MOBILE ENVIRONMENTAL POWER

STATEMENT OF QUALIFICATIONS

Prepared by:

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1.0 COMPANY PROFILE

Mobile Environmental Power, Inc. (MEP) is an environmental management company with subsidiary companies specializing in solid and hazardous waste management, and water and wastewater treatment. The senior professionals of MEP have extensive experience in the areas of environmental, geotechnical, structural, and civil engineering, solid, hazardous, and radioactive waste management, hydrology, and hydrogeology, and water and wastewater systems. The MEP professional staff has advanced degrees from some of the world's most prestigious engineering schools, is well-published, world renown in its areas of expertise, and highly involved in many engineering organizations.

MEP and its affiliated companies' experience and qualifications in environmental management, remediation, and solid and hazardous waste management are second to none. MEP and its affiliated companies have provided solid waste operations management at more than 100 facilities worldwide, and have provided design, management, and operations services on more than 250 solid waste management projects, including C&D processing and sorting facilities, landfills, compost plants, sorting facilities (materials recycling facilities), gasification facilities, medical waste treatment facilities, transfer stations, hazardous waste treatment facilities, and hazardous waste disposal facilities. In addition, MEP professionals have extensive experience in the design, construction, and operation of leachate and wastewater treatment facilities, and water treatment facilities, including desalination facilities.

MEP works with its strategic partners, Vanderweil Engineers and HTT, to design and construct Gasification Facilities to provide electric power form solid waste. Vanderweil Engineers (Vanderweil) has unprecedented experience in the design and standing up of power facilities of the types and sizes designed by MEP, and HTT has many years of experience manufacturing incinerators and gasification facilities for the waste to energy industry.

MEP has developed the MEP Gasification System, which converts municipal solid waste into clean, green, renewable energy. The gasification system has a conversion efficiency of approximately 0.8 to 1.1 MW-hr of electricity per tonne of waste, depending on the properties of the waste, and emissions of key parameters such as particulate matter, heavy metals, VOCs, and Dioxins/Furans are more than 3 orders of magnitude below US Air Quality Standards.

MEP professionals have designed and are currently designing gasification facilities in Kenya, Bahamas, California, Maryland, Tanzania, Ethiopia, Uganda, and Pakistan, and many other locations around the world.

MEP Team professionals have designed methane gas collection and treatment systems, including passive and active venting systems, for more than 100 buildings and facilities, and for more than 150 landfills. These designs have included the design of the geomembrane layer, the gas collection layer and system, and the methane gas venting and treatment system. Dr. Williams was an expert witness for 28 methane gas collection and treatment systems in 2015 and 2018.

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MEP professionals are also highly specialized in water resource development, including earth dam design, construction, and remediation, water treatment plant design, construction, and operation, and design and construction of water distribution systems and networks. MEP personnel have extensive experience in dam design projects in the Middle East, Asia, South America, Turkey, and the US, and have designed and provided construction management for water distribution systems in Asia, the Middle East, Turkey, and the US. In addition, MEP personnel are experts in lining system technologies and the use of innovative technologies for dam and reservoir systems in areas with poor construction materials.

MEP and its affiliated companies have strong international expertise in wastewater treatment system design, construction, and operation, including the design of innovative and cost-effective technologies. These technologies include hybrid systems utilizing anaerobic treatment systems to generate energy, and aerobic treatment systems to minimize constituent concentrations, mitigate odor, and reduce cost. MEP professionals have designed several wastewater treatment systems in developing areas where electricity is limited, technical expertise is non-existent, spare parts are difficult to obtain, and capital and operating costs must be minimized. The systems designed by MEP professionals for these markets are simple to operate, have few moving parts, require very few spare parts, have low capital and operating costs, and can be operated by inexperienced personnel.

MEP was founded to serve clients in the waste management, water resources, wastewater treatment, and infrastructure development areas using innovative and cost-effective technologies. MEP is committed to providing the highest levels of service, providing high quality deliverables, and meeting our clients time and budget requirements. MEP's commitment to excellence is demonstrated by its more than 85 percent repeat business with its existing clients, its ability to deliver projects on time and under budget, and its ongoing efforts to develop and implement innovative and cost-effective technologies for water treatment, water resource development, wastewater treatment, solid and hazardous waste management, and infrastructure development.

MEP professionals have established a reputation of excellence by providing engineering services throughout the United States (including Puerto Rico and the U.S. Virgin Islands), Algeria, Bahamas, Bahrain, Bangladesh, Belgium, Benin, Bolivia, Brazil, Canada, DRC, El Salvador, Eritrea, Ghana, India, Iraq, Ireland, Ivory Coast, Jordan, Kenya, Lebanon, Liberia, Nigeria, Oman, Pakistan, Panama, Portugal, Qatar, Saudi Arabia, Sri Lanka, Syria, Tanzania, Turkey, and the UAE.

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2.0 SERVICES AND CAPABILITIES

MEP is dedicated to providing the highest quality services to you, our client, in the formulation and implementation of effective solutions to all environmentally sensitive projects. The MEP professional staff is highly educated and experienced in the design, construction, and operation of environmental facilities, and has extensive experience in the use of innovative and cost-effective technologies. The MEP commitment to excellence is evidenced through:

- Design, Construction, and Operation of Environmental Management Systems and Facilities that are Protective of Human Health and the Environment, are Consistent with International Design Requirements and Regulations, and Maximize Performance at Minimum cost;
- Development and Implementation of Innovative, Cost-Effective, and State-of-the-Art Technologies;
- Integration of Your Input, Ideas, Concerns, and Desires into the Assessment, Design, Construction, and Operations Phase;
- Consistent Production of Exceptional Quality Work;
- Proven Track Record of Completing Work on Schedule and within Budget;
- Diversity and Technical Excellence of the Staff; and
- Extensive Education and Broad Experience of the MEP Professionals.

To MEP employees, dedication to client service is a way of life. We will work closely with you, drawing upon your experience and our expertise to provide accurate data that will help us identify the appropriate technologies necessary for the design of the project. We will then solicit your input and guidance throughout the assessment and design process to assure the development of appropriate designs that address your concerns, can be implemented within the time and budget constraints, and meet all applicable regulatory guidelines, requirements, and standards. Following design, the MEP professional staff will work closely with you to develop a construction program and operations, sensitive to your needs, to expedite the most efficient and cost-effective work schedule.

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3.0 MEP PROFESSIONAL TEAM AND SERVICES

The MEP professional team encompasses a vast spectrum of complementary, technical disciplines with diverse qualifications and experience. This versatility makes MEP extremely adaptable to client needs, and makes it possible for MEP to provide a more complete array of environmental services. MEP professionals (Resumes of key professionals are presented in Appendix A) are well published, respected in each of their fields, and involved extensively in professional societies. All of these factors help ensure the commitment to excellence in the following complementary areas:

WATER RESOURCES DEVELOPMENT

- DAM DESIGN AND CONSTRUCTION MANAGEMENT
- GROUND-WATER AND SURFACE-WATER INVESTIGATIONS
- WATER SUPPLY
- WATER QUALITY ANALYSIS
- AQUIFER TESTING ANALYSIS
- NUMERICAL MODEL DEVELOPMENT AND APPLICATION
- DESIGN AND CONSTRUCTION OF WATER TREATMENT SYSTEMS
- EXPERT WITNESS TESTIMONY

INFRASTRUCTURE DEVELOPMENT

- SITE LAYOUT
- ROADS AND BRIDGES
- EARTH RETAINING STRUCTURES
- RESIDENTIAL AND COMMERCIAL DEVELOPMENT
- COLLECTION AND DISTRIBUTION SYSTEMS
- CHEMICAL/PETROLEUM CONTAINMENT TANKS AND PONDS
- LIQUID AND GAS TRANSMISSION SYSTEMS
- TRAFFIC ANALYSIS
- EXPERT WITNESS TESTIMONY

CONSTRUCTION MANAGEMENT

- CONTRACT BIDDING SERVICES
- CONTRACT NEGOTIATIONS AND MANAGEMENT
- CONSTRUCTION DOCUMENTS, SPECIFICATIONS, AND DRAWINGS
- RESIDENT ENGINEERING
- CONSTRUCTION QUALITY ASSURANCE MONITORING SERVICES
- EXPERT WITNESS TESTIMONY

SOLID AND HAZARDOUS WASTE MANAGEMENT FACILITY SITING, PERMITTING, DESIGN, CLOSURE, AND OPERATIONS

- C&D PROCESSING, SORTING, AND LANDFILLING
- SITING
- PERMITTING
- PRESENTATIONS AT PUBLIC HEARINGS AND REGULATORY MEETINGS
- LANDFILL DESIGN
- LEACHATE COLLECTION AND TREATMENT SYSTEMS
- GAS EXTRACTION AND TREATMENT SYSTEMS
- SURFACE-WATER MANAGEMENT SYSTEMS
- COMPOST PLANTS

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- SORTING FACILITIES (MRFs)
- GASIFICATON FACILITIES
- TRANSFER STATIONS
- FINANCIAL MODELING AND PLANNING
- COMPREHENSIVE SOLID WASTE MANAGEMENT PLANS
- HAZARDOUS WASTE TREATMENT FACILITIES
- MEDICAL WASTE TREATMENT FACILITIES
- CONSTRUCTION MONITORING/QUALITY ASSURANCE
- CLOSURE/POST-CLOSURE MONITORING
- GEOLOGICAL AND HYDROGEOLOGICAL SITE INVESTIGATIONS
- REMEDIAL INVESTIGATIONS AND FEASIBILITY STUDIES
- HYDROGEOLOGIC MODELING
- GROUND-WATER DATA MANAGEMENT SYSTEMS

ENERGY

- GENERATION PLANT CONSTRUCTION & OPERATIONS
- PEAKING PLANT CONSTRUCTION & OPERATIONS
- TRANSMISSION & SUBSTATION PLANNING AND CONSTRUCT
- DISTRIBUTION SYSTEM MANAGEMENT
- SCADA DEPLOYMENT
- DISASTER RECOVERY (HURRICANE, FLOODING & TORNADOS)
- ENERGY TRADING
- FUEL LOGISTIC
- REGULATORY STRUCTURING AND COMPLIANCE
- RATE ANALYSIS AND DESIGN
- POWER PURCHASE AGREEMENTS
- INDUSTRIAL CLIENT MANAGEMENT
- BILLING AND CUSTOMER SERVICES FOR OVER 1.5M CLIENTS

GEOTECHINCAL ENGINEERING

- EARTHQUAKE ENGINEERING
- SEISMIC EVALUATIONS
- SLOPE STABILITY/EARTH RETAINING STRUCTURES
- GEOTECHINCAL SITE INVESTIGATIONS
- BOREHOLE AND SURFACE GEOPHYSICS
- SITE CHARACTERIZATIONS
- SOIL AND ROCK MECHANICS
- SOIL AND SITE IMPROVEMENT
- EXPERT WITNESS TESTIMONY

INVESTIGATION AND REMEDIATION OF CONTAMINATED SITES

- CERCLA REMEDIAL INVESTIGATIONS/FEASIBILITY STUDIES
- REMEDIAL DESIGNS
- CONTAMINANT TRANSPORT MODELING
- RCRA FACILITY ASSESSMENTS AND INVESTIGATIONS
- ENVIRONMENTAL SITE ASSESMENTS
- RECOVERY AND TREATMENT FACILITY DESIGNS
- WASTE TREATABILITY STUDIES
- RISK ASSESSMENT

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- EXPERT TESTIMONY

ADMINISTRATIVE AND REGULATORY ASSISTANCE

- PERMITTING REGULATORY COMPLIANCE
- CERCLA AND RCRA ANALYSIS/INTERPRETATION
- HAZARDOUS WASTE MANAGEMENT PLANS
- WASTE MINIMIZATION PLANS

AIR MANAGEMENT AND ODOR TREATMENT

- DESIGN, CONSTRUCTION, AND OPERATIONS OF AIR MANAGEMENT SYSTEMS
- DESIGN, CONSTRUCTION, AND OPERATION OF ODOR TREATMETNT SYSTEMS

REMEDIAL DESIGN AND CONSTRUCTION

- METHANE GAS COLLECTION AND TREATMENT SYSTEM
- LANDFILL GAS COLLECTION AND ENERGY SYSTEMS
- LANDFILL EXCAVATIONS AND GROUND RECOVERY
- GROUND-WATER RECOVERY AND TREATMENT
- ARSENIC REMEDIATION OF GOLF COURSES, NURSERIES, AND INDUSTRIAL FACILITIES
- CLEANUP OF CHEMICAL SPILLS
- CLEANUP OF GAS STATIONS, REFINERIES, AND FUEL DISTRIBUTION FACILITIES
- VACUUM RECOVERY OF PETROLEUM CONTAMINATED SOILS
- RECOVERY OF FREE PRODUCT
- BIOREMEDIATION OF ARSENIC CONTAMINATED SITES
- BIOREMEDIATION OF PETROLEUM CONTAMINATED SITES
- EXCAVATION, TRANSPORT, AND DISPOSAL OF CONTAMINATED SOILS

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4.0 COMPANY EXPERIENCE

MEP professionals have designed more than 20 earth dams and water treatment/distribution systems, designed, constructed, and/or operated over 250 solid and hazardous waste management projects at over 100 sites, and have completed more than 50 remediation and wastewater treatment projects. Discussions of several key projects are presented in Appendix Summaries of many projects are presented in Appendix C. The waste management projects cover a broad spectrum, including disposal, gasification, recycling, composting, waste transfer, and treatment facilities. Respected as the leaders of the environmental field, the MEP senior staff have worked closely with and provided technical guidance to several states in the U.S., and governments throughout the world.

MEP professionals are world class experts on lining system design, and have designed and permitted lining systems for MSW Landfills, Hazardous Waste Landfills, Methane Gas Collection Systems, Ponds, Surface Impoundments, Canals, Dams, and special applications.

MEP professionals have developed cost-effective and efficient gasification systems for solid waste and coal flyash. The systems include waste sorting and preparation, processing of the waste into Refuse Derived Fuel, Gasification, Energy Production, and Flue Gas Treatment. Flue Gas concentrations are more than 1,000 times cleaner than Incinerator flue gas concentrations, and are so clean that the US Government considers gasification a Green Technology. In addition, MEP has developed technologies to process the ash from gasification facilities into carbon free slag. These materials have market values that make the technology extremely cost effective.

The MEP professionals have also provided technical service on and are experts in the areas of wastewater treatment systems, water treatment systems, distribution network analysis, pipeline systems, CADD, structural engineering, earthquake engineering, geosynthetics, and ground improvements. These services include the design, construction, and operation of a water treatment plant and bottling plant in Karachi, Pakistan, the design and construction of wastewater treatment facilities, and the design and construction management of earth dams and water distribution systems.

As an industry leader and innovator of new technologies, MEP sets a higher standard of excellence for environmental management projects. The MEP professionals are experts in new environmental technologies, and can assist you as the Client to find the most cost-effective solution to your environmental needs.

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5.0 CONTACTS

In the event you are interested in obtaining additional information, or desire to contact representatives of MEP Holdings Company directly, the contact information is as follows:

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APPENDIX A

RESUMES OF KEY PROFESSIONALS

Neil D. Williams

Hazardous Waste Management
Remedial Design
Feasibility Studies
Constituent Transport
Solid Waste Management
Gasification of Solid Waste

EDUCATION:

- Doctor of Philosophy in Geotechnical Engineering (minors in Structural Mechanics and Mathematics), University of California at Berkeley, 1982;
- Master of Science in Geotechnical Engineering (minor in Structural Mechanics), Utah State University, 1979; and
- Bachelor of Science in Civil/Structural Engineering, Utah State University, 1977.

EXPERIENCE:

- 2017-present: Mobile Environmental Power, President and CEO
- 2014-present: Green^{3}Power Holdings Company, Green^{3}Power International Company, and Green^{3}Power Operations Company, President and CEO
- 2010-present: EnviroPower Management, President and CEO
- 2013-2014 : EnviroPower Renewable, Chairman and President
- 1998-present: Innviron Corporation, President and CEO.
- 2002-2014: Globex Engineering International, President and CEO.
- 2005-2006: Engineering Management Company International, President, CEO.
- 1997-2004: Globex Engineering & Development, President.
- 1988-1997: GeoSyntec Consultants, Inc., President and CEO.
- 1984-1988: Georgia Institute of Technology, Assistant Professor.
- 1982-1984: Woodward Clyde Consultants, Project Engineer.
- 1979-1982: University of California at Berkeley, Research Assistant.
- 1978-1979: Utah State University, Lecturer.
- 1977-1978: Civil Engineering Research Facility, Albuquerque, NM, Research Engineer.

REGISTRATIONS:

- Arizona (PE No. 27400);
- Arkansas (PE No. 7780);
- Florida (PE No. 44372);
- Georgia (PE No. 017984);
- Illinois (PE No. 062-048329);
- Indiana (PE No. C5028491);
- Kansas (PE No. 9920);
- Michigan (PE No. 6201038373);
- Mississippi (PE No. 13428);
- NCEES (PE No. 10221);
- New Jersey (PE No. 36378);
- New Mexico (PE No. 11127);
- Ohio (PE No. E-53616);
- Oklahoma (PE No. 17114);
- Pennsylvania (PE No. 042190R);
- Puerto Rico (PE No. 12496);
- South Carolina (PE No. 15504);
- Tennessee (PE No. 00103325); and
- Virginia (PE No. 023582).

QUALIFICATIONS:

Dr. Williams has performed research and consulting services in the environmental management area for over 20 years. These activities have included the design, remediation, or closure for more than 50 industrial facilities, CERCLA studies and designs, preparation of RCRA permits, remedial investigations and feasibility studies, hydrogeologic assessments, ground-water and constituent transport modeling, and design of ground-water recovery and treatment systems. Dr. Williams has developed numerical models to evaluate contaminant transport, recovery system efficiency, and the transport and recovery of pure phase liquids in both the saturated and unsaturated zones. In addition, Dr. Williams has provided expert testimony for several industrial clients on waste management facilities, has development design standards, requirements, and designs for industrial parks and facilities, and has worked with private industry to upgrade existing facilities to meet new environmental requirements, and implement environmental protection strategies.

Dr. Williams prepared more than 200 siting and permit applications, and has provided siting, design, permitting, construction management, and closure services for over 250 waste management facilities located in 25 states and 30 countries. These facilities have included municipal solid waste landfills (RCRA Subtitle D), hazardous waste landfills (RCRA Subtitle C), low level radioactive waste landfills, transuranic waste repositories, surface impoundments, leachate treatment systems, gas collection and disposal systems, surface-water management systems, closure systems, and end use plans. Dr. Williams has provided expert services and testimony at public hearings, siting hearings, and permit hearings at numerous facilities throughout the US. In addition, Dr. Williams provided expert testimony, performed constituent transport analyses and hydrogeologic assessments, and assisted in the permitting of the first deep geologic repository for disposal of transuranic waste permitted in the US.

Dr. Williams has designed and permitted the Mitrovica, Kosovo 12 MW plus 350 Tpd Gasification Diesel Power Plant, Lahore, Pakistan 36 MW, Karachi, Pakistan 4 x 120 MW, Peshawar, Pakistan 36 MW, Kinshasa DRC 3 x 108 MW, Lubumbashi DRC 108 MW, Lualaba 72 MW, Mbuji Mayi DRC 108 MW, Gortadroma, Ireland 36 MW, Accra, Ghana 144 MW, and Dar es Salaam 144 MW Waste Gasification Facilities. These designs included the design of the Sorting Facility, Tire Processing Facility, Refuse Derived Fuel preparation system, Gasifiers, Cyclone Units, Boilers, Steam Turbine/Generators, Acid Gas Removal Unit, Electrostatic Precipitator, Bag House with Upstream Carbon Injection, and Stacks. Dr. Williams managed the design studies and investigations, including the Waste Characterization Studies, preparation of the Waste Separation Plans, preparation of Solid Waste Permit Applications, preparation of Sorting/Gasification Design Report, Monitoring Plan, and Operations and Maintenance Plan, and Air Quality Modeling. In addition, Dr. Williams managed the preparation of the Air Quality Permit Applications and provided expert services for the permitting process. In addition, Dr. Williams and Benjamin Williams designed and developed the 1.2 and 6.6 Mobile Gasification Facilities and Mobile Gasification Diesel Production Facilities.

Dr. Williams also worked with the design team to develop the Gasification Synthetic Fuel Production System, and designed the Sharkia, Egypt 150 Tpd, Port au Prince 2,500 Tpd, Buckeye, Arizona 2,500 tpd, Imperial California 8,000 Tpd, and Costa Rica 150 Tpd Gasification Synthetic Fuel Production Facilities. These facilities were designed to convert municipal solid waste into a very high quality, sulfur free, synthetic diesel fuel. Production efficiencies varied depending primarily on waste characteristics.

Dr. Williams has also assisted in the development of environmental management regulations for several states and countries, and has assisted Municipal Governments to implement these new regulations. Dr. Williams was the Project Director for the Abu Dhabi environmental management projects, and for the Oman hazardous waste project. As such, Dr. Williams developed new environmental management regulations for the Municipality of Abu Dhabi, and the Government of Oman. Dr. Williams also assisted the Karachi Metropolitan Corporation to develop new solid and hazardous waste management regulations, and assisted the Municipality of Abu Dhabi to develop a Solid and Hazardous Waste Management Authority.

Dr. Williams has also performed research and consulting relating to soil/chemical interactions. These analyses led to the design of clay liners and slurry walls for hazardous waste management facilities and voluntary clean-up projects. Dr. Williams has developed equipment and analytical methods to evaluate changes in soil properties such as hydraulic conductivity, density, void ratio, Atterberg Limits, and effective diffusion, as well as transport and absorption characteristics of chemicals in various soils.

Dr. Williams also completed C&D waste and arsenic remediation projects for the Cameron Park II, Lantana Plaza, Port 5, Park Road, Atlas Lox Road, Dollyland, Misty Meadows, and Palm Beach Farm sites in Florida. These projects included soil and ground-water investigations, remedial design, soil removal actions, design and construction of ground-water recovery and treatment systems, and permitting of the remedial designs.

Dr. Williams has expertise in the design and implementation of recovery systems for nonaqueous phase liquids (NAPLs). He has developed two numerical models to evaluate the transport of NAPLs in soil. These models have been used to evaluate the cost effectiveness of remedial alternatives for NAPL recovery systems. Based on these analyses, Dr. Williams has designed innovative and cost-effective recovery systems for 3 refineries and over 20 industrial facilities.

While at the Georgia Institute of Technology, Dr. Williams developed new course materials for “Designing with Geosynthetics”, “Geotechnical Considerations in Hazardous Waste Containment”, “Soil Plasticity”, “Numerical Methods in Geotechnical engineering”, and “Advanced Soil Mechanics”. Dr. Williams also performed research on soil/chemical interaction, in-situ bioremediation, leachate generation in municipal solid waste and hazardous waste landfills, started the Geosynthetics Research Laboratory, and initiated over 20 research projects related to the design of containment systems using soil and/or geosynthetics. The primary geosynthetic-related research activities included design and evaluation of double liners for RCRA facilities, development of analytical methods for evaluation of slope stability of RCRA facilities, evaluation of the filtration characteristics of geotextiles in soil, evaluation of soil/geosynthetic interface friction, evaluation of soil/geosynthetic interaction pullout, development of new constitutive equations for interface elements, slope stability of reinforced slopes and walls, design of embankments with base reinforcement, evaluation of synthetic drainage composite flow properties, and evaluation of tension and compression creep of geosynthetics. In addition, Dr. Williams performed research on the design of final cover systems for low level radioactive waste facilities using geocomposite clay layers.

While a Research Assistant at the University of California at Berkeley, Dr. Williams performed research on the containment of high level radioactive waste in very low permeability clay soils. This included the design and assembly of a high temperature triaxial compression device, performing laboratory tests on sea floor sediments at temperatures ranging from 4 to 200 degrees Centigrade, and development of constitutive equations and analytical models required to describe sample deformations due to specific thermal and stress histories.

Prior to obtaining his Ph.D. degree, Dr. Williams was a Research Engineer with the Civil Engineering Research Facility in Albuquerque, New Mexico. During this time, he performed research work related to the migration of radionuclides through clay barriers, and the effects of high temperature on clay soils. In addition, Dr. Williams designed laboratory equipment to test the deformation characteristics of partially saturated soils subject to positive and negative air pressure pulses resulting from a nuclear explosion; designed, assembled, and tested a remote sensing aerial reconnaissance system for bomb damage assessment; designed radome coverings to withstand projectile perforation and penetration resulting from close proximity surface ordnance detonation; and designed an advanced wastewater treatment system that included fluidized bed, reverse osmosis, and conventional trickling filter systems.

AFFILIATIONS:

- American Society for Testing and Materials (ASTM) - member;
- American Society of Civil Engineers (ASCE) - member;
- International Geosynthetics Society (IGS) - member;
- Solid Waste Association of America (SWANA) - member;
- National Society of Professional Engineers (NSPE) - member; and
- Florida Engineering Society (FES) - member.

LIST OF PUBLICATIONS

N. D. WILLIAMS

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87-2 Williams, N.D., Pohland, F.G., McGowan, K.C., and Saunders, F.M., Simulation of Leachate Generation from Municipal Solid Waste, USEPA, HWERL, Contract CR 8125 80010, Mar 1987.

87-3 Still, K.L. and Williams, N.D., "Engineering Properties of Stitch-Bonded Geotextiles", Geotechnical Engineering Report, Georgia Institute of Technology, Nov 1987.

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90-4 Williams, N.D., and Badu-Tweneboah, K., "Design of Landfill Lining Systems on Sloping Waste Boundaries", Proceedings of the 1990 Annual Meeting of ASCE South Florida Section, Miami, FL, 14-15 Sept 1990.

91-1 Williams, N.D., and Badu-Tweneboah, K., "Design Considerations for the Closure of Wastewater Treatment Sludge Landfills", Proceedings of 22nd Ohio River Valley Soils Seminar on Design and Construction with Geosynthetics, Lexington, KY, 18 October 1991, pp. 10-1 to 10-15.

91-2 Weeks, N.D., and Williams, N.D., "Recovery of Fluids and Vapor in Fine-Grained Soils", Proceedings of Caribbean Haztech Environmental Conference & Exhibition, San Juan, Puerto Rico, 12-14 Nov, 1991.

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01-1 Williams, N.D., "Medical Waste Management," Proceedings of FECC Medical Waste Management Seminar, February 2001.

01-2 Williams, N.D., "Municipal Solid Waste Landfill Design," Training Manual for Solid Waste Authority, Abu Dhabi, March 2001.

01-3 Williams, N.D., "Remedial Design of Solid Waste Facilities," Training Manual for Solid Waste Authority, Abu Dhabi, March 2001.

01-4 Manzanera, I., and Williams, N.D., "A Comprehensive Solid Waste Management System," Proceedings of Oman Environmental Conference, June 2001.

02-1 Williams, N.D., and Orakzai, S., "Privatization of Solid Waste Management Facilities", Proceedings of Oman International Conference on Waste Management, Dec. 2002, pp. 31.

02-2 Williams, N.D., and Orakzai, S., "Integrated Hazardous Waste Management Facilities", Proceedings of Oman International Conference on Waste Management, Dec. 2002, pp. 26.

04-1 Liss, B., Noyes, D.G., and Williams, N.D., "Wastewater Treatment and Water Reuse Using One Moving Part Plant (OMPAPATM) Treatment System", Proceedings of the Algerian Water Conference, Dec. 2004, pp. 21.

05-1 Williams, N.D., and Homsy, J.G., "Laws, Regulations, and Environmental Standards for Wastewater Collection, Treatment, Reuse, and Discharge", Proceedings of Conference of Water Management, Euro University Conference, Manama, Bahrain, 6 June 2005.

08-1 Williams, N.D., Liss, B., Roberts, T.R., Williams, B.M., and Aguayo, R., "Medical Waste Management and Treatment", San Paolo Waste Management Conference, 25 July 2008.

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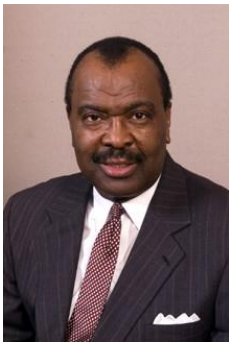
11-1 Wilson, B.W., and Williams, N.D., "Solid Waste to Energy Conversion: Renewable Energy for the US Military", AUSA Conference, 2011.
11-2 Harbor, G., Wilson, B.W., Williams, N.D., and Moll, F.J., "Installation Level Waste to Energy Electrical Generation Facility: The Business Case for Fort Knox", AUSA Conference, 2011.
11-3 Wilson, B.W., and Williams, N.D., "Technical and Economic Comparison of Reciprocating Engines and Boiler/Steam Turbines for Conversion of Synthesis Gas to Electrical Energy n a Gasification Facility", Conference Presentation, 2011.
12-1 Wilson, B.W., Williams, N.D., "A Comparative Assessment of Commercial Technologies for Conversion of Solid Waste to Energy", Conference Presentation, 2012.
17-1 Williams, N.D., and Williams, B.M., "Properties of Refuse Derived Fuel (RDF)", DRC Renewable Energy Conference, Kinshasa, DRC, 2017.
17-2 Williams, N.E., and Williams, B.M., "Gasification Power Plant Infrastructure Projects Funded by Sovereign Guarantee Bond Non-Recourse Investment Program in Democratic Republic of Congo (DRC)", Renewable Energy Conference, Finance Session, Kinshasa, DRC, 2017.



Biography
Lieutenant General Joe N. Ballard, US Army (Retired)
President and Chief Executive Officer
The Ravens Group, Inc

LTG Ballard is the Founder, Chief Executive Officer of The Ravens Group, Inc. The Ravens Group is a full function Consulting and Management Service Company located in Washington, DC and Lanham, MD. LTG Ballard has skillfully guided rapid growth of the company with a focus on Project Management, Financial Management Consulting, Cyber Security, IT and Training Services.

His last military assignment was as the 49th Chief of Engineers and Commander, United States Army Corps of Engineers. He was appointed to this prestigious position in 1996 by William Clinton, the President of the United States. In that capacity, LTG Ballard managed all missions for the Corps of Engineers including the nation's vast civil works program, environmental restoration and construction on military installations with a budget totaling more than $16 Billion. His strong leadership guided the Corps in assisting recovery from natural disasters, regulating work in the nation's waterways and wetlands, conducting research and development, serving as the Army and Air Force real estate agent, and providing engineering services to 60 other federal agencies and more than 80 other nations.

Prior to his appointment as Chief of Engineers, LTG Ballard was the Chief of Staff for the United States Army Training and Doctrine and as such was responsible for headquarters and installation operations, training and budget management for over twenty major training and operational bases throughout the United States. Immediately before being selected as Chief of Staff, he served as the Commander of the United States Army Engineer Center at Fort Leonard Wood, Missouri. In that role he was the Army's engineer proponent for combat and combat support systems, training and doctrinal matters.

LTG Ballard earlier commanded the 18th Engineer Brigade in Germany which at the time was the Army's largest and most experienced combat, construction and topographic engineer troop unit. Additionally, he commanded the 82nd Combat Engineer Battalion also located in Germany. He served two combat tours in Viet Nam.

