ANNEX L: HAZARDOUS MATERIALS

General: The following information was extracted from several sources including the State and Regional Hazard Profiles (Easton Environmental, May 1995), Alaska Level A and B Hazardous Materials Response Resources (Hart Crowser, June 1999), the Statewide Tier Two Data Summary, the Statewide Hazmat Commodity Flow Study, and the DEC Spills Database.

This annex profiles the hazards associated with extremely hazardous substances (EHS) in Alaska. It identifies the substances, where they are found, how they are transported, the risks they pose to the general public, and the current capability of industry and government to respond to large-scale accidents.

EHS, for the most part, are those substances that pose an acute inhalation threat to humans. A recent statewide Tier Two data analysis for Reporting Year 2007 indicated the following top five EHS chemicals found in the state (excluding hydrogen sulfide gas, which is associated with crude oil production): the EHS substances present in greatest total amounts are anhydrous ammonia (used primarily as a refrigerant); sulfuric acid and its solutions (used for a variety of industrial purposes); formaldehyde/formaldehyde solution (used in bulk in Alaska primarily as a biocide); sodium cyanide (used in mining operations); and chlorine gas (primarily for water and wastewater disinfection). See Appendices II and III for supporting data regarding the types of EHS, hazardous substances, and petroleum products reported and the number and types of reporting facilities.

In some cases, vast amounts of EHS are present at a small number of facilities. Examining the prevalence of EHS in terms of the number of facilities at which they are stored (or used) results in a profile different than the profile based on total amounts. In this view, sulfuric acid is the most prevalent (found at 260 facilities), followed by anhydrous ammonia (52 facilities), chlorine gas (26 facilities), and hydrogen peroxide and nitric acid (5 facilities each).

The distribution of EHS in Alaska falls into relatively distinct and predictable patterns. Hydrogen sulfide gas occurs only in association with crude oil production. Chlorine is found primarily at the municipal water and wastewater treatment facilities and seafood processing facilities of coastal southcentral and southeastern Alaska, as well as larger municipal facilities on the highway system. Anhydrous ammonia is found typically in coastal communities with seafood processing facilities. Sulfuric acid occurs at major industrial facilities and at remote communications facilities (as a battery electrolyte), and sodium cyanide is typically located at mining operations and transport facilities. Many of the more exotic substances occur at a small number of industrial or trans-shipment facilities.

The vast amount of hydrogen sulfide gas on the North Slope ranks that subarea as having the largest amount of EHS. The Cook Inlet, Interior and Southeast subareas follow, each with a lesser share of the total quantity of EHS used/stored in Alaska. Amounts present in all other subareas are small by comparison.

Major routes and modes of transportation of EHS into and around the state are relatively simple. Interstate transport of EHS consists nearly exclusively of transport of substances into the state from the southern contiguous states by water. The vast majority of EHS shipments transit the Gulf of Alaska and enter the state at the Port of Whittier via Prince William Sound or the port of Anchorage (and Kenai) via Cook Inlet. Upon arrival in Alaska, EHS are transported via the Alaska Railroad rail system, the highway system, or local roads to final destinations. See Appendix IV for a detailed assessment of Hazmat transported in the State of Alaska.

With a scattered and largely rural population, the potential for an accidental EHS release with catastrophic consequences – for example, affecting over 1,000 persons – in Alaska is confined to a handful of population centers. On the other hand, release consequences could still be great in many Alaskan communities when evaluated in terms of the percentage of a community's population affected and the degree of impact.

Two compressed gases pose the greatest risk to communities in Alaska: chlorine and anhydrous ammonia. Anhydrous ammonia presents the greatest threat to community populations in Alaska, and it is commonly found at seafood processing facilities and refrigeration plants. The risk associated with use and storage of chlorine gas is also substantial.

Response to an EHS release can be either defensive or offensive in nature. Defensive response measures include detecting a release, notifying the public and appropriate agencies, predicting plume movement, and protecting the public through evacuation or shelter-in-place tactics. Key to effective defensive response is a local emergency plan to guide the effort. A degree of defensive response capability exists in Alaska communities as evidenced by the existence of local emergency response plans in most communities.

Offensive response includes monitoring chemical concentrations and entering hazard zones to accomplish rescue, control, decontamination or other objectives. Key to effective offensive response is a well-trained, equipped and practiced Hazmat team. Such teams, though, are expensive to equip and train, and maintaining a level of proficiency commensurate with the risk to responders is also costly. The Hazmat response teams of the Municipality of Anchorage, the 103rd Civil Support Team WMD (Alaska National Guard), the Fairbanks North Star Borough, the City of Valdez, the City of Kodiak, City and Borough of Juneau, and the Ketchikan Gateway Borough provide a degree of offensive response capability for their respective locales.

Areas with a high degree of risk and no offensive response capability include the City and Borough of Sitka and the Petersburg/Wrangell planning district. Areas with substantial risk and no or limited offensive response capability include the Northern and Southern Southeast Planning Districts, the Prince William Sound Planning District (excluding Valdez), the Kenai Peninsula Borough Planning District, the Aleutians East and Aleutian and Pribilof Planning Districts, the Bristol Bay Planning District, and the Northwest Arctic Borough Planning District.

APPENDIX I – OVERVIEW OF CHEMICAL HAZARDS

This appendix discusses chemical hazards in general and those in Alaska particularly. It is intended to provide some background for readers that may not be familiar with the hazards posed by EHS.

1. Release and Dispersion Mechanics: EHS in Alaska include compressed and refrigerated gases, liquids and solids. The ways in which each is released and disperses in the environment differ.

Gases

Compressed and refrigerated gases can be released directly into the environment and spread under the influence of meteorological conditions. The rate at which a compressed gas is released depends on such factors as the amount of the substance in the container, the temperature of the substance, and the size of the hole through which the gas escapes. Once released, compressed gases spread in a downwind direction under the influence of meteorological conditions and gravity. The spread of compressed gases is particularly sensitive to wind speed. The slower the wind speed, the further high concentrations of gases will reach.

Liquids

Liquids are normally assumed to be dispersed into the atmosphere through evaporation. The evaporative rate is largely a function of chemical properties, the temperature of the liquid, and the surface area of the pool. The rate of release of liquids to the atmosphere through evaporation at normal temperatures is usually much slower than that for compressed gasses. As a result, even highly toxic liquids are far less likely to cause off-site impacts than the compressed gasses, provided the liquids are released and remain at ambient temperatures.

It is important to note that heating toxic liquids as a result of fire or other chemical reactions can dramatically increase release rates and downwind impact distances. Highly reactive liquids, such as strong acids, react with many substances while generating heat, which increases evaporative rates. Chemical reaction of liquids with substances in the environment upon release can also produce toxic gases as products of reaction. Under certain conditions, liquids can also be introduced into the environment as fine aerosols, which behave much like gases.

Solids

Finely divided solids can be released by explosion or other physical means and may disperse much like gases. Like liquids, solids can also react with other substances to release toxic gases.

2. Causes of Releases: Causes of chemical accidents in Alaska are expected to mirror causes reflected in nationwide records. In a general sense, causes of most chemical accidents fall into three primary (but not entirely distinct) categories: human error, fire, and natural disasters.

Human Error

The single greatest cause of chemical releases reflected in nationwide records is, directly or indirectly, human error. Inadequate training, lapses in judgment, and inadequate number of personnel appear repeatedly in the records as the cause of chemical accidents. The statistic suggests that the frequency of accidental releases is directly proportional to the level of human judgment and opportunity for mistakes. There is every reason to expect that the prevalence of human error as a cause of chemical accidents will apply in Alaska.

Fire

Fire is also a common, and in some ways a problematic, cause of releases. In closed systems, such as pressure vessels or refrigeration systems, increases in temperatures cause increases in internal pressure. To reduce the risk of explosion, most closed systems are equipped with some form of pressure relief device that will vent all or some of the system contents in the event of over-pressurization. Extreme temperatures associated with fires can be expected to result in the release of gases via these pressure relief devices.

For liquids, heat produced by fires increases vapor pressures and the rate at which liquids are released into the air. Fires can also produce or accelerate chemical reactions whereby toxic substances are created and dispersed. It is important to note that most plume models do not simulate the effects of fire and other chemical reactions.

One characteristic of fire, on the other hand, tends to reduce the effects of fire-associated releases. Produced heat forms strong vertical air currents that disperse emissions vertically, as opposed to horizontally along the ground surface.

Natural Disaster

Other causes of accidental chemical releases include natural phenomena such as earthquakes, and floods. With its active seismic zones, earthquakes may be a more likely cause of chemical releases in Alaska. Natural disasters can result in situations that exceed those contemplated in normal emergency planning.

3. Accident Frequencies: The expected frequency of accidental chemical releases on a unit basis will be higher in Alaska than on a national basis. Factors that will tend to increase the likelihood of a release include extreme environmental conditions, improper training, and lack of regulatory oversight.

Fixed Facilities

The Handbook of Chemical Hazard Analysis Procedures (Federal Emergency Management Agency - FEMA et al, 1990) presents an approach for estimating the likelihood of releases from facilities. In formulating the approach, FEMA suggests that the frequency of significant accidents is largely a function of the number of containers, and whether the containers are in use or in storage: Primarily due to the potential for fire damage, FEMA concludes that the frequency of accidents is ten times greater for containers in warehouses and other storage facilities than for containers at medium size industrial facilities such as water treatment plants. FEMA also concludes that accident frequency varies directly with the number of containers – the more containers, the higher the likelihood of an accident.

The handbook suggests a failure rate for water treatment plants and other medium size industrial users of 1×10^{-4} failures per storage tank or pressure vessel per year. For warehouses and other storage facilities, the handbook suggests a failure rate of 1×10^{-3} failures per storage tank or pressure vessel per year. While valve and piping leaks are far more common than container failures, such operational leaks are often detected and are often of a magnitude that does not pose a threat beyond the facility and immediate working environment. As a result of the limited number of containers present at individual facilities in Alaska, the expected frequency of container failure at any single facility should never exceed 1×10^{-2} per year.

Bulk Marine Transport

The Handbook of Chemical Hazard Analysis Procedures (FEMA et al, 1990) states that marine transportation has the lowest accident rate per ton-mile and the lowest number of accidents of the various modes of transportation. The large energies involved when accidents do occur, however, can result in large cargo losses. The handbook estimates spill frequency for bulk marine transport based on the likelihood of vessel accidents per mile traveled or per port call. Suggested accident frequencies vary from 1×10^{-3} per mile for collisions and groundings in harbors and bays to 5×10^{-6} per mile for groundings on lakes, rivers and intercoastal waterways. Of the accidents involving single-hulled vessels, 25 percent can be expected to result in releases, and of these, 30 percent can be expected to result in the loss of 100 percent of one tank or compartment. This suggests large scale releases may occur at a frequency of 7.5×10^{-5} to 3.75×10^{-7} per mile traveled.

