruce Facilities, Ritzville, WA.** Project Manager responsible for technical direction, engineering design, project estimates, plans and specifications, budget management, scheduling, staffing, subcontractor management, and reporting for the execution of solid waste transfer station planning and design services at the Ritzville and Bruce facilities in Ritzville and Othello, WA. The project involved the evaluation of two transfer station facilities. Based on the site visits and a previous waste system analysis performed by SCS, improvement options and recommendations were made to County personnel. Working with County staff, facility designs were developed that included grading and paving plans, storm water control, and structural design for slabs on grade. Following completion of the design phase, on-call services were provided for construction-period monitoring to verify that the designs were correctly implemented.

**San Juan County Public Works Dept (WA), Transfer Station Design-Build Upgrades, San Juan County Facility, Friday Harbor, WA.** Project Manager responsible for technical direction, engineering design, project estimates, plans and specifications, budget management, scheduling, staffing, subcontractor management, and reporting for the design upgrades to the existing San Juan County transfer station in Friday Harbor, WA. The project served to separate process water and storm water; sufficiently, capture, convey and store process water for transport to a mainland

POTW; and, convey and discharge storm water that does not create storm water management problems. Tasks involved fully enclosing the garbage tipping floor/trailer bay; developing a process water management system that did not leak or overflow; designing a process water management system that could be easily inspected; and, designing enclosures (tipping floor and trailer storage covers) that would remain serviceable and reusable after 10 years. Additional tasks included adequately accommodating enclosure dimensions and materials to avoid structural damage during operations and to accept the largest expected vehicles; re-surfacing of deteriorated tipping floor to create a barrier to liquids; and, preparing all necessary documentation/applications for a Town of Friday Harbor building permit and variance requests.

**Klickitat County PUD (WA), SEPA Checklist Update, Biogas Project Phase II, Roosevelt Regional Landfill, Roosevelt, WA.** Project Director responsible for engineering review for the provision of support to the Klickitat Public Utilities District (KPUD) in updating the Washington State Environmental Policy Act (SEPA) checklist for the Biogas Utilization Project Phase II at the Roosevelt Regional Landfill in Roosevelt, WA. Tasks involved preparing an update to the draft SEPA checklist and incorporating changes in the project based on input received from KPUD as to project status and revised project elements.

**MMM Group Limited, Administration and Entrance Area Relocation Concept and Pre-Design, Glenmore Landfill, Kelowna, British Columbia, Canada.** Project Manager responsible for technical direction, engineering design, project estimates, plans and specifications, budget management, scheduling, staffing, subcontractor management, and reporting for the conceptual and pre-design of service facilities at the Glenmore Landfill in Kelowna, BC, Canada. Tasks included design services for a new administration building, new scale and systems upgrade, scale house, recycle drop off, residential garbage transfer area, household hazardous waste drop off facility, and a disposed goods salvage and resale centre. Design of roads, parking areas and drainage requirements were also required.

**CEI Architecture & Planning, Solid Waste Transfer Station Facility Design, Whistler, BC.** Project Manager responsible for technical direction, engineering design, project estimates, plans and specifications, budget management, scheduling, staffing, subcontractor management, and reporting for the design, permitting, and construction oversight of the Whistler solid waste transfer station in Whistler, BC, Canada. The site includes a 9700 ft<sup>2</sup> transfer building and MSW area designed to handle 400 tpd, a 4800 ft<sup>2</sup> recyclables processing building and a 12.5K ft<sup>2</sup> recycling drop-off area. Facility features include floor sorting capability, recyclables balers, tunnel/bay load-out, and storage for recovered materials. Additional ancillary structures include a 400 ft<sup>2</sup> office and visitor center and 120 ft<sup>2</sup> scale house. Special features and challenges of the facility included design considerations for bear prevention, heavy snow conditions, bedrock close to the ground surface, and incorporation of "green" building features and techniques. The facility cost was approximately \$2.1M inclusive of \$100K in design fees. Construction was completed in 2007.

## **STORM WATER AND SPILL PLANNING**

**North Lincoln Sanitary Service, Storm Water Pollution Control (SWPC) Plan, Schooner Creek Transfer Station Compost Facility, Lincoln City, OR.** Project Manager responsible for technical direction, engineering design, project estimates, plans and specifications, budget management,



scheduling, staffing, subcontractor management, and reporting for the development of a storm water pollution control plan for the Schooner Creek Transfer Station and Compost Facility in Lincoln City, OR. The project included a site drainage inspection, the training of facility staff to conduct storm water monitoring, preparation of a site drainage map, and SWPC Plan development under the 1200Z permit. A storm water sampling SOP will also be prepared for facility staff.

**Skanska USA Building, Inc., Fuel Tank Spill Plan, Tacoma General Hospital Emergency Generators, Tacoma, WA.** Project Manager responsible for scheduling, staffing, and regulatory evaluation for the review of an emergency generator spill plan for a temporary 20,000 gallon fuel tank at the Tacoma General Hospital in Tacoma, WA. The task involved comparing the plan elements to items requested by the City of Tacoma, and providing a professional seal to authorize the plan.

### **US Military Facilities**

**U.S. Navy Salton Sea Test Base (SSTB), Imperial County, California.** Project Manager site restoration work at this BRAC facility included removal and disposal of approximately 370 tons of mixed waste consisting of telegraph poles; telegraph wire, scrap steel, tires, concrete, asphalt, and asbestos containing material. The debris was located near former building sites, along major roads, and in undeveloped areas of the former SSTB. The work was conducted in two phases because the Southwest Cahuilla Recessional Shoreline Archaeological District (District) is located in the northern half of the base and concurrence from State Historic Preservation Office (SHPO) was required to conduct work in that area. Phase I work was conducted outside the District between April and August 1997. After approval from SHPO, Phase II work began both within and outside the District from September to December 1998. This project was performed while employed by IT Corporation in San Diego, CA, between 1990 and 2001.

**U.S. Naval Air Station North Island, Coronado, California.** Project Manager for a remedial action to remove and treat soil containing PCBs from three installation restoration (IR) sites. PCB-contaminated soils were excavated from each IR site until the EPA Region 9 residential remediation goal was reached. The treatment process (soil washing/solvent extraction) involved an innovative technology using a proprietary solvent to remove the PCBs from the soil matrix to concentrations below the EPA Region 9 industrial remediation goal for on-site disposal. Work included development of the Work Plan, Site Quality Control Plan, and Site Health and Safety Plan; excavation of the PCB-contaminated soil, transporting soil to the treatment/disposal area, soil washing/solvent extraction the PCBs from the soil, installation and sampling of monitoring wells, soil sampling for analytical testing by both immunoassay field test kits (EPA Method 4020) and fixed laboratories (EPA Method 8080), and site restoration including revegetation and irrigation systems. Upon completion, the disposal area was incorporated into the base golf course driving range. This project was performed while employed by IT Corporation in San Diego, CA, between 1990 and 2001.

**U.S. Naval Submarine Base, Bangor, Washington.** Project Manager and Field Quality Control Officer for a removal action to excavate drums, debris, and impacted soils. Work included the excavation of drums containing various materials and placing them into salvage drums, hazard categorization of 34 salvage drums, separating impacted soil from visually clean soil, removal of all foreign material from the analytically clean soil prior to using as backfill, and backfilling and

revegetating the site. Additionally, samples were obtained for analytical analysis from the completed excavation, excavated soil stockpiles, decontamination water, storm water runoff, and import backfill soils. This project was performed while employed by IT Corporation in San Diego, CA, between 1990 and 2001.

**U.S. Naval Shipyard at Long Beach, California.** Project Manager for remedial action including the removal and on-site relocation of sand blast grit, regrading the area to provide drainage, engineering design and installation of a shotcrete cover over the sand blast grit, engineering design for the regrading two slopes having a net area of 1.7 acres, installation and monitoring of lysimeters to determine if contaminants are migrating downward through the soil, installation of an irrigation system on the slopes, and revegetating the slopes. This project was performed while employed by IT Corporation in San Diego, CA, between 1990 and 2001.

**U.S. Marine Corps Base Camp Pendleton, California.** Sr. Project Engineer and Resident Engineer for the environmental remediation of four sites contaminated with metals. Contaminated soils were excavated to depths that would meet either human health or ecological risk values determined acceptable by the Federal Facility Agreement (FFA). (Members of the FFA included U.S. EPA, California EPA - Department of Toxic Substances Control, San Diego Regional Water Quality Control Board, and the U.S. Navy - Naval Facility Engineering Command.) The contaminated soils were consolidated into a Corrective Action Management Unit (CAMU) located on Camp Pendleton. A 6-foot thick alternative final cover for the CAMU was designed as an evapotranspiration cover that would limit the infiltration of precipitation by allowing native vegetation to use the moisture before it could reach the underlying waste materials. This project was performed while employed by IT Corporation in San Diego, CA, between 1990 and 2001.

**U.S. Air Force, Mather Air Force Base, Sacramento, CA.** Project Engineer for the Landfill Operable Unit portion of the Focused Feasibility Study. The work included a record search of the waste types disposed at the eight landfill sites and determining the possible methods of closure to present to the Air Force and the State Water Quality Control Board. The HELP model was used to approximate the volume of leachate exiting the landfills before and after closure to determine the effectiveness of the closure cap. The results from the HELP model were also used in other groundwater modeling programs to determine potential reductions in constituent movement. This project was performed while employed by IT Corporation in San Diego, CA, between 1990 and 2001.

**U.S. Navy, Marine Corps Base Camp Pendleton, California.** Project Engineer and Field Supervisor for the removal of 35 underground storage tanks. The work included locating the USTs and surrounding utilities (potable water and natural gas pipelines), excavation of contaminated soil around the tanks, removal of sand inside the tanks (sand was placed in the tanks when taken out of service), stockpiling and managing contaminated soil and sand, locating remote fill piping for removal at a later date, and restoration/reclamation of the tank sites. This project was performed while employed by IT Corporation in San Diego, CA, between 1990 and 2001.

### **Publications**

Richards, J.M. and L.O. Yamamoto, 1992, "Hazardous Waste Landfill Design and Construction," IT Corporation Technology Exchange Symposium, Scottsdale, Arizona, June 18 - 20.