JACKSON CLEANERS ENVIRONMENTAL REMEDIATION

THE POLITICS OF TOXIC WASTE: EXAMINING THE RELATIONSHIP BETWEEN LOCALITIES AND THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

A Thesis Prospectus
In STS 4500
Presented to
The Faculty of the
School of Engineering and Applied Science
University of Virginia
In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Civil Engineering

By
Evan Fee

November 1, 2021

Technical Team Members:
Stephen Branch, Hannah Hockensmith, Eva Massarelli, and Brianna Wright

On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

ADVISORS

Rider Foley, Department of Engineering and Society

Teresa Culver, Department of Civil and Environmental Engineering

Introduction

According to Lall et al. (2020), ninety-nine percent of all liquid freshwater is stored beneath the surface of the Earth. This groundwater supplies nearly half of all drinking water across the globe, forty percent of water used for irrigation, and a third of industrial water. Lall and colleagues describe how contamination of this precious resource "has become endemic as human activities intersect with water flow pathways" (p. 172). Contaminants are often anthropogenic: agrochemicals, chlorinated solvents, pharmaceuticals, and human fecal pathogens, but natural contaminants such as, arsenic, saline, and lead also pose threats.

When a groundwater aquifer becomes contaminated, it can cost millions of dollars to treat and supply reusable water. Based on a study conducted by DeSimone et al. (2015) more than 20% of the 6,600 public and domestic wells sampled in the United States contained at least one chemical at a concentration greater than a Maximum Contaminant Level (MCL) set by the U.S. Environmental Protection Agency (USEPA). This study largely sampled deeper principal aquifers. However, it is ominously noted that "concentrations of manmade chemicals…exceeded human-health benchmarks two to four times more frequently in shallow groundwater beneath agricultural and urban land than in groundwater from the deeper parts of aquifers currently used for drinking water" (Desimone et al., 2015, p. 3). And that the downward migration of this water will have drastic consequences on the supply from deeper aquifers. Not only does the contamination of shallow aquifers pose a threat to future generations, but it also has tangible, short-term human health concerns. In areas with shallow aquifers as their primary drinking water source, when polluted via agricultural practices, studies have shown that children and infants are at especially high-risk compared to adults for negative health outcomes (Wu & Sun, 2015).

When a site is particularly hazardous, it may become part of the Superfund program. Managed by the USEPA, this program is designed to provide emergency response, site analysis, and remediation for toxic waste dumps, as well as hold responsible parties liable (USEPA & OLEM, 2018). The purpose of my technical project is to provide a remediation strategy for a site that is under the Superfund program. This thesis investigates the social factors at play for Superfund sites that have been a part of the program for numerous years and have still yet to see remediation and restoration.

Site Assessment, Modeling, and Remediation

Sometimes, groundwater contamination can originate from point sources that release high concentrations of organic chemicals, heavy metals, or radioactive isotopes that present incredibly significant and immediate health effects to the local population. These cases are managed by the Superfund program, established by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). Such is the case for site of the technical project our team will be working on. The site is in downtown Ypsilanti, MI, a small city adjacent to Ann Arbor, along the Huron River (Figure 1). The first evidence of contamination was identified in 2019 via an environmental site assessment, conducted by Quantum Environmental, Inc. Following future site assessments, concentrations of perchloroethylene (PCE) and associated chemical products were found to exceed regulatory limits for soil, groundwater, soil gas, and indoor air quality (Geosyntec, 2020).

