

Erin Warlow
Senior Scientist



Expertise

- Historical research and technical evaluation for litigation support
- Statistical analysis for forensic investigations
- Research design and strategy
- Environmental cost allocation

Summary

Ms. Warlow is a project scientist with eight years of experience in environmental investigations and litigation projects. She has expertise in preparing technical deliverables, including site-specific expert reports and academic research, as well as proposing methods for allocating costs between parties at complex sediment sites. She has conducted historical and property research in association with litigation support, identified contaminant sources and pathways, designed and implemented environmental investigations in academic contexts, performed robust statistical analyses, and served in task management roles. The focus of her career to date has been in quantifying and describing spatial and temporal changes to wetland and soil systems.

Ms. Warlow has considerable international working experience. She has worked in Spanish-speaking professional contexts and has elementary proficiency in Dutch. She has demonstrated ability in performing environments investigations in diverse cultural and legal contexts.

Professional Experience

Technical Consultation and Allocation/Litigation Support (2020–Ongoing)

Confidential Client, Seattle, Washington

TIG Environmental is providing support to a Washington State agency in responding to a broad Section 104(e) information request at a Superfund sediment site in the early stages of investigation and remediation. As a state agency, our client was potentially involved at several facilities in the vicinity of the subject site. TIG Environmental first supported its client in identifying which facilities potentially connected to the client were responsive to the EPA's request through drainage pathway delineation, interpretation of aerial photographs, and review of historical records. TIG Environmental then assisted its client in screening potentially responsive documents for relevance to the EPA's request, conducting current and former employee interviews, and preparing responses to the EPA's request for the responsive facilities. TIG Environmental is also working alongside the state agency to develop a strategy in anticipation of a potential future allocation process.

Ms. Warlow served the project team in a task manager role, overseeing a technical team in the review and triage of large volumes of historical and technical records for relevance to the case. Ms. Warlow developed of a document review protocol in line with client strategy, aided staff in effectively implementing this protocol, and guided team members in communicating relevant findings in written responses to the 104(e) information request.

Technical Consultation and Allocation/Litigation Support (2015–Ongoing)

Confidential Client, Michigan

TIG Environmental is providing technical support for environmental liability assessment and anticipated cost allocation for a Great Lakes Legacy Act sediment site. TIG Environmental is providing technical support to the client and counsel through position paper development including coordination of specific

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legal arguments. Evaluation includes research and forensic analysis to determine the nexus to the sediments for each upland potentially responsible party (PRP) (or orphan share) for specific contaminants.

TIG Environmental has completed the development of a proposed cost allocation strategy on behalf of the client, which included retrieval and evaluation of relevant documents, historical records, and environmental data/technical reports. Document retrieval included field research efforts, Freedom of Information Act requests, and investigation of online resources. TIG Environmental identified data gaps for use in allocator-mediated disclosure questionnaires to other PRPs. Site-wide sediment evaluation, conceptual site models, and additional graphics were developed in coordination with the client's accompanying consultants. Internal fact reports were prepared to transmit detailed, referenced research to the client and counsel.

Ms. Warlow serves in a deputy project manager role and provides technical support for client and counsel in developing an allocation strategy. She currently leads a team conducting multi-contaminant data analysis and data visualization tasks to further the development of contaminant specific arguments for the upcoming allocation position paper submittal.

Technical Consultation and Litigation Support (1999–Ongoing)

Confidential Clients, New Jersey

TIG Environmental is providing technical and litigation support for environmental liability assessment related to sediment remediation at a complex urban river Superfund site. Investigative services performed include acquisition of historical records, primary witness testimony, environmental data, and technical reports for the identification and assessment of PRPs associated with the site. Contaminant source identification involves evaluation of the historical operations of hundreds of upland sites; fate and transport analysis; and investigation and mapping of the historical storm, sanitary, and combined sewer systems of numerous municipalities. TIG Environmental manages the database encompassing all historical sediment data associated with the site.

TIG Environmental personnel are heavily involved in leading remedial investigation and feasibility studies (RI/FS) activities on the Passaic River. Activities focus on technical support related to the investigation and remediation of this urban tidal river. Most recently, TIG Environmental was instrumental in designing and overseeing removal of 40,000 cubic yards of contaminated sediments as part of the Passaic River Phase I Removal Action Project, implemented under EPA purview.

