

Nicholas D. Rose
Senior Scientist



Expertise

- Statistical analysis for forensic investigations
- Contaminant fate and transport
- Historical research and technical evaluation for litigation support
- Environmental due diligence

Summary

Mr. Rose has 16 years of experience working on a variety of scientific, environmental, and litigation projects. His focus has been on utilizing statistical techniques, historic research on site operations and environmental release mechanisms, and modeling to identify likely sources of contamination. He has extensive experience writing expert reports, reviewing historical documents, developing access and GIS databases, conducting statistical analysis of sampling data, and modeling potential allocation outcomes.

Specifically, Mr. Rose has written, collaborated on and/or overseen the production of expert reports, position papers, conceptual model reports, and white papers. These reports and white papers have focused on evaluating sediment, stormwater, upland soil, and groundwater data to identify chemical signatures for various sources. As part of the preparation of these reports, Mr. Rose has developed databases from historic records and used these databases to evaluate the potential sources of contaminant release using statistical fingerprinting methods and environmental fate and transport analysis. He has coupled the chemical analysis with historical research on a variety of historic operations, including petroleum refining, gas stations, manufactured gas plants, munitions manufacturing, asphalt and asphalt-related material production, and dry cleaners to provide strong lines of evidence for the results of the chemical analysis.

Professional Experience

Technical Consultant for Environmental Liability Assessment (2020–Ongoing)

Confidential Client, Washington

TIG Environmental is providing its client technical expert support for environmental liability assessment regarding contamination at a former gasoline station in Washington state. To support this effort, TIG Environmental performed a detailed analysis of existing data as part of a forensic evaluation. Based on the analysis, TIG recommended additional sampling of lead isotopes and gasoline additives to evaluate the timing of gasoline releases at the site. This information will be used to support allocation of cleanup costs.

Since 2020, Mr. Rose has conducted forensics analysis of existing site data to evaluate potential sources of contamination at the former gasoline station.

Expert Consultant for Sediment and Uplands Cleanup Cost Allocation (2019–Ongoing)

Confidential Client, New York

TIG Environmental provides litigation support to a private client participating in a Superfund site allocation. The site includes nearly two miles of waterway in a heavily industrialized area of New York state. Contamination at the site includes polychlorinated biphenyls (PCBs) and other chemicals, but PCBs are the primary chemicals of concern. After an initial remedial design phase was completed, regulatory agencies required additional investigation of the study area. Findings from the investigation

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increased the estimated remedial cost nearly seven-fold. The client retained TIG Environmental's services for potentially responsible party (PRP) identification and investigation, sampling and data analysis, and expert witness testimony for anticipated cost allocation for remediation of sediments. Since 2019, TIG Environmental evaluated and investigated documents for PRP sites to gather evidence of historical releases related to operations, developed a conceptual site model of the relationships between PRP operations and the contaminated waterway, conducted soil and sediment sampling, and completed forensic data analysis to identify sources of PCB contamination. TIG Environmental also provided and continues to maintain data visualization tools to assist the client in strengthening the connection between contamination in the waterway and adjacent PRPs, identifying PRPs that may not be responsible for contamination, and identifying additional discharge points that may be associated with additional PRPs.

Since 2019, Mr. Rose has analyzed PCB data with forensic techniques, including principal component analysis (PCA) and polytopic vector analysis (PVA), to identify and quantify contributions from using PCB sources present with existing sampling data.

Technical Consultant for Environmental Liability Assessment and Cost Allocation (2019–Ongoing)

Confidential Shipyard Site, Whatcom County, Washington

TIG Environmental is providing technical expert support for environmental liability assessment and cost allocation for the remediation of contamination at a shipyard site under an Agreed Order with Ecology. TIG Environmental's client is corporate successor to a former owner and operator of a facility on the site. TIG Environmental is producing technical evaluations of historical and current operations on the site and developing forensic and statistical analyses to identify contaminants attributable to the different types of operations at the site. Based on the results of these technical evaluations and analyses, TIG Environmental is developing an allocation strategy and methodology to estimate potential allocable shares to each owner and operator associated with the Site. TIG Environmental is assisting client's counsel with developing early cash-out settlement strategies to negotiate with the party performing the remediation.