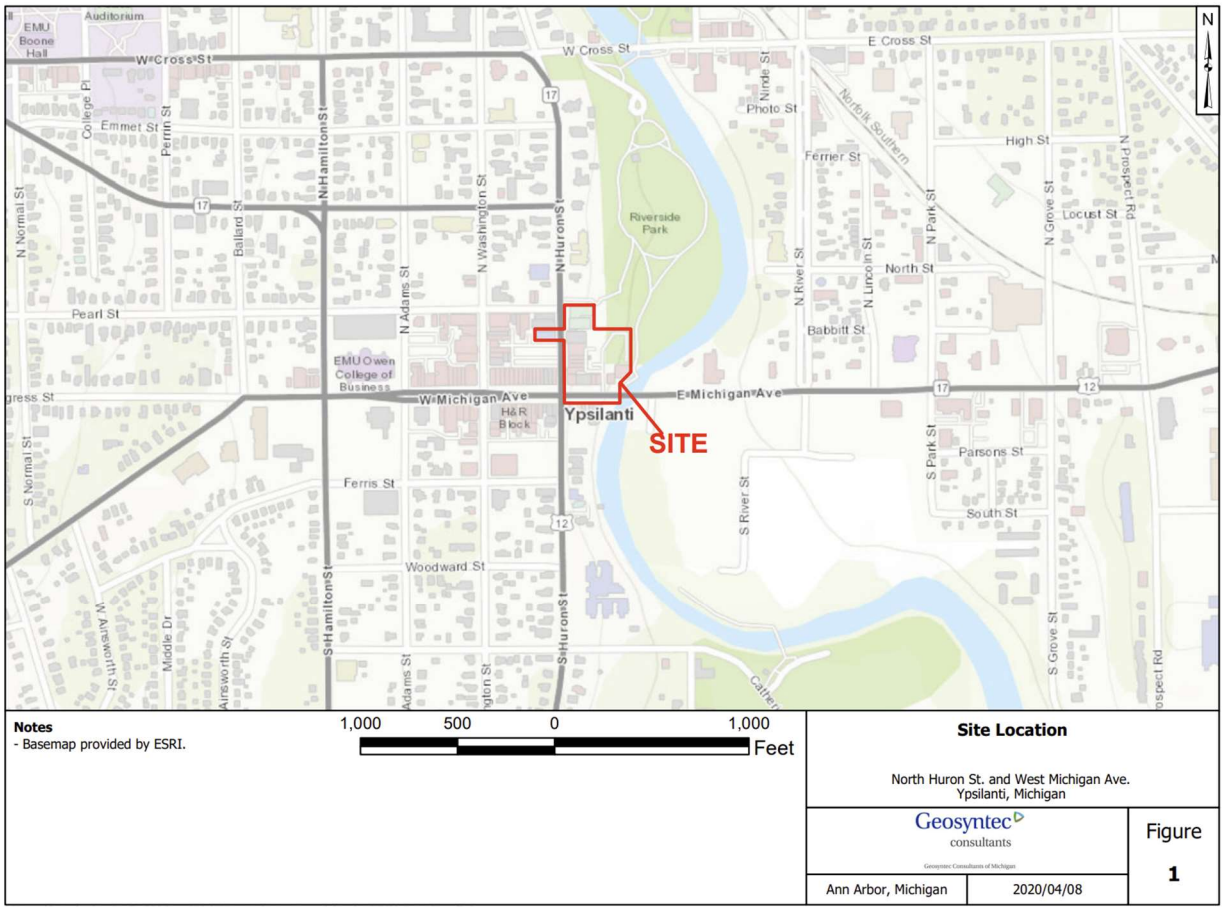

Figure 1. Site Location (Geosyntec, 2020)

In managing this site, the first goal for our team is to construct a Conceptual Site Model (CSM), illustrating site conditions and relevant exposure pathways (MDEQ, 2018). Components of the CSM include: a mapping of surface and groundwater elevations, spatial contaminant concentrations (in both groundwater and soil), a model for the future flow of contaminants in the subsurface, and the relevant exposure pathways to humans. These models are contingent upon the data provided to us by Geosyntec, as of now, further information detailing hydrogeologic parameters and the layout of existing utilities is needed. Our second goal is to utilize this model for the research of remediation techniques of groundwater, soil, and soil gas then assemble the most promising techniques in a decision matrix. This matrix will facilitate comparison of each technique across a multitude of factors including treatment type, cost, effectiveness, required

time, hydrogeologic parameters, and target contaminants. Based on this matrix and further data collection (to fortify our model), we will present our findings as a recommended remedial action plan for the site. This work is essential to protect the health of individuals and the environment in both Ypsilanti, MI and other communities facing similar challenges.