Ms. Warlow serves on a technical team conducting detailed analysis of environmental data, lease agreements, deed transfers, and historical reports. Responsibilities in this role include efficiently reviewing new records, comparing them against existing documentation, and communicating new findings to the project team, client, and counsel.

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

Confidential Client, New Jersey

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

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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 potentially responsible parties' (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.

Ms. Warlow serves in a deputy project manager role on a technical team seeking to develop defensive arguments in a new phase of the allocation process involving sediment adjacent to the upland site. This requires a review of the upland allocation as well as sediment conditions.

Technical Consultation and Allocation/Litigation Support (2012–Ongoing)

Confidential Client, Seattle, Washington

TIG Environmental is providing 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 has 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 is also assisting the state agency with the development of source control plans in accordance with Washington State Department of Ecology's source control strategy.

Ms. Warlow serves in a technical reviewer role, assisting project team members in reviewing position papers from the allocation team, assessing the relationship between the allocator's positions and those of the client, and communicating key findings to the project team and client. This includes oversight of the development of memoranda and presentations.

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 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

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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, Ms. Warlow has served in a task manager role to assess the contribution from upstream PRPs to the site. This evaluation has included a forensic data analysis of the nature of contamination in the area of concern as well as a review of historical documentation regarding the nature of operations at upstream properties. Ms. Warlow provides support by interpreting the findings from both the forensic and historical evaluations in order to develop a comprehensive understanding of the origin of PCBs at the site. Ms. Warlow has also developed a framework to assess the relative contribution of the PRPs at upstream sites to the waterway.

Technical Consultation and Allocation/Litigation Support (2015–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 2015, Ms. Warlow has served on the technical team conducting detailed analysis of environmental documents, lease agreements, deed transfers, and historical photographs at multiple sites. The findings of this research has been summarized in reports that evaluate the potential relationship between activities conducted on sites of interest with contamination in Portland Harbor. Ms. Warlow also provides allocation support for this client by compiling comparable evidence between multiple PRP sites and developing a scientifically robust approach to assess the relative contribution of each PRP site to contamination in Portland Harbor. Ms. Warlow also contributes to environmental forensic analyses in order to assess contaminant fate and transport for areas of concern. In this project, Ms. Warlow serves in a task manager capacity, ensuring timely and efficient delivery of work products.

Technical Support of Cost Allocation (2015–Ongoing)

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

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comprehensive allocation strategy and supporting expert reports for sediment and marsh cleanup cost allocation.

Since 2015, Ms. Warlow has served in a deputy project manager role in the development of a framework for the allocation of costs to remediate sediments in a complex tidal system. Ms. Warlow has collaborated with internal and external experts to develop a transparent and scientifically-defensible methodology for cost allocation. Ms. Warlow also assists in the evaluation and rebuttal of allocation methodologies submitted by other parties for this system. Additionally, Ms. Warlow has written site-specific reports following detailed review of historical documentation regarding PRP sites. In these reports, Ms. Warlow aims to characterize the likelihood that a PRP site has contributed to contamination in the tidal system and compiles available evidence that can be used to quantify this contribution in an allocation framework.

Technical Consultation and PRP Identification (2015–Ongoing)

Confidential Client, New Jersey

TIG Environmental is providing 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 2015, Ms. Warlow has served in a research capacity, conducting detailed analysis of environmental documents, lease agreements, and other historical documentation. Ms. Warlow has also assisted in document retrieval pursuant to Open Public Records Act and Freedom of Information Act requests.

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, Ms. Warlow served on the technical team that reviewed available documentation in order to propose an approach for allocation of costs associated with the remediation of a canal in Flanders. With experience in a Dutch-speaking professional context, Ms. Warlow aided in the interpretation of technical and historical documents.

Soil Quality Investigator for Ongoing European Soil Preservation Study (2014–2015)

Wageningen University, Wageningen, The Netherlands

This research was conducted in an academic context (Wageningen University, The Netherlands, and University of Valencia, Spain) with support from the European Union's RECARE project. The aim of the RECARE project is to perform research to develop effective prevention, remediation, and restoration measures using a trans-disciplinary approach to address a range of soil threats in different bio-physical and socio-economic environments across Europe.

