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ATTACHMENT 3

LSPA CLIMATE CHANGE SUBCOMMITTEE

FICTIONAL CASE STUDY #2 – DISPOSAL SITE NEAR FLOODING RIVER

Climate Change Vulnerability Assessment, January 2024

-- Site Exposed, Remedy not Vulnerable --

This case study is fictional and created for educational purposes only.

I. Conceptual Site Model (CSM)

Site Characteristics:

The two-acre site located at 220 Reservoir Street in Needham, MA is covered by one commercial building, paved parking areas, and landscaping. The 5,000-square foot, one-story, slab-on-grade building is occupied by ABC Insurance Company (ABC), which uses the building as office space. The site building is serviced by natural gas and municipal water and sewer.

Site Area:

The site is in a commercial area and is adjoined by Main Street to the north and other commercial buildings to the south and west. The Charles River abuts the site to the east. The disposal site is within Federal Emergency Management Agency's (FEMA) National Flood Hazard river flood zones.

Site History:

The site was undeveloped land until 1980 when the current facility was constructed for ABC, which has occupied the site since 1980.

Site Geology:

The site is located approximately 10 miles from the Atlantic Ocean and is approximately 100 feet above sea level. The site's subsurface geology consists of approximately 2 feet of granular fill, over 10 feet of sand and gravel, over glacial till. The water table was measured to be 5 feet below ground surface within the sand and gravel, and the groundwater was measured to flow to the east.

Site Oil and Hazardous Material Use:

Oil and Hazardous Materials have not been stored or used at the site since its development beyond No. 2 fuel oil stored in a former Underground Storage Tank (UST). The tank was approximately five feet from the building foundation until its removal as part of the natural gas conversion.

Response Actions:

The former 550-gallon, steel, single-walled, No. 2 fuel oil UST was removed on January 4, 2018. The UST appeared to be rusted, and evidence of limited oil staining in surrounding soil was noted. Three soil samples were collected from the excavation and analyzed for extractable petroleum hydrocarbons (EPH) and volatile petroleum hydrocarbons (VPH) analyses. EPH were detected in soil above Massachusetts Contingency Plan (MCP) RCS-2 Reportable Concentrations.

In accordance with the MCP, on January 11, 2020, the findings were reported on a Release Notification Form to the MassDEP, which issued a Notice of Responsibility with a Release Tracking Number (RTN) of 0-00000 on January 19, 2021.

A Release Abatement Measure (RAM) Plan was submitted to the MassDEP on January 25, 2021. The RAM Plan proposed:

- Additional assessment by the installation of four groundwater monitoring wells,
- Additional EPH and VPH analysis of soil and groundwater samples,
- The installation and sampling of two sub-slab soil vapor probes, and
- The possible excavation and removal of up to 50 cubic yards of impacted soil.

On February 1, 2021, four monitoring wells were installed:

- In the area of the former UST,
- 15 feet downgradient (south) of the UST,
- 60 feet downgradient of the UST, and
- 50 feet to the east of the UST.

EPH and VPH analyses of the soil and groundwater samples detected EPH in soil and groundwater samples obtained from the boring/monitoring well in the immediate area of the former UST. Collection and analysis of two sub-slab soil gas samples for air-phase petroleum hydrocarbons found Air-Phase Petroleum Hydrocarbon concentrations well below the commercial and residential screening values.

On February 8, 2021, 20 cubic yards of petroleum impacted soil was excavated from the former area of the UST. EPH and VPH analyses of five confirmatory soil samples obtained from the bottom and sides of the excavation did not detect EPH or VPH analytes above the applicable MCP Method 1 standards. The twenty cubic yards of excavated petroleum impacted soil was transported to a nearby licensed recycling facility. Subsequent sampling and analysis of groundwater from disposal site monitoring wells showed decreased concentrations of EPH in the monitoring well in the area of the former UST.

To assess whether additional remedial actions were warranted, an MCP Method 1 Risk Characterization was completed by comparing the final EPH and VPH soil and groundwater concentrations to the applicable Method 1 standards. All contaminants were below the applicable MCP Method 1 standards. Based on the results of the risk characterization, the release has achieved No Significant Risk and will achieve regulatory closure with a Permanent Solution Without Conditions.

Climate change vulnerability considerations were incorporated throughout the MCP process for this RTN from the development of the conceptual site model to the selection of the type of MCP closure. Additionally, a final climate change vulnerability assessment, as discussed below, was completed when considering if a Permanent Solution Without Conditions is applicable.

II. CLIMATE CHANGE VULNERABILITY

Climate change vulnerabilities will change over time. Current ResilientMass Climate Hub (arcgis.com) map layers provide two sea level rise map layers - Sea Level Inundation and Sea Level Rise Projections (Attachment 3, Appendix A). The LSP considers the potential impacts of climate change for the "reasonably foreseeable future." For this case study, the LSP has chosen 30 years or 2050.

Changes in Precipitation (inland flooding, drought & landslides):
The MCP regulatory closure of this disposal site is not impacted by future changes in precipitation, associated flooding, or groundwater fluctuations. The ResilientMass Climate Hub (arcgis.com) precipitation map layers indicate that the site would be impacted by extreme precipitation (Attachment 3, Appendix B). However, because the site does not have contaminant concentrations exceeding Method 1 Standards, the predicted increase in precipitation does not impact the Permanent Solution. Also, impacts to groundwater levels are not a concern because there are no residual LNAPLs or potentially mobile residual contaminants in the current unsaturated zone. Based on currently available FEMA flood risk maps (Attachment 3, Appendix B), the disposal site is exposed to the risk of the flooding from the abutting Charles River; however, the MCP Permanent Solution Without Conditions for this disposal site is not vulnerable to the flooding risk since the concentrations of the soil and groundwater Contaminants of Concern are below Method 1 standards and approaching background. The closure does not rely on a vegetative cover, which could die during a drought. Therefore, the closure of this disposal site is not vulnerable to changes in precipitation.

Sea Level Rise (coastal flooding, coastal erosion)
The MCP regulatory closure of this disposal site does not rely on conditions that could be adversely affected by future sea level rise. The site is at an elevation of approximately 100 feet above sea level and not near the coast. The Massachusetts Coastal Flood Risk Model map layers indicate that coastal flooding will not impact the site (Attachment 3, Appendix C). Therefore, the site is not vulnerable to sea level rise.

Rising Temperatures (average/extreme temperatures, wildfires, and invasive species)
As with all Massachusetts properties, ResilientMass Climate Hub (arcgis.com) temperature layers indicates that the site would be impacted by extreme temperature; however, the MCP regulatory closure of this disposal site does not rely on conditions, such as pavement barriers or a vegetative cover, which could be adversely affected by rising temperatures. Therefore, the site is not vulnerable to increased temperature.

Extreme Weather (hurricanes/tropical storms, severe winter storms/nor'easters and storm surges)
The MCP regulatory closure of this disposal site does not rely on conditions that could be adversely affected by extreme weather. As previously noted, based on currently available FEMA flood risk maps, the disposal site is exposed to the risk of extreme weather including river flooding from the abutting Charles River (Attachment 3, Appendix B). However, the closure does not rely on active remedial systems or above grade remedial infrastructure that could be affected by storms, hurricanes, resulting flooding or power outages. ResilientMass Climate Hub (arcgis.com) maps (storm surge) confirm that future storm surge scenarios in the Charles River do not extend to nearby river sections (Attachment 3, Appendix D). Therefore, the site is not vulnerable to extreme weather.

III. Conclusions

Future climate change vulnerabilities are considered when reviewing proposed MCP regulatory closure options. The uncertainties associated with climate change predictions increase with time. Therefore, more weight in the planning process is given to shorter term projections for a reasonably foreseeable future. However, projections further into the future may be considered as boundary conditions for planning purposes. MCP climate change impact assessments for disposal sites rely on available climate change and flooding projection sources, which include ResilientMass Climate Hub (arcgis.com) and Federal Emergency Management Agency's (FEMA) National Flood Hazard maps/layers. MA Climate Change Clearinghouse (mass.gov) is a resource clearing house of climate change projections that has been developed for Massachusetts. It provides Massachusetts climate change tools to support decisions regarding climate resilience for local planners, practitioners, policy makers, and the public. FEMA provides Flood Hazard Maps for most of the United States, including portions of Massachusetts.

The LSP is not recommending any additional Best Management Practices (BMPs), design features or response actions to support the Permanent Solution. Although foreseeable future climate change impacts may impact the site (i.e., river flooding), the Permanent Solution is supported by the limited removal of impacted soil and confirmatory sampling indicating that contamination exceeding Method 1 Standards does not remain on site.