Dutch Harbor Water Quality and Impairment Analysis

Final Report

Dutch Harbor, Iliuliuk Bay, and Iliuliuk Harbor

Unalaska, Alaska

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June 27, 2006

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Acronyms and Abbreviations

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADOT&PF	Alaska Department of Transportation and Public Facilities
APL	American President Lines
AST	Above-ground storage tanks
AWCRSA	Aleutians West Coast Coastal Resource Service Area
BMP	Best Management Practices
BTEX	Benzene, toluene, ethylbenzene, xylenes
CS	Contaminated Sites
CWA	Clean Water Act
DRO	Diesel Range Organics
EPA	Environmental Protection Agency
FRP	Facility Response Plan
LUST	Leaking Underground Storage Tanks
mg/kg	milligrams per kilogram
NPDES	National Pollutant Discharge Elimination System
OASIS	OASIS Environmental, Incorporated
RRO	Residual Range Organics
SPCC	Spill, Prevention, Control, and Countermeasure
TAH	Total Aromatic Hydrocarbons
TAqH	Total Aqueous Hydrocarbons
TMDL	Total Maximum Daily Load
UMC	Unalaska Marine Center
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
UST	Underground storage tanks
µg/L	micrograms per liter

1.0 Introduction

Under Notice-to-Proceed 18-9001-14-3A, Alaska Department of Environmental Conservation (ADEC) tasked OASIS Environmental, Inc. (OASIS) with collection, consolidation, and interpretation of all literature and data available on petroleum hydrocarbon pollution and sources in Dutch Harbor, Iliuliuk Bay, and Iliuliuk Harbor near Unalaska, Alaska (see Figure 1-1).

In 1990, Iliuliuk Bay was listed by ADEC as an impaired water body under the Federal Clean Water Act (CWA) Section 303(d) for petroleum hydrocarbon pollution exceeding state water quality standards of 18 Alaska Administrative Code (AAC) 70. Dutch Harbor also was added to the 303(d) list in 1994 for petroleum hydrocarbon pollution. The 303(d) listings were based on observed sheens and reports of numerous petroleum spills in the water bodies. The observed sheens caused violations of the water quality standard from 18 AAC 70.020(b)(5), which states in various forms that petroleum hydrocarbons "may not cause a visible sheen on the surface of the water."

These water bodies remain on the 303(d) list as presented in the most recent ADEC water quality report, *Alaska's 2002/2003 Integrated Water Quality Monitoring & Assessment Report* (ADEC 2004). By mandate of the CWA, Section 303(d)(1)(C), the Environmental Protection Agency (EPA) or ADEC must:

1) Complete either a Total Maximum Daily Load (TMDL) for an impaired water body;
2) Provide evidence that a water body is not impaired; or
3) Demonstrate that other controls are in place that will bring a water body back into compliance with state water quality standards.

A TMDL is a pollution budget that establishes discharge limits for pollutants in order to help an impaired water body recover and meet water quality standards. The intent of a TMDL is reduction of pollutant inputs to a level (or "load") that fully supports the designated uses of a given water body. The actions employed to implement a TMDL may include a combination of best management practices (BMPs), limits to existing effluent discharges, and additional environmental monitoring through National Pollutant Discharge Elimination System (NPDES) permits.

The purpose of this study is to determine whether to proceed with TMDL development or develop an alternative approach to address the current impairment listings for Iliuliuk Bay and Dutch Harbor.

The project's objectives to achieve this purpose are as follows:

- Develop a report that summarizes and evaluates all available information on petroleum pollution, sources, and the controls in place which address petroleum pollution in Dutch Harbor, Iliuliuk Bay, and Iliuliuk Harbor;
- Define the current areas of impairment;
- Identify data and information gaps that may impede the development of a TMDL; and
- Recommend a process for developing a TMDL, or an alternative approach, for pollution management in order to address petroleum impairment of Dutch Harbor, Iliuliuk Bay, and Iliuliuk Harbor.

Although Iliuliuk Harbor is not listed on the 303(d) list, this water body has been included in this analysis because of its physical connection with Iliuliuk Bay and because its

usage as a seaport is essentially identical to Iliuliuk Bay and Dutch Harbor. Therefore, Dutch Harbor, Iliuliuk Bay, and Iliuliuk Harbor together are defined as the project's *study area* (see Figure 1-2). In addition, when the report refers to the *greater Unalaska area*, this description entails all land regions surrounding the study area, which includes the City of Unalaska, Unalaska Island, Expedition Island, and Amaknak Island, where the International Port of Dutch Harbor is located. Lastly, it should be noted that *Dutch Harbor* and *Unalaska* often are used interchangeably. For clarification, *Unalaska* generally refers to the community and island that bear the same name. *Dutch Harbor* generally refers to the port and harbor that supports the fishing and marine transportation industries of the region. This report will use these terms in the manner described and defined above.

Following this introduction is Section 2, which details background information on sources of petroleum contamination and previous studies of water quality. Section 3 is an analysis of potential petroleum impacts and an assessment of impairment. Section 4 presents recommendations for management of the impaired water bodies. Section 5 concludes the findings of this report, and Section 6 lists the references used to develop this report.

2.0 Background Information

The two sections of background information present a summary of existing and potential sources of petroleum pollution in the greater Unalaska area and review previous studies of water quality in the study area and existing plans to control future impact from petroleum pollution.

2.1 Sources of Petroleum Pollution

The water quality of the study area is threatened by existing and potential sources of petroleum pollution. These sources include harbor and vessel activities, storm water runoff, on-shore contaminated sites, frequent marine and onshore spills, and other industrial facilities that are located in the greater Unalaska area. The following subsections detail these existing and potential sources of petroleum pollution.

2.1.1 Contaminated Sites

The greater Unalaska area has several contaminated sites that are impacted with petroleum-related constituents. ADEC's Division of Spill Prevention and Response, Contaminated Sites Program is responsible for managing clean-up operations at contaminated sites in Alaska. This program uses two databases to track contaminated sites: Contaminated Sites (CS) and Leaking Underground Storage Tanks (LUST). The CS and LUST databases identify 80 contaminated sites in the "Unalaska" or "Dutch Harbor" search areas; however, the database search results were evaluated to eliminate sites that have no potential or minimal potential to influence water quality in the study area. Sites that were eliminated include:

- Sites located on surrounding islands near the greater Unalaska area;
- Sites located in upland areas of Unalaska Island, such as Unalaska Valley, General's Hill, and Pyramid Valley;
- Sites located outside of the hydraulic drainage of Dutch Harbor, Iliuliuk Bay, and Iliuliuk Harbor (which include sites located on the west side of Amaknak Island near South Unalaska Bay); and
- Sites that are listed for hazardous substances other than petroleum products.

In addition, the Rocky Point and Fort Mears sites are divided into sub-management areas in the CS database; however, in this study, Rocky Point and Fort Mears are presented as single sites.

This evaluation of the databases reduces the number of sites from 80 to 8. The following is a description of these sites. The site locations are depicted on Figure 2-1.

Pre-World War II Tank Farm

The Pre-World War II Tank Farm was originally constructed in the 1920s and consisted of four 425,000-gallon above-ground storage tanks (ASTs) and six smaller ASTs. The tank farm was used to store fuel oils. The larger tanks were constructed with wood stave while the smaller tanks were steel. In 1942, the tanks were purposely drained, likely to prevent serious damage during Japanese bombing raids on Dutch Harbor. This event may have caused over one million gallons of petroleum fuel to be released. In 1943, the tank farm was demolished and four feet of clean fill was placed over the area (JEG 1998).

Beginning in 1989, the U.S. Army Corps of Engineers (USACE) has undertaken numerous site characterizations, remedial investigations, and removal actions at the Pre-World War II Tank Farm. Petroleum contamination was extensive, with oil-saturated soil measured at more than 10 feet thick surrounding the former tank farm. More than 13,000 cubic yards of contaminated soil have been excavated and thermally treated from the Pre-World War II Tank Farm since 1998. Fieldwork conducted in 2003 and 2004 found that Bunker C fuel located on top of groundwater is still present between the Pre-World War II Tank Farm and the shoreline of Dutch Harbor (JEG 2005).

Rocky Point

Rocky Point has been used as a bulk petroleum storage and distribution facility for over 60 years. The facility initially was operated by the military until the federal government leased the facilities to Standard Oil of California (currently known as Chevron) after World War II. Chevron operated the facilities until 1986, when Delta Western Fuels (Delta Western) took over operations (TetraTech 2003).

Similar to the Pre-World War II Tank Farm, USACE began as series of site characterizations, remedial investigations, and removal actions in the Rocky Point area in 1989. USACE divided Rocky Point into sub-management units because of the extensive size, operational history, and contamination at the site. These units have been variously described as the Lower Tank Farm, Tank Hill, Tank 17/18 Area (Strawberry Hill), Upper Tank Farm, and Pipeline Corridors. Characterization and cleanup of Rocky Point has been cooperatively shared by Chevron, Delta Western, and USACE. The sub-management units are briefly described below.

- Lower Tank Farm – This unit was constructed in 1942 and had 13 ASTs containing petroleum fuels. The destruction of four tanks by Japanese air raids during World War II caused the release of 924,000 gallons of Bunker C and 624,960 gallons of diesel fuel. Significant amounts reportedly reached Iliuliuk Bay. In 1967, a leak of unknown quantity again impacted Iliuliuk Bay. A 1974 leak released up to 8,000 gallons, but it was reported that the product was recovered before reaching water (GeoEngineers 1993). Five tanks were removed and later replaced by Delta Western (TetraTech 2003). A secondary containment wall was constructed by Delta Western between the Lower Tank Farm and Iliuliuk Bay (Halverson 2006). Delta Western currently operates the facility as a bulk storage facility for petroleum.
- Tank Hill – Tank Hill was constructed in 1943 and contained five concrete underground storage tanks (USTs) for Bunker C and other fuels. Concrete trenches (utilidors) equipped with steam-heating equipment were built in association with the tanks containing Bunker C fuel to facilitate flow of the heavy, viscous oil. Additionally, valve vaults were constructed at the base of each tank to act as a sump. In the 1950s, the contents of three of the tanks were released into trenches, which created two tar ponds currently being managed as contaminated sites. An overfilling of one of the USTs in 1974 caused the release of approximately 20,000 gallons of jet fuel, some of which reached Dutch Harbor. Small volume releases also occurred in 1983 and 1986, although specific volumes are unknown (TetraTech 2003). Tank Hill is no longer used for fuel storage. The tanks were emptied at the time of closure, but the USTs remain in place (Halverson 2006).
- Tank 17/18 Area (Strawberry Hill) – Two additional concrete USTs (Tanks 17 and 18) were constructed in 1943 on the eastern edge of Strawberry Hill. Similar to those located on Tank Hill, these two tanks were built to contain Bunker C and had

utilidors to hold steam-heating equipment. Valve vaults were located at the base of each tank and acted as sumps. In the late 1980s, approximately 1,500 gallons of diesel fuel were released when a pipeline connecting the two tanks ruptured. A reportable, yet unknown, quantity reached Iliuliuk Bay. Two tar ponds are associated with this release from these tanks, similar to the tar ponds at Tank Hill (TetraTech 2003). These tanks currently are not in use.