The Politics of Toxic Waste

The genesis of the Superfund program along with CERCLA was driven by a series of dramatic events surrounding several toxic waste sites. The most notable of which being Love Canal. In 1942, Hooker Chemical Co. began dumping hazardous chemical byproducts into the abandoned Love Canal of Niagara Falls, New York. By the end of their tirade, Hooker had cast aside approximately 20,000 tons of chemicals into the old canal, shortly thereafter, the company sold the property to the local school board for a downright bargain of $1 and rid itself of liability. On August 7th, 1978, following a marked increase in cancer rates in Niagara Falls, New York, President Carter declares a federal health emergency, enabling emergency funds for the relocation of more than 800 families and initial cleanup measures (*USEPA & OLEM*, 2018). This was the catalyst for the passing of CERCLA and with it the Superfund. Unfortunately for Hooker Chemical Co., now Occidental Chemical Corp., CERCLA allowed for retroactive liability which held the company responsible for the cost of waste cleanup (Glass, 2014).

Love canal is a glaring reminder of the disastrous consequences of the negligence of corporations. Over the years many sites have been added to the Superfund program, some of these sites have been remediated and subsequently deleted from the Superfund program, some, however, sit idle awaiting promised remediation that has yet to manifest. The program itself is inherently political, the success and timeliness of the cleanup for these sites is heavily dependent

on federal funding. This can lead to stalls, as under the Trump administration (Knickmeyer et al., 2020) and expedition, via $1 billion in funding under the Biden administration (Daly, 2023). Such is the case for several sites in Portsmouth, Virginia and an abandoned Cotter uranium mill in Cañon City, Colorado. Of the five sites in Portsmouth, all of them have been a part of the Superfund for at least 10 years, one has been since the founding of the program (Brown, 2022). The Cotter uranium mill has been a Superfund site for the past 39 years and as of now there is no plan of further action (Schmelzer, 2022).

Surrounding a Superfund site are a variety of social groups, natural resources, and government regulations and policies. Local communities are the crucial stakeholders, their health and well-being are contingent upon the swiftness and care of the USEPA, local government, and any third-party contractors involved. I am going to investigate the interplay between the local citizens affected by toxic waste dumps and their municipal government, specifically how their concerns are addressed or unaddressed. As well as how the USEPA receives communications from a given locality and its citizens and incorporates this feedback into their plans.

Hughes (1987) theory of technological momentum describes the evolution and expansion of technological systems through time and incorporate themselves into societal and environmental systems. This theory can be used to understand the key links between humans and technology. One critical component of technological momentum is the concept of a *reverse salient*. A reverse salient develops as a technological system expands, leaving behind components of the system that are out of sync with others. When considering the Superfund system, several questions arise: Why do some of these sites get left in the dust? Why are citizens' voices not being heard? What will it take for the remediation of these sites to be completed? The

time dilation seen in Superfund sites that have yet to have any real solution proposed or completed is an example of a reverse salient.

Research Question and Methods

This raises the question: How does the interplay between citizens, local government, and the USEPA affect the timeliness of remedial action for Superfund sites? The importance of this question is characterized by the health of individuals. Highlighting the issues at play may give rise to swifter discourse and action surrounding these sites and prevent further negative health outcomes for individuals. In answering this question, I hope to provide nuance to the complex scenarios surrounding these tragic events.

To answer the question, I will conduct a several case studies on several sites that pose (or posed) significant threats to human health in the United States. Some of these sites include: "Cancer Alley" in Louisiana, the Portsmouth, Virginia sites, and the Cotter uranium mill in Cañon City, Colorado. "Cancer Alley" alone has eight open Superfund sites, Portsmouth has had several over the past decades, and the defunct Cotter uranium mill has been a part of the program for nearly forty years. The basis for these case studies will center around government reports, local news reports, and impacted persons accounts. The purpose of this future analysis is to answer smaller questions revolving around the larger one: How does a citizen's background and circumstance affect their chance of being impacted by a human-induced environmental emergency? How much discrepancy was there between the time of discovery and time of response? How did emergency response vary amongst the sites? What was the response of local government? And ultimately, why did these areas experience such crises, was it negligence? Or

do factors such as income or race play a role? With these questions, I aim to identify the cause of the reverse salient in the system.

Conclusion

The human-induced contamination of groundwater is spread far and wide throughout both the United States and the rest of the world. This poses health risks to both humans and the natural environment. With acute cases of pollution, the Superfund program will investigate and manage site remediation. Our project, located in Ypsilanti, Michigan, will focus on the modeling of site parameters, including hydrogeologic features and spatial contaminant concentrations, as well as the eventual recommendation of a remedial action plan.