Since 2019, Mr. Rose has led the forensic and statistical analysis of data at this site to identify contaminants attributable to various operations. In addition, he has also developed the allocation methodology and strategy report, including development of the allocation model.

Forensic Analysis for Environmental Liability Assessment (2019–Ongoing)

Confidential Client, Confidential Location

TIG Environmental is providing its expert technical consulting related to determining the origin of PCBs detected in cow's milk. TIG Environmental is performing a forensic evaluation to identify potential sources of PCBs in surrounding areas and the pathways for those discharges to expose the local cows to PCBs (soil, sediment, feed, grazing, drinking water, architectural coatings). To support this effort, TIG Environmental suggested sampling efforts and expert evaluation of the resulting data. In addition, TIG Environmental is developing graphics to visualize the data and memoranda to summarize the results of the forensic evaluation.

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Since 2019, Mr. Rose has conducted forensic analysis of PCB contaminated milk, feed, soil, and sediment utilizing statistical forensic techniques. He has also oversaw development of project database and developed sampling guidance for future data collection.

Technical Consultation and Litigation Support (2017–Ongoing)

Confidential Client, New Jersey

TIG Environmental provides technical and litigation support for environmental liability assessment related to sediment remediation at a complex urban river Superfund site in northern New Jersey. Investigative services performed include acquisition of historical records, conducting witness testimonies, reviewing environmental data, and developing expert technical reports for the identification and assessment of PRPs who contributed to the contamination of the Superfund site. Contaminant source identification involves evaluation of the historical operations of hundreds of PRPs at upland sites, fate and transport analysis, and investigation and mapping of historical direct and indirect sewer discharges. TIG Environmental manages a database and client accessible data visualization platform encompassing all historical sampling data collected at the Superfund site.

Since 2017, Mr. Rose has served on the technical team conducting statistical and forensic analysis of sediment contamination. The findings of this research have been used to identify unique chemical signatures and potential sources in the urban river system. As part of this work, he also managed one of the sample databases and conducted data cleaning and evaluation.

Technical Support of Cost Allocation (2017–Ongoing)

Confidential Client, Seattle, Washington

TIG Environmental provides expert technical support to a private property owner participating in a Superfund site allocation. The Superfund sediment site consists of five miles of an urban and industrial estuarine waterway. Working with the property owner's attorney, TIG Environmental evaluated potential sources of PCB contamination in sediments adjacent to the property and developed an allocation strategy based on forensic chemistry and sediment transport modeling.

Since 2017, Mr. Rose has served on the technical team conducting forensic analysis of samples. The findings of this research have been used to evaluate the potential relationship between activities conducted on sites of interest and contamination.

South Park Marina Remedial Action (2017–2019)

South Park Marina Limited Partnership, Seattle, Washington

TIG Environmental assists the owner of a recreational marina site in the South Park neighborhood of Seattle, Washington. This site is the subject of remedial action under an Ecology Administered Agreed Order. Soil and groundwater at the site are contaminated with PCBs, petroleum hydrocarbons, volatile organic compounds, pesticides, and metals requiring cleanup under the Washington State Model Toxics Control Act (MTCA). TIG Environmental's work includes investigating of historical sources of contamination both on-site and nearby off-site. As a result, TIG Environmental identified and nominated additional potentially liable persons (PLPs) for release(s) of hazardous materials affecting the site to Ecology. These PLPs are now involved as participants under the Agreed Order. TIG Environmental, on

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behalf of South Park Marina Limited Partnership, and the other PLPs are working in partnership to oversee the completion of the tasks required to be performed under the Agreed Order, including a remedial investigation (RI) work plan, RI field activities, a source control evaluation, and a RI Report. TIG Environmental completed several source control, RI, feasibility study (FS), and preliminary engineering design tasks supportive of efforts under the current Agreed Order and/or future formal program designations.

