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Term Paper Report

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COMPASS INDUSTRIES SUPERFUND SITE– TULSA, OK

It is known that landfills are created in order to manage all the non-hazardous wastes that are generated every day in a specific urban/rural area and also to prevent contamination between the waste and the surrounding environment (especially groundwater). When a landfill is contaminated with hazardous waste, they become dangerous to the local ecosystems and/or local people, due to the fact that dangerous contaminants are being introduced to the soil, which sometimes can affect the groundwater of the site and release different dangerous components to the air. Then, the landfill becomes uncontrollable, and furthermore is listed in the National Priorities

List (NPL), right after a Hazard Ranking System (HRS) screening has been completed. This is type of landfills are called a Superfund Sites.

Oklahoma has a large amount of superfund sites; one of them is the Compass Industries Superfund Site, located in Tulsa, OK, which was used as a landfill in the 70's. But, even though it was prohibited to dispose hazardous waste in to it, this site received for 4 years industrial waste containing dangerous contaminants (such as oily sludge, acids, benzenes, PCBs, among others), affecting greatly the environment and increasing the risk for human health.

The good news is that a cleanup was performed (1991) and the site was removed from the National Priorities List (2002). However, as a superfund site it is also important to keep maintaining the area clean, and taking samples in order to know if there could be any suspicion of release (contamination).

Missing the Summary of: "Critical analysis for remedy: Five Year Review and other solutions proposal (future status)"

The Compass Industries Superfund Site is an abandoned landfill located in Tulsa, OK, specifically in the city of Sand Springs (shown in Figure 1), west to the Chandler Park area, with an area of 42 acres. Physically, it is situated in a former limestone quarry and on a bluff approximately one-quarter mile south and 200 feet above the Arkansas River (shown in Figure 2). The nearest residence area (Tulsa metropolitan area) is a

one-quarter mile from the site, and has an estimated population of 960,000 (EPA Region 6, 2014).

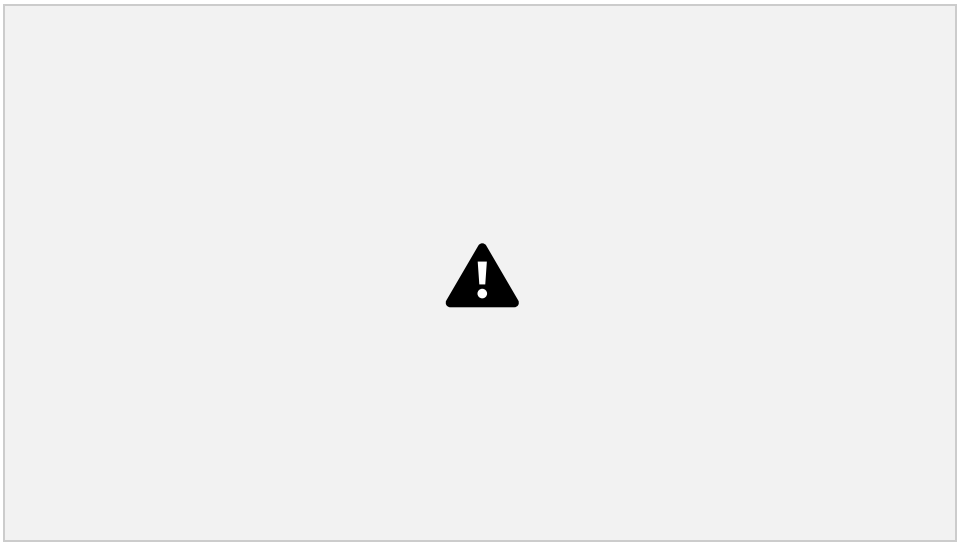

Figure 1: Compass Industries Superfund Site map location (EPA Region 6, 2014).

