Introduction

Hazardous chemicals are prevalent throughout our society. While industry is the primary user and maintainer of hazardous chemicals, we also have them in our homes, in our cars, at our places of work and recreation. Hazardous materials move through our region on highways, rail lines, pipelines, and by ship and barge through Puget Sound. These major transportation routes are utilized by our trucking industry to transport chemicals not only to local manufacturing plants, but also to businesses and retail outlets. [36]

The geographic and economic characteristics of King County make it likely that hazardous materials releases will occur. Our diverse industrial facilities and transportation routes share space with numerous bodies of waters, wetlands, environmentally sensitive areas, and a multitude of densely populated centers, creating areas of great potential risk for a hazardous materials release.

High Probability Low Impact	**High Probability Moderate Impact**	**High Probability High Impact**
Moderate Probability Low Impact	**Moderate Probability Moderate Impact**	**Moderate Probability High Impact**
Low Probability Low Impact	**Low Probability Moderate Impact**	**Low Probability High Impact**

Hazard Identification

King County hosts a variety of unique transportation and geographic conditions, including one of the largest deepwater seaports on the west coast, an International Airport in SeaTac that handles cargo from all over the world, as well as fuel pipelines running south from Whatcom County through King County and down into Portland carrying jet fuels, diesel, gasoline, etc. Additionally, local highways like I-5, I-90, US Highway 2, State Route (SR) 18, SR 516, SR 167, US Highway 99 and others transport hazardous materials throughout the region.

In the City of Seattle, there are over 3000 facilities with hazardous materials regulated under the fire code. Other areas with high concentrations of hazardous materials usage include Harbor Island, the Duwamish Corridor, Redmond and the Kent Valley. Business types that commonly use hazardous materials locally include: hospitals, schools, metal plating and finishing, the aircraft industry, public

[36] Pierce County Department of Emergency Management Hazard Identification and Vulnerability Assessment, Technological Hazards Section: Hazardous Materials, http://www.co.pierce.wa.us/xml/abtus/ourorg/dem/EMDiv/HIVA/hazmat.pdf

utilities, cold storage companies, the fuel industries, the communication industry, chemical distributors, research, and high technology firms. Each of these facilities is required to maintain plans for warning, notification, evacuation and site security under various regulations. The majority of releases that occur during the course of regular commerce happen at fixed facilities.

While the majority of incidents tend to involve petroleum products, a significant number involve extremely hazardous materials. Approximately 200 local facilities with extremely hazardous materials report their inventories to the county under SARA Title III provisions. Efforts continue to increase the compliance rate and education level of local facilities. In excess of 300 hazardous materials events require response in King County annually; however, many events are not reported or go undetected.

Hazardous materials may also be released as a secondary result of a natural disaster like earthquakes or floods. In either case, buildings or vehicles can release their hazardous materials inventories when structurally compromised or involved in traffic accidents. Pipelines can be exposed or ruptured from collapsed embankments, road washouts, bridge collapses, and fractures in roadways, and as nearly every neighborhood in urban King county includes a natural gas pipeline, this is a very possible risk. Examples of areas at risk for a secondary incident are Harbor Island, a western Washington facility with a large fuel storage area. Earthquake damage to Harbor Island could result in subsequent fuel spills that may impact the Duwamish River and Elliot Bay. These potential spills may occur from above ground storage, pipelines or fuel transfers from tankers. Events resulting from a spill would produce severe fire hazards and enormous environmental damages to fish, wildlife and commerce.

Additional potential causes of hazardous materials releases may include terrorist incidents and illegal drug labs or dumping. Illegal drug labs present a special concern due to the fact that each must be treated as a chemical hazard site and decontaminated before the property can be used again. Illegal drug labs can be set up in homes, apartments, vacant buildings, shacks in the forest or even in a van parked on the street.[37] Exposure of King County's sizable population to a hazardous materials release presents a complex problem to responders, since it is difficult to find a home, school, hospital or place of business in our modern society that isn't vulnerable to the possibility.

The chemical, physical and biological properties of hazardous materials pose a potential risk to life, health, the environment, and property when not properly contained. Hazardous materials may be explosive, flammable, combustible, corrosive, reactive, poisonous, biological or radioactive, as well as solid, liquid or

[37] Pierce County Department of Emergency Management Hazard Identification and Vulnerability Assessment, Technological Hazards Section: Hazardous Materials, http://www.co.pierce.wa.us/xml/abtus/ourorg/dem/EMDiv/HIVA/hazmat.pdf

gaseous. Hazardous materials incidents may be either generated from a fixed site or the result of a transportation-related accident or release.[38] Hazardous substances are subject to regulation by a variety of state and federal agencies through an assortment of labor, environmental and transportation laws.[39]

The types of materials that can cause a hazardous materials release are wide ranging in nature and may include chlorine, sodium hydroxide, sulfuric acid, radioactive isotopes, anhydrous ammonia, gasoline and other hydrocarbons, as well as medical/biological waste from hospitals or clinics. Hazardous materials subject to reporting under the Emergency Planning and Community Right-to-Know Act (EPCRA) or Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) include these four groups:

Extremely Hazardous Substances: These are materials with acutely toxic properties that may do irreversible damage or cause death to people or harm the environment when released or used outside their intended use. Examples include: ammonia, chlorine, and sulfuric acid. Includes 366 US EPA listed chemicals.

Hazardous Substances: These are any materials posing a threat to human health and/or the environment, or any substance designated by the Environmental Protection Agency (EPA) to be reported if a designated quantity of the substance is spilled into the waters of the United States or is otherwise released into the environment.[40] Includes 720 chemicals listed by the US EPA.

Hazardous Chemicals: If present at a chemical facility in certain amounts, these substances require a Material Safety Data Sheet (MSDS) under the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard. Such substances are capable of producing fires and explosions or adverse health effects such as cancer, burns, or dermatitis.[41]

Toxic Chemicals: Chemicals or chemical categories that appear on the list because of their chronic or long-term toxicity. Includes 325 chemicals. [42]

---

[38] Pierce County Department of Emergency Management Hazard Identification and Vulnerability Assessment, Technological Hazards Section: Hazardous Materials, http://www.co.pierce.wa.us/xml/abtus/ourorg/dem/EMDiv/HIVA/hazmat.pdf
[39] Snohomish County Department of Emergency Management Hazard Identification and Vulnerability Assessment: Hazardous Materials Section, http://www.snodem.org/HIVA.pdf
[40] Snohomish County Department of Emergency Management Hazard Identification and Vulnerability Assessment: Hazardous Materials Section, http://www.snodem.org/HIVA.pdf
[41] Snohomish County Department of Emergency Management Hazard Identification and Vulnerability Assessment: Hazardous Materials Section, http://www.snodem.org/HIVA.pdf
[42] Pierce County Department of Emergency Management Hazard Identification and Vulnerability Assessment, Technological Hazards Section: Hazardous Materials, http://www.co.pierce.wa.us/xml/abtus/ourorg/dem/EMDiv/HIVA/hazmat.pdf

Other hazardous materials include hazardous wastes, by-products of society that can pose a substantial or potential hazard to human health or the environment when improperly managed, and possess at least one of four characteristics (ignitability, corrosivity, reactivity, or toxicity), or appear on special EPA lists.[43]

Hazardous Materials Impacts

The industrial and geographic characteristics of our region continue to place King County at risk for probably hazardous materials releases. Many factors determine the impact of a potential incident including quick and solid decision-making by emergency officials, location and type of release, evacuation and shelter-in-place needs, public health concerns, and relevant economic considerations. Additionally, while most incidents are generally brief, the resulting recovery and cleanup may take time to exact.

If evacuation is necessary due to a chemical emergency road closures and traffic jams may result. If a large-scale evacuation is deemed necessary, it can pose serious long term economic consequences to the involved population area.[44] A delay in the resumption of industry commerce may cause economic losses for both business owners and employees. In addition, an evacuation ordered on short-notice could cause serious problems for businesses requiring time to shut down specialized equipment.[45] There is also the monetary impact borne by responding public or private emergency response organizations. These agencies may be challenged by the expenses dictated by a hazardous materials release, and may need to wait an uncomfortable length of time for the responsible party to reimburse any outstanding costs, further straining the economic resources of the region.

A major incident involving significant injuries may severely tax regional medical services, as medical facilities aren't generally designed to handle mass amounts of victims on short notice. Consequently, in the event of a major incident, hospitals and other medical facilities must still be able to provide their customary level of service to all patients, regardless of whether they were incident victims or not.

History of Events

Hazardous materials emergencies have emerged as a public concern only within the past 30 years, as older records mixed hazardous materials emergencies with

[43] Snohomish County Department of Emergency Management Hazard Identification and Vulnerability Assessment: Hazardous Materials Section, http://www.snodem.org/HIVA.pdf
[44] Snohomish County Department of Emergency Management Hazard Identification and Vulnerability Assessment: Hazardous Materials Section, http://www.snodem.org/HIVA.pdf
[45] Snohomish County Department of Emergency Management Hazard Identification and Vulnerability Assessment: Hazardous Materials Section, http://www.snodem.org/HIVA.pdf

fire emergencies. As a result constructing a detailed history is difficult. This section highlights major incidents.[46]
A Washington State Department of Health study examined incidents occurring in 1992. According to the report there were 118 events in King County, about 10.2% involving transportation and 89.8% occurring at fixed facilities. Twenty-six incidents caused a total of 66 injuries, most commonly involving acids and volatile organic compounds. Additionally, 29 incidents resulted in the evacuation of nearly 1400 people. The report indicates that 44 incidents in King County occurred within one-quarter mile of residential areas, indicating some risk to people not directly involved with the released chemicals.[47]

A recent Washington State Hazard Identification and Vulnerability Analysis cited an average of 960 emergency spills occurring annually in King County. Significant events in King County detailed by the study include: the release of 2500 gallons of fuel from Olympic Pipeline at their Renton pumping station, the release of hydrofluoric and nitric acids from Boeing's Auburn plant, numerous drug lab events, metal finishing company fires at Boeing and Universal Manufacturing, a spill at UPS in Redmond, numerous releases of ammonia from cold storage facilities and the release of a small amount of chorine from a public water company. Response teams have narrowly averted some potentially large releases.

Hazardous materials may also be released during transport. For example, a 1994 King County study shows that the most common material transported along I-5 is gasoline. In addition, the most commonly released chemicals in transportation accidents included volatile organic compounds, acids, herbicides, and insecticides. Consequently, the Washington State Department of Transportation reported that almost 60,000 transportation incidents resulting in the accidental release of hazardous materials occurred between 1987 and 1989. Case in point of a typical problem posed by chemical transport involves a crash in 1975 where a gasoline tanker traveling north on the Alaska Way Viaduct lost control, bounced sideways, and crashed against the guardrail, where the tank ruptured. Gasoline flowed down the side of the Viaduct where it was ignited by flares set coincidentally by a railroad crew. The resulting fire damaged several buildings, but there were no casualties. [48]
As for railroad incidents however, King County has not had any significant events in recent years, although rail lines do run throughout downtown Seattle and populous areas of King County.

[46] City of Seattle Emergency Management, Human-Caused Disasters: Hazardous Materials Resource Section, http://www.seattle.gov/emergency_mgt/hazards/hazardousMaterials.htm
[47] City of Seattle Emergency Management, Human-Caused Disasters: Hazardous Materials Resource Section, http://www.seattle.gov/emergency_mgt/hazards/hazardousMaterials.htm
[48] City of Seattle Emergency Management, Human-Caused Disasters: Hazardous Materials Resource Section, http://www.seattle.gov/emergency_mgt/hazards/hazardousMaterials.htm

King County also has numerous abandoned hazardous waste sites that are being cleaned up under the Superfund program. There are at lease five sites in Kent and one very large site in South Seattle.

Past Mitigation Efforts[49]

There are currently sixteen hazardous materials response teams in King County. These are split evenly between public fire jurisdictions and the Boeing Company. Private response contractors working with the Environmental Protection Agency (EPA) and a unit of the Washington State Department of Ecology supplement the hazardous materials teams in King County.

An Area Contingency Plan was developed by the State Department of Ecology in cooperation with Federal, State and Local agencies. The purpose of the plan is "to provide orderly implementation of response actions to protect the people and natural resources of the states of Washington, Oregon, and Idaho from the impacts of oil or hazardous substances spills." The plan accounts for potential problems from vessels, offshore facilities, onshore facilities or other sources. The EPA has responsibility for all spills in inland waters. The United States Coast Guard has responsibility for all spills in coastal waters.

Other mitigation efforts include the Local Hazardous Waste Management Program, a regional consortium of local governments working together to protect public health and environmental quality by helping citizens, businesses and government reduce the threat posed by the use, storage, and disposal of hazardous materials. Prompted by citizen demand, this program was developed when Washington State directed local governments to create plans to ensure proper management of hazardous wastes produced by households, businesses, and other organizations. In 1991 local governments and agencies within King County established a partnership to manage these wastes regionally by developing the Local Hazardous Waste Management Program.[50] This program offers information and services to help King County residents, businesses, and other groups reduce toxic and hazardous materials, safely use and store hazardous materials, and properly dispose of hazardous wastes.[51]

With 1.7 million people living in King County and more than 60,000 businesses and other institutions operating therein, the amount of hazardous waste generated adds up. When improperly used, stored or disposed of, these chemicals threaten human health and the environment. Moreover, exposure to some household products and business materials presents a risk to health and environmental quality even when

[49] Vulnerability Analysis prepared for the Local Emergency Planning Committee by Rich Tokarzewski, King County Office of Emergency Management
[50] Local Hazardous Waste Management Program in King County: Working Together to Reduce Hazardous Waste, http://www.govlink.org/hazwaste/about/
[51] Local Hazardous Waste Management Program in King County, http://www.govlink.org/hazwaste/

used and disposed of properly. Program efforts focus on helping local residents, business owners and operators, and other institutions (such as schools, hospitals and government agencies): use fewer and/or less toxic materials (and generate less hazardous waste), properly use and store hazardous materials, and properly dispose of hazardous wastes. [52]

As demonstrated by the Local Hazardous Waste Management Program's efforts, public education is a key component to reducing the risks associated with a hazardous materials release. Educating the public on the fundamentals of shelter-in-place is also a key component. Citizens must know when, where, and how to shelter-in-place effectively, as this response mechanism is key to saving lives in a chemical emergency. Being aware and attentive of emergency officials and their public safety directives during a hazardous materials release will help ensure the protection of vulnerable populations and may lessen the economic impact of a release to the business and industrial community.

[52] Local Hazardous Waste Management Program in King County: Working Together to Reduce Hazardous Waste, http://www.govlink.org/hazwaste/about/