Bulk Rail Transport

The Handbook of Chemical Hazard Analysis Procedures (FEMA et al, 1990) estimates spill frequency for bulk rail transport based on the likelihood of accidents per rail car-mile. The handbook suggests a frequency for mainline accidents of 6×10^{-7} per car-mile and a frequency for yard accidents of 3×10^{-6} per car-mile. Of the accidents, the handbook suggests that 30 percent can be expected to result in complete loss of cargo. This yields a frequency for large scale releases from mainline accidents of 1.8×10^{-7} per car-mile and 9×10^{-7} per car-mile for releases from accidents in rail yards.

Bulk Truck Transport

The Handbook of Chemical Hazard Analysis Procedures (FEMA et al, 1990) estimates spill frequency for bulk truck transport based on the likelihood of truck accidents per mile traveled, and the percentage of those accidents that result in a release of some or all of the contents. The handbook suggests use of an average accident rate of 2×10^{-6} accidents per mile for trucks carrying bulk quantities of hazardous materials. The method suggests that accidents result in spills 20 percent of the time, and of those, 20 percent will result in release of the entire cargo. Taking all factors into account, the handbook suggests that accidents will result in release of the entire contents at a rate of 8×10^{-8} per mile traveled per year.

4. Release Consequences: While releases of chemical substances can certainly affect the environment, release consequences are most often evaluated in terms of human injury and loss of life. If this standard is used, it goes without saying that the most severe consequences are associated with releases in highly populated areas. With a scattered and largely rural population, the potential for catastrophic consequences - for example, affecting over 1,000 persons - in Alaska is confined to a handful of population centers. On the other hand, release consequences evaluated in terms of the percentage of a community's population impacted and the degree of impact could still be great in many Alaskan communities.

5. Risk: Risk is normally considered a function of both the likelihood of a release, and the severity of the consequences. Risk is greatest where a release is most likely to occur and the consequences would be most severe - the least where releases are highly improbable, or even if one were to occur, impacts would be minor. In a general sense, chemical risk in Alaska is not nearly as high as many parts of the nation. Nevertheless, many Alaskan communities are faced with some degree of chemical risk.

APPENDIX II – A CHEMICAL PROFILE OF ALASKA

This appendix profiles specific EHSs in Alaska - the substances and their characteristics, the facilities that use or store them, their transportation, the risks they pose, and the capability to respond to large-scale releases.

1. Chemical Inventory

Alaska is fortunate in that a limited number of EHS are known to be present in the state, and of the limited number identified only a few are prevalent. The top five EHS substances (with the addition of hydrogen sulfide) are listed below, generally in order of the total amounts thought to be present in Alaska, from greatest to least:

- hydrogen sulfide gas associated with crude oil
- anhydrous ammonia as a compressed gas and as a refrigerated liquid
- sulfuric acid as a liquid and in solution
- formaldehyde, formaldehyde solution, and urea-formaldehyde solution
- sodium cyanide as a solid and in solution
- chlorine as a compressed gas

2. Chemical Properties

Under certain conditions, all of the EHS present in substantial quantities in Alaska pose an acute inhalable toxic threat. Properties of some of the more common chemicals are discussed in the following paragraphs.

Hydrogen sulfide gas is a colorless gas with an odor of rotten eggs. It is heavier than air and highly flammable. It forms explosive mixtures with air and a number of other substances. The gas is a central nervous system depressant. Inhalation of high concentrations for short periods can cause death. Even exposure to small concentrations for short periods can result in permanent injury or death.

Anhydrous ammonia is a colorless gas with a characteristic odor. The term "anhydrous" is used to distinguish the pure form of the compound from solutions of ammonia in water. Like chlorine, anhydrous ammonia is not explosive, but will support combustion. It readily dissolves in water to form an aqua ammonia solution. Anhydrous ammonia is considerably lighter than air and will rise in absolutely dry air. As a practical matter, however, anhydrous ammonia immediately reacts with any humidity in the air and will often behave as a heavier gas. The chemical reacts with and corrodes copper, zinc and many alloys.

Anhydrous ammonia affects the body in much the same way as chlorine gas. Like chlorine, anhydrous ammonia gas is primarily a respiratory toxicant. In sufficient concentrations, the gas affects the mucous membranes, the respiratory system and the skin. In high concentrations it can cause convulsive coughing, difficult and painful breathing, and death. Anhydrous ammonia will cause burns if it comes in contact with skin or eyes. Response to anhydrous ammonia releases may require Level A personal protective equipment.

Significant amounts of anhydrous ammonia are used in Alaska as a refrigerant, most often associated with cold storage of seafood. Historically, the chemical has been present in very large quantities at a single urea production facility on the Kenai Peninsula. It is nearly always found in transport and in temporary storage as a liquefied compressed gas in 100-, 150- and 2,000-lb pressure vessels. All pressure vessels are equipped with fusible metal pressure relief devices to relieve pressure and prevent rupture in the case of fire or other exposure to high temperatures.

While packaging for transport and temporary storage is nearly uniform, and similar to that for chlorine, anhydrous ammonia is often found in much larger volumes in the piping and receivers of refrigeration systems. There are numerous refrigeration systems in Alaska where the amount of anhydrous ammonia present exceeds ten thousand pounds.

Sulfuric acid is a colorless, oily liquid. It is highly reactive and readily soluble in water with release of heat. Both the liquid and solutions will cause burns if allowed to come in contact with skin or eyes. Fumes are highly toxic, and heat as a result of fire or other chemical reaction can significantly increase emissions. Reaction of the acid with a variety of substances can also produce other toxic gases.

While sulfuric acid is a versatile and common industrial chemical, in Alaska sulfuric acid solution is most often found in use as a battery electrolyte, as part of the water treatment process for industrial boilers, as part of the cleaning process for fish meal plants, and in ore milling processes. Sulfuric acid solution is found across the state, but nearly always in association with larger industrial facilities or at remote locations for power generation.

Formaldehyde at normal temperatures is a gas, but in Alaska it is found in bulk only as an industrial solution. Toxic formaldehyde gas readily vaporizes from solution. The gas is denser than air and will disperse as a heavy gas. Addition of heat will increase the rate at which formaldehyde gas is released from solution. While formaldehyde solution has a number of uses, it is used in bulk in Alaska primarily as a biocide, and occurs at fish hatcheries. It is most frequently found as a 37 percent solution in water.

The gas is highly toxic and can cause adverse health effects at small concentrations.

Sodium Cyanide is principally used by the mining industry to extract gold from gold bearing ore using the carbon-in-leach and carbon-in-pulp processes. These processes enable commercial recovery of gold at very low concentrations. It is normally shipped and stored as a white solid, and is readily soluble in water and other solvents including alcohol. The chemical is not combustible but forms flammable gas on contact with water or damp air, and emits irritating or toxic fumes (or gases) in a fire.

The chemical can cause eye irritation, and can be absorbed through the skin. It also presents an inhalation and ingestion hazard.

Chlorine is a greenish-yellow gas with a characteristic odor. It is neither explosive nor flammable, but is a strong oxidizing agent and will support combustion. It is only slightly soluble in water. At about two and one-half times the density of air, it will spread as a dense gas, flowing downhill under the influence of gravity. The chemical has a strong affinity for many substances and usually will produce heat on reacting. While dry chlorine is non-corrosive at ordinary temperatures, it becomes extremely corrosive in the presence of moisture.

Significant amounts of chlorine are used in Alaska for water and wastewater treatment. It is nearly always found in use, in transport and in storage as a liquefied compressed gas in 100-, 150- and 2,000-lb pressure vessels. All vessels are equipped with fusible metal pressure-relief devices to relieve pressure and prevent rupture in the case of fire or other exposure to high temperatures.

Chlorine gas is primarily a respiratory toxicant. In sufficient concentrations, the gas affects mucous membranes, the respiratory system and the skin. In high concentrations it can permanently damage the lungs and can cause death by suffocation. Liquid chlorine will cause burns if it comes in contact with skin or eyes. Response to chlorine releases may require Level A personal protective equipment. Chlorine can be disposed of by passing it through an alkali (caustic soda or soda ash) solution.

APPENDIX III – EXTREMELY HAZARDOUS SUBSTANCES (EHS) and HAZARDOUS SUBSTANCES (HS) AT FIXED FACILITIES

This appendix examines EHS and HS chemicals in use or stored at facilities in Alaska. Appendix IV addresses transportation of EHS into and around the state.

A Statewide Tier Two Summary report was developed under contract by EPA for Reporting Year (RY) 2007. Most of the information provided in this appendix appeared in the report. The report can be found at the following website: http://www.ak-prepared.com/serc/

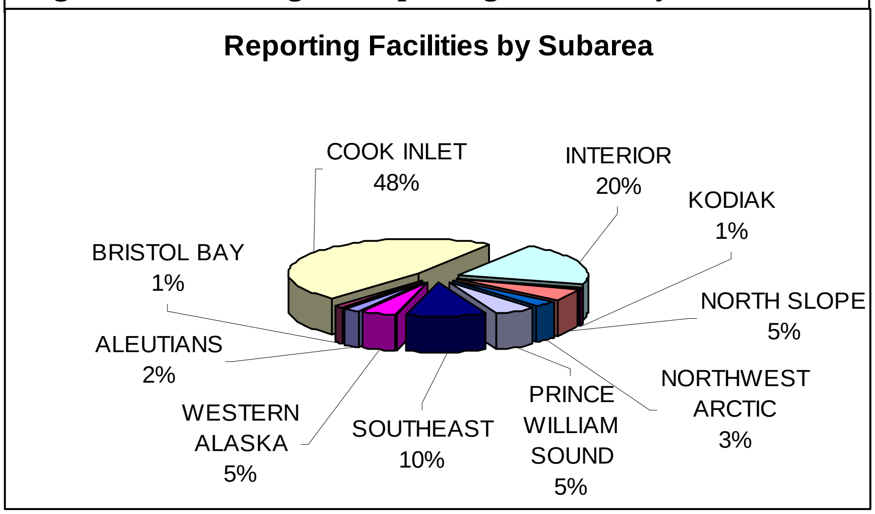
1. Statewide Summary of Tier Two Data by Subarea

A total of 967 facilities statewide reported their chemical inventories to the LEPCs and the SERC. The Municipality of Anchorage (MOA) has the largest number of facilities (332) that submitted Tier Two reports among all the LEPCs. The Cook Inlet Subarea (which includes the MOA) has the largest number of facilities (459) of all of the ten subareas in the state, followed by Interior Alaska with 193 facilities.