- Upper Tank Farm – Chevron constructed the Upper Tank Farm in approximately 1960. Six ASTs, ranging in capacity from approximately 100,000 to 1,600,000 gallons, currently are operated by Delta Western and hold unleaded fuel, jet fuel, aviation fuel, and diesel fuel. Fuel from these tanks is gravity-fed to the Delta Western dock and truck loading rack on the north side of Rocky Point (TetraTech 2003). No releases from these tanks are documented.
- Pipeline Corridors – A labyrinth of active and inactive aboveground and belowground pipelines exists in Rocky Point. All of the underground pipelines were constructed by the military while the aboveground pipelines were constructed by Chevron or Delta Western. Wood and concrete utilidors also were constructed to transfer fuel products and to contain other utility lines such as electric lines, water lines, sewer lines, and steam heat. Delta Western has an ongoing program to uncover, upgrade, and maintain the pipelines. In 1993, a fuel release was discovered from a belowground three-inch pipeline that ran through the American President Lines (APL) dock yard (TetraTech 2003). In general, these pipelines are known to be a chronic source of slow, continual releases of petroleum products, which is the reason Delta Western has instituted a program to replace these lines.

Former Aqua Fuel System #1

The Former Aqua Fuel System #1 originally was used to transfer fuel from the Delta Western dock to the airport via pipelines. The system was located just north of the current Unalaska Powerhouse and across East Point Road from the airport. Eight 25,000-gallon USTs were identified and removed in 1991 by Delta Western. A portion of pipeline from the airport apron to the fuel system was removed in 1998. Groundwater monitoring has demonstrated that petroleum levels in groundwater meet site specific cleanup levels, and groundwater that discharges to surface water meets water quality standards for petroleum (SECOR 2006).

Fort Mears Area

Fort Mears was situated on the narrow portion of Amaknak Island near Margaret Bay. Located within the former Fort Mears complex are sites listed in ADEC's CS and LUST databases. The sites include *Margaret Bay Post Office*, *Alaska Commercial Company*, and *General USTs*.

Twenty-eight USTs were identified and decommissioned in the Margaret Bay area during the late 1990s. Petroleum contaminated soils were removed and confirmation samples collected. The analytical results of soil and groundwater samples indicated that residual contamination is less than ADEC cleanup levels with the exception of one soil sample (JEG 2000).

Soil and groundwater contamination in the area of the former Fort Mears gas station was discovered during construction projects in the mid 1990s. During site preparation for building the Alaska Commercial store in 1993, abandoned USTs and fuel contaminated soil was encountered, and in 1994, during site preparation for a new post office, additional contamination was found. A subsequent investigation of the Fort Mears

gasoline station identified ten 6,000-gallon USTs. The USTs were removed, and analytical results from confirmation soil and groundwater samples were less than ADEC cleanup levels (JEG 2000).

Former Submarine Base / Ship Repair Facility

The former Submarine Base / Ship Repair Facility is located on the south side of Expedition Island and adjacent to the current City of Unalaska Small Boat Harbor. Walashek Shipyard now operates at this location. Characterization activities have been limited to a small area at this site and included soil borings and the installation of monitoring wells. Analytical results from sampling indicated no petroleum constituents above ADEC marine water quality standards (JEG 2000).

Former Mount Ballyhoo Spit Tank Farm

Historical aerial photographs indicate that at least four large ASTs were located at this site, positioned at the base of Mount Ballyhoo at the top of Ballyhoo Spit. Four test pits were dug downgradient of the former tanks in 1998, but no petroleum contamination was encountered. Groundwater from temporary well points did not exceed applicable cleanup levels. Also, a pipeline that ran from the former tank farm along Ballyhoo Spit was removed and site characterization during the removal did not identify any releases (Halverson 2006).

Alyeska Seafoods Processing Plant

This site was listed in the database in 1994 because of soil contamination related to a UST that contained gasoline. The UST was closed in place in 1995 and approximately 150 cubic yards of contaminated soil was treated. Residual soil contamination above soil cleanup levels remains under a building. ADEC has issued a “No Further Action” determination for the site with a notice requirement for the property deed (ADEC 2006).

AT&T Alascom Unalaska Earth Station

This site has subsurface soil and groundwater petroleum contamination related to a release from a UST. Concentrations of diesel-range organics (DRO) have been detected as high as 15,000 milligrams per kilogram (mg/kg) in soil and 61 milligrams per liter in groundwater. Corrective action planned for 2006 includes the construction of a bio-pile for excavated soils and the injection of oxygen releasing compound to groundwater (Seagren 2006).

Unalaska Landfill

This facility is not listed in the CS or LUST databases, but has been included in the discussion of contaminated sites given the nature of landfill contents. The landfill has an unlined cell that has been closed since 1994. A new cell is operational, and it is lined and has a leachate collection system, so potential impact to groundwater is expected to be minimal. Oily wastes, including oily rags or sorbent material, are prohibited in the landfill as part of the landfill’s *Solid Waste Management Plan*. Used oil is collected at a baler facility and is recycled as heating fuel for the landfill. Groundwater samples are collected quarterly from three to five monitoring wells, and surface water samples are collected semi-annually from three sample locations (Unalaska 2001). The only petroleum parameters currently analyzed for are benzene, toluene, ethylbenzene, and xylenes (BTEX). Analytical results for groundwater and surface water have shown that these parameters do not exceed water quality standards (Unalaska 2005a).

2.1.2 Spills

Spills historically have occurred at a frequent rate in the study area. The spills occur both on land and at sea; however, a combination of factors, particularly local topography that limits development away from shorelines and an economy that is reliant on the sea, creates situations where spills and releases are likely to occur near or on the water.

ADEC's Division of Spill Prevention and Response, Prevention and Emergency Response Program is responsible for tracking spill information. This program has managed an electronic database since 1995. Previous records are maintained in ADEC archives (Ha 2006). As part of this study, the electronic database was analyzed to provide information on the nature of spills in the greater Unalaska area.

The database contains 411 entries dating from July 22, 1995 to February 24, 2006; however, the database was evaluated to eliminate entries that are considered not applicable to this project. Spills that were removed from the database include:

- Marine spills located outside of the study area[1];
- Land spills located upland of shoreline, such as Unalaska valley;
- Land spills located outside of the drainages of Dutch Harbor, Iliuliuk Bay, and Iliuliuk Harbor, such as Pyramid valley;
- Any spill substance not related to petroleum products;
- All spills considered insignificant (less than 25 gallons) in contributing to petroleum loading of the impaired water bodies;
- A spill of 3,675 gallons at the Anderson Thermal Treatment Facility, which was a land-based facility operated as part of ongoing remedial activities at the Rocky Point contaminated site. This spill was addressed immediately and oversight was provided by ADEC's Contaminated Sites program (Halverson 2006); and
- Several duplicate entries.

The result of this effort reduced the database from 411 entries to 80 entries. These 80 spills released 11,780 gallons of petroleum-related products to the environment. At least half of the spills are known to have occurred either on the water or immediately adjacent to the water at a dock. Many more may have also directly impacted water, but limited database information prevents an adequate identification of locations. The causes of the spills have been broadly grouped into the following categories, which include the number of occurrences and volumes of released product:

- Human Factors – 38 spills, 6,635 gallons;
- Structural/Mechanical Failures – 20 spills, 2,155 gallons;
- Accident (Grounding or Collision) – 3 spills, 655 gallons; and
- Other Factors or Unknown Factors – 19 spills, 2,335 gallons.

Figure 2-2 has two graphs that depict statistics for the 74 spills covering the decade from 1996 to 2005. One graph presents the number of spills per year in the study area along with the average number of spills per year over that decade, and the other graph illustrates the volume of petroleum products released each year in the study area along with the median volume of release per year over that decade.

In addition to the spills for the study area described above, the grounding of the *M/V Selendang Ayu* on December 8, 2004 released approximately 335,000 gallons of

[1] One spill should be mentioned that was eliminated: November 1997 spill of the *M/V Kuroshima*, which released 39,000 gallons of non-crude oily waste in Summer Bay. Summer Bay is immediately adjacent to Iliuliuk Bay, and because of the volume released, it is likely that the oils had a significant impact on Iliuliuk Bay.

intermediate fuel oil and marine diesel on the western side of Unalaska Island. ADEC established a work group to address risk to commercial fisheries in the area. As part of this work group, six forms of visual oil pollution monitoring occurred in the study area from December 29, 2004 to March 24, 2005. Only two (tow net pulls and beach surveys) of the six forms of monitoring identified petroleum contamination. Six of approximately 86 tow net pulls in the study area had oil smears observed on the netting material. The tow net test involved pulling a tow net for 30 to 60 minutes at a depth of 0 to 12 feet below water surface, and then observing the net for signs for petroleum contamination. Eight separate beach surveys were conducted on both Ballyhoo Spit and Front Beach, which is located east of the community of Unalaska. On two occasions, 1 to 25 oil tar balls were observed on a one-mile stretch of Front Beach (Nuka 2005).

Lastly, it should be noted that there is no documentation of sunken vessels or other large equipment in the study area that may be a contributing factor to water quality impairment.

2.1.3 Storm Water

Storm water management in Unalaska is a critical issue for water quality given that nearly all development in the greater Unalaska area is located on or very near coastal areas. In addition, the sinuous coastlines around Unalaska Island and Amaknak Island create an unusually large amount of coastline that may be developed given the size of the City of Unalaska.

Over the past ten years, numerous road improvement projects have occurred in the greater Unalaska area. The City of Unalaska paved East Broadway, West Broadway, and Salmon Way in the City of Unalaska, and a portion of Biorka Drive in the Rocky Point area. Delta Way and East Point Road have been improved, although the two roads have not been paved. Alaska Department of Transportation and Public Facilities (ADOT&PF) also recently paved Airport Beach Road from Broadway in the City of Unalaska to the airport near Mount Ballyhoo on Amaknak Island (Dixon 2006).

