Undergraduate Thesis Prospectus

Contaminated Groundwater Remediation in Urban Areas

(technical research project in Civil and Environmental Engineering)

Rallying for Remediation: The Struggle for Safe Groundwater in Warren County, North Carolina

(sociotechnical research project)

by

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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.

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General research problem

How can health and environmental hazards of contaminated groundwater be mitigated?

The environmental neglect and social inequality of previous decades have led to the environmental contamination, which inevitably leads to negative health hazards in these affected communities. In many cases, this contamination is unintentional or caused without malicious intent, and is simply due to carelessness. However, there have been times when this contamination was a byproduct of intentional waste disposal in marginalized communities, often by direction of the government. As the talk of climate change and its human causes begin to grow, along with the expanding exposure of systemic oppression, the remediation of contaminated sites is becoming more important.

To ensure the well-being of all people in these affected communities, the contaminated sites and other affected areas must be decontaminated. For decontamination to occur properly, information such as how the contamination was caused or who caused it must be known. This information is helpful, as it will essentially place the blame and show who should pay for the remediation along the decontamination techniques that must be used for the remediation process. The social and technical aspects of the remedial process are inseparable and must be evaluated together for a successful product; in this case the environmental decontamination of affected communities.

Remediation of contaminated groundwater

How can the contaminated groundwater due to pollution from a dry cleaner be remedied, ensuring the protection of humans and environmental systems?

This Capstone project is within the School of Engineering's Department of Civil and Environmental Engineering, advised by Teresa B. Culver, in collaboration with team members: Brianna Wright, Evan Fee, Claire Sharp, Hannah Hockensmith, and Eva Massarelli. The project also is in collaboration with Geosyntec, an Environmental Engineering consulting firm, and employees, Sam Baushke and Kate Villars. The capstone group has been tasked with evaluating the best approach in the remediation of the contamination of groundwater from the now closed Jackson Cleaners dry cleaning business in Ypsilanti, Michigan. Constraints for this project include the formation of a budget (lower cost techniques), the existence of businesses and other features on the site, the location of the Huron River to the contaminated groundwater, and more. In its current state the contamination within the water continues to spread throughout the system and slowly approaches other environmental systems, such as the Huron River.

If this contamination is to continue spreading into these surface level systems the effects could be severe, especially to the animals that inhabit the system and people that potentially use the systems for different purposes, such as recreation. Along with these problems specifically associated with water, gas particles that come from the contaminated groundwater rise up through the soil to slabs beneath homes and businesses. This gas will at times leach through the slabs, entering the buildings and causing negative health risks to its inhabitants. As an initial remedial technique, Geosyntec has placed vents from beneath the slab, where the gas can enter and then be discharged into the atmosphere. This is just a short term solution, where

decontamination of the groundwater system will be a more permanent fix. The group assesses different remedial techniques, from a variety of aspects such as price or efficiency, as described above. Data for the project has been and will be provided by Geosyntec, as the Capstone group is not able to travel to the site and collect their own data. The data will be analyzed through software like *ArcGis,* and just by overall contaminant levels by the group and then after extensive research, a technology or numerous methods will be recommended for the remediation of the site in Ypsilanti, Michigan.

Rallying for Remediation: The Struggle for Safe Groundwater in Warren County, North Carolina

In the 1980s, in Warren County, North Carolina, how did residents and non-governmental organizations advocate for environmental remediation after contamination due to negligent waste disposal?

As the fight for environmental justice grows day by day, especially with the ever expanding conversations surrounding climate change, we can look back on one of the most profound events that accelerated this movement: the protests in Warren County, North Carolina in the early 1980's. Though these protests were at their largest in 1982, the events that led to them actually began four years earlier in 1978 (Labalme, 2022). In the summer of 1978, the Ward Transformer Company purposefully dumped approximately 31,000 gallons of Polychlorinated Biphenyls (PCBs), a highly toxic man made chemical that the production of had been banned in 1976 due to the Toxic Substances Control Act (Labalme, 2022). The dumping was deliberate and occurred in the middle of the night, as it was illegal, along 240 miles of roadways and 14 counties (Labalme, 2022). In some places along the roadways, the

concentration levels were two-hundred times above the limit set by the Environmental Protection Agency (EPA), which is extremely dangerous for any contact as the chemical is toxic and carcinogenic (Labalme, 2022). After the spill, one of the largest spills of PCBs in U.S. history, the state government had to decide how to move forward, as they could not just leave the spill in its dumped location (Labalme, 2022).

The state of North Carolina determined that the most cost-effective remedy was to remove the contaminated soil along the roadways and dispose of it elsewhere in the state. The state then had to decide on which landfill they would want to use for the dumping; a landfill that followed the EPA's requirements, none of which met the criteria (Labalme, 2022). After the EPA waived the regulations, where only seven feet separated the bottom of the landfill and the water table (instead of the required fifty), North Carolina decided to construct a new landfill for this specific purpose in 1979 (Labalme, 2022). Prior to the announcement to the construction of the landfill, no residents of Warren County were notified of this development, and gave citizens very little time to organize opposition to the landfill (Labalme, 2022). From the above events, residents and outside non-governmental organizations began to organize and form arguments against the landfill; a smaller movement that would lead to something much larger.