LTG Ballard's military honors include the Distinguished Service Medal, Legion of Merit (three awards), Bronze Star Medal (two awards), Defense Meritorious Service Medal and the Meritorious Service Medal (four awards).

He graduated from Southern University in Baton Rouge, La., in 1965 with a bachelor's degree in Electrical Engineering, and was immediately commissioned into the Army Corps of Engineers. He later earned a Master's Degree in Engineering Management from the University of Missouri. He is a graduate of the Army Command and General Staff College and the Army War College. He is a registered professional engineer in civil engineering. He holds a number of honorary degrees, including an Honorary Doctorate of Law from Lincoln University, Jefferson City, Mo., an Honorary Doctorate of Engineering Degree from the University of Missouri in Rolla, Mo., and an Honorary Doctorate in Engineering from Southern University, Baton Rouge, La.

In addition to his military honors, the Council of Deans of Historically Black Colleges and Universities and the Career Communications Group recognized him as the 1998 Black Engineer of the Year. He was also the 1998-1999 president of the Society of American Military Engineers and a member of the National Engineering Honor Society, Tau Beta Pi.

BENJAMIN WILLIAMS

Financial Analysis
Solid Waste Financial Modeling
Business Management
Contract Development
Equipment Acquisitions and Maintenance

EDUCATION

- Bachelor of Science in Business Economics, Weber State University, 2005.

EXPERIENCE

- 2017-present: Mobile Environmental Power, Principal, Vice President, Board Member
- 2014-present: Green^{3}Power, Controller, Vice President of Finance, Board Member
- 2010-present: EnviroPower Management, Controller, Vice President of Finance, Board Member
- 2012-2014: EnviroPower Renewable, Vice President of Finance, Board Member
- 2005-present: Innviron Corporation, Controller, Vice President of Operations
- 1999-2003: Globex Engineering & Development, Manager of CADD Group
- 1995-1996: GeoSyntec Consultants, Manager of CADD Group

QUALIFICATIONS

Benjamin Williams prepared and analyzed financial models for the solid waste management projects, including the Barka Region, Dhofar Region, Interior Region of Oman, Karachi, Amman Jordan, North Region of Jordan, Aqaba Jordan, Antalya Turkey, Antakya Turkey, and Adana Turkey, Cordoba and Villa Maria, Argentina, Quito Ecuador, Dhaka, Bangladesh, Sumpter, Indonesia, Trivandrum, Calicut, and Chennai, India, Accra, Ghana, Cotonou, Benin, and Las Vegas, NV, Fort Knox, KY, and West Palm Beach, FL, USA. Mr. Williams computed cost factors and prepared estimates used for profitability calculations and forecasting. Mr. Williams also analyzed blueprints, specifications and proposals for planning, scheduling, and organizing work for the solid waste management projects. In addition, Mr. Williams managed internal controls to maximize cash flows, control spending, and increase revenues. Mr. Williams Prepared balance statements, cash flows, income statements, and other key financial documents to analyze and provide leadership in strategic planning, budget analysis, and policy development.

Mr. Williams has 7 years experience in contract administration, successfully managing contracts, purchasing, negotiating, and procurement actions in the environmental engineering/solid waste management field. In addition, Mr. Williams is experienced in the environmental and construction industry as a team leader in legal compliance of government contracts, development of joint agreements, RFPs, and contract 'Terms and Conditions.' Mr. Williams has an excellent background in contract administration for solid waste facilities. Also, Mr. Williams has strong abilities in contract negotiations, dispute resolution, decision making,

and the management of the project site and associated personnel. Mr. Williams also has experience in contract compliance, contract modification, and change orders.

Mr. Williams has organized and managed accounting systems for the Innviron offices and subsidiary companies. He organizes and prepares the operating expenses, accounts payable, accounts receivable, and invoices for the different offices and subsidiary companies of the organization. Mr. Williams also prepares and maintains the payroll for the offices and organizes the tax documents. Mr. Williams manages the network accounting and management systems between the offices and subsidiary companies and determines ways to improve on efficiency and cost between the offices.

Mr. Williams has managed the solid waste operations and prepared the operations plans and guidance documents for the solid waste operations in Villa Maria 30 MW Gasification Facility, Zahle Landfill, Sorting Facility and Compost Plant, Iskenderun Landfill, Sorting Facility, and Compost Plant, Atlas Lox Road MRF, Las Vegas 30 MW Gasification Facility, College Avenue MRF, Manatee Management MRF, Quito 60 MW Gasification Facility, and Panama City 50 MW Gasification Facility. Mr. Williams has managed the CADD Group, and has supervised the preparation of the Engineering Drawings and Construction Specifications, and has managed the acquisition and maintenance of the solid waste management equipment for the landfill, sorting facility, compost plant, transfer stations, and gasification facilities.

Garen Demirchian, PE

Managing Principal

Education

- B.S., Mechanical Engineering, Northeastern University, 1983

Registrations

- Professional Engineer (Mechanical): AL, AZ, CA, CT, FL, GA, MA, MD, ME, NH, NJ, NM, NV, NY, OH, PA, TX, VT

Professional Activities

- International District Energy Association (IDEA)

Presentations

- IDEA Annual Conference, "The Benefits of Higher Condenser Water"
- IDEA Campus Energy Conference, "University of Massachusetts Central Heating Plant", 2008
- IDEA 21st Annual Campus Energy Conference, "CHP at Eastern Maine Medical Center, 2008
- IDEA 24th Annual Campus Conference, "Yale University School of Medicine, Innovation Marks MEP Design for New CHP Plant", 2011

Publications

- Demirchian, Garen and Marion, Michael. "UMass CHP Project: Campus System a Technical and Environmental Model." District Energy, Fourth Quarter 2007.
- Demirchian, Garen and Bennett, Bruce. "Power System Grows to Meet Hospital Needs." Energy & Power, August 2007.

Overview

Garen is a Managing Partner and the Sector Leader for Vanderweil's Power Group. He has significant expertise in cogeneration, central and district heating and cooling plants, control and instrumentation systems, campus distribution networks, energy conservation analysis, and thermal storage systems. His responsibilities have involved the management, engineering, coordination, and execution of all phases of design from concept through construction and startup.

Related Project Experience

- **City of Los Angeles/Constellation Energy, Digester Gas Utilization Project CHP, Hyperion Wastewater Treatment Plant, *Los Angeles, CA***

Project Principal for a $115M, 27 MW new and innovative style of CHP. The CHP will use cleaned digester gas produced at the Plant mixed with natural gas to provide renewable energy using turbine engines and HRSGs as the prime movers. The CHP will supply all of Hyperion's electricity and steam needs and will be retrofit into an existing structure, involving complex engineering and construction challenges. The CHP will be complete and operating in mid-2016.

- **Kimberly-Clark Corporation, CHP Cogeneration Project, *New Milford, CT***

This project is 35 MW cogeneration plant addition to a manufacturing plant. The cogen plant meets the electric and thermal energy needs of this plant, plus allows them to export electricity into the grid. Two (2) 15 MW Combustion Turbine Generators (CTG) and a condensing type 4,200 kW steam turbine generator produce power for the paper mill and export to the grid.

- **Hoffmann-LaRoche, Cogen Repowering Project, *Nutley, NJ***

Engineering and design for a 10 MW cogeneration retrofit project involving the replacement of three LM500 engines with two solar turbines Taurus 60. Required integration with existing auxiliary systems and close coordination with HRSG supplier.

- **Malden Mills, Cogeneration Facility, *Lawrence, MA***

A new 9 MW cogeneration plant to provide steam and electricity from one process to significantly reduce energy costs. The facility consists of two 4.5 MW Solar gas turbines which provide the textiles mill with the majority of its electric and steam requirements. The system runs parallel with the utility to minimize requirements for costly switching equipment. The US Department of Energy (DOE) has declared the facility a test site for the use of Dry Low NOx combustor technology which utilizes the latest developments in combustion turbines utilities ceramic liners.

- **Massachusetts Institute of Technology, Central Heating Cooling and Cogeneration Plant, *Cambridge, MA***

Upgrades to the central heating plant included a 60,000 lb/hr temporary boiler, a new 150 MM Btu/hr hot water conversion plant to serve a new hot water distribution, combustion inlet air cooling for the ABB GT-10 20 MW cogen plant, addition of 4,000 tons of cooling and reparation of the 16.5 CUP cogen expansion package consisting of three Solar Taurus 60 combustion turbine units with HRSG.

- **Middlesex County Utility Authority, Waste Water Treatment and Landfill Facility, *Sayreville, NJ***

Design of 20 MW combined cycle power plant at waste water treatment and landfill facility. The new plant includes two Solar Taurus 60 units and a single 10 MW steam turbine generator and utilizes municipal landfill gas as the primary fuel.

VANDERWEIL POWER GROUP

- Demirchian, Garen and Bennett, Bruce. “Eastern Maine Medical Center: Vital Needs.” Cogeneration and On-Site Power, January/ February 2007.
- Published paper at IDEA 88th Annual Conference: The Benefits of Higher Condenser Water at Logan International Airport Central Chilled Water Plant

- **Molycorp Minerals, LLC, Cogeneration Plant, *Mountain Pass, CA***
49 MW CHP Plant for Molycorp rare earth mining/chemical process facility in Mountain Pass, CA. Vanderweil is the Engineer of Record and provided major equipment procurement, air permitting pre-construction, construction management, start-up, and commissioning. The project comprised of four (4) combustion turbine generators with HRSGs providing 520,000 pph / 300 psig steam with all associated balance of plant (BOP) systems including buildings and utility distribution.
- **New York University, Cogeneration Plant Expansion, *New York, NY***
The existing central utilities plant was expanded to provide electrical power to 30 buildings while also supplying chilled water to 20 buildings and heat to 40 buildings. The new plant capacity has 13.4 MW of gas and steam turbines with 140 MMBtu/hr heating capacity via two new combustion gas turbines and heat recovery steam generators. Fourteen new substations were added to distribute 4160V electrical power to 23 new buildings.
- **Schering-Plough Corporation, Cogeneration Plant, *Union, NJ*** Design and engineering services for the installation of one gas turbine coupled with heat recovery steam generator (HRSG). The new HRSG product is designed to 25,000 unfired, and 60,000 lb/hr supplementary fired with duct burners. HRSG is designed to fresh air fire duct burners while gas turbine is off line to produce 60,000 lb/hr of 125 psig steam.
- **University of Massachusetts, Central Heating Plant, *Amherst, MA***
Design of a new 475,000 lbs/hr boiler plant and 10 MW cogeneration facility at the University of Massachusetts Amherst Campus. The project included a Vanderweil-directed team of engineers and architects to evaluate four different locations for the new plant and develop a design which fits within the fabric of the University and reflects elements of some of the surrounding buildings and campus features.
- **Yale School of Medicine, Sterling Power Plant, Central Heating Plant Cogeneration, *New Haven, CT***
Design of a new 15 MW cogeneration plant including two 7.5 MW turbines and heat recovery steam generators, 5 MW future combustion turbine generator, two (2) HRSGs with 190,000 pph steam generation, and balance of the plant ancillaries. A control room is located inside the newly created plant room.

Joel R. Oppenheim

Human Resources Management
Organizational Development
Strategic Planning
Financial Management
Risk Management
Business Operations

EDUCATION:

- BS Degree, Education – Oglethorpe University, Atlanta, Georgia, 1970.
- MS Degree, Administration, Finance, Education - University of Bridgeport, Bridgeport, Connecticut, 1973.

EXPERIENCE:

- 2017-present Mobile Environmental Power, CAO
- 2014-present Green^{3}Power Holdings Company, Green^{3}Power International Company, and Green^{3}Power Operations Company, Chief Administrative Officer;
- 2010-present EnviroPower Management, Chief Administrative Officer;
- 2008-present Innviron Corporation, Chief Administrative Officer;
- 2005-2008 Pelican Bay Development, Executive VP, COO;
- 2004-2005 Kaye Homes, VP Human Resources Development, VP Quality Assurance & Compliance;
- 2003-2004 London Bay Homes & Romanza Interior Design, Director of Human Resources;
- 2001-2003 Titan Custom Homes, Inc., Director of Human Resources;
- 1999-2004 Paradise Food & Beverage, Inc., CFO/Operations;
- 1992-1996 Superintendent of Schools, New Jersey, CEO, Secretary to Board, Chief Legal Officer;
- 1982-1992 School District, New Jersey, CFO, COO, Assistant Superintendent for Business, Chief Legal Officer;
- 1979-1982 School District, New Jersey, Assistant CFO, School Business Administrator; and
- 1973-1979 School District, New Jersey, Classroom Teacher and Media Specialist.

EXPERIENCE AND QUALIFICATONS:

Mr. Oppenheim brings to the firm a wealth of knowledge and experience in various disciplines of organizational development, planning, fiscal and risk management, human resources management, and general business operations. In addition, Mr. Oppenheim has extensive experience in the financial management, financing, and financial modeling of solid waste management facilities and projects, including waste to

energy projects. This includes projects in Las Vegas, NV, Ft. Campbell, TN, Logansport, IN, Mitrovica, Kosovo, Lahore, Pakistan, Imo State and Lagos, Nigeria, Gortadroma, Ireland, Ga South, Ghana, Mexico City and Villa Hermosa, Mexico, and Panama City and David, Panama.

For the past 6 years, Mr. Oppenheim has worked extensively with Innviron Corporation, EnviroPower Management, and Green^{3}Power to obtain financing for acquisitions and privatization of solid waste management facilities. As part of the financing due diligence process Mr. Oppenheim was significantly involved in the financial analysis of solid waste operations at existing sites targeted for acquisition as well as working through numerous pro formas for acquisitions and start-up operations.

Mr. Oppenheim has performed financial due diligence on the acquisitions, and has helped to prepare and evaluate the financial models for the international privatization projects. Additionally, has worked directly with the CEO and COO to develop the organization structure and systems required to expand the company into operations and construction.

Throughout his professional career responsibilities have included all aspects of Human Resources**;** oversight of all financial accounting practices and controls; corporate information technology systems and administration; and oversight of asset management and the daily internal operations of corporate activities. In his capacity as Chief Operating Officer of Pelican Bay Development Mr. Oppenheim was responsible for all aspects of the daily operation of the firm, reporting directly to the President/Chief Executive Officer. These responsibilities included:

- Corporate staff management;
- Operations management;
- Human Resources functions and service;
- Corporate training;
- Long range planning;
- Organizational Strategic Planning and Infrastructure.
- Development and implementation of corporate policies,;
- Recruitment and retention;
- Employee relations;
- Compensation planning and administration;
- Health benefits administration and planning;
- Insurance/risk management;
- Retirement plan administration and trustee;
- Consulted with and trained management team in the performance review of employees;
- Responsible for maintaining communication with corporate legal counsel on all pending litigation;
- IT oversight; and
- Financial/Accounting management.

Prior to joining Pelican Bay Developments, Mr. Oppenheim worked with residential developers/builders in the Southwest Florida market. His experience in this area ranged from high volume production construction of single family homes to semi-custom construction/development and high-end luxury custom homes. Joel also owned a highly successful small business in the Naples community for several years.

Prior to moving to Naples, Florida, Mr. Oppenheim had a successful career as a professional educator for more than twenty-five years. Joel served not only as a classroom teacher and school-based administrator, but was also a respected Chief Financial Officer and Superintendent of Schools. He brings large project management knowledge from school construction experience to commercial development along with his expertise in operations management and dealing with public and private sector issues.

Mr. Oppenheim was born in New York City; received his Bachelor of Science Degree from Oglethorpe University in Atlanta, Georgia and a Masters of Science Degree from the University of Bridgeport in Connecticut. He has done post graduate work in Strategic Planning, Organizational Development and Operations Management at Rutgers University, Emory University and Rider College and received Strategic Planning Certification from the Cambridge Institute.

Joel has been active in numerous professional organizations throughout his career such as Phi Delta Kappa, National and State Professional Associations and service to local zoning and publicly elected Boards of Education. Joel has been a requested public speaker and presenter at workshops, seminars and conferences throughout his professional career.

Joel is actively involved as a volunteer for non-profit charitable organizations such as the Guadalupe Center of Immokalee, Collier County, Florida and the Naples Children & Education Foundation, host of the annual Naples Winter Wine Festival that provide funding for educational programs and social services to disadvantage and poverty stricken children and families in Southwest Florida.

EXECUTIVE SUMMARY

Thirty years experience in the public and private sectors of business, education, finance and development. Demonstrated competencies in leadership, corporate staff management, financial oversight, organizational development, strategic planning and human capital asset administration.

AFFILIATIONS:

- Phi Delta Kappa International
- Society for Human Resource Management
- American Association of Chief School Administrators
- National Association of School Business Officials
- Association for Supervision and Curriculum Development
- International Council of Shopping Centers

Johnathan Coleman, P.Eng

Engineering Principal

Education

- BaSc., Electrical Engineering, University of Waterloo, Canada

Registrations

- Professional Engineer: Ontario PEO #90290370 British Columbia AOEG #35632

Professional Activities

- International District Energy Association (IDEA), past Board Member

Overview

Johnathan has over 25 of international construction and engineering management and sales experience in the power, gas, and heavy industrial fields. Mr. Coleman has special expertise in Project Management, Contract Negotiation Finance, and Business Development.

Related Project Experience

- **Hudson Yards, Cogeneration and Chiller Project, *New York, NY***
Engineer of Record for a new 12 MW cogeneration project with 4,800 ton chilled water plant. Project includes four natural gas reciprocating engine generators with four direct-fired absorption chillers and two electrical centrifugal chillers.

- **Kimberly-Clark Corp., Energy Independence Project, *New Milford, CT***
Construction Administration and Start-up Engineering of a new 35 MW cogeneration plant addition to a North American manufacturing plant. The cogen plant meets the electric and thermal energy needs of this plant, plus allows them to export electricity into CP&L grid. Thermal energy is used in the machine process and in a 4,200 kW steam turbine generator for electricity export.

- **Molycorp Minerals, LLC, Cogeneration Plant, *Mountain Pass, CA***
Owner's Engineer and Project Executive for engineering, procurement, and construction of a new Rare Earth Oxide processing facility and 50 MW combined heat and power plant (4 x Solar Titan 130 combustion turbine generators). Role included technical and commercial support of a $400 million IPO and management of investors' due diligence team.

- **New York University, Cogeneration Project, *New York, NY***
Construction Administration and Start-up Engineer for a new 13.4 MW cogeneration plant consisting of two combustion gas turbines, heat recovery steam generators, and a steam turbine generator.

- **New York University Langone Medical Center, Cogeneration Project, *New York, NY***
Owner's Engineer for peer review and design completion of a new 10 MW cogeneration project with 7.9 MW combustion turbine generator with heat recovery steam generator, 2.5 MW steam turbine generator, and two backup boilers.

- **One City Block, LLC (Google), Cogeneration Plant, *New York, NY***
Engineer of Record for a new 8 MW cogeneration plant consisting of a Solar Taurs 70 with unfired heat recovery steam generators. Steam system designed for regular export to local steam utility.

- **University of Maine, Utility Study, *Orono, ME***
Evaluated campus utility system to predict electrical and steam cost savings for several scenarios including a 3.9 MW condensing steam turbine generator (STG), a 3.5 MW conventional CTG, a 3.9 MW recuperated CTG, and a 5.6 MW extraction STG. A financial NPV comparison was performed for each scenario constructed on the East Campus and on the West Campus.

- **Yale School of Medicine, Sterling Power Plant, Central Heating Plant Cogeneration, *New Haven, CT***
Construction Administration and Start-up Enginering of a new 15 MW cogeneration plant including two 7.5 MW turbines and heat recovery steam generators, 5 MW future combustion turbine generator, two (2) HRSGs with 190,000 pph steam generation, and balance of the plant ancillaries. A control room is located inside the newly created plant room.

Prior Experience

- **Casco, London Cogeneration Project, *London, Ontario***

Project Manager responsible for the engineering, construction and start-up of a 13 MW Cogeneration installation at the Casco London Facility.

- **CES Landfill (DCO Energy), *Frailey, PA***

Project Manager for design and engineering of a 10MW landfill gas fired power generation project based upon two Solar Taurus 60 gas turbines in Mobile Package configurations.

- **Dartmouth Power, *Dartmouth, MA***

Power Engineering Consultant and Construction Manager for the engineering, procurement, and construction of a GE LM2500 25MW gas turbine generator addition to an existing 80 MW combined cycle peaking plant.

- **Easton Municipal Utility, *Easton, MD***

2 x 5.5 MW gas turbine generator sets in simple cycle peaking application.

- **Lake Superior Power, Cogeneration Project, *Sault Ste. Marie, Ontario, Canada***

Involved in the initial engineering phases and electrical construction review of the 102 MW Cogeneration project. Installation included two LM6000 gas turbine generators.

- **PEI Landfill, *Archbald, PA***

Project Manager for design and engineering of a 9 MW landfill gas fired power generation project based upon two Solar Mercury 50 gas turbines.

- **Pepco Energy Services, Landfill Gas, *Rolling Hills, PA***

5.5 MW gas turbine generator set in mobile package application for landfill gas service.

- **Rainy River Forest Products, Repowering Project, *Fort Francis, Ontario***

Project Manager for the removal, overhaul, and replacement of the Westinghouse 50 MW Gas Turbine Generator and Westinghouse 50 MW Steam Turbine Generator.

- **S.C. Johnson (Northern Power Systems), *Racine, WI***

2 x 3.5 MW gas turbine generators in CHP application with landfill gas.

- **TransCanada PipeLines, North Bay Power Plant, *North Bay, Ontario***

Involved with the initial engineering phases of a 150 MW cogeneration project with a Westinghouse 501D “Econo Pack” CTG.

- **University of Medicine and Dentistry of New Jersey, *Newark, NJ***

Consultant for the feasibility study and development of a 10 to 16 MW cogeneration plant upgrade in an operating plant.

- **University of Toronto, Cogeneration Project, *Toronto, Ontario***

Managed construction of a 7.3 MW Cogeneration Installation at the University of Toronto, St. George Steam Plant. The installation included an EGT Tornado gas Turbine/generator set, and an ABCO HRSG.

- **University of Vermont, Central Heating Plant, *Burlington, VT***

Project Manager for the design of a new 64,000 lb/hr boiler, plant master control system in an operating plant and conversion of the existing HTHW distribution system to a high pressure steam loop.

- **West Windsor Power, Cogeneration Project, *Windsor, Ontario, Canada***

Engineering and construction review of the 104 MW cogeneration project. Installation included an ABB steam and ABB gas turbine/generator.

APPENDIX B

DESCRIPTIONS OF KEY PROJECTS

APPENDIX B

Appendix B summarizes some of the key projects on which MEP Holdings Company, MEP International Company, and MEP Operations Company (MEP) personnel have played a significant role.

CONSTRUCTION AND DEMOLITION (C&D) PROJECTS

PROJECT NAME: Delta Transfer Corporation Transfer Station and Sorting Facility
OWNER: Delta Transfer Corporation
LOCATION: Pompano Beach, Florida, USA
PROJECT DESCRIPTION:

JR Capital has operated the collection and transport services for the Delta Transfer Corporation in Pompano Beach, Florida. JR Capital has operated 38 trucks from January 1998 to June 2001, collecting and transporting approximately 900 tons/day of municipal solid waste and construction & demolition debris.

JR Capital and its affiliate company Star Services Group, Inc., has completed the construction of a Sorting Facility and Transfer Station for municipal solid waste at the Delta Transfer Corporation. The Sorting Facility and Transfer Station process 900 tons/day of municipal solid waste. Recyclables are separated, baled, and transported to recycling companies for sale in the national in international markets. The Transfer Station construction was completed in 1999 at a cost of $1.14 M. The Sorting Facility was completed in 2001 at a cost of $3.66 M. The work included all phases of construction, including earthwork, building construction, and construction of the Sorting Lines and waste processing equipment.

MEP PERSONNEL provided the design of the Sorting Facility and Transfer Station, and has managed the operation of the facilities for the period from January 1998 to June 2001.

PROJECT NAME: Delta Resources Corporation Transfer Station and Landfill
OWNER: Delta Resources Corporation
LOCATION: Titusville, Florida, USA
PROJECT DESCRIPTION:

JR Capital has operated the collection and transport services for the Delta Resources Corporation in Titusville, Florida. JR Capital has operated 25 trucks from January 1998 to June 2001, collecting and transporting approximately 600 tons/day of municipal solid waste and construction & demolition debris.

JR Capital and its affiliate company Star Services Group, Inc., constructed cells of the Delta Titusville Landfill in 2000 ($1.47M), 2001 ($0.83M), and 2002 ($0.85M), and closed the landfill in 2003 ($1.29M). The Transfer Station was constructed in 1998 at a cost of $0.96M). The Landfill and Transfer Station processed approximately 600 tons/day of solid waste.

MEP PERSONNEL prepared the design, permitted the construction, and managed the construction of the landfill and transfer station. MEP Personnel managed the operation of the landfill for JR Capital from January 1998 to June 2003.

PROJECT NAME: Delta Tall Pines Corporation Transfer Station and Sorting Facility
OWNER: Delta Tall Pines Corporation
LOCATION: West Palm Beach, Florida, USA
PROJECT DESCRIPTION:

JR Capital has operated the collection and transport services for the Delta Tall Pines Corporation in West Palm Beach, Florida. JR Capital has operated 17 trucks from January 1998 to June 2001, collecting and transporting approximately 400 tons/day of municipal solid waste and construction & demolition debris.

JR Capital and its affiliate company Star Services Group, Inc., constructed the Transfer Station and Sorting Facility at the Delta Tall Pines Facility in West Palm Beach, Florida. The construction of the Transfer Station was completed in 1999 at a cost of $0.75M. The construction of the Sorting Facility was completed in 2001 at a cost of $1.65M. The Transfer Station and Sorting Facility processed approximately 400 tons/day of municipal solid waste. The construction included all phases of construction, including earthwork, building construction, and construction of the Sorting Lines and waste processing equipment.

MEP personnel performed the design, permitted the construction, and performed construction management for the Transfer Station and Sorting Facility. MEP Personnel managed the operation of the facilities from January 1998 to June 2001.

PROJECT NAME: Atlas Homestead Sorting Facility and Landfill
OWNER: Atlas Homestead Corporation
LOCATION: Homestead, Florida, US
PROJECT DESCRIPTION:

JR Capital has operated the collection and transport services for the Atlas Homestead Corporation in Homestead, Florida. JR Capital has operated 17 trucks from June 1996 to 2001, collecting and transporting approximately 400 tons/day of municipal solid waste and construction & demolition debris.

JR Capital constructed the Atlas Homestead Sorting Facility and Landfill. The Sorting Facility was initially constructed in 1997, and the first cell of the landfill was constructed in 1996. However, JR Capital completed significant expansions of the Sorting Facility in 2002 ($0.86M), and expansions of the landfill in 2003 ($0.76M), 2005 ($0.83M), and 2007 ($1.47M). The facilities processed more than 400 tons/day of municipal solid waste. The work included all phases of construction, including earthwork, building construction, and construction of the Sorting Lines and waste processing equipment.

MEP personnel designed, permitted, and performed construction management for the expansion of the Sorting Facility and Landfill. In addition, JR Capital and MEP personnel have managed the operation of the Sorting Facility and Landfill from June 1996 to 2001

PROJECT NAME: Atlas Davie Transfer Station and Sorting Facility
OWNER: Atlas Davie Corporation
LOCATION: Davie, Florida, USA
PROJECT DESCRIPTION:

JR Capital has operated the collection and transport services for the Atlas Davie Corporation in Davie, Florida. JR Capital has operated 38 trucks from June 1996 to 2001, collecting and transporting approximately 900 tons/day of municipal solid waste and construction & demolition debris. Atlas Davie Corporation currently leases out the facilities.

JR Capital constructed the Atlas Davie Transfer Station and Sorting Facility. The Transfer Station was constructed in 1997 at a cost of $1.37 M. The Sorting Facility was constructed in 2002 ($2.69M), and was significantly expanded in 2005 ($1.83M). The construction included all phases of construction, including earthwork, building construction, and construction of the Sorting Lines and waste processing equipment. The Transfer Station and Sorting Facility process approximately 900 tons/day of municipal solid waste.

MEP personnel designed, permitted, and performed construction management for the expansion of the Sorting Facility and Transfer Station. In addition, MEP personnel have managed the operation of the Sorting Facility and Transfer Station from June 1996 to 2001.

PROJECT NAME: Atlas Riviera Beach Transfer Station and Sorting Facility
OWNER: Atlas Riviera Beach Corporation
LOCATION: Riviera Beach, Florida, USA
PROJECT DESCRIPTION:

JR Capital has operated the collection and transport services for the Atlas Riviera Beach Corporation in Riviera Beach, Florida. JR Capital has operated 25 trucks from June 1996 to 2001, collecting and transporting approximately 600 tons/day of municipal solid waste and construction & demolition debris. Atlas Riviera Beach Corporation currently leases out the facility.

JR Capital constructed the Atlas Riviera Beach Transfer Station and Sorting Facility. The Transfer Station was constructed in 1997 at a cost of $1.02 M. The Sorting Facility was constructed in 2003 ($2.11M), and was significantly expanded in 2007 ($1.63M). The construction included all phases of construction, including earthwork, building construction, and construction of the Sorting Lines and waste processing equipment. The Transfer Station and Sorting Facility process approximately 600 tons/day of municipal solid waste.

MEP personnel designed, permitted, and performed construction management for the expansion of the Sorting Facility and Transfer Station. In addition, MEP personnel have managed the operation of the Sorting Facility and Transfer Station from June 1996 to 2001.

PROJECT NAME: Atlas Naples Transfer Station and Sorting Facility
OWNER: Atlas Naples Corporation
LOCATION: Naples, Florida, USA
PROJECT DESCRIPTION:

JR Capital has operated the collection and transport services for the Atlas Naples Corporation in Naples, Florida. JR Capital has operated 25 trucks from January 1998 to 2001, collecting and transporting approximately 600 tons/day of municipal solid waste and construction & demolition debris.

JR Capital constructed the Atlas Naples Transfer Station and Sorting Facility. The Transfer Station was constructed in 1997 at a cost of $0.97 M. The Sorting Facility was constructed in 2001 ($1.88M), and was significantly expanded in 2005 ($1.26M). The construction included all phases of construction, including earthwork, building construction, and construction of the Sorting Lines and waste processing equipment. The Transfer Station and Sorting Facility process approximately 600 tons/day of municipal solid waste.

MEP personnel designed, permitted, and performed construction management for the expansion of the Sorting Facility and Transfer Station. In addition, MEP personnel have managed the operation of the Sorting Facility and Transfer Station from June 1996 to 2001.

PROJECT NAME: Atlas Lox Road Solid Waste Management Facility
OWNER: Atlas Lox Road Corporation
LOCATION: Parkland, Florida, USA
PROJECT DESCRIPTION:

JR Capital has operated the collection and transport services for the Atlas Lox Road Corporation in Parkland, Florida. JR Capital has operated 63 trucks from June 1996 to 2001, collecting and transporting approximately 1,500 tons/day of municipal solid waste and construction & demolition debris. The Atlas Lox Road Corporation currently leases out the Facilities.