As part of the improvements, the City of Unalaska installed new storm water collection basins and outfalls. Each new basin has an oil/water separator to isolate any oils from continuing through the storm water system to the outfall. A total of nine oil/water separators are located along East and West Broadway. Biorka Drive, Salmon Way, Delta Way, and East Point Road each have one. The one along East Point Road is owned and operated by Delta Western. The City of Unalaska also installed two oil/water separators when paving the new surface at the Light Cargo Dock along Ballyhoo Spit. ADOT&PF did not install any oil/water separators in the storm drains when Airport Beach Road was paved; however, drainage from that road almost solely affects Captains Bay and Unalaska Bay (Dixon 2006).

The other roads around town are gravel. This situation creates continuous maintenance issues for the storm water system because the dirt and gravel that sticks to tires are immediately tracked to the paved roads, which then washes into the storm water system and creates sedimentation problems. The City of Unalaska cleans out each oil/water separator about once per year. This is accomplished using a vac-truck to remove the accumulated sediments. Occasionally, maybe once every two years, one of the oil/water separators will contain used oils during annual cleaning. When this occurs, the City of Unalaska calls a spill response contractor to remove the waste oils and dispose of them (Dixon 2006).

Storm water along the gravel roads drains into roadside culverts that empty to marine waters. EPA's 1994 *Water Quality Assessment of Greater Unalaska Bay* report stated that approximately 100 culverts drain to marine waters and that approximately 50% of these drain to Iliuliuk Bay, Iliuliuk Harbor, and Dutch Harbor. It is assumed that the number of culverts is now somewhat less because of the recent storm water drain improvements described above.

In the late 1990s, two surface water samples were collected from a storm water outfall at Rocky Point to characterize the water quality of the discharge as part of ongoing environmental investigations at Rocky Point. This discharge originates in the upland areas of Rocky Point, and the outfall is located approximately 400 feet southeast of the Delta Western dock. Analytical data from the samples contained detectable concentrations of DRO, benzene, xylenes, and polynuclear aromatic hydrocarbons, but detected concentrations were less than water quality standards (JEG 2000).

Lastly, when it snows, the City plows the streets and places the snow along open beach areas. No central snow storage impound exists (Dixon 2006).

2.1.4 Seafood Processors

Seafood processing is a major economic contributor to the Unalaska/Dutch Harbor economy. Both onshore and offshore facilities exist and some processors operate both. The EPA regulates the discharge of waste water from processors through NPDES permits, and uses two permitting mechanisms: a general permit or an individual permit. Both types of permits have specific requirements and effluent limitations. The General Permit authorizes the discharge of solid wastes that are ground to ½-inch or less, and the zone of deposit for settleable solid residues is one acre or less. In addition, the General Permit allows mixing zones for discharges of dissolved oxygen, floating and suspended waste residues, color, turbidity, temperature, pH, fecal coliform bacteria, and total residual chlorine. For each parameter, the mixing zone may extend 100 feet radially from the point of discharge (EPA 2000a).

Processors operating under an individual permit generally have more restrictive requirements that include effluent sampling, monitoring, and reporting of monitoring results. In addition, effluent associated with an individual permit must meet contaminant concentrations or masses as stated in the permit unless a variance has been applied for and approved by the EPA.

Three seafood processors currently operate and have permitted discharges within the study area. The processors include Icicle Seafoods, who operates under the General Permit for two floating facilities (Bering Star and the Arctic Star) at the top of Dutch Harbor, and Alyeska Seafoods and UniSea, Inc., both of whom operate facilities within Iliuliuk Harbor and have individual permits. Table 2-1 presents a summary of these processors including outfall information for the study area and permitted discharge information. Figure 2-3 shows the locations of the facilities in the study area.

The current NPDES permits prohibit the discharge of petroleum, but at the same time, the permits do not contain any monitoring requirements for petroleum pollutants. Therefore, no documentation exists to determine whether petroleum pollutants are contained in the facilities' effluents.

In addition, the processors use intake water from the study area for processing. No water quality analysis is performed on intake water. Intake water for Bering Star, Alyeska Seafoods, and UniSea, Inc., was observed more than 50 times during

monitoring activities for the grounding of the *M/V Selendang Ayu*, and no visual detection of oil pollution was observed (Nuka 2005).

Table 2-1. Seafood Processor Summary

Facility	NPDES Permit # Expiration Date	Outfalls	Regulated Parameters
Icicle Seafoods (Bering Star and Arctic Star)	AKG520082 7/27/2006	One outfall into Iliuliuk Bay	Solids Dissolved oxygen Floating and suspended residues Color Turbidity Temperature pH Fecal coliform bacteria Total residual chlorine
Alyeska Seafoods	AK0000272 3/31/2008	Two outfalls into Iliuliuk Harbor: Outfall 002 - Non-contact cooling water Outfall 003 - Scrubber/Condenser effluent	Outfall 002: Temperature Flow Outfall 003: No parameters
UniSea, Inc.	AK0028657 3/31/2008	Two outfalls into Iliuliuk Harbor: Outfall 002 - Non-contact cooling water Outfall 003 - Scrubber/Condenser effluent	Outfall 002: Temperature Flow Outfall 003: No parameters

2.1.5 Petroleum Storage and Transfer Facilities

Two companies, Delta Western and Petro Star, Inc., operate three bulk fuel storage and transfer facilities along the shore of Dutch Harbor. The facilities are known as Delta Western, North Pacific Fuel Ballyhoo Road, and North Pacific Fuel Resoff Terminal. These facilities offer residential and commercial heating fuel and commercial deliveries of diesel, gasoline, marine, and aviation fuels. Delta Western distributes fuel several ways including fueling vessels from their dock located on the south end of Dutch Harbor. The two North Pacific Fuel facilities are the fuel main supplier for the municipal docks. Deliveries to the municipal docks occur via pipeline to the large docks and via fuel tanker trucks to the smaller docks. Table 2-2 summarizes tank and capacity information for these facilities, and Figure 2-3 shows the locations of each.

Table 2-2. Petroleum Storage and Transfer Facilities Summary

COMPANY	LOCATION NAME	NUMBER OF TANKS	COMBINED APPROXIMATE CAPACITY (gallons)
Delta Western Fuels	Delta Western – Rocky Point	17	16,000,000
Petro Star, Inc dba North Pacific Fuel	North Pacific Fuel Ballyhoo Road	8	1,700,000
Petro Star, Inc. dba North Pacific Fuel	North Pacific Fuel Resoff Terminal	7	2,300,000

2.1.6 Docks and Harbors

Numerous docks and harbor facilities exist in the study area and play an integral part in the economy by providing marine support services. All these facilities are potential

sources of petroleum pollution because of the fuel contained in docked vessels, discharges of oily bilge water from these vessels, and the petroleum products used at the docks for operations; however, this subsection focuses on the docks that provide fueling services because of the increased risk to water quality from fueling operations. Figure 2-4 shows the locations of these facilities. The subsection presents the facilities by water body.

Dutch Harbor

The City of Unalaska, Department of Ports and Harbors manages, maintains, and operates two marine facilities where fuel is transferred to vessels. These facilities are located along the shores of Dutch Harbor and include the combined Unalaska Marine Center (UMC) / United States Coast Guard (USCG) Dock, and the Light Cargo Dock. Fueling operations are conducted at all mooring positions by pipeline or tanker truck at the UMC/USCG Dock. At the Light Cargo Dock, contract bulk fueling of vessels is allowed. Private docks located within Dutch Harbor include the Delta Western Dock, Trident Seafoods Dock, and the North Pacific Fuel Dock (AWCRSA 2003). Additionally, Magone Marine Service Inc., has a dock from which a significant volume of marine repair, salvage, and response activities occur, although no fueling occurs (Magone 2006).

Iliuliuk Bay

The APL container dock is located in Iliuliuk Bay less than ½-mile southwest of Rocky Point and provides major port services including container transfer, storage facilities, and fueling. The APL operations area supports the APL container dock by providing storage for containers and crab pots, and other support services. The current APL dock was originally constructed in the early 1940s to support fueling of vessels and facilitate fuel distribution activities. The dock was expanded in 1994 following an investigation on how to address chronic oil seepage (TetraTech 2003). A retaining wall with an oil/water separator was built in conjunction with the dock expansion to prevent clean fill from being impacted by petroleum contamination from the Lower Tank Farm of Rocky Point (Halverson 2006).

Iliuliuk Harbor

Iliuliuk Harbor has no dock that currently provides fueling services. Two large facilities in the water body are the Small Boat Harbor, owned and operated by the City of Unalaska, and Walashek Shipyard. The Small Boat Harbor consists of three floats providing long-term moorage for pleasure craft and small fishing vessels. Walashek Shipyard operates at the site of the Former Submarine Base / Ship Repair Facility, and provides major marine repair work for vessels.

2.2 Previous Studies and Existing Plans

This subsection reviews previous studies that have investigated the marine environment of the study area and the existing plans that are employed to minimize environmental impacts from sources of petroleum pollution.

2.2.1 Water Quality

From 1975 to 1994, 17 separate studies have investigated the marine environment and water quality issues in the study area. These studies focused almost solely on the impact of seafood processing waste, especially the impact to benthic communities on the marine floor where discharge wastes settle. Parameters of concern generally were

dissolved oxygen, hydrogen sulfide, and nutrient compounds like ammonia-nitrogen and total phosphorus (EPA 1994). A 1994 EPA report, *Water Quality Assessment of Greater Unalaska Bay*, is the only previous study that provides any real discussion of impact from petroleum hydrocarbons.

For Iliuliuk Bay, Iliuliuk Harbor, and Dutch Harbor, the EPA report stated that while petroleum products are the source of impairment, the development of a TMDL was not necessary because the two sources of pollution, intermittent spills and illegal releases, are not suitable for waste load assessment and allocation. The report recommended that sources of pollution should be addressed through education and enforcement. The report noted that Aleutians West Coast Coastal Resource Service Area (AWCRSA) developed a public information campaign to reduce the number of fuel spills and bilge pumping to local waters. The goal was a 10% annual reduction in the number of spills. The report also recommended that petroleum pollutants be monitored in the study area for determination of the level of impairment (EPA 1994). As part of this project, no documentation was identified on the outcome of the spill reduction goal or monitoring for petroleum pollutants.

