



11. HAZARDOUS MATERIALS

11.1 HAZARD PROFILE

11.1.1 HAZARD DESCRIPTION

This section provides a description of the hazard, including causes, hazard or incident characteristics, and potential impacts.

Overview

Hazardous materials are materials that are harmful to humans, animals, and the environment. The release of such materials caused by natural hazard events, human carelessness, intentional acts, or technological failures can contaminate air, water, and soils, possibly resulting in death, injuries or illnesses. Dispersion can take place rapidly if the hazardous material is transported by water and wind. Some hazardous materials also have the potential to cause fires or explosions. Human error, lack of training, and insufficient safety protocols can all contribute to accidents and releases of hazardous materials.

Relevant legislation often uses the term “hazardous substance”; for the purpose of this hazard profile, “hazardous materials” and “hazardous substances” are used interchangeably.

Hazardous Materials Incident Types and Causes

Hazardous materials incidents are generally one of the following:

- **Fixed-Site Hazardous Materials Incident**—A fixed-site hazardous materials incident is the uncontrolled release from a fixed site of materials capable of posing a risk to health, safety, and property. Incidents at a fixed site can be human caused due to accidents, poor maintenance practices, or criminal acts. These incidents can also be a secondary impact of other natural or human caused hazards that damage facilities or containment systems housing hazardous materials. It is possible to identify and prepare for a fixed-site incident because federal and state laws require facilities that store hazardous materials to notify state and City authorities about what is being used or produced at the site.
- **In-Transit Hazardous Materials Incident**—Many products contain hazardous materials and are shipped daily on highways, waterways, and pipelines. An in-transit hazardous materials incident is any event resulting in uncontrolled release of materials during transport that can pose a risk to health, safety, and property. Transportation of hazardous materials on highways involves tanker trucks or trailers and is responsible for the greatest number of hazardous substance release incidents nationwide. Transportation of hazardous materials, such as imported petroleum products, also occurs on navigable waters via ships and barges. In-transit incidents are difficult to prepare for because there may be little information about what materials are involved when an accident happens.



- **Nonpoint Source Pollution**—Nonpoint source pollution is a form of pollution in which hazardous materials are moved from one location to another through runoff from rainfall or other forms of precipitation. These materials are deposited into lakes, rivers, coastal waters, and groundwater. Nonpoint source pollution can include excess fertilizers, herbicides and insecticides on agricultural lands; oil, grease and toxic chemicals from urban surfaces; sediment from improperly managed construction sites, crop and forest lands, and eroding streambanks; and bacteria and nutrients from livestock, pet wastes and faulty septic systems (EPA 2024).

Regulatory Oversight

REGULATORY OVERSIGHT OF FIXED-SITE HAZARDOUS MATERIALS

Hazardous materials at fixed sites are regulated by the U.S. Environmental Protection Agency (EPA). The EPA lists substances as **hazardous** or **extremely hazardous**, though it does not provide objective definitions. Listed hazardous substances are generally materials that, if released into the environment, pose long-term health hazards for living organisms. Listed extremely hazardous substances are those that, when released, are immediately dangerous to the lives of humans and animals and cause serious damage to the environment. The EPA does not define oil as a hazardous substance, but the State of Hawai'i does.

The Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 requires industries to report the storage, use, and release of specific chemicals to federal, state, tribal, territorial, and local governments. These reports are then utilized to prepare for and safeguard communities against potential risks (EPA 2024). Fixed-site facilities that have hazardous materials in quantities at or above the threshold planning quantity must submit "Tier II" information to appropriate state or local agencies to facilitate emergency planning (EPA n.d.). Facilities are defined as Tier I or Tier II as follows (EPA 2024):

- A Tier II facility is one with less than 10,000 gallons of above-ground oil storage that has had no single discharge exceeding 1,000 gallons or no two discharges each exceeding 42 gallons within any 12-month period in the previous three years.
- A Tier I facility, in addition to meeting the eligibility criteria for a Tier II facility, must have no individual aboveground oil storage containers with a capacity greater than 5,000 gallons.

In 1993, the Hawai'i state legislature passed the Hawai'i Emergency Planning and Community Right-to-Know Act (HEPCRA) which is modeled after the federal EPCRA. HEPCRA has four major provisions: emergency response planning; emergency release reporting; hazardous chemical storage and Tier II reporting; and toxic release inventory reporting, which is requested by the EPA. HEPCRA established the Hawai'i State Department of Health (HDOH) Hazard Evaluation and Emergency Response (HEER) Office, which carries out the requirements of EPCRA and HEPCRA (HI EMA 2023).

To meet state and federal planning and reporting requirements, HDOH has established a State Emergency Response Commission (SERC) and Local Emergency Planning Committees (LEPCs) in each county.

- The SERC is a statewide body that provides hazardous materials planning, funding, training and education, and oversight of LEPCs.



- An LEPC is established in each county to serve as a local coordination point for information about hazardous substances, emergency planning measures, and health and environmental risks related to hazardous substances. The Honolulu LEPC is a volunteer body charged with bringing together local government, communities, academia, and industries as a resource for enhanced hazardous materials preparedness, planning and emergency response in Honolulu (EMPHI 2017).

As part of the requirements for hazardous chemical storage reporting, facilities must submit an Emergency and Hazardous Chemical Inventory Form annually to the LEPC, the SERC, and the local fire department. Reports are required for all Tier II facilities. If the chemical is considered a hazardous substance or extremely hazardous substance, the reporting threshold is 500 pounds or less. (HI HEER Office 2025).

REGULATORY OVERSIGHT OF IN-TRANSIT HAZARDOUS MATERIALS

Hazardous materials in transit are regulated by the U.S. Department of Transportation (USDOT) and HDOH (HI EMA 2023). USDOT regulations define hazardous materials as those that are capable of posing an unreasonable risk to health, safety, and property when transported in commerce. Specific substances are designated as hazardous under federal hazardous materials transportation law (49 U.S. Code [U.S.C.] 5103). They include hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in Title 49 of the Code of Federal Regulations (49 CFR 172.101), and materials that meet the defining criteria for hazard classes and divisions (DOE n.d.). When a substance meets the USDOT definition of a hazardous material, it must be transported in accordance with safety regulations providing for appropriate packaging, communication of hazards, and proper shipping controls.

NONPOINT SOURCE POLLUTION

The HDOH Nonpoint Source Management Program includes the oversight of on-site sewage disposal systems and develops the state's Nonpoint Source Management Plan with watershed-specific strategies to control pollution (HDOH 2024).

Potential Impacts

Hazardous materials incidents can have significant impacts on human health, the environment, and the economy. Precise impacts depend on the specific materials involved and the type and duration of exposure. Potential types of impacts are as follows:

- Health Impacts
 - Acute (immediate) effects: These can include skin, eye, and respiratory irritation, burns, nausea, and vomiting.
 - Chronic (long-term) effects: Exposure to hazardous materials can lead to various health problems, including respiratory issues, neurological damage, reproductive problems, developmental issues, and an increased risk of cancer.