Ms. Warlow developed and implemented a study using quantitative and qualitative data to determine the frequency and distribution of residues of banned pesticides in agricultural soils, comparing these findings to prior theoretical and laboratory-based knowledge. This research was conducted in diverse agricultural contexts in the Netherlands and Spain. Ms. Warlow designed the study, collected samples in the field, processed the samples in an analytical chemistry laboratory, and performed a statistical analysis of the results. The insights gained from this investigation were used for the design of future academic research aimed at preventing and remediating degradation of European soils.

Wetland Ecology Researcher (2014–2015)

Utrecht University and Private Client, Catfield, Norfolk, United Kingdom

Catfield Fen is a biodiverse wetland area within the Ant Broads and Marshes Site of Special Scientific Interest and the Broads National Park in Norfolk, United Kingdom. The Broads are considered one of Europe's most important wetland areas. For years, private and public stakeholders observed declining diversity in plant and wildlife in Catfield Fen. Private landowners of a portion of Catfield Fen commissioned Ms. Warlow, her academic advisor, and other experts to describe the observed changes and identify the causes of the changes in order to inform an approach to conservation of the unique ecosystem.

Ms. Warlow developed and implemented an ecohydrological study to assess the impacts of subsurface water quality on wetland vegetation in a groundwater-fed wetland system. Ms. Warlow's research concluded that observed adverse changes in vegetation composition in a wetland ecosystem were due to modified subsurface water chemistry following abstraction of groundwater for agriculture. Ms. Warlow's report was submitted among other wildlife and geological surveys as part of legal proceedings to conserve the wetland. Natural England, the United Kingdom government body responsible for ecological preservation, reviewed the compiled evidence and determined that water abstraction was having an adverse impact on the wetland. Consequently, the United Kingdom's Environment Agency has not renewed groundwater abstraction licenses in the vicinity of the wetland for agriculture.

Technical Consultation on Sustainable Urban Redevelopment (2014)

Metabolic, Amsterdam, The Netherlands

This research was conducted in an academic context in support of Metabolic, a consulting and venture building company that aims to use systems thinking to tackle global sustainability challenges. Metabolic's clients include government agencies, private companies, and non-profit organizations.

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Metabolic is involved in advising such entities in using holistic thought processes and modern technology to address sustainability concerns, particularly in urban contexts.

Ms. Warlow conducted research, the goal of which was to identify best practices and determine the value of a nutrient recycling system in order to recommend technological alternatives to conventional wastewater treatment in urban Amsterdam. Ms. Warlow collaborated with international peers from diverse professional backgrounds to conduct a holistic literature and case study review to submit to the client.

**Academic
Qualifications**

MS in Sustainable Development: Global Change and Ecosystems, Utrecht University, 2015
BS in Environmental Science, Wheaton College, 2013
BA in Spanish, Wheaton College, 2013

**Professional
Training**

- Coursera Data Science Specialization
- CPR and First Aid Training

**Publications
and
Presentations¹**

DeMars, Jillian, Erin Warlow. Effectively Building a Concise and Accurate Disclosure or Discovery Response Strategy. Webinar (2021).

Geissen, Violette, Vera Silva, Esperanza Huerta Lwanga, Nicolas Beriot, Klaas Oostindie, Zhaoqi Bin, Erin Warlow, Sjors Busink, Paul Zomer, Hans Mol, Coen J. Ritsema. "Cocktails of pesticide residues in conventional and organic farming systems in Europe- Legacy of the past and turning point for the future" *Environmental Pollution* 278 (2021).

Lasseter, K., D. Farley, E. Warlow. "A Review of Allocation Methods and Rationale for Method Selection." Presentation, Battelle – Tenth International Conference on Remediation and Management of Contaminated Sediments, New Orleans, LA, February 2019.

Van Dyke, Fred, Allison Berthel, Seth M. Harju, Rachel Lamb, Dan Thompson, Julia Ryan, Erin Warlow, Gwyneth Dreyer. "Amphibians in forest pools: Does habitat clustering affect community diversity and dynamics?" *Ecosphere* 8, no. 2 (2017).

¹ Name changed from Erin Pyne to Erin Warlow in 2021.