Appendix B of the EPA report addresses non-process waste waters (cooling water, boiler water, fresh water pressure relief discharge, refrigeration condensate, and live tank water) of the seafood processing industry, which are waste waters discharged directly into the study area. The report states that EPA has evaluated these waste streams and determined that they may be discharged without limitations or monitoring requirements, although no supporting documentation is provided (EPA 1994). In general, the report is almost void of data related to petroleum loading in the study area. The findings regarding petroleum pollution and impairment are not substantiated with any data or information review.

2.2.2 Sediments

Petroleum-contaminated sediments have been documented within the intertidal and subtidal portions of Dutch Harbor. The contaminated sediments located within the waters of Dutch Harbor generally are attributed to upland contaminated sites. The following discussions present summaries of three sediment sampling investigations.

Unalaska Powerhouse

Sediment residue from the Unalaska Powerhouse cooling water intake, which is located in Dutch Harbor, was sampled in 1993 as a part of routine maintenance. DRO was detected in the sediment sample at 1,350 mg/kg. Sediment from the cooling water intake again was sampled in 1997, and DRO and residual range organics (RRO) both were detected (EPA 2000b).

Army Corps of Engineers

In 1996, four shallow pits were excavated by hand within the intertidal area near the Delta Western Dock. Sediments in the four pits were observed to be visually contaminated with oil. In 1997, visual observations again were made at 13 intertidal hand-dug sediment pits and 20 off-shore sediment locations in areas around the Delta Western Dock. Petroleum odors and sheens were observed in most locations. Additionally, five of the off-shore locations had samples collected for DRO and RRO analysis. Analytical results for DRO and RRO ranged from 102 to 615 mg/kg and 100 to 910 mg/kg, respectively (JEG 1999).

EPA

Intertidal and subtidal sediment samples were collected in 1999 during an EPA investigation. A total of 65 marine sediment samples were collected: 30 from intertidal locations and 35 from subtidal locations. All but eight samples were collected within Dutch Harbor. Two were collected on the other side of Ballyhoo Spit in Iliuliuk Bay; one sample was collected at the imaginary boundary between Dutch Harbor and Iliuliuk Bay; and the other five samples were collected along the shore of Unalaska Island in Iliuliuk Bay (EPA 2000b). Figure 2-5 shows the locations and analytical results of these marine sediment samples.

Analytical results from the marine sediment samples indicated that detectable levels of DRO and RRO are ubiquitous in Dutch Harbor. All 57 samples in Dutch Harbor had a detectable concentration of DRO, while only one sample had an undetected concentration of RRO. The highest concentrations were centered at two areas: the area between the Delta Western Dock and the tip of Rocky Point, and the area in the center and western side of the top of Dutch Harbor behind Ballyhoo Spit. In general, the subtidal sediment samples had greater DRO and RRO concentrations than the intertidal sediment samples. This difference is attributed to the cleansing action of tides in the intertidal area and the more static environment found in the subtidal locations.

These results from Dutch Harbor contrast strikingly with the results from the five sediment samples along Unalaska Island. Only one of the five samples had a detectable concentration of DRO, and this result was at the laboratory reporting limit (5.4 mg/kg). RRO was not detected above laboratory reporting limits in any of the samples around Unalaska Island.

2.2.3 BMPs and Response Plans

The City Of Unalaska owns and operates four docks in Dutch Harbor and Iliuliuk Harbor. The City of Unalaska has developed a master plan for management of these facilities, *International Port of Dutch Harbor Best Management Practices BMP Plan*, which institutes standardized BMPs for the docks. These BMPs provide a safeguard to ensure that maritime operations have minimal impact on the environment and are conducted in compliance with all applicable environmental regulations. Specific sections of this plan address fueling operations, liquid management and hazardous waste and oil spill prevention and response measures (Unalaska 2005b). Additionally, the Small Boat Harbor in Iliuliuk Harbor also is managed and operated with a separate *Operating Plan* (Unalaska 2004). This plan outlines general rules and regulations governing operations at the Small Boat Harbor.

The private docks in the study area likely are subject to EPA's Oil Pollution Prevention regulations based on the volume of petroleum products stored at the facility and whether the facility transfers petroleum products to and from vessels. Facilities that meet these criteria likely have to develop and implement a Spill, Prevention, Control, and Countermeasure (SPCC) plan or a Facility Response Plan (FRP), or both. Determination of a facility's regulatory obligations falls on the individual facility, and this report does not attempt to identify the regulatory requirements of the private docks and harbors in the study area. However, the requirements of SPCC plans and FRPs are identified to address what countermeasures likely are in place if a spill or release occurs in the study area.

FRPs should be developed by facilities that have the possibility for causing "substantial harm" if a "worst-case discharge" were to occur. For the purpose of this study, FRPs are

generally required for facilities that transfer petroleum products to or from a vessel and have petroleum storage capacity of 42,000 gallons or more (EPA 2002). Based on public records, the three bulk storage fuel facilities identified in Section 2.1.5 have developed and implemented FRPs. These FRPs require comprehensive spill response measures that include, among other things, requirements for facility and response self-inspection, training, and spill response exercises and drills. Evidence that personnel and equipment are readily available to respond to spills are an important component of an FRP.

SPCC plans are the cornerstone of EPA's strategy to prevent petroleum spills because a facility is required to develop a plan if it is reasonable to expect a discharge of oil could occur into navigable waters or adjoining shorelines (EPA 2006). Although not extensive, the following summarizes some of the pertinent requirements of a SPCC plan:

- Certified by a licensed professional engineer;
- Spill prevention and control measures established for the type of facility or operations;
- Schedule for periodic integrity and leak testing of bulk containers and associated valves and piping;
- Develop and incorporate a spill contingency plan;
- Provide a written commitment of manpower, equipment, and materials required to quickly remove any quantity of oil discharged that may be harmful; and
- Facility owners or operators must conduct employee training on the contents of the SPCC Plan.

This combination of BMPs and regulatory response plans provide the framework for the prevention and response to oil spills for the docks and harbors in the study area.

3.0 Analysis

This section evaluates the significant and varied sources of petroleum products and pollutants in the greater Unalaska area that affect or have the potential to affect water quality in Dutch Harbor, Iliuliuk Bay, and Iliuliuk Harbor. The analysis evaluates the individual categories of petroleum sources, details the status of impairment for the impaired water bodies, and outlines a management of impairment for future actions.

3.1 Sources of Petroleum Pollutants

Based on the presentation of background information in Section 2, seven significant sources of petroleum products or pollution have been identified in the study area. The following subsections analyze the potential for each source to impact water quality in the study area. Table 3-1 provides a summary of each source along with a risk analysis. The risk analysis has two components: a status description of "existing" or "potential," and a relative measure of threat to water quality described as "low, medium, or high."

3.1.1 Contaminated Sites

Section 2.1.1 details nine contaminated sites located in the greater Unalaska area that may potentially impact water quality in the study area. The scope of these sites vary widely from single UST sites that likely pose minimal risk to water quality, to bulk fuel tank farms, one of which had an estimated release of up to one million gallons of petroleum fuels. A risk analysis for each site is presented below.

- Pre-World War II Tank Farm – This site poses an existing high risk to impact water quality from the release of petroleum pollutants. Although 13,000 cubic yards of contaminated soil have been remediated at this site, recent assessment activities have documented the presence of floating free product on groundwater between the site and the shore of Dutch Harbor. Remedial efforts continue, but the presence of free product so near Dutch Harbor creates a constant risk for additional sheening.
- Rocky Point – This site poses an existing high risk to impact water quality from the release of petroleum pollutants. Chronic sheening off the coast of Rocky Point in Iliuliuk Bay and Dutch Harbor was the cause of the original 303(d) listings in the early 1990s. While great progress has been made by USACE, Chevron, Delta Western, and ADEC in alleviating these water quality impacts, the extent of contamination is still widespread around Rocky Point. The sources of contamination include numerous historical spills and a network of underground, World War II-era pipelines. Assessment and remedial actions associated with the historical spills are ongoing. The pipelines, whether in-service or abandoned, plague remedial efforts because they appear to leak fuel slowly and continuously. Many of these pipelines have been removed or replaced with new lines, but until nearly all of the lines are removed they likely will continue to act as a chronic source of petroleum contamination at Rocky Point.
- Former Aqua Fuel Station #1 – This site poses an existing low risk to impact water quality from the release of petroleum pollutants. Semi-annual monitoring has shown that groundwater contamination meets site specific cleanup levels and groundwater discharging to surface water meets water quality standards for petroleum.
- Fort Mears Area – This site poses an existing low risk to impact water quality from the release of petroleum pollutants. Remedial activities have removed numerous

USTs from the Margaret Bay area and addressed residual soil and groundwater contamination. The fact that Fort Mears did not have bulk fuel storage also minimizes the potential for chronic petroleum contamination.

- Former Submarine Base / Ship Repair Facility – This site poses an existing low to medium risk to impact water quality from the release of petroleum pollutants. Limited assessment activities have not documented concentrations of petroleum above regulatory cleanup levels, although much of the site has not been characterized.
- Former Mount Ballyhoo Spit Tank Farm – This site poses an existing low risk to impact water quality from the release of petroleum pollutants. Groundwater samples downgradient of the tank farm did not identify groundwater contamination above applicable groundwater cleanup levels.
- Alyeska Seafoods Processing Plant – This site poses an existing low risk to impact water quality from petroleum pollutants. Remedial activities have addressed most of the gasoline-contaminated soil from a UST, although some contaminated soil still remains underneath a building.
- AT&T Alascom Earth Station – This site poses an existing low risk to impact water quality from the release of petroleum pollutants. A release from a UST has impacted soil and groundwater, but the extent of contamination appears small and corrective action is planned.
- Unalaska Landfill – This site poses an existing low risk to impact water quality from the release of petroleum pollutants. Quarterly monitoring activities have demonstrated that BTEX concentrations consistently are less than state water quality standards for surface water and less than cleanup levels for groundwater.

3.1.2 Spills

As presented in Section 2.1.2, a total of 80 spills of 25 gallons or more have occurred in the study area since September 1995, and these 80 spills have released approximately 11,780 gallons of petroleum products to the environment. While none of these spills appear to have created or contributed to chronic sheening in Dutch Harbor, Iliuliuk Bay, or Iliuliuk Harbor, the clockwork manner in which spills occur account for an average annual input of nearly 1,000 gallons of petroleum products into the study area. Nearly half of the spills and more than half of the volume discharged are identified as being caused by human factors. The amount of incidences caused by human error can be greatly reduced through public outreach, education, and enforcement of BMPs and other controls. In general, spills pose an existing medium to high risk to impact water quality from the release of petroleum pollutants.