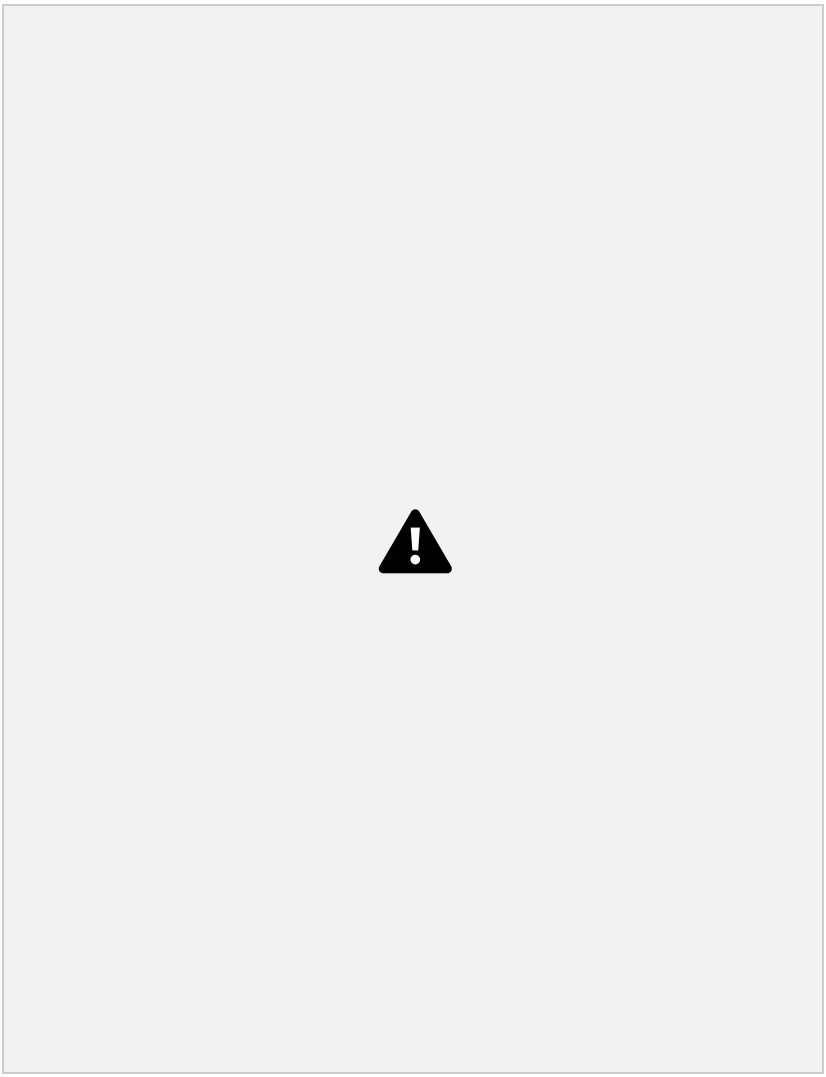

Figure 2: Compass Industries Superfund Site Geology map (Allyn, 1987).

In terms of characteristics of the land, the site's waste is located in "a stone quarry in the Hogshooter Limestone formation, which varies between 20 and 30 feet thick. Beneath the site is the Coffeyville formation, consisting of shales interspersed with minor sandstones and siltstones" (EPA Region 6, 2014). Also, the site is connected to the Arkansas River through a simple network of small streams, which are basically the surface water from precipitation runoff, springs, and seeps flows. As shown in Figure 2,

the “Hogshooter Formation” (unconfined, low-yield perched aquifer) and the “Coffeyville Formation” (thick sandstone zone and deeper aquifer) outcrop in and around the site, and “comprise part of a sequence of shales, sandstones, and limestones formed in shallow marine and deltaic environments in late Pennsylvanian time” (Allyn, 1987). The average groundwater flow of both aquifers is about 720 gallons per day, around 263,000 gallons of water per year (Allyn, 1987).

The topography of the site slopes downward to the west and north, and has an elevation of approximately 770 to 860 feet AMSL. In terms of hydrology, the majority of runoff flows through water gaps in the ridge between the landfilled area and the river or to ponds on the landfill. The topsoil is characterized as clay, which is primarily derived from cover material utilized by the landfill operation. For the natural soils in the area, it is mainly composed of limestone residuum and similar constituents, and pioneer plant species and grasses cover most of the site (Allyn, 1987).