- Emergency Responder Impacts: First responders, such as firefighters and local law enforcement, are at risk of exposure during HAZMAT incidents.
- Environmental Impacts
 - Contamination: HAZMAT spills can contaminate air, water, and soil, leading to long-term ecological disruption and the bioaccumulation of harmful substances in the food chain.
 - Ecosystem damage: Toxic chemicals released during incidents can harm plant and animal life, disrupting ecosystems.
 - Restoration costs: The aftermath of HAZMAT incidents requires thorough cleanup and restoration, which can be very costly.
- Economic Impacts
 - Cleanup costs: The costs associated with cleaning up HAZMAT spills and restoring contaminated sites can be significant.
 - Disrupted transportation: HAZMAT incidents can disrupt transportation systems, causing delays and economic losses.
 - Lost productivity: Workers may be unable to work due to exposure or cleanup efforts.
- Other Impacts
 - Psychological distress: Exposure to HAZMAT incidents can cause anxiety, fear, and other psychological distress.
 - Property damage: HAZMAT spills can damage buildings, homes, and other property.
 - Legal and regulatory consequences: HAZMAT incidents can lead to legal and regulatory actions, further increasing costs.

11.1.2 LOCATION

An event involving hazardous materials release can occur anywhere hazardous materials are stored or transported on O‘ahu. For this reason, the location of a hazardous materials release is classified as either being at a fixed site or in transit.

Fixed-Site Hazardous Materials

A fixed-site hazardous materials release occurs at facilities that store and/or use hazardous materials and include refineries, warehouses, portside facilities and harbors, and Superfund sites. Within the City there are concentrations of fixed-sites, which increases the vulnerability of these areas; they include Campbell Industrial Park, Barbers Point Harbor, Honolulu Harbor, Sand Island, and H-1.

TIER II FACILITIES

Hazardous materials incidents causing hospitalizations, deaths, and large-scale economic loss and environmental damage are generally the result of a series of improbable events involving large quantities of material. Such events are rare and difficult to predict. Tier II reporting reveals the location and identity of large quantities of



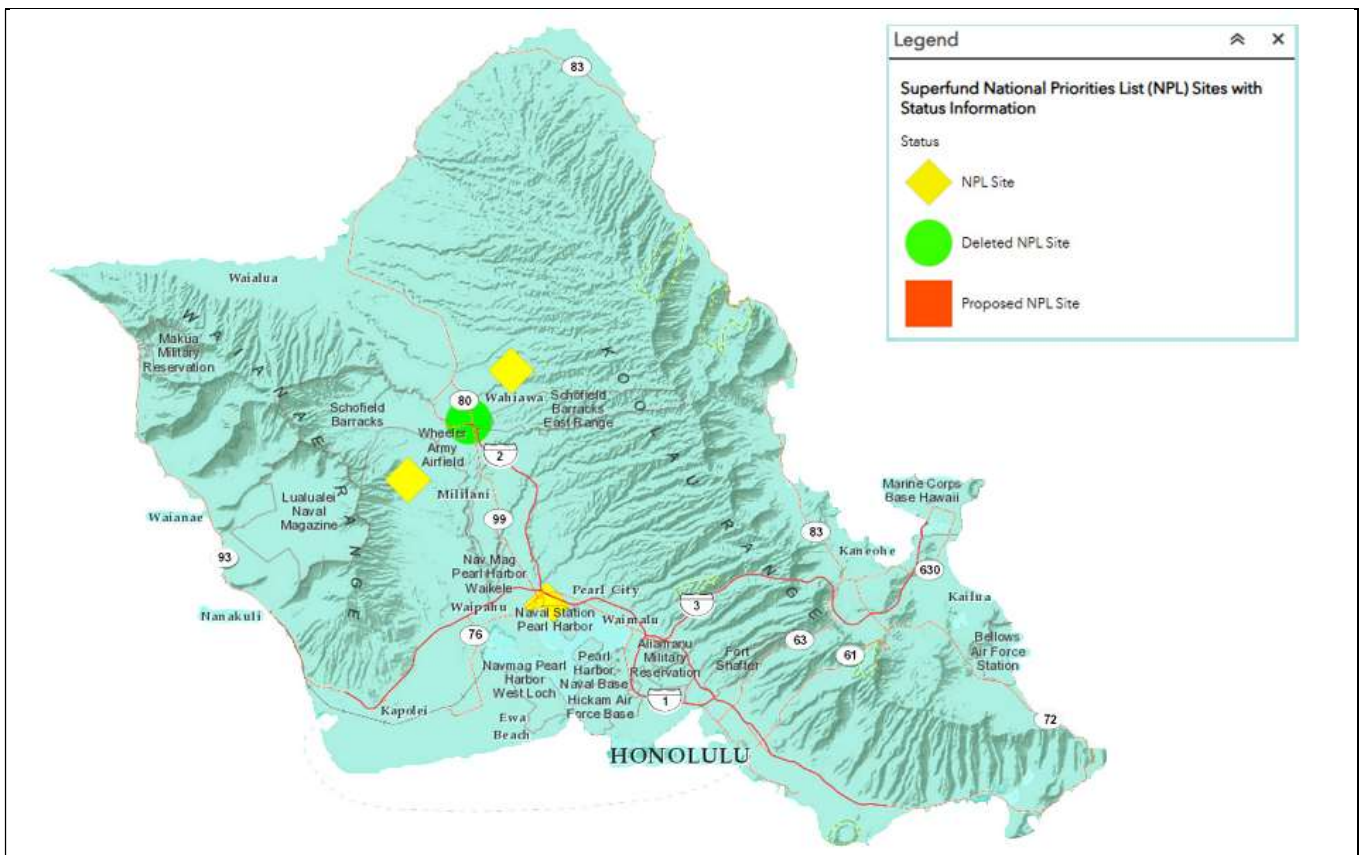
hazardous materials in storage and use. Tier II reporting facilities were identified by the Local Emergency Planning Committee (LEPC). Other facilities may that store hazardous materials under reportable amounts could also pose risk, but these are not regulated and there is no dataset available to identify these locations.

SUPERFUND AND HIGH PRIORITY SITES

The Superfund National Priorities List (NPL) is a list of U.S. sites with the most serious uncontrolled releases of contamination, serving as the basis for prioritizing Superfund cleanup funding and enforcement actions. It helps the EPA determine which sites require further investigation and cleanup, ensuring the protection of human health and the environment. Congress established the Superfund program in 1980 to clean up abandoned sites where hazardous materials had been released. The Superfund program is locally administered by the EPA in cooperation with the HDOH HEER Office.

As shown in Figure 11-1, there are three NPL sites in the City: Naval Computer and Telecommunications Area Master Station Eastern Pacific; Del Monte Corporation (O’ahu Plantation); and Pearl Harbor Naval Complex (EPA 2024).

Figure 11-1. Superfund NPL, O’ahu



Source: (EPA 2024)



In addition to the federal NPL sites, the HDOH Response Program List of Priority Sites presents all sites in the state identified for potential or known non-emergency response actions managed by remedial project managers at the HEER Office Site Discovery, Assessment, and Remediation Section. Sites are categorized as a potential hazard when sampling data indicates that contaminant concentrations exceed Hawai'i Environmental Action Levels. The list for the fiscal year 2024 includes 1,050 sites in O'ahu.

Both Superfund sites and identified high-priority sites increase the City's risk to impacts from other hazards, such as flooding, storm surge, and erosion, which can cause the migration or spread of hazardous materials throughout the environment. This will adversely impact both public and environmental health and add significant complications to recovery efforts following a disaster that impacts a Superfund site or high-priority site if identified hazardous materials are not properly contained.

In-Transit Hazardous Materials

An in-transit hazardous materials release occurs while a hazardous material is being transported from one location to another by way of major highways, navigable waters, or pipelines. Incidents involving hazardous substances in transit can occur anywhere on O'ahu.

BARGES

Refinery feedstock and refined petroleum products are imported to O'ahu via navigable waters. There is one crude oil refinery and multiple fuel storage facilities on the leeward coast of O'ahu, in the vicinity of Campbell Industrial Park. The PAR refinery produces a broad range of refined petroleum products. Because there are no inter-island pipelines to transport these products, refined petroleum products are loaded at O'ahu terminals onto fuel barges for distribution to the other islands (U.S. Energy Information Administration 2024).

Barges also transport propane gas from neighbor island storage facilities to O'ahu, and the gas is then routed by truck to various tanks and holders. If needed, the barge could take propane from O'ahu to the neighbor islands, though this is not commonly done.

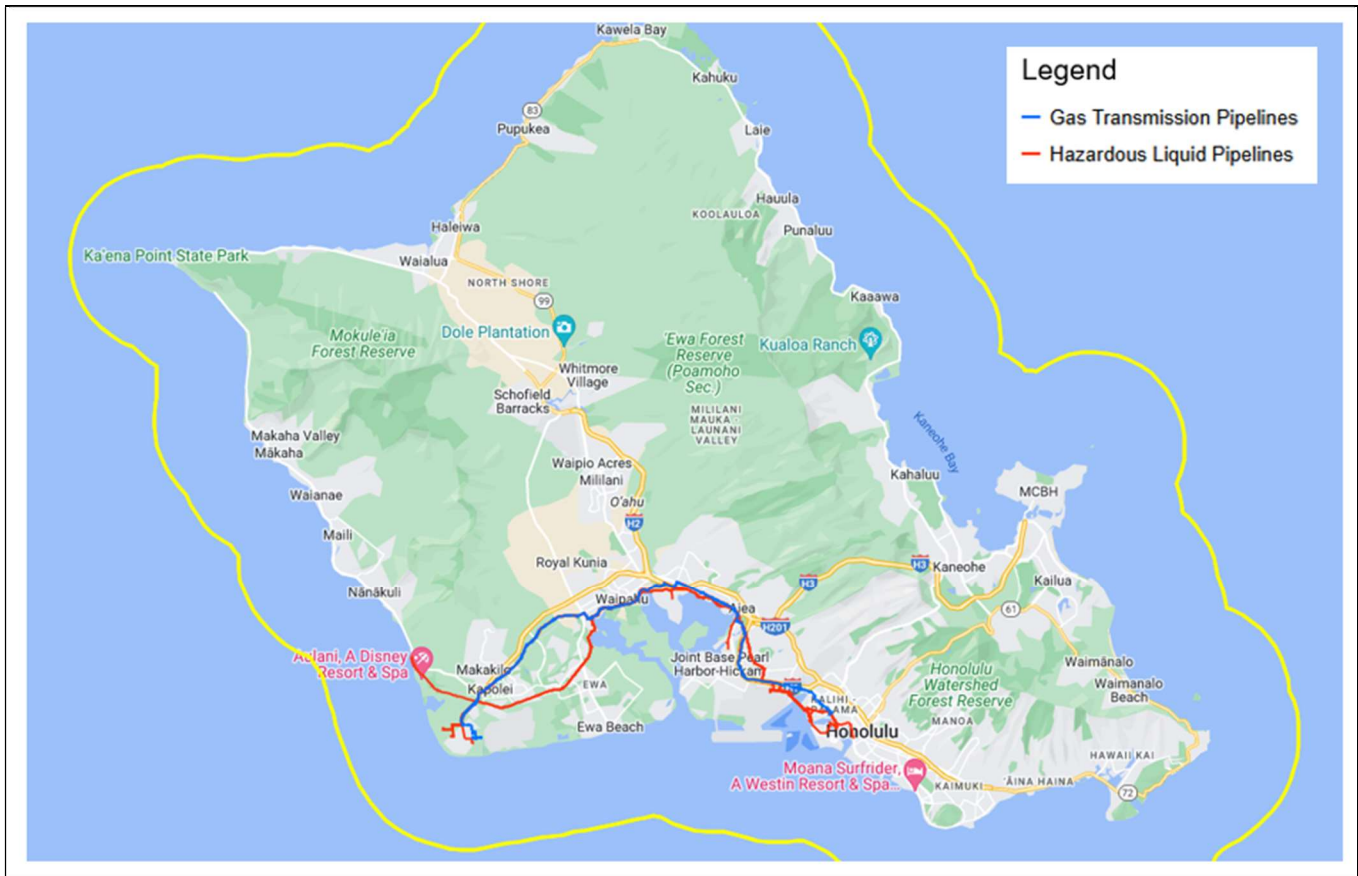
PIPELINES

On O'ahu, petroleum is transported via pipeline from the two crude oil refineries to other locations on the island (U.S. Energy Information Administration 2024). Figure 11-2 shows the gas transmission and hazardous liquids (refined petroleum products) pipelines. In addition, synthetic natural gas and propane vapor are distributed through nearly 1,000 miles of pipeline on O'ahu (U.S. Energy Information Administration 2024).

Island Energy Services operates a large-scale fuel import terminal in Kapolei with two 23-mile pipelines that transport gasoline, jet fuel, diesel, and naphtha from Kapolei to the company's Marine Terminal at Pier 30. It also transports jet fuel that supplies the Daniel K. Inouye International Airport in Honolulu.



Figure 11-2. Petroleum and Gas Transmission Pipelines in the City



Source: (U.S. DOT 2024)

Hawaiian Electric operates the Kahe and Waiau Pipelines to transport low sulfur fuel oil to the Kahe and Waiau Power Plants. The Kahe pipeline travels through Ko Olina to the Kahe Power Plant, and the Waiau pipeline travels through Kapolei, Waipahu, and Pearl City to the Waiau Power Plant.

Hawai'i Gas Operates a large network of pipelines on O'ahu (nearly 1,100 miles) that carry a mix of synthetic natural gas, renewable natural gas, and hydrogen.

GROUND TRANSPORTATION

The primary mode of vehicle transportation is via the highway network. O'ahu has three major highways, however, the major corridors for vehicle transport of hazardous materials are the H1 Freeway and Nimitz Highway, which connect the area around Campbell Industrial Park, where fuel import and refinery operations are located, with the airport and Honolulu Harbor, where there are substantial fuel storage and refueling operations.



11.1.3 EXTENT

Hazard extent refers to the potential severity or magnitude of hazard events in a given area. This section describes measurements used to indicate the extent of this hazard and the systems in place for monitoring severity and providing warnings as necessary.

The extent of a hazardous substance release will depend on whether it is from a fixed or in-transit source, the volume of substance released, duration of the release, the toxicity and properties of the substance, and environmental conditions (wind, precipitation, terrain, etc.). Exacerbating conditions—characteristics that can magnify the effects of a hazardous substance release—include the following:

- Weather conditions, which affect how the hazard occurs and develops (such as wind speed and direction)
- Micro-meteorological effects of buildings and terrain, which alter the dispersion of hazardous substances in compliance with applicable codes (such as building or fire codes)
- Mechanical failures (such as fire protection and containment features), which can substantially increase the damage to the facility and to surrounding buildings
- Land use, population, and building density, which affect the extent of exposure and impacts incurred

The severity of a hazardous material incident is also related to the type of substance released, distance from the release, and the related response time for emergency response teams to stabilize and contain the release. Generally, areas closest to a release are at the greatest risk due to their exposure to higher concentrations of the substance and the limited warning time before being impacted (HI EMA 2023). However, depending on the substance/material, a release can rapidly travel great distances or remain present in the environment for long periods of time (e.g., centuries to millennia), allowing for greater dispersal and increasing the spatial extent of impact.

Mitigating circumstances may reduce the severity of impact. Mitigating conditions are precautionary measures taken in advance to reduce the impact a release has on the surrounding environment. Primary and secondary containment or shielding by sheltering-in-place measures protects people and property from the harmful effects of a hazardous substance release (HI EMA 2023).

Monitoring and Warning

A hazardous materials incident can be sudden without any warning (such as an explosion) or may develop slowly (such as a leaking container). If an explosion or hazardous materials release does not occur immediately following an accident, there may be time for public safety officials to warn those at risk in the surrounding area and enough time to facilitate appropriate protective actions.

Facilities that store or transport hazardous substances are required to notify state and City officials when an incident occurs, including the HDOH HEER Office. If required, City emergency responders and emergency management officials communicate safety instructions and protective actions to the public.



A hazardous materials event requires a rapid response to contain released materials and protect humans and the environment before the event becomes a public health emergency. The urgency of response is affected by the location of the release, the method of transport if the incident is in transit, whether shelter in place or evacuations were ordered, if any persons were contaminated and not decontaminated properly, and whether a complete response team was dispatched. Because of the importance of rapid response, hazardous materials incidents have a strong interrelationship with any other hazard that requires response actions at the same time.

11.1.4 PREVIOUS OCCURRENCES

This section provides an overview of hazard occurrences since the publication of the previous LHMP, covering the period between January 2020 and February 2025. It identifies events that resulted in federal disaster declarations and/or state or local emergency proclamations. For events prior to 2020, refer to the 2020 LHMP.

Recent Events

Table 11-1 shows recent events for O’ahu.

Table 11-1. Hazardous Materials Events in the City (2020 to 2025)

Event Date	Disaster Declaration/ Proclamation			Description
	Federal	State	Mayoral	
March 17, 2020	N/A	N/A	N/A	Oil Release (pipeline): About 7,700 gallons of fuel collected from the soil and water.
June 2, 2020	N/A	N/A	N/A	Oil Release (pipeline): About 7,700 gallons of fuel collected from the soil and water.
January 26, 2021	N/A	N/A	N/A	Equipment Failure: 12 barrels hazardous liquid spilled; \$27,420 in damage.
May 6-7, 2021	N/A	N/A	N/A	Operator Error (pipeline): 21,000 gallons of jet fuel spilled into a fire suppression line and additional jet fuel spilled into the environment at the Red Hill Bulk Fuel Storage Facility.
November 20-21, 2021	N/A	N/A	N/A	Pipeline Rupture: 14,000 gallons of jet fuel released from fire suppression line; contaminated public water supply at the Red Hill Bulk Fuel Storage Facility.
November 29, 2022	N/A	N/A	N/A	Routine Maintenance Operation (pipeline): 1,300 gallons of Aqueous Film Forming Foam concentrate was released; \$1.5 million in damage

Source: (HI EMA 2023)



Federal Disaster Declarations

Under the Stafford Act, the President of the United States may issue an Emergency Declaration (EM) or Major Disaster Declaration (DR) for health related events and activate certain federal assistance programs based on factors related to the magnitude of the hazard threat or impacts.

No Stafford Act declarations for this hazard type that included the City occurred during this period.

State and Local Emergency Proclamations

State law authorizes the Governor to issue emergency proclamations if an emergency or disaster has occurred, or there is imminent danger or threat of an emergency or disaster in any portion of the state. County Mayors have the authority to issue local emergency proclamations when such conditions exist within any part of their respective jurisdictions.

No state or local emergency proclamations related to this hazard were issued for the City during this period.

11.1.5 PROBABILITY OF FUTURE OCCURRENCES

Hazardous materials are stored and transported citywide. On average, the City faces around 10 to 15 hazardous materials incidents each year. These incidents can range from minor spills to more significant releases that require coordinated emergency response efforts. Serious hazardous materials incidents—those causing hospitalizations, deaths, and large-scale economic loss and environmental damage—are generally the result of a series of improbable events involving large quantities of material and are thus relatively rare and difficult to predict (PHMSA 2024).

To assist with determining the probability of future hazardous materials incidents, an evaluation of prior incidents is beneficial. For example, the Red Hill Bulk Fuel Storage Facility supported military operations in the Pacific until a 2021 spill of approximately 21,000 gallons of jet fuel led the Department of Defense to defuel and close the facility by 2027. The spill contaminated the underground aquifer and the Joint Base Pearl Harbor Hickam drinking water system, exposing thousands of people to JP-5 jet fuel in their drinking water. Following this incident and the Joint Base Pearl Harbor Drinking Water Emergency, the Secretary of Defense decided on March 7, 2022, to defuel and permanently close the Red Hill Bulk Fuel Storage Facility by 2027. Defueling was completed in March 2024, and the Navy Closure Task Force assumed responsibility for removing the remaining sludge and closing the facility.

Information on previous hazardous materials occurrences in the City was used to calculate the probability of future occurrence of such events. Table 11-2 lists the number of events from various sources over the six-year period from 1996 to 2024, which is the most complete period of record for all sources reviewed. Based on these records, the probability of occurrence for hazardous materials in the City is considered “frequent.”



Table 11-2. Probability of Future Hazardous Materials Events in the City

Hazard Type	Number of Occurrences Between 1996 and 2024	Percent Chance of Occurring in Any Given Year
Fixed-Site Hazardous Materials	1,598	100%
In-Transit Hazardous Materials	8	28.57%

Source: (HI EMA 2023)

Note: 100% probability indicates that it is statistically likely for an event to occur every year. It does not indicate that the occurrence of an event is a certainty in any given year.

The condition of infrastructure plays a critical role in the potential for hazardous materials incidents. Aging or poorly maintained infrastructure, such as pipelines, storage tanks, and transportation routes, can significantly increase the likelihood of hazardous materials releases. Corrosion, structural weaknesses, and outdated technology can all contribute to failures that result in hazardous materials incidents.

11.2 VULNERABILITY AND IMPACT ASSESSMENT

A vulnerability analysis was conducted using transportation and Tier II site data provided by the City (2024). Three hazard areas were defined as the area within a half-mile buffer around the following:

- All identified Tier II sites in the City
- The length of Interstate Route H-1
- Areas identified as having a significant potential for storing hazardous materials—the Campbell Industrial Park, Barbers Point Harbor, Honolulu Harbor, and Sand Island—collectively referred to as the Hazardous Materials Hazard Area

The analysis overlaid these hazard areas on maps of updated asset inventories (population, building stock, critical facilities, historic sites, and new development). Centroids that intersected the hazard areas were totaled to estimate assets’ vulnerability to the hazardous materials release hazard.

11.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

Hazardous substances released into the air, water, or land pose danger to human health. The entire population could be exposed to a hazardous materials release through inhalation, ingestion, or dermal exposure. Exposure may be acute or chronic, depending upon the nature of the substance, extent of release, and concentration.

Populations living or working near facilities such as the Campbell Industrial Park, where hazardous substances are produced, stored, or transported, are at higher risk of exposure, especially those who are downstream,



downwind, and downhill of a released substance are. Depending on the type of release and environmental conditions, people may be evacuated or instructed to shelter-in-place. Populations living and/or working near major transportation routes (such as Interstates H1) are more vulnerable to a hazardous materials release because of the potential for chemicals to be transported on these major thoroughfares.

Table 11-3 summarizes the population within a half-mile radius of H-1, categorized by regional planning area. Overall, the City has 204,881 persons within the buffer area, with the Primary Urban Center planning area having the largest number (155,420) among all planning areas.

Table 11-3. Population Within 1/2 Mile of Route H-1

Regional Planning Area	Total Population (2022 ACS)	Population Within 1/2 Mile of Route H1	
		Number of Persons	% of Regional Planning Area Total
Central O’ahu	175,966	36,118	20.5%
East Honolulu	49,947	2,279	4.6%
‘Ewa	128,498	11,064	8.6%
Ko’olau Loa	14,512	0	0.0%
Ko’olau Poko	120,704	0	0.0%
North Shore	18,176	0	0.0%
Primary Urban Center	451,030	155,420	34.5%
Wai’anae	51,266	0	0.0%
City and County of Honolulu (Total)	1,010,100	204,881	20.3%

Source: US census Bureau ACS 2022; City and County of Honolulu 2024

Table 11-6 summarizes the population within a half-mile radius of Tier II sites, categorized by regional planning area. Overall, the City has 364,890 persons within the buffer area, with the Primary Urban Center planning area having the largest number (183,226) among all planning areas.



Table 11-4. Population Within 1/2 Mile of Tier II Sites

Regional Planning Area	Total Population (2022 ACS)	Population Within 1/2 Mile of Tier II Sites	
		Number of Persons	% of Regional Planning Area Total
Central O‘ahu	175,966	60,758	34.5%
East Honolulu	49,947	10,589	21.2%
‘Ewa	128,498	32,060	24.9%
Ko‘olau Loa	14,512	5,009	34.5%
Ko‘olau Poko	120,704	48,086	39.8%
North Shore	18,176	2,691	14.8%
Primary Urban Center	451,030	183,226	40.6%
Wai‘anae	51,266	22,471	43.8%
City and County of Honolulu (Total)	1,010,100	364,890	36.1%

Source: US census Bureau ACS 2022; City and County of Honolulu 2024

Table 11-5 summarizes the population within a half-mile radius of the hazardous materials release hazard area, categorized by regional planning area. Overall, the City has 28,088 persons within the buffer area, with the Primary Urban Center planning area having the largest number (27,088) among all planning areas.

Table 11-5. Population Within 1/2 Mile of Hazardous Materials Hazard Area

Regional Planning Area	Total Population (2022 ACS)	Population Within 1/2 Mile of Hazardous Materials Hazard Area	
		Number of Persons	% of Regional Planning Area Total
Central O‘ahu	175,966	0	0.0%
East Honolulu	49,947	0	0.0%
‘Ewa	128,498	1,000	0.8%
Ko‘olau Loa	14,512	0	0.0%
Ko‘olau Poko	120,704	0	0.0%
North Shore	18,176	0	0.0%
Primary Urban Center	451,030	27,088	6.0%
Wai‘anae	51,266	0	0.0%
City and County of Honolulu (Total)	1,010,100	28,088	2.8%

Source: US census Bureau ACS 2022; City and County of Honolulu 2024



Socially Vulnerable Population

The populations most vulnerable to hazardous materials release are persons over the age of 65, the young, and people who are ill or immunocompromised. Communities nearest to hazardous materials sites are often characterized by lower housing values, incomes, and education levels than the national average. These vulnerable communities have the least time to react in the event of a catastrophic hazardous material release (Orum, et al. 2014). Populations exposed to environmental contamination from hazardous materials may experience chronic stress, which can be compounded when socially vulnerable populations do not have the resources to move to another location or seek medical help (ATSDR 2021).

Table 11-6 shows the estimated socially vulnerable populations located within a half-mile radius of H-1, categorized by regional planning area. Of the 204,881 persons located within this radius in the City, there are 40,395 persons over the age of 65 years, 11,074 persons under the age of 5 years, 18,383 non-English speakers, 23,237 persons with a disability, and 18,438 persons living in poverty.

Table 11-7 shows the estimated socially vulnerable populations located within a half-mile radius of Tier II sites, categorized by regional planning area. Of the 364,890 persons located within this radius in the City, there are 68,401 persons over the age of 65 years, 21,480 persons under the age of 5 years, 24,084 non-English speakers, 40,703 persons with a disability, and 32,266 persons living in poverty.

Table 11-8 shows the estimated socially vulnerable populations located within a half-mile radius of the hazardous materials hazard area, categorized by regional planning area. Of the 28,088 persons located within this radius in the City, there are 5,768 persons over the age of 65 years, 1,434 persons under the age of 5 years, 2,932 non-English speakers, 3,218 persons with a disability, and 2,670 persons living in poverty.



Table 11-6. Estimated Number of Vulnerable Persons Located within 1/2 Mile of H-1

Regional Planning Area	Estimated Number of Vulnerable Persons Located Within 1/2 Mile of H-1									
	Persons Over 65	% of Total	Persons Under 5	% of Total	Non-English Speaking Persons	% of Total	Persons with a Disability	% of Total	Persons in Poverty	% of Total
Central O’ahu	6,064	20.5%	2,343	20.5%	1,370	20.5%	4,016	20.5%	2,647	20.5%
East Honolulu	627	4.6%	98	4.5%	70	4.5%	221	4.6%	95	4.6%
’Ewa	1,257	8.6%	841	8.6%	231	8.6%	1,106	8.6%	778	8.6%
Ko’olau Loa	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Ko’olau Poko	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
North Shore	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Primary Urban Center	32,447	34.5%	7,792	34.5%	16,712	34.5%	17,894	34.5%	14,918	34.5%
Wai’anae	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
City and County of Honolulu (Total)	40,395	21.6%	11,074	18.4%	18,383	29.5%	23,237	20.8%	18,438	21.3%

Source: US census Bureau ACS 2022; City and County of Honolulu 2024



Table 11-7. Estimated Number of Vulnerable Persons Located within 1/2 Mile of Tier II Sites

Regional Planning Area	Estimated Number of Vulnerable Persons Located Within 1/2 Mile of Tier II Sites									
	Persons Over 65	% of Total	Persons Under 5	% of Total	Non-English Speaking Persons	% of Total	Persons with a Disability	% of Total	Persons in Poverty	% of Total
Central O’ahu	10,201	34.5%	3,942	34.5%	2,305	34.5%	6,756	34.5%	4,453	34.5%
East Honolulu	2,916	21.2%	458	21.2%	328	21.2%	1,027	21.2%	442	21.2%
’Ewa	3,643	24.9%	2,439	24.9%	669	24.9%	3,205	24.9%	2,257	25.0%
Ko’olau Loa	540	34.5%	336	34.5%	83	34.1%	440	34.5%	430	34.5%
Ko’olau Poko	9,416	39.8%	2,973	39.8%	558	39.8%	4,820	39.8%	2,723	39.8%
North Shore	512	14.8%	205	14.8%	64	14.6%	325	14.8%	273	14.8%
Primary Urban Center	38,253	40.6%	9,186	40.6%	19,702	40.6%	21,096	40.6%	17,587	40.6%
Wai’anae	2,920	43.8%	1,941	43.8%	375	43.8%	3,034	43.8%	4,101	43.8%
City and County of Honolulu (Total)	68,401	36.5%	21,480	35.7%	24,084	38.6%	40,703	36.4%	32,266	37.3%

Source: US census Bureau ACS 2022; City and County of Honolulu 2024



Table 11-8. Estimated Number of Vulnerable Persons Located within 1/2 Mile of Hazardous Materials Hazard Area

Regional Planning Area	Estimated Number of Vulnerable Persons Located Within 1/2 Mile of Hazardous Materials Hazard Area									
	Persons Over 65	% of Total	Persons Under 5	% of Total	Non-English Speaking Persons	% of Total	Persons with a Disability	% of Total	Persons in Poverty	% of Total
Central O’ahu	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
East Honolulu	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
’Ewa	113	0.8%	76	0.8%	20	0.7%	100	0.8%	70	0.8%
Ko’olau Loa	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Ko’olau Poko	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
North Shore	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Primary Urban Center	5,655	6.0%	1,358	6.0%	2,912	6.0%	3,118	6.0%	2,600	6.0%
Wai’anae	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
City and County of Honolulu (Total)	5,768	3.1%	1,434	2.4%	2,932	4.7%	3,218	2.9%	2,670	3.1%

Source: US census Bureau ACS 2022; City and County of Honolulu 2024



11.2.2 ECONOMY AND GENERAL BUILDING STOCK

Hazardous material releases can damage and destroy public, commercial, and private property. Direct costs are associated with the cost of materials, physical damage to property, response, and remediation and cleanup. The greatest risk to the built environment from hazardous materials in transport would be from an explosion. Proximity, intensity, and the structural integrity of the building itself are all factors in the subsequent vulnerability and expected damage (HI EMA 2023).

The following tables summarize building vulnerability to hazardous material incidents by regional planning area, including the number and value of buildings near hazard areas and a breakdown of those buildings by occupancy class:

- Table 11-9 and Table 11-10 provide a summary for the Rout H-1 hazard area.
- Table 11-11 and Table 11-12 provide a summary for the Tier II sites hazard area.
- Table 11-13 and Table 11-14 provide a summary for the hazardous materials hazard area.

Within the half-mile radius around Route H-1, the City has 35,380 buildings with an estimated value of \$72 billion. The Primary Urban Center planning area again has the highest number of buildings within this buffer, with 26,155 buildings and an estimated replacement cost value of \$63 billion.

Within the half-mile radius around Tier II sites, the City has 73,890 buildings with an estimated value of \$150 billion. The Primary Urban Center planning area again has the highest number of buildings within this buffer, with 34,025 buildings and an estimated replacement cost value of \$100 billion.

Within the half-mile radius around the hazardous materials hazard area, the City has 8,988 buildings with an estimated value of \$43 billion. The Primary Urban Center planning area again has the highest number of buildings within this buffer, with 8,343 buildings and an estimated replacement cost value of \$39 billion.



Table 11-9. Buildings within 1/2 Mile of Route H-1

Regional Planning Area	Regional Planning Area Total Buildings		Buildings Within 1/2 Mile of H-1			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Regional Planning Area Total	Value	% of Regional Planning Area Total
Central O’ahu	32,090	\$31,358,898,963	6,401	19.9%	\$4,962,066,772	15.8%
East Honolulu	14,670	\$12,765,314,977	666	4.5%	\$743,407,944	5.8%
’Ewa	23,477	\$23,523,097,571	2,158	9.2%	\$2,929,576,893	12.5%
Ko’olau Loa	3,131	\$3,703,783,129	0	0.0%	\$0	0.0%
Ko’olau Poko	28,843	\$24,614,804,769	0	0.0%	\$0	0.0%
North Shore	4,723	\$3,819,600,126	0	0.0%	\$0	0.0%
Primary Urban Center	71,191	\$137,698,243,063	26,155	36.7%	\$63,295,389,320	46.0%
Wai’anae	10,213	\$7,730,241,840	0	0.0%	\$0	0.0%
City and County of Honolulu (Total)	188,338	\$245,213,984,438	35,380	18.8%	\$71,930,440,929	29.3%

Source: USACE, NID 2022; City and County of Honolulu 2024; RS Means 2024



Table 11-10. Buildings within 1/2 Mile of Route H-1, by General Occupancy Class

Regional Planning Area	Buildings Within 1/2 Mile of Tier II Sites			
	Residential	Commercial	Industrial	Other ^a
Central O’ahu	6,155	157	60	29
East Honolulu	637	20	1	8
’Ewa	1,913	185	36	24
Ko’olau Loa	0	0	0	0
Ko’olau Poko	0	0	0	0
North Shore	0	0	0	0
Primary Urban Center	20,368	4,420	711	656
Wai’anae	0	0	0	0
City and County of Honolulu (Total)	29,073	4,782	808	717

