Nicole Barclay

BIOL 364-01

Dr. Shanle

December 4, 2019

**Risk Assessment**

DESCRIPTION OF THE BROWNFIELD SITE

Former Jefferson Davis Hospital

<https://obipublic.epa.gov/analytics/saw.dll?PortalPages&Action=Navigate&PortalPath=/shared/CIMC/_portal/CIMC&Page=Profile+Page&col1=ACRES_GRANT_EXPORT.PROPERTY_ID&val1=%2215155%22>

This property is the former Jefferson Davis Hospital located in the city of Houston, Texas. The hospital was built in 1924 atop a cemetery used during the confederate war and has now been reoccupied as Elder Street Artists Lofts since 2005. On November 13, 2013, this building was designated as a protected historic landmark within Houston’s Historic First Ward.

Through cleanup efforts, an underground storage tank was removed, and asbestos and lead abatement were performed. While the cleanup at this location has been listed as complete, redevelopment is still in progress and was initiated in August of 2004 for the Jefferson Davis Artist Lofts. Contaminants found at this location have included petroleum products, asbestos and lead, all of which have reportedly been cleaned up.

HAZARD IDENTIFICATION

Asbestos is found in rocks and soil and it is used predominantly in construction material including insulation, roofing shingles, floor tiles, cement products, etc. These mineral fibers can be released into the air when disturbed or damaged, which may occur during demolition for example. Exposure to asbestos can have a significant impact on human health, causing lung cancer, mesothelioma or asbestosis (4).

Petroleum products can be found in various fuels, lubricants, household products, industrial products, medications and plastics (3). Incorrect handling, distribution or disposal of petroleum products can also lead to exposure. Long-term exposure can cause deterioration of the central nervous system, destroying the brain and spinal cord.

Lead can be found in gasoline and air emissions, as well as food and water, and can cause illness, severe anemia, neuropathy, encephalopathy, colic, or renal disease (2). People are commonly exposed to lead through ingestion or inhalation, which can also contribute to cognitive and neural deficits, hypertension, congenital malformations, immunotoxicity and growth and development deficits (2).

DOSE RESPONSE ASSESSMENT

One study conducted a dose response assessment of lead levels in the blood and the consequent effects (2). This study found that gastrointestinal colic, acute encephalopathy, anemia, and chronic renal disease were most common amongst those with the highest levels of lead in their blood (greater than 60 µg/dL). Those with lower lead levels in their blood had cognitive and behavioral deficits and peripheral neuropathy. While the Centers for Disease Control recommended that 25 µg/dL of lead in the blood be the “action level” in children, this paper suggests that this level is too high. In January of 2012, the CDC changed the “blood lead level of concern” to 10 µg/dL in children (11). A reference dose for this toxin was not available.

Another study examined the dose response relationship in regard to asbestos (9). For men first employed after 1950, they found a decrease in lung functioning and increase in developing conditions with greater cumulative inhalation exposure to asbestos. Due to the route of exposure in this study, the long-term doses that these men were exposed to were difficult to estimate, so numerical data was likely unreliable, but the research still emphasizes the importance of reducing dust levels. Additionally, his study only analyzed the occupational and workplace environment of men, rather than including women or the general population, so there are limitations to the generalizability of this study, but the biological effects of asbestos in men were documented (9). Again, a reference dose for this toxin was also not available

DESCRIPTION OF THE SURROUNDING COMMUNITY

The former hospital is located in the heart of the city of Houston, Texas, so there are several buildings and roads nearby, in addition to waterways and other establishments. A large portion of the surrounding community is low income and/or below the poverty level, with a median income of almost $16,000. Additionally, there is about a 4% unemployment rate within a three-mile radius from the lofts and around 15% of the area is vacant housing units (5). Houston, Texas is not far from the Gulf of Mexico, so natural disasters including hurricanes, tornadoes and flooding are common.

ASSESSMENT OF THE RISKS FOR EXPOSURE TO THE SURROUNDING COMMUNITY

Major sources of lead exposure are drinking water, paint and gasoline (1). Because this area has a significant portion of low-income residents and 15% of the area is vacant housing units, lead is probably most likely to be found in paint that has not been cleaned up yet. This will most likely affect children the most, as they like to explore objects and put things in their mouths (increased oral and dermal exposure), and lead can have detrimental effects on child development. Furthermore, children also have a high frequency of pica and a high rate of intestinal absorption and retention, which can consequently lead to harmful effects on red blood cell production, kidneys and the central nervous system (1). The large portion of vacant housing indicates that they are most likely not properly cleaned up due to insufficient funding or motivation in this low-income area, which could also potentially signify environmental injustice if residents find high levels of lead in drinking water, food and beverages (2). Lead also lowers the pH of water, which contributes to acid rain and increased human exposure to this toxin (2). Previous efforts to reduce lead exposure have only been targeted in the occupational environment, rather than the general population as a whole.