This site operated between 1972 and 1976 as a municipal landfill, which did not allowed industrial waste disposal. However, industrial waste was disposed into the landfill without taking into account the regulations and permit conditions. The contaminants disposed at the site include waste jet fuel and oily sludges, miscellaneous solvents, acids, caustics, bleaches and benzene as well as PCBs (EPA Region 6, 2014). The amount of waste that was determined was of approximately 620,000 cubic yards. Also, as the area had few records about the wastes that were disposed in to the landfill and

the data indicated that disposal of the waste was done in an irregular manner, it was hard to determine where the wastes were located (Allyn, 1987).

Therefore, the Compass Industries site was listed on the National Priorities List (NPL) in September 1984, and the U. S. Environmental Protection Agency (EPA) awarded the funds for a remedial investigation (RI) and feasibility study to the Oklahoma State Department of Health (OSDH). The main results were:

1. The three major pathways of possible off-site contaminant migration were surface water, groundwater, and air. Surface water runoff and seeps that discharge along the perimeter of the site are the most significant pathways of contaminant migration off-site.

2. Human Health: After investigating the site, three conclusions were determined in terms of the risk that the contamination of the site could bring to human health; first, the ingestion of ground water was not considered a potential exposure pathway, because it was considered incomplete since nearby residents use city water. Second, ingestion or dermal absorption of surface water was determined not to pose a health hazard. And finally, the site soil represented the only contaminated environmental medium for which the exposure pathways were complete. (Allyn, 1987).

3. Air: The results obtained from the air monitoring showed the presence of organics, but at non-hazardous levels. But also, it was determined that the

source material possessed an exposure risk due to direct contact or by inhalation and ingestion of airborne dust (Allyn, 1987).

4. Groundwater: The investigation shows that the relatively low permeability of the shale acts as a partial confining bed that appears to restrict most of the downward migration of contamination to the deep aquifer. Therefore, it appears that most of the contaminated groundwater at the site was contained within the “Hogshooter” Formation and overlying soils (Allyn, 1987).

5. EPA contaminant list: During the RI of the Compass Industries site, samples were collected from soil, water, and air to determine if significant pollutant concentrations were present. The specific pollutants that were found at the site are shown in table 1.

Table 1: Contaminants of Concern List (EPA, 2002).

Name	**Classification**	**Media**
2-MethylNaphthalene	PAH	Groundwater, Solid waste
Barium	Metals	Groundwater
3,4-Benzofluoranthene	PAH	Solid waste
1,2-Benzanthracene	PAH	Solid waste

Bis(2-ethylhexyl)phthalate	PAH	Groundwater
Chromium	Metals	Groundwater, Solid waste
Copper	Metals	Groundwater, solid waste
Dibutyl phthalate	PAH	Groundwater
Lead	Metals	Solid waste
Lead Inorganic	Metals	Groundwater
Phenanthrene	PAH	Groundwater, solid Waste
Pyrene	PAH	Solid waste
Toluene	VOC	Ground water
Xylene (mixed isomers)	VOC	Solid waste
Zinc	Metals	Groundwater, Solid waste

On the other hand, the community was also involved in the site investigation as, first air monitoring was conducted at the site in response to citizen complaints of strong odors coming from the landfill. Second, after the EPA awarded funds to OSDH for the RI, the OSDH held a public meeting at the Berryhill High School on August 20, 1984, to explain the project, answer questions, and take comments. Third, the OSDH announced to the public, via news, the completion of the studies on July 16, 1987, and the EPA on July 22, 1987. The scheduling of the August 18, 1987, public meeting to discuss the proposed remedy for the site was also announced. Finally, around 65 people attended the public meeting held on August 18, 1987, where the main community concerns were the costs of the alternative remedies, the efficiency and public health (Allyn, 1987).