Source: USACE, NID 2022; City and County of Honolulu 2024; RS Means 2024

a. Other = Government, Religion, Agricultural, and Education



Table 11-11. Buildings within 1/2 Mile of Tier II Sites

Regional Planning Area	Regional Planning Area Total Buildings		Buildings Within 1/2 Mile of Tier II Sites			
	Count	Replacement Cost Value	Number of Buildings		Replacement Cost Value	
			Count	% of Regional Planning Area Total	Value	% of Regional Planning Area Total
Central O’ahu	32,090	\$31,358,898,963	11,965	37.3%	\$16,409,739,833	52.3%
East Honolulu	14,670	\$12,765,314,977	3,129	21.3%	\$2,910,263,008	22.8%
’Ewa	23,477	\$23,523,097,571	6,401	27.3%	\$10,515,979,001	44.7%
Ko’olau Loa	3,131	\$3,703,783,129	1,155	36.9%	\$2,141,783,038	57.8%
Ko’olau Poko	28,843	\$24,614,804,769	11,950	41.4%	\$12,701,646,202	51.6%
North Shore	4,723	\$3,819,600,126	767	16.2%	\$838,391,466	21.9%
Primary Urban Center	71,191	\$137,698,243,063	34,025	47.8%	\$100,313,628,548	72.9%
Wai’anae	10,213	\$7,730,241,840	4,498	44.0%	\$3,669,303,802	47.5%
City and County of Honolulu (Total)	188,338	\$245,213,984,438	73,890	39.2%	\$149,500,734,897	61.0%

Source: USACE, NID 2022; City and County of Honolulu 2024; RS Means 2024



Table 11-12. Buildings within 1/2 Mile of Tier II Sites, by General Occupancy Class

Regional Planning Area	Buildings Within 1/2 Mile of Tier II Sites			
	Residential	Commercial	Industrial	Other ^a
Central O’ahu	10,354	1,201	265	145
East Honolulu	2,959	130	24	16
’Ewa	5,543	533	267	58
Ko’olau Loa	981	93	61	20
Ko’olau Poko	10,693	958	158	141
North Shore	637	112	12	6
Primary Urban Center	24,012	7,561	1,486	966
Wai’anae	4,264	187	18	29
City and County of Honolulu (Total)	59,443	10,775	2,291	1,381

Source: USACE, NID 2022; City and County of Honolulu 2024; RS Means 2024

a. Other = Government, Religion, Agricultural, and Education



Table 11-13. Buildings within 1/2 Mile of Hazardous Materials Hazard Area

Regional Planning Area	Regional Planning Area Total Buildings		Buildings Within 1/2 Mile of Hazardous Materials Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Regional Planning Area Total	Value	% of Regional Planning Area Total
Central O’ahu	32,090	\$31,358,898,963	0	0.0%	\$0	0.0%
East Honolulu	14,670	\$12,765,314,977	0	0.0%	\$0	0.0%
‘Ewa	23,477	\$23,523,097,571	645	2.7%	\$4,558,589,836	19.4%
Ko’olau Loa	3,131	\$3,703,783,129	0	0.0%	\$0	0.0%
Ko’olau Poko	28,843	\$24,614,804,769	0	0.0%	\$0	0.0%
North Shore	4,723	\$3,819,600,126	0	0.0%	\$0	0.0%
Primary Urban Center	71,191	\$137,698,243,063	8,343	11.7%	\$38,507,979,180	28.0%
Wai’anae	10,213	\$7,730,241,840	0	0.0%	\$0	0.0%
City and County of Honolulu (Total)	188,338	\$245,213,984,438	8,988	4.8%	\$43,066,569,017	17.6%

Source: USACE, NID 2022; City and County of Honolulu 2024; RS Means 2024



Table 11-14. Buildings within 1/2 Mile of Hazardous Materials Hazard Area, by General Occupancy Class

Regional Planning Area	Buildings Within 1/2 Mile of Hazardous Materials Hazard Area			
	Residential	Commercial	Industrial	Other ^a
Central O’ahu	0	0	0	0
East Honolulu	0	0	0	0
’Ewa	173	272	184	16
Ko’olau Loa	0	0	0	0
Ko’olau Poko	0	0	0	0
North Shore	0	0	0	0
Primary Urban Center	3,550	3,323	1,015	455
Wai’anae	0	0	0	0
City and County of Honolulu (Total)	3,723	3,595	1,199	471

Source: USACE, NID 2022; City and County of Honolulu 2024; RS Means 2024

a. Other = Government, Religion, Agricultural, and Education



11.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

Critical facilities need to remain operational before, during, and after disaster events. Loss of use will impact the services they provide to the City, which may have public safety and economic implications. Ports and harbors are critical points of entry that need to remain open and operational to maintain the vital just-in-time shipping logistics required to sustain each island. In the event of a large-scale hazardous materials release resulting in port closures, there will be cascading impacts statewide. Damage to transportation infrastructure and resulting closure is not uncommon following a hazardous materials release. Actual losses to community lifelines and critical facilities caused by a hazardous materials release depend on the scale of the incident.

Table 11-15, Table 11-16, and Table 11-17 summarize the number of community lifelines within the defined hazard areas.



Table 11-15. Number of Facilities within 1/2 Mile of H-1, by Lifeline Category

Regional Planning Area	Number of Facilities Within 1/2 Mile of H-1									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Count	% of Regional Planning Area Total
Central O’ahu	0	0	2	2	2	9	43	2	0	60	21.1%
East Honolulu	0	0	0	0	1	3	4	0	0	8	8.2%
’Ewa	2	3	6	6	2	7	15	4	1	46	18.8%
Ko’olau Loa	0	0	0	0	0	0	0	0	0	0	0.0%
Ko’olau Poko	0	0	0	0	0	0	0	0	0	0	0.0%
North Shore	0	0	0	0	0	0	0	0	0	0	0.0%
Primary Urban Center	11	25	41	73	35	133	189	22	8	537	46.1%
Wai’anae	0	0	0	0	0	0	0	0	0	0	0.0%
City and County of Honolulu (Total)	13	28	49	81	40	152	251	28	9	651	27.0%

Source: City and County of Honolulu 2023,2024; State of Hawai’i 2017,2021,2022,2023,2024; US Energy Atlas 2024



Table 11-16. Number of Facilities within 1/2 Mile of Tier II Sites, by Lifeline Category

Regional Planning Area	Number of Facilities Within 1/2 Mile of Tier II Sites									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Count	% of Regional Planning Area Total
Central O’ahu	11	13	13	58	10	30	34	17	3	189	66.3%
East Honolulu	1	1	7	5	0	4	14	3	0	35	35.7%
‘Ewa	6	26	12	89	9	15	23	3	1	184	75.1%
Ko’olau Loa	1	6	9	13	1	7	8	2	0	47	48.5%
Ko’olau Poko	7	9	19	23	15	38	33	15	3	162	53.3%
North Shore	0	2	1	7	0	2	6	0	0	18	20.7%
Primary Urban Center	18	33	205	163	34	178	224	45	9	909	78.0%
Wai’anae	5	11	5	16	5	10	16	3	1	72	56.7%
City and County of Honolulu (Total)	49	101	271	374	74	284	358	88	17	1,616	67.1%

Source: City and County of Honolulu 2023,2024; State of Hawai’i 2017,2021,2022,2023,2024; US Energy Atlas 2024



Table 11-17. Number of Facilities within 1/2 Mile of Hazardous Material Hazard Area, by Lifeline Category