Table 1: Number of Facilities by Subarea for RY 2007

Subarea Name	Number of Facilities
Aleutians	18
Bristol Bay	14
Cook Inlet	459
Interior	193
Kodiak Island	14
North Slope	52
Northwest Arctic	28
Prince William Sound	51
Southeast Alaska	94
Western Alaska	44
Total	**967**

Figure 1: Percentage of Reporting Facilities by Subarea

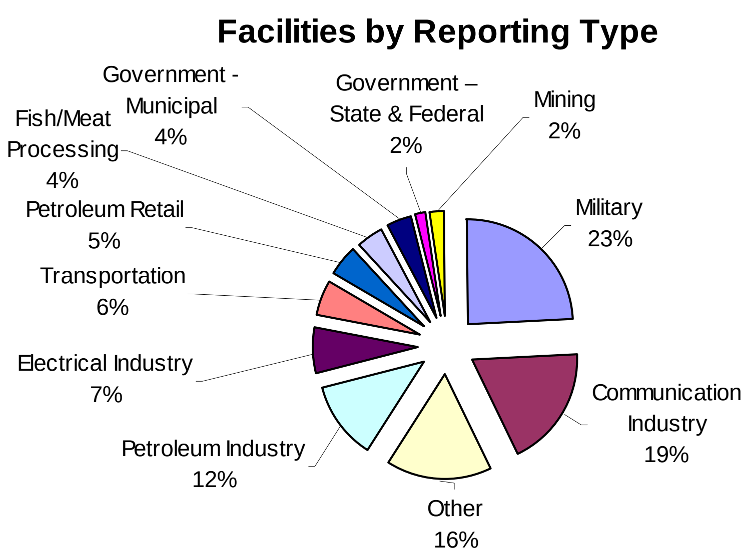


Military facilities comprise 29% of the total reporting facilities in the state, followed by the communication industry, "other" facilities, and the petroleum industry.

Table 2: Facilities by Type for Reporting Year 2007

Facility Type	Number of Facilities
Communication Industry	179
Electrical Industry	68
Fish/Meat Processing	40
Government - Municipal	38
Government – State & Federal	17
Military	235
Mining	21
Other	155
Petroleum Industry	115
Petroleum Retail	44
Transportation	55

Figure 2: Percentage of Facilities by Reporting Type



2. Prevalent EHS and HS reported in the State

The top five EHS and HS chemicals reported by total quantity and by the number of facilities reporting in 2007 are depicted below.

Top 5 EHS Chemicals by Total Quantity – 2007

Rank	EHS Chemical	Quantity (lbs)
1	Ammonia (All), Anhydrous & Ammonia (Solution)	120,807,434
2	Sulfuric Acid	3,704,629
3	Formaldehyde	1,375,874
4	Sodium Cyanide	468,001
5	Chlorine	182,400

***Note:** Hydrogen sulfide is not specifically identified in the Top 5 EHS above. It is generally present as a naturally occurring gas in oil production fields.

Top 5 EHS Chemicals by Number of Facilities Reporting – 2007

Rank	EHS Chemical	Number of Facilities
1	Sulfuric Acid	260
2	Ammonia (All)	52
3	Chlorine	26
4	Hydrogen Peroxide	5
5	Nitric Acid	5

Top 5 HS Chemicals by Total Quantity – 2007

Rank	Hazardous Substance	Quantity (lbs)
1	Propylene Glycol	10,007,233,217
2	Zinc Concentrate	1,589,084,000
3	Lead	408,341,567
4	Coal	237,976,000
5	Portland Cement	29,635,178

Top 5 HS Chemicals by Number of Facilities Reporting – 2007

Rank	HS Chemical	Number of Facilities
1	Acetylene	112
2	Argon & Argon Mixtures	111
3	Oxygen	85
4	Nitrogen	82
5	Ethylene Glycol	61

APPENDIX IV – TRANSPORT OF HAZARDOUS MATERIALS IN ALASKA

A Statewide Hazmat Commodity Flow Study was jointly sponsored in 2005 by ADEC, ADMVA, and EPA. Most of the information provided in this appendix can be found in the study. The report can be found at the following website: http://www.ak-prepared.com/serc/

Companies transport hazardous materials into and throughout Alaska via air, highway, marine, pipeline, and railroad modes of transportation. Based on the frequency of reported shipments, the top three hazard classes transported within all the subareas reported were Class 2 flammable and non-flammable gases, Class 3 flammable liquids, and Class 8 corrosives.

Air Transportation: The hazard classes of the materials transported by air include Class 2 gases, Class 3 flammable liquids, Class 8 corrosive materials, Class 9 miscellaneous dangerous goods, and a consumer commodity of an unknown hazard class. Bulk air shipments of fuel occur to other subareas in Alaska, including locations such as Bethel, Dutch Harbor, Kotzebue, Nome, and the North Slope.

Road Transportation: The highway routes are the primary means of moving hazardous materials of all hazard classes throughout Alaska. Hazardous materials enter the state via the Alaska Marine Highway to ports or docks, or from the lower 48 states via the Al-can Highway, and are transferred to various Alaska Highway routes, including the Dalton, Denali, Elliott, Glenn, Parks, Richardson, Seward and Sterling highways. The top three hazard classes transported via highway are Class 2 gases, Class 3 flammable liquids, and Class 8 corrosive materials. The prevalent subareas for this mode of transportation include Cook Inlet, Interior, Prince William Sound, and North Slope. Highway mode refers to shipments made by motor freight carriers or trucking companies, although the shipments may be transported intermodal, such as air, marine vessel, railroad, or truck.

Marine Transportation: Large bulk commodity shipments enter the state via marine vessels to ports of Anchorage, Juneau, Valdez and Whittier, and transfer to other modes of transportation, such as air, highway, marine, and railroad. Whittier is the only location where rail cars can be interchanged with Canadian and Lower 48 rail carriers. The majority of bulk hazardous materials that enter the Alaska Railroad Corporation (ARRC) system from outside the state come through Whittier. The Port of Anchorage is the Alaska base for ocean container shippers such as Sealand and Totem Ocean Trailer Express (TOTE). The subareas where the marine mode of transportation is extensively used include the Aleutians, Cook Inlet, Kodiak, North Slope, Southeast, and Western Alaska. Marine routes are typically used to transport Class 1 Explosives into the state through Alaska ports including Anchorage, Craig, Haines, Juneau, Ketchikan, and Valdez to Western Alaska ports that include Dutch Harbor. Increased quantities of explosive commodities into the state correlate with increased road construction, mining, and oil exploration activities. The U.S. Coast Guard Marine Safety Offices (MSO) for Anchorage, Juneau and Valdez track shipments of explosives entering their ports. Other hazard classes transported in Alaska via marine routes include Class 2 gases or containers with residue last containing a gas; Class 3 flammable liquids, which include petroleum products; Class 4 flammable solids, of which urea is the single commodity; Class 5 oxidizers, ammonium nitrate bulk; Class 8 corrosives, which include sulfuric acid, corrosive liquids, n.o.s. (not otherwise specified), hypochlorite solutions; and Class 9 miscellaneous, including formaldehyde and diethylene glycol.

Pipeline Transportation: The hazardous materials transported via major pipelines are petroleum products, which fall within Class 3 flammable liquids. The majority of products transported in these pipelines includes crude oil, natural gas, and Jet A fuel, gasoline, and diesel fuel. The subareas for which this mode of transportation is prevalent include Cook Inlet, Interior, North Slope, and Prince William Sound.

Railroad Transportation: The Alaska Railroad Corporation (ARRC) reported in its 2003 Hazardous Traffic Analysis that numerous trends may significantly alter the quantities and types of hazardous materials movements on the ARRC system. These trends include increasing amounts of specialty chemicals for North Slope oilfield operations; the changing market of petroleum shipments; an increase in mining activities and potentially greater volumes of shipments of sodium cyanide and ammonium nitrate; and an increase in hazardous waste shipments. The ARRC expects the trends to continue for the next 20 years. The Anchorage to Fairbanks track segment carries the greatest volume of hazardous materials on the ARRC system. Mainly large quantities of Class 3 materials are transported between Fairbanks refineries and Anchorage bulk product handlers, which include Jet A fuel, diesel, gasoline, and naphtha products. From the ports, Class 1 explosives are transported via ARRC from Whittier and Seward to Portage, Portage to Anchorage, Anchorage to Fairbanks, and Fairbanks to Eielson. The ARRC reported that the majority of bulk hazardous materials that enter the rail system from outside of Alaska come through Whittier. The ARRC report states that explosives and blasting agents are a "small but significant segment of the total amount of hazardous materials" that they ship. The ARRC transports hazardous materials within the other eight hazard classes, including Class 6 toxic materials and infectious substances, Class 7 radioactive materials.

EHS Transport: Transportation of the prevalent EHS used at fixed facilities can be summarized as follows: The top six extremely hazardous substances transported in the State and the primary mode(s) of transportation are:

1. Anhydrous Ammonia – Transported via highway modes between Anchorage, Fairbanks, and Prudhoe Bay; Anchorage and Kenai, Seward, Homer, and between Anchorage and Seattle. Transported via marine modes to Anchorage, Dutch Harbor, and Kodiak ports.
2. Formaldehyde and Formaldehyde Solution – Transported via highway modes between Anchorage and Fairbanks, Kenai, Homer, Valdez, Seattle, and Prudhoe Bay and Fairbanks, Seattle and Dutch Harbor and Southeast.
3. Sulfuric Acid – Transported via highway mode between Anchorage and Fair-banks, Delta Junction, Prudhoe Bay, Anchorage and Kenai, Homer, Seward, Valdez, Wasilla, Anchorage and Kodiak, Seattle and Anchorage, Seattle and Fairbanks, and Tacoma and Anchorage.
4. Chlorine – Transported via highway mode between Anchorage and Fairbanks, Seattle and Fairbanks, Anchorage and Eagle River, Kenai, and Valdez, and Anchorage and Seattle.
5. Sodium Cyanide – Transported via highway mode between Anchorage and Fairbanks, Anchorage and Washington State. Transported in large quantities by railroad to gold mines in the Interior. The ARRC anticipates doubling the volume of sodium cyanide shipments, once the Pogo Mine begins operating.
6. Nitric Acid – Transported via highway mode between Anchorage and Fair-banks, Anchorage and Kenai, Seward, Fairbanks and Prudhoe Bay, Seattle and Anchorage, Seattle and Fairbanks, and Seattle and Southeast.

Hazardous Substances Transport: Common hazardous substances (HS) transported in the State include the following:

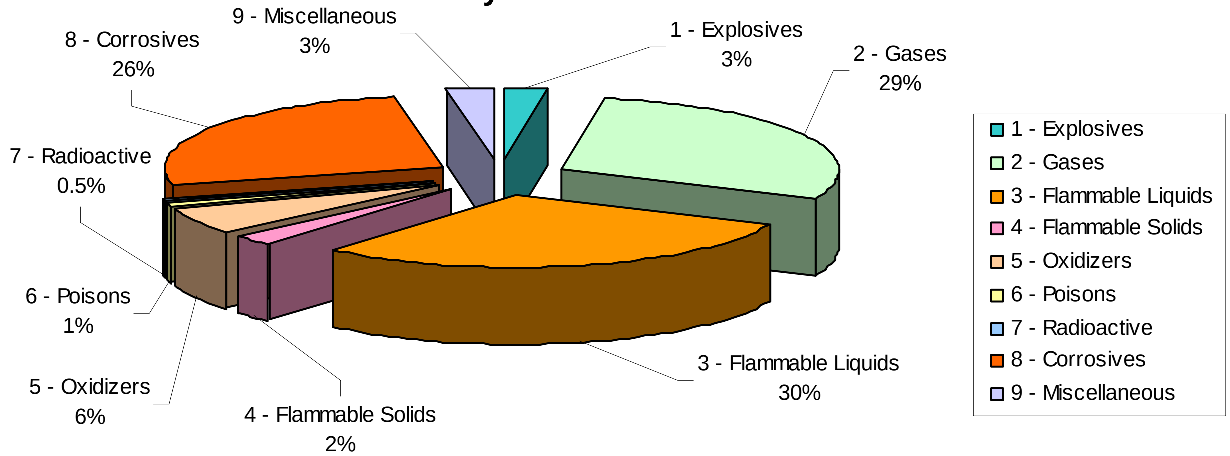
1. Acetylene – Transported via marine mode between Anchorage, Dutch Harbor, and Kodiak. Transported via highway mode between Anchorage and Fairbanks and Valdez; Fairbanks and Prudhoe Bay, Delta Junction; Seattle and Anchorage; Anchorage and Kenai; Kenai and Homer; Anchorage and Wasilla, Seward, and Valdez.
2. Oxygen – Transported via highway mode between Fairbanks, Kenai, and Palmer; compressed oxygen transported via highway mode between Anchorage and Fairbanks, Girdwood, Kenai, Seward, Valdez, Wasilla, and Kodiak; Fairbanks and Prudhoe Bay; Kenai and Homer; Seattle and Anchorage and Fairbanks; refrigerated oxygen transported via highway mode between Anchorage and Fairbanks, Kenai, and Seward.