3.1.3 Storm Water

Storm water for the City of Unalaska and much of the Port of Dutch Harbor is channeled to the waters of the study area. In the most developed areas of the community, storm water drains have oil/water separators to filter out oils from entering the impaired water bodies. Otherwise, storm water travels through roadside, gravel culverts on its way to the impaired water bodies.

The City of Unalaska does not have a storm water management plan, and therefore, there is no institutional mechanism to manage and reduce pollutants from entering the waters of the study area. The oil/water separators provide a useful barrier to reduce petroleum pollutant inputs to the impaired water bodies, but these separators require regular maintenance to ensure they operate as intended. Although the separators are

reportedly inspected annually, the lack of an established inspection plan means that inspection times are more likely to lapse, thereby compromising the effectiveness of the separators. In addition, there has been no evaluation of the volume of water moving through the storm water system, which allows for more accurate design of improvements to handle storm water loads. The management of snow removal is also of concern because snow gathered directly from roads is deposited at open shoreline areas.

Storm water appears to present an existing low to medium risk to impact water quality from the release of petroleum pollutants. The mass of petroleum pollutant input from storm water is likely low, and the distribution of storm water outfalls is spread across a wide area from the City of Unalaska to Ballyhoo Spit. In addition, the only data for storm water, collected from the Rocky Point area which is a known area of contamination, showed that while petroleum constituents were present in the effluent, the concentrations were less than state water quality standards. The main concern with storm water is the fact that it is a nearly continuous discharge. That means if petroleum products were to spill and overload any part of the storm water system, the resulting petroleum contamination would quickly impact the affected water bodies of the study area.

3.1.4 Seafood Processors

Three seafood processors are located in the study area: UniSea, Inc., and Alyeska Seafoods in Iliuliuk Harbor and Icicle Seafoods in Dutch Harbor. As documented in Section 2.1.4, only Icicle Seafoods discharges process waste water to a water body of the study area, Iliuliuk Bay. All three facilities, however, discharge non-contact cooling water directly to the study area. These non-contact cooling waters are categorized as one of the following: cooling water, boiler water, fresh water pressure relief discharge, refrigeration condensate, or live tank water. The NPDES permits for these facilities prohibit the discharge of petroleum, but they do not require any monitoring for petroleum parameters in facility discharges; therefore, documented evidence to ascertain the potential presence or absence of petroleum pollutants in the discharges is not available. While the discharges from seafood processors likely are not a source of petroleum pollution given the nature of the operations, the high volume of discharge and the lack of analytical documentation warrants a classification as an existing low risk to impact water quality with petroleum pollutants.

3.1.5 Petroleum Storage and Transfer Facilities

As discussed in Section 2.1.5, there are three major petroleum storage and transfer facilities in the study area. These facilities store a combined total of approximately 20 million gallons of fuel in 35 ASTs. The facilities have current FRPs that require comprehensive spill response measures that include, among other things, requirements for facility and response self-inspection, training, and spill response exercises and drills. Evidence that personnel and equipment are readily available to respond to spills are an important component of an FRP. For example, North Pacific Fuel maintains a spill response van and boat at the UMC Dock that is deployable via crane. Also, Delta Western has developed an Oil Spill Prevention and Response Training Program, which has been approved by ADEC. This program includes hazardous waste operations, incident command, oil spill response, and a standardized oil transfer and response communication system.

ADEC generally performs biannual inspections of the facilities. The last inspections occurred in July 2005. No significant deficiencies were noted in the inspection reports that would indicate a substantial threat to water quality (Dickens 2006).

The three facilities appear to have implemented BMPs, developed the appropriate plans for spill scenarios, and properly manage their operations. There is no indication that these facilities are chronic sources of petroleum pollutants for the study area; however, given the fact that almost 20 million gallons of fuel are stored within close proximity to Dutch Harbor and Iliuliuk Bay, these facilities pose a potential high risk to impact water quality from the release of petroleum pollutants.

3.1.6 Docks and Harbors

Section 2.1.6 presents the numerous docks and harbors within the study area that provide fuel transfer services or other significant vessel services. The public docks are managed under a master BMP plan, while private docks may have FRPs, SPCC plans, or other contingency plans based on the nature of operations at each facility. Based on these variable conditions, this category is one of the most difficult to assess.

This degree of difficulty also stems from the requirement of individual responsibility to comply with BMPs and other controls. A large number of commercial and private vessels frequent the study area on a year round basis and require services at the various docks and harbors. Vessels often keep fuel oil on deck in drums or other small containers and operate portable equipment with external tanks, which create the potential for spills if not properly stored. The release of oily bilge water also is a significant threat because boats moored at a facility for a long period will accumulate excessive water in their bilges. Many bilges are pumped automatically, and if the bilges are not properly inspected and maintained by owners and operators, these discharges often contain oily mixtures.

Based on this analysis, docks and harbors pose an existing medium to high risk to impact water quality from the release of petroleum pollutants.

3.1.7 Sediments

Section 2.2.2 presents a summary of investigations that have documented significant petroleum contamination in marine sediments within the study area. These investigations represent the only extensive data that are available on petroleum impact to the environment of the study area. The data shows that Dutch Harbor suffers from wide-spread petroleum contamination, especially in offshore subtidal sediments. This situation is likely the result of historical, large-scale releases from known contaminated sites, such as the Pre-World War II Tank Farm and Rocky Point. The presence of the contaminated sediments potentially allows petroleum pollution to constantly affect the waters of the study area as the marine waters mix with the sediments. This interaction may impart some dissolved phase concentrations of petroleum constituents to the marine waters, but no data exists to determine if this is occurring. Based on this analysis, sediments in Dutch Harbor pose an existing medium to high risk to impact water quality from the release of dissolved phase petroleum pollutants.

Table 3-1. Petroleum Source Analysis Summary

Sources of Petroleum Pollutants	Description	Risk
Contaminated Sites	Nine contaminated sites identified in the study area. Range in scope from single UST sites to tank farms, one of which had an estimated release of up to one million gallons. Remedial actions are ongoing at the many of the sites, which should continue to mitigate future impacts to water quality.	**Existing and Medium to High** – While the risk for each individual site varies from minimal to high, the category as a whole poses a substantial risk to water quality because of the presence of uncontrolled petroleum contamination at the sites, especially at the Pre-World War II Tank Farm and Rocky Point.
Spills	During the past ten years, an average of 7.4 spills occurs per year in the study area, which accounts for the release of nearly 1,000 gallons of petroleum products annually to the study area.	**Existing and Medium to High** – This category poses a substantial risk to water quality because of the consistent input of petroleum pollutants to the study area. In addition, given the regularity with which spills occur, the threat of a large volume spill is always present.
Storm Water	The City of Unalaska has improved storm water outfall over the past decade by installing numerous oil/water separators; however, the lack of a storm water management plan hinders a standardized approach to managing storm water and potential pollutants.	**Existing and Low to Medium** – While some level of petroleum pollutants are expected to be present in storm water effluent, concentrations that would cause water quality impairment from petroleum pollutants generally are not expected. The nearly constant input of storm water caused by the region's climate increases the risk associated with this source.
Seafood Processors	Three seafood processors are located within the study area. One discharges permitted waste water to Iliuliuk Bay, while all three discharge non-contact cooling water to the waters of the study area. The petroleum content of these discharges is unknown.	**Existing and Low** – The discharges of waste water from seafood processors is not likely to contain significant concentrations of petroleum pollutants given the nature of processing. However, because these facilities have a nearly continuous discharge of waste and no analytical data exists on the concentrations of petroleum constituents in the effluents, there is a potential that processors are contributing to water quality impairment.
Petroleum Storage and Transfer Facilities	Three facilities located in the greater Unalaska area have a combined storage capacity of 20 million gallons of petroleum.	**Potential and High** – Regardless of the BMPs, spill plans, and contingency plans developed and implemented by these facilities, this category poses a high risk simply because of the threat of a significant release.
Docks and Harbors	Numerous public and private docks and harbors operate in the waters of the study area. Many of these offer fueling services or significant vessel repair and maintenance.	**Existing and Medium to High** – This category poses a substantial risk because of the fuel transfers that regularly occur at these facilities. In addition, the responsibility of individual vessel owners and operators to comply with BMPs, rules, and regulations increases the risk of this category.
Sediments	Previous investigations have shown that detectable concentrations of DRO and RRO are ubiquitous in the sediments of Dutch Harbor. Two areas have especially high concentrations: Rocky Point and the area at the top of Dutch Harbor between Ballyhoo Spit and Amaknak Island.	**Existing and Medium to High** – The levels of DRO and RRO in sediments from Dutch Harbor indicate that the marine environment has previously been impacted by petroleum pollutants, and that the contamination is potentially available to impact the water column.

3.2 Status of Impairment

This section combines the individual analyses of Section 3.1 to determine locations in the study area that potentially have impaired water quality from petroleum pollution and other areas where water quality is threatened by potential releases of petroleum pollutants. A discussion of data gaps identified during the analysis also is presented.

3.2.1 Potentially Impacted Areas

The Alaska water quality standards as presented in 18 AAC 70 list several petroleum standards that apply to the waters of the study area. They include:

- Water Supply (drinking, culinary, and food processing) – May not cause a visible sheen upon the surface of the water. May not exceed concentrations that individually or in combination impart odor or taste as determined by organoleptic tests (18 AAC 70.020(b)(5)(A)(i)).
- Water Supply (industrial) – May not make the water unfit or unsafe for the use (18 AAC 70.020(b)(5)(A)(iv)).
- Water Recreation (secondary contact) – May not cause a film, sheen, or discoloration on the surface or floor of the water body or adjoining shorelines. Surface waters must be virtually free from floating oils (18 AAC 70.020(b)(5)(B)(ii)).
- Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife – Total aqueous hydrocarbons (TAqH) in the water column may not exceed 15 micrograms per liter (µg/L). Total aromatic hydrocarbons (TAH) in the water column may not exceed 10 µg/L. There may be no concentrations of petroleum hydrocarbons, animal fats, or vegetable oils in shoreline or bottom sediments that cause deleterious effects to aquatic life. Surface waters and adjoining shorelines must be virtually free from floating oil, film, sheen, or discoloration (18 AAC 70.020(b)(5)(C)).
- Human Health Criteria for Noncarcinogens – These values are taken from Table V of *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances* (ADEC 2003).
    - Ethylbenzene for *Water + Aquatic Organisms* = 3,100 µg/L,
    - Ethylbenzene for *Aquatic Organisms Only* = 29,000 µg/L,
    - Toluene for *Water + Aquatic Organisms* = 6,800 µg/L, and
    - Toluene for *Aquatic Organisms Only* = 200,000 µg/L.

The visual water quality standard must be relied on to assess impairment in the study area because there is no quantified analytical data for the waters of the study area. The visual standard, although worded in various forms above, essentially states that no visible sheen may be on the surface of the water. Since the chronic sheens that used to plague Iliuliuk Bay and Dutch Harbor have been absent for some time now, there is no part of the study area that is known to be in a current state of impairment for "visible sheens." However, given the existing risks to water quality that were outlined in Section 3.1, portions of the study area may fail the numeric standards for TAqH, TAH, ethylbenzene, and toluene if water quality sampling were performed in the study area.

In particular, there are certain portions of the study area that are likely to be at greater risk for impairment, whether from numeric exceedances of water quality standards or the presence of visual sheens, based on the presence of nearby threats to water quality. The following details these areas and threats:

- Rocky Point – The waters located off this land feature of Amaknak Island appear to have the greatest risk for impairment of any portion of the study area. The area under consideration covers approximately 1.5 miles of coastline from the eastern end of the airport around the tip of Rocky Point and down past the APL dock. The numerous risks include the contaminated sites associated with Rocky Point; Delta Western bulk fuel storage; Delta Western Dock and APL Dock where regular fueling activities occur; contaminated sediments that are documented from the Delta Western Dock to the tip of Rocky Point; and the documented petroleum

parameters in two samples from the storm water outfall near the Delta Western Dock.

- Top of Dutch Harbor – The waters in this area are enclosed by Ballyhoo Spit, which shelters this water body from open water. The area under consideration covers approximately 0.5 mile of coastline along the western shore of Dutch Harbor to the top of the water body. The identified risks include the former Mount Ballyhoo Spit Tank Farm; seafood processing at Icicle Seafoods; fuel storage and transfer at North Pacific Fuel Resoff Terminal; fueling operations at Trident Seafoods Dock; and contaminated sediments along the western shore of the area.
- Coastline of Iliuliuk Harbor – The waters in this area are surrounded by significant development around Expedition Island, Margaret Bay, and the tip of Unalaska Island. Identified risks include contaminated sites at Alyeska Seafoods, AT&T Alascom, former Fort Mears, and former Submarine Base / Ship Repair Facility; seafood processing at UniSea, Inc., and Alyeska Seafoods; vessel activities at the Small Boat Harbor and Walashek Shipyard; and the absence of sediment data for the area.

Figure 3-1 shows a conceptual model of where impairment from petroleum pollutants may or is most likely to occur based on the descriptions above.

3.2.2 Data Gaps

During the gathering of background information and analysis of existing conditions for this project, data gaps were identified that impeded the formulation of conclusive opinions regarding the status of impairment and the potential for future occurrences of impairment from petroleum pollution. The following details these data gaps:

- Contaminated Sites – Extensive investigations and characterization have occurred at most of the contaminated sites within the study area since the early 1990s; however, the former Submarine Base / Ship Repair Facility is a contaminated site with limited information on the potential extent of contamination.
- Spills – The information contained in the spill database used by ADEC and analyzed for this project is limited by what is reported and what is added to the database. Fields that often hindered a thorough analysis included coordinate location, facility name/description, cause of the spill, and recovered quantities.
- Storm Water – The City of Unalaska has taken measures to mitigate petroleum pollution in storm water discharges; however, no documentation exists to determine whether the storm water outfalls are a source of petroleum pollution. A storm water management plan would be a useful tool for maximizing the performance of the system to reduce any petroleum loading that occurs through storm water.
- Seafood Processors – The NPDES permits for the seafood processors in the study area do not require monitoring for petroleum parameters; therefore, no documentation exists to determine whether the facilities' discharges may be a source of petroleum pollution.
- Petroleum Storage and Transfer Facilities – No data gaps were identified for this category.
- Docks and Harbors – The docks and harbors of the study area are known, but a lack of information does exist regarding the volume of bilge-related discharges of petroleum pollution that occur at these facilities. Additionally, because EPA does not maintain a database of facilities that require a SPCC plan, there is no method to verify that facilities are meeting regulatory obligations.

- Sediments – Although extensive data is available for Dutch Harbor, no samples have been collected in Iliuliuk Bay off the coast of Rocky Point and throughout Iliuliuk Harbor where industrialized activities occur.
- Water Quality – Most importantly, no analytical data are available on the concentrations of petroleum parameters within the impaired water bodies of the study area. This simple fact limits analysis of water quality in the study area because there is no data to conclude that the water bodies meet all water quality criteria for petroleum pollutants. In addition, minimal data exists on the quantities contributed from sources of petroleum pollution; therefore, the relative contribution from each source is unknown.

3.3 Management of Impairment

The final objective of this project is to recommend a process for developing a TMDL, or an alternative approach known as a water body recovery plan, for addressing impairment of Dutch Harbor, Iliuliuk Bay, and Iliuliuk Harbor. The goal of the TMDL or alternative approach is to bring the water bodies of the study area into attainment with Alaska water quality standards so that Dutch Harbor and Iliuliuk Bay may be removed from the 303(d) list.

Based on the preceding information review and analysis, the best approach for attaining water quality criteria is an alternative approach and not the development of a TMDL. The reason for not developing a TMDL is best described in EPA's 1994 report, *Water Quality Assessment of Greater Unalaska Bay*, which stated, "Intermittent spills and illegal releases are the source of pollution; these issues are not suitable for wasteload assessment and allocation and must be dealt with through education and enforcement." While this report also has included releases from contaminated sites and contaminated sediments as significant contributing sources of petroleum pollution, the EPA's conclusion remains unchanged that load allocation is not suitable for the study area. There is no realistic method for assigning numeric allocation of petroleum loads to uncontrolled releases caused by contaminated sites, contaminated sediments, spills, and releases. Therefore, an alternative approach for attaining water quality is required.

The alternative approach should include two main components. The first, and most important, is a water quality monitoring plan. The impaired water bodies need to meet all applicable petroleum water quality standards as outlined in Section 3.2.1. The water bodies have met the "no visual sheens" standard for nearly a decade, but no analytical data exists to determine whether the water bodies have attained the numeric criteria for TAH, TAqH, ethylbenzene, and toluene. The second component of the alternative approach is the development of a plan to eliminate the data gaps identified in Section 3.2.2. These data gaps represent areas that are lacking in management for the potential sources of petroleum pollution.

The combination of meeting water quality criteria and implementing a strategy to better manage the potential sources of petroleum pollution should provide the data and oversight necessary to demonstrate that water quality is protected for the study area. This will allow the agency to initiate the process for removing Dutch Harbor and Iliuliuk Bay from the 303(d) list.

4.0 Recommendations

Based on the review of background conditions and analysis of the current conditions, an alternative approach, as outlined in Section 3.3, is recommended to address water quality impairment from petroleum pollution in Dutch Harbor, Iliuliuk Bay, and Iliuliuk Harbor. The EPA recommends a standard format for developing an alternative approach. The six required features of the standard format are:

- Statement of impairment;
- Proposed implementation strategy and pollution controls;
- Timetable for water quality attainment;
- Schedule for implementing pollution controls;
- Monitoring milestones for tracking progress on implementation of pollution controls; and
- Commitment to revise implementation strategy and pollution controls as necessary

The alternative approach for this project's study area should be composed of two main components: water quality monitoring and management of the potential sources of petroleum pollution. The specific recommendation for water quality monitoring is:

- Development of a water quality monitoring program. The program should include a sample and analysis plan that outlines quality assurance methods for gathering and reporting field and analytical data. TAH, TAqH, ethylbenzene, and toluene are the required aqueous analytical parameters, although physical water quality parameters and sediment samples for BTEX and DRO are recommended. The sample schedule should include a minimum of quarterly sampling, or a schedule based on commercial fishing seasons, for one year to generate a baseline data set. Sampling should occur in Dutch Harbor, Iliuliuk Bay, and Iliuliuk Harbor with a focus on the potentially impacted areas outlined in Section 3.2.1.

- Estimated costs to conduct one round of sampling is approximately $60,000 and includes the following, broad assumptions:

    - $20,000 of labor for a 4-person field team to collect water and sediment samples over a 4-day period;
    - $20,000 of analytical costs for an estimated 30 to 35 water and sediment samples;
    - $13,000 of travel, mobilization, and equipment costs; and
    - $7,000 for rental of two boats for 4-days, one for water sampling and one for sediment sampling.

For the second component of the alternative approach, the following specific recommendations are provided to eliminate data gaps from the management and oversight of the potential sources of petroleum pollution:

- Conduct a more comprehensive assessment of the former Submarine Base / Ship Repair Facility.
- Institute more detailed reporting requirements for spills to better identify where spills occur and why they occur.
- Provide assistance to the City of Unalaska for developing a storm water management plan.
- Demonstrate that discharges of the seafood processors do not contain petroleum pollution.

- Continue education and enforcement of the current BMPs for operations at the public docks and harbors, and review SPCC plans for facilities operating in the greater Unalaska area to ensure that regulatory obligations are being met.
- Collect intertidal and subtidal sediment samples from locations in Iliuliuk Bay and Iliuliuk Harbor to determine the distribution of petroleum pollutants outside of Dutch Harbor.

5.0 Conclusions

This study undertook to collect, consolidate, and interpret the available literature and data on petroleum pollution and sources in Dutch Harbor, Iliuliuk Bay, and Iliuliuk Harbor. The purpose of this undertaking was to determine whether to proceed with TMDL development or develop an alternative approach to address the current impairment listings for Iliuliuk Bay and Dutch Harbor.

The result of the collection, consolidation, and interpretation of the available literature and data was the identification of six sources of existing or potential petroleum pollution in the study area: contaminated sites, spills, storm water, seafood processors, bulk petroleum storage and transfer facilities, and docks and harbors. In addition, contaminated sediments were identified as contributing to potential water quality impairment because of constant mixing of the water column with contaminated sediments. Other studies of water quality and existing plans also were reviewed to determine the extent of previous impact to water quality and what mechanisms are in place to reduce, eliminate, and respond to water quality issues.

The findings of the literature and data review were analyzed to determine what sources of existing or potential petroleum pollution pose the greatest risk to future water quality. Petroleum storage and transfer facilities was the only source ranked as having a high risk, but the risk also was the only potential one because the risk stems from the inherent threat of 20 million gallons of petroleum stored near the shorelines of the study area. On the other hand, the remaining sources of petroleum pollution are all existing sources source of petroleum pollution because these sources have previously or currently impact water quality in the study area. These sources are categorized as follows: contaminated sites (existing medium to high risk), spills (existing medium to high risk), docks and harbors (existing medium to high risk), storm water (existing low to medium risk), and seafood processors (existing low risk). In addition, documented petroleum contamination of intertidal and subtidal sediments in Dutch Harbor were ranked as having an existing medium to high risk to impact water quality because of the constant mixing of water with the contaminated sediments.

Based on the review and analysis of sources of petroleum pollution, the current status of impairment was evaluated for Dutch Harbor, Iliuliuk Bay, and Iliuliuk Harbor. While no specific region in the study area appears to be impacted by visible sheens, three specific areas were identified as having potential water quality impact from dissolved phase petroleum pollutants and contaminated sediments:

1) area off Rocky Point from the airport past the APL Dock;
2) area at the top of Dutch Harbor between Ballyhoo Spit and the coast of Amaknak Island; and
3) area around the coastlines of Iliuliuk Harbor.

In order to address these identified areas of potential impairment and the 303(d) listings of Dutch Harbor and Iliuliuk Bay, this report recommends the development of an alternative approach instead of a TMDL. The development of a TMDL was dismissed because the allocation of petroleum loads to contaminated sites, spills, and contaminated sediments is not feasible. The alternative approach should be constructed within EPA's recommended guidelines for a water body recovery plan, and the alternative approach should include two main components: water quality monitoring and increased management of petroleum sources in the study area.

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FIGURES

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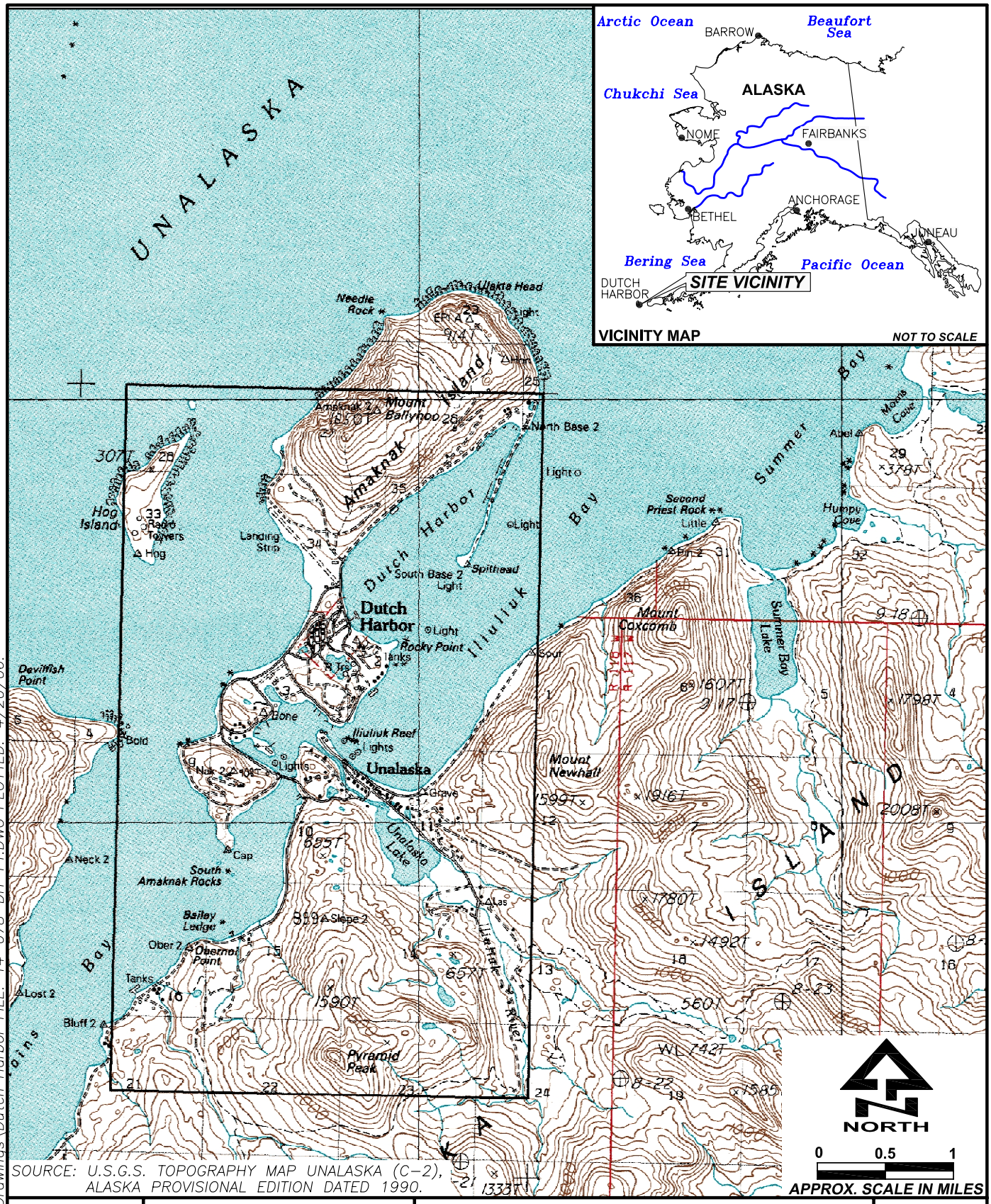

SOURCE: U.S.G.S. TOPOGRAPHY MAP UNALASKA (C-2), ALASKA PROVISIONAL EDITION DATED 1990.

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DATE	APRIL 2006
CHKD	B.J.M.
DRAWN	C.E.H.
PROJ. NO	14-078

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SITE LOCATION MAP

DUTCH HARBOR WATER QUALITY AND IMPAIRMENT STUDY
Unalaska, Alaska

FIGURE
1-1

Figure 1-2
STUDY AREA

Dutch Harbor Water Quality and Impairment Analysis
Unalaska, Alaska

Orthophotograph: Aeromap 1997

0 0.15 0.3 0.6
Miles

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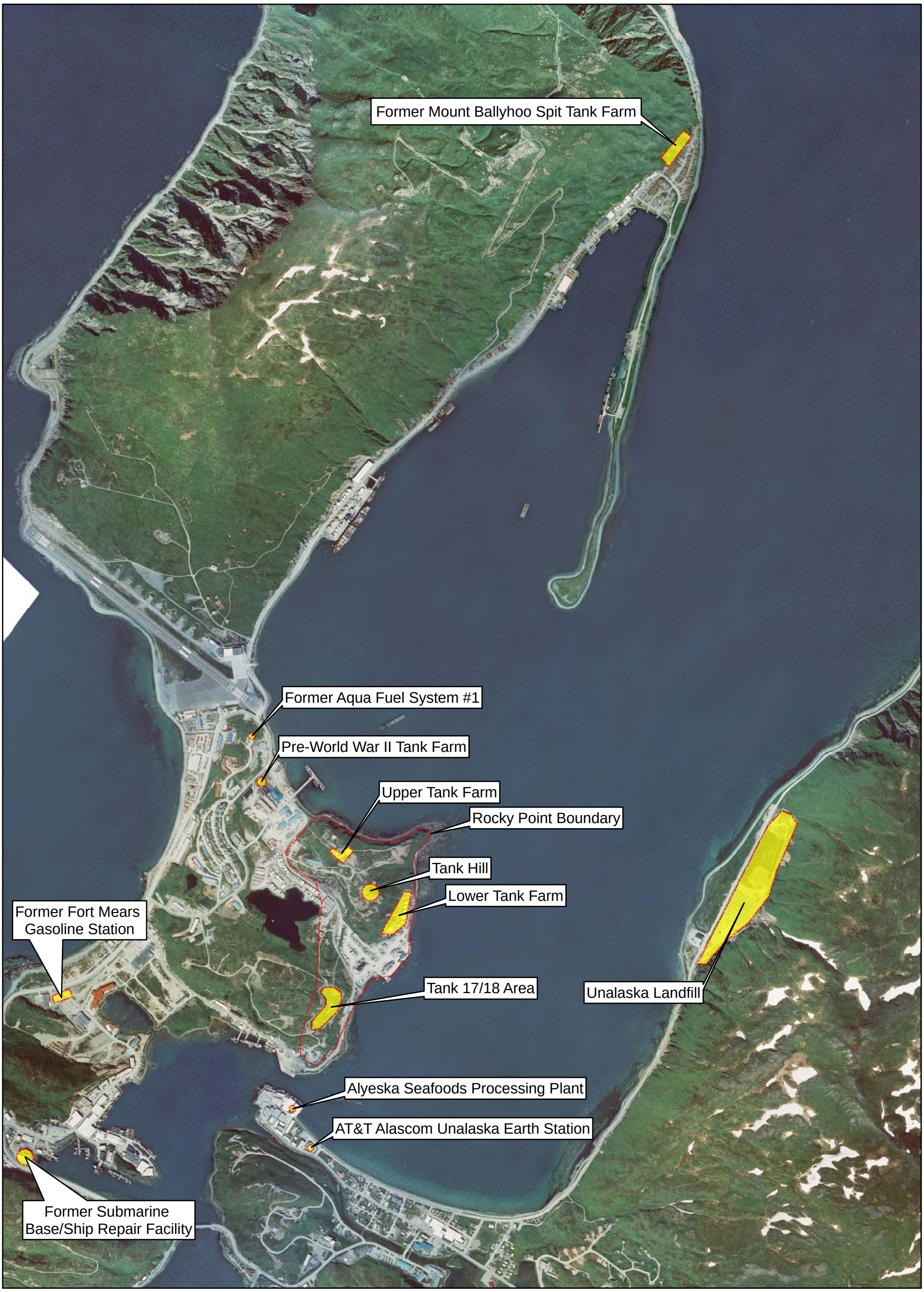