As a first course of action, residents, who had just been made aware of the danger that the chemicals that would soon be dumped in their community would cause, took legal action, by filing lawsuits against the state and other involved parties, but these would all fail (Jose, 2022). After this approach and subsequent failure, in September 1982, the community decided that protest and civil disobedience would be the next best thing in the opposition to the landfill, specifically calling out then North Carolina Governor, James B. Hunt (Jose, 2022). Per one of the participants of these protests, Jenny Labalme, a journalist and photographer of many of the

events in Warren County, who has been referenced above, said that this was the "first time in the nation's history, that people had been jailed for protesting dump trucks hauling dirt that was laced with toxic chemicals" (Jose, 2022).

In a newspaper article from 1982, it is said that on September 27th, 1982, Congressman Walter E. Fauntroy, and 145 other protestors were arrested for participating in a demonstration against the dumping of these chemicals (Reid, 1982). In the article it goes on saying that with the jailing of prominent non-governmental organization leadership like Dr. Curtis Harris, the president of the Virginia Stata Unity of the Southern Christian Leadership Conference (SCLC) was still jailed, along with the wife of the SCLC's national president's wife at the time of writing, and that it was quite reminiscent of the Civil Rights Movement twenty years earlier in the 1960s (Reid, 1982). It goes on in its recall to the Civil Rights movement by saying that the protests are "calling attention to the relentless stronghold of institutional racism that has complete disregard for both the black presence and black life in America," continuing that, "it's Warren County this week, and in may be in your neighborhood next week" (Reid, 1982). The article proceeds with explaining how on the surface the contamination might not seem to be a big deal, but explains that if the contaminants leach into the groundwater system it can begin to reach its way to the counties' inhabitants causing severe negative health effects, specifically mentioning its effect on the health of children (Reid, 1982). Finally, the article notes that more demonstrations are expected, with major ones planned for the days after, not only protesting the chemicals but the fact that people were being jailed as well (Reid, 1982).

In a journal about the events in Warren County, it's mentioned that following these demonstrations that started small and grew to gain national attention, research was conducted to find the correlation, if any, between pollution and race and poverty (Banzhaf et. al., 2019). In a

very simple analysis, locations with lower income and often marginalized racial groups it is shown that more environmental pollution occurs than in higher income majority white neighborhoods. It also showed that governmental organizations like the EPA and the state government bypassed regulations for the construction of the landfill to be made, specifically in an area with often marginalized racial groups.

In the newspaper article by Jose, Labalme says, “I was so moved by what I saw: the grit, the determination, the outrage, and the sense of injustice of a landfill that didn’t even meet EPA standards at the time being placed in a predominantly Black community” (Jose, 2022). Labalme is referencing the grassroots movement that started shortly after the announcement of the construction, and how it grew into something that gained national attention and acted as a catalyst for what would eventually become a not only nationwide but worldwide movement for environmental justice, and introduced new terms such as environmental racism. With the construction of the landfill announced, citizens and non-governmental organizations first took legal action hoping for a reversal. When this didn’t work, these groups moved to a different plan of protesting the landfill, and faced punishment because of it. Without this example of protest, the environmental justice movement would have been delayed and most likely not addressed like it is today. These demonstrations not only served as a catalyst for the movement but acted as an inspiration for other movements, like those addressing the climate crisis and the way that human made technologies have negatively affected the communities we live in and the environmental health of the planet as a whole, something that because of demonstrations like these are now being remedied.

References

- Labalme, J. (2022, September 30). From the Archives: Dumping on Warren County. *Facing South.* https://www.facingsouth.org/2022/09/archives-dumping-warren-county

- Jose, J. (2022, September 29). Panel celebrates 40th anniversary of Warren County environmental justice movement. *The Duke Chronicle, Duke University*. https://advance.lexis.com/document/?pdmfid=1516831&crid=8a8c98f2-a4c2-408e-bf92-c8ac7e4d05b6&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A66H4-BNY1-JBSN-335V-00000-00&pdcontentcomponentid=172244&pdteaserkey=sr6&pditab=allpods&ecomp=hmnyk&earg=sr6&prid=990c4253-b182-4855-aee2-7540172a09ea

- Reid, M. (1982, September 29). Warren county jails black leaders. *New Journal and Guide* https://www.proquest.com/docview/569367207/pageviewPDF/183BF4F9897E491DPQ/23?accountid=14678

- Banzhaf, S., Ma, L., & Timmins, C. (2019, Winter). Environmental Justice: The Economics of Race, Place, and Pollution. *The Journal of Economic Perspectives*, *33*(1), 185–208. https://www.jstor.org/stable/26566983