3. Ethylene Glycol – Transported via highway mode between Anchorage, Fairbanks, and Prudhoe Bay.
4. Nitrogen – Transported via highway mode between Kenai, Fairbanks, and Prudhoe Bay. Compressed nitrogen transported via highway mode between Anchorage and Fairbanks, Girdwood, Kenai, Seward, Valdez, and Wasilla; Anchorage and Washington state; Fairbanks and Delta Junction, Prudhoe Bay; Seattle and Anchorage; Seattle and Southeast; Edmonton and Anchorage; Edmonton and Fairbanks. Refrigerated liquid nitrogen transported via highway mode between Seattle and Anchorage, Seattle and Southeast, and Seward and Anchorage. Also by vessel between Seattle and Alaska Southeast and Anchorage.
5. Argon and Argon Carbon Dioxide Gas – Transported via highway mode between Anchorage and Fairbanks, Kenai, Seward, Valdez, Wasilla; Anchorage and Washington state; Fairbanks and Prudhoe Bay; Fairbanks and Kenai and Homer; also by vessel between Seattle and Alaska Southeast and Anchorage.

Oil Transport: The most frequently reported oil commodities transported throughout the state, with the exception of commodities transported by major pipelines, include:

1. Fuel, aviation, turbine engine, Jet A – Transported via highway mode between Anchorage and Fairbanks, Anchorage and Kenai, Homer, Valdez, Fairbanks and Eielson AFB, Fairbanks and Prudhoe Bay, Kenai and Homer, and Seattle and Anchorage. Transported via marine route between Anchorage and Valdez Cordova and Valdez and Anchorage and Western Alaska ports.
2. Gasoline – Transported via highway mode between Anchorage and Fairbanks, Kenai, and Valdez; Fairbanks and Delta Junction, North Pole, Tok, Denali Park and Prudhoe Bay; Seattle and Anchorage; transported via marine route between Anchorage and Cordova, Valdez and Western Alaska ports; and transported via pipeline to Anchorage from Nikiski.
3. Diesel Fuel, Marine Diesel, Heating Oil #1 and Low Sulfur Insulating Oil – Transported via marine mode between Anchorage and Cordova, Valdez, Dutch Harbor and other locations throughout the State of Alaska. Transported via highway mode between Anchorage and Matanuska-Susitna Valley, Fairbanks, Prudhoe Bay, Kenai/Soldotna and Nikiski; Fairbanks and Prudhoe Bay and, North Pole. The ARRC reported that the Flint Hills Refinery uses the rail system to transport major quantities of hazardous materials from Fairbanks to Anchorage. These include petroleum products, such as Jet A fuel, diesel, gasoline and naphtha.

Figure 3: Statewide Summary of Hazmat Transportation by UN Hazard Class



United Nations Hazardous Materials Classification System: The following table (Table 3) summarizes the United Nations classification code system used with reference to the types of EHS and HS transported throughout the State:

TABLE 3: HAZARDOUS MATERIALS CLASSIFICATION

Class 1: Explosive Materials, 49CFR, Part 173.50 An ***explosive*** means any substance or article, unless otherwise classified, which is *(a)* designed to function by explosion, or *(b)* which (by chemical reaction within itself, is able to function in a similar manner even it not designed to function by explosion. ***Division 1.1*** consists of explosives which have a mass explosion hazard. A mass explosion is one which affects almost the entire load instantaneously. ***Division 1.2*** consists of explosives which have a projection hazard but not a mass explosion hazard. ***Division 1.3*** consists of explosives which have a fire hazard and either a minor blast hazard or a minor projection hazard, or both, but not a mass explosion hazard. ***Division 1.4*** consists of explosives which present a minor explosion hazard. The explosive effects are largely confined to the package, and no projection of fragments of appreciable size or range is to be expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package. ***Division 1.5*** consists of very insensitive explosives. This division is comprised of substances that have a mass explosion hazard, but they are so insensitive that they offer very little probability of initiation or of transition from burning to detonation under normal transport conditions. ***Division 1.6*** consists of extremely insensitive articles which lack a mass explosive hazard. This division is comprised of articles which contain only extremely insensitive detonating substances and which demonstrate a negligible probability of accidental initiation or propagation.
Class 2: Gas Materials, 49 CFR Part 173.115 ***Division 2.1*** means that any material that is a gas at 20C (68F) or less and 101.3 kPa (14.7 psi) of pressure, and that *(a)* is ignitable when in a mixture of 13% or less by volume with air, or *(b)* has a flammable range with air of at least 12%, regardless of the lower limit. ***Division 2.2*** materials are nonflammable, nonpoisonous compressed gases including compressed gas, liquefied gas, pressurized cryogenic gas and compressed gas in solution. They include any material or mixture that *(a)* exerts in the packaging an absolute pressure of 280 kPa (41psia or greater at 20C (68F), and *(b)* does not meet the definition of Divisions 2.1 and 2.3. ***Division 2.3*** materials are gases that are poisonous by inhalation and are *(a)* known to be so toxic to humans that they pose a health hazard dur8ing transportation, or *(b)* in the absence of adequate data on human toxicity, are presumed toxic to humans because when tested on laboratory animals they have an LC50 value of not more than 5000 ml/m^3.

Class 3: Flammable Liquid Materials, 49CFR Part 173.120

A **flammable** liquid is *(a)* any liquid having a flash point of not more than 60.5C (141F), or *(b)* any material in a liquid with a flash point at or above 37.8C (100F) that is intentionally heated and offered for transportation, or transported, at or above its flash point in a bulk packaging.

A distilled spirit of 140 proof or lower is considered to have a flash point no lower than 23C (73F).

A **combustible** liquid is any liquid that does not meet the definition of any other hazard class and has a flash point above 60.5C (141F) and below 93C (200F). The classification of a material as a combustible liquid is strictly for transportation within the United States and is not recognized internationally. However, *49CFR Part 173.120(b)(2)* provides for Class 3 Flammable Materials with flash points at or above 38C (100F) and up to 60.5C (141F) which do not meet the definition of any other hazard class, to be reclassified as *combustible liquids* for transportation by highway and rail. For shipments involving any air, water, or international movement, these materials are Class 3 Flammable Materials.

Class 4: Flammable Solid Materials, 49CFR Part 173.124

Division 4.1 **Flammable Solid** includes any of the following three types of flammable solid material:

Wetted explosives, which, when dry, are explosives of Class 1, other than those of compatibility group A, which, when wetted, suppress the explosive properties, and materials specifically authorized by name in the HMT or by the Associate Administrator for Hazardous Materials Safety.

Self-reactive materials that are liable to undergo, at normal or elevated temperatures, a strongly exothermal decomposition caused by excessively high transport temperatures or by contamination.

Readily combustible solids that may *(a)* cause a fire through friction, or *(b)* show a burning rate faster than 2.2 mm (0.087 inch) per second under specified test procedures, or any metal powders that can be ignited and react over the whole length of a sample in ten minutes or less under specified test procedures.

Division 4.2 **Spontaneously Combustible** material includes *(a)* liquid or solid pyrophoric material, which (even in small quantities and without an external ignition source), can ignite within five minutes after coming in contact with air under specified test procedures, or *(b)* self heating material which (when in contact with air and without an energy supply), is liable to self-heat and which exhibits spontaneous ignition, or under specified test procedures would be classed as a Division 4.2 material.

Division 4.3 **Dangerous When Wet** material are ones which *(a)* by contact with water is liable to become spontaneously flammable, or *(b)* give off flammable or toxic gas at a rate greater than one liter per kilogram of material per hour under specified test procedures.

Class 5: Oxidizer and Organic Peroxide Materials, 49CFR Parts 173.127 and 128

Division 5.1 **Oxidizer** material is a material which may (generally by yielding oxygen), cause or enhance the combustion of other materials.

Division 5.2 **Organic Peroxide** material is any organic compound containing oxygen *(O)* in the bivalent *-O-O-* structure which may be considered a derivative of hydrogen peroxide, where one or more of the hydrogen atoms have been replaced by organic radicals, with some exceptions.

Class 6: Poison Materials, 49CFR Parts 173.132 and 134

Division 6.1 those materials, other than gases, which *(a)* are known to be so toxic to humans as to afford a hazard to health during transportation, or *(b)* in the absence of adequate data on human toxicity, are presumed to be toxic to humans because they fall within specified oral, dermal, or inhalation toxicity ranges when tested on laboratory animals, or (c) are irritating materials (with properties similar to tear gas), which cause extreme irritation, especially in confined spaces.

Division 6.2 materials are *(a)* infectious substances which are viable microorganisms (or their toxins) which cause or may cause disease in humans or animals., *(b)* those agents listed in 42CFR part 72.3 of the Department of Health and Human Services regulations, or *(c)* any other agents which cause or may cause severe disabling or fatal disease.

Class 7: Radioactive Materials, 49CFR Part 173.403

Radioactive Material is any material having a specific activity greater than 0.002 micro curie per gram (MCi/g).

Class 8: Corrosive Materials, 49CFR Part 173.136

A **Corrosive Material** is a liquid or solid which causes visible destruction or irreversible alteration in human skin tissue at the site of contact, or a liquid which has a severe corrosion rate on steel or aluminum in accordance with specified criteria.

Class 9: Miscellaneous Materials, 49CFR Part 173.140

A **Miscellaneous Hazardous Material** is one which presents a hazard during transportation but does not meet the definition of any other hazard class. This includes *(a)* any material which has an anesthetic, noxious, or other similar property which could cause extreme annoyance or discomfort to any employee so as to prevent the performance of assigned duties, or *(b)* any material which meets the definition in 49CFR Part 171.8 for an elevated temperature.

Other Regulated Materials (ORM-D): 49CFR Part 173.144

An **ORM-D Material** is a material such as a consumer commodity, which (although otherwise subject to the regulations) presents a limited hazard during transportation because of its form, quantity, and packaging. It must be a material for which exceptions are provided in the HMT. In addition to the limited quantity exceptions from labeling, specification packaging and placarding, ORM-D materials are also excepted from the shipping paper requirements unless the material is a hazardous substance, hazardous waste, marine pollutant, or the material is offered or intended for transport by air.

APPENDIX V – CHEMICAL RISK AND RELEASE HISTORY

The chemical risk in the Cook Inlet Subarea, and particularly the Municipality of Anchorage and Kenai Local Emergency Planning Districts, eclipses the combined risk for the rest of the state. Interestingly, the subarea with the next greatest risk is Southeast Alaska, due to the widespread use of chlorine gas for water treatment and the use of sulfur dioxide for wastewater treatment. In terms of chemical risk, the Southeast Subarea is followed by Kodiak and Interior Alaska. Chemical risk in Kodiak is largely a result of the use of chlorine gas for water treatment, and the relatively large number of seafood processors using chlorine and anhydrous ammonia. The risk in the Interior Alaska Subarea is nearly exclusively confined to the Fairbanks North Star Borough and is likely underestimated since identification of chemical substances in the area is not as complete as for other areas.

Another way to examine the distribution of chemical risk is to look at the risk associated with each of the compressed toxic gases. From this perspective, chlorine gas, by far, presents the greatest chemical threat to community populations in Alaska. Here again, the high risk ranking is primarily due to the chemical's presence at municipal facilities in highly populated areas. The risk associated with use and storage of anhydrous ammonia, is also substantial.

As a rule-of-thumb for depicting chemical risks in Alaska, the two compressed gases of chlorine and anhydrous ammonia pose the greatest risk: Risk associated with release of chlorine is approximately four times that associated with anhydrous ammonia.

Sulfur dioxide releases are nearly non-existent in the state following the closure of the pulp mills in Sitka and Ketchikan in the 1996-1997 timeframe.

For the most recent summary of EHS releases by Calendar Year, visit the ADEC website at:

http://dec.alaska.gov/spar/perp/hazmat.htm

Summary of EHS Releases (July 1, 1995 through June 30, 2005)

Source: ADEC Spills Database

Over a period of ten years (July 1, 1995 thru June 30, 2005) a total of 485 EHS releases have occurred in the State, or approximately 49 incidents per year. The majority of these incidents involved minor EHS releases of approximately one pound. Table 4 below denotes the number of releases by EHS chemical, while Figure 4 depicts the top 5 chemicals plus an "Other" category to capture the lesser chemical release incidents.

Table 5 and Figure 5 on the next page provide data depicting the number of chemical releases by the subareas of the State.

Table 4: Total EHS Releases by Chemical	Total Count
Ammonia (Anhydrous)	196
Chlorine	80
Formaldehyde	2
Hydrazine (Anhydrous)	1
Hydrochloric Acid	15
Hydrofluoric Acid	2
Hydrogen Peroxide	6
Hydrogen Sulfide	2
Phosphoric Acid, Dimethyl 4-(Methylthio)	1
Sodium Azide (Solid)	1
Sodium Cyanide (Solid)	2
Sodium Cyanide (Solution)	6
Sulfur (Dioxide)	96
Sulfuric Acid	70
Toluene 2,4-Diisocyanate	4
Total	485

Figure 4: EHS Releases by Chemical

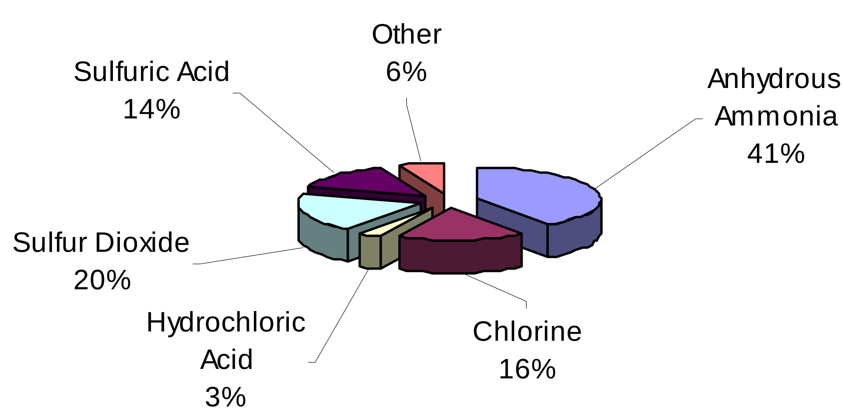
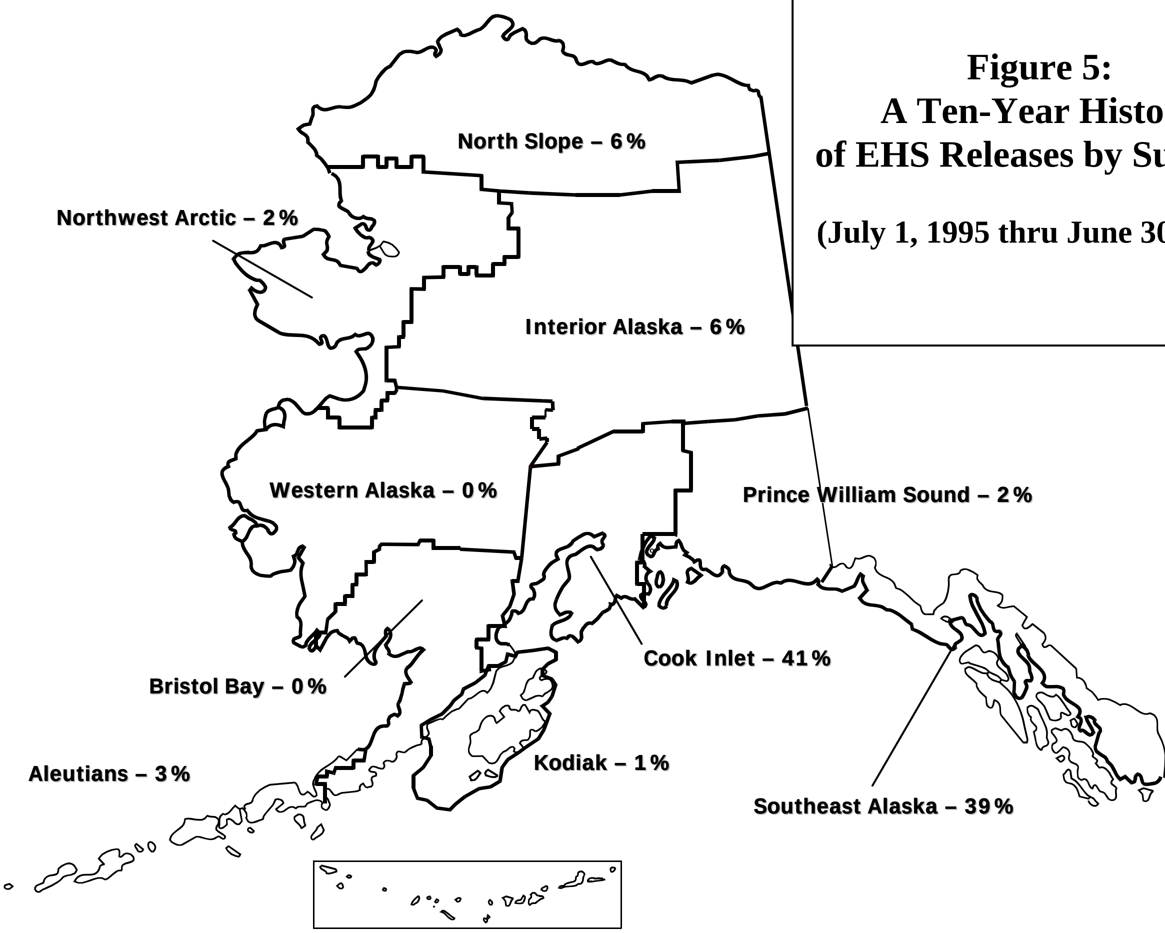


Table 5: EHS Releases by Subarea			
Subarea	**count**	**gallons**	**pounds**
Aleutian	15	380	8,012
Bristol Bay	2		31
Cook Inlet	196	25,366	349,271
Interior Alaska	27	1,432	
Kodiak Island	6	38	1
North Slope	28	2,050	500
Northwest Arctic	9	221	
Prince William Sound	12	13	28
Southeast Alaska	188	1,058	7,055
Western Alaska	2	10	1
TOTAL	485	30,568	364,899

Figure 5:
A Ten-Year History
of EHS Releases by Subarea

(July 1, 1995 thru June 30, 2005)



The following table summarizes the major EHS releases in the state over the ten-year period. There were a total of 55 EHS releases greater than 1,000 pounds, or roughly 5 to 6 significant releases per year.

Table 6: Significant EHS Releases (1,000 lbs or greater) – July 1, 1995 to June 30, 2005

Spill Date	EHS Substance	Qty Released (lbs)	Cause	Facility Type	Location	Subarea
4/21/1998	Ammonia (Anhydrous)	49,605 lb	Valve Failure	Refinery	Kenai City	Cook Inlet
7/1/1998	Ammonia (Anhydrous)	35,000 lb	Explosion	Cannery	Homer City	Cook Inlet
10/31/1997	Ammonia (Anhydrous)	20,000 lb	Human Error	Refinery	Kenai City	Cook Inlet
10/24/1997	Ammonia (Anhydrous)	17,946 lb	Valve Failure	Refinery	Kenai City	Cook Inlet
10/30/1995	Ammonia (Anhydrous)	16,215 lb	Valve Failure	Refinery	Central Kenai	Cook Inlet
3/25/1997	Ammonia (Anhydrous)	13,806 lb	Valve Failure	Refinery	Kenai City	Cook Inlet
7/21/2004	Ammonia (Anhydrous)	13,200 lb	Human Error	Other	Kenai City	Cook Inlet
3/2/1996	Ammonia (Anhydrous)	12,135 lb	Overfill	Refinery	Central Kenai	Cook Inlet
5/13/1997	Ammonia (Anhydrous)	12,000 lb	Overfill	Refinery	Kenai City	Cook Inlet
2/1/1996	Ammonia (Anhydrous)	11,000 lb	Human Error	Refinery	Central Kenai	Cook Inlet
3/28/1997	Ammonia (Anhydrous)	11,000 lb	Valve Failure	Refinery	Kenai City	Cook Inlet
1/24/1997	Ammonia (Anhydrous)	10,000 lb	Overfill	Refinery	Kenai City	Cook Inlet
6/20/1997	Ammonia (Anhydrous)	9,016 lb		Refinery	Kenai City	Cook Inlet
6/8/1996	Ammonia (Anhydrous)	8,943 lb	Unknown	Refinery	Kenai City	Cook Inlet
2/19/1996	Ammonia (Anhydrous)	8,700 lb	Seal Failure	Refinery	Kenai City	Cook Inlet
9/17/2000	Ammonia (Anhydrous)	7,800 gal	Unknown	Unknown	Kenai City	Cook Inlet
7/18/1998	Ammonia (Anhydrous)	7,134 lb	Overfill	Refinery	Kenai City	Cook Inlet
12/16/2000	Ammonia (Anhydrous)	7,000 gal	Other	Other	Kenai City	Cook Inlet
6/18/1996	Ammonia (Anhydrous)	6,006 lb	Unknown	Refinery	Kenai City	Cook Inlet
1/20/2005	Ammonia (Anhydrous)	5,800 lb	Eqpt Failure	Other	Nikiski	Cook Inlet
11/1/1996	Ammonia (Anhydrous)	5,040 lb	Overfill	Refinery	Kenai City	Cook Inlet
5/15/1997	Ammonia (Anhydrous)	5,000 lb	Overfill	Refinery	Kenai City	Cook Inlet
9/11/1998	Ammonia (Anhydrous)	5,000 lb	Overfill	Refinery	Kenai City	Cook Inlet
7/27/2001	Ammonia (Anhydrous)	5,000 gal	Overfill	Other	Kenai City	Cook Inlet
5/18/1997	Ammonia (Anhydrous)	4,999 lb	Overfill	Refinery	Kenai City	Cook Inlet
11/7/1997	Ammonia (Anhydrous)	4,158 lb	Human Error	Refinery	Kenai City	Cook Inlet
12/16/1995	Ammonia (Anhydrous)	4,000 lb	Overfill	Refinery	Central Kenai	Cook Inlet
10/12/1996	Ammonia (Anhydrous)	4,000 lb	Overfill	Vessel	Eastern Chain	Aleutian
11/11/1995	Ammonia (Anhydrous)	3,389 lb	Valve Failure	Refinery	Central Kenai	Cook Inlet
10/5/1995	Ammonia (Anhydrous)	3,377 lb	Leak	Refinery	Central Kenai	Cook Inlet
5/16/1997	Ammonia (Anhydrous)	3,000 lb	Overfill	Refinery	Kenai City	Cook Inlet
10/4/1997	Ammonia (Anhydrous)	3,000 lb	Other	Vessel	Ketchikan	SE Alaska
2/13/1996	Ammonia (Anhydrous)	2,978 lb	Overfill	Refinery	Central Kenai	Cook Inlet
6/17/1996	Ammonia (Anhydrous)	2,772 lb	Valve Failure	Refinery	Kenai City	Cook Inlet
7/15/1996	Ammonia (Anhydrous)	2,685 lb	Valve Failure	Refinery	Kenai City	Cook Inlet
10/13/1996	Ammonia (Anhydrous)	2,500 lb	Unknown	Refinery	Kenai City	Cook Inlet
1/22/1996	Ammonia (Anhydrous)	2,049 lb	Overfill	Refinery	Central Kenai	Cook Inlet
1/19/1997	Ammonia (Anhydrous)	2,000 lb	Overfill	Refinery	Kenai City	Cook Inlet
11/4/1997	Ammonia (Anhydrous)	2,000 lb	Valve Failure	Refinery	Kenai City	Cook Inlet
12/21/1996	Ammonia (Anhydrous)	1,999 lb	Overfill	Refinery	Kenai City	Cook Inlet

Spill Date	EHS Substance	Qty Released (lbs)	Cause	Facility Type	Location	Subarea
10/30/2001	Hydrochloric Acid	1,764 gal	Human Error	Vehicle	W Prudhoe Bay	North Slope
9/19/2000	Ammonia (Anhydrous)	1,700 gal	Unknown	Unknown	Kenai City	Cook Inlet
6/15/1996	Ammonia (Anhydrous)	1,645 lb	Valve Failure	Refinery	Kenai City	Cook Inlet
6/17/1996	Ammonia (Anhydrous)	1,617 lb	Valve Failure	Refinery	Kenai City	Cook Inlet
11/10/1996	Ammonia (Anhydrous)	1,527 lb	Overfill	Refinery	Kenai City	Cook Inlet
12/3/1995	Ammonia (Anhydrous)	1,500 lb	Line Failure	Cannery	Western Chain	Aleutian
7/14/1996	Ammonia (Anhydrous)	1,500 lb	Unknown	Refinery	Kenai City	Cook Inlet
9/5/1996	Ammonia (Anhydrous)	1,500 lb	Unknown	Vessel	Eastern Chain	Aleutian
5/14/1998	Ammonia (Anhydrous)	1,359 lb	Valve Failure	Refinery	Kenai City	Cook Inlet
9/18/2000	Ammonia (Anhydrous)	1,300 gal	Other	Other	Kenai City	Cook Inlet
5/15/1997	Ammonia (Anhydrous)	1,108 lb	Overfill	Refinery	Kenai City	Cook Inlet
11/28/1998	Ammonia (Anhydrous)	1,065 lb	Overfill	Refinery	Kenai City	Cook Inlet
1/29/1997	Ammonia (Anhydrous)	1,046 lb	Unknown	Refinery	Kenai City	Cook Inlet
11/4/1997	Ammonia (Anhydrous)	1,000 lb	Overfill	Refinery	Kenai City	Cook Inlet
2/12/2000	Ammonia (Anhydrous)	1,000 gal	Unknown	Refinery	Kenai Gas Field	Cook Inlet

APPENDIX VI – RESPONSE CAPABILITY

1. General

The Statewide Hazards Analysis noted serious deficiencies in the State's ability to respond to a hazardous materials incident. The limited offensive response capability is inadequate, and areas exist with significant risks and no response capability.

Many of the Local Emergency Planning Committees are making progress towards defensive response capability by developing or maintaining viable local response plans. Focusing on offensive Hazmat response capability, areas with a high degree of risk and no offensive response capability include the City and Borough of Sitka, and the Petersburg/Wrangell planning district. Areas with substantial risk and no or limited offensive response capability include the Northern Southeast and the Southern Southeast planning districts, the Kenai Peninsula Borough, the Aleutians East Borough, the Aleutian and Pribilof Islands planning districts, the Bristol Bay planning district, and the Northwest Arctic Borough.

Several Level A/B Hazmat response capability studies have been conducted by the Alaska Department of Environmental Conservation through contracts with Easton Environmental (May 1995), and Hart Crowser (June 1999).

In the 1995 Easton study, a total of 97 state, federal, local, and industry organizations were contacted, of which 34 organizations indicated they had level A/B response resources. Eighteen organizations responded with completed questionnaires. An additional five organizations were thought to have level A/B response resources. While the survey undoubtedly does not comprise a comprehensive inventory of A/B resources, the included facilities are thought to represent the major repositories of those resources. For example, not included (with the exception of UniSea's resources at Dutch Harbor and St. Paul) are the A/B resources at the numerous seafood processing facilities around the state. In talking with the processors, most indicated that resources are limited to those required to meet OSHA requirements and are very chemical- and facility-specific. There are undoubtedly small stores of OSHA-required equipment at other facilities such as municipal water treatment facilities as well.

2. Current Level A/B Response Capability

a. Federal: The Pacific Strike Team (located at Novato, California) maintains a Level A entry capability and may be requested by the Federal On-Scene Coordinator to respond to incidents in Alaska. The Strike Team maintains an alert standby posture and can be deployed to Alaska locations within 24 hours (weather permitting).

The U.S. Environmental Protection Agency capabilities include the use of EPA Superfund Technical Assistance and Response Teams located in Alaska and the lower 48 states. Additionally, the Coast Guard and EPA may call upon the Department of Defense's Alaskan Command (as a member of the Alaska Regional Response Team) to provide Hazmat response resources (teams and equipment) from Elmendorf Air Force Base and Eielson Air Force Base.

b. State: The Alaska Department of Environmental Conservation (ADEC) is mandated by statute to respond promptly to a discharge of oil or a hazardous substance (AS 46.08.130). The ADEC may contract with a person, business or municipality in order to meet response requirements, or may establish and maintain a containment and cleanup capability (i.e., personnel, equipment and supplies).

Presently, the ADEC has no Level A or B Hazmat response capability, although there is some possibility that ADEC response term contractors could be mobilized out of Anchorage in time to assist in certain Hazmat responses. The ADEC has some monitoring equipment in Anchorage and Fairbanks and there is some capacity for the agency to assist local or nearby response efforts by monitoring airborne contaminant levels.

As an alternative measure, the ADEC has negotiated response agreements with local communities to enhance oil and hazardous substance response capabilities through the use of existing local resources. The ADEC will, in turn, reimburse the responding local community for expenses incurred during the response. Under the provisions of the local response agreement, the local community reserves the right to refuse an SOSC's request to respond based on local conditions and overall readiness capability.

The ADEC has formally entered into local response agreements with the Fairbanks North Star Borough (FNSB), the Municipality of Anchorage (MOA), the City of Valdez, and the City of Kodiak whereby the local Hazmat team may elect to respond on the State's behalf to an incident when requested by the State On-Scene Coordinator. These agreements address Hazmat responses beyond the normal jurisdictional boundaries of the FNSB, MOA, the City of Valdez, and the City of Kodiak.

c. Level A/B Response Resource Summary: Table 7 summarizes some of the key characteristics of the 18 organizations with substantial A/B resources. It is important to note that not all of the organizations are actually organized into response teams. Some, for example, have substantial equipment and offer technical services, but are not primary responders. Others limit their response to defensive-type operations despite having entry-type training and gear. Of the 18 organizations, there are 13 that comprise level A/B response teams, and another five level-B-only teams. Known level A and B entry teams and detection equipment assets are shown in Tables 8 and 9, respectively. Figure 6 provides a map that summarizes the current locations of in-state Level A response capabilities.

It is also interesting to examine the distribution of level A and B response capability in relation to the locations where EHS are found -- which can be roughly equated to the locations where a level A or B response might be required.

Resources may include trained personnel, equipment, or both. Personnel and equipment already organized as Hazmat teams, of course, are the most formidable resources. The inventory, however, seeks also to identify significant stores of A/B response equipment in the absence of trained personnel, and vice versa. Such information may prove valuable when looking at ways to expand A/B response capabilities.

Aside from the task of developing options for a state-wide A/B response capability, the inventory is beneficial in many respects. In the unlikely event of a large, or even catastrophic, release of some sort, knowing what additional resources are located in the area could be important. Organizations with A/B response resources should also take the opportunity to compare their strategies and resources with those of other organizations.

d. Personnel: Sources of Hazmat response personnel fell into relatively distinct categories depending on the type of organization. Municipal organizations draw their Hazmat personnel primarily from local fire departments. In most cases, Hazmat response is simply one function of the local fire department(s) -- along with firefighting, other forms of disaster management and emergency medical services. Fire department Hazmat personnel include both paid and volunteer members.

Federal organizations with Hazmat response capability draw members from defense installation fire departments. The military fire departments often include both military and civilian personnel.

Industry organizations with Hazmat response capability draw personnel from two areas: facility workers and industry fire departments. The single exception is Philip Environmental, which draws emergency response personnel from their pool of Hazmat site and tank workers.

e. Equipment:

(1) Personal Protection Equipment (PPE): The reported number of self-contained breathing

apparatus (SCBAs) varied with the size of response organization from 3 to 140. Where reported, spare bottles are available at a ratio of between one spare for each unit to one spare for each two units. The Life-Guard Responder is by far the most common level A suit. The B suits are largely Tyvek/SARANEX products.

(2) Source Control Kits: Chlorine kits are common where a chlorine release is of concern. In most cases, response organizations reported that they have at least one kit for the predominant chlorine container size(s) in the area (or at the facility). Most organizations also have generic pipe and drum plug and patch tools and materials.

(3) Gas Detection and Monitoring: Essentially all organizations have electronic gas detection and monitoring equipment capable of at least measuring LEL, O_2, H_2S, and CO concentrations. The variety in the types of equipment reported reflects the large number of manufacturers offering portable gas measuring equipment. For a complete listing of detection equipment maintained by Hazmat Teams, see Table 9.

f. Transport Capability: In most cases, Hazmat response equipment is pre-staged in either a trailer or utility vehicle. For the most part, the gear is air transportable, though none of the organizations currently use aircraft as a primary means of mobilizing personnel and equipment. Based on the restrictions imposed by commercial airlines on certain response equipment (e.g., air cylinders), the Coast Guard and State are currently exploring other means for rapidly air deploying a Level A Hazmat team to a major release. Mobile cascading systems (SCBA refill systems) are available in Anchorage thru the Anchorage Hazmat Team and the 103rd Civil Support Team and in Fairbanks thru the Fairbanks Hazmat Team.

g. Response Areas and Frequencies

(1) Response Area: In nearly all cases formal response areas were limited to jurisdictional boundaries: local responders indicated that they will respond within city or borough limits, military organizations will respond within installation boundaries, industry personnel will respond inside the facility perimeter. The Fairbanks, Anchorage, Valdez, and Kodiak Hazmat Teams, through the local response agreements negotiated with ADEC, may elect to respond beyond jurisdictional boundaries (at the SOSC's request and with the concurrence of local officials). The 103rd Civil Support Team is available for statewide deployment, as well.

While response areas are fairly clear-cut, several local organizations indicated that they would provide support upon request of another district with or without a mutual aid agreement under severe circumstances. Industry organizations were most emphatic about extra-jurisdictional response indicating that liability concerns would prohibit a response to other than a facility release. In most cases, however, industry allows its staff to serves as volunteers to local fire departments where duties may include Hazmat response. In some cases, private organizations are willing to loan equipment and serve as technical resources to other response personnel.

(2) Response Frequency: There is a wide range in the number of actual Hazmat responses conducted by Hazmat teams in Alaska. At one end, the Municipality of Anchorage Fire Department Hazmat team responded to approximately 20-25 Hazmat incidents ranging from carbon monoxide calls to chlorine and ammonia releases. The Fairbanks Hazmat Team averages approximately 10-15 Hazmat responses each year. Most of their responses are smaller spills, though they occasionally respond to one or two major responses per year.

h. Administrative and Response Support – Databases and Plume Prediction: The vast majority of response organizations use CAMEO/ALOHA. Several had the programs loaded on a portable computer. MSDSs are usually on file in hard copy form. The UAF Risk Management team indicated that they use the TOMES data base. The Anchorage Fire Department also uses TOMES and has weather monitoring capabilities for on-site meteorological monitoring.

i. Availability: Regarding the availability of personnel and equipment on extra-jurisdictional releases, the response from the industry organizations is clear: due primarily to liability concerns, industry personnel resources are not able to respond to extra-jurisdictional spills. For those industry organizations that draw Hazmat team members from their everyday work force, the effect on operations is also an obvious and important concern. In some cases, industry organizations would (and do) make their equipment available to others, and allow their personnel to serve as technical resources. In most, if not all, cases, industry Hazmat personnel are free to provide Hazmat response as volunteer members of the local fire department.

In the case of government organizations, liability also tends to restrict availability, as does team size, logistics and budget. In some cases, requests for resources on extra-jurisdictional releases are considered on a case-by-case basis; two organizations have indicated that they would consider expansion of their response areas under formal response agreements with the State. The Fairbanks North Star Borough, the Municipality of Anchorage, the City of Valdez, and the City of Kodiak have negotiated such agreements with the ADEC.

3. General Response Objectives

As with the risk assessment, the statewide response capability assessment focuses on large scale releases of toxic gases. While the need for and type of response will depend on the particular substance released, the amount released, the release duration and a number of other factors, a simplified standard was developed to evaluate response capability. The standard consists of two objectives, and response capability is defined as the degree to which each of the two objectives can be met:

Defensive Response Objective. Detect the release and initiate immediate defensive measures including agency and public notification, plume movement prediction, and evacuation and shelter-in-place of the public.

Offensive Response Objective. Provide offensive measures including testing and monitoring chemical concentrations, setting hazard zones, entering hazardous atmospheres, and controlling the release.

A number of other objectives, of course, may have to be met during an actual response, such as providing medical care, firefighting capability, and decontamination. While all response elements are potentially important, examining the planning and resources needed to meet the above key objectives helps to focus the analysis.

While the first objective would apply for all toxic gas releases in populated areas, the second objective will not always be required or feasible. Offensive response may not be feasible, for example, for short duration releases. It is assumed, however, that there should be some offensive response capability wherever there are substantial risks.

4. General Response Capability Indicators

In specifying plans and resources required to meet the key offensive and defensive objectives, it is again necessary to simplify and focus on a few key items that can be used as indicators of response capability. The mere presence of certain plans or resources does not, of course, mean that a successful response will always occur. On the other hand, a successful response -- one that meets response objectives -- is highly unlikely in the absence of these key plans and resources.

The indicator of defensive response capability selected for the analysis is the existence of local emergency response plans that identify the hazards and at-risk facilities and populations, and contain specific procedures for notification, plume tracking, evacuation and shelter-in-place.

The in-state offensive response capability was discussed earlier and is based on the existence of a Level A/B Hazmat team available to respond within two to four hours of notification.

The State Emergency Response Commission has reviewed most local emergency response plans, including those for the Fairbanks North Star Borough, the City of Petersburg, the Ketchikan Gateway Borough, Municipality of Anchorage, and the southern zone of the Kenai Peninsula Borough. Many unorganized areas of the state have developed local emergency response plans that provide specific procedures for release detection, agency and public notification, plume movement prediction, and evacuation and shelter-in-place.

The distribution of offensive response capability was previously described. The Municipality of Anchorage, the area with the highest risk, is also the area where offensive response capability is greatest. The Municipality of Anchorage, the Fairbanks North Star Borough, the City of Valdez, the City of Kodiak, the City and Borough of Juneau, and the Ketchikan Gateway Borough have functioning Hazmat response teams to serve the local community. The Municipality of Anchorage Fire Department Hazmat response team also may respond to incidents in the Kenai and the Matanuska-Susitna boroughs upon request to and approval by the MOA Fire Chief, subject to conditions specified in the governing agreement, thereby providing some coverage in those areas. As stated previously, the FNSB, MOA, Valdez, and Kodiak Hazmat Teams may elect to respond beyond jurisdictional boundaries when requested by the ADEC SOSC, as per signed agreements.

Table 7: Response Resource Summary

			RESPONSE MODES			PERSONNEL			PPE		
ORGANIZATION	RESPONSE AREA	TYPE	A ENTRY	B ENTRY	NON-ENTRY	SOURCE	TOTAL NO.	24-HR CALL	SCBA	A SUITS	B SUITS
103rd Civil Support Team (Alaska National Guard)	Statewide	State/ Military	Yes	Yes	Yes	AKNG	22	Yes	Yes	Yes	Yes
Anchorage Fire Department	Municipality of Anchorage; Other locations in Alaska at request of SOSC	Municipal	Yes	Yes	Yes	Mun FD	46	Yes	140	>24	>24
CPAI, Prudhoe Bay Unit - Eastern Operating Area	Prudhoe Bay Unit - Eastern Operating Area, mutual aid to other area facilities	Industry	Yes	Yes	Yes	Empl	8-10	Yes	6	8	16
Cook Inlet Spill Prevention and Response Inc. (CISPRI)	Cook Inlet	Industry	No	Yes	Yes	Empl	8	Yes	6	0	Many
EPA Alaska Operations Office	Statewide	Federal	Yes	Yes	Yes	Empl & contract	8	Yes	34	8	>10
Elmendorf AFB	Facility	Federal	Yes	Yes	Yes	Facility FD	--	Yes	Yes	Yes	Yes
Eielson AFB	Facility	Federal	Yes	No	Yes	Facility FD	17	Yes	NS	8	0
Fairbanks North Star Borough Hazardous Materials Response Team	Fairbanks North Star Borough; Other locations in Alaska at request of SOSC	Municipal	Yes	Yes	Yes	Misc.	24-30	Yes	27	12	27

			RESPONSE MODES			PERSONNEL			PPE		
ORGANIZATION	RESPONSE AREA	TYPE	A ENTRY	B ENTRY	NON-ENTRY	SOURCE	TOTAL NO.	24-HR CALL	SCBA	A SUITS	B SUITS
Forty Niner Remediation & Oil Spill Group	Statewide, with contract	Industry	Yes	Yes	Yes	Empl	5	Yes	2	6	NS
Ketchikan Fire Department	Ketchikan Gateway Borough	Municipal	Yes	Yes	Yes	Mun FD	30	Yes	30	0	30
95th Chemical Co. (US Army)	Facility	Military	Yes	Yes	Yes	Empl	--	Yes	Yes	--	Yes
Kodiak Fire Department	Statewide, with contract	Municipal	Yes	Yes	Yes	Mun/ Vol FD	40	Yes	4	6	6
Phillip Services Corp.	Statewide, with contract	Industry	Yes	Yes	Yes	Empl	NS	Yes	4	4	6
Space Mark Inc., USCG Integrated Support Command Kodiak	Facility	Federal	Yes	Yes	Yes	Empl	42	Yes	12	6	62
Tesoro Alaska Petroleum Co., Kenai Refinery	Facility	Industry	Yes	Yes	Yes	Empl	12	Yes	35	2	Many
Unalaska Fire Department	Unalaska city limits	Municipal	No	Yes	Yes	Mun/ Vol FD	12	Yes	10	0	12
University of Alaska Fairbanks Fire Department	UAF Campus, Other UA property, FNSB mutual aid	State	No	Yes	Yes	Facility FD	48	Yes	8+	0	80
Unocal Alaska Resources, Nikiski Plant	Facility	Industry	Yes	Yes	Yes	Empl	25-30	Yes	47	19	35
Valdez Hazmat Team	City of Valdez	Municipal	Yes	Yes	Yes	Mun/ Vol FD	24-30	Yes	27	12	27
Westward Seafoods, Dutch Harbor	Facility	Industry	No	Yes	Yes	Empl	20	Yes	4	0	NS

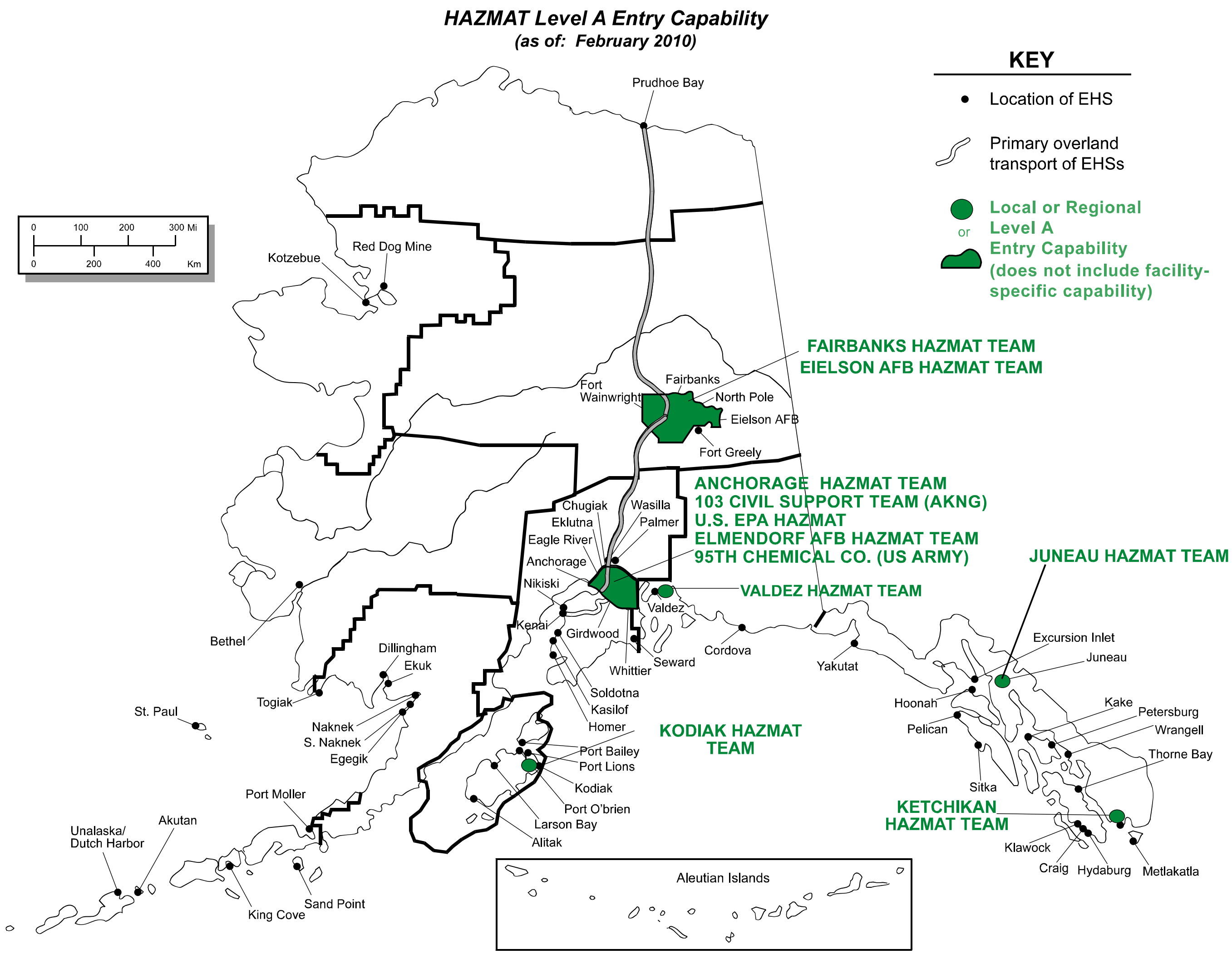
Abbreviations used in table:

AKNG: AK National Guard
Mun: Municipal
SOSC: State On-Scene Coordinator
Empl: Employees
NS: Not specified
UAF: University of Alaska Fairbanks
FD: Fire department
PPE: Personal Protective Equipment
Vol: Volunteer
FNSB: Fairbanks North Star Borough
SCBA: Self-Contained Breathing Apparatus

Table 8: Level A/B Entry Teams

ORGANIZATION	RESPONSE AREA	TYPE	TOTAL PERSONNEL
Anchorage Fire Department	Statewide	Municipal	45
103rd Civil Support Team (CST) (Alaska National Guard) WMD	Statewide	State/ Military	22
CPAI Alaska, Prudhoe Bay Unit - Eastern Operating Area	Prudhoe Bay Unit - EOA, mutual aid to other facilities	Industry	8-10
Clear Air Force Station	Facility, mutual aid to Anderson, Nenana and ADNR Forestry	Federal	24
Elmendorf AFB	Facility, mutual aid	Federal	
Eielson AFB	Facility	Federal	17
95th Chemical Company (US Army)	Facility, mutual aid	Federal	
EPA Alaska Operations Office	Statewide	Federal	8
Fairbanks North Star Borough Hazardous Materials Response Team	Statewide	Borough	24-30
Juneau Hazmat Team	Local jurisdiction	Borough	
Ketchikan Hazmat Team	Local jurisdiction	Borough	20-25
Kodiak Hazmat Team	Statewide	Municipal	40
Space Mark Inc., U.SCG Integrated Support Command Kodiak	Facility	Federal	42
Tesoro Alaska Petroleum Co., Kenai Refinery	Facility	Industry	12
Unocal Alaska Resources, Nikiski Plant	Facility	Industry	25-30
Valdez Hazmat Team	Local jurisdiction	Municipal	15-20

Figure 6: Statewide Hazmat Level A Entry Capability



<u>For a current listing of Hazmat detection equipment and other assets, visit the ADEC website at:</u>

http://dec.alaska.gov/spar/perp/hazmat.htm

APPENDIX VII – STATEWIDE DECONTAMINATION CAPABILITY

Collapsible Rigid-Frame Tent Systems (Main System and Deployable System): These collapsible, rigid frame tent systems are erected at the field decontamination (decon) site, supported with heater systems and soap and water. This three-tent system is the decon system for major population areas.

The main system is pre-positioned in communities with high population densities or risks, and where a operational Level A team exists to provide support with use of the system. The system would consist of the three-tent configuration with a trailer for storage and transport. The communities equipped with main decon systems include Anchorage (2), Fairbanks (2), Kenai (1), Mat-Su Valley (1), and Valdez (1). Anchorage and Fairbanks maintain a second system in deployable configuration for responses elsewhere in the state.

The systems may be collocated with local hospitals to assist with contaminated individuals either self-transported or transported to the hospital via ambulances for decontamination (for both expedient as well as complete decontamination.) Further coordination is on-going with local hospitals and State medical staff to further develop and enhance the overall mass decontamination capabilities in the state.

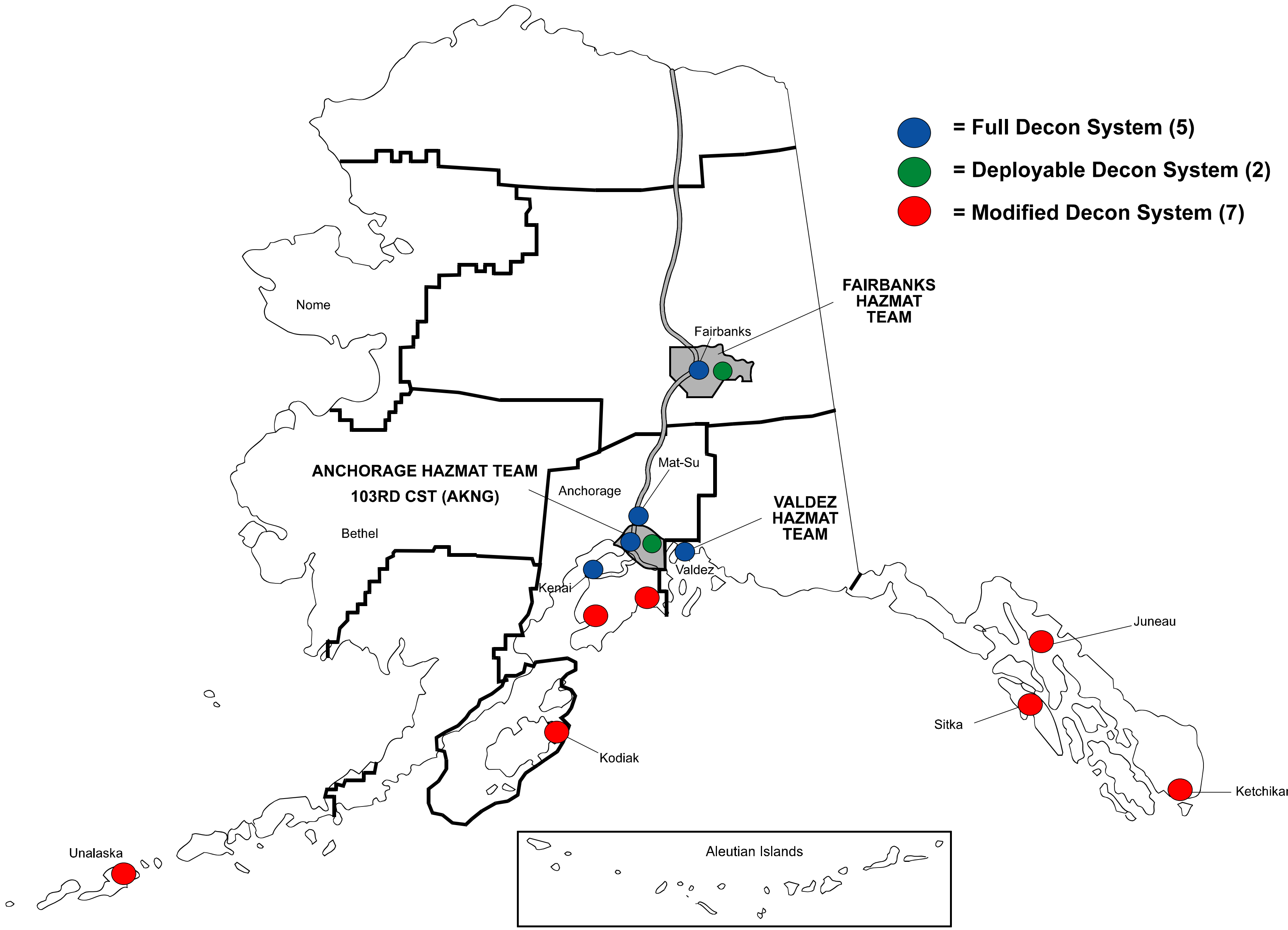
Modified Decontamination System: A modified tent system was also purchased for smaller at-risk communities with an expressed interest in maintaining a decon system. The modified system consists of a single tent system with support equipment and a trailer for storage and transport. Communities equipped with the modified decon systems include Homer, Juneau, Ketchikan, Kodiak, Seward, Sitka, and Unalaska. Several other communities have requested decon systems as part of their federal Office of Domestic Preparedness grant request. The modified decon system specs and trailer specs were provided to these communities to maintain consistency throughout the state.

The Statewide Hazmat Response Workgroup continues to coordinate with the medical community on issues related to expedient field and hospital decontamination issues. The Hazmat Teams will generally perform expedient decontamination of persons at the scene of an incident. Once decontaminated in the field, individuals are then transported to the hospital or another location for further decontamination.

In the event of a major incident involving numerous casualties and contaminated personnel, there is a definite potential for ambulatory and otherwise self-transported patients to arrive at the hospital for decontamination and treatment.

Figure 7 on the next page provides a quick summary of the locations of main and modified decontamination assets in the state.

Figure 7: Statewide Decontamination Assets



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