Between 2017 and 2019, Mr. Rose has served on the technical team providing database management and analysis of regulatory sampling. The findings of this research have been used to evaluate compliance of onsite discharges.

Technical Consultation and Allocation/Litigation Support (2016–Ongoing)

Confidential Client, Multnomah County, Oregon

TIG Environmental provides technical expert support for environmental liability assessment and cost allocation for the remediation of sediments in the Portland Harbor Superfund Site, and for the associated Natural Resource Damages claims. The harbor has been the site of numerous industrial and manufacturing operations for more than a century, including shipbuilding, petroleum storage and distribution, metal salvaging, and electrical power generation. Technical support for this project includes research, sampling, and forensic analysis to determine the specific contaminants associated with activities or facilities. The project also includes evaluating potential historical contaminant sources, determining contaminant fate and transport, and chemical fingerprinting polycyclic aromatic hydrocarbons (PAHs) and PCBs.

Since 2016, Mr. Rose has served on the technical team conducting detailed analysis of environmental documents, lease agreements, deed transfers, and historical photographs. The findings of this research have been summarized in reports that evaluate the potential relationship between activities conducted on sites of interest and contamination in the Portland Harbor. Since 2018, he has served as a technical lead on the project conducting statistical analysis of sediment contamination, developing technical allocation position papers, and providing technical guidance on client's allocation position. He has also developed models of potential allocation costs and sediment contamination deposition and conducted fingerprinting analysis of PAHs and PCBs.

Technical Consultation and PRP Identification (2016–Ongoing)

Confidential Client, New Jersey

TIG Environmental provides technical support on investigative identification of PRPs in a tidal river system with contaminated sediments. Evaluation includes research and forensic analysis to determine the nexus from investigated upland PRP sites to the tidal river system's specific contaminants; results are being used to prepare internal fact reports to transmit detailed, referenced research to the client and counsel.

Since 2016, Mr. Rose has served on the technical team conducting detailed analysis of sediment data, environmental documents, technical documents, lease agreements, deed transfers, and historical photographs. The findings of this research have been summarized in reports that evaluate the potential relationship between activities conducted on sites of interest and contamination to a tidal river system.

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Technical Support of Cost Allocation (2016–Ongoing)

Confidential Client, New York

TIG Environmental provides technical support regarding cost allocation for a Superfund site involving remediation of sediments contaminated with PAHs, PCBs, non-aqueous phase liquids (NAPLs), and metals. The effort includes historical research to understand the operational history of various industries adjacent to the waterway since the late 1800s, including the specific processes used at each facility. TIG Environmental evaluates documents provided by PRPs and obtains other relevant information from historical media sources, archives, and a variety of records repositories. This research focuses on the specific processes used at each facility, including types and quantities of raw materials used, waste materials generated, and type and duration of discharges. TIG Environmental completed expert reports to detail each PRP's nexus with activities that caused releases of hazardous substances contributing to response costs and provided similar reports and rebuttal testimony regarding the client's historical operating facilities. TIG also assists in developing allocation strategies used to secure a favorable outcome for the client.

Since 2016, Mr. Rose has served on the technical team conducting detailed analysis of environmental documents, technical documents, lease agreements, deed transfers, and historical photographs. The findings of this research have been summarized in reports that evaluate the potential relationship between activities conducted on sites of interest and contamination to the waterway.

Technical Consultation and Allocation/Litigation Support (2017–Ongoing)

Confidential Client, Seattle, Washington

TIG Environmental provides litigation support to a Washington State agency participating in a Superfund site allocation. The Superfund sediment site consists of five miles of urban and industrial estuarine waterway. The key issues revolve around potential stormwater loads from state-maintained roads, bridges, and properties. TIG Environmental prepared expert reports that evaluate whether there is a potential relationship between the Superfund site sediment contamination and the discharge of hazardous substances from the state-owned facilities, potentially resulting in the need for remedial action and associated response costs. TIG Environmental is developing an allocation strategy based on sampling and statistical analysis of stormwater, historical and scientific research, drainage pathway delineation, and sediment transport modeling. TIG Environmental also assists the state agency with the development of source control plans in accordance with Ecology's source control strategy.

Since 2017, Mr. Rose has served on the technical team conducting sediment transport modeling and developing probabilistic costs models. The findings of this research have been summarized in reports that support the proposed allocation strategy.

DDx Fingerprinting (2017–2019)

Confidential Client, Confidential Location

TIG Environmental conducted a forensic analysis of the sum of the dichloro-diphenyl-trichloroethane (DDT), dichloro-diphenyl-dichloroethylene (DDE), and dichloro-diphenyl-dichloroethane (DDD) isomers (DDx) to assess potential sources of contamination into a tidal waterway. In this case, TIG Environmental personnel used various mathematical and statistical techniques to distinguish between

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the potential effects of current sources in the uplands and historical sources that may have already affected waterway sediments. Specific multivariate analyses included PCA and K-means cluster.

Since 2017, Mr. Rose has served on the technical team preparing written work product summarizing the results of statistical and mathematical analysis that were conducted.

Design for Sediment Removal, Capping, and Natural Attenuation (2018–Ongoing)

Yosemite Slough Cooperating Parties Group, San Francisco, California

TIG Environmental and a design team with engineers and scientists from multiple specialist firms are conducting pre-remedial design studies for a contaminated intertidal channel in a highly urbanized area within San Francisco Bay. U.S. Environmental Protection Agency (EPA) had originally proposed a time-critical removal action for removing more than 20,000 cubic yards of contaminated sediment, however TIG Environmental helped its client achieve agreement with EPA on the application of risk-based multi-technology approach, which will result in significant reduction in removal volume and cost.

Pre-remedial design studies include specialized evaluations of sedimentation rates, depth of the biologically active zone, bulk sediment and pore water chemistry, erosion and particle transport, and geotechnical parameters. Overall, the studies will support the design for dredging, capping, and monitored natural recovery of the contaminated sediments.

Since 2018, Mr. Rose has served on the technical team conducting detailed analysis of sedimentation and chemical fingerprinting. The findings of this research have been summarized in a presentation to the relevant regulatory agencies regarding applicability of proposed remediation.

Expert Consultation for Sediment Cleanup Cost Allocation Project in Flanders (2017)

Flemish Government and AnteaGroup, Antwerp, Belgium

TIG Environmental developed a technical basis for allocation of sediment cleanup costs in the Diepteloop Canal east of Antwerp in Flanders. The contamination, which originated from local industrial sources, included a variety of trace metals that could be reasonably associated with particular current or historical industrial operations. TIG Environmental used a variety of techniques, both statistical and graphic, to analyze the existing sediment data and develop proportional allocations for the various parties involved. The technical approach was presented to Public Waste Agency of Flanders (OVAM) as well as the involved parties. The technical basis and allocation outcome were accepted without significant comment or debate.

In 2017, Mr. Rose served on the technical team conducting statistical and graphical analysis of data to develop fingerprints of involved parties. The findings of this research were used to develop a proportional allocation presented to the client and involved parties.

Technical Consultation and Allocation/Litigation Support (2016–2019)

Confidential Client, New Jersey

TIG Environmental provides technical support for environmental liability assessment and cost allocation on an accelerated schedule for an upland Superfund site involving soil and groundwater. Development of a proposed cost allocation strategy, on behalf of the client, included evaluating

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environmental data and technical reports, witness testimony, and historical records. The effort included research and forensic analysis of potential historical contaminant sources, other PRPs' contaminant contributions, industrial archeology/chemical processes, and contaminant fate and transport. TIG Environmental used allocation modeling, calculations, and statistical analyses based on the data generated from this research to assist the client in decision-making on numerous allocation scenarios among the approximately 60 PRPs. TIG Environmental authored position papers to support the client in both offensive and defensive positions.

In 2016, Mr. Rose served on the technical team conducting detailed analysis of environmental documents and historical photographs. The findings of this research were summarized in report evaluating the groundwater plumes present at the Site. He has also developed a model of potential allocation costs and analysis of modeling results to provide client evaluate potential allocation scenarios. In addition, Mr. Rose co-authored position papers supporting the client's positions.