JR Capital constructed the Atlas Lox Road Sorting Facility, Compost Facility, and Landfill. The initial phase of the landfill was constructed in 1996. The first phase of the Sorting Facility was constructed in 2000. The Landfill was expanded in 1998 ($1.51M), 2000 ($1.57M), 2002 ($1.66M), 2004 ($1.65M), and 2006 ($1.85M). The Sorting Facility was significantly expanded in 2006 at a cost of $3.38 M. The Compost Plant was constructed in 2006 and 2007 at a cost of $2.28M. The Compost Plant included a sludge processing and drying facility. The facilities handled more than 1,500 tons/day of solid waste. In addition, MEP personnel were responsible for all aspects of the management and operation of the facilities, including financial management and planning, collection and transport, data management, invoicing, and business management. The landfill project included the design, permitting, and construction of the leachate treatment plant.

The project included the design, construction, and operation of a 1,500 ton/day Sorting Facility, Compost Plant, and Landfill for Municipal Solid Waste. The design and permitting of the facilities was initially completed in June 1996. MEP personnel designed and permitted the expansion and modification of the facilities in 2006 and 2007. The facility construction was completed in 2007 by JR Capital. MEP PERSONNEL performed the construction management for the expansion and modification of the facilities. MEP Personnel operated the facility from June 1996 to present under an agreement with Atlas Lox Road Corporation, a subsidiary company of JR Capital Corporation. Municipal solid waste was transported to Sorting Facility where the potentially recyclable materials were removed. The potentially recyclable materials included paper, cardboard, plastics, steel, aluminum, other metals, wood, soil, concrete, and rock. Organic materials were processed through a shredder to reduce particle size. The organic feedstock was then sold as mulch, or processed into green waste compost. Reject materials were transported to the landfill for disposal.

PROJECT NAME: Zahle Solid Waste Management and C&D Processing Facility
OWNER: Municipality of Zahle, Lebanon
LOCATION: Zahle, Lebanon
PROJECT DESCRIPTION:

MEP personnel managed and operated the Sorting Facility, C&D Processing Facility, Compost Plant, MSW Landfill, Leachate Treatment Plant, and Gas to Energy Facility in Zahle, Lebanon through its subsidiary company, Globex Engineering International. MEP personnel have designed and constructed the landfill expansions for Cells 1, 2a, 2b, and 3a, and has constructed the final cover system, gas collection wells, and gas to energy facility. In addition, MEP personnel designed and constructed the Sorting Facility, Compost Plant, and Leachate Treatment Facility under a USAID grant in cooperation with CHF Corporation.

MEP personnel operated the solid waste management facilities, which processed approximately 150 tonnes per day of municipal solid waste. MEP personnel designed and constructed an expansion of the facility that included a new landfill cell, expansion of the gas collection and gas to energy facility, expansion of the Leachate Treatment Plant, and improvements to the Sorting Facility to allow separation of organic feedstock from the waste stream.

PROJECT NAME: Palmetto Kleensoil Facility
OWNER: Atlas Transoil, Inc.
LOCATION: Palmetto, Florida
PROJECT DESCRIPTION:

MEP Personnel manage the operation of the largest Soil Thermal Treatment Tacility, and C&D Processing Facility in Florida. The Kleensoil facility provides thermal treatment of non-hazardous petroleum contaminated soils, coal tar impacted soils, and low level PCB impacted soils,. The facilities are FDEP approved and permitted, and are a member of FPMA. The facility has processed more than 600,000 tons of petroleum impacted soils from more than 5,000 sites.

The tunnel kiln at the Palmetto Facility operates at temperatures in excess of 1500 deg F, with retention times typically in the range of 1 to 3 hours.

PROJECT NAME: Moorehaven Kleensoil Facility
OWNER: Atlas Transoil, Inc.
LOCATION: Palmetto, Florida
PROJECT DESCRIPTION:

MEP personnel managed the operation of the largest Soil Thermal Treatment and C&D Processing Facility in Florida. The Kleensoil facility provides thermal treatment of non-hazardous petroleum contaminated soils, coal tar impacted soils, and low level PCB impacted soils,. The facilities are FDEP approved and permitted, and are a member of FPMA. The Moorehaven Facility process petroleum contaminated soils from the central part of the State of Florida.

Contaminated soils are thermally treated in a kiln, removing the organic constituents. The clean soils are then sold for use as backfill materials.

PROJECT NAME: SALTA C&D Landfill Assessment and Reporting
OWNER: TLH-18-Salta, LLC
LOCATION: Parkland, Florida
PROJECT DESCRIPTION:

MEP personnel performed a site assessment of the Atlas Lox Road Site in Parkland, Florida. The Site Assessment included the installation of more than 100 soil borings, soil sampling, sampling of waste materials placed in the reclaim area, installation of ground-water monitoring wells, and characterization and assessment of the soil, ground-water, and surface-water impacts resulting from the dumping of C&D waste and municipal solid waste in the reclaim area during the cleanup of hurricane debris from Hurricane Andrew.

Site Assessment Reports and a Remedial Action Plan were prepared based on the data and information obtainted from the Site Assessments. The Site Assessment Reports and Remedial Action Plan were approved by Broward County Department of Environmental Protection, leading to the implementation of the remedial actions at the site.

PROJECT NAME: SALTA C&D Landfill Remediation
OWNER: TLH-18-Salta, LLC
LOCATION: Parkland, FLORIDA
PROJECT DESCRIPTION:

MEP personnel managed the implementation of the remedial action at the former Atlas Lox Road C&D Recycling and Compost Facility site in Parkland, Florida. The remedial action included the excavation and screening of more than 400,000 tons of C&D waste, impacted soil, and residual screened materials placed on the reclaim area of the site. The excavated materials were screened through 0.5 in. And 3.0 in. Screens, and the materials passing the 0.5 in. screen were tested for Arsenic. High organic content soils and excavated materials with Arsenic concentrations greater than 6.0 mg/kg were hauled to a licensed landfill for use as daily cover.

Materials retained on the 0.5 in and 3.0 in screens were sorted and separated into concrete/rock, processed wood, vegetation, C&D waste, used tires, metals, and MSW. Concrete and rock were crushed and tested for Arsenic. Crushed concrete and rock with Arsenic concentrations greater than 6.0 mg/kg were hauled to a landfill. C&D Waste, proceesed wood, and vegetation were hauled to a C&D recycling facility or C&D landfill. Used tires and metals were recycled. MSW was hauled to a licensed Class I landfill for disposal.

Arsenic and SPLP Arsenic tests were performed on excavated materials passing the 0.5 in. screen with Arsenic concentrations less than 6.0 mg/kg, and on the crushed rock and concrete. The leachability of the Arsenic from the excavated material and crushed rock/concrete was evaluated for the materials, and for the materials mixed with imported clean soil at a ratio of 5 parts imported clean soil, to one part excavated or crushed material. These leached concentrations were compared to the 95% confidence limit of the ground-water contamination to determine the suitability of the mixed imported clean soil and excavated or crushed materials for use as general fill material at the site. Based on these analyses, it was determined that as long as the Arsenic concentration of the mixed materials were less than the residential SCTL for Arsenic (2.1 mg/kg), there would be no measurable impact to ground-water quality resulting for leaching of water through the mixed general fill materials.

The general fill mateirals were compacted in lifts to 95 percent modified proctor, and the site was approved for clean closure and development as a residential area.

PROJECT NAME: Misty Meadows C&D Landfill Assessment and Reporting
OWNER: TLH-19-Misty Meadows, LLC
LOCATION: Parkland, Florida
PROJECT DESCRIPTION:

MEP personnel performed a site assessment of the Misty Meadows site in Parkland, Florida. The Site Assessment included the installation of more than 100 soil borings, soil sampling, sampling of waste materials placed in the reclaim area, installation of ground-water monitoring wells, and characterization and assessment of the soil, ground-water, and surface-water impacts resulting from the dumping of C&D waste and municipal solid waste in the reclaim area during the cleanup of hurricane debris from Hurricane Andrew.

Site Assessment Reports and a Remedial Action Plan were prepared based on the data and information obtainted from the Site Assessments. The Site Assessment Reports and Remedial Action Plan were approved by Broward County Department of Environmental Protection, leading to the implementation of the remedial actions at the site.

PROJECT NAME: Misty Meadows C&D Landfill Remediation
OWNER: TLH-19-Misty Meadows, LLC
LOCATION: Parkland, Florida
PROJECT DESCRIPTION:

MEP personnel managed the implementation of the remedial action at the Misty Meadows site in Parkland, Florida. The remedial action included the excavation and screening of more than 100,000 tons of C&D waste, impacted soil, and residual screened materials placed on the reclaim area of the site. The excavated materials were screened through 0.5 in. And 3.0 in. Screens, and the materials passing the 0.5 in. screen were tested for Arsenic. High organic content soils and excavated materials with Arsenic and Benzo(a) Pyrene equivalent concentrations greater than 6.0 mg/kg were hauled to a licensed landfill for use as daily cover.

Materials retained on the 0.5 in and 3.0 in screens were sorted and separated into concrete/rock, processed wood, vegetation, C&D waste, used tires, metals, and MSW. Concrete and rock were crushed and tested for Arsenic and Benzo(a)Pyrene equivalent. Crushed concrete and rock with Arsenic and Benzo(a)Pyrene equivalent concentrations greater than 6.0 mg/kg were hauled to a landfill. C&D Waste, proceesed wood, and vegetation were hauled to a C&D recycling facility or C&D landfill. Used tires and metals were recycled. MSW was hauled to a licensed Class I landfill for disposal.

Arsenic, Benzo(a)Pyrene, SPLP Arsenic, and SPLP Benzo(a)Pyrene tests were performed on excavated materials passing the 0.5 in. screen with Arsenic and Benzo(a)Pyrene equivalent concentrations less than 6.0 mg/kg, and on the crushed rock and concrete. The leachability of the Arsenic and Benzo(a)Pyrene equivalent from the excavated material and crushed rock/concrete was evaluated for the materials, and for the materials mixed with imported clean soil at a ratio of 5 parts imported clean soil, to one part excavated or crushed material. These leached concentrations were compared to the 95% confidence limit of the ground-water contamination to determine the suitability of the mixed imported clean soil and excavated or crushed materials for use as general fill material at the site. Based on these analyses, it was determined that as long as the Arsenic and Benzo(a)Pyrene equivalent concentrations of the mixed materials were less than the residential SCTLs, there would be no measurable impact to ground-water quality resulting for leaching of water through the mixed general fill materials.

The general fill mateirals were compacted in lifts to 95 percent modified proctor, and the site was approved for clean closure and development as a residential area.

PROJECT NAME: Palm Beach Farms C&D Landfill Assessment and Reporting
OWNER: TLH-20-Palm Beach Farms, LLC
LOCATION: Parkland, Florida
PROJECT DESCRIPTION:

MEP personnel performed a site assessment of the Palm Beach Farms site in Parkland, Florida. The Site Assessment included the installation of more than 100 soil borings, soil sampling, sampling of waste materials placed in the reclaim area, installation of ground-water monitoring wells, and characterization and assessment of the soil, ground-water, and surface-water impacts resulting from the dumping of C&D waste and municipal solid waste in the reclaim area during the cleanup of hurricane debris from Hurricane Andrew.

Site Assessment Reports and a Remedial Action Plan were prepared based on the data and information obtainted from the Site Assessments. The Site Assessment Reports and Remedial Action Plan were approved by Broward County Department of Environmental Protection, leading to the implementation of the remedial actions at the site.

PROJECT NAME: Palm Beach Farms C&D Landfill Remediation
OWNER: TLH-20-Palm Beach Farms, LLC
LOCATION: Parkland, Florida
PROJECT DESCRIPTION:

MEP personnel managed the implementation of the remedial action at the former Palm Beach Farms site in Parkland, Florida. The remedial action included the excavation and screening of more than 100,000 tons of C&D waste, impacted soil, and residual screened materials placed on the reclaim area of the site. The excavated materials were screened through 0.5 in. And 3.0 in. Screens, and the materials passing the 0.5 in. screen were tested for Arsenic. High organic content soils and excavated materials with Arsenic concentrations greater than 6.0 mg/kg were hauled to a licensed landfill for use as daily cover.

Materials retained on the 0.5 in and 3.0 in screens were sorted and separated into concrete/rock, processed wood, vegetation, C&D waste, used tires, metals, and MSW. Concrete and rock were crushed and tested for Arsenic. Crushed concrete and rock with Arsenic concentrations greater than 6.0 mg/kg were hauled to a landfill. C&D Waste, proceesed wood, and vegetation were hauled to a C&D recycling facility or C&D landfill. Used tires and metals were recycled. MSW was hauled to a licensed Class I landfill for disposal.

The general fill mateirals were compacted in lifts to 95 percent modified proctor, and the site was approved for clean closure and development as a residential area.

PROJECT NAME: Dollyland C&D Landfill Assessment and Reporting
OWNER: TLH-21-Dollyland, LLC
LOCATION: Parkland, Florida
PROJECT DESCRIPTION:

MEP personnel performed a site assessment of the Palm Beach Farms site in Parkland, Florida. The Site Assessment included the installation of more than 20 soil borings, soil sampling, sampling of waste materials placed in the reclaim area, installation of ground-water monitoring wells, and characterization and assessment of the soil, ground-water, and surface-water impacts resulting from the dumping of C&D waste at the site.

Site Assessment Reports and a Remedial Action Plan were prepared based on the data and information obtainted from the Site Assessments. The Site Assessment Reports and Remedial Action Plan were approved by Broward County Department of Environmental Protection, leading to the implementation of the remedial actions at the site.

PROJECT NAME: Dollyland C&D Landfill Remediation
OWNER: TLH-21-Dollyland, LLC
LOCATION: Parkland, Florida
PROJECT DESCRIPTION:

MEP personnel managed the implementation of the remedial action at the former Dollyland site in Parkland, Florida. The remedial action included the excavation and screening of more than 20,000 tons of C&D waste, impacted soil, and residual screened materials placed on the reclaim area of the site. The excavated materials were screened through 0.5 in. And 3.0 in. Screens, and the materials passing the 0.5 in. screen were tested for Arsenic. High organic content soils and excavated materials with Arsenic concentrations greater than 6.0 mg/kg were hauled to a licensed landfill for use as daily cover.

Materials retained on the 0.5 in and 3.0 in screens were sorted and separated into concrete/rock, processed wood, vegetation, C&D waste, used tires, metals, and MSW. Concrete and rock were crushed and tested for Arsenic. Crushed concrete and rock with Arsenic concentrations greater than 6.0 mg/kg were hauled to a landfill. C&D Waste, proceesed wood, and vegetation were hauled to a C&D recycling facility or C&D landfill. Used tires and metals were recycled. MSW was hauled to a licensed Class I landfill for disposal.

The general fill mateirals were compacted in lifts to 95 percent modified proctor, and the site was approved for clean closure and development as a residential area.

PROJECT NAME: Lunas C&D Sorting Facility
OWNER: Lunas Services Corporation
LOCATION: North Las Vegas, Nevada
PROJECT DESCRIPTION:

MEP personnel assisted in the design and operation of the Lunas C&D Sorting Facility. The C&D Sorting Facility was designed to process approximately 2,000 tons/day of C&D waste from hotel renovation projects, hotel, commercial, and residential demolition projects, and construction projects in the Las Vegas Metro Area. MEP personnel provided design and permitting services, and assisted in the layout in development of the operations plan for the facility.

The C&D Sorting Facility was designed to be the first stage of the process to provide feedstock to a Gasification Facility designed by Dr. Neil Williams.

WASTE MANAGEMENT EXPERIENCE

122nd STREET SOLID WASTE MANAGEMENT FACILTIES
Chicago, Illinois, USA
Client: Land and Lakes Company

The 122nd Street Solid Waste Management Facilities include a landfill, leachate treatment facility, hazardous waste treatment facility, and surface impoundment. The facility includes an active 50-acre (20-hectare) municipal solid waste landfill located in Chicago, Illinois, owned and operated by Land and Lakes Company (LALC). The services provided to LALC at the 122nd Street Landfill include: represented client in public hearings; designed and permitted a closure plan for the facility; prepared closure and post-closure care cost estimates; designed and permitted a double-lined leachate storage pond; designed and permitted a Class I landfill cell; prepared a regulatory mandated permit application to upgrade the landfill operations to meet the current rules; designed a surface-water management system for the entire facility; designed a leachate management system which included a leachate extraction and conveyance system for the existing facility; prepared a ground-water monitoring plan; prepared an operating plan for the facility; provided QA/QC monitoring services for the construction of clay and geosynthetic components of the lining system; represented LALC on numerous occasions in meetings with IEPA; and prepared and evaluated bids for construction of a gas-to-energy system.

138th STREEET LANDFILL
Chicago, Illinois, USA
Client: Land and Lakes Company

The 138th Street Landfill is a hazardous waste landfill in Chicago, Illinois that was operated from 1975 until 1990. MEP Personnel performed several site investigations, ground-water quality assessments, and slope stability investigations at the 138th Street Landfill. In addition, MEP personnel prepared supplemental applications, a corrective measures study, and a design report for modification of the ground-water and leachate monitoring program, and design of the slurry wall and leachate collection trench. MEP Personnel developed a numerical model to evaluate the effectiveness of the proposed slurry wall and leachate collection trench, and performed constituent transport modeling to evaluate potential long-term (up to 130 years) impacts on ground-water quality in the Silurian Dolomite aquifer and shallow perched saturated zone.

COUNTRYSIDE LANDFILL AND SOLID WASTE MANAGEMENT FACILITIES
Grayslake, Illinois, USA
Client: USA Waste Services, Inc.

As the Engineer-of-Record for the Countryside Landfill facility, MEP personnel were involved in every technical aspect of the operations and development at the site. A landfill siting approval was obtained as part of the future expansion of the landfill which was a major accomplishment in the northern Illinois. The siting application prepared by others had previously been denied on two separate occasions. Following the siting approval, a permit application was submitted to the Illinois Environmental Protection Agency (IEPA) for review and approval. The permit was approved within eight months of the date of submittal. To complete the permitting process, eight other permit applications were submitted to various federal, state, and local regulatory agencies. All necessary permits for the development of the landfill expansion have been issued and the expansion construction is presently in progress.

The following activities were among the major accomplishments in the course of this project: met with adjacent property owners during planning phases and worked with landscape architect to address community concerns; designed, permitted, and constructed an innovative intermediate cover to address odor problems; designed and obtained siting approval for the future expansion; designed, permitted, and constructed an innovative passive gas collection system; designed, permitted, and constructed a dual leachate/gas extraction system; participated in the preparation of a wetland mitigation permit application to the USACOE; designed a wetland mitigation plan that included the creation of 100 acres (40 hectares) of new wetland; prepared a new operations plan which included landfilling in a double-lined facility equipped with leachate collection, leachate recirculation, gas collection, gas disposal flares, and a leachate treatment system; coordinated a waste stream need analysis, required for siting the project; coordinated design of an expansion of a state highway adjacent to the landfill; designed, permitted, and constructed a leachate control trench around the existing landfill to prevent seepage of leachate into the landfill expansion; designed and permitted a barrier wall along one side of the property to protect the site against seepage from an abandoned landfill on the adjacent property; designed and permitted a surface-water management system for the site which involved flood-proofing the future expansion areas that are presently within the 100-year floodplain and revised the applicable FIRM plans prepared by FEMA; prepared construction drawings for each phase of construction; and provided QA/QC monitoring services and construction management.

DECATUR SOLID WASTE MANAGEMENT FACILITIES
Decatur County, Tennessee, USA
Client: Waste Services of America, Inc.

Decatur Solid Waste Management Facilities are owned by Decatur County and operated by Waste Services of America, Inc. (WSA). Decatur Landfill is a 600 tons/day (540 tonnes/day) municipal solid waste landfill located in the mid-southern part of Tennessee. MEP personnel performed as the Project Manager for the redesign of the originally permitted landfill to improve its design upon change of ownership to WSA. Following the approval of the proposed design by the State, MEP personnel designed an 80-acre (32-hectare) expansion to provide, approximately, an additional *50* years of disposal capacity at the site. As part of the expansion design, two existing streams within the expansion footprint were to be impacted. A mitigation plan was prepared and permitted by the state to improve other existing streams on site and to create wetlands on a portion of the site.

An extensive geotechnical and hydrogeologic investigation was performed at the site to characterize the site specific geology and hydrogeology. The uppermost aquifer was identified and the landfill was designed to remain above this aquifer. Several ground-water monitoring wells were installed at the site as part of the ground-water monitoring well implementation plan. Several landfill gas wells were also constructed on the landfill perimeter and the site property to monitor landfill gas migration. In addition to detailed design analyses of various components of the landfill, the permit application contained: a comprehensive operating plan; a construction quality assurance plan; ground-water surface-water, and leachate monitoring plans; a gas monitoring plan; a closure plan; and a post-closure plan. MEP Personnel also assisted WSA in the preparation of a pro forma to estimate capital expenditures, operating costs, and profit of the Decatur Landfill for the next twenty years. MEP personnel prepared construction drawings and contract documents for each phase of the Decatur Landfill development.

FORENSIC INVESTIGATION OF KETTLEMAN HILLS FACILTITY
Kettleman City, California, USA
Client: Chemical Waste Management, Inc

A forensic investigation was conducted of a landfill liner failure at the Chemical Waste Management, Inc. Kettleman Hills Facility. In March 1988 the Landfill B-19, Phase IA unit of this hazardous waste disposal facility suffered a major failure when approximately 1,000,000 yd^3 (764,000 m^3) of waste moved along a failure plane located within the double composite lining system. The investigation involved developing and implementing a program: (i) to document the nature and extent of damage to the lining system; (ii) to assess the existence and extent of potential leachate migration into the damaged lining system; (iii) to evaluate the suitability of portions of the lining system for future use; (iv) to obtain and test samples of the lining system soil and geosynthetic components; and (v) to explore and document the existence of failure features within the waste mass. In addition, third party QA services were provided to assure that the waste mass was excavated and removed from the unit in accordance with regulatory agency-approved plans, as well as during construction of a temporary HDPE cover over the damaged lining system exposed by removal of the waste mass.

GRANDE PRAIRIE SOLID WASTE MANAGEMENT FACILITIES
Randolph County, Illinois, USA
Client: Land and Lakes Company

MEP personnel prepared the siting application for the Grande Prairie Landfill in Randolph County, Illinois. This included the design of the landfill, lining system, leachate collection system, surface-water management system, landfill gas collection and treatment system, and all of the related facilities. In addition, MEP PERSONNEL performed numerical modeling ground-water flow and leachate constituent transport for a 150-year period to show that the proposed facility would not impact ground-water quality. The site is located near the New Madrid fault. Slope stability analyses were performed to evaluate the short-term and long-term stability of the slope for both static and dynamic conditions. MEP personnel also provided expert testimony during the siting hearing on landfill design, hydrogeology, hydrology, seismic design, leachate constituent transport, and operations.

The design of the solid waste management facilities also included the design of the Transfer Station, Compost Plant, Sorting Facility, Leachate Treatment Plant, and Gas Treatment Plant.

MEDLEY CLASS I LANDFILL
Medley, Florida, USA
Client: Waste Management, Inc. of Florida

The Medley Landfill is a regional municipal solid waste landfill located in Miami, Florida. MEP personnel performed as the Engineer-of-Record and Project Engineer for the design and permitting of a 50-acre (20-hectare) expansion at the Medley Landfill during a time that the available air space was being used up rapidly and new space was to be permitted. The design included the landfill containment, landfill closure, and the innovative surface-water management system. Due to the lack of land available on site, the area between and above several previously filled cells was selected to site the expansion footprint. The lining system at the bottom of the landfill was to be constructed over a closed construction demolition debris landfill, and the lining system for three out of the four sides of the landfill was to be constructed over existing closed landfills. The construction permit application for the landfill expansion was submitted to the Florida Department of Environmental Protection (FDEP) for review. A surface-water management permit application, which addressed wetlands mitigation, was submitted to the South Florida Water Management District (SFWMD). The two permit applications were approved shortly after their submittal.

To densify the expansion foundation in the area occupied by the construction demolition, debris landfill, dynamic compaction was selected as the most feasible option among four proposed options. Numerical analyses were performed to evaluate the impact of dynamic compaction on the development of a ground-water mound beneath the site due to the energy imparted by the dynamic compaction. Following the permitting of the expansion, the dynamic compaction was successfully conducted over a period of six months, with constant 24-hour operation. The results obtained from a preloading program carried out following the completion of the dynamic compaction, indicated that the dynamic compaction resulted in more than adequate densification of the foundation. The permitted lining system was subsequently constructed above the prepared area. MEP Personnel also the construction QA/QC for installation of the lining system.

NORTH DADE LANDFILL
Miami, Florida, USA
Client: Metropolitan Dade County Department of Solid Waste Management

Metropolitan Dade County Department of Solid Waste Management (DSWM) owns and operates a Class III landfill in the northern part of Dade County in Florida. The initial phase of the landfill reached final elevations and a new phase was to be developed to continue accepting Class III waste at the landfill. The area designated for the new phase had been excavated and backfilled with municipal solid waste approximately 20 years prior to the development of the new phase. The Florida Department of Environmental Protection (FDEP) required the surface of the existing waste to be covered with geomembrane, and the new phase of the Class III landfill be constructed above the geomembrane. MEP personnel worked as the Engineer-of-Record for the construction of geomembrane, above the existing waste. The scope of work at the North Dade Landfill included the inspection of subgrade proofrolling and installation of 3.5 million ft^2 (310,000 m^2) of woven geotextile liner reinforcing layer; QA/QC of 3.9 million ft^2 (350,000 m^2) of 40-mil (1-mm) thick HDPE geomembrane, geonet, and nonwoven geotextile. A detailed final report was submitted to FDEP upon completion of the project.

RESOURCES RECOVERY ASH MONOFILL
Miami, Florida, USA
Client: Metropolitan Dade County Department of Solid Waste Management

Metropolitan Dade County Department of Solid Waste Management (DSWM) owns and operates an ash monofill adjacent to a municipal solid waste incinerator in Miami, Florida. MEP Personnel provided services to DSWM, which included: a closure system for a 26-acre (10.4-hectare) ash monofill; geosynthetics QA/QC monitoring services for the two 10-acre (4-hectare) ash monofill cells lining systems and the closure of a 26-acre (10.4-hectare) cell; clay liner material borrow source investigation; leachate management system analysis for a 10-acre (4-hectare) ash monofill cell; blasting feasibility study for the excavation of a 40-acre (16-hectare) surface-water management pond; preparation of a soils QA/QC plan; preparation of construction/bid documents; design of a phasing plan for an ash monofill cell to minimize leachate generation; review of contractors submittals; and preparation of certification reports.

RIVER BEND PRAIRIE LANDFILL
Chicago, Illinois, USA
Client: Land and Lakes Company

The River Bend Prairie Landfill was formerly known as the Dolton Landfill, and is located in Dolton, Illinois. MEP personnel performed site investigations, ground-water quality assessments, and hydrogeologic studies at the River Bend Prairie Landfill to assess potential impacts of the existing landfill on ground-water and surface-water quality. MEP personnel developed numerical models to evaluate ground-water and leachate flow, to evaluate the effectiveness of leachate collection systems, and to evaluate leachate constituent migration. These numerical models were then used to design the leachate collection system for the site. In addition, MEP personnel prepared the Significant Modification Permit Applications for expansions of the landfill, modification of the ground-water monitoring system, and design of the leachate collection system. MEP personnel also provided expert testimony for the siting and permit hearings.

SOUTH DADE LANDFILL
Miami, Florida, USA
Client: Metropolitan Dade County Department of Solid Waste Management

Metropolitan Dade County Department of Solid Waste Management (DSWM) owns and operates a municipal solid waste landfill (South Dade Landfill) in the southern part of Dade County, Florida. Cells 1 and 2 of the landfill reached final permitted elevations. Cell 3 is currently active. DSWM constructed Cell 4 to become the active cell upon Cell 3 reaching its maximum elevation. MEP personnel served as the Project Engineer for the construction of 5O-acre (20-hectare) composite lining system in Cell 4. The composite lining system included a compacted clay liner with a maximum hydraulic conductivity of $1xl0^{-8}$ cm/s. Extensive quality assurance monitoring was required to ensure that the clay lifts met the necessary permeability requirements. MEP personnel also designed a final cover system for Cells 1 and 2 that had reached final elevations. Extensive slope stability analysis in combination with laboratory testing were performed to ensure the final cover would remain stable on the 2.5 horizontal: 1 vertical slopes. The final cover was constructed in association with the construction of 17 gas extraction wells. The gas extraction wells extended approximately 100 ft (30 m) into the 150 ft (45 m) waste thickness. The approximately 3.9 million tons (3.5 million tonnes) of municipal solid waste in Cells 1, 2, and 3 was estimated to generate over one billion standard cubic feet of landfill gas. Construction of the gas system included installation of 26 single and multiple gas monitoring probes, ranging in depth from 3 ft (1 m) to 51 ft (17m).

TECHNICAL ASSISTANCE TO THE US EPA ON LINING SYSTEM REGULATIONS
Cincinnati, Ohio, USA
Client: U.S. Environmental Protection Agency

MEP personnel provided assistance to the USEPA on the development of necessary rules for hazardous waste lining system regulations. These regulations implement the mandate of the 1984 Hazardous and Solid Waste Amendments to the RCRA for hazardous waste land disposal facilities. Two reports written submitted for the USEPA have been published. These include *"Liner/Leak Detection Rule Background Document"* EPA 530-SW-87-O15 and *"Bottom Liner Performance in Double-Lined Landfills and Surface impoundments"* EPA 530-SW-87-O1 3. The reports present the developed analytical models for evaluating the performance of leachate flow through the double-liner systems. In addition, assistance was provided to the USEPA in preparing technical rules that appeared in the Federal Register and in responding to public comments to the rules. Other documents prepared for the USEPA include the background document *"Comparative Performance* of *Single-Liner and Double-Liner Systems"* and a report entitled *"Preliminary Assessment of Stress Cracking of Polyethylene Liners."*

TECHNICAL REGULATORY ASSISTANCE
Tallahassee, Florida, USA
Client: Florida Department of Environmental Protection

This project involved providing technical assistance for regulations implementing the 1988 Florida Solid Waste Management Act. The technical assistance covered Resource Conservation and Recovery Act (RCRA) Subtitle D landfills, recycling, composting, full cost accounting, and escrow funding. This project included the following tasks: (i) provide technical data, write technical reports and documents, and brief the government officials on the technical basis for proposed regulations; (ii) serve as expert witness(es) for Florida Department of Environmental Protection (FDEP) and the Environmental Regulation Commission (ERC) meetings, Administrative Hearings and other judicial hearings regarding the technical basis for regulations; (iii) research, evaluate, and draft initial proposals for regulations implementing the 1988 Florida Solid Waste Management Act; and (iv) provide other services as the FDEP requires, including quick responses to specific technical points which arise during rulemaking workshops and hearings.

WILLOW RANCH LANDFILL
Will County, Illinois, USA
Client: Land and Lakes Company

Land and Lakes Company (LALC) owns and operates the Willow Ranch Landfill located in Will County, Illinois. The landfill has approximately reached its final capacity and an expansion is currently being designed to increase disposal life at the facility. The services provided at the Willow Ranch Landfill include: represented client in public hearings; performed ground-water assessment; performed gas migration assessment; prepared eight supplemental permit applications; represented client in numerous negotiations with the IEPA and Will County; modified ground-water monitoring program; evaluated leachate monitoring plan and suggested modifications; addressed slope stability issues and made recommendations; performed hydrogeologic assessment; prepared bid documents and evaluated bids for gas-to-energy system; and provided ground-water monitoring/management assistance.

WIPP FACILITY RCRA PERMITTING
Carlsbad, New Mexico, USA
Client: Winston & Strawn

MEP personnel provided expert services for the RCRA Permit for the WIPP Facility in Carlsbad, New Mexico. The WIPP Facility is the first facility in the US to be permitted to take Transuranic (TRU) waste. These waste materials include both radioactive waste and hazardous waste from the production of uranium fuel rods at Department of Energy (DOE) facilities. The TRU waste is placed in mine shafts in bedded salt at a depth of approximately 2,150 ft (655 m) below the ground surface. The system is designed to limit the entry of water and release of contaminants through the mine shafts at the WIPP facility.

The role of the MEP personnel in the permitting process is to evaluate the transport of waste materials through the soil and rock formations, and to assess the potential for impacts to human health and the environment. In addition, MEP personnel evaluated the stability of the mine, and the design of the shaft sealing system. MEP personnel also evaluated the design of the facility, and the effectiveness of the various systems to prevent constituent migration.

COMPREHENSIVE SOLID WASTE MANAGEMENT PLAN
Abu Dhabi, UAE
Client: Abu Dhabi Municipality

MEP personnel performed waste characterization studies, collection and transportation studies, performed a recycling feasibility study, and developed a Comprehensive Solid Waste Management Plan for the Municipality of Abu Dhabi. The Comprehensive Solid Waste Management Plan provided the framework for development of the solid waste management facilities in Greater Abu Dhabi from 2001 to 2050. The Plan provided an overview of the existing solid waste management systems, identified the sources, quantities, and characteristics of solid and liquid waste, and described the existing collection, transportation, treatment, and disposal systems. In addition, the Plan presented the results of the development of a financial model of solid waste management in Greater Abu Dhabi, and provided the locations and design requirements for development of the proposed new facilities.

WESTERN REGION COMPREHENSIVE SOLID WASTE MANAGEMENT PLAN
Western Region, UAE
Client: Abu Dhabi Municipality

MEP personnel performed waste characterization studies, collection and transportation studies, performed a recycling feasibility study, and developed a Comprehensive Solid Waste Management Plan for the Western Region in the UAE, including Sir Baniyas Island and Delma Island. The Comprehensive Solid Waste Management Plan provided the framework for development of the solid waste management facilities in the Western Region from 2001 to 2050. The Plan provided an overview of the existing solid waste management systems, identified the sources, quantities, and characteristics of solid and liquid waste, and described the existing collection, transportation, treatment, and disposal systems. In addition, the Plan presented the results of the development of a financial model of solid waste management in the Western Region, and provided the locations and design requirements for development of the proposed new facilities. These facilities included three regional landfills, five transfer stations, and two compost plants.

DESIGN OF SOLID WASTE MANAGEMENT FACILITIES
Abu Dhabi, UAE
Client: Abu Dhabi Municipality

The design of the solid waste management facilities for Greater Abu Dhabi included an MSW Landfill with a single composite lining system, a hazardous waste landfill with a double composite lining system, closure of two existing landfills, design of Green Waste Compost Plant (750 tonnes/day), design of the MSW Compost Plant (1,000 tonnes/day), design of Transfer Stations in Abu Dhabi, Shahama, Mussafah, and Mufraq, design a sorting facility, design of the Solid Waste Management Center, and design of the Medical Waste Incinerator.

DESIGN OF WESTERN REGION SOLID WASTE MANAGEMENT FACILITIES
Western Region, UAE
Client: Abu Dhabi, Municipality

The design of the Western Region Solid Waste Management Facilities included three single composite lined MSW landfills with leachate treatment systems and gas treatment systems, five transfer stations, a barge loading facility, and two compost plants. These facilities were designed to meet the requirements of the Western Region Comprehensive Solid Waste Management Plan.

ABU DHABI HAZARDOUS WASTE TREATMENT FACILITY
Abu Dhabi, UAE
Client: Abu Dhabi Municipality

MEP personnel performed a feasibility study to evaluate the requirements for design of a hazardous waste treatment facility in Abu Dhabi, UAE. The feasibility study identified the sources, quantities, and characteristics of hazardous and industrial wastes generated in Greater Abu Dhabi. Following the feasibility study, MEP personnel designed a liquid hazardous waste treatment facility. The treatment facility included a waste reception area, laboratory, office and emergency services building, solidification facility, drum processing facility, physical/chemical treatment facility.

OMAN NATIONAL HAZARDOUS WASTE STUDY
Muscat, Oman
Client: GPEC International

MEP personnel performed the National Hazardous Waste Study for the Government of Oman. This study included the identification and quantifications of the sources, quantities, and characteristics of hazardous waste and industrial waste in the Sultanate of Oman. Field studies were performed to evaluate existing waste treatment and disposal facilities, and to assess the need for potential future remediation.

Preliminary designs were developed for the hazardous waste treatment and disposal facilities. These facilities included a hazardous waste landfill, five regional medical waste incinerators, a solidification facilities, physical/chemical treatment facilities, an office and laboratory building, a drum processing building, and an emergency services building. In addition, MEP personnel developed the legal framework for hazardous waste management regulations, and developed new hazardous waste standards, laws, and regulations.

UAE SOLID AND HAZARDOUS WASTE REGULATIONS
Abu Dhabi, UAE
Client: Abu Dhabi Municipality

MEP personnel developed the legal framework for environmental regulations in the UAE. This included the development of laws, standards, regulations, and guidelines for the collection, transportation, storage, treatment, disposal, and monitoring of solid and hazardous waste.

KARACHI SOLID WASTE MANAGEMENT PLAN
Karachi, Pakistan
Client: Karachi Metropolitan Corporation

MEP personnel developed a Comprehensive Solid Waste Management Plant for the Karachi Metropolitan Corporation. This project included waste characterization studies, a recycling feasibility study, collection and transportation studies, assessment of the existing laws and regulations, and an evaluation of the existing hazardous waste and medical waste management programs.

Based on the results of these studies, MEP personnel developed a plan for solid waste management in Karachi from 2002 to 2032. The study provides a blueprint of the development and implementation of the solid waste management systems and facilities in Karachi.

KARACHI SOLID WASTE MANAGEMENT FACILITIES
Karachi, Pakistan
Client: Karachi Metropolitan Corporation

MEP personnel prepared the designs for the new solid waste management facilities in Karachi, Pakistan. These facilities included three solid waste landfills, including leachate treatment systems, gas to energy facilities, compost plants, sorting facilities, and five transfer stations.

EASTERN PROVINCE SOLID WASTE MANAGEMENT FACILITIES
Eastern Province, Saudi Arabia
Client: Private Company

MEP personnel performed a waste characterization study, recycling feasibility study, and developed a financial model for the Eastern Province Solid Waste Management Facilities in Saudi Arabia. Based on the results of the studies, MEP personnel designed new solid waste management facilities, including a lined landfill and a sorting facility (materials recovery facility). The design of the sorting facility included the main sorting lines, sorting building, processing facilities, plastics washing and granulating facility, bale storage building, office building, gate house, and the site infrastructure. In addition, MEP personnel sourced the equipment, solicited quotations, and prepared equipment specifications for each piece of equipment at the facility.

MADINA SOLID WASTE MANAGEMENT FACILITIES
Madina, Saudi Arabia
Client: Private Company

MEP personnel performed a waste characterization study, recycling feasibility study, developed a financial model, and performed an investigation of the existing collection and transport systems for MSW for Madina, Saudi Arabia. Based on the results of the studies, MEP personnel designed new solid waste management facilities, including a sorting facility (materials recovery facility). The design of the sorting facility included the main sorting lines, sorting building, processing facilities, plastics washing and granulating facility, bale storage building, office building, gate house, and the site infrastructure. MEP personnel evaluated the existing collection and transportation systems and provided recommendations to reduce cost and improve the profitability of the existing operations.

TRIPOLI SOLID WASTE MANAGEMENT FACILITIES
Tripoli, Lebanon
Client: Private Company

MEP personnel performed a waste characterization study, recycling feasibility study, developed a financial model, and designed a vertical expansion of the landfill, compost plant, and sorting facility. The design of the sorting facility included the main sorting lines, sorting building, processing facilities, plastics washing and granulating facility, bale storage building, office building, gate house, and the site infrastructure. The design of the landfill vertical expansion included the use of innovative technologies to increase capacity while minimizing space requirements. The compost plant was designed to process both MSW and green waste, and was designed to minimize odor and produce compost at low cost.

BARKA SOLID WASTE MANAGEMENT FACILITIES
Barka, Oman
Client: Ministry of Regional Municipalities, Environment, and Water Resources

MEP personnel performed waste characterizations studies, recycling feasibility studies, an assessment of the existing collection and transportation systems, and an evaluation of the Medical Waste collection, treatment, and disposal systems. Based on the results of the studies, MEP personnel prepared a Comprehensive Solid Waste Management Plan for Barka and two nearby communities. In addition, MEP personnel performed a remedial investigation of the existing dumpsite, and an assessment of the existing treatment and disposal systems. Based on the results of these studies, and consistent with the Comprehensive Solid Waste Management Plan, MEP personnel designed a new MSW Landfill, Sorting Facility, and Medical Waste Treatment Facility.

DHOFAR REGIONAL SOLID WASTE MANAGEMENT FACILITIES
Salalah, Oman
Client: Dhofar Municipality

MEP personnel performed waste characterizations studies, recycling feasibility studies, an assessment of the existing collection and transportation systems, and an evaluation of the Medical Waste collection, treatment, and disposal systems. Based on the results of the studies, MEP personnel prepared a Comprehensive Solid Waste Management Plan for Dhofar Municipality, including Salalah. In addition, MEP personnel performed a remedial investigation of the existing dumpsite, and an assessment of the existing treatment and disposal systems. Based on the results of these studies, and consistent with the Comprehensive Solid Waste Management Plan for Dhofar Municiaplity, MEP personnel designed a new MSW Landfill, Sorting Facility, and Medical Waste Treatment Facility.

NIZWA REGIONAL SOLID WASTE MANAGEMENT FACILITIES
Nizwa, Oman
Client: Ministry of Regional Municipalities, Environment, and Water Resources

MEP personnel performed waste characterizations studies, recycling feasibility studies, an assessment of the existing collection and transportation systems, and an evaluation of the Medical Waste collection, treatment, and disposal systems for Nizwa and five regional municipalities in Central Oman. Based on the results of the studies, MEP personnel prepared a Comprehensive Solid Waste Management Plan for the Nizwa Region, which included five regional municipalities. In addition, MEP personnel performed a remedial investigation of the existing dumpsites, and an assessment of the existing treatment and disposal systems. Based on the results of these studies, and consistent with the Comprehensive Solid Waste Management Plan for the Nizwa Regional Municipalities, MEP personnel designed a two new regional MSW Landfills, Sorting Facilities, and Medical Waste Treatment Facilities.

ZAHLE SOLID WASTE MANAGEMENT FACILITIES
Zahle, Lebanon
Client: CDR and World Bank

MEP personnel have prepared a design for expansion of the Zahle Landfill to increase the capacity and life of the existing landfill. In addition, MEP personnel have performed a study to evaluate the feasibility of constructing a leachate treatment facility to eliminate the leachate ponds, and minimize odor at the site. MEP personnel is also providing supervision and management of the operations at the facility, and working with the Contractor to improve operations. MEP personnel evaluated the performance of the Sorting Facility, and proposing modifications to improve operations, increase the quantities of recyclables, and increase income.

CLOSURE OF ZAHLE DUMPSITE
Zahle, Lebanon
Client: CDR and World Bank

MEP personnel have performed a site assessment to evaluate and assess the alternatives for closure of the existing Zahle Dumpsite. The dumpsite is an unlined facility that has received waste from the Municipality of Zahle for many years. Wastes included MSW, as well as commercial and industrial waste materials and medical wastes. Prior to the year 2000, wastes were typically burned in open pits, resulting in massive discharge of particulate matter to the atmosphere. The dumpsite was constructed adjacent to a stream, and is bounded on one side by a slaughterhouse. Based on the site investigation, a remedial action for the site has been developed and is in the process of being implement.

OUED SMAR LANDFILL CLOSURES
Algiers, Algeria
Client: Sistem Yapi

MEP personnel have prepared the detailed design for remediation and closure of the Oued Smar Landfill in Algiers, Algeria. The project has included the remedial design for two large slides, design of the Leachate Recovery Well System, Leachate Treatment System, Gas Collection and Treatment System, Surface-Water Management System, and Final Cover Design. In addition, MEP personnel have provided design and construction management services for a dynamic compaction program, and construction management for the remediation and closure construction.

DeSoto C&D Landfill
DeSoto County, Florida

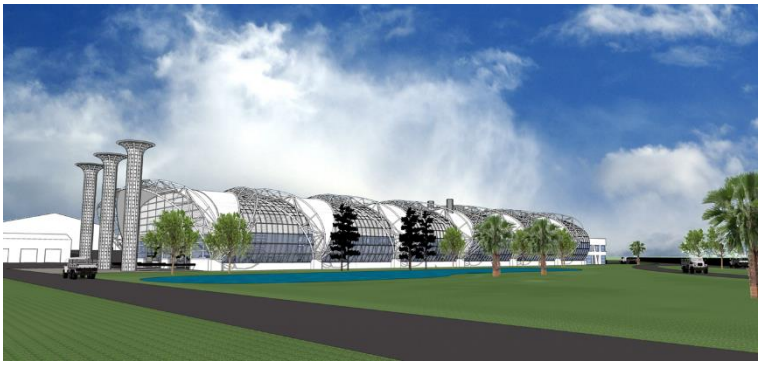
MEP personnel have designed and permitted the DeSoto County C&D Landfill. The project included detailed design of the landfill, surface water management system, and preparation of the Solid Waste Permit Application, Environmental Resource Permit Application, and Florida Department of Transportation Permit Application.

GASIFICATION PROJECTS IN DESIGN, PERMITTING, OR UNDER DEVELOPMENT

KAKAMEGA, KENYA 144 MW GASIFICATION FACILITY POWER PLANT

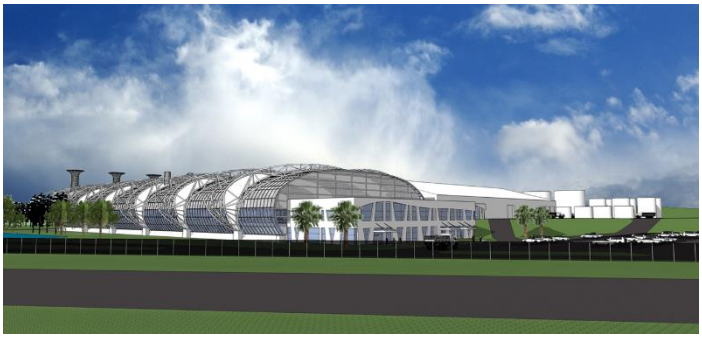
Mobile Environmental Power, Inc. and **Togo Technologies** are in the process of developing a 144 MW, 4,800 tonne/day (Tpd) Gasification Facility in Kakamega, Kenya. Under the waste services agreement, the Gasification Facility would receive approximately 4,800 Tpd of municipal solid waste and approximately 10 tonnes/day of used tires, and would generate a nameplate capacity of more than 144 MW, with available power of 120 MW, and a minimum average of 108 MW to the Grid 24 hrs/day, 365 days/yr. The Gasification Facility includes a Sorting Facility to remove heavy metals and reduce ash content, in-line jacketed Waste Dryer, Gasifier, a Cyclone to remove particulate matter from the synthesis gas, Slagging Unit, high efficiency, high temperature and pressure HRSG Boiler, and four-stage Steam Turbine/Generator, and highly effective flue gas treatment system.

When in full operation, the new $600 million power plant will generate a minimum average of 108 MW of electrical energy to the Grid, while earning revenues of more than $260.5 million annually. The anticipated internal rate of return on the project is approximately 16.3 percent with an EBIDTA of approximate $168.9 million. The plant will create approximately 4,000 new jobs in the Kakamega area. The power plant will feature an effective flue gas clean up train to ensure that regulated emissions are far below the concentrations allowed under Federal air quality standards. The fluidized bed gasifiers to be used at the new facility are of the type shown above and have been in waste to energy service for more than 33 years.



The waste is sorted to remove metals, glass, e-waste, and unacceptable waste, and then processed through a shredder to reduce the particle size. The waste is then fed into the dryers, to reduce the water content, and then fed into the Rotary Kiln Gasifiers. The Gasifiers convert the waste into a synthesis gas and ash at a temperature of 1,000 deg. C. The Synthesis gas is combusted in a reducing environment to prevent NO_2 formation, and then process through an HRSG Boiler to produce high temperature and pressure steam. The Steam is fed to a high efficiency steam turbine to generate clean, green, renewable electric energy. The flue gas is processed through a Cyclone to remove particulate matter, an Acid Gas Removal Unit to remove HCl, H_2S, and HNO_3, an Electrostatic Precipitator to remove sub 2.5-micron particulate matter, a Bag House with carbon injection to remove particulate matter, heavy metals, and organics, and is then discharged out the stack at a temperature of 140 deg C, which prevents condensation. Therefore, there is nothing visible discharged from the stack. The constituent concentrations in the stack are more than 1,000 times lower than EU and USEPA Air Quality Standards.

The project includes the collection of waste. A total of 267 compaction trucks and 10 crane trucks will be operated 7 days per week to collect and transport waste to the sorting facility. The project includes the purchase of 8,638 1.1 liter bins, 1,728 3.0 cu m bins, and 1,152 5.0 cu m bins. The trucks and supervision vehicles will be fitted with GPS and communication systems to track the progress of the collection vehicles at all times during the collection and transport process. In addition, 300 mobile street sweepers will be employed to sweep and clean the streets in Kakamega and the surrounding areas.



ST. LUCIE COUNTY, FLORIDA,
1,000 TPD WASTE GASIFICATION TO DIESEL PRODUCTION FACILITY

Mobile Environmental Power, Inc., Vanderweil Engineers, and APAPA International have developed a 1,000 tpd Gasification Diesel Fuel Production Facility in St. Lucie County, Florida. Under the waste services agreement, the Gasification Facility would receive approximately 800 tpd of waste including 471.4 tpd of freshly collected municipal solid waste (MSW); approximately 105.0 tpd of construction and demolition debris (C&D Debris), approximately 123.3 tpd of Yard Waste, and approximately 100.3 tons/day of used tires. In addition, 200.0 tpd of C&D Debris from the existing C&D Landfill, or 200.0 tpd of baled MSW from the existing MSW Balefill would be excavated and would be transported to the Gasification Facility, where the waste would be converted into 80,000 gallons per day of very high quality, ultra-low sulfur, synthetic green No. 2 diesel fuel and electricity for the running of the facility. The Gasification Facility includes a Sorting Facility to remove heavy metals and reduce ash content, patented Waste Dryer, Gasifier, a Cyclone to remove particulate matter from the synthesis gas, a patented Slagging Unit, a high efficiency, high temperature and pressure HRSG Boiler, and four-stage Steam Turbine/Generator, a Fischer Tropsch Reactor and Fuel Production System, and highly effective flue gas treatment system.

When in full operation, the new $267 million power plant will produce approximately 64,000 gal/day of Premium Renewable Synthetic Fuel and 16,0000 gal/day of Naphtha, while earning revenues of more than $133.7 million annually. The anticipated internal rate of return on the project investment is approximately 20.3 percent with an EBIDTA of approximately $82.5 million in Year 1. The plant will create approximately 221 new jobs in the St. Lucie area. The power plant will feature an effective flue gas clean up train to ensure that regulated emissions are far below the concentrations allowed under Federal air quality standards. The upflow fluidized bed gasifiers to be used at the new facility are of the type shown above and have been in waste to energy service for more than 33 years. The project management team consists of the following team members:

- **MEP**, who manages the project, and is responsible for the design, construction, and operation of the St. Lucie County Renewable Energy Facility;
- **Vanderweil Engineers,** who is also responsible for the design, construction and permitting of the St. Lucie County Renewable Energy Facility;
- **APAPA International,** who is financing and will own the majority of the project.

Waste will be transported to the Sorting Facility, where the waste will be sorted to remove metals, glass, e-waste, and unacceptable waste, and then processed through a shredder to reduce the particle size. The waste will then be fed into the dryers, to reduce the water content, and then fed into the Gasifiers. The Gasifiers convert the waste into a synthesis gas and ash at a temperature of 1,000 to 1,400 deg. C. The diesel fuel production system utilizes an advanced Fischer Tropsch reactor, distillation unit, and cracking unit to produce very high quality, Premium Renewable Synthetic Fischer Tropsch Diesel Fuel and Naphtha. The flue gas is processed through a Cyclone to remove particulate matter, an Acid Gas Removal Unit and Ammonia Scrubber to remove HCl, H_2S, and HNO_3, an Electrostatic Precipitator to remove sub 2.5 micron particulate matter, a Bag House with carbon injection to remove particulate matter, heavy metals, and organics, and is then discharged out the stack at a temperature of 200 deg C, which prevents condensation.

Therefore, there is nothing visible discharged from the stack. The constituent concentrations in the stack are more than 100 times lower than EU and USEPA Air Quality Standards.
The MEP Operations Renewable Energy Gasification System extracts water from the waste, and combines that water with leachate from the collection vehicles, Sorting Facility, and Inert MSW Landfill, and wastewater from the onsite sanitary facilities and cleaning water, and that water is treated in an onsite leachate/water treatment facility to boiler feedwater standards. This treated water is then used as the makeup water in the system to provide the process and cooling water for the facility. Therefore, 100 percent of the water used by the facility is recycled.

On the Power Production Line the Synthesis gas is combusted in a reducing environment to prevent NOx formation, and then processed through an HRSG Boiler to produce high temperature and pressure steam. The steam is fed to a high efficiency steam turbine to generate clean, green, renewable electric energy. The flue gas is processed through a Cyclone to remove particulate matter, an Acid Gas Removal Unit to remove HCl, H_2S, and HNO_3, an Electrostatic Precipitator to remove sub 2.5 micron particulate matter, a Bag House with carbon injection to remove particulate matter, heavy metals, and organics, and is then discharged out the stack at a temperature of 140 to 200 deg C, which prevents condensation. Therefore, there is nothing visible discharged from the stack. The Power Production Line produces parasitic loading for the electricity needed for the facility of clean, green, electrical power 24 hours per day, 365 days per year.

As a result, the MEP Operations Renewable Energy Gasification System does not take water from the city water supply, and does not discharge any wastewater to the sanitary system. All water is collected on site, treated onsite, and is recycled and used as process and cooling water. In addition, emissions from the facility are 100 times lower than EU and USEPA standards for Heavy Metals, Particulate Matter, NOx, SOx, and other key industrial pollutants, and the ash is processed through a slagging unit to remove the carbon, melted to form slag, and then crushed and sold as a sand replacement for concrete block production. As a result, the Gasification Facility recycles 100 percent of the water that it uses, has emission more than 100 times below air quality standards, and does not put by-product ash into a landfill. As a result, the Renewable Energy Gasification Facility is considered to be a "Green" technology for water, air, and solids.

In addition, the equipment is operated under negative air pressure, which results in air inflow instead of leakage from the piping and production equipment. The air intake for the Blowers driving the system is inside the Sorting Building and Gasification Building. All odor causing chemicals from the waste are collected in the air management system, and are piped into the Gasifiers and Combustion Tube, where they are ultimately treated at temperatures of 1,000 ºC and 1,460ºC, respectively. As a result, no odor causing chemicals, no volatile organic compounds, and no long chain hydrocarbons survive the gasification process. The Sorting Building and Gasification Building are maintained at a very strong negative pressure, which makes it impossible for odor causing chemicals to escape from either the Sorting Building, or the Gasification Building. Since the waste materials are tipped on the floor inside the Sorting Building, and no waste is allowed to be tipped outside the buildings, the Gasification process is odor free.

The projected cost of the project is $267,000,000. The breakdown of the use of the investment funds may be summarized as follows:

Description	**Cost Estimate**
Capital Cost of Equipment	$156,611,364
Installation of Equipment	$18,464,223
General Liability Insurance	$3,727,789
Product Quantity and Quality Insurance	$18,638,944
Construction Cost	$22,918,327
Final Design, Permitting, and Construct and Project Management	$18,327,690
Project Development	$3,727,789
License Fee	$3,727,789
Loan Fees	$8,010,000
Project and SPV Management Expense	$10,694,786
Working Capital	$2,151,299

Total Use of Funds	**$267,000,000**

CONVERSON OF IVRR 18.8 MW BIOMASS POWER PLANT TO 18.8 MW GASIFICATION FACILITY AND 700 TPD GASIFICATION FUEL PRODUCTION FACILITY AND DESIGN, CONSTRUCTION, AND OPERATION OF A 7,200 TPD GASIFICATION FUEL PRODUCTION FACILITY IN 1,200 TPD STAGES

MEP Operations, Inc. (MEP Operations) has signed a Purchase Agreement with Mesquite Lake Water and Power LLC to purchase the existing Imperial Valley Resource Recovery (IVRR) 18.8 MW Biomass Power Plant, convert the existing IVRR Biomass Power Plant to an 18.8 MW Gasification Facility and 700 Tpd Diesel Fuel Production Facility, and then to design, permit, construct, and operate a 7,200 ton/day gasification synthetic fuel production facility to be constructed in 1,200 tpd increments on the same 80 acre property. The location of the existing IVRR Power Plant site location is shown in Figure 1.

Figure 1. IVRR 18.8 MW Biomass Power Plant Site Location Map

Background

The IVRR Power Plant was designed, constructed, and permitted in the middle 1980s, and began commercial production of power in 1989 for HydraCo, a subsidiary of Niagara Mohawk Power Company, and shut down in 1999. A fire in the electrical room resulted in new electrical power equipment (i.e. switchgear, motor control centers, etc.) funded by insurance coverage in 2003 and 2004.

A subsidiary of Leucadia International, LP Valley Power, LLC (LPVP), purchased the Plant from Primary Power International (PPI) on 31 May 2007 and conducted a complete overhaul of the Plant. The IVRR Power Plant began commercial operation again on 30 June 2009, and sold electric power to the Southern California Edison Company (SCE) under a PPA. Power was provided through a Transmission Service Agreement with the Imperial Irrigation District (IID). The IVRR Plant had a Title V Air Quality Permit, Conditional Use Permit (CUP) with Imperial County, and other approvals and permits. Additional equipment issues were identified and a Plant Availability and Improvement Plan (PAIP) was started in 2010, but was only partially implemented.

A series of earthquakes in mid-2010 hindered the progress of the PAIP, and caused vibrations in the Steam Turbine and Generator. At that time, LPVP made the decision to divest IVRR rather than continue with the PAIP. Rodney Williams, a private individual, formed Mesquite Lake Water and Power LLC and purchased IVRR in August 2013 with the intention of developing a Renewable Energy Park on the IVRR, Green Hunter, and Granite Construction properties.

The IVRR Plant has a water rights agreement with the IID to supply water to the facility. The water is supplied to the water reservoir in the Northeast corner of the Plant. The IVRR Plant sits on an 80 acre parcel of land, as shown in an aerial photograph of the site in Figure 2. The existing IVRR Plant is on Highway 111 in Imperial, California, and has agricultural land on the West side, a piping company on the North side, Highway 111 and agricultural land on the East side, and the former Green Hunter Biomass Power Plant and the Granite Construction Property on the South side. The land is located in an Industrial Park, and has the Air Quality, County Zoning, and CUP permits.

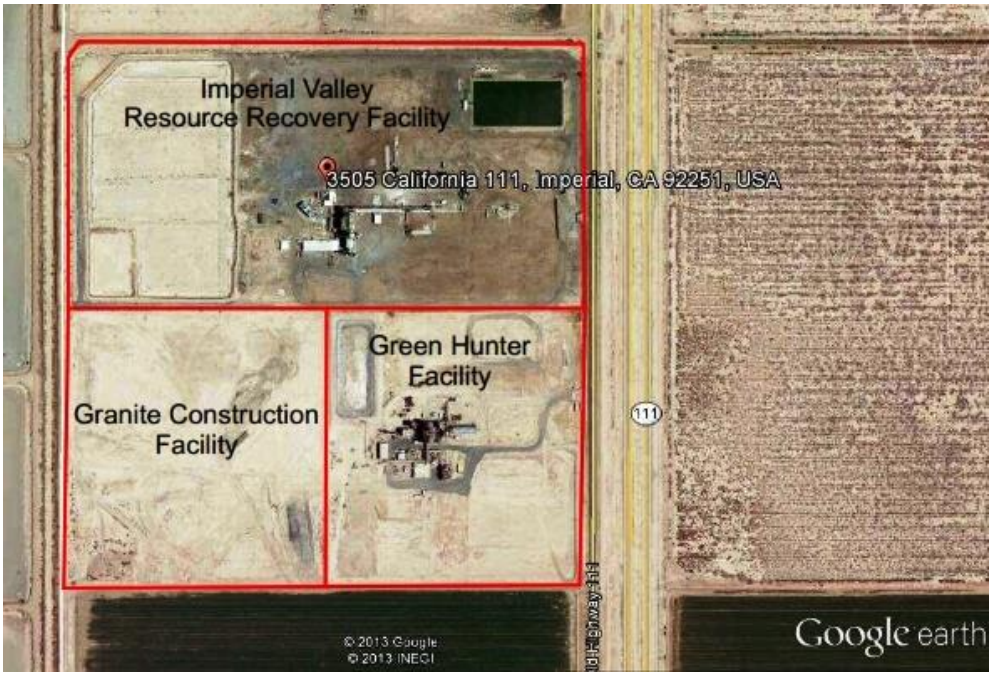


Figure 2. IVRR and Green Hunter Aerial Photographs

Existing 18.8 MW Biomass Power Plant

The existing 18.8 MW Biomass Power Plant has a Connection Agreement with IID to the Grid (Contract No. GIA-0507-02, and a Transmission Agreement, also with IID (Contract No. TSA-06-07-04). The Connection Agreement allows up to 25 MW to be transmitted through the IID grid at a cost of $49,000 per month ($44,000 for transmission and $5,000 for connection). The Existing Biomass Power Plant also has a Water License to use water from the IID irrigation canal system at a cost of $367/acre-ft. The facility has an existing Air Quality permit from the State of California, and a CUD from Imperial County.

MEP Operations and Vanderweil plan to replace the existing incinerator with two 12 MW Gasification Lines, and two Gasification Synthetic Fuel Production Lines, and utilize the existing steam generation, power production, and flue gas treatment equipment for one of the lines, while configuring the second line to have same flue gasw treatment as our traditional systems. In order to utilize the existing equipment and facilities, the following existing equipment must be repaired, modified, and/or moved:

- Repair Steam Turbine and Generator;
- Repair Boiler;
- Fuel System;
- Spare Boiler Feed Pump;
- Water Cooled Condenser;
- Cooling Tower and Cooling Water System;
- Water Treatment System;
- Wiring System
- Computers and Control System
- Reinstall Ammonia Tank;
- Reinstall Pumps and Blowers;
- Repair/Replace Valves;
- CEMS Repair and Testing;
- Construct Sorting Facility;
- Install Biomass/Waste Shredders;
- Transmission and Substation Improvements;
- Fire System Improvements; and
- Start-up and Commissioning.

During the period of time the IVRR plant is under construction, MEP and Vanderweil will modify the existing Air Quality and CUD permits to allow the use of waste as a feedstock, and to sign the necessary agreements for the PPA for the facility. The IVRR plant will be modified to allow the plant to produce up to 18.8 MW of nameplate capacity power from the existing steam turbine, plus up to 55,851 gal/day of very high quality, ultra low sulfur, synthetic green diesel fuel. The total projected cost of the conversion of the IVRR plant to a merchant Gasification Waste to Energy and Synthetic Fuel Production Facility is summarized as follows:

• Repair of Existing Plant	$4,809,640
• Sorting Facility	$5,598,285
• New Maintenance Facility	$847,000
• Leachate/Water Treatment	$968,000
• 24 MW Gasification Facility	$29,347,964
• 700 TPD Fuel Production	$28,204,000
• Equipment Installation	$14,106,408
• Construction and/or Repair	$16,983,356
• Purchase of IVRR	$12,000,000
• Design/Project Manage	$11,707,220
• Project Development	$4,112,392
• Loan Fees	$1,477,778
• Corporate Expenses	$1,267,122

- Working Capital $6,380,476

Total Budget Estimate for IVRR $133,000,000

Therefore, the total cost to purchase, refurbish, modify, modify permits, test, commission, and produce commercial power/fuel from the IVRR Gasification and Diesel Fuel Production Facility is approximately $133,000,000.

The IVRR Biomass Power Plant is permitted to take biomass, which includes wood, agricultural waste, pallets, light-weight C&D, land clearing and landscape waste, and right of way trimmings from utilities. These permits will be modified to take waste and process the waste through the gasification facilities. Based on preliminary meetings with Imperial County and the State of California, the regulatory agencies appear to be more receptive to the gasification facility than to the restart of the existing biomass incinerator, which had a long history of emissions and regulatory violations.

Design, Permitting, Construction, Operation, and Maintenance of 1,200 to 7,200 tpd Gasification Synthetic Fuel Production Facility

MEP Operations and joint venture partners plan to finance, design, permit, construct, operate, and maintain a 7,200 tons/day Gasification Synthetic Fuel Production Facility in six phases. Each phase will be designed to process 1,200 tons/day of municipal solid waste, and 100 tons/day of used tires into very high quality, ultra low sulfur, synthetic green fuel. The proposed Site Development Plan for the 7,200 Gasification Synthetic Fuel Production Facility, which will produce up to 643,470 gal/day of very high quality, very low sulfur, synthetic green fuel as shown in Figure 3.

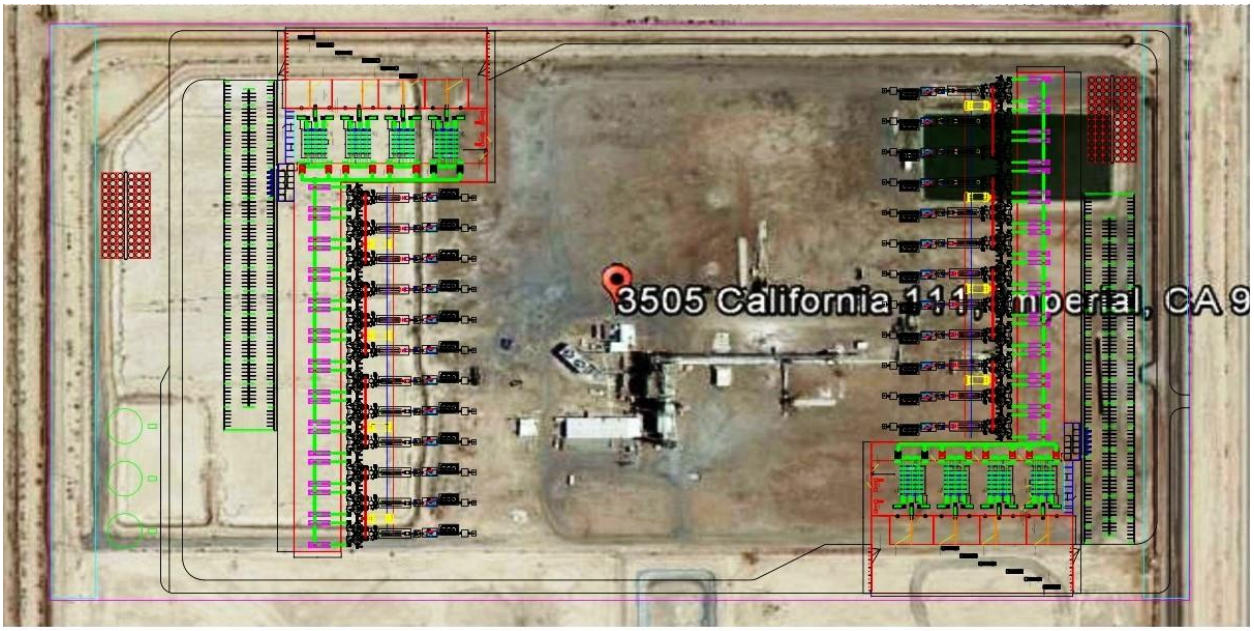


Figure 3. Imperial, California 3,600 ton/day Gasification Synthetic Fuel Facility Site Development Plan

1. Construction of a 1,200 tonne/day Sorting Facility and sorting the waste to separate out glass, metal, e-waste, soil, rock, and concrete for recycling. Removing unacceptable waste such as batteries, household hazardous waste, and inert industrial hazardous waste;
2. Construction of 1,200 Tpd Gasification Synthetic Fuel Production Facility. The used tires are debeaded, shredded, and fed to the gasifiers (Figure 4) with the MSW. With limited and regulated flow of air, the used tires and MSW are converted to Synthesis Gas (Syngas), which is converted to Synthetic Fuel;

Figure 4. Rotary Kiln Gasifiers

3. Construction of 107,345 gal/day/phase (405,764 liters/day/phase) Synthetic fuel production facility (Figure 5) from the synthesis gas produced by the Gasification Facility using a Fischer Tropsch Reactor and Condensation Column;
4. Construction of a Leachate/Water Treatment Plant. The leachate water from waste and condensate from the boiler and steam turbine are used as boiler feed water. The high pressure steam generated drives a turbine that generates power, which is output to the grid. A patented drying system is used to extract water from the waste, making the system extremely efficient for wet, organic waste, and resulting in extraction of 100 percent of the water needs for the facility from the waste, and from precipitation at the facility. The facility does not use city drinking water, and does not discharge wastewater to the sanitary sewer;
5. Slagging Unit. The residue is inert ash that can be used in a variety of ways. This constitutes less than 5 percent of the tonnage of used tires sent to the facility per day. This ash is free of toxic pollutants and can be safely used as aggregate, or may be used to make concrete block;
6. The unique design of MEP Gasification technology ensures negligible quantities of dioxins, furans, NOx, SOx, CO_2, volatile hydrocarbons, and particulate matter into the atmosphere. The efficiency of Synthetic fuel production depends on the characteristics of the feedstock;
7. Construction of State of the Art Flue Gas Treatment System. All international pollution control standards are easily met, since the plant design inherently generates less than 2 to 3 orders of magnitude of effluent gas, particulates, and heavy metals as compared USEPA Air Quality Standards, which are amongst the most stringent in the world; and
8. The design is patented and MEP is the only company authorized to implement projects using this design.

Figure 5. Fischer Tropsch Equipment

The Gasification Synthetic Fuel Production Facilities will be designed to be enclosed in buildings. The air management systems for the Gasification Facilities have the intakes located inside the buildings. As a result, all odors generated by the MSW will be captured by the air management system and will be treated in the Gasifiers at temperatures of 1,000 ºC and higher. Therefore, all odor causing chemical will be destroyed. The buildings will be maintained are relatively high negative pressures, resulting in high velocities into the buildings when doors are opened. Therefore, it will not be possible of any odors to leave the buildings, and wastes will not be tipped outside the buildings, so no odors will be generated by the facilities.

Figure 6. Gasification Facility Building

<u>Budget Estimate for Implementation of Each 1,200 tpd Phase of the Gasification Facility</u>

The Gasification Synthetic Fuel Production Facility will be constructed in 6 phases. The cost of the first phase of construction, which is the highest cost of construction is as follows:

• Equipment Cost	$143,112,897
• Installation of Equipment	$18,553,494
• Construction	$33,215,200
• Design and Project Manage	$16,419,220
• Project Development	$3,493,729
• License Fee	$3,493,729
• Loan Fees	$2,499,750
• Corporate Expenses	$2,011,971
• Working Capital	$2,200,009
Total Phase I Estimate	**$225,000,000**

Projected First Year Revenues

The estimated unit rates used in the financial model consist of the following:

• Tipping Fee for processing of MSW	$40.00/ton
• Tipping Fee for processing of Used Tires	$80.00/ton
• Tipping Fee for Sale of Recycled Clear Glass	$56.00/ton
• Tipping Fee for Sale of Recycled Colored Glass	$56.00/ton
• Tipping Fee for Sale of Recycled Ferrous Metal	$365.00/ton
• Tipping Fee for Sale of Recycled Aluminum	$1,705/ton
• Tipping Fee for Sale of Recycled e-waste	$600/ton
• Sale of Synthetic Fuel to Wholesaler	$2.00/gal
• Sale of Electricity to Grid	$0.12/kwh
• Sale of Carbon, Methane, PM, and Other Credits	$16.00/ton

The diesel rate is assumed to be $2.00/gal, which is low compared to the expected price at the time the construction of the facility will be completed. It is also conservatively assumed that the facility will be operated 50 percent of the time to produce electricity, and 50 percent of the time to produce Diesel fuel. Based on these unit rates, the calculated average annual revenues for each 1,200 tpd phase of the Gasification and Diesel Fuel Production Facility from tipping fees, sale of recyclables, sale of synthetic fuel, and sale of environmental credits are as follows:

• Processing of MSW	$17,520,000/yr
• Processing of Used Tires	$2,920,000/yr
• Sale of Recycled Clear Glass	$228,928/yr
• Sale of Recycled Colored Glass	$226,884/yr
• Sale of Recycled Ferrous Metal	$1,385,540/yr
• Sale of Recycled Aluminum	$311,163/yr
• Sale of Recycled e-waste	$832,200/yr
• Sale of Synthetic Fuel	$39,180,925/yr (50 percent of time)
• Sale of Electricity to Grid	$18,921,600/yr (50 percent of time)
• Environmental Credits	$1,739,633/yr
Total Annual Revenue	**$83,267,073/yr**

Therefore, the total estimated revenue in the first year of operation of Phase I of the Gasification Synthetic Fuel Facility is $83,267,073. The total projected revenue of the Facility in Year 6 as soon as Phase III is constructed is approximately $281,153,472, and the revenue in year 12 after the final stage is constructed is $569,966,754. Based on these numbers, the EBITDA in Year 6 is $202,783,595, the IRR is 35.7 percent, and the IRRe is 54.4 percent. The Net Present Value with a discount rate of 6 percent is $4,192,712,062, making the project highly profitable.

PRM Energy and HTT Gasifiers

The Gasifiers used by MEP in the MEP Gasification System are manufactured by PRM Energy. PRM Energy Systems, Inc. (PRME) has more than 30 years of experience in the design, manufacture, deployment and operation of gasification systems. The PRME Gasification Systems located at Producers Rice Mill, Inc., Stuttgart, Arkansas, have accumulated over 30 years of around the clock high demand industrial operation supplying process steam and heat for the world's largest rice parboiling complex. In addition, PRME gasifiers have gasified more solid waste than the next 5 largest gasification manufacturers combined.

At the Stuttgart Gasification Facility, two PRME Model KC-12 Gasifiers convert 135 metric tons per day of rice husks to synthesis gas for firing a heat recovery steam generator, a large rotary dryer, and four vertical dryers. A PRME Model KC-6 was installed in 1984 at the same location as a demonstration unit. The combined capacity of the three PRME Gasifiers is 16.9 MW. A summary of the PRME gasification facilities manufactured by PRME that are currently in operations is summarized in Table 2.1.

The Waste Dryers and Slagging Kiln for Buenos Aires Gasification Facility will be manufactured by HTT Municipality (HTT). HTT has manufactured waste gasification and dryers for more than 13 facilities around the world. HTT manufactured the intermediate size waste gasifiers and waste dryers for the MEP gasification facility in Trivandrum, India. The HTT experience in waste gasification and drying is also summarized in Table 2.

Table 2. PRME Gasification Facility Locations that are Currently Operating

Gasification Facility Locations	Capacity Feedstock (MWt)	Year	Application	Model
PRM Vertical Gasifiers:				
Stuttgart, Arkansas	7.5 MW	1982	Process steam and heat for drying parboiled rice	KC-12
Stuttgart, Arkansas	7.5 MW	1983	Process heat for drying parboiled rice	KC-12
Stuttgart, Arkansas	1.9 MW	1984	Test/demo model	KC-6
Griffith, Australia	10.6 MW	1985	Drying citrus waste	KC-14
Archer Daniel Midland	4 MW	1985	MSW, Process heat	KC-12
Pasir-Puteh, Malaysia	3.8 MW	1987	Drying paddy rice	KC-8
Simpang-Empat, Malaysia	3.8 MW	1988	Drying paddy rice	KC-8
Sekinchan, Malaysia	3.8 MW	1988	250kWe + Drying paddy rice	KC-8
Simpang-Lima, Malaysia	3.8 MW	1988	Drying paddy rice	KC-8
Seri-Tiram-Jaya, Malaysia	3.8 MW	1991	Drying paddy rice	KC-8
Megat-Dewa, Malaysia	3.8 MW	1992	Drying paddy rice	KC-8
Bukit-Kenak, Malaysia	3.8 MW	1993	Drying paddy rice	KC-8
Costa Rica	3.8 MW	1995	MSW	KC-8
Greenville, Mississippi	33.0 MW	1995	MSW, Rice Husks, 7.5Mwe + Steam for rice parboiling	KC-218
Tulsa Oklahoma	3.8 MW	1996	Demonstration model	KC-8
Stuttgart, Arkansas	63 MW	1996	Rice Husks, 13Mwe, + Process steam	KC-318
Jonesboro, Arkansas	17.0 MW	1996	Steam for rice parboiling, drying parboiled rice	KC-18
Rossano, Italy	3.8 MW	2002	Biomass Fired Engine Generator	KC-18
Dalton, Georgia	18.0 MW	2005	Steam for Process, Carpet and Wood Waste	KC-20
France, Moissannes	3.8 MW	2006	MSW, Biomass Fired Engine Generator	KC-8
St. Joe, Missouri	17.0 MW	2007	Steam for Process	KC-18
Scotland	3.8 MW	2009	Sludge Firing Thermal Oxidizer/Boiler	KC-8
HTT Rotary Gasifiers:				
Germantown, Maryland	2.0 MW		MSW, Agricultural Waste	50 Tpd
Yaphank, New York	2.0 MW		Tantilum Ore	50 Tpd
Mobile Unit	2.0 MW		Hazardous Waste	50 Tpd
Charlotte, North Carolina	2.0 MW		Contaminated Soil	50 Tpd
Chengdu, China	2.0 MW		MSW, Hazardous Waste	50 Tpd
Tucson, Arizona	2.0 MW		MSW	50 Tpd
South Plainfield, New Jersey	2.0 MW		MSW	50 Tpd
CPC Corporation, Taiwan	2.0 MW	2006	MSW	50 Tpd
Taoyuan Airport, Taiwan	4.0 MW	2007	MSW	120 Tpd
PetroChina, China	2.8 MW	2011	MSW	70 Tpd
Allron Corp., Phillipines	2.0 MW	2005	Hazardous Waste	50 Tpd
Bound Brook, New Jersey	2.0 MW	1006	Hazardous Waste	50 Tpd
Thermal Oxidizer:				
Ocala, FL	20 MW		MSW	600 Tpd

As shown in Table 2, PRME Gasifiers have been installed and are currently operating at 23 facilities around the world. The combined capacity of the PRME operating facilities is 207.1 MW, or 4,970.4 MW-hrs/day. The first system installed in Stuttgart, Arkansas in 1982 has been in continuous operation for more than 30 years, and continues to operate today. In addition, HTT has installed 12 Waste Gasification Facilities and one thermal oxidizer with combined capacity of 46.8 MW.

Brief descriptions of several key PRME Gasification systems are presented in the following sections.

Cargill Rice Milling 33 MW Gasifier, Greenville, Mississippi

PRME completed the installation of a 330-ton/day, 33 MW rice waste gasification system for Cargill Rice Milling of Greenville, Mississippi in 1995. The PRME Gasification system converts unground rice hulls/straw and other biomass fuels to **PRME Naturally™Gas**, which is burned in the Heat Recovery Boiler furnace delivering 115 million BTU/hr to an existing Heat Recovery Boiler/power island to produce 6.5 MW of electricity and 15,000 PPH of process steam for the rice parboiling facility.

PRME KC 218 Gasifiers and Multi-Stage Combustion Tube at the 33 MW Cargill Rice Milling Gasifier in Greenville, Mississippi

The PRME Gasification system includes: the fuel metering bin and structure, the refractory lined Model KC 218 Reactor/Gasifier, the combustion tube and chamber, the gasifier cooling water system, ash discharge/cooling assembly, multi-zone gasification air supply, multi- zone combustion air supply, rotary feeders and instrumentation required to provide automatic control over the process.

The major components of the system were fabricated and shipped on 24 August 1995 by river barge down the Arkansas River to the Port of Greenville, Mississippi. Components were off-loaded onto trucks and transported approximately 5 miles to the Cargill site and erected directly onto the foundations. The combustion tube refractory was installed in the fabrication shop and the gasifier refractories were gunned in place on site. Erection of the gasifiers and combustion tube was completed on 14 October 1995.

Installation of control instrumentation was essentially complete and bakeout of refractory was completed on 24 October 1995. Boilout of the Heat Recovery Boiler and blowdown/testing of steam lines was completed on 5 December 1995, and the turbine was placed into service.

Two bolted metal bins, each with a capacity of 150 tons, were supplied by Cargill for waste rice hull storage and feeding to the PRME metering bin. Cargill also supplied the ash conveying system, which received the rice hull ash from the water cooled ash cooling conveyor and transported the ash to the ash storage and loadout bin.

Fuel is introduced into the gasifier by a water-cooled screw conveyor that discharges into the drying and heating zone of the gasifier. The gasification process is controlled by the proportioned application of gasification and combustion air in a manner that supports efficient gasification. Residence time in the gasifier is varied by a residence control system that is adjusted to achieve the desired carbon content of the ash discharged from the gasifier. The use of mechanical bed agitation, precise gasification air control and zoning produces a clean, combustible gas that can be burned in the combustion tube and chamber for drying applications or in the radiant section of a Heat Recovery Boiler. The gasification rate is controlled by the demand of the dryer or Heat Recovery Boiler

Fuel is metered to the gasifier from the fabricated steel metering bin. The bin is equipped with level controls, an infeed leveling conveyor and a variable speed outfeed conveyor that delivers fuel to the gasifier. The speed of the outfeed conveyor is automatically adjusted by the gasifier control system to maintain a pre-set first stage gasification zone temperature. The discharge from the outfeed conveyor is directed through an impact weigh metering device that provides precise indication and control of the fuel feed rate. The feed system is installed complete with the necessary support steel, platforms and access ladders. The first stage temperature set point is manually adjusted to compensate for the average moisture content of the fuel being gasified.

The hydrocarbons contained in the gases are thermally cracked and burned in the combustion tube and chamber. The resulting clean hot air can be cooled and blended with recirculating air to maintain the desired temperature in drying applications or directed to a Heat Recovery Boiler for final combustion. At the Cargill project, the biogas is combusted in the Heat Recovery Boiler furnace. The gas combustion tube includes an emergency vent stack to safely exhaust gas to the atmosphere in the event of a failure of the induced draft fan.

The unique design of the PRME KC gasifier makes it possible to remove practically all of the ash and particulate matter from the bottom of the gasifier, continuously and automatically. Particulate carryover that occurs with other types of solid fuel combustion systems is greatly reduced. The extremely low particulate concentration in the gases leaving the gasifier makes it possible to direct fire a Heat Recovery Boiler without hot gas cleanup and to comply with particulate emission regulations without the use of expensive emission control equipment.

Various components of the gasifier are water cooled to insure reliable operation and longevity.

The power generating center is equipped with a standard high pressure heat recovery type water tube Heat Recovery Boiler, 450 psig/900 ºF, with a refractory lined furnace section where the final combustion of the biomass gases takes place, a high pressure condensing steam turbine/generator, economizer, condenser, deaerator, cooling tower and all of the auxiliary piping, valves, pumps, motors, drives, fans and controls necessary for a completely functional power center.

The gasifier and power center are equipped with all of the instrumentation and control devices required for complete, automatic operation of the system. The metering bin feed system, gasifier system and the ash discharge system all have an interlock control scheme functioning through the process controller. These interlocks are designed to shut down each system if a malfunction occurs that could cause damage to the gasifier. The metering bin level controls are interfaced with the feed stock storage bins to provide a uniform feed rate to the metering bin.

The gasifier instrumentation and control system provides sequential operation of the gasifier feed and ash discharge systems, PID control loops which adjust conditions within the gasifier to achieve efficient gasification of the feedstock, temperature and pressure transmitters, which signal the process controller, and a video display terminal for operator interface with the control system, motor control centers and wiring. The instruments are integrated with the main Heat Recovery Boiler master control.

PRME provided trained service personnel to supervise the erection, start-up, and commissioning of the equipment, and trained the client operators in the proper operation and maintenance of the ***PRME*** system. The training program included classroom and on-site training as well as supervision of operators during initial operation of the system.

PRME 7.5 MW Stuttgart Gasification Facility

The Stuttgart energy facility site is located at Riceland's soybean processing complex, which is approximately 1.5 miles from the rice milling facilities. The soybean complex uses up to 100,000 PPH of process steam and 6 to 8 MW of electricity. Locating the rice hull energy system at the soybean plant gives Riceland the flexibility to produce both process steam and electricity. In order to serve the rice mills with electricity, Riceland constructed its own transmission lines from the soybean plant to the rice mills.

A soybean wastewater sludge pond was drained, excavated, and backfilled to create the site for the energy facility. PRME began the search for appropriate used Heat Recovery Boilers and turbine/generators while Thermal Systems churned out the process design details. Packaged water tube Heat Recovery Boilers were located in Chicago, purchased, loaded and shipped to Stuttgart for refurbishing. A 15 MW extraction steam turbine/generator/condenser was purchased in Massachusetts and refurbished in Stuttgart and Dallas. Riceland began pouring foundations while PRME arranged fabrication of the Model KC-318 Gasifier system. Thermal Systems were designed, assembled, and programmed for the complete control system for the 525 ton per day facility.

Riceland constructed the rice hull truck unloading, receiving, and storage bins to receive up to 1,000 tons per day from their rice hull by products plant and the outdoor storage pile. The PRME gasification system included: the fuel metering bin and structure, the refractory lined Model KC-318 Gasifier, the biogas combustion tube and chamber, the gasifier cooling water system, water cooled ash discharge assembly, multi-zone gasification air supply, multi-zone combustion air supply, rotary feeders and instrumentation required to provide automatic control over the process.

The PRME KC-318 Gasifier consisted of a high temperature refractory lined cylindrical steel shell that is mounted in a vertical position on heavy structural steel supports. The lower portion of the gasifier contained an 18 ft diameter fixed grate. The cross sectional area of the upper portion of the gasifier was reduced to provide the turbulence required to ensure proper mixing of the product gas and the combustion air that is introduced into this area of the gas combustion tube. The refractory lining consisted of 2 inches of insulating castable and 6 inches of high temperature dense castable that was applied by gunning after the shell was erected. The lining was secured by stainless steel anchor clips attached to the shell.

Various components of the gasifier were water cooled to insure reliable operation and longevity.

The power generating center was equipped with two refurbished gas fired, packaged water tube Heat Recovery Boilers augmented with ash removal hoppers and soot blowers. High pressure steam, 900 psig/7500F, was delivered to the steam turbine/generator which generated up to 13MW, depending upon the process steam requirement. Process steam for the soybean plant was produced in a separate reHeat Recovery Boiler from condensate return from the soybean process by extracting steam from the turbine.

The gasifier and power center were equipped with all of the instrumentation and control devices required for complete, automatic operation of the system. The metering bin feed system, gasifier system and the ash discharge system all had an interlock control scheme functioning through the process controller. These interlocks were designed to shut down each system if a malfunction occurred that could cause damage to the gasifier.

Fuel was metered to the gasifier from the fabricated steel metering bin. The bin was equipped with level controls, an infeed leveling conveyor, and a variable speed outfeed conveyor that delivered fuel to the gasifier. The speed of the outfeed conveyor was automatically adjusted by the gasifier control system to maintain a preset first stage gasification zone temperature. The discharge from the outfeed conveyor was directed through an impact weigh metering device that provided precise indication and control of the fuel feed rate. The feed system was installed complete with the necessary support steel, platforms and access ladders. The first stage temperature set point was manually adjusted to compensate for the average moisture content of the fuel being gasified.

Fuel was introduced into the gasifier by a water-cooled screw conveyor that discharged into the drying and heating zone of the gasifier. The gasification process was controlled by the proportioned application of gasification and combustion air in a manner that supports efficient gasification. Residence time in the gasifier was varied by a residence control system that was adjusted to achieve the desired carbon content of the ash discharged from the gasifier. The gasifier and Heat Recovery Boiler system operated at a slightly negative pressure provided by the induced draft fan. The synthesis gas combustion tube included an emergency vent stack to safely exhaust gas to the atmosphere in the event of a failure of the induced draft fan.

The unique design of the PRME KC-318 Gasifier made it possible to remove practically all of the ash and particulate matter from the bottom of the gasifier, continuously and automatically. Particulate carryover that occurred with other types of solid fuel combustion systems was dramatically reduced.

Proper operation of the system made it possible to direct fire a Heat Recovery Boiler without hot gas cleanup and to comply with particulate emission regulations normally without the use of expensive emission control equipment.

The Riceland/Riviana facility at Stuttgart is currently the largest of many rice hull gasification systems installed by PRME. Rice hulls are a unique, high alkali fuel, high in ash content and high in silica content. Strict adherence to proper operating parameters, temperatures, and pressures must be observed for successful rice hull gasification.

Jonesboro 9 MW Gasification Facility

The Jonesboro rice hull energy system is located at Riceland’s white rice and parboiling complex in Jonesboro, Arkansas. The energy system is designed to convert 150 tons per day of unground rice hulls to a combustible gas that is used to fire a 15,000 PPH process steam Heat Recovery Boiler and three (3) rotary parboiled rice dryers.

The Jonesboro facility was planned, designed, and constructed simultaneously with the Stuttgart energy center. A site adjacent to Riceland's parboil/drying facility was chosen for the PRME KC-18 gasifier to facilitate the supplying of clean hot air to the rotary dryers. The rice parboiling process requires the soaking and steam pressure cooking of the rice before the hull is removed. During the process, the rice kernel becomes saturated with moisture and expands causing some partial exposure of the rice kernel. Because of this partial exposure, the rice kernel becomes vulnerable to any minute particulate that may be present in the first stage drying; therefore, to protect the exposed rice kernel from possible contamination during this critical drying stage, a portion of the gasifier flue gas is directed to a gas-to-air heat exchanger to heat ambient air to the proper drying temperature. The balance of the gasifier flue gas is directed to a used modified natural gas/oil fired Heat Recovery Boiler, as in the Stuttgart plant, to produce the required process steam for the parboiling process.

With the exception of some foundation and structural modifications for Jonesboro seismic requirements, the PRME Model KC-18 gasifier is the same design as the gasifiers at Stuttgart.

The operation of the Jonesboro gasification system is essentially the same as for the Stuttgart facility with the exception of the gas to air heat exchanger. This application requires that the synthesis gas produced from the rice hulls be fully combusted in the refractory lined biogas combustion tube and chamber before reaching the heat exchanger. The Jonesboro PLC based control system includes field instrumentation devices to monitor and control hot air drying temperatures to the parboiled rice drying system.

Startup and operation of the Jonesboro rice hull energy system was completed prior to the deadline. The gas-to-air heat exchanger design and air flows were computer modeled to target an 80 percent gas savings in the three large parboiled rice rotary dryers.

Moisssannes, France Experimental Gasification Facility

A PRME KC-8 Gasification Facility was constructed in Moissannes, France in 2005. The Moissannes Gasification Facility is an R&D plant constructed by Energia to test multiple feedstocks, including sawdust, bark, oak wood, pine wood, sludges, wine residue, and municipal solid waste. The power plant is a Caterpillar gas genset with a test gas cleaning system to remove tars from the synthesis gas.

The PRME gasifiers were selected because of the capability to adapt to any type of waste or biomass, low operating cost, high efficiency, and high reliability. Testing was performed by ECN Research Center (Netherlands). Power production from the facility has consistently been greater than 1.0 MW-hr/tonne of RDF.

PRME/ENERIA Gasification Facility in Moissannes, France

REMEDIAL ASSESSMENT & DESIGN EXPERIENCE

AIDEX PESTICIDE PLANT
Council Bluffs, Iowa, USA
Client: Confidential Client

MEP personnel performed a Remedial Investigation and Feasibility Study for the Aidex pesticide plant in Council Bluffs, Iowa. The Aidex pesticide plant produced numerous types of pesticides and herbicides. The plant went bankrupt and management abandoned the facility with numerous drums of pesticides and raw materials stacked both inside and outside the warehouses. Shortly after the company went bankrupt, there was a major fire at the facility, resulting the widespread release of chemical constituents and pesticides. The Remedial Investigation included soil sampling, and the installation of ground-water monitoring wells. An analysis of the available data indicated that there were significant impacts to site soils, and minor impacts to ground water and surface water. A Feasibility Study was performed to evaluate potential remedial technologies, develop remedial alternatives, and to screen and select the most appropriate and cost-effective remedial alternative. Based on these analyses, a conceptual remedial design for the facility was developed.

BRINE MUD IMPOUNDMENTS AT AN INDUSTRIAL SITE
Brunswick, Georgia, USA
Client: LCP Chemicals-Georgia

LCP Chemicals-Georgia (LCP) currently owns a site in Brunswick, Georgia, that had previously been occupied by several manufacturing operations, the earliest dating back to 1918. The previous operators included an oil refiner, a power generator, a paint manufacturer, and a chemical producer. Prior and ongoing operations have resulted in contamination of soil and ground water at the site. The site is adjacent to an ecologically sensitive estuarine marsh. The project involved several components, including investigation of ground-water contamination from on-site brine mud impoundments, evaluation of closure options for the impoundments, preparation of a closure plan meeting federal requirements, preparation of a ground-water monitoring plan, preparation of a detailed hydrogeologic model of the site, and preparation of a work plan for an RIFS for other areas of the site. A final remedial design for a containment dike forming a portion of a retention pond at the site has been undertaken. The dike was constructed from various fill materials, including anodes containing polychlorinated biphenyls (PCBs). The pond receives water from the chemical plant and cannot be drained. To address this constraint, a staged remedial construction procedure was developed that utilized an earthen cofferdam to allow remediation of the berm without draining the pond.

