Chemical Exposure from Manufactured Gas Plants: Public Health Risks?

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ABSTRACT

This project aims at identifying the chemicals and their risk factors to public health, which were found underneath Public Place, a brownfield next to the Gowanus Canal. The site is heavily contaminated with coal tar — a toxic chemical by-product of gas manufacturing, which happened at the site for 100 years until the gas plant closed down in the 1960s and the land was seized by the city. Recently, the city has planned to develop Public Place into "Gowanus Green" and which will be comprised of a school and low-income housing units on this site. The aim of this research is to find out what kind of health issues can result from chemical exposure to naphthalene, benzene, toluene, ethylbenzene, and xylene pollutants on former Manufactured Gas Plant (MGP) sites when developed. For the first stage of this project, we will conduct medical research on chemicals and adverse health impacts. In addition, we will examine historical environmental justice struggles to determine what kind of data collection and documentation is needed to support a public health claim; second part of this research focuses on demographics and government.

MATERIALS AND METHODS

- Extensive literature search was conducted to understand the polluted chemicals that were found to be underground in this site. Ten newspaper and scientific articles were selected for this research.
- Key words: Gowanus, chemical pollutants, gas plants, chemicals.
- Selection criteria: 2000 to 2021
- Research Experts consulted: Professor Nora Almeida

INTRODUCTION

The City of New York proposes building a "modern and affordable" housing complex and school on a chemically polluted site known as "Gowanus Green." EPA recommends full clean-up before building housing for people. The chemicals from former gas plants will remain underneath the ground and can cause harm to potential future residents. The century old chemicals underneath the ground will eventually find their way up whether it is in the water line or in the air. State environmental officials have found many toxic chemicals such as naphthalene, benzene, toluene, ethylbenzene, and xylene, in the dark viscous material, known as "black mayonnaise," at depths of more than 150 feet in the area. The city and private developers have planned affordable housing right next to some of the most polluted sections of the site that once housed gas tanks.

CONCLUSION

As a result of the extent of polluted on this and given how harmful each exposed chemical is, developers should take a minute to understand what we have uncovered and re-think their decision on building affordable housing at "Gowanus Green." By having a better understanding through the toxicology reports of these chemicals we know how risky it is for the public to even live around the site. The chemicals that are seeped underneath the gas plant site can contaminate the water and the air in the future and risk people's lives and cause different diseases included cancer.

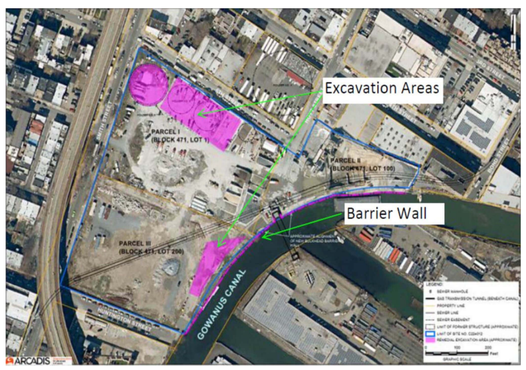
RESULTS

Ethylbenzene:

Ethylbenzene is a colorless, flammable liquid that smells like gasoline. It is naturally found in coal tar and petroleum and is also found in manufactured products such as inks, pesticides, and paints. Ethylbenzene is used primarily to make another chemical, styrene. Other uses include as a solvent, in fuels, and to make other chemicals. Ethylbenzene moves easily into the air from water and soil. It takes about 3 days for ethylbenzene to be broken down in air into other chemicals once exposed in the air. In surface water, ethylbenzene breaks down by reacting with other chemicals found naturally in water. Ethylbenzene can move through soil into groundwater. If you live in a city or near many factories or heavily traveled highways, you may be exposed to ethylbenzene in air. Releases of ethylbenzene into the air occur from burning oil, gas, and coal and from industries using ethylbenzene. Higher levels may be found in residential drinking water wells near landfills, waste sites, or leaking underground fuel storage tanks. Exposure to high levels of ethylbenzene in air for short periods can cause eye and throat irritation. Exposure to higher levels can result in dizziness; if in air for several months to years it can cause kidney damage. It is likely that children would have the same health effects as adults.

Naphthalene:

Naphthalene is a polycyclic aromatic hydrocarbon that is commonly encountered in indoor and outdoor environments around gas plants. There is growing awareness of the environmental health risks associated with inhalation exposure to naphthalene in the environment. Acute (short-term) exposure of humans to naphthalene by inhalation, ingestion, and dermal contact is associated with hemolytic anemia, damage to the liver, and neurological damage. EPA has classified naphthalene as a Group C, possible human carcinogen. The Occupational Safety and Health Administration (OSHA) in the United States has established a permissible exposure limit (PEL) of 10 ppm for naphthalene. The National Institute of Occupational Safety and Health (NIOSH) established an immediately dangerous to life or health (IDLH) value of 250 ppm for naphthalene.



The pollution hotspots where the former gas tanks were situated are marked in pink at the northern end of the site.

Gowanus Green. Photo by Susan De Vries

Benzene:

Benzene levels in the air can be elevated by emissions from burning coal and oil, benzene waste and storage operations, motor vehicle exhaust, and evaporation from gasoline service stations (including gas manufacturing plants). Benzene can evaporate into the air and become breathed into the lung causing serious damage. It causes harmful effects on the bone marrow and can cause a decrease in red blood cells, leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.

Toluene:

Gasoline (from gas plants) contains toluene. Without proper ventilation and safety precautions, toluene can cause irritated eyes, nose, and throat; dry or cracked skin; headache, dizziness, feeling of being drunk, confusion and anxiety. Symptoms worsen as exposure increases, and long term exposure may lead to tiredness, slow reaction, difficulty sleeping, numbness in the hands or feet, or female reproductive system damage and pregnancy loss; including nervous system damage to the mother and the baby. Toluene is a chemical that can cause harm to the lungs, kidneys, liver, and central nervous system, depending on the point of entry. Serious damage to these body organs and systems can occur with prolonged and/or repeated exposure

Xylene:

Xylene enters your body rapidly when you breathe in its vapors. If working or living around gas plants the chemical pollutants can also be absorbed through your skin, particularly if the period of contact is lengthy. Especially, if chemicals are absorbed underground from old gas plants it could be ingestion of contaminated drinking water. Overexposure to xylene most commonly affects your nervous system, respiratory system, and skin. The depression of the central nervous system causing dizziness, headache, nausea and vomiting. According to CDC, acute inhalation exposure to a mixture of toluene and xylenes results in more than additive respiratory and in high doses, death.

DISCUSSION

Although, National Grid have acknowledged the contaminants of concern are BTEX (Benzene, Toluene, Ethylbenzene and Xylene), PAHs, cyanide, and metals, New York City and developers still want to build housing and a school on this polluted site. To keep the poisonous materials from seeping into the buildings, developers will have to thoroughly clean-up and install a vapor protection system to trap toxic materials below ground because even after the clean-up toxics will remain underground. Whether building any housing or not, the canal should be cleaned anyway for the potential public health risks and to prevent ongoing contamination of the Gowanus Canal. It is very risky for the chemicals to be spreading in the air and there shouldn't be any development plan until they fully remediate one of the most polluted brownfields in New York State. Developers need to understand the risk factors of these chemicals; which is why we did our research and looked at many toxicological profiles of known chemical pollutants, which are provided in results of this research.

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