Technical Support of Cost Allocation (2016–2018)

Confidential Client, New Jersey

TIG Environmental provides technical support on investigative identification of PRPs in a tidal tributary system with contaminated sediments for remedial cost allocation purposes. The evaluation includes research and forensic analysis to determine the nexus from investigated upland PRP sites to the tributary system for specific contaminants. The results of this investigation were used to develop a comprehensive allocation strategy and supporting expert reports for sediment and marsh cleanup cost allocation.

Between 2016 and 2018, Mr. Rose served on the technical team conducting detailed analysis of environmental documents, technical documents, lease agreements, deed transfers, and historical photographs. The findings of this research have been summarized in reports that evaluate the potential relationship between activities conducted on sites of interest and contamination to a tidal river system.

Technical Consultation on Propellant Production (2015)

Confidential Client, Santa Clarita, CA

In 2015, Mr. Rose conducted an analysis of environmental documents, technical documents, contracts, and historical photographs. Based on his findings, Mr. Rose prepared a technical summary of the methods used for producing propellant used in rockets, potential sources of contamination associated with these production techniques, and involvement of government contracting agencies in the production process.

Mr. Rose's former employer was retained to investigate the role of government oversight in the client's production of propellant and the role this played in on site contamination. Evaluation included review and evaluation of historical documents to determine the method of production and extent of government oversight of the production process. The results of this investigation were used to develop an expert witness report and expert witness testimony for litigation.

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Expert Consultation on Allocation Strategy (2015)

Confidential Client, Oklahoma City, OK

In 2015, Mr. Rose conducted an analysis of environmental documents, technical documents, and historical photographs. Based on his findings, Mr. Rose prepared a technical summary of the potential sources and transport pathways of petroleum and petroleum product contamination.

Mr. Rose's former employer was retained to delineate contaminated areas applicable and not-applicable to petroleum exclusion under CERCLA. This investigation included review and evaluation of historical documents to evaluate refinery operations and potential sources of contamination. The results of this investigation were used to develop an expert witness report for litigation.

Technical Consultation on Potential Responsible Parties (2014–2015)

Confidential Client, Clifton, NJ

Between 2014 and 2015, Mr. Rose conducted a review of historical operation records, public information and historical photographs. Based on his findings, Mr. Rose prepared a geodatabase and technical presentations identifying potentially responsible parties discharging PCE and/or TCE to public sewers.

Mr. Rose's former employer was retained to identify potential discharges of PCE and TCE to public sewers. Evaluation included review and evaluation of publicly available documents to identify potential operations that used these chemicals and development of geodatabase of sewer lines, connections and historical sites. The results of this investigation were used to identify potentially responsible parties for client's future litigation.

Expert Consultation on Allocation Strategy (2014–2015)

Confidential Client, East Rutherford, NJ

Between 2014 and 2015, Mr. Rose conducted a review of historical documents, environmental documents, public information, and historical photographs. Based on his findings, Mr. Rose prepared a geodatabase and access database documenting the results of historical sampling events. He also used this research to prepare memorandums summarizing potential of PCB contamination from client operations to migrate in adjacent ditch system. Mr. Rose also provided technical input and evaluation of the remedial investigation and design progress for tidal river system.

Mr. Rose's former employer was retained to provide technical consultation to the client during the allocation of a large tidal river system. This consultation included review and evaluation of remedial investigation and design being proposed by the group of cooperating parties and development of allocation approach for client.

Expert Consultation of Timing and mechanism of Historical PCE Release (2014–2015)

Confidential Client, Seattle, WA

Between 2014 and 2015, Mr. Rose conducted a review of historical operation records, public information, remedial investigation reports, historical photographs, and groundwater modeling. Based

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on his findings, Mr. Rose wrote an expert witness report summarizing the likely source and timing of PCE contamination.

Mr. Rose's former employer was retained to provide expert witness testimony on the source and timing of release of PCE contamination. This work included the review and evaluation of documents from discovery and publicly available documents to identify operations that resulted in the release of PCE and an estimation of the timing of groundwater contamination. The results of this investigation were used to provide an expert witness report and expert witness testimony.