CONSERVATION CHEMICAL COMPANY
Kansas City, Missouri
Client: Confidential Client

MEP personnel performed a Remedial Investigation, Feasibility Study, and Remedial Design for the Conservation Chemical Company site in Kansas City, Missouri. The facility consisted of five surface impoundments, storage tanks, and a liquid waste incinerator used to dispose of over 1000 different types of wastes. Volatile organic compounds were either incinerated, or placed directly in the impoundments for disposal. Liquid wastes, including PCBs, acids, petroleum by-products, plating wastes, and pentachlorophenol were placed directly in the pits. Spent cyanide was mixed with spent acids to form cyanide salts. The facility was closed by mixing the wastes in place with fly ash, and covering with soil. The remedial design for the facility included the installation of a RCRA compliant final cover system, and installation of a ground-water recovery and treatment system.

DESIGN EROSION CONTROL SYSTEM
Broward County, Florida, USA
Client: South Florida Water Management District

A structural solution was sought to control the erosion along a 1.2-mile (1.9-km) long section of the North New River Canal in Broward County, Florida. Tasks included preparing conceptual designs for various structural alternatives that would provide erosion control. The alternatives that were being evaluated include articulating block systems (ABS), geoweb cellular confinement systems, and rip-rap slope protection. These alternatives were being evaluated on the basis of: (i) material and construction costs; (ii) construction feasibility; and (iii) environmental and other factors. Following approval of the selected alternative by the client, a detailed design of the selected structural solution will be performed, which will include construction drawings and design specifications.

GLEN BURNIE LANDFILL
Glen Burnie, Maryland, USA
Client: Anne Arundel County, Maryland

MEP personnel participated in the Remedial Investigation performed at the Glen Burnie NPL Landfill in Glen Burnie, Maryland. The site is within a recharge area for major water-bearing formations just outside of Baltimore. A site investigation plan was prepared and presented to the Maryland Department of Environment (MDE) and USEPA for review. Following approval of the plan, soil borings, piezometers, and ground-water monitoring wells were installed at the site. Air, soil, surface-water, and ground-water sampling was performed, and a detailed hydrogeologic model was developed for the site. An assessment was then performed to evaluate the pathways and potential receptors of impacted ground water and surface water. A baseline risk assessment was performed to provide a basis to determine the need for additional work, and to provide a baseline for evaluation of remedial alternatives.

INDUSTRIAL HAZARDOUS WASTE LANDFILL
Criner, Oklahoma, USA
Client: PRP Steering and Technical Committee

The Hardage NPL site was an active industrial hazardous waste landfill from September 1972 until November 1980. During its active life the Hardage site received approximately 24 million gallons of solid, liquid and drummed wastes. The wastes included sludges, solvents, fuels, paints, acids, bases, oils, pesticides, insecticides and other industrial wastes. Remedial work on the Hardage project began in early 1988. The scope of activities performed for the project have included: (i) serving as consultant to the Hardage Steering Committee and Technical Committee; (ii) performing a study of the likely performance of a range of potential corrective measures; (iii) designing the source control remedy; (iv) performing a risk assessment of primary source control remedies; (v) performing contaminant transport evaluations for primary source control remedies; and (vi) providing expert testimony. With respect to controlling the source of contamination, lateral containment berms were proposed, as well as a surface-water management system, a final cover system, and several other features. Construction drawings, specifications, and cost estimates were prepared for each component of the source control remedy.

INVESTIGATION OF REMEDIATION STRATEGIES FOR A FORMER ZINC SMELTING AND DIE CASTING OPERATION
Lasalle, Illinois, USA
Client: Carus Chemical Company

A plan was negotiated with the Illinois Environmental Protection Agency (IEPA) to include the Carus site in the voluntary cleanup program in an effort to maintain owner/consultant control over the project and save the client approximately 75 percent of anticipated cost compared to those anticipated for an IEPA or USEPA directed site. An assessment was conducted of the chemical manufacturing facility and a former zinc smelting and die casting operation. Solid waste units were identified as large slag and sinter deposits, wastewater holding pond area, former filter and bag house area, former underground storage tank, and an emergency storage pond. Negotiations were held with the IEPA to reduce the scope of work (and associated investigation costs by approximately $80,000) to exclude unnecessary information, as well as prepare work plans to reflect the changes. A facility investigation was performed on the affected media, soil, ground-water, surface-water, and sludge, to determine the nature, scope, and impact of releasing the constituents of concern (i.e., petroleum products, cadmium, copper, lead, and zinc). Corrective measures were evaluated that could effectively mitigate or minimize impacts to the environment and human health. Corrective measures considered included: (i) monitoring and access control; (ii) installation of protective cover; (ill) construction of gravel drain; (iv) construction of grout curtain; (v) stabilization and/or solidification of sinter and slag deposits; and (vi) removal actions. A risk assessment was conducted to evaluate the impact of the release of constituents to the environment and public health, and to guide necessary remedial actions.

INVESTIGATION OF THE BRIDGEPORT-PIEDMONT MANUFACTURING FACILITY
Altavista, Virginia, USA
Client: Bridge Products Incorporated

A comprehensive investigation was conducted of an industrial facility that manufactures fluid control devices (i.e., tire valves and changing ports for refrigeration and air conditioning systems). Manufacturing operations at the site included brass, aluminum, and steel machining of rods and coils as well as the mixing and molding of rubber compounds. Solid Waste Management Units (SWMUs) were identified to include; (i) an industrial wastewater treatment system; (ii) sludge filter beds; (iii) a sludge impoundment; (iv) scrap metal dumpsters; (v) a perchioroethylene vapor degreaser and distillation unit; (vi) a waste soluble cutting oil disposal area; (vii) an insoluble cutting oil recycling and waste oil disposal area; and (viii) a waste oil tank. The facility investigation included soil and ground-water sampling, soil gas survey, and ground-water modeling to determine the nature, scope, and impact of releasing the constituents of concern (i.e., perchloroethylene (PCE), trichloroethylene (TCE), and degradation products). In addition, the project required the review of a risk assessment performed by others. Intermediate corrective measures (i.e., pumping of ground water and air stripping to remove volatile organic compounds (VOCs)) were implemented to mitigate off-site migration of contaminated ground water. Source removal of contaminated soil was also implemented as a corrective measure. A ground-water monitoring system was installed at the site to delineate the extent of ground-water contamination and, subsequently, to assess the effectiveness of the remedial actions.

MIAMI PAINT FACILITY
Opa Locka, Florida, USA
Client: Atlantic Richfield Company Environmental Remediation

The project involved the preparation of a contaminant assessment plan/remedial action plan (CAR/RAP) for the former Miami Paint facility in Opa Locka, Florida. The CAR/RAP was submitted to the applicable government agency for review and approval. For the CAR/RAP, the vertical and horizontal extent of chromium-affected soil were delineated through soil sampling and analysis. The vertical extent of chromium-affected soil was greater than originally anticipated, extending below the water table and several sumps. Various methods for remediation of the chromium-affected soil were evaluated. These methods included: (i) dewatering using a well-point system and subsequent excavation; (ii) in-situ stabilization; (iii) construction of sheet pile walls and subsequent excavation; (iv) pressure grouting to reduce the permeability of the chromium-affected soil; and (v) construction of a slurry wall and subsequent excavation. Dewatering and excavation/disposal was chosen as the preferred remedial alternative due to cost effectiveness and proven applicability to the site conditions. A vacuum well-point system was installed to draw down the water table at the site, with extracted water discharged to on-site infiltration sumps. The contaminated soil was disposed of at an approved landfill.

MOTCO SITE
Texas City, Texas
Client: USEPA

MEP personnel participated in the Remedial Investigation and Feasibility Study, and provided expert testimony for the MOTCO site in Texas City, Texas. The MOTCO site is a former sand pit that was filled with industrial wastes from petro-chemical industries in the vicinity. The pits contained both dense non-aqueous phase liquids (DNAPLs) and light weight non-aqueous phase fluids (NAPLs), including styrene tars, solvents, PCBs, pesticides, petroleum by-products, and heavy metals. DNAPLs were detected in pure phase at depth moving along slickensides in the underlying clay soils. Soil borings, piezometers, and ground-water monitoring wells were installed to evaluate the extent and magnitude of contamination. Geophysics were performed at the site to evaluate the extent of migration between monitoring wells. The Feasibility Study evaluated remedial technologies that could be implemented at the site. Based on the Feasibility Study, a combination of containment in place and destruction alternatives were selected for implementation at the site.

NORTHEAST UTILITIES SITES
Several States in Northeast USA
Client: Baach, Robinson, & Lewis

MEP personnel prepared remedial designs for more than 20 Manufactured Gas Plant (MGP) sites, five Generating Stations, and an underground cable in the northeast USA. These remedial designs included excavation and disposal, in-situ treatment, ground-water recovery and treatment, slurry wall, trenches, capping, and stream and wetland restoration. In addition, MEP Personnel provided expert services in settlement meetings and legal proceedings.

REMEDIAL DESIGN AND CONSTRUCTION OF 138TH STREET FACILITY
Chicago, Illinois
Client: Land and Lakes Company

MEP personnel performed a Remedial Investigation, Feasibility Study, Risk Assessment, Remedial Design, and Construction Supervision for the 138th Street Hazardous Waste Landfill. The Landfill was originally constructed in a clay pit along the boundary of the Little Calumet River. Leachate constituents were detected in the ground-water monitoring wells between the landfill and the river. MEP personnel designed a ground-water collection system and bentonite slurry wall between the landfill and the river. Trenchless construction was used to install the ground-water recovery system in the soft soils adjacent to the Little Calumet River. In addition, MEP personnel designed vertical gas extraction wells, a gas collection and treatment system, and leachate recovery wells in the landfill to reduce leachate head and minimize the potential for lateral and vertical migration. MEP personnel performed numerical modeling of the site to evaluate ground-water flow and constituent migration. This model was used to predict ground-water concentrations at the point of compliance boundary, and to predict the performance of the leachate and ground-water recovery systems.

MUSSAFAH DUMPSITE INVESTIGATION
Mussafah, UAE
Client: Abu Dhabi Municipality

MEP personnel were retained to perform a remedial investigation, feasibility study, and risk assessment of a former dumpsite in Mussafah, UAE. The site was an abandoned dumpsite that was being developed as an industrial complex. MEP personnel installed ground-water monitoring wells, and surface-water sampling points, and obtained samples of ground water, surface water, soil and waste for chemical analysis. In addition, MEP personnel performed numerical modeling of ground-water flow and constituent migration to evaluate constituent concentrations over a 50-year period, and to evaluate potential impacts to surface water and ground water over time. Based on the results of the site investigation, assessment, and the results of the numerical modeling, MEP personnel performed a feasibility study to evaluate the cost-effectiveness of various remedial measures. Based on the results of the study, MEP personnel prepared recommendations to address the existing contamination and mitigate potential harm to human health and the environment.

AL DAHFRA DUMPSITE INVESTIGATION
Al Dahfra, UAE
Client: Abu Dhabi Municipality

MEP personnel was retained to perform a remedial investigation, feasibility study, and risk assessment of an existing dumpsite in Al LDhafra, UAE. The site was an active dumpsite that received C&D, MSW, and industrial waste, including liquid hazardous waste. MEP personnel installed ground-water monitoring wells, and obtained samples of ground water and soil for chemical analysis. In addition, MEP personnel performed numerical modeling of ground-water flow and constituent migration to evaluate constituent concentrations over a 50-year period, and to evaluate potential impacts to ground water over time. Based on the results of the site investigation, assessment, and the results of the numerical modeling, MEP personnel performed a feasibility study to evaluate the cost-effectiveness of various remedial measures. Based on the results of the study, MEP personnel prepared a remedial design for the dumpsite, which included the excavation of highly contaminated soil, construction of a geosynthetic and soil final cover system, and construction of a slurry wall.

WESTERN REGION DUMPSITES INVESTIGATION
Western Region, UAE
Client: Abu Dhabi Municipality

MEP personnel performed site investigations and preliminary contamination assessments of 17 former and existing dumpsites in the Western Region. The investigations included an assessment of the types and quantities of waste disposed of at each facility, an assessment of the site geology and hydrogeology, and a preliminary assessment of potential impacts to human health and the environment. Based on the results of the site investigations, MEP personnel prepared recommendations for additional actions at each of the dumpsites.

SALTA SITE ASSESSMENT AND REMEDIAL ACTION PLAN
Parkland, Florida
Client : TLH-18-Salta LLC

MEP personnel performed a site assessment of the Atlas Lox Road Site in Parkland, Florida. The Site Assessment included the installation of more than 100 soil borings, soil sampling, sampling of waste materials placed in the reclaim area, installation of ground-water monitoring wells, and characterization and assessment of the soil, ground-water, and surface-water impacts resulting from the dumping of C&D waste and municipal solid waste in the reclaim area during the cleanup of hurricane debris from Hurricane Andrew.

Site Assessment Reports and a Remedial Action Plan were prepared based on the data and information obtainted from the Site Assessments. The Site Assessment Reports and Remedial Action Plan were approved by Broward County Department of Environmental Protection, leading to the implementation of the remedial actions at the site.

SALTA REMEDIAL ACTION
Parkland, Florida
Client : TLH-18-Salta LLC

MEP personnel managed the implementation of the remedial action at the former Atlas Lox Road C&D Recycling and Compost Facility site in Parkland, Florida. The remedial action included the excavation and screening of more than 400,000 tons of C&D waste, impacted soil, and residual screened materials placed on the reclaim area of the site. The excavated materials were screened through 0.5 in. And 3.0 in. Screens, and the materials passing the 0.5 in. screen were tested for Arsenic. High organic content soils and excavated materials with Arsenic concentrations greater than 6.0 mg/kg were hauled to a licensed landfill for use as daily cover.

Materials retained on the 0.5 in and 3.0 in screens were sorted and separated into concrete/rock, processed wood, vegetation, C&D waste, used tires, metals, and MSW. Concrete and rock were crushed and tested for Arsenic. Crushed concrete and rock with Arsenic concentrations greater than 6.0 mg/kg were hauled to a landfill. C&D Waste, proceesed wood, and vegetation were hauled to a C&D recycling facility or C&D landfill. Used tires and metals were recycled. MSW was hauled to a licensed Class I landfill for disposal.

Arsenic and SPLP Arsenic tests were performed on excavated materials passing the 0.5 in. screen with Arsenic concentrations less than 6.0 mg/kg, and on the crushed rock and concrete. The leachability of the Arsenic from the excavated material and crushed rock/concrete was evaluated for the materials, and for the materials mixed with imported clean soil at a ratio of 5 parts imported clean soil, to one part excavated or crushed material. These leached concentrations were compared to the 95% confidence limit of the ground-water contamination to determine the suitability of the mixed imported clean soil and excavated or crushed materials for use as general fill material at the site. Based on these analyses, it was determined that as long as the Arsenic concentration of the mixed materials were less than the residential SCTL for Arsenic (2.1 mg/kg), there would be no measurable impact to ground-water quality resulting for leaching of water through the mixed general fill materials.

The general fill mateirals were compacted in lifts to 95 percent modified proctor, and the site was approved for clean closure and development as a residential area.

MISTY MEADOWS SITE ASSESSMENT AND REMEDIAL ACTION PLAN
Parkland, Florida
Client : TLH-19-Misty Meadows LLC

MEP personnel performed a site assessment of the Misty Meadows site in Parkland, Florida. The Site Assessment included the installation of more than 100 soil borings, soil sampling, sampling of waste materials placed in the reclaim area, installation of ground-water monitoring wells, and characterization and assessment of the soil, ground-water, and surface-water impacts resulting from the dumping of C&D waste and municipal solid waste in the reclaim area during the cleanup of hurricane debris from Hurricane Andrew.

Site Assessment Reports and a Remedial Action Plan were prepared based on the data and information obtainted from the Site Assessments. The Site Assessment Reports and Remedial Action Plan were approved by Broward County Department of Environmental Protection, leading to the implementation of the remedial actions at the site.

MISTY MEADOWS REMEDIAL ACTION
Parkland, Florida
Client : TLH-18-Salta LLC

MEP personnel managed the implementation of the remedial action at the Misty Meadows site in Parkland, Florida. The remedial action included the excavation and screening of more than 100,000 tons of C&D waste, impacted soil, and residual screened materials placed on the reclaim area of the site. The excavated materials were screened through 0.5 in. And 3.0 in. Screens, and the materials passing the 0.5 in. screen were tested for Arsenic. High organic content soils and excavated materials with Arsenic and Benzo(a) Pyrene equivalent concentrations greater than 6.0 mg/kg were hauled to a licensed landfill for use as daily cover.

Materials retained on the 0.5 in and 3.0 in screens were sorted and separated into concrete/rock, processed wood, vegetation, C&D waste, used tires, metals, and MSW. Concrete and rock were crushed and tested for Arsenic and Benzo(a)Pyrene equivalent. Crushed concrete and rock with Arsenic and Benzo(a)Pyrene equivalent concentrations greater than 6.0 mg/kg were hauled to a landfill. C&D Waste, proceesed wood, and vegetation were hauled to a C&D recycling facility or C&D landfill. Used tires and metals were recycled. MSW was hauled to a licensed Class I landfill for disposal.

Arsenic, Benzo(a)Pyrene, SPLP Arsenic, and SPLP Benzo(a)Pyrene tests were performed on excavated materials passing the 0.5 in. screen with Arsenic and Benzo(a)Pyrene equivalent concentrations less than 6.0 mg/kg, and on the crushed rock and concrete. The leachability of the Arsenic and Benzo(a)Pyrene equivalent from the excavated material and crushed rock/concrete was evaluated for the materials, and for the materials mixed with imported clean soil at a ratio of 5 parts imported clean soil, to one part excavated or crushed material. These leached concentrations were compared to the 95% confidence limit of the ground-water contamination to determine the suitability of the mixed imported clean soil and excavated or crushed materials for use as general fill material at the site. Based on these analyses, it was determined that as long as the Arsenic and Benzo(a)Pyrene equivalent concentrations of the mixed materials were less than the residential SCTLs, there would be no measurable impact to ground-water quality resulting for leaching of water through the mixed general fill materials.

The general fill mateirals were compacted in lifts to 95 percent modified proctor, and the site was approved for clean closure and development as a residential area.

PALM BEACH FARMS SITE ASSESSMENT AND REMEDIAL ACTION PLAN
Parkland, Florida
Client : TLH-20-Palm Beach Farms LLC

MEP personnel performed a site assessment of the Palm Beach Farms site in Parkland, Florida. The Site Assessment included the installation of more than 100 soil borings, soil sampling, sampling of waste materials placed in the reclaim area, installation of ground-water monitoring wells, and characterization and assessment of the soil, ground-water, and surface-water impacts resulting from the dumping of C&D waste and municipal solid waste in the reclaim area during the cleanup of hurricane debris from Hurricane Andrew.

Site Assessment Reports and a Remedial Action Plan were prepared based on the data and information obtainted from the Site Assessments. The Site Assessment Reports and Remedial Action Plan were approved by Broward County Department of Environmental Protection, leading to the implementation of the remedial actions at the site.

PALM BEACH FARMS REMEDIAL ACTION
Parkland, Florida
Client : TLH-20-Palm Beach Farms LLC

MEP personnel managed the implementation of the remedial action at the former Palm Beach Farms site in Parkland, Florida. The remedial action included the excavation and screening of more than 100,000 tons of C&D waste, impacted soil, and residual screened materials placed on the reclaim area of the site. The excavated materials were screened through 0.5 in. And 3.0 in. Screens, and the materials passing the 0.5 in. screen were tested for Arsenic. High organic content soils and excavated materials with Arsenic concentrations greater than 6.0 mg/kg were hauled to a licensed landfill for use as daily cover.

Materials retained on the 0.5 in and 3.0 in screens were sorted and separated into concrete/rock, processed wood, vegetation, C&D waste, used tires, metals, and MSW. Concrete and rock were crushed and tested for Arsenic. Crushed concrete and rock with Arsenic concentrations greater than 6.0 mg/kg were hauled to a landfill. C&D Waste, proceesed wood, and vegetation were hauled to a C&D recycling facility or C&D landfill. Used tires and metals were recycled. MSW was hauled to a licensed Class I landfill for disposal.

The general fill mateirals were compacted in lifts to 95 percent modified proctor, and the site was approved for clean closure and development as a residential area.

DOLLYLAND SITE ASSESSMENT AND REMEDIAL ACTION PLAN
Parkland, Florida
Client : TLH-21-Dollyland LLC

MEP personnel performed a site assessment of the Palm Beach Farms site in Parkland, Florida. The Site Assessment included the installation of more than 20 soil borings, soil sampling, sampling of waste materials placed in the reclaim area, installation of ground-water monitoring wells, and characterization and assessment of the soil, ground-water, and surface-water impacts resulting from the dumping of C&D waste at the site.

Site Assessment Reports and a Remedial Action Plan were prepared based on the data and information obtainted from the Site Assessments. The Site Assessment Reports and Remedial Action Plan were approved by Broward County Department of Environmental Protection, leading to the implementation of the remedial actions at the site.

DOLLYLAND REMEDIAL ACTION
Parkland, Florida
Client : TLH-21-Dollyland LLC

MEP personnel managed the implementation of the remedial action at the former Dollyland site in Parkland, Florida. The remedial action included the excavation and screening of more than 20,000 tons of C&D waste, impacted soil, and residual screened materials placed on the reclaim area of the site. The excavated materials were screened through 0.5 in. And 3.0 in. Screens, and the materials passing the 0.5 in. screen were tested for Arsenic. High organic content soils and excavated materials with Arsenic concentrations greater than 6.0 mg/kg were hauled to a licensed landfill for use as daily cover.

Materials retained on the 0.5 in and 3.0 in screens were sorted and separated into concrete/rock, processed wood, vegetation, C&D waste, used tires, metals, and MSW. Concrete and rock were crushed and tested for Arsenic. Crushed concrete and rock with Arsenic concentrations greater than 6.0 mg/kg were hauled to a landfill. C&D Waste, proceesed wood, and vegetation were hauled to a C&D recycling facility or C&D landfill. Used tires and metals were recycled. MSW was hauled to a licensed Class I landfill for disposal.

The general fill mateirals were compacted in lifts to 95 percent modified proctor, and the site was approved for clean closure and development as a residential area.

WASTEWATER TREATMENT PROJECT EXPERIENCE

RIVERBEND PRAIRIE LEACHATE TREATMENT SYSTEM
Dalton, Illinois
Client: Land and Lakes Company

The project included the design of the gravity lines, fittings, manholes, and roadway restoration, preparing construction drawings and technical specifications, and obtaining the permits for construction. In addition, MEP personnel were retained to evaluate the source of odors in the manholes, and to design an odor treatment system. MEP personnel supervised construction of the project and provided QA/QC during construction.

KADUNA WASTEWATER TREATMENT FACILITY
Kaduna, Nigeria
Client: Municipality

MEP personnel design a wastewater treatment plant for municipal and industrial wastewater for the Municipality of Kaduna. The facility included both primary and secondary treatment, with discharge to surface water. The facility was located in an industrial area and was specifically designed to handle dies and discharges from the garment industry in the area.

BERMAN ROAD LEACHATE TREATMENT FACILITY
Okachobee, Florida
Client: Waste Management Inc.

The project included the design and construction management of a wastewater treatment facility to treat landfill leachate. The design included a lined aeration ponds and secondary treatment using reverse osmosis. Treated water was discharged to surface water. MEP personnel prepared the design, construction drawings, specifications, obtained the state and local permits, and evaluated the bid packages from the contractors. MEP personnel also provided construction management for the facilities, and performed QA/QC during construction.

COUNTRYSIDE WASTEWATER TREATMENT FACILITY
Lake County, Illinois
Client: USA Waste

The project included the design of a wastewater treatment plant to treat leachate from an MSW Landfill. The facility included both primary and secondary treatment, and treated water was discharged to surface water. MEP personnel prepared the design, construction drawings, specifications, obtained the state and local permits, and evaluated the bid packages from the contractors. MEP personnel also provided construction management for the facilities, and performed QA/QC during construction.

KARACHI DHA 5.0 MGPD WWTP FACILITY
Karachi, Pakistan
Client: DHA

MEP personnel designed a 5.0 MGPD (19,000 m^3/day) wastewater treatment plant (WWTP) for Phase VIII of the Defense Housing Authority (DHA) in Karachi, Pakistan. The feasibility study for the project included the development of designs and detailed cost estimates for construction and operation of both a conventional activated sludge WWTP, and a modified plant using the One Moving Part (OMPAPA™) system developed by Noyes Associates (Noyes Technology). Based on the results of the feasibility study, it was determined that for the site conditions, the Noyes Technology, which is a modified Activated Sludge Treatment System, had a lower capital cost (30 percent lower) and operating cost (70 percent lower). The treatment facility consisted of a pump station, screens, aeration basin, clarifier, aerobic sludge digester, centrifuges to dewater the sludge, and a chlorination system to treat the effluent. The design requirements for the system specified a reduction in the BOD for the influent from over 400 mg/L, to less than 15 mg/L. The treated effluent was required to be of an acceptable quality for use as irrigation water in parks and at the Golf Course.

KARACHI DHA 0.5 MGPD WWTP FACILITY
Karachi, Pakistan
Client: DHA

MEP Ppersonnel designed a 0.5 MGPD (2,000 m^3/day) wastewater treatment plant (WWTP) for the Defense Housing Authority (DHA) in Karachi, Pakistan. The feasibility study for the project included the development of designs and detailed cost estimates for construction and operation of both a conventional activated sludge WWTP, and a modified plant using the One Moving Part (OMPAPA™) system developed by Noyes Associates (Noyes Technology). Based on the results of the feasibility study, it was determined that for the site conditions, the Noyes Technology, which is a modified Activated Sludge Treatment System, had a lower capital cost (30 percent lower) and operating cost (70 percent lower). The treatment facility consisted of a pump station, screens, aeration basin, clarifier, aerobic sludge digester, centrifuges to dewater the sludge, and a chlorination system to treat the effluent. The design requirements for the system specified a reduction in the BOD for the influent from over 400 mg/L, to less than 15 mg/L. In addition, the treatment system was designed to accommodate a with range in initial flowrates, and high salt concentrations due to saline ground-water conditions in the area. The treated effluent was required to be of an acceptable quality for use as irrigation water in parks and at the Golf Course.

BARKA 2,000 M^3/DAY WWTP FACILITY
Barka, Oman
Client: MRMEWR

MEP personnel designed the 2,000 m^3/day wastewater treatment plant (WWTP) expansion for Barka Municipality and the Ministry of Regional Municipalities, Environment, and Water Resources (MRMEWR). The design included a reception tank, screens, concentric aeration basin and clarifier, centrifuges, and sludge drying beds. The design also included and option to modify the existing WWTP to be used as an aerobic sludge digester to replace the sludge drying beds. The system was designed for an average influent BOD of 400 mg/L, with an effluent BOD of 25 mg/L. The design included treatment of the effluent with chlorination so the effluent could be used for irrigation of agricultural areas and municipality parks and green areas. The system design was also modified to allow major fluctuations in the influent flowrates, resulting from delivery of the influent by tanker trucks. The system was also designed to provide treatment of leachate from an adjacent municipal solid waste (MSW) landfill.

MIRBAT 900 M^3/DAY WWTP FACILITY
Mirbat, Oman
Client: Dhofar Municipality

Dhofar Municipalty requested that MEP personnel provide design and equipment supply for a 0.239 MGPD (900 m^3/day) wastewater treatment plant (WWTP) that would treat municipal sewage for the Municipality of Mirbat, Oman. MEP personnel formed a Joint Venture with Noyes Associates, the manufacturer of the wastewater treatment equipment, to design and provide the wastewater treatment equipment for the 0.239 MGPD (900 m^3/day) WWTP.

Based on the information provided by the Dhofar Municipality, an alternative design was developed using a modified type of activated sludge treatment system. The alternative design was based on a One Moving Part Plant (OMPAPA^{TM}) technology, with a concentric aeration basin and clarifier to minimize both the capital cost and operating cost of the plant, and sludge digester to reduce the quantity of sludge prior to disposal in the new MSW Landfill. The 0.239 MGPD (900 m^3/day) OMPAPA^{TM} WWTP design was selected as the recommended and specified conceptual plant design configuration because the proposed plant design:

- Could meet WWTP performance requirements within site area limitations,
- Could cost-effectively provide water at landscape reuse quality,
- Could be built faster than a conventional WWTP,
- Could provide sufficient flexibility for operation at the range of influent flowrates;
- Had fewer moving parts, which minimized maintenance costs and made the OMPAPA^{TM} WWTP easier to operate;
- The OMPAPA^{TM} WWTP was driven by one pump, which reduced the spare parts inventory, reduced the possibility of down time, and made the system much easier to operate and maintain; AND
- Minimized odors to the extent possible.

A preliminary engineering feasibility analysis resulted in the determination that overall site size and layout for the most reliable, easy to maintain, and most cost effective treatment plant process configuration to achieve the design requirements and specifications could easily fit on a plot of 840 m^2 (0.08 Hectares). The system design included an aerobic sludge digester to processs the sludge and covert the sludge to compost. This process minimized odors and converted the sludge into compost, which could be used for fertilizer. The system design could also be modified to use either sludge drying beds, or additional centrifuges instead of the aerobic sludge digester. This would reduce the overall cost of the system, but would increase the odors associated with the management and handling of the sludge.

TAQAH 600 M^3/DAY WWTP FACILITY
Taqah, Oman
Client: Dhofar Municipality

Dhofar Municipalty requested that MEP personnel provide the design and equipment supply for a 0.159 MGPD (600 m^3/day) wastewater treatment plant (WWTP) that would treat municipal sewage for the Municipality of Taqah, Oman. Globex formed a Joint Venture with Noyes Associates (Globex-Noyes JV), the manufacturer of the wastewater treatment equipment, to design and provide the wastewater treatment equipment for the 0.159 MGPD (600 m^3/day) WWTP.

Based on the information provided by the Dhofar Municipality, MEP personnel prepared an alternative design based on a One Moving Part Plant (OMPAPA^{TM}) technology, with a concentric aeration basin and clarifier to minimize both the capital cost and operating cost of the plant, and centrifuges and/or a sludge digester to reduce the quantity of sludge prior to disposal in the new MSW Landfill.

A preliminary engineering feasibility analysis resulted in the determination that overall site size and layout for the most reliable, easy to maintain, and most cost effective treatment plant process configuration to achieve the design requirements and specifications can easily fit on a plot of 560 m^2 (0.06 hectares). The system design included an aerobic sludge digester to process the sludge and covert the sludge to compost. This process minimized odors and converted the sludge into compost, which could be used for fertilizer. The system design could be modified to use either sludge drying beds, or additional centrifuges instead of the aerobic sludge digester. This reduced the overall cost of the system, but increased the odors associated with the management and handling of the sludge.