Petroleum products are often brightly colored and not stored in labelled containers, so children are again more likely to be exposed to petroleum products. Additionally, a significant amount of poisoning happens in preschoolers (3). Despite regulations reducing exposure to these toxins, those with the greatest risk of exposure are children (ingestion and dermal exposure) and those working with storage tanks containing fuels (inhalation and dermal exposure). Regulations regarding the maintenance and handling of these products are gradually being put in place in order to reduce exposure.

PROPOSED ACTION PLAN TO RE-CLAIM THE SITE

A major problem in this area is the almost 12,000 vacant housing units within three miles of this current loft building. In order to address this issue, new buildings and businesses could be established in place of these abandoned buildings, also bringing in jobs to hopefully raise the unemployment rate in the area and consequently the number of residents below the poverty level as well. Figures 1 and 2 illustrate the difference following renovation of the vacant building which turned the abandoned hospital into a residential building. Also, because natural disasters are common and especially hurt low-income areas, re-development efforts need to take that into account in order to help the city and its residents (10). After re-development of several establishments in the area, the average income and number of people below the poverty line was examined in addition to the unemployment rate in order to see if businesses and jobs had been created (8).

FIGURES AND TABLES

**A large brick building

Description automatically generatedFigure 1**. This picture was photographed while abandoned and vacant before renovation took place starting in 2003. The building itself was falling apart, full of trash and old hospital supplies, and was commonly broken into in search for paranormal activity (6).

**A close up of a street in front of a building

Description automatically generatedFigure 2.** This picture was photographed in 2010 of the Old Jefferson Davis Hospital in Houston, Texas while being utilized as an apartment building for the Elder Street Artist Lofts (7).

**Table 1.** Population characteristics within a three-mile radius as determined by the census (5).

|  |  |
| --- | --- |
| **Population characteristic** | **Data** |
| # of Low Income | 61,302 |
| % of Low Income | 39.57% |
| # Below Poverty Level | 34,248 |
| % Below Poverty Level | 22.11% |
| # of Vacant Housing Units | 11,810 |
| % of Unemployed | 4.02% |
| % of Vacant Housing Units | 15.02% |
| Median Income | $15,847 |
| Total Population | 154,909 |

REFERENCES

1. Papanikolaou, N. C., Hatzidaki, E. G., Belivanis, S., Tzanakakis, G. N., & Tsatsakis, A. M. (2005). Lead toxicity update. A brief review. *Medical science monitor, 11*(10), RA329-RA336.
2. Goyer, R. A. (1990). Lead toxicity: from overt to subclinical to subtle health effects. *Environmental Health Perspectives, 86*, 177-181.
3. Seymour, F. K., & Henry, J. A. (2001). Assessment and management of acute poisoning by petroleum products. *Human & experimental toxicology, 20*(11), 551-562.
4. Learn about asbestos. (n.d.). Retrieved from <https://www.epa.gov/asbestos/learn-about-asbestos>.
5. <https://obipublic.epa.gov/analytics/saw.dll?PortalPages&Action=Navigate&PortalPath=/shared/CIMC/_portal/CIMC&Page=Profile+Page&col1=ACRES_GRANT_EXPORT.PROPERTY_ID&val1=%2215155%22>
6. <https://en.wikipedia.org/wiki/Jefferson_Davis_Hospital#/media/File:Jefferson_Davis_Hospital_pre-renovation.jpg>
7. <https://en.wikipedia.org/wiki/Jefferson_Davis_Hospital#/media/File:Jefferson_Davis_Hospital_(HDR).jpg>
8. <https://www.atsdr.cdc.gov/sites/brownfields/actionmodeltoolkit/what-is-the-action-model/#section-1-2>
9. Berry, G., Gilson, J. C., Holmes, S., Lewinsohn, H. C., & Roach, S. A. (1979). Asbestosis: a study of dose-response relationships in an asbestos textile factory. *Occupational and Environmental Medicine, 36*(2), 98-112.
10. <https://www.nytimes.com/2018/09/03/us/hurricane-harvey-houston.html>
11. Learn about lead. (n.d.). Retrieved from <https://www.epa.gov/lead/learn-about-lead>