Regional Planning Area	Number of Facilities Within 1/2 Mile of Hazardous Material Hazard Area									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Count	% of Regional Planning Area Total
Central O’ahu	0	0	0	0	0	0	0	0	0	0	0.0%
East Honolulu	0	0	0	0	0	0	0	0	0	0	0.0%
‘Ewa	1	20	7	66	1	4	2	1	0	102	41.6%
Ko’olau Loa	0	0	0	0	0	0	0	0	0	0	0.0%
Ko’olau Poko	0	0	0	0	0	0	0	0	0	0	0.0%
North Shore	0	0	0	0	0	0	0	0	0	0	0.0%
Primary Urban Center	8	20	25	112	7	75	86	12	2	347	29.8%
Wai’anae	0	0	0	0	0	0	0	0	0	0	0.0%
City and County of Honolulu (Total)	9	40	32	178	8	79	88	13	2	449	18.6%

Source: City and County of Honolulu 2023,2024; State of Hawai’i 2017,2021,2022,2023,2024; US Energy Atlas 2024



11.2.4 NATURAL, HISTORIC, AND CULTURAL RESOURCES

Natural Resources

A hazardous materials release, whether fixed-site or in-transit, can contaminate air, water, and soil, adversely affecting local ecosystems and potentially leading to enduring environmental harm. Water contamination, whether surface water, groundwater, or marine, is an immediate concern from a hazardous materials release. Wildlife may also be impacted. Hazardous material releases could also significantly impact soils. Depending on the characteristics of the hazardous material and the volume of product involved, the affected area that requires soil remediation can be as small as several square feet or as large as many square miles. Such environmental damage can linger for decades and result in extensive remediation costs.

Coral reef ecosystems are fragile and extremely vulnerable to environmental stresses, including runoff and oil spills. Runoff from land-based pollution sources may include hazardous materials that carry sediment, high levels of nutrients from agricultural areas, sewage outflows, or pollutants such as petroleum products and pesticides. The degree of damage will depend upon the coral species, life stage, and exposure. Impacts can result in bleaching, which can damage or kill coral depending upon the severity and duration of the environmental stress (NOAA 2024).

Historic and Cultural Resources

Hazardous materials can pose a serious long-term threat to historic resources, particularly if an incident is on or near a historic site. Refer to Table 11-18 for a breakdown of historic site vulnerability by regional planning area.

Any loss of or harm to native species and ecosystems as a result of a hazardous materials release will adversely impact Hawaiian cultural traditions and practices, which are closely tied to the natural environment. Hawaiian fishponds may be impacted by a hazardous materials release. Depending on the material, the release may kill the fish species, or the bioaccumulation of pollutants can affect animals high on the food chain long after a release. Site remediation efforts following a hazardous material release can result in adverse impacts on archeological resources and sensitive cultural areas in the attempt to remove and/or excavate contaminated sediments from an affected area (HI EMA 2023).



Table 11-18. Historic Sites within 1/2 Mile of Defined Hazard Areas

Regional Planning Area	Historic Sites Within 1/2 Mile of Route H1		Historic Sites Within 1/2 Mile of Tier II Sites		Historic Sites Within 1/2 Mile of Hazardous Materials Hazard Area	
	Count	% of Regional Planning Area Total	Count	% of Regional Planning Area Total	Count	% of Regional Planning Area Total
Central O’ahu	3	33.3%	7	77.8%	0	0.0%
East Honolulu	1	12.5%	2	25.0%	0	0.0%
’Ewa	0	0.0%	2	100.0%	0	0.0%
Ko’olau Loa	0	0.0%	0	0.0%	0	0.0%
Ko’olau Poko	0	0.0%	1	3.7%	0	0.0%
North Shore	0	0.0%	1	12.5%	0	0.0%
Primary Urban Center	95	21.2%	195	43.4%	59	13.1%
Wai’anae	0	0.0%	1	33.3%	0	0.0%
City and County of Honolulu (Total)	99	19.5%	209	41.1%	59	11.6%

11.2.5 FUTURE CHANGES THAT MAY AFFECT RISK

Potential or Planned Development

As development continues, the risk for a hazardous material release and the potential impacts on the community will increase. The number and types of hazardous chemicals stored in and transported through the City will likely continue to rise. Growth increasing commercial and residential density near fixed-site hazardous materials facilities will also increase vulnerability. Table 11-19 shows the number of new developments within a half mile of the defined hazard areas across the City.



Table 11-19. New Development within 1/2 Mile of Defined Hazard Areas

Regional Planning Area	New Development Within 1/2 Mile of Route H1		New Development Within 1/2 Mile of Tier II Sites		New Development Within 1/2 Mile of Hazardous Materials Hazard Area	
	Count	% of Regional Planning Area Total	Count	% of Regional Planning Area Total	Count	% of Regional Planning Area Total
Central O’ahu	12	10.1%	68	57.1%	0	0.0%
East Honolulu	10	8.4%	20	16.8%	0	0.0%
’Ewa	98	9.6%	76	7.4%	43	4.2%
Ko’olau Loa	0	0.0%	28	43.8%	0	0.0%
Ko’olau Poko	0	0.0%	110	39.3%	0	0.0%
North Shore	0	0.0%	10	16.9%	0	0.0%
Primary Urban Center	296	38.2%	314	40.5%	40	5.2%
Wai’anae	0	0.0%	68	58.1%	0	0.0%
City and County of Honolulu (Total)	416	16.3%	694	27.1%	83	3.2%

Projected Changes in Population

As populations increase, the number of people vulnerable to the impacts of hazardous materials spills and transportation incidents will grow. Population and business growth along major transportation corridors increases the vulnerability to transportation-related hazardous material spills.

Climate Change

Flooding or wildfire can cause releases of hazardous materials that are not properly stored or contained. It is highly likely that changing climate conditions will exacerbate the frequency and intensity future flood and wildfire risk. Sites that store hazardous materials that are at risk from flooding and wildfires will become more vulnerable as climate change accelerates these hazards (HI EMA 2023).

Additionally, rising sea levels will impact coastal septic tanks, cesspools, and other on-site sewage disposal systems, leading to their failure and contributing to the degradation of nearshore water quality. This could increase disease risks for coral reefs and negatively affect coastal resources. As sea levels continue to rise, the frequency of hazardous materials releases is expected to increase.

In coastal areas, septic tanks, cesspools, and other on-site sewage disposal systems, as well as other hazardous materials storage and disposal sites, are vulnerable to sea level rise (Hawai’i Climate Change Mitigation and Adaptation Commission 2017). The projected rise in sea level will eventually result in the failure of on-site sewage disposal systems. Unable to operate properly, they will contribute to the degradation of nearshore water quality. A release from these systems could change disease risk for coral reefs and negatively impact nearby coral and coastal resources. A recent study indicates that tidally driven groundwater inundation of



wastewater infrastructure is already occurring in urban Honolulu. The study shows that higher ocean water levels are leading to wastewater entering storm drains and the ocean (UH 2021). As sea levels continue to rise, so will these hazardous materials releases.