DHOFAR MINICIPALITY AEROBIC SLUDGE DIGESTER
Salalah, Oman
Client: Dhofar Municipality

The Dhofar Municipality requested the MEP personnel to design, supply, and construct a 372 m^3/day Aerobic Sludge Digester at the existing Salalah WWTP, and a 15 tonne/day Compost Plant at the existing Salalah solid waste management facilities.

Sludge waste from the primary and secondary settlement tanks was combined with a recycle stream of digested biosolids and was pumped into the Aerobic Sludge Digester through a fluid manifold pipe. Prior to re-entry to the Aerobic Sludge Digester, aeration was achieved by aspiration in the throat of a Venturi inserted in the pipe prior to the redistribution manifold. This configuration eliminated the need for conventional air diffusers or surface aerators, which were maintenance intensive and costly to operate due to high power input per ton of oxygen dissolved. The liquid pump was the only moving part of the system addition.

The treated sludge from the Aerobic Sludge Digester was then sent to the existing dewatering belt press and dried to 30 percent by weight solids for transport to the proposed new 15 tonne/day Compost Plant. The supernatant from the Aerobic Sludge Digester was returned to the aeration basin of the existing plant. The proposed design was selected because:

- Minimized odors to a much greater extent than the technologies recommended in the study by Parsons and ONEC;
- Could be built and operated at a low cost compared to conventional technologies;
- Could be built faster than an anaerobic sludge digester;
- Was more cost effective than thermal treatment systems;
- Provided a treated sludge suitable for composting;
- Minimized odors to the extent possible;
- Were the most reliable and easy to maintain of the viable alternatives; and
- Converted the sludge and green waste into a very high quality compost that could be sold in Oman.

HERMEL WASTEWATER TREATMENT PROJECT
Hermel, Lebanon
Client: Municipality of Hermel, Cooperative Housing Foundation (CHF)

MEP personnel performed a full detailed design of a hybrid system for treatment of solid waste and wastewater in the region of Hermel. The design included the segregation of the organic portion of solid waste by passing the mixed MSW through a sorting facility. The organic fraction was then grinded, mixed with treated wastewater, and added to the wastewater influent in a UASB (anaerobic) reactor. The mixture of wastewater and organics then passed through an extended aeration system in order to meet the effluent treatment requirements. The remaining solid waste was segregated, potentially recyclable materials were removed from the waste stream, and the rejects were transported to an MSW Landfill. The potentially recyclable materials were processed and sold into the local recycled materials markets.

The treatment processes were designed to eliminate contamination that is currently polluting the Assi River that flows into Syria. The Assi River is a major source of drinking water, and a main source of irrigation water on both the Lebanese and Syrian sides of the borders.

The WWTP was design in a modular form, and took into consideration future growth of the area. The system was designed to accommodate the current population of 20,000 people, but was also designed to be incrementally expanded to accommodate up to 60,000 people.

The WWTP included screens, inline solids grinders, anaerobic digesters, recovery of gas and production of electricity, and treatment of the effluent from the anaerobic digesters in a modified extended aeration system, including a concentric aeration basins and clarifiers, centrifuges, and sludge drying beds. An alternative design for the modified extended aeration treatment system was developed using the Noyes technology to minimize cost, reduce maintenance requirements, and improve operational performance.

HAZARDOUS WASTE REMEDIATION

REPRESENTATIVE EXPERIENCE

MEP personnel have extensive experience in performing remedial investigations, feasibility studies, remedial design, and construction management at CERCLA National Priority List sites, and industrial sites involving remediation of hazardous wastes. Locations of hazardous waste sites at which MEP personnel have provided professional services are summarized below:

Project Name	Location
Aidex	Council Bluffs, Iowa
Air Products	Miami, Florida
Alaskan Oil Company	Humboldt, Arizona
Atlanta Gas Light	Eleven Sites in Georgia and Florida
BHS Hazardous Waste Landfill	St. Louis, Missouri
Bridge-Port Manufacturing Company	Altavista, Virginia
Brine Pond 6 Closure	Midland, Michigan
Carus Chemical Company	Lasalle, Illinois
Chevron Pond Closure	NIGERIA
Chevron Refinery	Puerto Rico
Chevron Site Investigations	Puerto Rico
CECOS SCRF 6	Niagara, New York
Cinnaminson	Cinnaminson, New Jersey
Conservation Chemical Company	Kansas City, Missouri
EXPO ‘98	Lisbon, PORTUGAL
Glen Burnie	Glen Burnie, Maryland
Hardage Criner	Criner, Oklahoma
Institutional Strengthening	Dhaka, BANGLADESH
Kaduna Industrial Treatment Plant	Kaduna, Nigeria
L&D Landfill	Mount Holly, New Jersey
LCP Chemical	Brunswick, Georgia
Motco	Texas City, Texas
Northeast Utilities	Twenty-five Sites
Rocky Mountain Arsenal	Denver, Colorado
Russell Bliss Site	St. Louis, Missouri
Abu Dhabi Medical Waste Facility	Abu Dhabi, UAE

REPRESENTATIVE EXPERIENCE (continued)

Project Name	Location
San Juan Bus Maintenance Facility	San Juan, Puerto Rico
San Juan Cannery	San Juan, Puerto Rico
Saunders Lead	South Carolina
Sludge Impoundment	Chilicothe, Ohio
Southern Wood Piedmont	Atlanta, Georgia
Sugar Creek Refinery	Kansas City, Missouri
Tacoma Swamp	Tacoma, Washington
Tacoma Wells	Tacoma, Washington
138th Street Facility	Chicago, Illinois
Lake County Facility	Lake County, Illinois
Mussafah Dumpsite	Mussafah, UAE
Al Dhafra Dumpsite	Al Dhafra, UAE
Western Region Dumpsites	Western Region, UAE
Cameron Park Arsenic Remediation	Delray Beach, FL
Lantana Plaza Soil Remediation	Lantana, FL
Lantana Plaza Ground-Water	Lantana, FL
Port 5 Arsenic Remediation	Ft. Lauderdale, FL
Park Road Soil Remediation	Pembroke Park, FL
Apache Marina Soil Remediation	Aventura, FL
Apache Marina GW Remediation	Aventura, FL

AIDEX PESTICIDE PLANT
Council Bluffs, Iowa, USA
Client: Confidential Client

MEP personnel performed a Remedial Investigation and Feasibility Study for the Aidex pesticide plant in Council Bluffs, Iowa. The Aidex pesticide plant produced numerous types of pesticides and herbicides. The plant went bankrupt and management abandoned the facility with numerous drums of pesticides and raw materials stacked both inside and outside the warehouses. Shortly after the company went bankrupt, there was a major fire at the facility, resulting the widespread release of chemical constituents and pesticides. The Remedial Investigation included soil sampling, and the installation of ground-water monitoring wells. An analysis of the available data indicated that there were significant impacts to site soils, and minor impacts to ground water and surface water. A Feasibility Study was performed to evaluate potential remedial technologies, develop remedial alternatives, and to screen and select the most appropriate and cost-effective remedial alternative. Based on these analyses, a conceptual remedial design for the facility was developed.

CONSERVATION CHEMICAL COMPANY
Kansas City, Missouri
Client: Confidential Client

MEP personnel performed a Remedial Investigation, Feasibility Study, and Remedial Design for the Conservation Chemical Company site in Kansas City, Missouri. The facility consisted of five surface impoundments, storage tanks, and a liquid waste incinerator used to dispose of over 1000 different types of wastes. Volatile organic compounds were either incinerated, or placed directly in the impoundments for disposal. Liquid wastes, including PCBs, acids, petroleum by-products, plating wastes, and pentachlorophenol were placed directly in the pits. Spent cyanide was mixed with spent acids to form cyanide salts. The facility was closed by mixing the wastes in place with fly ash, and covering with soil. The remedial design for the facility included the installation of a RCRA compliant final cover system, and installation of a ground-water recovery and treatment system.

GLEN BURNIE LANDFILL
Glen Burnie, Maryland, USA
Client: Anne Arundel County, Maryland

MEP personnel participated in the Remedial Investigation performed at the Glen Burnie NPL Landfill in Glen Burnie, Maryland. The site is within a recharge area for major water-bearing formations just outside of Baltimore. A site investigation plan was prepared and presented to the Maryland Department of Environment (MDE) and USEPA for review. Following approval of the plan, soil borings, piezometers, and ground-water monitoring wells were installed at the site. Air, soil, surface-water, and ground-water sampling was performed, and a detailed hydrogeologic model was developed for the site. An assessment was then performed to evaluate the pathways and potential receptors of impacted ground water and surface water. A baseline risk assessment was performed to provide a basis to determine the need for additional work, and to provide a baseline for evaluation of remedial alternatives.

L&D LANDFILL
Mt. Holly, New Jersey
Client: Confidential Industrial Client

MEP personnel participated in the Phase II Remedial Investigation and Feasibility Study at the L&D Landfill site in Mt. Holly, New Jersey. The Remedial Investigation included the installation of soil borings, piezometeres, and ground-water monitoring wells. Based on the site investigation, heavy metals and volatile organic compounds were detected in the shallow ground water adjacent to the landfill. A Feasibility Study was performed to: (1) identify and evaluate remedial technologies; (2) evaluate applicable or relevant and appropriate requirements (ARARs); (3) develop and screen remedial alternatives; (4) provide a detailed comparison and analysis of selected remedial alternatives; and (5) recommend the most appropriate and cost-effective remedial alternative. Ground-water modeling was performed to evaluate the effectiveness of remedial alternatives and to select the most cost-effective design alternatives.

MOTCO SITE
Texas City, Texas
Client: USEPA

MEP personnel participated in the Remedial Investigation and Feasibility Study, and provided expert testimony for the MOTCO site in Texas City, Texas. The MOTCO site is a former sand pit that was filled with industrial wastes from petro-chemical industries in the vicinity. The pits contained both dense non-aqueous phase liquids (DNAPLs) and light weight non-aqueous phase fluids (NAPLs), including styrene tars, solvents, PCBs, pesticides, petroleum by-products, and heavy metals. DNAPLs were detected in pure phase at depth moving along slickensides in the underlying clay soils. Soil borings, piezometers, and ground-water monitoring wells were installed to evaluate the extent and magnitude of contamination. Geophysics were performed at the site to evaluate the extent of migration between monitoring wells. The Feasibility Study evaluated remedial technologies that could be implemented at the site. Based on the Feasibility Study, a combination of containment in place and destruction alternatives were selected for implementation at the site.

WIPP FACILITY RCRA PERMITTING
Project Location: Carlsbad, New Mexico
Client Contact: Ken Kristl, Esq. (312) 558-6081

Description: MEP personnel is providing expert services for the RCRA Permit for the WIPP Facility in Carlsbad, New Mexico. The WIPP Facility is the first facility in the US to be permitted to take Transuranic (TRU) waste. These waste materials include both radioactive waste and hazardous waste from the production of uranium fuel rods at Department of Energy (DOE) facilities. The TRU waste is placed in mine shafts in bedded salt at a depth of approximately 2,150 ft (655 m) below the ground surface. The system is designed to limit the entry of water and release of contaminants through the mine shafts at the WIPP facility.

The MEP personnel role in the permitting process is to evaluate the transport of waste materials through the soil and rock formations, and to assess the potential for impacts to human health and the environment. In addition, MEP personnel is evaluating the stability of the mine, and the design of the shaft sealing system. MEP personnel is also evaluating the design of the facility, and the effectiveness of the various systems to prevent constituent migration.

ABU DHABI MEDICAL WASTE TREATMENT FACILITY
Abu Dhabi, UAE
Client: Abu Dhabi Municipality

MEP personnel performed an investigation of the existing medical waste management practices in Abu Dhabi. This included an assessment of the management of medical waste at each hospital and clinic, veterinary clinics, and dental facility in Abu Dhabi. The studies also included an evaluation of the existing regulations, collection systems, and treatment and disposal systems. Based on the results of the studies, MEP personnel was requested to design the Abu Dhabi Medical Waste Treatment Facility. The design included an evaluation of the existing technologies, and the design of the treatment facility, including the design report, construction drawings, construction specifications, and preparation of the tender documents. The project is currently out to tender, and MEP personnel will evaluate the tenders, and provide construction management.

BARKA MEDICAL WASTE TREATMENT FACILITY
Barka, Oman
Client: Ministry of Regional Municipalities, Environment, and Water Resources

MEP personnel performed an evaluation of the existing medical waste collection, transport, treatment, and disposal facilities for the public and private medical facilities in Barka and the nearby regional municipalities. The investigation included an assessment of the types and quantities of medical waste, the medical waste handling procedures, collection systems, and transport systems. Medical waste is currently placed in plastics bags with mixed waste, and is transported to the Barka dumpsite for disposal. Based on the types and quantities of medical waste, MEP personnel has designed a medical waste treatment facility to treat all of the medical waste generated in the region. It is anticipated that the medical waste treatment facility will be constructed adjacent to the hospital in Barka, and will include an autoclave system for treatment of the medical waste. The treated waste will then be transported to the new MSW Landfill for disposal.

SALALAH MEDICAL WASTE TREATMENT FACILITY
Salalah, Oman
Client: Dhofar Municipality

MEP personnel performed an evaluation of the existing medical waste collection, transport, treatment, and disposal facilities for the public and private medical facilities in Salalah and the nearby regional municipalities. The investigation included an assessment of the types and quantities of medical waste, the medical waste handling procedures, collection systems, and transport systems. Medical waste is currently placed in plastics bags with mixed waste, and is transported to the Salalah dumpsite for disposal. Based on the types and quantities of medical waste, MEP personnel has designed a medical waste treatment facility to treat all of the medical waste generated in the region. It is anticipated that the medical waste treatment facility will be constructed adjacent to one of the hospitals in Salalah, and will include an autoclave system for treatment of the medical waste. The treated waste will then be transported to the new MSW Landfill for disposal.

NIZWA REGIONAL MEDICAL WASTE TREATMENT FACILITY
Nizwa, Oman
Client: Ministry of Regional Municipalities, Environment, and Water Resources

MEP personnel performed an evaluation of the existing medical waste collection, transport, treatment, and disposal facilities for the public and private medical facilities in Nizwa and five regional municipalities in Central Oman. The investigation included an assessment of the types and quantities of medical waste, the medical waste handling procedures, collection systems, and transport systems. Medical waste is currently placed in plastics bags with mixed waste, and is transported to the several unlined dumpsites for disposal. The medical waste is often left uncovered, and poses a significant risk to human health and the environment. Based on the types and quantities of medical waste, MEP personnel has designed a medical waste treatment facility to treat all of the medical waste generated in the region. It is anticipated that the medical waste treatment facility will be constructed adjacent to one of the hospitals in Nizwa, and will include an autoclave system for treatment of the medical waste. The treated waste will then be transported to one of the new regional MSW landfills for disposal.

KARACHI MEDICAL WASTE TREATMENT FACILITY
Karachi, Pakistan
Client: KMC

MEP personnel performed an investigation of the medical waste collection, treatment, and disposal practices in Karachi, Pakistan. The studies included an evaluation of the types and quantities of medical waste generated in the public and private health care facilities, and assessment of the collection equipment and methods, an evaluation of the procedures for medical waste management in the health care facilities, transport equipment, and the treatment and disposal facilities. Based on the results of the study, MEP personnel made recommendations to upgrade the existing systems for collection, treatment, and disposal of medical wastes, including a recommendation to privatize the treatment facilities.

FIELD SERVICES, CONSTRUCTION, & DEVELOPMENT

REPRESENTATIVE EXPERIENCE

MEP personnel have extensive experience in site preparation, design, construction, and development of storm water systems, waste water systems, drainage systems, roadways, landfills, sewage systems, wetland areas, hotels, housing complexes, and subdivisions. Locations of various representative projects at which MEP personnel have provided professional services are summarized below:

Project Name	Location
Adul Latif Hotel	Eritrea
Athurugiriya Town Development	Sri Lanka
Berman Road Landfill	Okeechobee, Florida
Berry Groves Drainage System	Charlotte County, Florida
Boca Grande	Boca Grande, Florida
Brazilian Theme Park	Brazil
DeSoto County Landfill	DeSoto County, Florida
DeSoto County Landfill Closure	DeSoto County, Florida
DeSoto County Landfill Closure	DeSoto City, Florida
DeSoto County Manmade Wetland	DeSoto County, Florida
DeSoto County Retention Basin	DeSoto County, Florida
Gardens of Gulf Cove	Port Charlotte, Florida
Gourgousum Hotel	Eritrea
Gulf Cove Subdivision	Charlotte County, Florida
Highlands Landfill	Highlands County, Florida
Highlands Wastewater Treatment Plant	Highlands County, Florida
Highlands Wetland	Highlands County, Florida
Low Cost Housing Project	Eritrea
Low Cost Housing Project	Managua, Nicaragua
North Port Subdivision	North Port, Florida
Sarasota Airport Runway Extension	Sarasota County, Florida
School “F” Site Preparation	North Port, Florida
Turner Foods Citrus grove	Charlotte, Florida

5-ACRE SARA SUBTITLE D LANDFILL
DeSoto County, Florida, USA
Client: DeSoto County

A 5-acre double lined landfill with a 6" clay layer of $1x10^{-5}$, and 2-60mm HDPE geomembranes was constructed. Leachate collection and detection systems were installed. In addition, a pumping station, subsequent plumbing, and an above ground impoundment pound were also constructed.

10-ACRE CLASS I LANDFILL AND WASTEWATER TREATMENT FACILITY
Highlands County, Florida, USA
Client: Highlands County

MEP personnel constructed a 10-acre double lined landfill, a wastewater treatment facility, a 17-acre evaporative spray field, a drainage system, subsequent roadways, a scale house, and maintenance and office buildings.

10-ACRE LANDFILL CLOSURE
DeSoto City, Florida, USA
Client: DeSoto County

A 10-acre closure system of a Class I landfill was designed and constructed. The project included site grading, installation of gas wells, placement of a 40-mm HDPE geomembrane, insertion of two feet of protective soil, laying of sod, and implementation of the landfill's end use plan.

20-ACRE CLASS I LANDFILL CLOSURE
DeSoto County, Florida, USA
Client: DeSoto County

MEP personnel managed the construction of a 20-acre Class I landfill closure, which involved placement and grading of the immediate cover, the installation of gas wells, placement of a 40 mm PVC liner, and placement of a two-foot protective layer of cover soil.

WATER RESOURCE MANAGEMENT PROJECTS

REPRESENTATIVE EXPERIENCE

MEP personnel have extensive experience in water resource management, including the design of earth dams, remedial design of earth dams and reservoirs, lining system design for reservoirs and canals, water resource development, contamination assessments, numerical modeling of ground-water flow and contaminant transport, design of water distribution networks, and design and operation of water treatment systems.

Project Name	Location
Chilicothe Dam	Chilicothe, Ohio
Dhaka Flood Control Embankment	Dhaka, Bangladesh
Lake County Dam and Reservoir	Lake County, Illinois
Little Calumet River Flood Control Levee	Chicago, Illinois
Harbor View Dam and Reservoir	Chicago, Illinois
Ruidoso Dam and Reservoir	Ruidoso, New Mexico
New Mexico Reservoir	Western New Mexico
DHA Water Supply Project	Karachi, Pakistan
Cinnaminson Contamination Assessment	Cinnaminson, New Jersey
High Acres Water Quality Assessment	High Acres, New York
Millersville Water Quality Assessment	Millersville, Maryland
Earth Dam Design	Turkish Electrical Institute
Contamination Assessment	Barnwell Nuclear Fuel Plant
Sarasota Reservoir	Sarasota, Florida
Sakahaby Dam	Western Syria
Dreikiche Dam	Western Syria
Mzareib Embankement and Reservoir	Southern Syria

CHILICOTHE DAM DESIGN
Chilicothe, Ohio
Client: Mead Paper

MEP personnel designed an extension to the Chilicothe Earth Dam. The project included an evaluation of seepage through the dam, an assessment of the stability of the dam, and the design of a 10 m vertical extension of the earth dam. The project included the preparation of a design report, construction drawings, specifications, and bid documents. MEP personnel performed the bid evaluation, and supervised construction of the vertical expansion and remedial measures. The remedial measures also include a geomembrane liner to intercept and control seepage through the dam, and steel piles driven into the embankment to improve stability. The dam extension was constructed in an area susceptible to seismic loading, and the design included static and dynamic analyses. MEP personnel also obtained the dam permit from the state agency.

DHAKA FLOOD CONTROL PROJECT
Dhaka, Bangladesh
Client: Asian Development Bank

MEP personnel performed a hydrologic and geotechnical investigation of a 10-m high, 30-km long flood control embankment in Dhaka, Bangladesh. The Government of Bangladesh constructed portions of the embankment over a soft foundation. The embankment failed in several locations due to inadequate bearing capacity. MEP personnel evaluated the causes of failure, performed the remedial design, and supervised the reconstruction of the failed portions of the embankment. The remedial design of the embankment included the use of wick drains to accelerate settlement and increase bearing capacity. In addition, MEP personnel staff was retained to design the extension of the embankment through the old city. The embankment included the use of high strength geosynthetics in areas where the embankment crossed very soft subgrade materials.

LAKE COUNTY FLOOD CONTROL PROJECT
Lake County, Illinois
Client: Private Company

MEP personnel performed the hydrologic investigations, designed, and provided construction management for a dam and 3-km long flood control levee for an industrial facility in Lake County, Illinois. The reservoir covered an area of approximately 3.0 km^2, and included the development of wetland areas to replace wetlands destroyed during the construction of the industrial facility. In addition, the design included the construction of three geomembrane and soil, single composite lined reservoirs. These reservoirs covered an area of approximately 120 hectares.

LITTLE CALUMET RIVER FLOOD CONTROL PROJECT
Chicago, Illinois
Client: Private Company

MEP personnel designed and provided construction management of a flood control levee along the Little Calumet River in Chicago, Illinois. The levee included a geomembrane and compacted clay single composite lining system, and was designed for both static and seismic loading conditions. During the construction of the levee the site was hit by a 500-yr storm, and the levee functioned as designed, without significant damage.

HARBOR VIEW DAM AND RESERVOIR
Chicago, Illinois
Client: Private Company

MEP personnel designed and provided construction management for a 30-m high dam and geomembrane and compacted clay single composite lining system for a reservoir at the Harbor View site in Chicago, Illinois. The dam and reservoir were constructed to contain contaminated water, and prevent migration from the site.

CINNAMINSON WATER SUPPLY PROJECT
Cinnaminson, New Jersey
Client: USEPA/Private Company

MEP personnel performed a remedial investigation to evaluate the sources of contamination in the well field for the water supply system for Cinnaminson, New Jersey. The project included the installation of nested ground-water monitoring wells to evaluate the distribution of chemical constituents in the aquifers supplying the well field. Ground-water sampling and analysis and field monitoring was performed to evaluate the potential sources and source characteristics. Based on the data and information from the studies, a finite element model was developed for the multi-level aquifer system. The model was calibrated to existing conditions and the site, and was used to predict constituent migration and chemical concentrations in the well field with time. Based on the results of the modeling, MEP personnel developed a remedial design for the well field, which included a ground-water recovery and treatment system, closure of a landfill with a geomembrane cover system, collection and treatment of landfill gas, and the clean-up requirements for several industrial facilities and underground fuel tanks in the area. MEP personnel prepared the design report, construction drawings, and construction specifications for the project.

TACOMO WATER SUPPLY PROJECT
Tacoma, Washington
Client: USEPA

MEP personnel performed a remedial investigation and feasibility study to assess ground-water contamination in the well field in Tacoma, Washington. The studies included the installation and sampling of nested ground-water monitoring wells to evaluate the sources and distribution of contamination in the aquifer. Based on the results of the site investigations, a finite difference numerical model was used to evaluate the sources of contamination, and to assess the distribution of contamination over time. The model was then used to evaluate the constituent concentrations at the well heads in the well field, and to design the water treatment system. Based on the results of the modeling, an aeration tower was designed to treat water from the wells.

RESERVOIR AND CONTAINMENT LINING SYSTEMS
Multiple Locations
Multiple Clients

MEP personnel have provided design and construction management services on more than 300 projects involving the construction of single or double composite lining systems. These projects have been completed in more than 48 states in the USA, Puerto Rico, Bangladesh, Belgium, Canada, Ecuador, France, Lebanon, Oman, Pakistan, Portugal, Saudi Arabia, St. Lucia, UAE, UK, and Venezuela. These projects have included the installation of more than 25,000,000 m^2 of reservoir and barrier lining systems during the past 20 years.

APPENDIX C

PROJECT SUMMARIES

APPENDIX C

WASTE MANAGEMENT EXPERIENCE

Construction and Demolition Debris Processing Facilities

Project Description	Location	Client/Owner
Davie Sorting Facility	Davie, Florida	Southern Waste Services
College Avenue Sorting Facility	Davie, Florida	Southern Waste Services
Baghdad Sorting Facility	Baghdad, Iraq	Government of Iraq
St. Lucie C&C Sorting Facility	St. Lucie County, FL	St. Lucie County, Florida
Zahle Sorting Facility	Zahle, Lebanon	USAID/CHF
Lantana Plaza Soil Remediation	Lantana, FL	Lantana Plaza Development
Cameron Park Soil Remediation	Delray Beach, FL	Archstone
County Waste MRF	Ft. Myers, FL	County Waste
Captain Jack's C&D Processing Facility	Manatee, FL	Captain Jack's Corporation
Codding C&D Processing Facility	Northern Florida	Codding Sand & GravelDelta T
C&D Processing Facility	Pompano Beach, FL	Transfer Corporation
Transfer Station, C&D Processing Facility and Landfill	Titusville, FL	Delta Resources Corp
Transfer Station, C&D Processing Facility	West Palm Beach, FL	Delta Tall Pines Corp
C&D Processing Fac. & Landfill	Homestead, FL	Atlas Homestead Corp
Transfer Station, C&D Processing Facility	Davie, FL	Atlas Davie Corp
C&D Process Fac, TS, and Landfill	Riviera Beach, FL	Atlas Riviera Beach Corp
C&D Process Fac, TS, and Landfill	Naples, FL	Atlas Naples Corp
C&D Process Fac, TS, and Landfill	Parkland, FL	Atlas Lox Road Corp
C&D Process Fac, and Landfill	Villa Maria, Argentina	Municipality of Villa Maria
Thermal Treatment and C&D Processing Facility	Palmetto, Florida	Atlas Kleensoil Palmetto
Thermal Treatment and C&D Processing Facility	Moore Haven, Florida	Atlas Kleensoil Moore Haven
College Avenue Sorting Facility	Davie, Florida	Southern Waste Services
Lunas C&D Processing Facility	Las Vegas, Nevada	Lunas Services
Northern C&D Processing Facility and C&D Landfill	Nothern Lebanon	Government of Lebanon
Southern C&D Processing Facility and C&D Landfill	Southern Lebanon	Government of Lebanon
Kinshasa 1 C&D Processing Facility	Kinshasa, DRC	Government of DRC
Kinshasa 2 C&D Processing Facility	Kinshasa, DRC	Government of DRC
Kinshasa 3 C&D Processing Facility	Kinshasa, DRC	Government of DRC
Lubumbashi C&D Processing Facility	Lubumbashi, DRC	Government of DRC
Lualaba C&D Processing Facility	Lualaba, DRC	Government of DRC
Mbuji-Mayi C&D Processing Facility	Mbuji-Mayi, DRC	Government of DRC
Dar es Salaam C&D Processing Facility	Dar es Salaam, Tanzania	Government of Tanzania
Dodoma C&D Processing Facility	Dodoma, Tanzania	Government of Tanzania
Mwanza C&D Processing Facility	Mwanza, Tanzania	Government of Tanzania
Arusha C&D Processing Facility	Arusha, Tanzania	Government of Tanzania
Mbeya C&D Processing Facility	Mbeya, Tanzania	Government of Tanzania
Morogoro C&D Processing Facility	Morogoro, Tanzania	Government of Tanzania
C&D Management Plan	Lagos, Nigeria	Government of Nigeria
Kakamega C&D Processing Facility	Kakamega, Kenya	Togo Technologies Inc.
Nassau 1,600 Tpd C&D Process. Facility	Nassau, The Bahamas	APAPA, International
Freeport 2,000 Tpd C&D Proc. Fac.	Freeport, The Bahamas	APAPA, International

SUMMARY OF SOLID WASTE MANAGEMENT OPERATIONS

FACILITY OWNER	TYPE OF FACILITY	LOCATION
Delta Transfer Corporation	Collection Company, Transfer Station, and Sorting Facility	Pompano Beach, FL
Delta Resources Corporation	Collection Company, Transfer Station, and Landfill	Titusville, FL
Delta Tall Pines Corporation	Collection Company, Transfer Station, and Sorting Facility	West Palm Beach, FL
Atlas Homestead Corporation	Collection Company, Sorting Facility, and Landfill	Homestead, FL
Atlas Davie Corporation	Collection Company, Transfer Station, and Sorting Facility	Davie, FL
Atlas Riviera Beach Corporation	Collection Company, Transfer Station, and Sorting Facility	Riviera Beach, FL
Atlas Naples Corporation	Collection Company, Transfer Station, and Sorting Facility	Naples, FL
Atlas Lox Road Corporation	Collection Company, Transfer Station, Compost Plant, and Landfill	Parkland, FL
Zahle Solid Waste Management Facility	Collection Company, Sorting Facility, Compost Plant, Landfill, Gas to Energy Facility, Leachate Treatment Plant	Zahle, Lebanon
Villa Maria Solid Waste Management Facilities	Collection Company, Sorting Facility, Landfill, Leachate Treatment Plant, 30 MW Gasification Facility, Water Treatment Plant	Villa Maria, Argentina
Atlas Kleensoil Palmetto	Thermal Treatment of Petroleum Contaminated Soils	Palmetto, Florida
Atlas Kleensoil Moore Haven	Thermal Treatment of Petroleum Contaminated Soils	Moore Haven, Florida

SUMMARY OF KEY WASTE MANAGEMENT DESIGN/PERMITTING PROJECTS

FACILITY OWNER	LOCATION
Municipal Waste Landfills	
Abu Dhabi MSW Landfill	Abu Dhabi, UAE
Anne Arundel County	Millersville, MD
Anne Arundel County	Deale, MD
Browning-Ferris Industries	Guaynabo, PUERTO RICO
Browning-Ferris Industries	Pittsburg, CA
Browning-Ferris Industries	Ponce, PUERTO RICO
Browning-Ferris Industries	Hawkins County, TN
CEIP/ World Bank	Colombo, SRI LANKA
City of Atlanta	Atlanta, GA
City of Conyers	Conyers, GA
Dade County	Miami, FL
GF Enterprises	South Florida
Karachi MSW Landfill	Karachi, Pakistan
Land and Lakes Company	Chicago, IL

