PROFESSIONAL PROFILE



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EDUCATION
MEng, Environmental Engineering, Stevens Institute of Technology, New Jersey
BTech, Civil Engineering, Indian Institute of Technology, India

PROFESSIONAL LICENSES
Professional Engineer in New Jersey
Licensed Site Remediation Professional

Wahid S. Khan, PE, LSRP

Principal Engineer

EXPERIENCE SUMMARY

Over twenty-five years of experience. Specific areas of expertise include environmental due diligence; environmental liability assessments and cost estimation; environmental compliance auditing; drinking water quality assessments; vapor intrusion investigation and mitigation; multi-media remedial investigations, feasibility and treatability studies, and design and implementation of cost-effective and innovative remedial technologies under RCRA, TSCA, CERCLA, NJ ISRA, NJ Spill Act, NY State BCP, NY State VCP and other State regulatory and voluntary cleanup programs; regulatory negotiations; contaminated sediment management; construction management; and litigation support.

TECHNICAL SPECIALTIES

Wahid Khan, a New Jersey Professional Engineer and Licensed Site Remediation Professional (LSRP), has over twenty-five years of experience in multidisciplinary environmental consulting to major industrial clients, including electronics and telecommunication clients, developers, law firms, financial institutions and State and Federal agencies, with emphasis in environmental due diligence, industrial site assessments and investigations, design and construction of cost-effective and innovative remedial systems, and liability assessment, and Brownfields redevelopment. Wahid has provided management, and technical support of environmental remedial activities at more than a dozen federal and state Superfund (CERCLA) sites in various EPA regions, including in Region 2, 3 and 4. Experience includes performance under a variety of legal frameworks, including Administrative Orders by Consent, Unilateral Orders, and Consent Decrees. Responsibilities have included management and performance of remedial investigations, feasibility studies, remedial design, AND remedial action/construction; engineering evaluation and cost analysis; operations and maintenance (O&M); negotiation with regulatory agencies, public relations, AND management of multiple contractors; and litigation support.

Wahid has provided expert witness services, and technical and strategic mediation support for litigation cases involving soil and groundwater remediation, drinking water systems, contractual disputes including standard of care, public water system, insurance claim related disputes, cost-recovery and cost-allocation actions and Natural Resource Damage (NRD) claims and settlements.

As the LSRP and technical lead, he has directed and managed compliance with the Industrial Site Recovery Act (ISRA) and Spill Compensation and Control Act (NJ Spill Act) at more than 50 commercial and industrial sites in New Jersey, including Brownfields, MGP and Dry Cleaner sites. Mr. Khan developed innovative site closure and/or exit strategies including performance-based fixed price remediation for a multitude of multimillion-dollar soil and/or groundwater remediation and Brownfields projects in complex geologic settings to address a variety of contaminants, including recalcitrant and emerging contaminants such as dioxin/furans, Per- and Polyfluoroalkyl Substances (PFAS), including PFOA/PFOS/PFNA, 1,4-dioxane, chlorobenzenes, MTBE/TBA, hexavalent chromium, and perchlorate.

In addition, Wahid has worked on numerous international site assessment/environmental investigation/remedial construction projects located in Australia, Bulgaria, Spain, Bangladesh, Canada, Puerto Rico, Brazil, China, and Singapore.

REPRESENTATIVE PROJECTS

Environmental Due Diligence

- Conducted hundreds of environmental due diligence assessments covering a wide variety of commercial and industrial facilities throughout United States. These assessments, which have been performed in support of Merger and Acquisition (M&A), real estate transactions,

financing, insurance evaluations, and other business transactions. The scope of these projects has ranged from high-level environmental reviews performed as part of multi-billion-dollar transactions, including acquisition of 2,800-acre site to standard Phase I Environmental Site Assessments (ESAs) performed to support the purchase or sale of a single site.

- Technical lead for hundreds due diligence projects for clients in United States, Canada and across the world including Europe, Latin America, and Asia. Portfolios included sites with large and complex legacy contamination issues spanning over several decades. Work typically required highly expedited schedules with scope that included assessments of environmental liabilities and implementation of Phase II studies where necessary to close the data gaps. Assisted clients in identifying potential liabilities and reducing their future financial risks and exposure.
- Conducted over 100 Phase I environmental site assessments and due diligence for various developers and real estate companies specializing in urban renewal, real estate transaction and Brownfield redevelopment. Many of these properties were located in Metropolitan Areas and included warehouses, hotels, industrial and manufacturing facilities, stores, shops, residential buildings, gas stations, and vacant land.
- Conducted more than 25 Phase I and Phase II environmental site assessments (ESAs) for New York City School Construction Corporation.

Expert Services and Litigation Support

- Providing expert services for a lawsuit filed against more than two dozen defendants, including manufacturers, distributors, and users of 1,4-Dioxane. The cost recovery action was filed by one of the largest public drinking water system suppliers who sought damages for 1,4-Dioxane contamination of more than 250 drinking water wells. This project involves contribution analysis, forensic analysis, fate and transport modeling and evaluation of 1,4-Dioxane treatment alternatives and costs.
- As the consulting expert and lead technical advisor, provided litigation support and prepared environmental expert report and rebuttal of opposing expert reports for Civil Action lawsuit that involved groundwater and vapor exposures to chlorinated solvent, including 1,4-dioxane plumes in fractured bedrock emanating from an adjacent industrial site. Participated in court appointed mediation as an expert and negotiated settlement terms. Worked with real estate expert to estimate potential damage, including diminution of the property. Assisted Plaintiff's counsel with preparation of and in responding to interrogatories. Careful review and additional investigation conducted on behalf of the Plaintiff identified additional exposure pathways and a new emerging mobile contaminant (e.g., 1,4-dioxane) that were not previously identified by the defendant and were not being addressed by ongoing treatment by the existing Pump and Treat (P&T) system. The 1,4-dioxane plume was identified to be discharging to the on-site wetland. Evaluated alternative remedial options and recommended installation of additional extraction wells and retrofitting the existing P&T system with an advanced oxidation processes (AOP) using hydrogen peroxide with ultraviolet (UV) light to address 1,4-dioxane.
- Provided expert and litigation support for a lawsuit filed against more than two dozen defendants, including manufacturers, distributors, and retailers of perchloroethylene (PCE), a chemical commonly used in dry cleaning. The cost recovery action was filed by one of the largest public drinking water system suppliers in New York who sought damages for PCE contamination of more than 200 drinking water wells. This project involved a review of documents and engineering calculations regarding the relative contribution of defendant parties. As the technical advisor, estimated the expected service life or change out frequency of activated carbon (GAC) and capital and operating costs over time. For cost allocation purposes, the GAC usage costs associated with VOCs that were not related to dry-cleaning operation were subtracted from the costs associated total GAC usage.
- Providing expert services for a cost recovery action lawsuit filed by US DOJ that involves past remediation cost incurred by USEPA and its contractors for CERCLA emergency removal action and estimated future remediation cost at a Superfund site in Region 3.
- Provided mediation support for over a $200-million-dollar insurance claim at seven Manufactured Gas Plant (MGP) sites in New Jersey. Prepared an independent estimate of appropriate and cost-effective remedial actions for use in settlement discussions. Participated in settlement discussions, evaluated reasonableness of the proposed remedy for each site and presented alternative remedial approaches for each site.
- Provided expert and litigation support for a Civil Action lawsuit in the Superior Court of New Jersey that involved a complaint filed against a consulting company and the excavation contractor for appropriate standard of care and breach of contract. Prepared expert report and assisted in settlement negotiations.
- Provided expert and litigation support for a Civil Action lawsuit that involved indemnification and insurance coverage related to historical free product and petroleum hydrocarbon contamination. Prepared expert report and assisted in settlement negotiations. Provided independent estimates of future costs analysis of potential cost-effective remedial

options and opinions on the appropriateness of past expenditures.

- Providing expert and litigation support for a Civil Action lawsuit in the Superior Court of New Jersey that involves a complaint filed against a consulting company and a dry cleaner for contractual breach and appropriate standard of care during remedial investigations/remediation of chlorinated solvents at a dry cleaning site.
- Provided litigation support and prepared Expert Report in a cost recovery litigation involving remediation of chromium slag at a former a metal processing and production facility. The main ferrochrome slag area was adversely impacting a nearby Creek through the release of chromium and elevated pH in leachate discharged to the creek. Material was entering the creek through the existing concrete pipe culvert system located beneath a portion of the main ferrochrome slag area through unsealed and misaligned joints in the concrete pipe.
- Provided expert consultation on the liability in defense of a cost recovery actions at a former MGP site in New York City. The projects involved evaluation of the appropriateness of a remedy implemented by the developer and its contractors. Prepared an estimate of the cost of an appropriate remedial action for use in settlement discussions.
- Consulting expert and fact witness for an insurance matter involving a class action suit against a Fortune-500 client for groundwater contamination at a former chemical manufacturing facility in New Jersey that was impacted by chlorinated solvents remediated by another consultant using an Electrical Resistance Heating (ERH). Provided sworn deposition.
- As part of a cost-allocation settlement for a site, performed remedial cost estimate for remediation of regional and the on-site MTBE plume using groundwater extraction and treatment system with air stripper and catalytic oxidizer.
- Provided mediation support on a multi-million-dollar cost allocation case at a redevelopment site in Brooklyn, NY. Prepared analysis of appropriate cost allocation between the developer and former owners.

Remedial Design/Construction Management

- Engineering lead for a pre-design investigation and remedial design and construction of a pump and treat (P&T) system to address a chlorinated solvent contamination in karst bedrock aquifer at a Superfund Site in Region 2, which encompasses an area of about 16.5 square miles (10,600 acres) that extends about 10 miles. The design team consisted of 6 to 8 people and Mechanical, Electrical and Plumbing (MEP), Structural and Geotechnical engineering subconsultants. The selected remedy for operable unit (OU)1 involves pumping and treatment of groundwater in the most highly contaminated area and monitored natural attenuation (MNA) for areas downgradient from the treatment area. As part of pre-design investigations, geophysical surveys including seismic reflection and microgravity were conducted to help identify subsurface geologic features (e.g., voids, fractures, and solution channels) and locate paths of preferential ground water flow through the karst aquifer. The 500-gpm P&T system included influent equalization and effluent holding tanks, duplex bag filters, six-tray shallow air stripper system, transfer pumps, chemical feed system, and duplex cartridge filters. The 5,000-sf pre-engineered treatment building was supported by concrete-filled 8-inch diameter steel pipe piles that allowed for a load capacity of 20 tons. The project also involved installation of more than 2,000 ft. of influent and effluent HDPE pipes that were installed under an existing rail line using horizontal directional drilling and jack and bore methods. The remedial activities also included installation of Point of Entry Treatment (POET) systems and/or water line service systems. During the pumping test, Mr. Khan designed and implemented a Treatability Study, which eliminated the need for inorganic treatment that would potentially save both capital (at least $200,000) and O&M costs. For the OU2 portion of the plume, Mr. Khan evaluated alternative remedial options that included in situ reactive barrier and point-of-entry treatment systems) which would potentially save approximately $7 Million. In addition, Mr. Khan estimated NRD liabilities, including actual injury calculation based on water demand, impacted residents, and shrinking plume over time. The project involved extensive coordination with the USEPA, and its design team led by USACE, stakeholders, and other local and State agencies, including NJDEP and NJ Historic Preservation Office (NJSHPO).
- Project manager and lead engineer responsible for the remedial design [$2-million design fee] of a 6-acre Superfund Site in Region 2. Managed a multi-disciplinary project team of 6 to 8 people. Prepared technical specifications using SPECSINTACT, contract drawings and bid documents for excavation and off-site disposal/treatment of approximately 0.5 million tons of arsenic, pesticide, and herbicide contaminated soil, of which approximately 30,000 tons of hazardous soil contained underlying hazardous constituents (UHC). The design included requirement for pretreatment (chemical oxidation) of UHCs prior to disposal pursuant to land disposal restrictions (LDR). Several in situ remedial alternatives evaluated to minimize transportation and disposal costs include on-site soil stabilization using EnviroBlend, on-site soil washing with base extraction, and subsequent disposal. The remedial action included removal of the existing impervious liner, gabion dam, and stormwater outlet structure; final grading to create a detention basin with riprap channels and perimeter ditches; and restoration of the controlled stormwater

release structure. Prepared specification and drawings for soil and erosion control; site restoration; demolition; utility relocation; road resurfacing; UST and buried drum removal and handling; wetland mitigation; wastewater treatment, odor, and dust control. Used CWALSHT to analyze the stability of the sheet pile. Performed stability analyses using the STABL5 software to determine potential failure planes for the critical areas with side slope excavations. Prepared construction schedule using Primavera software and engineer's cost estimate using Micro Computer Aided Cost Estimating System (MCACES) software.

- Technical lead for conducting pre-design investigation, treatability study and developing Remedial Action Workplan to address the dioxin/furans, PCP and petroleum impacted soils and groundwater at 43-acre at State Superfund Site in Missoula, Montana. The site was formerly used as a mill and wood treating facility manufactured precision millwork products, primarily wood window and door components. The selected remedy included excavation and on-site treatment of soils containing PCP co-located with petroleum hydrocarbons or dioxin; excavation and off-site disposal of dioxin-containing and ash-containing soils; excavation and off-site disposal or recycling of buried wood waste containing methane; and in situ chemical oxidation of soil and groundwater using Cool-Ox™. The PCP-contaminated soil on the southern portion of the site was classified as an F032-listed hazardous waste and was banned from land disposal. The selected remedy included excavation of an estimated 4,347 cy of PCP-contaminated soil (including soils comingled with petroleum hydrocarbons or dioxin followed by ex situ bioremediation of this soil in an on-site LTU located within a CAMU. Remediation within the LTU involves land farming that will promote aerobic biodegradation of the COCs. Aerobic conditions were conceptually planned to be promoted by either turning over the soil (i.e., tilling) so that the soil can be exposed to the air on a routine basis or by installing a perforated piping network or spray irrigation system within the soils to be treated.
- Engineering Manager responsible for remedial design, construction, and start-up of SVE a system at the Southwest Disposal Area of the Superfund Site located in Region 4. The SVE remediation system includes a vapor-liquid separator, a blower with a capacity range between 1,000 and 2,000 acfm, a heat exchanger and a granular activated carbon off-gas treatment system to treat chlorinated solvents and carbon tetrachloride. The SVE system will operate for a minimum of two years at a total estimated cost of approximately $4 Million.
- As part of an emergency removal action, as the lead engineer, conducted successful characterization, risk assessment, risk communication, interim measures as emergency response and final remedial design/remedial implementation services to effectively address and eliminate vapor intrusion exposure within the 300,000-square foot active industrial facility located within a Superfund Site in Region 2. Vapor intrusion exposure, which was alleged to be an imminent and substantial endangerment to workers at an active industrial facility, was investigated and subsequently eliminated within 28 days through a combination of interim measures (e.g., crack sealing, low cost HVAC adjustments) and subsequent vapor mitigation/remedial action via the design, installation, and commissioning of a hybrid soil vapor extraction (SVE)/sub slab depressurization system (SSDS). Provided O&M and system optimization services to ensure continued effective operation of the SVE/SSDS.
- Under an ACO with USEPA and NJDEP, prepared conceptual design report, technical specification, and drawings for construction of soil-cement barrier wall to contain of the mobile coal-tar plume and stabilization of residual coal-tar materials using Cement Deep Soil Mixing at a Brownfield Redevelopment site located adjacent to a Superfund Site in Region 2. The remedial plans included a soil-cement mix design for the construction of a vertical ground water barrier and the solidification and stabilization of residual coal tar present at the site. However, during the pre-construction delineation activities, significant amount of coal tar emanating from the adjacent Superfund site was discovered downgradient of the proposed barrier wall which led to the decision of abandoning the proposed soil stabilization within the footprint of the proposed residential developments. Consequently, developed alternative remedial approach which involved excavation and off-site disposal/treatment of coal-tar impacted soils.
- Prepared design report, technical specification and drawings of former tannery waste sludge at a NPL-Ranked Former Tannery Site in Tennessee. The site contained wastewater treatment lagoons covering greater than 10 acres. At the time the leather operations ceased, wet sludges from certain treatment lagoons were placed in cells within two soil berms. In the late 1990s, the site was ranked for inclusion on the National Priorities List due to concerns with the failing nature of the constructed sludge cells. Although TDEC initially requested that the former tannery wastes be addressed via excavation and off-site disposal, a feasibility study was prepared that defined a greatly increased risk to the community of this approach compared with in-situ remedies and recommended sludge solidification and capping in three areas of the site. The recommended remedy also was shown to be between $10MM to $20MM less than the cost for the approach initially requested by TDEC. Subsequently, TDEC issued a ROD consisting of a sludge solidification and capping remedy. Prepared performance-based technical specifications and drawings and design report for sludge solidification and

capping. Participated in bid review and selection of the remedial contractor.

- Project manager and lead engineer responsible for a long-term (3 years), large-scale construction site which was redeveloped into a commercial bioscience research and development campus that currently consists of two 14-story buildings (the East and West Towers) with below grade parking spaces. A variety of contaminants were detected in soil and groundwater at the site, including heavy metals, volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and organochlorine pesticides. Responsibilities included scheduling, staff management, and assistance in project budgeting. Prepared a Soil Management Plan (SMP) that was approved by the NYCDEP for implementation during construction. To minimize the amount of hazardous soils, utilized a combination of field-based analysis (i.e., real time screening with x-ray fluorescence [XRF]) and certified laboratory analytical methods to delineate and excavate the potentially hazardous materials during construction. Prepared and submitted a Certified Closure Report to NYCDEP to document the soil excavation, on-site reuse, and off-site disposal/beneficial reuse activities.
- Project manager and lead engineer responsible for providing construction management services during the $65-million remedial action at a high-visibility Superfund Site in Region 2, which included excavation and off-site disposal and treatment of approximately 370,000 tons of arsenic, pesticide, and herbicide contaminated soil. Participated in weekly construction progress meetings which were also attended by representatives from USEPA, USACE, NJDEP, local and county offices, affected neighbors and their consultants. Monitored contractor's work practices for conformance with the contract specification. Provided technical support in obtaining soil erosion and sediment control permit, temporary discharge approval (TDA). Provided bid support and assisted USACE in contract negotiation with the remedial contractors. Reviewed contractor's work plan and submittals including monitoring well salvaging and abandonment plan, sampling and analysis plan, utility relocation plan, excavation and material handling plan, odor control plan, stormwater management plan and precast design of drainage outlet structure. Revised the final grading plan based on the discrepancy between the aerial survey and ground survey. Reviewed the design of a concrete slab and trench drain for the loading dock area of a warehouse adjacent to the site.
- Project manager/engineer responsible for providing construction period engineering services support to NJDOT during the closure of 36-acre sanitary landfill located in Hamilton, New Jersey. Prepared the Post Closure Certification Report in accordance with N.J.A.C. 7:26-2A. Reviewed contractor's submittals, shop drawing, and related calculations for conformance to the contract plans and specifications. Resolved construction and design conflicts; addressed client needs and other technical issues related to surveying (ground versus aerial) discrepancies, construction of the geomembrane and geocomposite drain under the gabion wall, gas valve box, gas collection system, riprap slope protection, topsoil stabilization matting, guide rail beam, etc. Reviewed material testing data submitted by the contractor for approval of common fill, geocomposite and geomembrane. Evaluated the blinding and clogging potential of geocomposite by fine soil particles from proposed common fill and contractor's proposal for using a filter layer between the geocomposite and common fill. Performed hydraulic (i.e., transmissivity) evaluation of the proposed geocomposite material; and evaluated interface frictional stability between the geomembrane and geocomposite, and geocomposite and common fill.
- Project manager and lead engineer responsible for remedial design and construction of a groundwater extraction and treatment system which originally included an infiltration gallery for reinjecting groundwater into the aquifer at a Superfund Site. During the remedial design, performed careful review and computer modeling which led to installation of additional extraction well, and the decision to abandon the infiltration gallery for permitted surface water discharge. Provided oversight of aquifer testing (e.g., pump test) to determine the capture zone. Responsibilities also included preparation of RAWP, technical specifications, contract drawings, design, design calculations, site management plan, start-up plan, shutdown plan, and operations, maintenance, and monitoring (OMM) plan.
- Project manager and lead engineer responsible for remedial design and implementation of an in situ chemical oxidation (ozone sparging) and SVE system for remediation of groundwater contaminated with gasoline and its additives including MTBE/TBA at a site in northern New Jersey. The full-scale Ozone/SVE system was designed to operate remotely with dedicated solenoid valves and a timing mechanism that can be programmed to inject ozone in target areas for a specific time. Through targeted ozone injections, approximately 75 % of the estimated contaminant mass has been successfully removed to date. Mr. Khan also designed and implemented a free product recovery system that involved implementation of enhanced fluid recovery (EFR) using an internal combustion engine. Also implemented a bio-barrier using in situ submerged oxygen curtain (iSOC™) as an interim remedy to prevent migration of gasoline and MTBE/TBA contaminated groundwater to the adjacent Newark Bay. Prepared Remedial Action Selection Report (RASR)/Remedial Action Work Plan (RAWP) for enhanced bioremediation using

ORC to address fuel oil contamination in area of concern. In addition, Mr. Khan directed remedial investigation (RI) activities including vertical and horizontal contamination profiling using Membrane Interface Probe (MIP), deep soil borings installation, temporary and permanent monitoring well installation, and groundwater sampling.

- Project manager and lead engineer for design, operation, and maintenance of a pump and treat groundwater remediation system at a former electronics manufacturing site under the ISRA program. The pump and treat system included bag filter, air stripper, liquid, and gas phase granular activated carbon (GAC) which was designed to recover and treat chlorinated volatile organic compounds from fractured bedrock. Responsibilities included general operation and maintenance activities including start-up and troubleshooting. Performed routine groundwater investigations using the new passive diffusion bags (PDBs). Prepared semi-annual groundwater assessment reports, quarterly progress reports, discharge monitoring reports (DMR), and self-assessment monitoring reports (SMR). Evaluated impact from potential vapor intrusion in accordance with the new NJDEP vapor intrusion guidance.
- Principal engineer for preparing certified Remedial Design Work Plan and Remedial Action Work Plan to address VOC Source Area at a confidential site in New York. The VOC impacts are primarily found within a silt/clay layer referred to as the Low Permeability Zone (LPZ), at an approximate depth of 40-55 feet below land surface). The remedy for the VOC Source Area consists of in situ thermal remediation (ISTR). The estimated target treatment zone (TTZ) for the remedy is 11,000 square feet in area and is comprised of three vertical intervals as follows: 15-foot interval in the LPZ (i.e., 40-55 ft bls); 10-foot interval (i.e., 30 – 40 ft bls) above the LPZ that will be heated to prevent vaporized VOCs from condensing in soil before they can be removed by the SVE wells; 5-foot interval below the bottom of the LPZ (i.e., 55 - 60 ft bls) that will be heated to promote uniform heating of the overlying LPZ.
- Lead engineer responsible for a remedial design of a sub-surface permeable reactive barrier (PRB) to address groundwater impacted with sulfate from mining operations at a site Minnesota. The PRB includes Zero-Valent Iron (ZVI) and deep injection of EHC or emulsified vegetable oil. Conducted a pilot study to evaluate the constructability of PRB using large-diameter caisson and small diameter ZVI borings.
- Task order manager in providing construction engineering service for installation of 600 feet of sheet pile containment barrier wall in a New Jersey Turnpike Authority Service Area in New Jersey to prevent migration of BTEX and MTBE plume. The remedy included containment of gasoline-contaminated soil and groundwater with institutional control. Conducted quality control inspections and provided construction oversight of installation of the containment system (i.e., sheet pile wall) and abandonment of monitoring wells. Implemented a multi-phase extraction (MPE) program to recover free product and vapors from a series of extraction wells.
- Project manager and lead engineer responsible for developing a Remedial Alternative Study/Corrective Measure Study to address a comingled petroleum and chlorinated solvent plume at an industrial site located in Spartanburg, South Carolina. Prepared a Remedial Alternative Study/Corrective Measure Study report and an application of SC Mixing Zone, which were submitted to SCDEHC. Evaluated various innovative remedial alternatives, which included enhanced anaerobic biodegradation of CVOCs followed by biodegradation of toluene under the sulfate reducing conditions and Monitored Natural Attenuation (MNA).
- Project manager and lead engineer responsible for performing site investigation and remediation of groundwater contaminated with BTEX and MTBE at a confidential site in New York. Performed a pilot study for AS/SVE system. Evaluated soil and groundwater remediation alternatives including enhanced fluid recovery (EFR), chemical oxidation and ozone sparging. Performed figure printing analysis to determine the age of spill. Negotiated with NYSDEC and the current owner, and provided technical support which saved the client approximately $1-million cleanup cost.
- Project manager and lead engineer responsible for performing supplemental investigation using Membrane Interface Probe (MIP), in situ chemical oxidation Treatability Study, remedial design and implementation in situ chemical oxidation using alkaline activated persulfate to address petroleum hydrocarbon contamination at an industrial site located in Vaughan, Ontario.
- Project engineer responsible for design/operation of an Air Sparging/Soil Vapor Extraction (AS/SVE) to address elevated concentrations of chlorinated solvents in the subsurface soils and groundwater at a shopping plaza. The AS/SVE system consisted of thirteen air sparging and thirteen vapor extraction wells, two skid-mounted blowers, associated piping, fittings, and instrumentation.
- Project engineer responsible for developing a remedial action work plan (RAWP), remedial design, and providing construction oversight of soil remediation at a former manufactured gas plant (MGP) site. The source removal included the excavation of soil impacted by polycyclic aromatic hydrocarbon (PAH) and free or residual product (DNAPL). Approximately 140,000 tons of excavated soils were transported off site for thermal desorption treatment (LDT) and then returned for reuse as backfill. Final remedial components include a new stormwater drainage

system and an asphalt cap. Conducted aquifer testing, and numerical groundwater flow and contaminant mass transport modeling, which was used to indicate that groundwater contamination would attenuate naturally within 8 years following the removal of contaminated soil.

- Designed and coordinated injection of HRC™ for reductive dechlorination of chlorinated solvents at Superfund Site in Region 2. Directed sampling and analysis to characterize the off-site groundwater contaminant plume. Additional groundwater sampling was performed to collect useful site-specific geochemical data to evaluate alternative remedial options for an expedited and cost-effective site closure.
- Conducted peer-review for on-site biotreatment pilot study at a Superfund Site. The ROD required solid phase bioremediation (compost or aerated pile techniques) of contaminated sludge and placement of stabilized material in on-site impoundment designated as Corrective Action Management Unit (CAMU). Due to the concerns associated with compliance with the Air Quality Regulations, developed an alternative remedial approach which included off-site biotreatment (aerated Biopiles) and disposal using the concept of "CAMU eligibility" regulations.
- Preformed remedial design for the proposed redevelopment of a municipal landfill located in Wildwood, New Jersey. Performed conceptual design of a sub-slab vapor mitigation system (VMS) and a deep extraction system (DES) for the proposed residential buildings. Estimated the amount of landfill gas and methane that need to be extracted/captured by the proposed DES and VMS systems.
- Performed technical review of remedial investigation and remediation documents for a Brownfields development site located in Yonkers, NY. Evaluated potential risk/environmental liabilities associated with the remediation of soil and sediment contaminated with PCBs and lead. Evaluated if environmental insurance coverage (cost cap policy and a pollution legal liability policy) is adequate to cover any reasonable additional cost to complete the proposed remedial action at the site.
- Developed conceptual remedial alternatives for a Brownfield project which involves redevelopment of a former auto junkyard located in Jersey City, New Jersey. Prepared order of magnitude cost estimate for various remedial alternatives including site-wide containment using slurry wall and a passive free product collection system (French drain and sumps with skimmers and/or sorbent pads), excavation and removal of contaminated soil, groundwater, and free product, and in situ groundwater remediation using ORC.
- Under the NJDEP ISRA program, provided oversight of an ongoing remedial action at a former electronics manufacturing site. The project involved performing a treatability study to evaluate the effectiveness of controlled injection of sodium permanganate solution to remediate CVOC contamination in fractured bedrock.
- Performed an order of magnitude cost estimate for remediation of groundwater contaminated with chlorinated solvents (PCE and TCE) at a site in Bloomington, Minnesota. Remedial technologies evaluated include groundwater pump and treat system and in situ reductive dechlorination using HRC or Anaerobic BioChem (ABC+) with a downgradient reactive barrier using ZVI.
- Prepared design specifications and plans for a sub slab vapor barrier system for a Public School in Bronx, New York. The sub slab vapor barrier system consisted of 40 mil HDPE geomembrane liner and a protective geotextile underliner beneath the school basement level, beneath school basement level structural slab, including sump pits, elevator shaft slab and behind below-grade basement walls. Design drawings included details for slab and pile penetration, mechanical fastener, etc.
- Project manager and lead engineer responsible for negotiating with the NYSDEC to reuse contaminated soil (mostly historical cinder fill) for construction of an observatory mound at the New York Hall of Science Museum in Queens, New York. Prepared design specifications and contract documents associated with health and safety requirements, dust monitoring plan, contaminated soil reuse plan, and earthwork and contaminated soil management plan.
- Project manager and technical lead responsible for conducting soil investigations that involved exploration of approximately 120 test pits at a New York State BCP site in Whitestone, Queens, New York. The site underwent remedial actions conducted by others for soil and groundwater. Responsible for developing plans to investigate the nature and extent of the fill materials and negotiated with NYSDEC and NYSDOH. The investigation plan was implemented under NYSDEC oversight, and a Remedial Action Plan (RAP) has been developed which is awaiting final approval by NYSDEC and NYSDOH. Upon final approval of the RAP, approximately 35,000 cubic yards of fill material will be removed from the site.
- Project manager and technical lead responsible for conducting site assessments and site investigations in connection with the planned acquisition of the Broadway Triangle Urban Renewal Area in Brooklyn, New York for redevelopment as affordable low-income housing under USEPA grant. The Broadway Triangle Urban Renewal Area, which encompasses 66 city lots, is located adjacent to Pfizer Brooklyn Plant. Prepared work plan and sampling analysis and monitoring Plan (SAMP) for site investigation in accordance with USEPA Brownfield Guidance.

The interim remedial action involved removal and closure of several USTs, and disposal of drums and contaminated soil.

- Project manager and technical lead responsible for performing environmental assessment/investigations at the Atlantic Terminal Urban Renewal Area in Brooklyn, New York which was required under CEQR to facilitate construction of housing projects under USEPA grant. Prepared SAMP to address active NYSDEC Spill to address the regulatory requirements under 6NYCRR Part 611.
- Project manager and technical lead responsible for performing environmental assessment/investigations at the Central Avenue Bushwick Brownfield Site in Brooklyn, New York which was required under CEQR to facilitate construction of housing projects under Housing Trust Fund. Prepared work plan to address subsurface contamination associated with active NYSDEC Spill and leaking drums.

Remedial Investigation/Feasibility Studies

- Project engineer for performance of a focused feasibility study (FFS) for a former chemical manufacturing site in Bronx, New York. The FFS was prepared to address contaminated groundwater in bedrock aquifer and assist NYSDEC in preparing the record of decision (ROD). Analyzed packer test and well development data to calculate hydraulic conductivity using AQTESOLV; and prepared a full-scale FFS to address groundwater contaminated with aromatic hydrocarbon (BTEX), chlorinated aliphatic hydrocarbon (CAH), and metals (nickel and antimony). The natural attenuation parameters were evaluated to assess anaerobic biodegradation of CAH compounds in the source area. Performed conceptual designs for enhanced bioremediation (HRC followed by ORC), in situ oxidation treatment using Fenton's reagent and potassium/sodium permanganate, fracture enhancement by pneumatic fracturing, dual phase extraction, and monitored natural attenuation.
- Project advisor for a focused feasibility study at a former MGP site located adjacent to Tonawanda Creek in New York. Combinations of wide range of remedial technologies were developed to remediate the NAPL plume and contaminated soil and groundwater. Developed conceptual designs and cost estimates for in situ thermal desorption, in situ chemical oxidation, in situ solidification, containment with barrier wall and jet grouting.
- Project manager responsible for coordinating and developing predesign investigations to delineate the lateral and vertical extent of soil contamination at a Superfund site in Region 2. Analytical and geological data were assimilated in GIS database which facilitated the determination of volume of total contaminated/hazardous soil with UHCs. Concentration isopleth maps created using ArcView were used to demonstrate the apparent attenuation of principal contaminants of concern with depth. Subsurface geological information was integrated into a database to develop geological cross sections and fence diagrams using gINT software and AutoCAD. Evaluated site-specific ROD-specified cleanup criterion for dinoseb using Synthetic Precipitation Leaching Procedure (SPLP) analyses data. The treatability study results for on-site stabilization, and soil washing, and base extraction were re-evaluated based on the site-specific information (e.g., silt-clay fraction, contamination profile at various hydrogeological units) obtained during the predesign investigations.
- Project Manager and technical lead responsible for developing a Remedial Alternative Study/Corrective Measure Study to address a comingled petroleum and chlorinated solvent plume at an industrial site located in Spartanburg, South Carolina. Prepared a Remedial Alternative Study/Corrective Measure Study report and an application of SC Mixing Zone, which were submitted to SCDEHC. Evaluated various innovative remedial alternatives, which included enhanced anaerobic biodegradation of CVOCs followed by biodegradation of toluene under the sulfate reducing conditions and Monitored Natural Attenuation (MNA).
- Task Manager responsible for conducting RI/FS of a toxic waste lagoon at a 5-acre Superfund Site in Region 2. Contaminants detected in lagoon sediments, shallow groundwater, and on-site soil include various CVOCs, including 1,4-Dioxane and metals. The feasibility study report for OU2 included conceptual designs for enhanced bioremediation, in situ chemical oxidation, pump and treat and monitored natural attenuation.
- Project Manager and technical lead responsible for performing supplemental investigation using Membrane Interface Probe (MIP) and in situ chemical oxidation Treatability Study and full-scale treatment at an industrial site located in Vaughan, Ontario. The full-scale treatment involved soil blending of base active persulfate (BAP) to address the vadose zone impact and direct push injection of BAP to address the BTEX impacted groundwater.
- Project engineer responsible for providing technical review of project planning documents for conducting Remedial Investigation at a former rolling mill under the FUSRAP program in New York. The site performed rolling mill operations using radioactive materials such as uranium and thorium metal under contract with the Atomic Energy Commission (AEC) to support the Nation's early atomic energy program.
- Provided technical review of environmental documents related to the proposed Meadowland Xanadu Redevelopment project in Bergen County, New Jersey. The document reviewed included preliminary assessment report, site investigation

report, RAWP and soil (historic fill) reuse plan. Provided expert testimony which was presented at a public scoping hearing before the NJDEP and New Jersey Meadowland Commission.

- Project manager responsible for reviewing the scope of work for performing environmental site investigation for the Monmouth Executive Airport in New Jersey. Performed an independent cost estimate that provided basis to the county for effectively evaluating another consultant's cost proposal.

Sediment Investigation and Remediation

- Prepared Feasibility Study for a site Marathon, Ontario in which sediments were impacted with elevated concentrations of mercury (including methylmercury) and PCBs. The development of remedial alternatives included cost estimations, an assessment of implementability and effectiveness, and exploration of geotechnical and geochemical constraints on feasibility. Evaluated several remedial alternatives which included institutional controls, isolation capping with armoring layer, hydraulic dredging and disposal at an off-site landfill, hydraulic dredging, and disposal in an on-site confined disposal facility (CDF), and hydraulic dredging and disposal in a local CDF.
- Provided technical review of the draft feasibility study for a Superfund Site in Region 2. Remedial alternatives included hydraulic dredging, oxygenation of profundal areas, habitat enhancement, monitored natural recovery, thin layer capping and construction of sediment consolidation area.
- As a Task Leader, prepared design documents for restoration of Dicks Creek Study Area in southwestern Ohio. The design of interim measures included containment and recovery of free product, excavation, and proper disposal of PCB contaminated sediments/soils from the Study Area.
- Involved with the development of resuspension performance standards and water quality thresholds to be enforced by USEPA to ensure that the extent of PCB release is minimized during the dredging at Superfund Site in Region 2. Responsibilities included review of available PCB data from the downstream Water Treatment Plants (WTPs) to ensure the protection of downstream public water users intakes from resuspension related impact. The current treatment capabilities of the downstream WTPs (Waterford Water Works, Poughkeepsie, and Half-moon) were assessed and monitoring plan for water entering the intake and treated water were proposed. Contingencies proposed include use of alternate source of water, adding Powdered Activated Carbon (PAC) prior to chemical addition, biweekly cleaning of Sedimentation Basin and augmentation with Granular Activated Carbon (GAC) polishing unit.

New Jersey ISRA, Spill Act & LSRP Services

- As the LSRP, directed and managed compliance with the Industrial Site Recovery Act (ISRA) and Spill Compensation and Control Act (NJ Spill Act) at more than 40 industrial sites for clients in various industries. Sites have included major pharmaceutical manufacturing and research and development facilities; chemical manufacturing, storage, and distribution facilities; automotive processing facility; plastics manufacturing; lead-battery manufacturing; and printing and publishing facilities. Major responsibilities at these sites included providing guidance on ISRA alternative compliance options such as obtaining Remediation In Progress Waivers (RIP) waiver and De Minimis Quantity Exemption Affidavits, preparation of preliminary assessments (PA), implementation of site investigations (SI), remedial investigations (RI), strategic planning, design and implementation of remedial actions and issuance of Response Action Outcome (RAO formerly NFA) letters. Contaminants included petroleum and petroleum solvents, chlorinated solvents, DNAPL/LNAPL, heavy metals, pesticides, PCBs, and semi volatile organic compounds. Impacted media included soil, sediments, groundwater, surface water, indoor air, soil vapor and concrete. Some of the representative LSRP projects include the following:
- As an LSRP, performing remedial investigation of Perfluorooctanoic Acid (PFOA), Perfluorononanoic Acid (PFNA) and Perfluorooctanesulfonic Acid (PFOS) impacts in overburden and bedrock aquifers at an industrial site adjacent to a Superfund Site in New Jersey. Currently developing a pilot that combines ART In-Well Technology with foam fractionation to remove PFAS mass from the source area.
- As a technical advisor, assisting an industrial client with their claim against former property owner who allegedly used PFOA/PFOS associated with Aqueous Film Forming Foam (AFFF) in one of the AOCs (former Fire Fighting Training Area) at a confidential site in New Jersey that is currently being investigated under the ISRA program.
- As a technical advisor, conducting peer-review and assisting a client with ongoing on-site and off-site investigation of groundwater impacted with PFOA/PFOS/PFNA associated with PTFE materials at a confidential site in New Jersey that is currently being investigated under the ISRA program.
- As the LSRP, directed PA/SI and remedial investigations for a major pharmaceutical client with four ISRA sites; some of which have been subject to multiple prior ECRA/ISRA triggers and/or remediated by other responsible parties. After conducting PA/SI that identified new AOCs, successfully obtained RIP waivers for one of these facilities. For the other facilities, issued RAOs or assisted the client in negotiating lease termination and settlement agreements with the landowners, who agreed to

comply with the ISRA requirements for the pre-existing conditions (i.e., historic AOCs).

- As the LSRP and remedial engineer, directing ongoing investigation and remediation of a former mattress and box spring assembly facility with 21 AOCs. Managing operation of a Pump and Treat (P&T) system to address CVOC impacted groundwater, and a Sub-Slab Depressurization (SSD) system to mitigate potential vapor intrusion at the site that is currently used as a furniture showroom. Developed an accelerated remedial option to address the PCE and 1,4-Dioxane under the building using in-well air stripping and groundwater recirculation, and the dissolved phase plume downgradient of the source areas.
- As the LSRP and principal engineer, conducted groundwater, indoor air and sub-slab vapor sampling to identify migration pathways for the tetrachloroethylene ("PERC") contamination suspected of resulting from a dry cleaner operation within a shopping mall in Parsippany, NJ. Elevated concentrations of tetrachloroethylene were detected at a couple of stores located within the shopping complex. The investigations identified a mass of tetrachloroethylene under the former dry cleaner as source for sub-slab contaminant migration. Designed and implemented a sub-slab vapor extraction system consisting of vertical and horizontal extraction points installed through the floor within the impacted area of the shopping mall. Evaluated remedial options to address the groundwater impacted with tetrachloroethylene and its degradation by products.
- As the LSRP and Principal-in-Charge, developed Remedial Action Work Plan to address the petroleum and CVOC impacted groundwater in deep overburden aquifer at a former dry-cleaning facility that used mineral spirit as the cleaning agent. Conducted bench-scale treatability study to evaluate the effectiveness of chemical oxidation. Conducted ISCO field scale pilot-study using hydrogen peroxide and activated persulfate to design the full-scale ISCO program.
- As the LSRP, directed remediation of a complicated former confidential industrial site with 15 historical Areas of Environmental Concern (historical AEC). The site was remediated by another consultant using an Electrical Resistance Heating (ERH) to enhance the performance of Dual Phase Extraction (DPE) system. The remedial objectives were a) removal of NAPL, b) reduction of the VOC, including 1,4-Dioxane concentrations to less than 1% of their aqueous solubility, and c) asymptotic mass recovery rate, which would be used as the transition point to implement enhanced in situ bioremediation and long-term groundwater monitoring.
- As the LSRP, directing PA/SI and remedial investigation of a former iron work facility that involved conversion of pig-iron to wrought iron. The release or discharge of an unspecified material was reported to NJDEP after discovering crushed and partially buried drums. The groundwater at the site is impacted with chlorinated VOCs and soil is impacted with VOCs, SVOCs and PCBs. Pursuant to Mega Rule or Final PCB Rule (40 CFR 761.61), the PCB impacted soils above 100 ppm is currently addressed under Performance Based Remediation followed by implementation of Self Implementing Plan to address PCB impacted soils below 100 ppm.
- As the LSRP, directed remedial investigation and remedial action of a former manufacturing site under the ISRA program. The site groundwater and nearby creek is impacted with chlorinated solvents and 1,4-Dioxane. To evaluate if monitored natural attenuation (MNA) combined with CEA can be used as a stand-alone remedy, conducted Bio-Trap® sampling to determine the presence of microbial population that is needed for complete reductive dechlorination of PCE and TCE. In addition, conducted Compound Specific Isotopic Analysis (CSIA) to determine if biodegradation is occurring at variable degree. Developed a remedial plan to address the CVOC impact using enhanced reductive dechlorination followed by MNA.
- As the LSRP, directing the ongoing remedial investigation at a former manufacturing facility under the ISRA program. Conducted remedial action/closure of multiple of USTs and former septic system and on-site and off-site VI investigation. Following the completion of RI, a Remedial Action Work Plan (RAWP) was developed to address 1,4-dioxane and CVOC contamination in groundwater by ISCO (activated persulfate).
- As the LSRP, directing remedial investigations and remediation at a former automotive batteries manufacturing facility. The Preliminary Assessment identified a total of 40 Areas of Concern (AOC), of which 27 required further investigation. The site has been redeveloped concurrently with the remedial investigation. Currently addressing the CVOC and 1,4-Dioxane impacted groundwater in fractured bedrock using ISCO (modified Fenton's) followed by biroremediation using aerobic biological microorganisms for 1,4-Dioxane.
- As the LSRP, directed PA/SI of a complicated industrial site that has been subject to multiple prior ISRA cases with over 50 AOCs and is currently being remediated under the CERCLA program.
- As the LSRP, issued unrestricted use AOC-specific Response Action Outcome (RAO) for a discharge associated with a regulated UST at a confidential site in Princeton, New Jersey. The soil remedial action included excavation and off-site disposal impacted soil to the top of the bedrock.
- As the LSRP, issued unrestricted use Response Action Outcome (RAO) for a multi-tenant site in Moonachie, New Jersey under the ISRA program.

- As the LSRP, directing ongoing remedial investigation at commercial warehouse facility in Mahwah, New Jersey. Following the completion of RI, a Remedial Action Workplan (RAW) will be developed to address the chlorinated volatile organic compound (CVOC) contamination in groundwater. Prepared a conceptual site model (CSM) including vapor intrusion (VI) pathway evaluation. Conducted VI investigation on-site.
- As the LSRP and technical lead, designed and implemented in-situ chemical oxidation using modified Fenton's reagent to address petroleum hydrocarbon contamination in the smear zone and groundwater at a site located in Pinelands.
- Under the ISRA program, as the LSRP, directed additional soil delineation activities, bench-scale treatability study and performed remedial alternative analysis for a site. Mr. Khan is currently directing the remedial design/planning which involves in situ chemical oxidation (alkaline activated persulfate) by soil blending and injection to address the BTEX contaminated soil and groundwater inside a Warehouse building.
- As the LSRP, Mr. Khan directed the multi-phase site investigation at a confidential site. The soil remedial action included excavation and off-site disposal impacted soil to the top of the bedrock. Issued unrestricted use Response Action Outcome (RAO) for the release associated with a suspect UST.
- As the LSRP, issued unrestricted use Response Action Outcome (RAO) for a multi-tenant site under the ISRA program.
- Performed a high-level peer-review of a 55-acre complicated site with over 50 AOCs that are being remediated under the LSRP program. Estimated the timeline for receiving an NFA/RAO and future investigation/remediation costs associated with each AOC. In addition, Mr. Khan identified possible land-use restrictions that may be associated with the proposed redevelopment.

PROFESSIONAL AFFILIATIONS

Licensed Site Remediation Professional Association

American Society of Civil Engineers (ASCE)

Society of Military Engineers

Water Environment Federation (WEF)

MARKETS AND SERVICES

Environmental Due Diligence, Litigation Services, LSRP Services, Brownfields Redevelopment, Site/Remedial Investigation, Remedial Engineering, Operation and Maintenance of Remedial Systems.