In conducting case studies on Superfund sites that have been ongoing for numerous years, my aim is to uncover the complex social dynamics at play between citizens, local government, and the USEPA. This research will provide understanding of why these sites are stuck in limbo and perhaps the actions that may be taken to the issues faced.

References

Brown, D. (2022, August 26). In Portsmouth, a Superfund site pollutes a creek, threatens a neighborhood and defies a quick fix. *Inside Climate News*. https://insideclimatenews.org/news/26082022/portsmouth-virginia-superfund-peck/

Daly, M. (2023, February 10). EPA awards $1B to clean up 22 toxic waste sites nationwide. *Associated Press*. https://apnews.com/article/biden-us-environmental-protection-agency-atlanta-business-climate-and-environment-6ca052f1b3dd0c60602aa0e709793e8d

DeSimone, L. et al. (2015). The quality of our nation's waters: Water quality in principal aquifers of the United States, 1991-2010. *Circular*. https://doi.org/10.3133/cir1360

Fitchen, J. M. (1987). Cultural Aspects of Environmental Problems: Individualism and Chemical Contamination of Groundwater. *Science, Technology, & Human Values*, 12(2), 1-12. https://doi.org/10.1177/016224398701200201

Geosyntec Consultants of Michigan, Inc. (2020). Jackson Cleaners site investigation report.

Glass, A. (2014, August 7). Carter declares Love Canal toxic dump a health emergency, Aug. 7, 1978. *Politico*. https://www.politico.com/story/2014/08/carter-declares-love-canal-toxic-dump-a-health-emergency-aug-7-1978-109766

Hughes, T. P. (1987). The evolution of large technological systems. *The social construction of technological systems: New directions in the sociology and history of technology*, 51-82.

Knickmeyer, E. et al. (2020, January 2). Backlog of toxic Superfund clean-ups grows under Trump. *PBS NewsHour*. https://www.pbs.org/newshour/nation/backlog-of-toxic-superfund-clean-ups-grows-under-trump

Lall, U., Josset, L., & Russo, T. (2020). A snapshot of the world's groundwater challenges. *Annual Review of Environment and Resources*, *45*(1), 171–194. https://doi.org/10.1146/annurev-environ-102017-025800

Michigan Department of Environmental Quality, Groundwater-surface water interface pathway compliance options (2018). Lansing, Michigan.

Ormerod, K. J., & Scott, C. A. (2013). Drinking Wastewater: Public Trust in Potable Reuse. Science, Technology, & Human Values, 38(3), 351-373. https://doi.org/10.1177/0162243912444736

Roth, W.-M., Riecken, J., Pozzer-Ardenghi, L., McMillan, R., Storr, B., Tait, D., Bradshaw, G., & Penner, T. P. (2004). Those Who Get Hurt Aren't Always Being Heard: Scientist-Resident Interactions over Community Water. *Science, Technology, & Human Values*, 29(2), 153-183. https://doi.org/10.1177/0162243903261949

Schmelzer, E. (2022, October 22). Nearly 40 years later, one of Colorado's longest-running Superfund sites still has no radioactive waste cleanup plan. *The Denver Post*. https://www.denverpost.com/2023/10/22/canon-city-superfund-cleanup-cotter-uranium-mill/

Slota, S. C. (2022). Bootstrapping the Boundary between Research and Environmental Management: The TMDL as a Point of Engagement between Science and Governance. *Science, Technology, & Human Values*, 47(4), 750-773. https://doi.org/10.1177/01622439211026364

Switzer, D., & Teodoro, M. P. (2017). The color of drinking water: Class, race, ethnicity, and safe drinking water act compliance. *Journal American Water Works Association*, *109*(9), 40–45. https://doi.org/10.5942/jawwa.2017.109.0128

US EPA, OLEM. (2018, November 26). *Superfund History | US EPA*. US EPA. https://www.epa.gov/superfund/superfund-history

US EPA. (2019, April 23). Superfund: National Priorities List (NPL) | US EPA. US EPA. https://www.epa.gov/superfund/superfund-national-priorities-list-npl

Wu, J., & Sun, Z. (2015). Evaluation of Shallow Groundwater Contamination and Associated Human Health Risk in an Alluvial Plain Impacted by Agricultural and Industrial Activities, Mid-west China. *Exposure and Health*, 8(3), 311–329. https://doi.org/10.1007/s12403-015-0170-x