Expert Consultation on Due Diligence for Environmental Investigations (2014–2015)

Confidential Client, Trenton, NJ

Between 2014 and 2015, Mr. Rose conducted a review of construction logs, historical guidance documents and standards, remedial investigation reports, witness interviews, and historical photographs. Based on his findings, Mr. Rose wrote an expert report summarizing the historical standard of care on environmental investigations and evaluating if specific parties met that standard.

Mr. Rose's former employer was retained to provide expert witness testimony on whether appropriate due diligence was followed by client's previous environmental consultant. This work included the review and evaluation of documents from discovery and publicly available documents to identify investigations undertaken and standard of care at time of investigations. The results of this investigation were used to provide an expert witness report and expert witness testimony due mediation.

Expert Consultation on Groundwater Contamination Source Identification (2014–2015)

Confidential Client, White Plains, NY

Between 2014 and 2015, Mr. Rose conducted a review of remedial investigation reports to evaluate groundwater movement and petroleum-related contaminant plumes in groundwater near two gas stations. Based on his findings, Mr. Rose wrote a technical report summarizing the likely source of petroleum contamination.

Mr. Rose's former employer was retained to provide expert witness testimony on the source of petroleum contamination in groundwater. This work included the review and evaluation of remedial investigation documents and remedial sampling to identify sources of petroleum products in groundwater. The results of this investigation were used to provide an expert witness report and expert witness testimony.

Remedial Investigation (2013–2014)

Bayer Crop Sciences, Middlesex, NJ

Between 2013 and 2014, Mr. Rose conducted remedial investigations of soil, surface water, and groundwater at the Factory Lane Site. Based on his findings, Mr. Rose wrote remedial investigation reports and remedial design plans for various sites comprising the larger Factory Lane Site.

Mr. Rose's former employer was retained to conduct the environmental investigation and remediation of the Factory Lane Site. This work included the investigation of soil and groundwater contamination



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per NJDEP's Licensed Site Remediation Professionals standards and the design and implementation of soil and groundwater remediation systems.

Academic Qualifications

MS in Microbial Biology, Rutgers, 2013

MS in Environmental Engineering, Pennsylvania State University, 2011

BA in Chemistry (emphasis on biochemistry), University of San Diego, 2004

Professional Training

- Engineer in Training
- 40-Hour OSHA Hazardous Waste Operations (HAZWOPER) Safety Training (29 CFR 1910.120)
- CPR and First Aid Training

Publications and Presentations

Rose, Nicholas D., Negley, Timothy, Johnson, Glenn "Development of an R-based Implementation of the Polytopic Vector Analysis Mixing Model" SciX, Palm Springs, CA. October 17, 2019.

Rose, Nicholas D., Negley, Timothy, Monti, Carlo "Evaluating the challenges of using disparate data sets in forensic methods." Battelle – Tenth International Conference on Remediation and Management of Contaminated Sediments, New Orleans, LA, February 13, 2019.

Monti C., Mudge S.M., Rose N., Negley T., "Integrating PCDD/F fingerprint study, using the 190 nontoxic congeners, with Hg isotopes: first results." Dioxin 2018, Krakow, Poland, August 26, 2018.

Rose, Nicholas D., Negley, Timothy, Monti, Carlo "Challenges and Considerations of Using Disparate Datasets in Multivariate Forensic Analysis." INEF, Salt Lake City, UT, June 25–27, 2018.

Rose, Nicholas D., Regan, John M. "Changes in phosphorylation of adenosine phosphate and redox state of nicotinamide-adenine dinucleotide (phosphate) in *Geobacter sulfurreducens* in response to electron acceptor and anode potential variation." *BioElectroChemistry* 106 (2015): 213–220.

Bhattacharya, Debashish, Dana C. Price, Cheong Xin Chan, Huan Qiu, Nicholas Rose, Steven Ball, Andreas PM Weber et al. "Genome of the red alga *Porphyridium purpureum*." *Nature communications* 4, no. 1 (2013): 1–10.