Furthermore, the summary of the major elements of the remedy, shown in the record of decision (which will be discussed in more detail later), are the following:

- Resource Conservation and Recovery Act (RCRA) cap involving site grading, cap placement, diversion of surface water, and air emissions monitoring.
- Treatment of Groundwater.
- Installation of security fences and signs to restrict access to the Site.

REMEDY DESIGN - *by Emily Canaday*

A. **Main Idea**: Alternative Evaluation

1. Criteria for evaluation
2. What are the alternatives
3. Evaluation of the alternatives

B. **Main Idea:** Record of Decision

1. Description of the selected remedy
2. Schedule of remedial action
3. Status of the clean-up

C. **Main Idea:** Progress of most recent Five Year Review

1. Status of site
2. Future remedial actions

Main Idea: Proposed alternative remedies

PERFORMANCE OF REMEDY - *by Michael Cox*

The cleanup was finished in June 1991 but was not removed from the NPL until July 2002, although they had suggested removing it from the NPL in their five year reviews in 1995 and 2001 as the site was proved to be protective of human health and the environment.

EPA's first five year review (May 1995) - "The remedy of a RCRA type cap over the 43-acre landfill is operating as designed. Water samples from the shallow aquifer exposed in seeps adjacent to the cap, and surface water were below action levels set forth in the Operating and Maintenance Plan. The cap is in good condition, and minor repairs have been made. Settlement of the cap has been minimal".

The only actions the EPA determined were necessary for the site was minor upkeep and maintenance, mowing the grass, clearing brush, and clearing burrowing animals. They determined that there was no risk of groundwater contamination

Second five year review (November 2001) - "The vegetative cover is well established. The site is covered with native grasses except in the main swale where Bermuda grass was planted to control the erosion. The bermuda grass has continued to thrive in spite of no maintenance. The native grasses are beginning to naturally seed this area and mix with the bermuda grasses. The vegetative cover is holding the soil in place, as there are no new erosion sites and the prior erosion sites have been repaired. There are some bare spots, which have been reseeded. Also, some slopes have woody vegetation which must be removed prior to its damaging the liner. The drainage system appears to be working property."

Third five year review (April 2006) - "By September 2006, the Oklahoma Department of Environmental Quality (ODEQ), in consultation with EPA, plans to issue a deed notice (Notice of Remediation under CERCLA) involving the site. The deed notice

is intended as an institutional control to restrict the uses of the land at the site and minimize potential exposure to contaminants."

Fourth five year review (April 2011) - "The cap remains in place with no evidence of erosion, cracking, subsidence, or bulging. The vegetative cover is well established and healthy and continues to provide erosion protection for the capped area as evidenced by the lack of erosion areas and siltation accumulation in the swale. Surface water runoff is controlled by allowing sheet flow from the cap to accumulate in the native swale located onsite which then carries water past the capped area to eventually discharge into the river. The cap continues to provide a barrier against exposure to the landfill waste as well as precipitation infiltration as evidenced by the lack of seep water from the perched aquifer and the lack of contaminants detected in surface water samples. Site fencing and locked access gates remain intact and in good condition providing limited access to the site for authorized personnel only."

The site has performed as specified up until the last five year review in 2011 and I believe it will continue to perform as specified the full 30 year lifespan it was planned for as long as the maintenance and upkeep required is performed.

B. **Main Idea:** Our expected performance of our proposed alternative remedy:

1. Expected results from alternative and removal from NPL.

2. Expected outcomes of five year reviews of our proposed alternative:

3. Expected obstacles that our remedy must avoid or address (overgrowth or animal issues)

CONCLUSIONS - *by Yassine Filali*

A. **Main Idea:** How the site was delisted from the NPL list

1. Consolidations
2. Capping
3. Institutional control,
4. Operation and maintenance
5. Analysis of surface water

B. **Main Idea:** Future Implications:

1. Potentially Responsible Parties
2. Site's future use

C. **Main Idea**: What can we improve

1. Health Safety and Environment

2. Toxic substances that should not be used in the first place – Prevention rather than cure

3. Restrictions

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