Figure 2-1
CONTAMINATED SITES

Dutch Harbor Water Quality and Impairment Analysis
Unalaska, Alaska

Orthophotograph: Aeromap 1997

0 0.125 0.25 0.5
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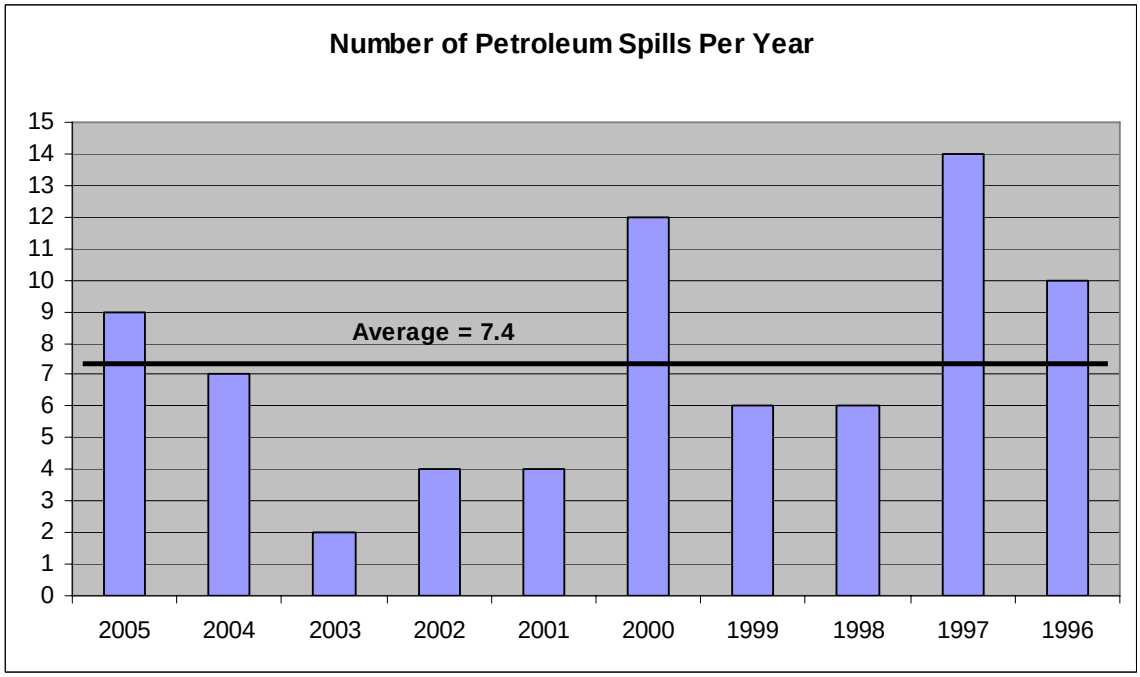
Figure 2-2 Spill Statistics



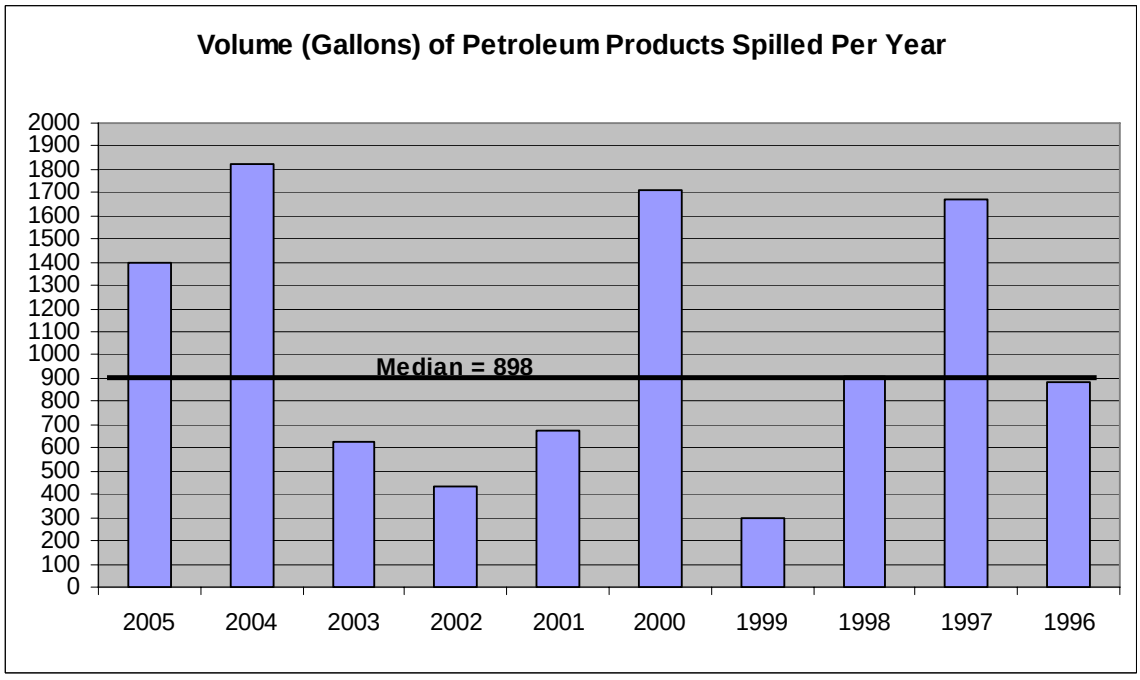


Figure 2-3
SEAFOOD PROCESSORS AND
PETROLEUM STORAGE FACILITIES

Dutch Harbor Water Quality and Impairment Analysis
Unalaska, Alaska

Orthophotograph: Aeromap 1997

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Figure 2-4
DOCKS AND HARBORS

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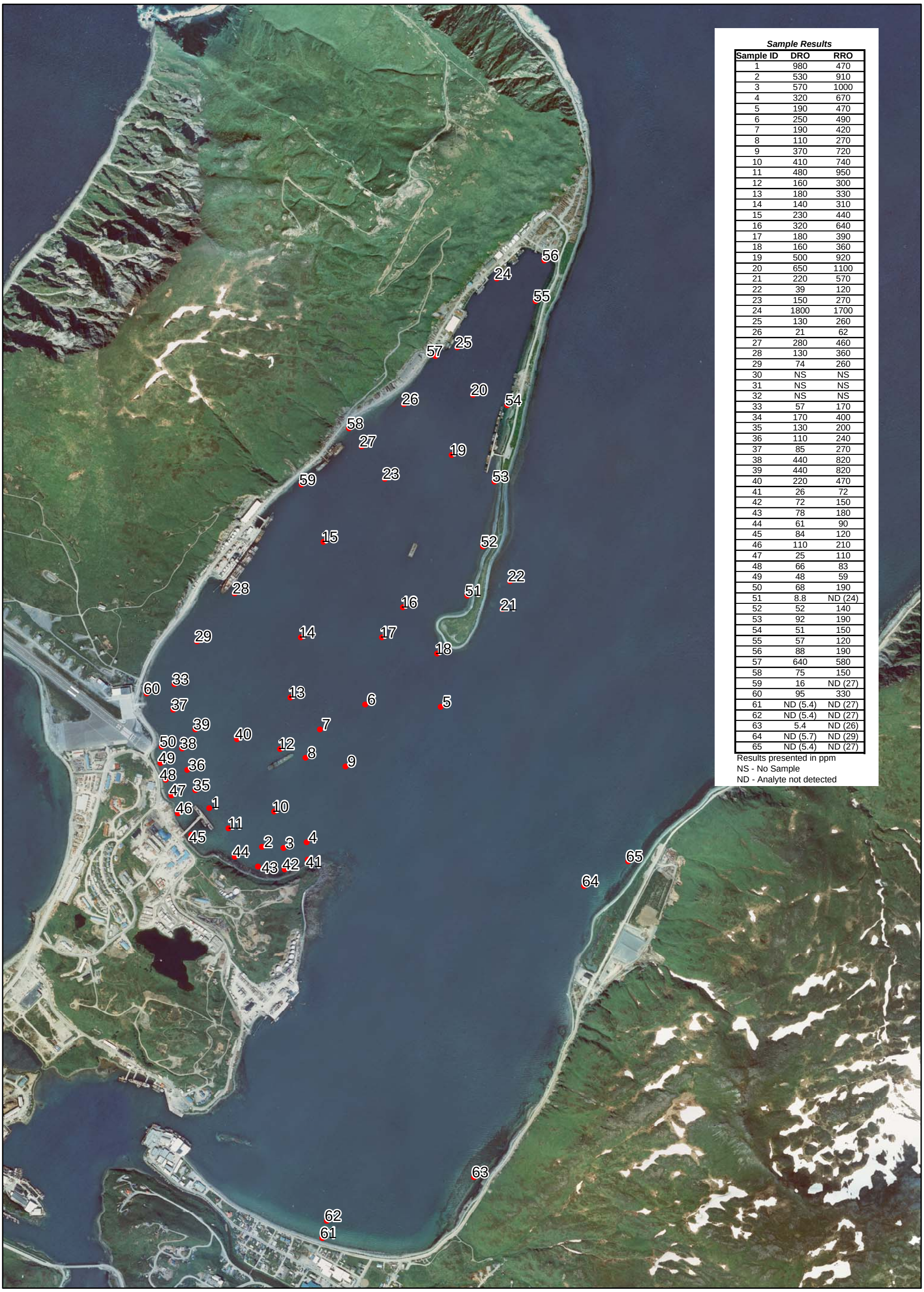

Sample Results

Sample ID	DRO	RRO
1	980	470
2	530	910
3	570	1000
4	320	670
5	190	470
6	250	490
7	190	420
8	110	270
9	370	720
10	410	740
11	480	950
12	160	300
13	180	330
14	140	310
15	230	440
16	320	640
17	180	390
18	160	360
19	500	920
20	650	1100
21	220	570
22	39	120
23	150	270
24	1800	1700
25	130	260
26	21	62
27	280	460
28	130	360
29	74	260
30	NS	NS
31	NS	NS
32	NS	NS
33	57	170
34	170	400
35	130	200
36	110	240
37	85	270
38	440	820
39	440	820
40	220	470
41	26	72
42	72	150
43	78	180
44	61	90
45	84	120
46	110	210
47	25	110
48	66	83
49	48	59
50	68	190
51	8.8	ND (24)
52	52	140
53	92	190
54	51	150
55	57	120
56	88	190
57	640	580
58	75	150
59	16	ND (27)
60	95	330
61	ND (5.4)	ND (27)
62	ND (5.4)	ND (27)
63	5.4	ND (26)
64	ND (5.7)	ND (29)
65	ND (5.4)	ND (27)

Results presented in ppm
NS - No Sample
ND - Analyte not detected

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Figure 2-5
PREVIOUS SEDIMENT STUDIES

Dutch Harbor Water Quality and Impairment Analysis
Unalaska, Alaska

Orthophotograph: Aeromap 1997

0 0.125 0.25 0.5
Miles

Figure 3-1
AREAS OF POTENTIAL WATER QUALITY IMPAIRMENT

Dutch Harbor Water Quality and Impairment Analysis
Unalaska, Alaska

Orthophotograph: Aeromap 1997

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Miles

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