Land and Lakes Company	Chicago, IL
Land and Lakes Company	Dolton, IL
Land and Lakes Company	Will County, IL
Land and Lakes Company	Randolph County, IL
Montgomery County	Montgomery County, MD
Municipality of Cordoba	Cordoba, ARGENTINA
Municipality of Lagos	Lagos, NIGERIA
Parque EXPO '98	Lisbon, Portugal
Town of Babylon	Town of Babylon, NY
USA Waste Services	Atlanta, GA
USA Waste Services	Charles City County, VA
USA Waste Services	Elkhart, IN
USA Waste Services	Lake County, IL
USA Waste Services	Lake County, IN
USA Waste Services	Okeechobee, FL
USA Waste Services	S. St. Marie, MI
USA Waste Services	Washington County, AK
Waste Management	Medley, FL
Waste Management	Pompano Beach, FL
Waste Management	Rochester, NY
Waste Services of America	Decaturville, TN
Waste Services of America	Kemper County, MS
Waste Services of America	Scott County, TN
Western Region Landfills	UAE
Tripoli Landfill	Tripoli, Lebanon
Zahle Landfill	Zahle, Lebanon
Hermel Landfill	Hermel, Lebanon
Atlas-Homestead Landfill	Homestead, Florida
Codding Landfill	Northern Florida
Dade County Landfill	Dade County, Florida
Sebring Landfill	Sebring, Florida
Alanya, Turkey Landfill	Alanya, Turkey
Adana, Turkey Landfill	Adana, Turkey
Antalya, Turkey Landfill	Antalya, Turkey
Mersin, Turkey Landfill	Mersin, Turkey
Baghdad Iraq Landfill	Baghdad, Turkey
Latacunga, Ecuador Landfill	Latacunga, Ecuador
Babahoyo, Ecuador Landfill	Babahoyo, Ecuador
Montecristi, Ecuador Landfill	Montecristi, Ecuador
Salinas, Ecuador Landfill	Salinas, Ecuador
Bahamas Landfills (6)	The Bahamas
Bahrain Landfill	Manama, Bahrain
Abidjan, Ivory Coast Landfill	Abidjan, Ivory Coast
Shell Petroleum Development Corp	Warri, Nigeria
Iskenderun Landfill	Iskenderun, Turkey
Duqm Landfill	Duqm, Oman
Perungudi Landfill	Chennai, India
Kodungaiyur Landfill	Chennai, India
Calicut, Landfill	Calicut, India
Trivandrum Landfill	Trivandrum, India
Quito Landfill	Quito, Ecuador
Dhaka Landfill	Dhaka, Bangladesh
Mitrovica Landfill	Mitrovica, Kosovo
Busia Landfill	Busia County, Kenya
Kakamega Landfill	Kakamega County, Kenya

Imo State Landfill	Imo State, Nigeria
Lahore Landfill	Lahore, Pakistan
Djerba Landfill	Djerba, Tunisia
New Providence Sanitary Landfill	Nassau, The Bahamas
Freeport Sanitary Landfill	Freeport, The Bahamas
Abaco Inert MSW Landfill	Abaco, The Bahamas
Kinshasa Inert MSW Landfill	Kinshasa, DRC
Lubumbashi Inert MSW Landfill	Lubumbashi, DRC
Lualaba Inert MSW Landfill	Lualaba, DRC
Mbuji-Mayi Inert MSW Landfill	Mbuji-Mayi, DRC
Dar es Salaam Inert MSW Landfill	Dar es Salaam, Tanzania
Dodoma Inert MSW Landfill	Dodoma, Tanzania
Mwanza Inert MSW Landfill	Mwanza, Tanzania
Arusha Inert MSW Landfill	Arusha, Tanzania
Mbeya Inert MSW Landfill	Mbeya, Tanzania
Morogoro Inert MSW Landfill	Morogoro, Tanzania

Hazardous Waste Landfills

Abu Dhabi Municipality	Abu Dhabi, UAE
AlliedSignal, Inc.	Brunswick, GA
Chemical Waste Management, Inc.	Kettleman Hills, CA
Concord Resources Group	Deer Trail, CO
Dow Chemical	Midland, MI
Oman Hazardous Waste Landfill	Adam, Oman
Parque EXPO '98	Lisbon, PORTUGAL

Ash Monofills

Broward County	Broward County, FL
Dade County	Miami, FL
Town of Babylon	Town of Babylon, NY
Waste Management, Inc.	Pompano Beach, FL

Radioactive Waste

FERMCO	Cincinnati, OH
Subseabed Disposal Program	Pacific Ocean
WIPP Facility	Carlsbad, New Mexico

Industrial Surface Impoundments

Dow Chemical	Midland, MI
Land and Lakes 122nd Street Leachate Pond	Chicago, IL
LCP Chemicals, Inc.	Brunswick, GA
Public Service of New Mexico	Farmington, NM
USA Waste Berman Rd Leachate Ponds	Okeechobee, FL

Methane Gas Collection and Venting Systems

Warehouse Complex at the Ft. Lauderdale Airport;
Hotel and Shopping Center over a former landfill in Lake County, Illinois;
Buildings at the Anne Arundel County Landfill, Millersville, Maryland;
Buildings at Abu Dhabi Landfill, Abu Dhabi, UAE;
Buildings at Guaynabo Landfill, Guaynabo, Puerto Rico
Buildings at Ponce Landfill, Ponce Puerto Rico
Shopping Center over former Atlanta Landfill, Atlanta, Georgia

Waste Transfer Stations, Miami-Dade County (5);
Buildings at 138th Street Landfill, Chicago, Illinois;
Buildings at River Bend Landfill, Dolton, Illinois;
Buildings at 122nd Street Landfill, Chicago, Illinois;
Buildings at Will County Landfill, Will County, Illinois;
Buildings at Randolph County Landfill, Randolph County, Illinois;
Buildings at Babylon Landfill, Babylon, New York;
Buildings at Charles City County Landfill, Charles City County, Virgina;
Buildings at Countryside Landfill, Lake County, Illinois;
Buildings at Lake County Landfill, Lake County, Indiana;
Buildings at Okeechobee Landfill, Okeechobee, Florida;
Buildings at S. St. Marie Landfill, S. St. Marie, Michigan;
Buildings at Washington County Landfill, Washington County, Arkansas;
Buildings at Medley Landfill, Medley, Florida;
Buildings at Central Disposal Facility, Pompano Beach, Florida;
Buildings at Codding Landfill, Northern Florida;
Buildings at Adana Landfill Sorting Facility and Compost Plant, Adana, Turkey;
Buildings at Antalya Landfill, Sorting Facility, and Compost Plant, Antalya, Turkey;
Buildings at Mersin Landfill, Sorting Facility, and Compost Plant, Mersin, Turkey;
Buildings at Baghdad Landfill, Sorting Facility, and Compost Plant, Baghdad, Iraq;
Buildings at Trivandrum Gasification Facility, Trivandrum, India;
Buildings at St. Maarten Gasification Facility, Philipsburg, St. Maarten

Transfer Stations

Abu Dhabi Municipality	Abu Dhabi, UAE
Abu Dhabi Municipality	Shahama, UAE
Abu Dhabi Municipality	Mussafah, UAE
Abu Dhabi Municipality	Mufraq, UAE
Abu Dhabi Municipality	Sir Baniyas Island, UAE
Abu Dhabi Municipality	Madinat Zayed
Abu Dhabi Municipality	Liwa
Abu Dhabi Municipality	Sila
Abu Dhabi Municipality	Ruwais
City of Miami (8)	Miami, Florida
Karachi Metropolitan Corporation (5)	Karachi, Pakistan
Government of Barbados	Barbados
Waste Management Inc.	Ft. Lauderdale, Florida
Salalah Transfer Stations (2)	Salalah, Oman
Interior Region Transfer Stations (6)	Nizwa, Oman
Alanya, Turkey Transfer Station	Alanya, Turkey
Adana, Turkey Transfer Stations (2)	Adana, Turkey
Baghdad Iraq Transfer Stations (7)	Baghdad, Turkey
Latacunga, Ecuador Transfer Stations (2)	Latacunga, Ecuador
Babahoyo, Ecuador Transfer Stations (2)	Babahoyo, Ecuador
Montecristi, Ecuador Transfer Stations (2)	Montecristi, Ecuador
Salinas, Ecuador Transfer Stations (4)	Salinas, Ecuador
Bahamas Transfer Stations (12)	The Bahamas
Villa Maria Transfer Stations (4)	Villa Maria, Argentina
Panama City Transfer Stations (4)	Panama City, Panama
Quito Transfer Stations (4)	Quito, Ecuador

Compost Plants

Abu Dhabi Municipality (Green Waste)	Abu Dhabi, UAE
Abu Dhabi Municipality (MSW)	Abu Dhabi, UAE
Abu Dhabi Municipality (Green Waste)	Liwa, UAE
Abu Dhabi Municipality (MSW & Green Waste)	Ruwais, UAE
Barka Compost Plant	Barka, Oman
Dhofar Municipality Compost Plant	Salalah, Oman
Interior Region Compost Plant	Nizwa, Oman
Shell Compost Plant	Warri, Nigeria
Tripoli Compost Plant	Tripoli, Lebanon
Arab Salim Compost Plant	Southern Lebanon
Zahle Compost Plant	Zahle, Lebanon
Karachi Metropolitan Corporation	Karachi, Pakistan
Land and Lakes Company (Green Waste)	Chicago, Illinois
Land and Lakes Company (Green Waste)	Will County, Illinois
Land and Lakes Company (Green Waste)	Dolton, Illinois
Municipality of Islamabad (MSW)	Islamabad, Pakistan
Alanya, Turkey Compost Plant	Alanya, Turkey
Adana, Turkey Compost Plant	Adana, Turkey
Antalya, Turkey Compost Plant	Antalya, Turkey
Kemer, Turkey Compost Plant	Kemer, Turkey
Mersin, Turkey Compost Plant	Mersin, Turkey
Baghdad Iraq Compost Plant	Baghdad, Turkey
Latacunga, Ecuador Compost Plant	Latacunga, Ecuador
Babahoyo, Ecuador Compost Plant	Babahoyo, Ecuador
Montecristi, Ecuador Compost Plant	Montecristi, Ecuador
Salinas, Ecuador Compost Plant	Salinas, Ecuador
Bahamas Compost Plants (6)	The Bahamas
Bahrain Compost Plant	Manama, Bahrain
Abidjan, Ivory Coast Compost Plant	Abidjan, Ivory Coast
Shell Petroleum Development Corporation	Warri, Nigeria
Villa Maria Compost Plant	Villa Maria, Argentina
Iskenderun Compost Plant	Iskenderun, Turkey
Trivandrum Compost Plant	Trivandrum, India
Duqm Compost Plant	Duqm, Oman

Hazardous Waste Treatment Facilities

BHS Hazardous Waste Facility	Eastern Missouri
Missouri City Hazardous Waste Facility	Missouri City, Missouri
Conservation Chemical Company	Kansas City, Missouri
Government of Oman	Muscat, Oman
Abu Dhabi Municipality	Abu Dhabi, UAE
Carus Chemical Company	LaSalle, Illinois
CECOS Secure Residue Facility	Niagara Falls, New York
Hardage Criner Treatment & Disposal Facility	Criner, Oklahoma
WIPP Transuranic Facility	Carlsbad, New Mexico
MOTCO Treatment and Disposal Facility	Motco, Texas

Materials Recovery Facilities (Sorting Facilities)

Abu Dhabi Municipality	Abu Dhabi, UAE
Abu Dhabi Municipality	Madinat Zayed
Al-Khodari Sons Co.	Dammam, Saudi Arabia

Al-Khodari Sons Co.	Madina, Saudi Arabia
Karachi Metropolitan Corporation	Karachi, Pakistan
Oman MRMEWR	Barka, Oman
Salalah Sorting Facility	Salalah, Oman
Nizwa Sorting Facility	Nizwa, Oman
Tripoli Sorting Facility	Tripoli, Lebanon
Zahle Sorting Facility	Zahle, Lebanon
Arab Salim Sorting Facility	Southern Lebanon
Hermel Sorting Facility	Hermel, Lebanon
Atlas-Homestead Materials Recovery Facility	Homestead, Florida
Dade County Recycling	Dade County, Florida
Atlas-Lox Road Materials Recovery Facility	Palm Beach County, Florida
Alanya, Turkey Sorting Facility	Alanya, Turkey
Adana, Turkey Sorting Facility	Adana, Turkey
Antalya, Turkey Sorting Facility	Antalya, Turkey
Kemer, Turkey Sorting Facility	Kemer, Turkey
Mersin, Turkey Sorting Facility	Mersin, Turkey
Baghdad Iraq Sorting Facility	Baghdad, Turkey
Latacunga, Ecuador Sorting Facility	Latacunga, Ecuador
Babahoyo, Ecuador Sorting Facility	Babahoyo, Ecuador
Montecristi, Ecuador Sorting Facility	Montecristi, Ecuador
Salinas, Ecuador Sorting Facility	Salinas, Ecuador
Bahamas Sorting Facilities (6)	The Bahamas
Bahrain Sorting Facility	Manama, Bahrain
Abidjan, Ivory Coast Sorting Facility	Abidjan, Ivory Coast
Shell Petroleum Development Corporation	Warri, Nigeria
Captain Jack's MRF	Manatee, FL
College Avenue MRF	Davie, Florida
Iskenderun Sorting Facility	Iskenderun, Turkey
McCook Sorting Facility	McCook, Illinois
College Avenue Sorting Facility	Fort Lauderdale, Florida
Perungudi Sorting Facility	Chennai, India
Kodungaiyur Sorting Facility	Chennai, India
Calicut Sorting Facility	Chennai, India
Trivandrum Sorting Facility	Trivandrum, India
Phenom Penh Sorting Facility	Phenom Penh, Cambodia
Batam Sorting Facility	Batam, Indonesia
Sunter Sorting Facility	Sunter, Indonesia
Quito Sorting Facility	Quito, Ecuador
Panama City Sorting Facility	Panama City, Panama
David Sorting Facility	David, Panama
Dhaka Sorting Facilities (4)	Dhaka, Bangladesh
Mitrovica Sorting Facility	Mitrovica, Kosovo
Busia Sorting Facility	Busia County, Kenya
Kakamega Sorting Facility	Kakamega County, Kenya
Imo State Sorting Facility	Imo State, Nigeria
Lahore Sorting Facility	Lahore, Pakistan
Djerba Sorting Facility	Djerba, Tunisia
Davie Sorting Facility	Davie, Florida
Logansport Sorting Facility	Logansport, Indiana
College Avenue Sorting Facility	Davie, Florida
Dar es Salaam Sorting Facilities (8)	Dar es Salaam, Tanzania
Kinshasa Sorting Facilities (12)	Kinshasa, DRC

Solid Waste Facility Operation Consulting and Management

Delta Landfill	Titusville, Florida
Tripoli Landfill	Tripoli, Lebanon
Barka Solid Waste Management Facilities	Barka, Oman
Salalah Solid Waste Management Facilities	Salalah, Oman
Nizwa Solid Waste Management Facilities	Nizwah, Oman
Dade Recycling and Landfill	Dade County, Florida
Sebring Landfill	Sebring, Florida
Countryside Landfill	Lake County, Illinois
138th Street Landfill	Chicago, Illinois
122nd Street Solid Waste Management Facilities	Chicago, Illinois
River Bend Prairie Solid Waste Facilities	Chicago, Illinois
Willow Ranch Solid Waste Facilities	Randolph County, IL
Okeechobee Solid Waste Management Facilities	Okeechobee, FL
Baghdad Solid Waste Management Facilities	Baghdad, Iraq
Zahle Solid Waste Management Facilities	Zahle, Lebanon
Iskenderun Solid Waste Management Facilities	Iskenderun, Turkey
Duqm Solid Waste Management Facilities	Duqm, Oman
Lagos Solid Waste Management Facilities	Lagos, Nigeria
Nigeria C&D Facilities	Nigeria
New Providence Solid Waste Manage. Facilities	Nassau, The Bahamas
Freeport Solid Waste Management Facilities	Freeport, The Bahamas
Abaco Solid Waste Management Facilities	Abaco, The Bahamas
Andros Solid Waste Management Facilities	Andros, The Bahamas
Eleuthera Solid Waste Management Facilities	Eleuthera, The Bahamas
Bimini Solid Waste Management Facilities	Bimini, The Bahamas
Exuma Solid Waste Management Facilities	Exuma, The Bahamas
Long Island Solid Waste Management Facilities	Long Island, The Bahamas
Cat Island Solid Waste Management Facilities	Cat Island, The Bahamas

Gasification Design Projects

Abu Dhabi 72 MW	UAE
Kabul 24 MW	Afganistan
Army Mobile Units 0.1 to 2.2 MW	USA
Bali 72 MW	Indonesia
Surabaya 72 MW	Indonesia
Jakarta 480 MW	Indonesia
Batam 36 MW	Indonesia
Sunter 36 MW	Indonesia
Coutonou 36 MW	Benin
Phenom Pehn 36 MW	Cambodia
Beijing 36 MW	China
Curacao 24 MW	Curasao
Quito 72 MW	Ecuador
Guayaquil 120 MW	Ecuador
Addis Ababa 240 MW	Ethiopia
Ft. Campbell 24 MW	TN, USA
Ft. Knox 36 MW	KY, USA

Ga South 36 MW	Ghana
Takoradi 36 MW	Ghana
Amman 36 MW	Jordan
Honolulu 36 MW	HI, USA
Ohio 36 MW	OH, USA
Jeykjavic 2.2, 4.4, 6.6, 8.8 MW	Iceland
Trivandrum 6.6 MW	India
Kochi 24 MW	India
Calicut 12 MW	India
Kannur 6.6 MW	India
Bangalore 36 MW	India
Chennai 72 MW	India
Chennai 96 MW	India
Srei Bagasse 6.6 MW	India
Himacha Pradesh 36 MW	India
Pondicherry 12 MW	India
Rice Hust 6.6 MW	India
Bhubaneswar 36 MW	India
Malaysia 36 MW (3)	Malaysia
Gortadroma 36 MW	Ireland
Kosovo 6.6, 12 MW	Kosovo
Las Vegas 48/108 MW	NV, USA
Mauritius 24 MW	Mauritius
Mauritius 36 MW	Mauritius
Mexico City 12, 24, 36 MW	Mexico
Karachi 36 MW (3)	Pakistan
Lahore 36 MW	Pakistan
Ho Chi Minh 120 MW	Vietnam
Panama City 60 MW	Panama
David 12 MW	Panama
Colon 12 MW	Panama
Pucallpa 24 MW	Peru
Trujillo 36 MW	Peru
Chiclayo 48 MW	Peru
Cono Norte 60 MW	Peru
Manila 120 MW	Philippines
Jeddah 84 MW x 4	Saudi Arabia
Dhaka 36 MW x 4	Bangladesh
Kiev 12 MW	Ukraine
Gabes 6.6 MW	Tunisia
Djerba 6.6 MW	Tunisia

TRABRIKAB 24, 36 MW	Turkey
Ordu 12 MW	Turkey
Kus-Atak 12 MW	Turkey
Palm Beach 36 MW	FL, USA
Ft. Dix 12 MW	NJ, USA
Sharjah 12 MW	UAE
Villa Hermosa 36 MW	Tabasco State, Mexico
Mexico City 2 x 96 MW	Mexico City, Mexico
Kiev 4.4 MW	Ukraine
Cavite 24 MW	Philippines
Moscow 48 MW	Russia
Panama City 24 MW	Panama
Busia 24 MW	Kenya
Kakamega 36 MW	Kenya
Mitrovica 12/24 MW	Kosovo
Punta Cana 24 MW	Dominican Republic
Surabaya 12MW Phase 1	Indonesia
Bamboo 12 MW	India, Ghana
Punta Cana 6.6 MW	Dominican Republic
Rosedale 4.4 MW Medwaste	Rosedale, Mississippi
Sacramento 4.4 MW Medwaste	Sacramento, California
Suffolk County 4.4 MW Medwaste	Suffolk County, New York
Orleans County 4.4 MW Medwaste	Orleans County, New York
Pryor 4.4 MW Medwaste	Pryor, Oklahoma
Crawfordville 4.4 MW Medwaste	Crawfordville, Indiana
Pahrump 4.4 MW Medwaste	Pahrump, Nevada
Cannon Falls 4.4 MW Medwaste	Cannon Falls, Minnesota
Muscatine 4.4 MW Medwaste	Muscatine, Iowa
Duplin County 4.4 MW Medwaste	Duplin County, North Carolina
Aliquippa 4.4 MW Medwaste	Aliquippa, Pennsylvania
Jacksonville 4.4 MW Medwaste	Jacksonville, Florida
Imo State 12 MW	Imo State, Nigeria
Colombo 12 MW	Colombo, Sri Lanka
Jakarta 36 MW	Jakarta, Indonesia
Kuala Lampur 60 MW	Kuala Lampur, Malaysia
Lagos 60 MW	Lagos, Nigeria
Moscow 12 MW	Moscow, Russia
Lagos 36 MW	Lagos, Nigeria
Dar es Salaam 144 MW	Dar es Salaam, Tanzania
Dodoma 72 MW	Dodoma, Tanzania

Mwanza 72 MW	Mwanza, Tanzania
Morogoro 72 MW	Morogoro, Tanzania
100, 1.2 MW Mobile Units	Rural Tanzania
Kinshasa 3 x 108 MW	Kinshasa, DRC
Lualaba 60 MW	Lualaba, DRC
Lubumbashi 108 MW	Lubumbashi, DRC
Mbuji-Mayi 108 MW	Mbuji, Mayi, DRC
100, 1.2 MW Mobile Units	Rural DRC
20, 6.6 Mobile Units	Rural DRC
Nassau 84 MW	Nassau, The Bahamas
Freeport 10 MW plus 4.800 Tpd Diesel	Freeport, The Bahamas
Abaco 1.2 MW	Abaco, The Bahamas
Andros 1.2 MW	Andros, The Bahamas
Eleuthera 1.2 MW	Eleuthera, The Bahamas
Bimini 0.25 MW	Bimini, The Bahamas
Exuma 0.25 MW	Exuma, The Bahamas
Long Island 0.25 MW	Long Island, The Bahamas
Cat Island 0.25 MW	Cat Island, The Bahamas
Crooked Island 0.25 MW	Crooked Island, The Bahamas
Inagua 0.25 MW	Inagua, The Bahamas
Mayaguana 0.25 MW	Mayaguana, The Bahamas

CONSTRUCTION MANAGEMENT, CQA, & RESIDENT ENGINEERING

Project Description	Location	Client/Owner
138th St. Landfill - Slurry Wall	Chicago, IL	Land and Lakes Company
Berman Road Landfill Closure	Okeechobee, FL	USA Waste Services, Inc.
River Bend Prairie Landfill	Dolton, IL	Land and Lakes Company
Kemper County Landfill	Kemper, Mississippi	Waste Services of America
Cells 4 & 8 Closure	Okeechobee, FL	Waste Management
Willow Ranch East Slope	Will County, FL	Land and Lakes
138th Street Slurry Wall	Chicago, IL	Land and Lakes
Decatur Landfill Cell 2B Closure	Decatur County, TN	Waste Services of America
Decatur County LF Leachate Collection	Decatur County, TN	Waste Services of America
Grande Prairie Hydrogeologic Assessment	Randolf County, IL	Land and Lakes
Levee Construction	Brevard County, FL	ERC General Contracting
Southport Landfill Cell Construction	Oceola County, FL	ERC General Contracting
Phase VI Levee Construction	Brevard County, FL	ERC General Contracting
Hydrogeologic Assessment	Titusville, FL	Delta Recycling
Royal Oaks Wetland Restoration	Titusville, FL	Delta Recycling
Piezometer Installation	Titusville, FL	Delta Recycling
Ground-Water Monitoring	Titusville, FL	Delta Recycling
Ground-Water Monitoring	Titusville, FL	Delta Recycling
Compost Plant Assessment	Abu Dhabi, UAE	Abu Dhabi Municipality
Al Dhafra Landfill Investigation	Abu Dhabi, UAE	Abu Dhabi Municipality
MSW Landfill Investigation	Abu Dhabi, UAE	Abu Dhabi Municipality
Hazardous Waste Landfill Investigation	Abu Dhabi, UAE	Abu Dhabi Municipality
SWMF Site Investigation	Abu Dhabi, UAE	Abu Dhabi Municipality

KMC Solid Waste Assessment	Karachi, Pakistan	KMC
KMC Waste Characterization Study	Karachi, Pakistan	KMC
Malta Landfill Investigation	Malta	Government of Malta
Toe Berm Construction	St. Lucia	GPEC
Deglos Landfill Construction	St. Lucia	GPEC
Leachate Treatment System Investigation	St. Lucia	GPEC
East Slope Construction	Romeoville, Illinois	LALC
Mussafah Dumpsite Closure	Mussafah, UAE	Abu Dhabi
MunicipalityGround-Water Monitoring	Homestead, FL	Atlas Homestead
Beruit Airport Dynamic Compaction	Beirut, Lebanon	CDR
Tripoli Landfill Investigation	Tripoli, Lebanon	Batco
KMC Solid Waste Assessment	Karachi, Pakistan	KMC
KMC Waste Characterization Study	Karachi, Pakistan	KMC
Toe Berm Construction	St. Lucia	GPEC
Deglos Landfill Construction	St. Lucia	GPEC
Leachate Treatment System Investigation	St. Lucia	GPEC
East Slope Construction	Will County, Illinois	LALC
Zahle Dumpsite Closure	Zahle, Lebanon	CDR
Damam Waste Characterization Study	Damam, KSA	Al-Khodari
Damam Landfill Study	Damam, KSA	Al-Khodari
Karachi Water Plant Assessment	Karachi, Pakistan	GET
Western Region Landfill Investigation	WR, UAE	Abu Dhabi Municipality
Western Region MRF Investigation	WR, UAE	Abu Dhabi Municipality
Western Region Compost Plant Inves.	WR, UAE	Abu Dhabi Municipality
Western Region Dumpsite Investigation	WR, UAE	Abu Dhabi Municiaplity
Egbeleku Landfill Construction	Warri, Nigeria	SPDC
Egbeleku Site Investigation	Warri, Nigeria	SPDC
National Hazardous Waste Investigation	Oman	GPEC
Barka Landfill Investigation	Barka, Oman	MRMEWR
Barka Waste Characterization Study	Barka, Oman	MRMEWR
East Slope Construction	Will County, FL	Land and Lakes
Zahle Dumpsite Closure	Zahle, Lebanon	CDR/World Bank
Tripoli Landfill Expansion	Tripoli, Lebanon	CDR
Beirut Airport VIP Taxiway	Beirut, Lebanon	CDR
Toe Berm Construction	St. Lucia	GPEC
Deglos Landfill Construction	St. Lucia	GPEC
Leachate Treatment System Investigation	St. Lucia	GPEC
Zahle Landfill Construction	Zahle, Lebanon	CDR
Madina Waste Characterization Study	Madina, KSA	Al-Khodari
Eastern Province Parking Study	Damam, KSA	Al-Khodari
Atlas-Homestead Landfill Investigation	Homestead, Florida	Atlas-Homestead
Apache Marina Remediation	Miami, Florida	Investura
Apache Marina Site Closure	Miami, Florida	Investura
Codding Landfill Investigation	Northern Florida	Codding Sand & Gravel
Zahle Landfill Expansion	Zahle, Lebanon	CDR
Karachi Water Plant Construction	Karachi, Lebanon	GET
Dhofar Landfill Investigation	Salalah, Oman	MRMEWR
Dhofar Waste Characterization Study	Salalah, Oman	MRMEWR
Interior Region Dumpsite Investigation	Nizwa, Oman	MRMEWR
Interior Region Waste Characterization	Nizwa, Oman	MRMEWR
Sakhaby Dam Investigation	Syria	Government of Syria
Baghdad Landfill Investigation	Baghdad, Iraq	CPA
Zahle Landfill Construction	Zahle, Lebanon	CDR
Madina Waste Characterization Study	Madina, KSA	Al-Khodari
Atlas-Homestead Landfill Investigation	Homestead, Florida	Atlas-Homestead
Atlas-Homestead MRF Investigation	Homestead, Florida	Atlas-Homestead
Apache Marina Remediation	Miami, Florida	Investura
Apache Marina Site Closure	Miami, Florida	Investura
Codding Landfill Investigation	Northern Florida	Codding Sand & Gravel
Karachi Water Plant Construction	Karachi, Lebanon	GET
Tartous Landfill Investigation	Tartous, Syria	Tartous Municipality
Baghdad Transfer Stations (8)	Baghdad, Iraq	CPA

Zahle Landfill Expansion	Zahle, Lebanon	CDR
Karachi Water Plant	Karachi, Pakistan	GET
Arab Salim Compost Plant	Arab Salim, Lebanon	YMCA
Arab Salim Sorting Facility	Arab Salim, Lebanon	YMCA
Sur Landfill	Sur, Oman	OLNG
Eastern Waste Site Investigation	Pompano Beach, FL	Eastern Waste
East Coast Recycling Investigation	Ft. Pierce, FL	East Coast Recycling
Atlas Lox Road Investigations	Parkland, FL	Atlas Lox Road Corporation
Atlas Tall Pines Investigations	West Palm Beach, FL	Atlas Tall Pines Corporation
Captain Jack's Investigations	Manatee, FL	Captain Jack's Corporation
Cameron Park Soil Remediation	Delray Beach, FL	Archstone
Cameron Park Berm Construction	Delray Beach, FL	Archstone
Cameron Park Impoundment Construct	Delray Beach, FL	Archstone
Cameron Park Muck Remediation	Delray Beach, FL	Archstone
Lantana Plaza Drip Pad Closure	Lantana, FL	Lantana Plaza Development
Lantana Plaza Soil Remediation	Lantana, FL	Lantana Plaza Development
Lantana Plaza Ground Water Remed.	Lantana, FL	Lantana Plaza Development
County Waste MRF	Ft. Myers, FL	County Waste
St. Lucie County Leachate Treatment	Ft. Pierce, FL	St. Lucie County
Zahle Sorting Facility	Zahle, Lebanon	USAID/CHF
Zahle Compost Plant	Zahle, Lebanon	USAID/CHF
Zahle Leachate Treatment Plant	Zahle, Lebanon	USAID/CHF
Zahle Gas to Energy Facility	Zahle, Lebanon	USAID/CHF
Baghdad Landfill	Baghdad, Iraq	Government of Iraq
Baghdad Sorting Facility	Baghdad, Iraq	Government of Iraq
Baghdad Compost Plant	Baghdad, Iraq	Government of Iraq
Regional Compost Plant	Beirut, Lebanon	Government of Lebanon
Algiers Landfill Closure	Algiers, Algeria	Sistem Yapi
Iskenderun Solid Waste Faciliteis	Iskenderun, Turkey	Electrowaste
Duqm Solid Waste Management Facilities	Duqm, Oman	Be'ah
Perungudi Dumpsite	Chennai, India	Loro Group
Kodungaiyur Dumpsite	Chennai, India	Loro Group
Calicut Dumpsite	Calicut, India	Loro Group
Trivandrum Dumpsite	Trivandrum, India	Loro Group
Davie Sorting Facility	Davie, Florida	Southern Waste Services
College Avenue Sorting Facility	Davie, Florida	Southern Waste Services