Appendix C:
Hazardous Materials and Waste Management

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C.1 Introduction

Affected environments are defined for each of the major waste types associated with Trans-Alaska Pipeline System (TAPS) operations. For each waste category, the respective Alyeska Pipeline Service Company (APSC) Environmental Management System program, relevant implementing procedures, and information obtained through interviews of APSC and Joint Pipeline Office (JPO) representatives are used to describe the general nature of the wastes being generated and the external and internal controls that govern APSC extant management strategies. The most recently available disposal records are used to provide quantification where possible. Information provided in the Hazardous Materials Management Business Model and its related implementation procedures is used to define the affected environment with respect to hazardous materials. Quantities of some hazardous materials are reflected in the APSC Emergency Planning and Community Right-To-Know (EPCRA) Tier II report for 2000.

C.2 Hazardous Materials Management

Hazardous materials are used throughout the TAPS system to support operations and maintenance. The APSC Hazardous Materials Management Business Model provides for both administrative tracking and physical control of hazardous materials (APSC 2000a). Chapter 8 of the TAPS *Environmental Protection Manual*, EN-43-1 (APSC 2000b), contains implementing procedures for hazardous materials management. The more salient elements of the program include the following:

- *Review and authorization for use:* Before a chemical can be used within the TAPS (including at contractor facilities), approvals must be obtained from both APSC environmental and safety authorities. The safety review identifies the prominent chemical and physical hazards of the chemical and specifies unique storage and handling requirements as well as the necessary hazard communication training for workers who will handle, or potentially be exposed to, the chemical. The environmental review identifies the compliance obligations that result from using the chemical and specifies the appropriate disposal scheme for resulting wastes. Appropriate elements of spill contingency planning are also identified.

- *Inventory management:* A systemwide Hazardous Materials Consolidation and Redistribution (HAZCORE) Program is in place. Databases are maintained on a commercially available computer software program to provide for systemwide comprehensive hazardous materials procurement and inventory management, as well as the electronic management and distribution of Material Safety Data Sheets (MSDS). Initiatives such as redistributing hazardous materials throughout the system, limiting excess hazardous materials purchases, and tracking material shelf lives are all facilitated by the HAZCORE databases. The HAZCORE databases also interface with programs for employee training to ensure that training is consistent with Occupational Safety and Health Administration (OSHA) and State of Alaska requirements and APSC corporate policies.

- *Hazardous material transportation:* Separate training on U.S. Department of Transportation (DOT) requirements is provided to APSC employees and contractor employees who repackage and transport hazardous materials throughout the TAPS.

- *Hazardous materials management plans:* Hazardous materials brought into TAPS facilities by contractors or to support a specific project require an approved Hazardous Materials Management Plan. Such plans provide details on the materials, their packaging and storage circumstances, appropriate contingency plans, and an identification of all wastes anticipated from the use of the materials in question.

- *Emergency planning:* Emergency planning includes the development of site-specific contingency plans for hazardous material storage or usage locations. This program element also supports APSC's responsibility to notify local emergency response authorities of all hazardous materials present in quantities above their respective threshold planning quantities (TPQs) as required by EPCRA (also known as Superfund Amendments and Reauthorization Act [SARA] Title III). In addition to initial notifications, the program is also capable of generating an annual report to the state (known as a Tier II Report) of amounts and types of hazardous materials present at TAPS facilities above TPQs, as also required by EPCRA.

A wide variety of hazardous materials are necessary to support the TAPS. Materials used include equipment and vehicle fuels, heat transfer fluids, organic solvents, petroleum-based cleaners and detergents, lubricating oils, adhesives and sealants, refrigerants, photographic materials, fire suppressants, fire fighting agents, corrosion inhibitors, corrosive agents, explosives, and pesticides. In addition, hazardous materials are also used for infrastructure repair and maintenance. These include paints and solvents as well as various adhesives and protective coatings.

In addition to hazardous commodities, hazardous materials are also present in some equipment or products in widespread use throughout the TAPS. Such products include batteries of the following types: lead-acid, alkaline, lead calcium, lithium, mercury, nickel-cadmium, and zinc chloride. Other commodities containing hazardous materials include various items of air emission monitoring equipment that may contain corrosive solutions or toxic heavy metals; thermometers, thermostats, or electrical switches that contain mercury; vapor or fluorescent lightbulbs that contain mercury; and incandescent lightbulbs containing lead.

Hazardous materials are delivered to the central APSC warehouse in Anchorage, the Anchorage Distribution Center, or directly to the appropriate maintenance facility or pump station by commercial carriers. APSC employees and operating contractors also engage in some repackaging (into smaller containers) and redistribution of hazardous materials throughout the TAPS. With few exceptions, hazardous materials shipments are by truck (either commercial carrier or APSC vehicle). Contractors conducting specific tasks may also bring hazardous materials obtained from outside the APSC inventory directly to the job site. Fuels are delivered by bulk load by commercial carriers. With the exception of fuels in portable tanks brought to maintenance or repair work sites along the pipeline and fuels brought to remote gate valve (RGV) control buildings, APSC employees and contractors do not redistribute or otherwise transport fuels. Notwithstanding fuels, hazardous materials are stored in 55-gal or smaller containers.

Although the potential exists for hazardous materials to be used anywhere throughout the pipeline or within the Valdez Marine Terminal, the majority of hazardous material usage occurs at the marine terminal, the operating pump stations, and maintenance and equipment yards off the TAPS ROW. These locations include the Doyon Industrial Facility (Fairbanks), Nordale Storage Yard (Fairbanks), North Pole Metering Station, and the Van Horn Facility (Fairbanks). Hazardous materials are also used along the pipeline to support maintenance or repair activities and special projects. Very small amounts of hazardous materials are used at the APSC "Bragaw Facility" administrative headquarters in Anchorage. With the exception of fuels that are stored in aboveground tanks at pump stations and maintenance yards and in one belowground storage tank at the Bragaw Facility, hazardous materials are stored in dedicated storage areas within buildings at the Valdez Marine Terminal, the maintenance facilities, and the pump stations. For some line maintenance activities or special projects (e.g., vaulting of check valves), limited quantities of hazardous materials and fuels are stored in temporary facilities or portable tanks at the job site through the duration of the job.

In March 2001, the APSC submitted an EPCRA Tier II Report to the ADEC reporting on the amounts of hazardous materials present at APSC facilities in amounts above their respective TPQs (Ferrell 2001). Table C-1 provides a summary of that report.

C.3 Hazardous Waste

Section 3 of the TAPS *Environmental Protection Manual*, EN-43-2 (APSC 2000c), describes procedures by which any waste generated within the TAPS will be evaluated and characterized. Section 4 establishes systemwide programmatic controls for managing those TAPS wastes that are determined to be hazardous waste by federal or state regulations. Section 4 of the TAPS *Environmental Protection Manual*, EN-43-2, establishes APSC standards for containerization and labeling of hazardous waste; storage of hazardous waste at satellite locations and designated storage facilities; inspections and record keeping for storage areas; and pickup and transportation of hazardous waste to designated permitted treatment, storage, and disposal facilities (TSDFs). Section 4 also establishes training requirements for personnel responsible for management of hazardous waste and requires the development of contingency plans for all hazardous waste accumulation and storage areas.

The APSC has determined where hazardous wastes are generated and accumulated and has given notification to the U.S. Environmental Protection Agency (EPA) Region 10 of the status of these locations (Seward 2001a). These APSC-operated hazardous waste generation/ accumulation sites include Pump Station (PS) 1 through PS 12 (excluding those now on standby); Mainline Refrigeration Units 1, 2, and 7; the Ship Escort Response Annex; Ship Escort Response Base; Valdez Marine Terminal; North Pole Metering Station; Nordale Yard Facility; Northstar Terminal; Van Horn Facility; North Pole Laboratory; and Bragaw Facility. Only the hazardous waste management areas at Mainline Refrigeration Unit 2, Northstar Terminal, and the Marine Terminal are large-quantity generators (i.e., generate more than 2,200 lb hazardous waste per month). The other sites are conditionally exempt small-quantity generators that generate less than 220 lb of hazardous waste or 2.2 lb of acute hazardous waste in any month.

Some APCS-generated wastes, such as spent fluorescent bulbs and batteries, are managed as Resource Conservation and Recovery Act (RCRA) Universal Wastes and are ultimately delivered to a disposal facility by the APSC hazardous waste contractor. Spent lead acid batteries are recycled and therefore are not considered RCRA wastes.

Hazardous waste is generated from the use of hazardous materials (e.g., methyl ethyl ketone [MEK]) or the disposal of off-specification or excess chemicals (e.g., 1,1,1-tricholorethane [TCA]), which the EPA designates as "listed hazardous waste" when they are discarded. Wastes generated from the maintenance of various items of pipeline and Valdez Marine Terminal equipment that display any of the EPA-designated hazardous characteristics (i.e., ignitability, corrosivity, toxicity, or reactivity) are also considered hazardous wastes. Only large-quantity generators are required to file a biennial report with the EPA showing the type of waste generated, source of the waste, quantity of waste generated, identity of the hazardous waste contractor taking the waste, and the type of disposal facility to which it was shipped. Thus, the biennial report filed in 1999 reflects only the hazardous waste generated and shipped from Mainline Refrigeration Unit 2, Northstar Terminal, and the Valdez Marine Terminal. The hazardous wastes reflected in the 1999 biennial report are shown in Table C-2. Other facilities along the pipeline generate similar hazardous wastes, but in smaller quantities.

As shown in Table C.2, a systemwide total of 142,118.9 lb of hazardous waste was shipped off site in 1999. A major reduction in the generation of hazardous waste has occurred over the years, principally because of better hazardous materials management and other pollution prevention initiatives. For example, 712,000 and 310,000 lb of hazardous waste were disposed

TABLE C-1 Summary of EPCRA Tier II Report for Calendar Year 2000[a]

TAPS Facility	Hazardous Material	Maximum Daily Amount Present[b]	Average Daily Amount Present[b]	Principal Hazard[c]
Bragaw Office Complex	Diesel fuel	24,000 gal	18,000 gal	F, I
Doyon Industrial Facility	Antifreeze	1,000 gal	1,000 gal	I, D
	Therminol 44® (heat transfer fluid)	11,500 gal	6,500 gal	I
	Therminol 55® (heat transfer fluid)	13,000 gal	13,000 gal	I
	Oakite®	13,125 lb	13,125 lb	I
	Diesel fuel	2,000 gal	2,000 gal	F, I
	Therminol FF® (heat transfer fluid)	11,500 gal	6,500 gal	I
	Therminol 44® (heat transfer fluid)	99,999 gal	9,999 gal	I
	Diesel fuel	2,000 gal	2,000 gal	F, I
	Jet oil II	500 gal	500 gal	D
	Lubricating oils	99,999 gal	9,999 gal	F, I
Drag Reducing Agent Injection Facility	Drag reducing agent (Conoco)	10,000 gal	5,000 gal	F, I, D
	Drag reducing agent (Baker)	39,000 gal	20,000 gal	F, I, D
	Liquid nitrogen	5,200 gal	2,600 gal	P
	Diesel fuel	3,150 gal	2,000 gal	F, I
Nordale Storage Yard	Halon 1301®	99,999 lb	99,999 lb	I
	Lubricating oil	99,999 lb	99,999 lb	F, I
	Gasoline	9,999 lb	9,999 lb	F, I, D
	Diesel fuel	99,999 lb	99,999 lb	F, I
	Antifreeze	9,999 lb	9,999 lb	I, D
	Methanol	9,999 lb	9,999 lb	F, I, D
	Methyl ethyl ketone (MEK)	9,999 lb	9,999 lb	F, I
	Petroleum solvent, Varsol 18®	9,999 lb	9,999 lb	F, P
	Transmission fluid	9,999 lb	9,999 lb	F, I
	Used oil	5,000 gal	3,000 gal	F, I
North Pole Metering Station	Diesel fuel	5,821 gal	2,500 gal	F, I
Anchorage Operations Support Facility	Citrikleen® (new and waste)	900 lb	450 lb	NA[d]
	1,1,1-trichloroethane	500 lb	200 lb	I, D
	Stoddard solvent (Naphtha-based)	600 lb	500 lb	F, I

TABLE C-1 (Cont.)

TAPS Facility	Hazardous Material	Maximum Daily Amount Present[b]	Average Daily Amount Present[b]	Principal Hazard[c]
PS 1	Therminol 44® (heat transfer fluid)	18,800 lb	18,800 lb	I
	Therminol 55® (heat transfer fluid)	18,800 lb	18,800 lb	I
	Drag reducing agent (Baker)	267,000 lb	267,000 lb	F, I, D
	Diesel fuel	2,931,000 lb	2,931,000 lb	F, I
PS 2	JP-4 aviation fuel	64,000 lb	64,000 lb	F, I
	Diesel fuel	40,000 lb	40,000 lb	F, I
PS 3	Therminol 44® (heat transfer fluid)	9,300 lb	9,300 lb	I
	Diesel fuel	5,938,000 lb	5,938,000 lb	F, I
	Lubricating oils and used oil	24,700 lb	24,700 lb	F, I
PS 4	Therminol 55® (heat transfer fluid)	9,300 lb	9,300 lb	I
	Lubricating oils and used oil	13,500 lb	13,500 lb	F, I
	JP-4 aviation fuel	64,000 lb	64,000 lb	F, I
	Therminol 44® (heat transfer fluid)	9,300 lb	9,300 lb	I
	Gasoline	23,300 lb	12,000 lb	F, I., D
	Diesel fuel	5,937,000 lb	5,937,000 lb	F, I
	Propane	12,000 gal	12,000 gal	F, P, I
PS 5	Therminol 44® (heat transfer fluid)	6,000 gal	6,000 gal	I
	Sulfuric acid (battery electrolyte)	600 gal	500 gal	R, I
	Lubricating oils and used oil	3,250 gal	1,500 gal	F, I
	JP-4 aviation fuel	8,000 gal	4,000 gal	F, I
	Halon 1301® (including weight of storage cylinders)	260,000 lb	260,000 lb	P
	Therminol 55® (heat transfer fluid)	6,000 gal	6,000 gal	I
	Corrosion inhibitor	700 gal	350 gal	F, I
	AFFF (aqueous film-forming foam) (3M)	2,310 gal	2,310 gal	
	Diesel fuel	812,000 gal	400,000 gal	F, I
	Antifreeze	165 gal	100 gal	I, D
PS 6	Corrosion inhibitor	700 gal	350 gal	F, I
	Therminol 44® (heat transfer fluid)	7,500 gal	7,500 gal	I
	Sulfuric acid (battery electrolyte)	600 lb	600 lb	R, I
	JP-4 aviation fuel	8,000 gal	4,000 gal	F, I
	Halon 1301® (including weight of storage cylinders)	260,000 lb	2,600,000 lb	P
	Gasoline	300 gal	150 gal	F, I, D
	Diesel fuel	35,000 gal	17,500 gal	F, I

TABLE C-1 (Cont.)

TAPS Facility	Hazardous Material	Maximum Daily Amount Present[b]	Average Daily Amount Present[b]	Principal Hazard[c]
PS 7	AFFF (3M)	1,695 gal	1,695 gal	NA
	Corrosion inhibitor	700 gal	350 gal	F, I
	Diesel fuel	1,780,000 gal	1,300,000 gal	F, I
	Drag reducing agent (Baker)	43,200 gal	21,600 gal	F, I, D
	Sulfuric acid (battery electrolyte)	4,000 gal	4,000 gal	R, I
	Halon 1301® (including weight of storage cylinders)	164,000 lb	164,000 lb	P
	Liquid nitrogen	3,000 gal	1,500 gal	P
	Therminol 55® (heat transfer fluid)	5,000 gal	4,700 gal	I
PS 8	Diesel fuel	3,000 gal	2,000 gal	F, I
	Halon 1301® (including weight of storage cylinders)	99,999 lb	99,999 lb	P
	Sulfuric acid (battery electrolyte)	36 gal	36 gal	R, I
PS 9	Drag reducing agent (Conoco)	10,000 gal	5,000 gal	F, I, D
	Therminol 44® (heat transfer fluid)	6,500 gal	6,500 gal	I
	Sulfuric acid (battery electrolyte)	4,000 gal	4,000 gal	R, I
	Liquid nitrogen	2,800 gal	1,000 gal	P
	Lubricating oil	605 gal	605 gal	F, I
	Halon 1301® (including weight of storage cylinders)	32,200 lb	32,200 lb	P
	Drag reducing agent (Baker)	22,000 gal	18,000 gal	F, I, D
	Diesel fuel	1,680,000 gal	1,400,000 gal	F, I
	Corrosion inhibitor	750 gal	250 gal	F, I
	AFFF (3M)	1,450 gal	1,450 gal	NA
PS 10	Diesel fuel	12,800 gal	12,800 gal	F, I
	Halon 1301® (including weight of storage cylinders)	48,000 lb	48,000 lb	P
PS 12	Lubricating oil	99,999 lb	99,999 lb	F, I
	Halon 1301® (including weight of storage cylinders)	99,999 lb	99,999 lb	P
	Gasoline	99,999 lb	99,999 lb	F, I, D
	Diesel fuel	9,999,999 lb	9,999,999 lb	F, I
	Corrosion inhibitor	99,999 lb	99,999 lb	F, I
	AFFF (3M)	99,999 lb	99,999 lb	
	Sulfuric acid (battery electrolyte)	500 lb	500 lb	R, I
RGVs 26–37 at PS 4[e]	Propane	8,000 gal	4,000 gal	F, P, I
	Diesel fuel	5,821 gal	2,500 gal	F, I

TABLE C-1 (Cont.)

TAPS Facility	Hazardous Material	Maximum Daily Amount Present[b]	Average Daily Amount Present[b]	Principal Hazard[c]
RGVs 39–62 at PS 5[e]	Propane	8,000 gal	4,000 gal	F, P, I
	Diesel fuel	5,821 gal	2500 gal	F, I
RGVs 65–77A at PS 7[e]	Propane	8,000 gal	4,000 gal	F, P, I
	Diesel fuel	5,821 gal	2,500 gal	F, I
RGVs 80–96 at PS 9[e]	Propane	8,000 gal	4,000 gal	F, P, I
	Diesel fuel	5,821 gal	2,500 gal	F, I
RGVs 97–125 at PS 12[e]	Propane	8,000 gal	4,000 gal	F, P, I
	Diesel fuel	5,821 gal	2,500 gal	F, I
SERVS (Downtown)	Diesel fuel	99,999 lb	9,999 lb	F, I
SERVS (Mineral Creek Rd.)	Corexit™ dispersant	100,800 lb	100,800 lb[f]	F, I, D[f]
	Diesel fuel	58,000 lb	58,000 lb	F, I
	Motor oil	4,470 lb	4,470 lb	F, I
	Corrosion inhibitor	9,800 lb	4,900 lb	F, I
Valdez Marine Terminal	Diesel fuel	23,869,366 lb	23,869,366 lb	F, I
	Ethylene glycol	280,000 lb[f]	280,000 lb[f]	I, D
	Gasoline	7,000 lb	7,000 lb[f]	F, I, D
	Hydraulic lubricating oil	80,000 lb	50000 lb	F, I
	Cleartron ZB-258®	108,000 lb	108,000 lb	I
	Sodium hydroxide	159,000 lb[f]	159,000 lb[f]	R, I
	Sulfuric acid (both pure and battery electrolyte)	53,000 lb[f]	53,000 lb[f]	R, I
	Aer-o-lite® (3% Green foam) (fire fighting foam) (National foam)	312,200 lb	312,200 lb	I
	AFFF (3M)	999,999 lb	999,999 lb	NA
	Fluoroprotein foam (National)	496,000 lb	465,000 lb	NA
	BioNutrient 2170	280,000 lb[f]	280,000 lb[f]	I
	Crude oil	1.056 billion lb[f]	1.056 billion lb[f,g]	F
Van Horn Facility	Gasoline	1,000 gal	500 gal	F, I, D
	Transmission fluid	700 gal	470 gal	F, I
	Propane	300 lbs	30 lbs	F, P, I
	PF 32 degreaser	200 gal	165 gal	F
	Motor oil	700 gal	690 gal	F, I
	Methanol	55 gal	55 gal	F, I, D

TABLE C-1 (Cont.)

TAPS Facility	Hazardous Material	Maximum Daily Amount Present[b]	Average Daily Amount Present[b]	Principal Hazard[c]
Van Horn Facility	Hydraulic oil	500 gal	455 gal	F, I
(Cont.)	Diesel fuel	26,000 gal	15,850 gal	F, I
	Antifreeze	500 gal	315 gal	I, D
	Sulfuric acid (battery electrolyte)	12 gal	12 gal	R, I

[a] Except as noted in footnote f, data in this table were derived from the State of Alaska Tier II forms submitted by APSC to the Alaska Department of Environmental Conservation (ADEC) on March 1, 2001, covering the period January 1, 2000, through December 31, 2000. No attempts were made to independently verify any of the quantities reported. Storage of hazardous materials in calendar year 2000 is believed to be generally representative of ongoing TAPS operations.

[b] Under the federal regulations governing completion of the Tier II report, the facility may choose to report the maximum amount possible rather than provide quantities based on actual throughput (e.g., entries such as 99,999 lb).

[c] Federal regulations provide for three physical hazard categories: Fire (F), Sudden Release of Pressure (P), and Reactive (R). Two health hazard categories are defined: Immediate (Acute) Health Hazard (I) and Delayed (Chronic) Health Hazard (D). These hazard categories are defined in the *Code of Federal Regulations,* Title 40, Part 370 (40 CFR 370.2).

[d] NA = not applicable; although they do not meet any hazard categories defined in 40 CFR 370.2, these chemicals were nonetheless included in the APSC's EPCRA report for completeness.

[e] A small building at each gate valve houses controls. The buildings are heated by a propane heater. Each gate valve building also has a diesel-fired electric generator. The amounts of propane and diesel fuel present at each gate valve are very limited. Maintenance crews stationed at pump stations are responsible for maintaining the gate valves, including supplying propane and diesel fuel to the control buildings on an as-needed basis. Supplies of propane and diesel fuel to support gate valves are stored at the pump stations, as indicated in the table.

[f] Recent changes in operating circumstances have resulted in different types and amounts being present at certain facilities. On April 17, 2002, APSC submitted a revised EPCRA Tier II report to ADEC. The data in this table are from this amended report (Willson 2002).

[g] This total does not represent crude oil in Tanks 1 and 3. That oil is considered to be in the transportation mode and not subject to EPCRA reporting.

of off-site in 1993 and 1996, respectively (APSC undated).

According to the TAPS *Environmental Protection Manual*, EN-43-2 (APSC 2000c), wastes are containerized and accumulated within designated waste accumulation areas located within buildings. APSC policies require that all hazardous waste accumulation areas have secondary containment features; this requirement is satisfied by the secondary containment features of the buildings or by the installation of secondary containment features at the accumulation areas. Small amounts of hazardous wastes are also occasionally generated along the pipeline ROW as the result of remote maintenance or repair projects. All such wastes are containerized and brought back to the closest pump station or maintenance facility hazardous waste accumulation area. APSC contractors are obligated to properly containerize, label, and store wastes that they generate. Such contractor hazardous wastes are ultimately transported to APSC hazardous waste accumulation areas for management under APSC hazardous waste procedures. Hazardous waste accumulation generally occurs in

TABLE C-2 Hazardous Wastes Generated at the Mainline Refrigeration Unit 2, Northstar Terminal, and VALDEZ Marine Terminal in 1998–1999

Waste Description	Disposal Facility or Technology	Quantity (lb)
Mainline Refrigeration Unit 2		
Brine solution from refrigeration units (contaminated with chromium)	Off-site POTW[a]/sewer	5,000.00
Absorbent pad contaminated with brine solution (chromium)	Incinerator	2,009.00
Brine (chromium) contaminated pipe	Stabilization	2,500.00
Total hazardous waste generated		9,509.00
Northstar Terminal		
Spent carbon filters from aerosol can puncturing unit contaminated with carbon tetrachloride, methyl ethyl ketone, tetrachloroethylene, dichloromethane, or 1,1,1-tricholorethane	Energy recovery	46.7
Flammable cleaning compound	Energy recovery	200.0
Thinners and rags contaminated with solvents	Incinerator	420.0
Flammable petroleum residues (gelblok) containing benzene	Energy recovery	2,000.0
Flammable used paint, epoxy, and thinners	Energy recovery	1,188.0
Petroleum-based product with 1,1,1-tricholorethane (valve cleaner)	Incinerator	350.0
Mercury debris (bulb crusher filter)	Retorting	10.0
Crushed fluorescent bulbs contaminated with mercury	Landfill	2,800.00
Hydrochloric acid	POTW/sewer	5.0
Freon™ gas cylinders	Incinerator	100.0
Flammable aerosol can residue, sorbents, and plastic contaminated with carbon tetrachloride, methyl ethyl ketone, tetrachloroethylene, dichloromethane, or 1,1,1-tricholorethane	Energy recovery	144.0
Total hazardous waste generated		7,263.7

TABLE C-2 (Cont.)

Waste Description	Disposal Facility or Technology	Quantity (lb)
Valdez Marine Terminal		
Freon 113™, oil and water	Incinerator	75.0
Silver-contaminated spent photographic chemicals (fixer/developer)	POTW/sewer	1,300.0
Flammable adhesives	Incinerator	150.0
Used oil with chlorinated compounds	Energy recovery	5.0
Oxidizer	Incinerator	8.0
Petroleum residues (strainer and filter wastes) contaminated with benzene	Incinerator	18,260.0
Petroleum residues (steam rack sludge) contaminated with benzene	Energy recovery	81,151.2
Used paint, epoxy, and thinners	Energy recovery	6,600.00
Spent carbon filters from aerosol can puncturing unit contaminated with carbon tetrachloride, methyl ethyl ketone, tetrachloroethylene, dichloromethane, or 1,1,1-tricholorethane	Energy recovery	5.0
Flammable lab pack	Energy recovery	225.0
Mercury thermometers	Retorting	10.0
Mercury debris	Retorting	40.0
Crushed fluorescent bulbs contaminated with mercury	Landfill	2,960.0
Crude oil and gravel contaminated with benzene	Incinerator	11,000.00
Corrosive spent film fixative contaminated with silver and chromium	Landfill	1,250.0
Flammable, reactive zinc dust	Incinerator	40.0
Filters contaminated with benzene (used gas filters)	Incinerator	95.0
Coolant filters contaminated with lead	Landfill	147.0
Labpack contaminated with lead	Incinerator	5.0

TABLE C-2 (Cont.)

Waste Description	Disposal Facility or Technology	Quantity (lb)
Valdez Marine Terminal (Cont.)		
Toxic labpack contaminated with methylene chloride and 1,1,1-trichloroethane	Incinerator	150.0
Flammable, corrosive, vapor recovery system scale contaminated with benzene	Incinerator	120.0
Mercury contaminated sediment	Landfill	715.0
Caustic lab pack (alkali)	Neutralization	15.0
Acid lab pack	Neutralization	165.0
Xylene, methanol, and crude oil solution	Energy recovery	90.0
Aerosol can residue, sorbents, plastic contaminated with carbon tetrachloride, methyl ethyl ketone, tetrachloroethylene, dichloromethane, or 1,1,1-tricholorethane	Energy recovery	120.0
Lead contaminated incandescent lightbulbs	Landfill	645.0
Total hazardous waste generated		125,346.2

[a] Publicly owned treatment works such as a municipal wastewater treatment plant.

Source: Seward (1999).

containers with a 55-gal capacity or less. There is no accumulation or storage of hazardous waste in tanks.

Under the current scheme, the APSC contractor collects hazardous waste from the accumulation areas on a regular schedule, weather permitting. Trucks begin the collection at PS 1 and continue down the pipeline, collecting waste containers from each designated accumulation area along the way. The waste is then consolidated at the hazardous waste contractor's transfer facility. No permitted RCRA TSDFs exist within the state of Alaska. Therefore, the APSC hazardous waste contractor transports all APSC hazardous waste to out-of-state RCRA-permitted TSDFs. Under a proper hazardous waste manifest, trucks deliver the waste to a rail terminal in Anchorage (Burlington 2001). Wastes proceed by rail to a ship terminal in Anchorage, where they are transported by ship or barge to a rail yard in the State of Washington. The wastes are then transferred by rail to the hazardous waste contractor's transfer facility in Washington. Wastes are then sent, via truck, to various TSDFs in Washington or elsewhere in the contiguous 48 states, depending on the treatment, storage, or disposal designated by the APSC. All wastes are transported in containers meeting DOT specifications.

Likewise, routinely generated wastes from the Valdez Marine Terminal are transported via truck by the hazardous waste contractor to Anchorage, where they follow the same general path to out of state TSDFs. Special projects may generate substantial quantities of hazardous waste over short periods of time (e.g., recovery of tank bottoms) and may require specially scheduled pickup and transportation. However, the management of hazardous waste from such special projects is essentially the same as that described above. In 2001, approximately 4,000 55-gallon drums of waste tank bottom sludge were removed from the Valdez Marine Terminal during a one-time cleanout project. Because of prior years of transferring the tank bottoms from one tank to another to accommodate the tank inspection schedules, this cleanout project effectively represents 10 years of tank bottoms buildup. This buildup was characterized as hazardous and is being shipped out via the APSC hazardous waste contractor under proper manifests to appropriate, permitted out-of-state TSDFs.

During early years of operation of the pipeline, three “Topping Plants” were operational at PS 6, 8 and 10. These Topping Plants were initially operated to provide refined petroleum product for use as fuel for APSC equipment and vehicles. Thus, the Topping Plants met the RCRA definition of a petroleum refinery, and various EPA-designated listed hazardous waste can be expected from their operation. However, once commercial fuel outlets became available in areas along the pipeline route, the APSC determined that continuation of the Topping Plants was no longer cost-effective. The plants have been “mothballed” and are not expected to go back into service in the foreseeable future. Therefore, no additional impact analyses are provided for wastes related to Topping Plant operations.

Spill debris (e.g., contaminated environmental media, spent absorbent pads, and other items used in spill response) may be hazardous waste. When unplanned releases of crude oil, refined petroleum product, or hazardous material occur along the main line, circumstantial factors of such releases may dictate temporary storage of contaminated debris at the spill site. When logistics permit, such contaminated debris will be containerized or otherwise impeded from further environmental impact until adequate characterization of the debris is completed. Temporary storage plans may also need to be developed and approved by the ADEC. Such plans may allow for storage at the spill site or at pump stations nearest the spill site for a period of up to two years, or at the Valdez Marine Terminal for periods of up to four years.

Ultimate disposition of contaminated media and spill debris is addressed on a case-by-case basis in remediation and restoration plans that have been approved by the appropriate JPO member agencies. Ultimately, nonhazardous contaminated media are trucked to a commercial facility where they undergo thermal treatment. All spill debris that has been determined by analysis to be hazardous waste is containerized and handled in accordance with extant hazardous waste management procedures. (See Section 3.16.5 for additional discussion on the management of nonhazardous spill debris and related remediation wastes.)

C.4 Solid Waste

The APSC has established administrative controls for the management of all solid wastes generated throughout the TAPS. Guidelines are provided in Section 5, *Waste Management*, of the TAPS *Environmental Protection Manual*, EN-43-2 (APSC 2000c). Various arrangements are in place for the management and disposition of solid wastes. These include incineration, followed by landfilling of resulting ash in permitted landfills, direct landfilling of some solid waste in APSC- or municipally owned permitted landfills and recycling. Explicit guidelines are provided for all anticipated solid waste streams.

Both domestic and industrial solid wastes are generated at various locations throughout the TAPS. Domestic solid waste results primarily from the operation and maintenance of personnel living quarters and support facilities, such as kitchens and cafeterias located at the pump stations and maintenance and administrative facilities. Common office wastes also fall into the category of domestic solid wastes. Industrial solid wastes are generated at pump stations, mainline refrigeration units, and off ROW maintenance facilities as well as at the Valdez Marine Terminal.

Solid waste incinerators are located at PS 1 through 7 and PS 10 and at the Valdez Marine Terminal. However, incinerators located at pump stations that are now on standby (PS 2, 6, and 10) are not operational. Solid waste incinerators operate under the auspices of ADEC-issued air quality operating permits (ADEC 1996). In all instances, one operating permit addresses all stationary air emission sources at the pump station and the Valdez Marine Terminal. Solid wastes that are incinerated include oily waste materials (but not used oil), shredded documents, kitchen wastes, untreated wood, empty containers, and non-hazardous paint waste as well as domestic solid waste. Hazardous wastes are not incinerated in APSC incinerators. Operating records indicate that the cumulative amounts of solid wastes incinerated at the APSC incinerators have steadily declined since 1994. Estimated amounts of solid waste incinerated during calendar years (CYs) 1994 through 2000 are 1.65, 1.23, 1.17, 0.94, 0.93, 0.87, and 0.74 million pounds, respectively (APSC undated; Seward 2001b). Although operating permits issued by the ADEC do not specify a limit to the amount of solid waste that can be incinerated, they do require that APSC base its waste management decisions on a hierarchy consistent with that established in the Pollution Prevention Act of 1990: “1) minimize pollution entering the air, land, and water; and 2) promote waste management practices in the following order of priority: source reductions, recycling/reuse, treatment, and disposal” (ADEC 1996).

Statistically relevant sampling over time of incinerator ash has shown the ash to be nonhazardous, provided waste segregation controls remain in effect (APSC 2000c). However, the City of Valdez and the Boroughs of North Star and North Slope require laboratory analyses verifying nonhazardous character for each delivery of ash to their facilities. Consequently, each shipment of ash from incinerators at PS 1 and 2 and the Valdez Marine Terminal is sampled for hazardous characteristics before delivery to designated landfills. Ash from all other incinerators is sampled annually. Sampling and analysis of ash follow the prescriptions of approved EPA test methodologies (EPA 1986). Ash that demonstrates hazardous waste characteristics is managed within APSC as hazardous waste and is collected by APSC’s hazardous waste transporter for delivery to out of state TSDFs.

The APSC maintains three solid waste disposal sites (SWDSs), SWDS 117-1B, 100-1, and 38-1. Each disposal site is permitted by ADEC as a Class III Municipal Landfill (Seward 2001b,c).[1] All three permits were renewed in September 2001 and have expiration dates of July 31, 2006.

SWDS 117-1B is located approximately 1 mi south of Dalton Highway MP 285, Sections 28 and 33, T.9S, R.12E, Unimat Meridian. SWDS 100-1 is located approximately 1.5 mi south of Wiseman, Alaska, in Sections 25 and 36, T.30N, R.12W, Fairbanks Meridian. SWDS 38-1 is located approximately 1 mi south of PS 10 in Section 25, T.17S, R.10E, Fairbanks Meridian. (Seward 2001c) The APSC landfills are permitted to receive ash from the solid waste incinerators at PS 3, 4, 5, 6, 7, and 10 and the Valdez Marine Terminal, as well as inert construction wastes, including nonsalvageable metals and other miscellaneous nonhazardous solid industrial wastes from APSC facilities.

Wastes prohibited from disposal in the APSC-operated landfills include any hazardous waste as defined by 40 CFR 261.3, oily waste, waste oil, greases, paints, sludge, chemical wastes, putrescible waste that has not been incinerated, and medical waste that has not been sterilized. Certain restrictions are also placed on the receipt of contaminated soil. Disposal options for contaminated soils and other remediation wastes resulting from responses to accidental releases of crude oil, refined petroleum products or hazardous materials are addressed in Section 3.16.5. In

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1 Class III Municipal Landfills are defined in ADEC regulation 18 AAC 60.300(c). Class III landfills are those that are not connected by road to Class I landfills or are at least 50 mi distant from Class I landfills. By rule, Class III landfills are limited to no more than 1 ton per day of ash from incinerated solid waste and less than 5 tons per day of municipal solid waste. However, the operating permits impose additional restrictions on the wastes that can be disposed of in APSC landfills.

accordance with conditions in the operating permits for the three APSC-operated landfills, APSC personnel maintain a solid waste operating log at each of the facilities that deliver wastes to any of the APSC landfills. The APSC also develops and submits quarterly reports of landfill operations to the ADEC. These reports include amounts and types of waste disposed of and completed APSC-developed inspection checklists that incorporate all performance standards contained in the ADEC-issued operating permits as well as amended "As-built" landfill plans. For landfill 117-1B only, the permit renewal issued in September 2001 by the ADEC calls for the APSC to annually sample surface water ponded in the disposal cell, analyze for parameters contained in the landfill's Enhanced Management Plan, and submit the results to the ADEC. The first such sampling event under the renewed permit has yet to occur.

The APSC also utilizes eight municipally owned and operated landfills for disposal of solid wastes generated throughout the TAPS. Information on these landfills and the APSC landfills and the manner in which all are currently utilized is provided in Table C-3.

At most locations, the APSC maintains service contracts with local commercial waste haulers for the collection of solid wastes from its facilities and delivery to the specified landfill. Municipal employees provide this collection and hauling service in Valdez as part of the municipality's solid waste disposal service. Valdez Marine Terminal personnel, however, can also deliver solid wastes directly to either the Valdez sanitary landfill or the Valdez construction debris landfill. APSC employees collect and deliver wastes from APSC facilities to any of the three APSC-operated landfills. Details on the management of asbestos waste are provided in Section 3.16.5.

The APSC also maintains a number of recycling programs for some solid waste streams. The solid wastes for which recycling options have been identified are precious metals, scrap metals, aluminum beverage cans, copy machine toner cartridges, thermostats and thermometers (mercury containing), asphalt, nonhazardous spent sandblasting sand and grit, wood, office furniture, waste office paper, and newspaper. However, the extent to which each recycling program is active at any given time is dependent on the viability of recycled product markets as well as other circumstantial factors. Some solid wastes (e.g., office paper, spent heat transfer fluids) are also burned as supplemental fuel. Table C-4 provides the latest available data on APSC recycling activities.

C.5 Wastewater

The Ballast Water Treatment Facility (BWTF) treats ballast water and other wastewater from Valdez Marine Terminal operations. Its general components are described in the *Best Management Practices Plan for Ballast Water Treatment* (APSC 2001b). The BWTF includes ballast water storage tanks (90s tanks), dissolved air flotation (DAF) cells, biological treatment tanks (BTTs), air strippers, a chemical storage/injection system, control room, laboratory, and oil recovery tanks (80s tanks). The 90s tanks provide primary gravity separation of separable solids and free-phase oil, and allow containment of spills or equalization of flow variations. The DAF cells further reduce free-phase separable and dissolved hydrocarbons by enhancing phase separation through release of water supersaturated with air. The BTTs continue the treatment process by biologically degrading most residual levels of dissolved hydrocarbons and other organic wastes still in the waste stream. Finally, air strippers may be used to prevent exceeding the BWTF's permit limit for BTEX (benzene, toluene, ethylbenzene, xylene) if biological treatment is insufficient.

The BWTF also includes an "oil recovery system." The 90s tanks, DAF cells, and BTTs recover oil in the wastewater through skimming, which in turn is hardpiped to the 80s tanks. In the 80s tanks, the recovered oil is separated from the wastewater through gravity separation. Recovered oil from the 80s tanks is hardpiped to the Valdez Marine Terminal oil transfer system and becomes a part of the crude oil loaded onboard tankers or stored with the crude oil in the marine terminal crude oil storage tanks until it is loaded onboard tankers. Wastewater from the 80s tanks is routed by hardpiping to the 90s tanks for treatment by the BWTF.

TABLE C-3 Solid Waste Disposal Sites Currently Used by APSC

Owner/Operator	Disposal Site Name	Permit Number	APSC Facilities Using This Site	Amount Delivered[a,b]
APSC	SWDS 117-1B	0131-BA006	PS 3 and 4	0 73 (first two quarters of 2001)
APSC	SWDS 100-1	0131-BA005	PS 5, 6, and 7	208.8 11.1 (first two quarters of 2001)
APSC	SWDS 38-1	0132-BA003	PS 10, VMT	72 520 (first two quarters of 2001)
North Slope Borough	Oxbow Landfill	9536-BA006	PS 1, 2, 3, and 4	NA[c]
North Star Borough	South Cushman Landfill	9131-BA005	PS 7 and 8, Van Horn, Nordale Yard, Doyon Industrial Facility, North Pole Metering	1,608
City of Delta Junction	Delta Landfill	8833-BA002	PS 9	NA
Copper Basin Sanitation Services Company	Glennallen Landfill	9022-BA001	PS 12	1,950
City of Valdez	Valdez City Landfill	8224-BA001	VMT, SERVS[d]	1,450[e]
City of Valdez	Valdez Construction Debris Landfill	9322-BA001	VMT, SERVS	40[e,f]
Municipality of Anchorage Regional Landfill	Municipal Landfill	8721-BA018	Bragaw Administrative Center, other Anchorage facilities, other facilities outside Anchorage with special permission	880 waste[f,g] 208 cardboard[h] (Over the period Nov. 12, 2000, to Nov. 12, 2001)
City of Palmer "Matinuska-Susitria" or Mat-Su	Palmer Landfill		Asbestos wastes from all APSC facilities (with prior approval)	Data not available[g]

TABLE C-3 (Cont.)

[a] Amount delivered is reported in uncompacted cubic yards. Latest available data are displayed and are considered to be representative of annual waste volumes routinely generated. Reporting period is CY 2000 unless otherwise specified.

[b] Volumes of solid waste delivered to APSC-operated landfills were compiled from quarterly reports submitted to the ADEC in accordance with operating permit provisions. Landfill operators provided data on waste volumes delivered to municipal landfills to the APSC (Seward 2000a–c, 2001d–g, 2002a).

[c] NA = data not available

[d] VMT = Valdez Marine Terminal; SERVS = Ship Escort/Response Vessel System.

[e] Volumes of solid waste delivered to City of Valdez landfills were compiled from billing statements issued by the City of Valdez (APSC 2000d). All volumes are reported in cubic yards and are approximate.

[f] Volumes of construction and demolition waste delivered to the City of Valdez Construction Debris landfill by APSC personnel are not represented in this total. However, these volumes are considered to be inconsequential to the total amount delivered.

[g] Normally, solid waste is collected at the Bragaw facility in a compactor. However, temporarily staged roll-off containers were also used during the reporting period. Approximately 800 yd^3 of compacted solid waste were removed over the reporting period and represent approximately 86.23 tons. The remaining 80 yd^3 of uncompacted solid waste collected in roll-off containers represent an additional 32 tons. Presumably, the landfill operators were able to recycle the 208 yd^3 of cardboard collected over the reporting period.

[h] APSC personnel report that the Palmer landfill is used exclusively for disposal of asbestos containing waste resulting from asbestos-containing material removal/remediation actions, and then only when the resulting volumes are large enough to make shipment to Palmer cost effective. Alternatively, small volumes of asbestos waste are shipped out of state together with hazardous waste (Seward 2002b).

The industrial wastewater sewer system (IWSS) is an integral component of the Valdez Marine Terminal and is designed to route industrial wastewater to the BWTF (e.g., incidental spills, oily water, potentially contaminated storm waters, and process wastewater). Areas served by the IWSS that may contribute contaminants from spills or leaks are the tank farms; power generation/vapor recovery area; fuel storage and loading areas; emergency response building/administration area (which includes the laboratory and otter cleaning station); fire training grounds; sludge tank area; transformer dike areas; berths; fire pump buildings; west metering facilities; maintenance/warehouse area; SERVS; and SERVS contract vessels, including tank vessel escort tugs, discharge bilge waters, and oil spill waters. Drainage to and through the IWSS in the upper Valdez Marine Terminal area is by gravity. Water and contaminants are contained by dikes and drain through the sewer lines to the ballast water headers. Flow from the various areas is controlled by valves. A chemical sewer line from the vapor recovery area is used to route scrubber water, effluent knockout water, vapor recovery water condensate, and boiler chemicals directly to the BWTF 90s tanks.

Wastewater is discharged from the Valdez Marine Terminal pursuant to a National Pollutant Discharge Elimination System (NPDES) permit issued by the EPA, Region 10, effective May 21, 1997 (APSC 1997). The Valdez Marine Terminal is authorized to discharge treated ballast and bilge water, storm water, and other wastewaters from a submarine outfall near Berth 3 into the Port of Valdez. Only treated wastewaters that

TABLE C-4 APSC Recycled Waste Types, Sources, Disposition, and Amounts

Material	Source[a]	Disposition	Year/Amount[b]
Office paper	Doyon Industrial Facility[c]	Delivered to Eielson Air Force Base for use as supplemental fuel in the power plant	1999/350 yd^3
Mixed paper	APSC employee residences	Delivered to Eielson Air Force Base for use as supplemental fuel	1999/150 yd^3
Copy machine toner cartridges	FBU	Returned to manufacturer	1999/307 units
Copy machine toner cartridges	Anchorage, VMT, and some pump stations	Returned to manufacturer	1999/576 units
Aluminum (beverage cans, printing plates)	Systemwide	Sent to aluminum recycler (delivery had not yet occurred as of April 10, 2000)	1995/8,408 lb 1996/6,345 lb 1997/992 lb 1999/8 yd^3
Styrofoam packing peanuts	FBU	Given to commercial mailing service for reuse	1999/64 lb
Therminol™ (heat transfer fluid)	Systemwide	Sent for burning as supplemental fuel	1999/18,000 gal
Lead-acid batteries	Systemwide	Returned to manufacturer for recycling	1995/5,990 lb 1999/51,408 lb 2000/38,700 lb
Scrap metal	Systemwide	Sent to metal recyclers	1995/795.52 tons 1996/984.34 tons 1997/1,065.91 tons 1999/910.44 tons 2000/548.95 tons
Freon™	Systemwide	Recovered for reuse	1999/759 lb
Cardboard	Systemwide	Sent to recyclers, reused, distributed to employees for home use	1997/5,912 lb
Antifreeze	Systemwide	Returned to manufacturer for reprocessing	NA[d]

TABLE C-4 (Cont.)

[a] APSC = Alyeska Pipeline Service Company; FBU = Fairbanks Business Unit (Doyon Industrial Facility); VMT = Valdez Marine Terminal.

[b] Latest available data are displayed. Data were derived from an internal APSC memorandum as well as from a draft report on APSC recycling programs (Seward 2000d; APSC 2001a).

[c] Includes FBU administrative offices at Doyon.

[d] NA = data not available.

originate from sources listed in the Best Management Practices (BMP) Plan may be discharged through Outfall 001. Any waste stream not listed in that document or in quantities significantly greater than the estimated amounts listed in the BMP Plan are not to be discharged without prior authorization of the EPA, in consultation with the ADEC. These waste streams and estimated average flow are shown in Table C-5.

On a volume basis, tank vessel discharges of ballast and bilge water account for approximately 93% of the total wastewater processed by the BWTF (APSC 2001b). Influents that are primarily oil are routed to the BWTF oil recovery system or injected into the crude stream at the east metering building sump. Influents that are primarily water are introduced into the BWTF through the 90s tanks.

The BWTF effluent flow averages in CY 2000 are shown in Table C-6. The total BWTF effluent flow for 2000 was 3,785,050,000 gal.

The BWTF permit establishes effluent limits for BTEX (monthly average-0.3 mg/L, daily maximum-1.0 mg/L), total suspended solids (TSS) (monthly average-2.5 mg/L, daily maximum-40 mg/L, except on the day of and the day after stripper activation when the limit is a daily maximum of 170 mg/L), flow (monthly average-21 mg/L, daily average-30 mg/L), and pH (minimum 6.5, maximum 8.5). It also contains detailed, periodic monitoring and reporting requirements for both influents and effluents. In addition, the permit also sets out detailed mixing zones where human health and chronic aquatic life criteria sampling and analysis apply. The BMP Plan establishes specific practices to control the quality of incoming ballast from tankers and bilge waters from SERVS and contracted vessels.

Sludge accumulates in the bottoms of the 90s tanks, the DAF cells, and the BTTs. Sludge of similar composition also accumulates in sumps and portions of the IWSS. The 80s tanks are hybrid tanks because they act as both wastewater treatment tanks and recovered crude oil storage tanks. The 80s tanks recovered crude oil is routinely routed to the crude oil storage tank or directly onto a tanker. The heavier crude oil components, commonly called “tank bottoms,” are treated the same as crude oil tank bottoms and are also routed to crude oil storage tanks or onto tankers. If maintenance or inspection of the 80s tanks is necessary, the recovered crude oil and tank bottoms will be routed to the crude oil storage tanks or tankers. Normal maintenance requires periodic cleaning of the BWTF tanks and the IWSS. The removed sludges are not reintroduced into the treatment system.

Sludge that is transferred from the tanks into containers must be managed as a solid waste, including sampling to determine if it is a hazardous waste (e.g., exceeds the toxicity characteristic levels for benzene). If it is a hazardous waste it is accumulated and managed as hazardous waste and removed by the hazardous waste contractor. Even if it is not a hazardous waste, because of its high hydrocarbon content, it is not disposed of to the local landfill but is transported off-site for thermal remediation.

The APSC also holds a NPDES Permit authorizing discharge from various sites along the 800-mi route of the TAPS, effective June 30,

TABLE C-5 Ballast Water Treatment Facility Influent Sources at Valdez Marine Terminal

Waste Stream[a]	Estimated Average Flow (bbl/d)[b]	Description[c]
Chemicals for water treatment maintenance/ processing/analysis	0.40	Dilute solutions of caustics, acids, solvents, and inorganic salts from regeneration of ion-exchange resins used to treat boiler feed water, for maintenance such as piping repairs, and for water analysis from process monitoring.
Concentrate fire foam	2.00	Proprietary foam concentrates used as fire fighting agents, Mixtures generally include protein hydrolysate, glycol solvents, fluorosurfactants, hydrocarbon surfactants, inorganic salts, and water. Sources include incidental leakage and equipment maintenance activities.
Fire water[d]	3,000.00	Salt water used for fire protection, fire training at the fire training grounds, snow removal from tops of 80s and 90s tanks, and pressure testing lines or vessels.
Dilute fire foam[e]	50.00	Mixture of fire foam concentrate and fire water that is also used in sumps for vapor suppression to allow for hot work and for fire training.
Waste glycol	<0.10	Incidental leakage from vehicle cooling systems.
Dilute glycol	2.00	Mixture of glycol and water used for cooling and maintenance of stationary equipment.
Potable, raw saltwater	240.00	Primary source of continually flowing emergency eyewash stations at the vapor recovery/power generation plant and BWTF/Oil Recovery Building. May also include safety shower discharges that may contain trace amounts of chemicals, petroleum or grease. Raw, potable, and salt water may contain residual products associated with periodic maintenance activities on fire, fuel, ballast, or crude systems. Pipe lining activities may generate residual products associated with in-situ lining operations.
Rain and snow melt	11,000.00	Precipitation collected as surface runoff from contained drainage areas. May contain free oil, dissolved hydrocarbons, and suspended solids. Trace amounts of nitrogen and phosphorous may be present because of the application of fertilizer on soils exposed to crude oil or diesel fuel as a result of surface spills or subsurface leakage from tanks or piping. The fertilizer is applied to promote hydrocarbon biodegradation in contaminated soils located in secondary containment areas for crude oil, diesel fuel, or ballast water tankage. May also contain contaminants from the contaminated soils storage area. Roadway, equipment, and tank de-icing products may be present from the application of de-icing products during winter months. The de-icing products are primarily composed of mineral salts designed to meet various application demands.

TABLE C-5 (Cont.)

Waste Stream[a]	Estimated Average Flow (bbl/d)[b]	Description[c]
Scrubber water	1,500.00	Water used to absorb SO_2 from boiler flue gas prior to introduction into the vapor recovery is mixed with caustic solution. Scrubber water contains sodium compounds, sulfates, sulfites, hydroxides, and carbonates at a pH of approximately 2.0 to 8.0.
Boiler blowdown	2,000.00	Water discharged from steam boiler circuit to prevent buildup of scale, corrosive substances, and corrosion products. Contains inorganic salts and dilute boiler treatment chemicals.
Filter backwash	14.00	Combination of fresh water and glacial silts from treating water for potable consumption and boiler water make-up and vapor recovery compressor suction filters. Water filter backwash includes some carryover from charcoal sand and resin beads. Vapor recovery filter backwash contains iron oxide and trace hydrocarbons and is sent occasionally to the 80s tanks or sludge tank, depending on availability, and primarily to the 90s tanks via the IWSS.
Washdown water	300.00	Water and steam condensate collected during washdown of mobile and spill contingency equipment and stationary equipment and facilities. Contains small amounts of crude oil residues, rust residues, dissolved hydrocarbons, free phase crude oil, dilute glycol, floor/vehicle wax, lubricating oils, degreasers, water soluble detergents, and soil/sediment.
Dry fire fighting chemical	3.00	Chemical fire extinguishing agent that is a dry mixture of monoammonium phosphate, ammonium sulfate, mica, clays, methyl hydrogen polysiloxane, and pigment.
Knockout water [f]	121.00	Water from the oil/water separation drum at a pH of 1.8 to 7.0, which is anticipated to contain some dissolved hydrocarbons.
Degreasers	<1.00	Primarily kerosene-based used to remove crude oil and crude oil residues from parts and equipment. May occasionally include small amounts of water-soluble detergents to remove oil and/or oily residues form parts and equipment. May contain free hydrocarbons, dissolved hydrocarbons, surfactants, ethers, amines, alkyl solfonates, and chelating agents. Use of chlorinated solvent is allowed, providing that any such spent liquid solvent will not be discharged to the BWTF.
Diesel fuel	1.00	Incidental leakage from hoses, vehicles, stationary equipment, draindown of loading arms, and spills during fuel transfer operations.
Gasoline	<0.03	Incidental leakage from hoses, vehicles, operations, and fire training.

TABLE C-5 (Cont.)

Waste Stream[a]	Estimated Average Flow (bbl/d)[b]	Description[c]
Lubricating oils	0.03	Incidental leakage from pump seals, bearings, and vehicles. The majority of spent lubricating oils are collected and injected into the crude oil system.
Hydraulic fluids	<0.03	Incidental leakage from pumps, valve actuators, and vehicles. The majority of spent hydraulic fluid is collected and injected into the crude oil system.
Transformer fluid	g	Highly refined petroleum distillate used in high voltage capacitors and transformers. Does not contain PCBs. Normally not discharged to the BWTF; incidental leakage or spill from catastrophic transformer failure would be collected.
Crude oil	2,000.00	Primary sources are tanker ballast, draindown of loading arms, and sample tap blowdowns at metering facilities.
Crude oil residues	0.333	Major sources are cleaning of pipeline scraper pigs and oil spill contingency equipment.
Crude oil and diesel tank water draws	786.00	Mixture of produced brine, minor amounts of fresh water, bottom sediments, dissolved hydrocarbons, and free-phase crude oil periodically removed from the bottom of crude oil and diesel storage tanks. Trace constituents from routine activities associated with operational and maintenance activities of oil production fields and the pipeline may include corrosion inhibitors, methanol, glycol, fire foam, nonhalogenated cleaning agents, and emulsion reduction agents.
Tank cleaning solution	370.00	Mixture of water, dissolved hydrocarbons, drag reducing agent, crude oil, diesel, and heavy-duty emulsifying cleaner (containing surfactants, monoaromatic hydrocarbons, diaromatic hydrocarbons, and terpenes). Usage rate for undiluted cleaner is approximately 100–500 gal/yr, depending on the number of tanks cleaned.
Hydrotest water	27.00	Mixtures of fresh or salt water and crude oil or petroleum products collected during pressure testing of crude oil loading arms at berths and/or other process piping and tanks at the VMT, or originating from tankers, tugs, escort vessels, barges or other APSC/SERVS service vessels. May include up to 1 ppm of Intracid Rhodamine W + liquid dye.

TABLE C-5 (Cont.)

Waste Stream[a]	Estimated Average Flow (bbl/d)[b]	Description[c]
Oil spill cleanup water	2,500.00	Highly variable mixtures of fresh water and/or salt water, dissolved hydrocarbons, sediments, crude oil residues, petroleum product residues, trace amounts of dispersants and emulsion breakers, and oil spill cleanup chemicals from cleaning of equipment. Sources may include storm-water runoff from temporary spill debris collection sites, bilge waters from vessels involved in spill cleanup, and oily water (including degreasers) collected during cleanup activities, including cleanup of equipment. For tanker crude oil spills resulting from tanker structural failures, agency notification will be made prior to discharge to the BWTF.
Tanker ballast	400,000.00	Harbor water, river water, and/or sea water added to vessel ballast spaces to maintain ship stability. Generally, a mixture of water, salts, suspended solids, dissolved hydrocarbons, 0.5–1.5% crude oil, and occasionally hydrogen sulfide. May include bilge water, cleaning agents, and crude oil produced water with associated constituents, but may not include machinery space oils.
Oil recovery system water draws	5,000.00	Clarified wastewater separated by gravity in the 80s tanks. Inputs to the 80s tanks are recovered crude oil skimmed from 90s tanks, DAF float, BTT skimmings, oily waters from cleaning pipeline scraper pigs and oil spill recovery equipment, rain and snow melt from diked areas not connected to the IWSS (e.g., some transformer areas and maintenance/warehouse building sump), and, as necessary, oily wastewater from spill cleanup operations when free oil content exceeds that of typical tanker ballast. Clarified wastewater from 80s tanks may contain inorganic salts, suspended solids, dissolved hydrocarbons, H_2O_2 residuals, glycol, small quantities of free oil, dilute fire foam, and hydrogen sulfide.
Service vessel bilges and slops	26.60	Bilge water from SERVS vessels and its contract vessels (including water, salts, and incidental volumes of used oil, diesel, degreasers, and engine coolants) sent to the 90s tanks via the IWSS or vacuum truck or direct piping. Segregated used oil discharged to the VMT does not enter the BWTF.
Sludge processing filtrate	33.00	Water derived from dewatering operations. Contains approximately 1% crude oil, inorganic salts, dissolved hydrocarbons, suspended solids and trace amounts of glycols, oxyalkylated fatty acids, bacteria, polymer, enzymes, surfactants and nutrients. Estimated average flows are averages, but sludge processing usually occurs only once per year. Total quantity of water generated during each sludge processing event is approximately 400,000 to 500,000 gal. Sources include the ballast water treatment tanks, recovered crude oil tanks, crude oil, and other petroleum storage tanks.

TABLE C-5 (Cont.)

Waste Stream[a]	Estimated Average Flow (bbl/d)[b]	Description[c]
Hydrogen peroxide	2.00	Commercial-strength solution of H_2O_2 injected on an as-needed basis to control hydrogen sulfide in tanker ballast and crude oil recovery system water draws. Sulfide control is necessary as a health and safety measure and to avoid upsets in the biological treatment system.
Dilute polymer	5.00	Approximately 1% solution of cationic, high molecular weight polyamine added as a flocculant at DAF to enhance separation of finely dispersed oil and suspended solids.
Nutrient	8.00	Solution of urea, ammonia, and phosphate added to DAF effluent to stimulate microbiological activity in BTTs.
Corrosion inhibitors	2.00	Minimal amounts of corrosion inhibitor compounds added to the crude oil piping at the VMT to control corrosion. The inhibitors are composed of proprietary mixtures of oil and water-soluble amines in an alcohol carrier fluid. The inhibitors contain no heavy metals or priority pollutants. Trace residuals of these compounds may be present in crude tank water draws.
Chemicals used for laboratory tests	<0.10	Substances used for water testing at the analytical laboratory, BWTF Sample Room, and Powerhouse Water Treatment Room as follows: dilute aqueous solutions of acids, caustics, salts, hydrocarbon-based solvents, alcohols, ketones, aldehydes, unused standardization and calibration solutions, unused samples of water (including potable water, ballast water, boiler feedwater, steam condensate, and fire foam water). No halogenated solvents are disposed of in this waste stream.
Wildlife wash water	2,000.00	Mixture of water, oil, and household detergents from cleaning wildlife members that have been oiled (is not routinely generated).
Groundwater	1,400.00	Groundwater that is slightly contaminated with petroleum hydrocarbons as a result of surface spills or leaks of these materials from tankage or piping at the VMT.
Hydrochloric acid	0.13	HCl acid injected into the sampling line for the on-line BTEX analyzer to control the growth of microorganisms within this line. The analyzer provides data that can be used to determine when the air strippers will be activated. The biogrowth interferes with the analyzer's ability to accurately measure BTEX concentrations.
Gray water	40.00	Water from kitchen, bathroom, and mop sinks, washing machines, and floor cleaning activities in the BWTF Control Building, Emergency Response Building, Administration Building, Marine Building, and Maintenance Warehouse. These sources do not include human wastes. They may contain small amounts of crude oil residues, dissolved hydrocarbons, soil/sediment, water-soluble detergents, floor wax, and household wastewater (excluding human wastes).

TABLE C-5 (Cont.)

[a] These waste streams are not always part of the influent stream and may enter on a seasonal or even related basis.

[b] Quantities shown for each waste stream are estimated from consumption and meteorological data. The numbers shown are only averages.

[c] Abbreviations: BTT = biological treatment tank; BWTF = Ballast Water Treatment Facility; DAF = dissolved air flotation; H_2O_2 = hydrogen peroxide; IWSS = industrial wastewater sewer system; PCB = polychlorinated biphenyl; SERVS = Ship Escort/Response Vessel System; SO_2 = sulfur dioxide; VMT = Valdez Marine Terminal.

[d] More firewater is generated in winter than in summer.

[e] Approximately 70 bbl of dilute fire foam is generated during fire training exercises.

[f] More knockout is generated in spring than in winter.

[g] Waste not routinely generated; enters BWTF on emergency basis only.

Source: Modified from APSC (2001b).

TABLE C-6 Ballast Water Treatment Facility Effluent Flow Averages in 2000

Month	Volume (million gal/d)
January	13.3
February	12.0
March	12.0
April	12.7
May	11.1
June	7.8
July	7.1
August	8.5
September	9.1
October	9.9
November	10.1
December	10.8
Average daily flow	10.37

Source: APSC (2000e).

1993 (EPA 1993). This permit governs four types of discharges, secondary containment dewatering, excavation dewatering, hydrostatic testing wastewaters, and domestic sanitary wastewaters from MCCFs. A Notice of Disposal (NOD) must be submitted to the EPA for each area where excavation dewatering discharges in excess of 500,000 gal will take place. NODs are also required for discharge of hydrostatic testing wastewater in excess of 30,000 gal or discharge of domestic wastewater in excess of 500 gal.

Discharge of hydrostatic test water not covered by the APSC individual NPDES permit is controlled by an ADEC Wastewater General Permit issued in April 1999 (ADEC 1999). Under that permit, discharges of up to 1,000,000 gal/d of hydrostatic test water are authorized. NOD's must also be filed with ADEC for disposals in excess of 50,000 gal.

The average volumes for discharges addressed in the linewide NPDES permit, as calculated in preparation for the 1998 renewal application, are shown in Table C-7.

The permit establishes effluent limitations and, if the discharge reaches receiving waters, monitoring requirements. The permit also establishes acceptable types of treatment and control methods for excavation sites depending upon seasonal, topographic, vegetative, soil and receiving water conditions (e.g., a discharge to areas of ice in a manner that prevents the effluent from reaching unfrozen receiving waters or a discharge to upland areas in a manner that does not cause destruction of vegetation or an increase in soil erosion). Wherever possible, discharge to dry channels, tundra, or upland areas is preferred to discharge to surface waters (TAPS Owners 2001). The permit requires the

TABLE C-7 Discharges Addressed in the Linewide NPDES Permit for 1998[a]

Category	Source	Discharge Volume	Discharge Point	Treatment
Excavation dewatering	Maintenance of buried pipeline	380 gal/d to 21 million gal/d	Varies; upland discharge preferred	BMP, erosion control, infiltration
Hydrostatic testing	Leak testing of new or repaired pipelines and tankage	Varies – 1996/7: 7,800,000 gal/yr	Dry channel, snow	BMP, erosion control, infiltration
Sanitary wastewater	PS 5, 6 MCCFs	6,000 gal/d 14,000 gal/d each	Tundra wetlands	Secondary biological
Secondary containment dewatering	Tank farms Valve vaults Basement Leading edge flow meters Fuel loading areas	4,000,000 gal/yr 500,000 gal/yr 50,000 gal/yr 30,000,000 gal/yr 10,000 gal/yr	PS workpad	BMP, sorbent used if sheen noted
Potentially containing oil	Petroleum product spill PS air filter cleaning Monitoring well purging Pump test water PS mop water PS meltwater PS equipment shop meltwater PS accumulated rain water Vacuum truck hydrotest	500,000 gal/yr 20,000 gal/yr 100 gal/event 300-900 gal/event 50,000 gal/yr 10,000 gal/yr 10,000 gal/yr 1–500 gal/event 25,000 gal/yr	Facility workpad	BMP
Containing particulate	Outdoor vehicles washing Indoor vehicles washing Equipment/structure washing	10,000 gal/yr 10,000 gal/yr 100–3,000 gal/event	PS workpad	BMP
Containing chlorine	Water truck disinfection Drinking water facility disinfection	2,000–4,000 gal/event 1–500 gal/event	Facility workpad	BMP

TABLE C-7 (Cont.)

Category	Source	Discharge Volume	Discharge Point	Treatment
Containing residual AFFF	Fire line flushing	100,000 gal/yr	PS workpad	BMP
	Fire training	2,000 gal/yr		
	Fire truck flushing	3,000 gal/event	Airport taxiway	

[a] Abbreviations: AFFF = aqueous-film-forming foam; BMP = best management practices; MCCF = mobile contingency camp facility; PS = pump station.

Source: TAPS Owners (2001).

APSC to maintain a Storm Water Pollution Prevention Plan (SWPPP) for industrial activity, including excavation dewatering projects in excess of 5 acres.

On December 27, 1996, the APSC submitted an application to the ADEC for a Wastewater Disposal Permit for a number of wastewaters generated at facilities located along the TAPS. At that time, the ADEC acknowledged it did not have time to review the application and issue a permit in a timely manner. Consequently, it granted APSC verbal authorization to discharge all of the wastewater streams listed in the Draft Wastewater Disposal Permit submitted with the application (Gryder-Boutet 1996). The permit covers discharges from secondary containment areas, waters potentially containing oil and/or sediments, petroleum product spill water (land discharges only), waters containing chlorine, waters potentially containing aqueous film-forming foam (AFFF), and waters collected in active cells of permitted solid waste disposal sites. The permit establishes effluent limitations and monitoring requirements for each wastewater stream, including limits on erosion and sediment accumulation, as well as total aromatic hydrocarbons, total petroleum hydrocarbons, and total aqueous hydrocarbons.

The Valdez Marine Terminal also operates a sanitary waste treatment plant (SWTP). SWTP effluent discharges to permitted Outfall 002, which is located at latitude 61º 05’14” N and longitude 146º 23’24” W. Effluent limitations are established for flow, biochemical oxygen demand (BOD_5), TSS, and pH. The permit establishes a mixing zone and effluent monitoring requirements.

Table C-8 gives the SWTP effluent flow averages in CY 2000. The total SWTP effluent flow for CY 2000 was 705,399 gal; the average daily flow was 1,932.6 gal.

The sanitary sewage system collects and treats sewage generated at the Valdez Marine Terminal, including shower, sink, kitchen, and toilet wastewater. Sewage generated at the main onshore buildings is piped to the SWTP (Building 58-BD-6) via gravity-flow sanitary sewer pipelines. Holding tanks located at Berths 1, 3, 4, and 5, Area 19, and the Ballast Water Treatment (BWT) Control Area collect

TABLE C-8 Sanitary Waste Treatment Plant Effluent Flow Averages for 2000

Month	Volume (gal/d)
January	2,644.0
February	2,355.0
March	2,274.0
April	1,714.0
May	1,635.0
June	1,486.0
July	1,611.0
August	1,927.0
September	1,724.0
October	1,745.0
November	1,999.0
December	2,077.0
Average daily flow	1,932.6

Source: APSC (2000d).

sewage generated in those buildings/areas. A vacuum tank truck periodically removes the sewage from the holding tanks and transports it to the SWTP.

The SWTP consists of a below-grade wet well or sump tank, which is the final collection point for all sanitary wastewaters generated on-site. The sump is equipped with lift pumps to transport wastewater to the influent end of the biological treatment unit. The SWTP is a package biological treatment unit consisting of a skid-mounted, compartmentalized, steel tank with pumps, blowers, and the electrical control circuitry. The unit has a rated hydraulic capacity of 10,000 gal/d (APSC 2000f).

The aeration basins do not discharge to either the BWTF or the SWTP. Therefore, these wastes are cleaned out periodically by a contractor and hauled to the City of Valdez under Non-Residential Wastewater Discharge Permit (City of Valdez 2001). The wastes are discharged to Sewer Pump Station No. 1 at the City of Valdez sewage treatment plant. Sludges from the SWTP aerobic digester, Valdez Marine Terminal septic tanks, and various Valdez Marine Terminal and SERVS holding tanks are also hauled to Sewer Pump Station No. 1 (City of Valdez 2000). Other APSC facilities discharge domestic sanitary wastewater directly to the City of Valdez sewage collection system. The SERVS barge waste is also disposed of through the City of Valdez sewage treatment plant. A total of 43,000 gal of sewage was discharged to the City of Valdez in 1999 (APSC 2000e). Of that, 22,700 gal was attributable to the aerobic digesters, 15,000 to the SWTP, and 5,300 to SERVS.

Domestic sanitary and industrial wastewater from the Van Horn Facility is discharged to Golden Hearts Utilities pursuant to an Industrial Pre-Treatment Program Wastewater Discharge Permit, effective November 24, 1999 (Noll 2001). Pretreatment of the wastewater from this facility is accomplished with an oil/water separator. PS 5 is served by an extended aeration activated sludge sewage treatment plant (STP), which discharges through a diffuse outfall across tundra wetlands (TAPS Owners 2001). Digested sludge from the PS 5 treatment plant is collected and hauled by a contractor for discharge directly to the Golden Hearts Utilities facility sludge thickener unit. This discharge is permitted under a Special Discharge Permit, effective December 17, 2000 (Owen 2000).

As described in the *Environmental Report for Trans Alaska Pipeline System Right-of-Way Renewal* (TAPS Owners 2001), screened domestic sanitary wastewater from PS 1, 3, and 4 is stored in a holding tank and then pumped to the exhaust stacks of the engines powering the crude oil pumps. High-pressure nozzles inject the wastewater into the hot exhaust flow, where it is atomized and dispersed into the atmosphere as sterilized water vapor. Screenings are incinerated at each pump station. Periodically, holding tank sludges are cleaned out and trucked away for disposal at municipal wastewater utilities, including North Slope Borough, Fairbanks Municipal Utility System, and City of Valdez Sewage Treatment Plant (APSC 2000g). Since an extended aeration-activated sludge plant was installed at PS 6, stack injection technology is no longer utilized at that station (Edwards 2002a; Mikkelson 1997). MCCF 2 and MCCF 3 have self-contained sanitary wastewater secondary treatment systems that use a rotating biological contractor technology and a holding tank. Treated wastewater from each site is discharged locally in accordance with the linewide NPDES permit. (TAPS Owners 2001). Domestic sanitary wastewater from PS 7, 8, 9, 10, and 12 is discharged to individual septic systems. The PS 6 Fly Camp has a septic system, however, PS 6 is now using the personnel living quarters rather than the fly camp (Edwards 2002a). These systems are periodically cleaned out by a contract service. Domestic sanitary wastewater from the APSC office complex in Anchorage and in Fairbanks is connected to the municipal wastewater treatment systems. Typical flows and design capacity for these systems are shown in Table C-9.

APSC has filed Notices of Intent (NOIs) to be governed by the EPA Multi-Sector General Permit for Industrial Activities for each of 12 industrial areas affiliated with pipeline operations, such as the operations material sites. Each NOI includes a Stormwater Characterization Checklist, which provides information on the site history, site

TABLE C-9 Typical Effluent Flows of Sanitary Wastewater at Various Sites in 1997

Site	Current Wastewater Disposal	Typical Flow (gal/d)	Design Capacity (gal/d)
PS 1	Stack injection	2,000	10,000
PS 2	Stack injection (not in use)	4,00 (sic)	10,000
PS 3	Stack injection	7,500	10,000
MCCF 2	Secondary biological	2,900	14,000
PS 4	Stack injection	4,700	10,000
PS 5	Secondary biological	6,300	8,000
PS 6[b]	Stack injection (not in use)	6,500	6,000
Fly Camp at PS 6[c]	Septic	950	850
PS 7	Septic	3,800	3,400
PS 8	Septic	600	1,000
PS 9	Septic	780	1,000
PS 10	Septic	4,200	12,000
MCCF 3	Secondary biological	3,500	14,000
PS 11	NA[a]	NA	NA
PS 12	Septic	4,200	9,100

[a] NA = data not available.

[b] PS 6 is now using a self-contained biological wastewater treatment system.

[c] PS 6 is now using the pump station living quarters rather than the Fly Camp (Sweeney 2002).

Sources: Mikkelsen (1997); TAPS Owners (2001).

setting/topography, precipitation and storm-water characterization, observed barriers to storm-water flow reaching adjacent water bodies, and adjacent water bodies/wetlands that may be impacted by the site (APSC 1999b). The Multi-Sector General Permit authorizes storm-water discharges from certain types of industrial facilities provided the permittee complies with the conditions of the permit, including preparing and implementing a SWPPP. The SWPPP identifies sources of potential pollutants that could contaminate storm-water discharge from the area and establishes BMP to minimize and control these potential pollutant sources, such as preventive maintenance, good housekeeping, and sediment and erosion control.

As needed, the APSC files NOIs to be governed by the EPA General Permit for Discharges from Construction Activities. This permit allows discharge of storm-water runoff from construction sites in excess of 5 acres if the permittee complies with the conditions of the permit. This permit may not be used if the storm-water discharges are not protective of federal listed endangered and threatened species or designated critical habitat. A SWPPP must be developed for each construction site, including the identification of pollutant sources and mitigation actions to prevent contamination of storm water runoff. A Notice of Termination must be filed within 30 days of the final stabilization of the site.

C.6 Special Wastes

Special handling procedures have been established for numerous other wastes associated with TAPS operations. Wastes discussed under this category include wastes for which specific regulatory controls exist, wastes that are routinely generated, wastes for which unique management and disposal schemes have been established, and wastes that have a high potential for adversely affecting the environment or human health if not managed properly. TAPS special wastes include polychlorinated biphenyl (PCB) wastes, asbestos wastes, pesticide wastes, drag reducing agent wastes, spent glycols, tanker garbage, medical wastes, spent sandblast media, asphalt, radioactive wastes, naturally occurring radioactive materials (NORM) wastes, and spill debris and remediation wastes.

C.6.1 Polychlorinated Biphenyl Wastes

PCBs are known to be present in some APSC equipment at pump stations, maintenance facilities, and the Valdez Marine Terminal. An initial systemwide survey for PCB-containing items was conducted in 1989. Equipment and systems surveyed included electrical equipment, such as transformers, capacitors, relays, electrical actuators, and switches. Both in-service and stored equipment were included in the survey. In addition, fluorescent lighting fixtures that are not expressly labeled by the manufacturer as PCB-free were presumed to have PCBs present in their ballasts. Hydraulic systems and equipment containing heat transfer fluids were also surveyed and characterized. A second verification survey was conducted in 1995 (EMCON Alaska, Inc., 1995). Survey techniques included physical inspections, reviews of equipment nameplate information and product specifications, interviews with equipment or product manufacturers, interviews with maintenance supervisors, and reviews of maintenance records. In some instances, suspect fluids (e.g., dielectric oils, heat transfer oils, etc.) were sampled and analyzed for the presence of PCBs in regulated concentrations.

Together, the two surveys established the following with respect to the presence of PCBs in TAPS facilities.

- Capacitors in solid-state controls in the static inverter system at the North Pole metering station contain PCBs. These capacitors meet the definition of “small capacitor” contained in EPA regulations (40 CFR 761.3(1)). They are located within a building that provides adequate containment of any spills or leaks and are expected to continue in service until the ends of their useful lives.
- Twelve large capacitors in service at the Valdez Marine Terminal are assumed to contain PCBs in concentrations below 50 ppm. All capacitors are located within restricted access areas inside buildings that provide adequate containment of any spills or leaks. All capacitors are properly labeled as “PCB Articles” and are expected to continue in service until the ends of their useful lives.

As a matter of APSC policy, capacitors present in the ballasts of some fluorescent lighting fixtures throughout the APSC are presumed to contain PCBs unless explicitly labeled to the contrary by the manufacturer. These fixtures will stay in service until the ends of their useful lives. At that point, the ballasts will be removed and managed through the APSC hazardous waste contractor.

The PCB inventories suggest that there is the potential for only very small amounts of PCB wastes to be generated. Such wastes will result when PCB-containing electrical equipment is taken out of service or in response to a spill or leak from operating equipment. The surveys also confirmed that the operating locations for all PCB-containing equipment satisfy EPA requirements for containment of any spills or leaks from such equipment. APSC procedures call for all disposals of equipment that contains or may contain PCBs to be coordinated through APSC environmental authorities. Although certain PCB-containing articles can be disposed of in municipal landfills in accordance with EPA regulations, APSC policies require that PCB waste be handled through the APSC hazardous waste contractor and disposed of in facilities specifically permitted for PCB wastes.

C.6.2 Asbestos Wastes

Asbestos-containing materials (ACMs) are known to be present at APSC pump stations and the Valdez Marine Terminal. Surveys by APSC's industrial hygienists revealed that ACM is present in some infrastructure components (building materials) and some components of pipeline equipment (Norton 2001a). APSC's Fire Safety and Industrial Hygiene (FSIH) personnel are in the process of developing a formal systemwide asbestos management plan, expected to be available in early 2002. Despite the lack of a formal plan, however, other controls are in place to ensure timely identification of ACM and proper management of ACM wastes. Each APSC industrial hygienist maintains an inventory of ACM in facilities for which they are responsible and periodically inspects their facilities to verify that ACM is not damaged or deteriorated to a degree where the release of asbestos fibers to the air is possible. Whenever infrastructure or equipment maintenance, repair, or refurbishment has the potential to disturb ACM (including asbestos abatement actions such as the planned removal of deteriorated ACM), FSIH personnel reviewing the planned activities will intervene and impose special controls to ensure proper isolation of ACM. The APSC Safety Manual SA-38, Requirement 1.26, requires that such reviews be incorporated into work plans.

APSC maintenance employees are responsible for removing and replacing ACM items such as gaskets. Such simple replacement activities are not considered by OSHA to be asbestos abatement and are performed by APSC maintenance personnel. Wastes generated from such simple maintenance activities are nevertheless identified as containing asbestos. The ACM wastes are delivered to one of the Alaska municipal landfills or disposed of through the hazardous waste contractor facilities. Currently, the municipal landfills at Palmer and Anchorage, as well as the South Cushman landfill in Fairbanks, are authorized by ADEC to receive asbestos wastes. All three landfills have received ACM wastes from the APSC. When infrastructure maintenance, repair, or remodeling impacts ACM present in building components, specially licensed contractors will remove and properly containerize the ACM. APSC environmental staff make advanced disposal arrangements for any ACM waste and are responsible for making any necessary notifications to the EPA for such removal and disposal events.

C.6.3 Pesticide Wastes

Only very small amounts of pesticides are used to maintain the pipeline ROW and other APSC facilities. With the exception of personal protection products (e.g., mosquito repellant), each chemical to be used and its application restraint must be approved by the Authorized Officer (Stipulation 2.2.5.1). In most instances, commercial, licensed applicators are used when pesticide applications are necessary. Those contractors are responsible for using the pesticide in the manner prescribed by the label and in engaging in practices that will minimize the amounts of pesticide wastes needing disposal. When necessary, disposal of pesticide waste is controlled by federal hazardous waste regulations as a Universal Waste. Disposal of pesticide waste occurs at out of state RCRA TSDFs.

C.6.4 Drag Reducing Agent Wastes

Drag reducing agent is injected into the pipeline at various pump stations to reduce turbulence and enhance laminar flow in the pipeline, thus reducing the amount of horsepower needed to pump crude oil. A number of different commercial formulations are used. Drag reducing agent is a proprietary mixture of olefinic long-chained petroleum distillates with flash points in the range of 105° to 131°F. Under normal conditions, drag reducing agent will comingle with the crude oil and undergo molecular changes resulting from mechanical actions of turbine impellers. It does not need to be removed from the oil when it reaches the Valdez Marine Terminal. The APSC has established specific controls for managing drag reducing agent wastes that result from accidental spills or releases at its points of use. Waste drag reducing agent and spill debris (including rags and absorbent pads) are containerized in vapor-tight fiber drums or clear plastic bags and stored in designated hazardous waste storage areas. Small amounts (less than ½ gal) are incinerated at APSC facilities. Larger amounts are handled by the APSC hazardous waste contractor and delivered to designated facilities where it is burned as supplemental fuel.

C.6.5 Spent Glycols

Glycols are used as antifreezes and coolants and as rust inhibitors in a variety of APSC equipment. Ethylene glycol, propylene glycol, and triethylene glycol wastes are generated primarily at pump stations and the Valdez Marine Terminal, as well as at the contractor facility where APSC vehicles are maintained. APSC procedures prohibit the incinerating or placing any waste glycol into landfills. All waste glycols are stored in designated waste storage areas until they are removed by the APSC waste contractor. Currently, all waste glycols are delivered to a recycling facility.

C.6.6 Tanker Garbage

Separate management procedures are in place for putrescible solid wastes from tankers from Hawaii and foreign ports that berth at the Valdez Marine Terminal. In accordance with U.S. Coast Guard and USDA Animal and Plant Health Inspection Service regulations, garbage from tankers is considered “regulated garbage” and is treated as potentially infectious waste. Wastes are collected in red bags, designated as regulated garbage, and delivered to a commercial facility in Anchorage where the waste is sterilized by autoclaving. Sterilized wastes are subsequently delivered to the Anchorage municipal landfill by the sterilization contractor.

C.6.7 Medical Waste

Separate management procedures are in place for medical waste generated throughout the TAPS at clinics and first aid stations. Out-of-date medical products that exhibit the characteristics of ignitable or toxic hazardous waste are managed as hazardous waste. Medical supplies that are nonhazardous are managed as solid wastes and, depending on the points of generation, sent directly to the landfill serving that facility or to one of the APSC incinerators.

TABLE C-10 Amounts of Medical Wastes and Solid Wastes Burned in APSC Incinerators in 2000[a]

Incinerator Location[b]	Total Solid Waste Incinerated (lb)	Medical Waste Incinerated (lb)	% of Medical Waste to Total Waste Incinerated
PS 1	69,975	0	0
PS 3	305,290	86	0.028
PS 5	154,953	55	0.036
PS 7	105,128	0	0
PS 12	17,716	0	0
Valdez Marine Terminal	82,720	53	0.064
Total	735,782	194	0.026 (average)

[a] Data provided by APSC (Seward 2001b).

[b] Incinerators at PS 2, 4, 6, and 10 were not operational during CY 2000.

Very limited amounts of medical waste that may be biohazardous or infectious (i.e., containing blood, tissue, or blood-borne pathogens) are incinerated at APSC incinerators. The APSC conforms to the requirements of 40 CFR Part 60, Subpart E, for such incineration, including notification, record keeping, and reporting. The APSC incinerators are also covered by air emission permits issued for each pump station and the Valdez Marine Terminal by the ADEC. However, the latest iterations of those permits require the APSC to maintain records of amounts of wastes burned in each incinerator, but these have been modified to remove previous record-keeping requirements with respect to amounts of medical waste incinerated (ADEC 1996). Nevertheless, the APSC continues to maintain such data. Table C-10 provides data on amounts of medical wastes and solid wastes burned in the pump station incinerators during CY 2000. Data provided for the first two quarters of 2001 indicate that rates of medical waste and solid waste incineration have not changed significantly from 2000 (Seward 2001b).

C.6.8 Spent Sandblast Media

Spent sandblast media wastes are generated as the result of a number of repair and refurbishment activities as well as part of corrosion control activities. Wastes are generated under controlled conditions at maintenance facilities or pump stations and are also generated under uncontrolled conditions along the ROW in connection with maintenance or repair activities, corrosion control activities, or special projects such as technology enhancements or control valve vaulting. Sandblasting media are normally Green Diamond or red garnet sand. Manufacturers of the Green Diamond sand have provided information that demonstrates that the sand does not contain leachable heavy metals that would cause the spent sand to become hazardous waste (Glenbrook Nickel Co., undated). An internal APSC memorandum confirms that the red garnet sand is similarly inert (Redmond 1994). Spent sandblast media become contaminated with pieces of the coatings present on the equipment or surfaces being sandblasted. APSC's routine analyses of spent media have consistently demonstrated that spent media does not exhibit characteristics of hazardous waste.

Data were provided to the ADEC in 1995, along with a request for approval to use spent media that do not exhibit characteristics of hazardous waste as fill, rather than discarding them as waste (Morton 1995; Lipchak 1995). The ADEC has concurred in this practice, provided the APSC continues to document the nonhazardous nature of spent media with appropriate analyses (Chapple 1995). Consequently, spent media generated in controlled conditions are collected, analyzed to confirm their nonhazardous character, and stored for later use as fill material. When spent media waste can be anticipated in ROW activities where its collection is difficult to control use, the coating being removed is evaluated for the presence of heavy metals that would cause spent media to exhibit hazardous waste characteristics. When no such heavy metals are known to be present in the coating to be removed, spent media are allowed to remain at the job site (e.g., in the excavation). All analytical results are retained as part of the documentation for each specific ROW project. No precise volumes of spent media are available. However, internal APSC memoranda suggest that most ROW projects result in the use of anywhere from 25 to 100 lb of media (Redmond 1994).

C.6.9 Asphalt

Waste asphalt paving is periodically generated as a result of workpad maintenance or the removal of tank aprons and parking areas. In 1995, the APSC explored options for reuse and recycling of this material with the ADEC (Morton 1995; Lipchak 1995). The ADEC has approved the reuse of spent asphalt as construction backfill, road/pad base and bedding for tanks, pipes, and conduit. However, although the asphalt is weathered, it still may have some potential to leach petroleum hydrocarbons. Consequently, the ADEC has limited use of asphalt as bank stabilization material in circumstances where it may come into contact with surface water (Chapple 1995). No volumes of waste asphalt being reused are available.

C.6.10 Radioactive Wastes

Small amounts of radioactive wastes are possible from the operation and maintenance of TAPS facilities. These include discarded smoke detectors that contain americium and self-illuminated EXIT signs that contain small amounts of tritium. Both the radioisotope and its concentration dictate the disposal path for such materials. Wastes containing radioactive materials are segregated from other solid wastes, containerized, and given two labels: “nonhazardous waste” and “radioactive waste.” Containers of spent EXIT signs are stored in designated hazardous waste storage areas and subject to the same routine inspections for container integrity as hazardous waste containers. Spent EXIT signs are ultimately shipped by the TAPS facility at which they were generated to the manufacturer for recycling. The Waste Management Specialist arranges for the lights to be shipped to a recycler for recovery and reprocessing of the tritium. Smoke detectors are containerized and shipped back to the manufacturer for disposal. Facilities at which spent smoke detectors are generated are responsible for ensuring that the detectors are not incinerated or sent to any of the APSC-operated landfills. Otherwise, the smoke detectors are placed in landfills.

C.6.11 Naturally Occurring Radioactive Material (NORM)

Radioactive isotopes of uranium and thorium (and their respective progenies) are known to be present in rock formations from which North Slope oil is recovered. These naturally occurring radioisotopes dissolve in formation water and are brought to the surface along with oil and gas recovered from the formation. NORM waste is generated as the result of the precipitation of these isotopic salts onto the inside surfaces of well pipes (tubulars) as well the surfaces of various “downhole” equipment such as safety valves and gas mandels.

Radioisotopes are present only in the aqueous phase of materials brought to the surface during oil exploration and recovery. Because the TAPS has established rigorous criteria limiting the amount of water allowed to be present in oil accepted at PS 1, the potential is very low for NORM waste issues to be manifested in pipeline or marine terminal operations. A memoranda from British Petroleum (BP) to the APSC confirms that NORM wastes are associated primarily with the water fractions and that since production water and sediments from aboveground production vessels are removed before oil is delivered to PS 1 for metering and introduction into the pipeline, the amount of NORM waste entering the pipeline is negligible (Taylor 2001a).

APSC FSIH personnel have conducted surveys of selected TAPS facilities for the presence of NORM in 1991, 1993, and 1994. Survey locations were places where water and condensate could accumulate and where precipitation of dissolved salts might occur. They included rust and scale in crude oil Tank 111 (PS 1), tank bottoms from Tanks 16 and 17 (Valdez Marine Terminal), heat exchanger bundles at PS 6 and the Desalter at PS 10. None of these surveys detected NORM above background levels (APSC 2001c).

Currently, the APSC is engaged in a wholesale removal of tank bottoms, rust, scale, and other sediments from crude oil storage tanks at the Valdez Marine Terminal. NORM surveys are being conducted on the tank bottoms as they are being removed from the tanks and on condensate withdrawal plumbing inside the tank. Surveys completed to date for Tank 5 indicated no NORM to be present above background levels in tank bottoms or on the inside surface of the condensate withdrawal line. In addition, surveys conducted on the soles of workers’ shoes as they exited the tank also showed no NORM contamination. Valdez Marine Terminal Industrial Hygiene personnel intend to sample the rust and scale on the inside tank walls when the removal of tank bottoms is completed (Norton 2001b). Because the tank bottoms have been accumulating over a long period of time, the materials and areas surveyed during the tank cleanout operation are considered to represent a “worst case” with respect to NORM contamination. The data appear to indicate, therefore, that significant amounts of NORM wastes are not associated with routine pipeline operations.

C.6.12 Spill Debris and Remediation Waste

Section 6, *Waste Management*, of the TAPS *Environmental Protection Manual*, EN-43-2, provides detailed guidance on the management of wastes resulting from accidental releases of crude oil, refined petroleum product, or hazardous materials (APSC 2000b). Wastes may result from the initial response to a release and also as a result of subsequent remediation of affected environmental media. Ultimate spill site remediation and restoration are subject to case-by-case approval of JPO agencies. Nevertheless, the APSC has an obligation to correctly manage all wastes resulting from the release event within the context of the approved remediation/restoration plan. Specific guidance has been developed for spill debris including contaminated rags, sorbents, and personal protective equipment (PPE), as well as for contaminated environmental media (soil, including gravel that makes up the pipeline workpad or backfill materials associated with buried pipeline segments, surface water, and groundwater). For the purpose of this discussion, contaminated soils include natural materials such as soils, subsoils, or gravel that have been contaminated with crude oil, refined petroleum products such as gasoline, diesel fuel and turbine fuel, lubricating oils, hydraulic oils, sludge contained in pipeline storage tanks or equipment, or petroleum-based heat transfer fluids. Section 3.16.4 provides information on the management of petroleum-contaminated waters.

In general, the management of all spill debris and contaminated media first involves their characterization as hazardous or nonhazardous wastes. This is carried out by the application of circumstantial factors (e.g., the material spilled), or as the result of sampling and analyses when process knowledge is insufficient to support a complete waste evaluation. Waste determined to be hazardous is incorporated into the existing hazardous waste management program as dictated by logistics of the spill. Waste determined to be nonhazardous is further evaluated against the ADEC soil cleanup levels contained in state regulations (see 18 AAC 75.341). Case-by-case decisions are made regarding the management of nonhazardous wastes after this evaluation is completed. Options include incineration at the nearest PS, in-situ remediation through the application of such technologies as biological treatment or soil venting (if approved by JPO authorities), stockpiling for later thermal treatment or placement in APSC-operated or municipal landfills. Soil that contains hazardous substances in concentrations exceeding one or more of the applicable "migration to groundwater" levels prescribed in state regulations, exhibits a characteristic of toxicity defined in 40 CFR 261.24(a), or is determined by the ADEC to pose a threat of migration (of hazardous constituents) to surface water is prohibited from disposal in any of the APSC landfills. Acceptance criteria have been established for petroleum-contaminated soils at all of the municipal landfills that currently accept APSC solid wastes.

Finally, within the context of the approved remediation and restoration plan for each spill event, special provisions may also be included for the interim storage of spill debris or contaminated media at or near the spill site, at the nearest pump station, or at the Valdez Marine Terminal. Storage that is incident to the "immediate response action" is approved by ADEC authorities overseeing response actions. Normally, such immediate storage or stockpiling lasts for 30 days or less. Storage for longer periods of time may also be approved; however, "short-term stockpiling" or "long-term stockpiling" plans must be developed and submitted to the ADEC for approval. The APSC has obtained preapproval from ADEC to construct long-term stockpiles at some pump stations and the Valdez Marine Terminal. Pump station stockpiles can be maintained for up to two years. Those at the Valdez Marine Terminal are authorized for up to four years. In both instances, volume limits are also specified in the approved stockpiling plans. These approaches incorporate the design specifications and operational control for soil stockpiles contained in APSC's linewide soil stockpile management plan (APSC 1999a).

In recent years, contaminated soils have been stockpiled at PS 1, 2, 3, 4, and 9, at Check Valves 10 and 12, and at the Valdez Marine Terminal (APSC 2001d; Schmidt 2000; Schnabl 1996; Clearwater/Golder J.V. 2000; OIT Inc. 1999, 2001a,b). Soils and other debris from responses to accidental releases remain in the ADEC-approved stockpiles until the maximum authorized volumes or storage time limits are reached, or until sufficient volumes have been aggregated to allow for cost-effective transport and treatment. In accordance with provisions of the ADEC-approved remediation and restoration plan discussed above, all stockpiled contaminated soils are ultimately removed by a transport contractor and delivered under a “Contaminated Soils (Non-Hazardous) Custody Transfer” form to a subcontractor for thermal treatment. Most recently, a contractor located in North Pole, Alaska, has been utilized (Schmidt 2000; Schnabl 1996; Clearwater/Golder J.V. 2000). The treatment contractor conducts treatment under the auspices of an air emissions permit issued by the ADEC. The treatment contractor also subjects treated media to analytical testing to verify successful treatment to contaminant levels below those specified in ADEC regulations. Other contaminated items related to soil stockpiling, such as liners and covers, are managed in the same manner.

In 1999, 2,302.23 tons of stockpiled soils from PS 1, 2, 3, and 4 and from Check Valves 10 and 12 were delivered for thermal treatment. This total represents contaminated soils resulting from spills along the ROW and at the pump stations over an approximate two-year period. Also included in this total are contaminated soils removed during remediation of historic releases at the Toolik Work Camp.[2] Table C-11 gives the amounts of contaminated soils that have been stockpiled at the Valdez Marine Terminal since 1996.

Acceptable levels of treatment are specified in ADEC regulations and are specific to material spilled, potential for migration, potential receptors, and various other site-specific parameters. Treatment levels appear in ADEC regulations at 18 ACC 75.325 through 75.390. These levels define the allowable residual levels of specific chemical constituents that will be allowed to remain at the location where a release has occurred. The thermal treatment contractor’s analyses of treated soils are referenced against these allowable residual

TABLE C-11 Contaminated Soil Stockpiled at the Valdez Marine Terminal[a]

Year	Volume (yd^3)[b]	Weight (tons)[c]
1996[d]	131.9	237.4
1997	607.9	1,094.2
1998	168.2	302.8
1999	208.5	375.3
2000	670.2	1,206.4
2001	867.7	1,561.9

[a] Soils stockpiled at the Valdez Marine Terminal result from response to, and remediation of, releases at the Valdez Marine Terminal as well as along the ROW at such locations where it was feasible to transport contaminated soil from the spill site to the Valdez Marine Terminal for stockpiling.

[b] All volumes are approximate.

[c] The weight of a cubic yard of contaminated soil will vary greatly, depending on such parameters as soil type, percent moisture, and extent of contamination. For the purpose of this table, one cubic yard of contaminated soil is assumed to weigh 1.8 tons. This number was empirically derived by comparing weights of soils from each APSC stockpile location undergoing thermal treatment (as reported by the treatment contractor) to estimated yardages of soils removed from those same APSC stockpile locations (as provided by the transport contractor).

[d] Volume and weight displayed represent soils stockpiled from September 25, 1996, to December 31, 1996. On September 25, 1996, 2,172.9 yd^3 of contaminated soils from the Valdez Marine Terminal stockpile underwent thermal treatment, bringing the stockpiled volume of contaminated soils at the Valdez Marine Terminal to zero.

Source: APSC (2001d).

2 Contaminated soils from Toolik totaled approximately 58 tons (Authier 2002).

levels, providing maximum flexibility for management of treated soils. Options for disposition of successfully treated soils include returning them to the spill location, sending them to a landfill to be used as clean cover material, or using them in other circumstances as fill.

C.7 Cumulative Waste

C.7.1 Wastes Associated with Cumulative Factors

Waste impacts can be associated with many of the past, present, and reasonably foreseeable activities that qualify as cumulative impacts. In most instances, the majority of waste impacts associated with those activities are generally related to human habitation or presence (i.e., the generation of domestic solid wastes and domestic and sanitary wastewaters). With the exception of North Slope activities, human habitation related to these cumulative actions (i.e., the workforce engaged in those actions) would likely occur at or near population centers or established communities. It is therefore assumed that solid wastes and domestic and sanitary wastewaters attributable to that workforce would be managed in existing municipal treatment or disposal facilities. It is further assumed that the relative sizes of the workforces engaged in most cumulative actions are small relative to the sizes of the communities in which they reside or work, and that cumulative actions would have only incremental impacts on existing waste management systems. Consequently, those waste impacts are not analyzed further. Such assumptions are only partially correct for the North Slope; thus, waste impacts from the presence of a workforce at the North Slope are included in this analysis. Among the potential cumulative actions identified in Table 4.7-2, three ongoing actions have substantial waste impacts: (1) North Slope oil exploration, development, and production (including maintaining the North Slope workforce); (2) oil refining at three of the four operating refineries in Alaska; and (3) tanker loading activities at the Valdez Marine Terminal. One proposed action, the construction of a natural gas pipeline also has the potential for substantial waste impacts.

C.7.2 Hazardous Materials and Wastes Associated with Oil Exploration, Development, and Production

The volumes and chemical characteristics of wastes associated with oil exploration, development, and production are heavily dependent on the characteristics of the oil-bearing formation from which the oil is extracted and the extraction techniques employed. However, some general similarities exist. In October 2000, the EPA published a comprehensive profile of the oil and gas extraction industry (EPA 2000). The profile covered all major activities within the Standard Industrial Classification (SIC) 13.[3] Unless otherwise referenced, the generic descriptions of wastes and waste management options provided below were derived from that EPA publication.

Mixtures of oil, production water, and natural gas are recovered from each onshore well at the North Slope and sent without separation to a central processing facility where separation of oil, water, and natural gas is accomplished. Similar mixtures recovered from offshore production wells undergo initial separation at those offshore facilities before being sent to natural gas pipelines or the TAPS, or managed as wastes.

3 The SIC codes were developed by the federal Office of Management and Budget (OMB) to track the flow of goods and services within the economy. The OMB has recently devised a different industry categorization system, the North American Industry Classification System (NAICS). A complete list of SIC codes and conversions between SIC and NAICS categories is available on the Internet at http://www.census.gov/epcd/www/naics.html. There are five major groups within SIC 13: (1) SIC 1311 Crude Petroleum and Natural Gas, (2) SIC 1321 Natural Gas Liquids, (3) SIC 1381 Drilling Oil and Gas Wells, (4) SIC 1382 Oil and Gas Field Exploration Services, and (5) SIC 1389 Oil and Gas Field Services Not Otherwise Classified.

C.7.2.1 Hazardous Material Usage in North Slope Oil Exploration, Development, and Production

Only a limited variety of hazardous materials are used in oil exploration, development, and production. Relatively small volumes of chemicals may be used as additives to facilitate drilling or to enhance the capability of the well to recover hydrocarbons. For example, mineral acids (primarily, hydrochloric acid and hydrofluoric acid) may be added to increase permeability of the rock in the oil-bearing formation (a process sometimes referred to as stimulation) or to stem the buildup of salts on downhole equipment. Biocides may be introduced to the well to inhibit the growth of sulfide-loving bacteria, the growth of which is enhanced when air is introduced into the sulfide-rich environment that often exists in oil-bearing formations. Refined petroleum fuels and lubricants are also used to power the well drilling and recovery equipment.

C.7.2.2 Wastes Generated during Oil Exploration, Development, and Production

Drilling fluids, produced waters, and other wastes associated with the exploration, development, or production of crude oil, natural gas, or geothermal energy are not hazardous wastes under RCRA (40 CFR 261.4(b)(5)). Any wastes that do not meet these criteria (e.g., generated from support facilities or maintenance activities), that demonstrate a hazardous characteristic, or that are listed under RCRA as hazardous wastes, would have to be managed as RCRA hazardous wastes. British Petroleum Exploration (Alaska), Inc. (BPXA) and Phillips Alaska, Inc. (PAI) have jointly developed a waste management certification program for staff and contractors. Training covers basic regulations, waste classification, facility restrictions, and paperwork requirements. BPXA developed the *Alaska Waste Disposal & Reuse Guide* to provide consistent waste management guidance to field personnel. This guide has been adopted by PAI, and is followed by both companies (BPXA 2001).

Well Drilling Wastes. Wastes generated during well drilling and completion include rock cuttings and drilling muds brought to the surface. