

TECHNICAL SPECIALTIES

Environmental engineer with experience in: litigation support including expert witness reports; USEPA Superfund program including PRP allocations; development, design and implementation soil and groundwater remediation using numerous remedial technologies; design and optimization of water and wastewater (sanitary, industrial and pharmaceutical) treatment and conveyance systems; design and construction of landfill caps; design of engineered natural systems (ENS) for various wastewater streams (sanitary, process and stormwater); regulatory negotiations under various programs (USEPA, NJDEP, PADEP, SCDHEC); preparation remedial options analysis, feasibility studies and remedial cost estimating; facility decommissioning including removal and remediation of underground storage tanks (USTs), asbestos and facility demolition.

EXPERIENCE SUMMARY

16 years of experience in the environmental field;
Principal Engineer with Roux Associates, Inc.;
Project Engineer with American Water, Applied Water Management Group;
Research Associate at Villanova University apparent

CREDENTIALS

M.S., 2005, Water Resources and Environmental Engineering, Villanova University;
B.S., 2002, Environmental Science; Marist College;
Licensed Professional Engineer in Delaware, New Jersey, Pennsylvania & South Carolina;
Licensed Site Remediation Professional (LSRP) in New Jersey;
OSHA 40-Hour Health and Safety Training.

KEY PROJECTS

Litigation Support Experience

- Named expert witness relating to the design, construction and operation of a brine concentrator to reduce the volume of the tailings storage facility for an energy company in Australia. The treatment system encountered significant issues during start-up. This case is currently ongoing and planned
- Assisted in the preparation of an expert report relating to the United States Environmental Protection Agency Long Term 2 Enhanced Surface Water Treatment Rule which applies to public drinking water systems utilizing a surface water source. The expert report was submitted and the case was settled out of court upon review of the document.
- Provided neutral third-party observation during a litigation case involving decontamination of asbestos abatement equipment for both lead and asbestos. This case is currently ongoing.

Water Treatment (Sanitary, Industrial & Ex Situ Groundwater)

- Design of primary sedimentation anaerobic treatment (PSAT) tanks for a 1.4 million gallon per day (MGD)

sanitary engineered natural system for a new aluminum manufacturing facility located in Saudi Arabia. The design consisted of concrete above ground septic tanks with between 2 to 4-day hydraulic residence time (HRT) based on influent flow rate which precedes secondary treatment in a constructed treatment wetland (CTW). The PSAT tank operated like a traditional septic tank; however, an internal baffle system was installed to increase treatment effectiveness. This minor modification increased the treatment efficiency by approximately 60%. After the wastewater was treated in the CTW it flowed into an ultraviolet disinfection chamber and was subsequently sent back to the facility for reuse. This system achieved the goal of zero-net water discharge and was the first of its kind to be installed Saudi Arabia.

- Performed construction oversight for of a 1.4 MGD engineered natural system located at a 3,800-acre aluminum refinery site in Saudi Arabia. Responsibilities included, review and approval of shop drawings, technical support to the construction team and construction management company, value engineering and troubleshooting construction issues which arose from working in a different country with different regulations and a very different culture.
- Technical support to assist a construction company in disposal of 40,000 gallons of molybdate containing wastewater which included conducting a benchtop treatability study to precipitate the molybdate prior to discharge to the sanitary sewer A cost benefit analysis was performed and ultimately, on-site treatment was similar in cost to off-site disposal. The off-site disposal option was selected based on a number of factors including simplicity and schedule.
- Engineering and process optimization for the reactivation of a 150 gpm groundwater recovery and treatment system located at a RCRA site in Reading, Pennsylvania. Target contaminants of concern include: beryllium, cadmium, hexavalent chromium, copper and fluoride from historic metals refining operations. The reactivated system used ferrous iron to convert hexavalent chromium to trivalent chromium, aluminum chlorohydrate to precipitate metals from solution followed by a anionic polymer and clarification through a lamella inclined plate clarifier and recirculating sand filter. After traditional metals treatment, a fluoride polishing step was designed and installed to remove fluoride. The fluoride polishing step consisted of two activated alumina adsorption columns capable of removing 14 mg of fluoride per gram of activated alumina and was able to meet the NPDES discharge standard of 6.6 mg/l.
- Design engineer for the installation of an arsenic removal/water softening treatment in central Pennsylvania. The system was designed and installed in response to a reduction in the arsenic drinking water standards. The owner was under a consent order from

the PADEP compressing the schedule. Activities included: design, permitting, drafting, scheduling and cost estimating for the installation of the treatment system within an existing building.

- Provided technical and operational support for a fixed film trickling filter sanitary wastewater treatment plant experiencing exceedances of ammonia. An evaluation of the treatment plant revealed that an overall reduction in flow and a previous upgrade to the treatment plant reduced the overall health of the biomass (i.e., there was not enough wastewater to feed the bacteria). Low cost operational recommendations were provided (i.e., remove one of the two trickling filters from service) to increase the treatment efficiency and health of the biomass. The operational recommendations were successful at increasing ammonia treatment efficiency without capital improvements reducing overall treatment while increasing treatment efficiency.
- Preparation of Chapter 94 Wasteload Management Reports on a yearly basis. These reports are required to monitor and track wastewater treatment plants to ensure proper hydraulic and organic loadings.
- Evaluation and preparation of an options analysis for the treatment of wastewater generated as part at a tomato processing facility which operates at 1,500 gallons per minute (gpm). The client required 100% uptime during the processing season to meet required facility throughput. Evaluation consisted primarily of solids separation through various commercially available methods (settling, dissolved air flotation, filter press and centrifugation). A summary report was provided to the client providing three options with associated costs and schedules. The client has reviewed the options and is awaiting funding for project execution.
- Preparation of Consumer Confidence Reports on a yearly basis. The reports are required to monitor and track public water supply quality and notify the consumers of any water system violations.
- Design of a residential UV point of entry system treatment disinfection system. This system was installed to eliminate bacteria that develop within the residential well due to intermittent well usage. Previously, the resident would chlorinate the well on a yearly basis to reduce bacteria growth, this system ensures all bacteria will be inactivated prior to use.
- Provided engineering and process optimization for a 250 gpm groundwater recovery and treatment system located at a superfund in the New Jersey Pinelands. Target contaminants of concern include metals (copper, beryllium, chromium, copper and nickel) and volatile organic compounds (VOC). This system uses a flocculant/coagulant metals removal followed by an air stripper for VOC removal. Process optimization included evaluation of other treatment technologies,

chemical addition rate testing and chemical addition sequence to increase treatment efficiency.

- Preparation of wastewater treatment plant permits and wastewater treatment plant permit renewals including industrial pretreatment permits through various state environmental agencies including Georgia, Virginia, New Jersey and Pennsylvania.
- Design engineer for the improvements to a 60,000 gpm activated sludge wastewater treatment plant located in southeastern Pennsylvania. The system was upgraded in response to a new phosphorous limit of 0.5 mg/l was imposed by the PADEP. Activities included surveying support, permitting, project management, construction estimates, design and drafting of engineering drawings, construction inspections, meetings and value engineering.
- Design engineer for the construction of a 250,000 gpd water treatment system located in southcentral Pennsylvania. Activities included permitting and development of design drawings and specifications. This project also involved design of an elevated water storage tank.
- Evaluation of a large mammal aquarium experiencing copper exceedances in their sanitary sewer discharge resulting in fines from the public utility. The copper exceedances were traced back from the aquarium filters to the aquarium tanks where copper sulfate was added to prevent algal growth which was then precipitating as copper carbonate. Operational modification were implemented to prevent future discharge of copper and no capital expenses were incurred.

In Situ Groundwater Treatment

- Developed a treatability study for the remediation of trichloroethylene (TCE) and dichloroethylene (DCE) at a former compressed gas facility in Florence, South Carolina through the United States Environmental Protection Administration (EPA) Resource Conservation and Recovery Act (RCRA) program implemented through the South Carolina Department of Health and Environmental Control (SCDHEC). The pilot-study involved the injection of over 200,000 pounds of zero valent iron (ZVI) to abiotically degrade the chlorinated solvents. Certain injection locations also received emulsified vegetable oil (EVO) to stimulate the indigenous microbial community to increase the rate of TCE and DCE degradation and to treat low levels of trichloroethane (TCA). Currently, post-injection performance monitoring is occurring and full-scale injections are anticipated to occur in late 2019.
- Developed a treatability study to evaluate the feasibility of TCE bioremediation at a former stainless-steel tube manufacturer using molasses, a low-cost carbon source. Maximum TCE concentrations at the Site were over 700 milligrams per liter (mg/l) and extended from the overburden soil into fractured bedrock at depths greater

than 300 feet below ground surface (bgs). The pilot test was designed to evaluate the effectiveness of the molasses injections and determine if bioremediation is an effective remedial approach for TCE degradation at levels high levels with the potential of dense non-aqueous phase liquid (DNAPL) present. The results of the pilot-study showed that bioremediation is effective at degrading TCE at the Site; however, the overburden proved difficult to tread due to the underlying fractured bedrock allowing downward migration of injected amendments. Future pilot-studies are warranted to improve upon the distribution of molasses within the overburden while minimizing discharge into the fractured bedrock.

- Design of a pilot test to remediate a 1,2-dichlorobenzene (1,2-DCB) located glacial till/weathered bedrock using ammonium nitrate. Ammonium nitrate was selected based on: 1) aerobic degradation pathway of 1,2-DCB; 2) high water solubility when compared to oxygen; and, 3) low cost of the amendment. The small-scale pilot-study was successful in degrading 1,2-DCB below the New Jersey Groundwater Quality Standards within the injection area. Consequently, a full-scale remediation was designed and implemented in Spring 2016 using pneumatic fracturing techniques. Ammonium nitrate injections using pneumatic fracturing techniques allowed for a larger radius-of-influence (ROI) reducing the injection points and fracturing the subsurface to promote amendment migration and contact with contaminated soils. Post-injection performance monitoring is currently on-going. Preliminary results show contaminants have reduced and re-injection of amendments is not required because of the high solubility of ammonium nitrate in water. This remedial amendment has been self-sustaining reducing overall remedial costs.
- Design and implementation of a large-scale pilot study to remediate metals and low pH in groundwater. In-situ injection of over 300,000 pounds of amendment consisting of either magnesium hydroxide ($Mg(OH)_2$) or calcium hydroxide ($Ca(OH)_2$) were used to increase the alkalinity and precipitate/readsorb metals onto the formation. A series of groundwater wells installed before the injections took place will be used for post-injection performance monitoring. Full-scale injection is expected to require over 2.5 million pounds of amendment to treat the source area. Full-scale remediation is anticipated to begin in early 2020.
- Designed and oversaw installation of an air sparge/soil vapor extraction (AS/SVE) system to remediate a gasoline release at a service station in central New Jersey. AS/SVE was selected based on the site geology consisting mostly of coarse grained sand. The system operated for less than 6 months and reduced the saturated soil concentrations to below the New Jersey Residential Direct Contact Soil Remediation Standards. Low level groundwater exceedances of certain compounds remained after the initial 6-month AS/SVE

operation and the site was moved into monitored natural attenuation (MNA) to minimize overall remedial costs.

- Assisted in the design and implementation of *in situ* chemical oxidation (ISCO) remediation of a former underground storage tank using RegenOx reagents for the degradation of BTEX compounds. The pilot injection activities were successful at reducing contaminant concentrations within the targeted wells. Upon review of results the injections were scaled up to treat the source area. Upon completion of three rounds of ISCO injections, 8-quarters of groundwater monitoring will be conducted to implement a MNA remedial action.

Stormwater and Engineered Natural Systems

- Design of a passive stormwater treatment system at a new aluminum facility. The passive stormwater treatment was designed to remove fluoride (an airborne contaminant which accumulates around aluminum smelters that subsequently contaminates stormwater) to below the surface water discharge standards. The passive stormwater treatment system consisted of six 65' long by 4' wide poured-in-place concrete gravity fed activated alumina adsorption cells that would collect, treat and discharge stormwater to the facility's stormwater conveyance system.
- Engineering support for design and construction of an innovative phytoremediation cap at a superfund site. The phytoremediation cap designed to: 1) minimize infiltration of stormwater into the contaminated soil/groundwater at the site; 2) consumptively use site groundwater to reduce groundwater elevations and increase effectiveness of LNAPL recovery systems; and stabilize the Site to minimize erosion.
- Provided overall project management for the installation of a high-density polyethylene (HDPE) landfill cap in Iowa. The landfill capping took 24-weeks to complete and was finished within budget. Key components of the landfill cap included grading to promote positive drainage, installation of a gas collection layer and subsurface piping to vent any methane produced from degradation of landfill wastes, a stormwater collection system (riprap lined swales, stormwater structures and conveyance piping) and installation of a SmartDitch (HDPE prefabricated ditch liner) to prevent erosion along landfill slopes during rain events.
- Provided engineering design and permitting for the closure of a sanitary landfill through the NJDEP. This project included stormwater runoff calculations, slope stability calculations, grading of the proposed landfill surface including swale and check dam sizing, wetland mitigation, post closure care financial plan and soil erosion and sedimentation control measures.
- Provided engineering support for regrading and capping activities at a former industrial facility in northern New Jersey for a brownfield redevelopment. The project

included the relocation; import and placement of over 130,000 cubic yards of fill (soil and dredged spoils) and topsoil material to cap a former lagoon area. Activities included the preparation of a comprehensive request for bid package, bid support, contractor selection, construction submittal review and part-time oversight of field activities. This project include preparation of a detailed imported fill protocol to screen cap materials, negotiation with state regulators and a detailed review of potential fill sources. The cap included a manmade wetland and soil berm as this site is located along the bank of the Raritan River and the area is prone to flooding and storm surges.

- Perform overall stormwater evaluation for a 168-acre cemetery in Woodbridge, New Jersey to determine: stormwater best management practices to minimize standing water; locations for additional stormwater inlets and conveyance piping and; 3) sitewide water budget. Installation of best management practices and additional infrastructure is currently in the planning stages.
- Designed the restoration of a solid waste management unit (SWMU) stormwater collection swale. The original asphalt swale which is approximately 25-years old and reached the end of its useful life. Various options were evaluated to restore the swale including direct replacement with asphalt, installation of traditional concrete, installation of shotcrete and installation of concrete cloth. Concrete cloth was chosen for the following reasons: 1) minimum disturbance to the existing SWMU liner; 2) provides a long-term maintenance free swale preventing vegetation growth and stormwater infiltration; 3) utilized the existing asphalt swale as a foundation (e.g., no excavation or disposal of asphalt is required) and was the low-cost option. The swale was installed faster than anticipated and has been performing as designed.
- Performed multiple inflow and infiltration (I&I) investigations at various sanitary wastewater collection systems. I&I investigation information was used to design mitigation measures to prevent stormwater from entering the sewer system including manhole replacement, pipe lining and regrading.
- Contractor oversight on multiple inflow and infiltration projects with the goal of reducing the quantity of stormwater inflow and groundwater infiltration contributing to the wastewater flow.

General Engineering

- Provided overall project management for the demolition of a 120+ year old powerhouse. The scope included the demolition of a 200' water tower, 150' smokestack, asbestos abatement throughout the building and within the boilers and furnaces, removal and remediation of a 40' diameter above ground storage tank (AST) and building demolition. Crushed concrete and brick was reused on-site after sampling in accordance with New

Jersey regulations. Overall, the project was completed on-time and within budget.

- Provided overall project management facility decommissioning of an operating foil manufacturer. The scope included: asbestos surveying, asbestos abatement, universal waste management, contractor selection and management. This project is currently ongoing as of January 2018.

Provided the remedial design and overall project management for the ex situ treatment of soils exceeding the federal Toxicity Contaminant Leaching Procedure (TCLP) standard for lead resulting in classification as hazardous waste. The lead containing soil was stabilized on-site resulting in TCLP results below the federal limits reducing disposal costs by over \$300,000.

- Managed the importation of beneficial use material at a former industrial facility in Northern New Jersey. The facility required over 2.5 million cubic yards of fill material to bring the site up to pre-construction grades. To date, approximately 1,500,000 cy of processed dredged material have been accepted at the facility through in accordance with the New Jersey Department of Environmental Protection (NJDEP) Approved Site Imported Fill Protocol. This process requires knowledge of the dredging process, working with local dredgers and dredge processing facilities and the NJDEP Office of Sediment and Dredging technologies.
- Provided engineering for the design and permitting of a sanitary landfill closure through the NJDEP. This project included stormwater runoff calculations, slope stability calculations, grading of the proposed landfill surface including swale and check dam sizing, wetland mitigation, post closure care financial plan and soil erosion and sedimentation control measures.
- Provided engineering support for regrading and capping activities at a former industrial facility in Northern New Jersey for a Brownfield Redevelopment. The project included the relocation; import and placement of over 130,000 cubic yards of fill (Soil and Dredged Spoils) and topsoil material to cap a former lagoon area. Activities included the preparation of a comprehensive request for bid package, bid support, contractor selection, construction submittal review and part-time oversight of field activities. Unique aspects of this project include preparation of a detailed imported fill protocol to screen cap materials, negotiation with state regulators and a detailed review of potential fill sources. The project was completed in 2018 with the conveyance the property to the town as green space.
- Provided engineering support for the preparation of a comprehensive request for bid package for conventional and radiological soil remediation activities at a former industrial facility in Northern New Jersey for a Brownfield Redevelopment. The project includes the excavation of TSCA-level PCBs, soil amendments to

mitigate pH levels below 2 S.U. and a systematic approach for screening, excavation, staging and mixing of radiologically impacted soils from a 62-acre area. Following preparation of the request for bid, activities responses to formal contractor questions and request for information. The project was successfully completed in the spring of 2013.

- Management of a groundwater sampling crew at a site located in Athens Georgia. Low flow sampling techniques were employed to minimize wastewater produced. Sampling results will eventually result in the proper sizing of a activated carbon adsorption system to hydraulically control the VOC plume and prevent further migration of contaminants.
- Project Manager and design engineer for the design and permitting of a wastewater pump station and associate force main serving a mobile home park. Activities included project management, preparation of construction cost estimate, design and drafting of engineering drawings and permitting. A sequence of construction was also developed to aid contractor in minimizing downtime of existing pump station and allow the existing wastewater treatment plant to continue operation.
- Preparation of feasibility studies for a developer outlining cost, treatment options preliminary design and permitting requirements for new residential developments.

PUBLICATIONS

Fu, H., Suri, R.P.S. Chimchirian, R., Helmig, E., Constable, R., "Ultrasound-Induced Destruction of Low Levels of Estrogen Hormones in Aqueous Solutions" *Environ. Sci. Technol.*, 41 (16), 5869 -5874, 2007.

Chimchirian, R., Suri, R.P.S., Fu, H., "Free Synthetic and Natural Estrogen Hormones in Influent and Effluent of Three Municipal Wastewater Treatment Plants" *Water Env. Res.*, 79 (9), 969-974, 2007

Suri, R.P.S., Singh, T.S., Chimchirian, R., "Effect of Process Conditions on the Analysis of Free and Conjugated Estrogen Hormones by Solid-Phase Extraction-Gas Chromatography/Mass Spectrometry (SPE-GC/MS)" *Environmental Monitoring Assessment*, 184(3), 1657-69, 2012

Chimchirian, R., Suri, R.P.S., Stofey, J., "Analysis of Low Levels of Free, Synthetic and Natural Estrogen Hormones in Water and Wastewaters" (Presented at WEFTEC 2005)

Chimchirian, R., Suri, R.P.S., Velicu, M., "Sonolytic Destruction of Free Estrogens in Water Using Ultrasound Irradiation with GC/MS analysis" (Presentation at WEFTEC 2005)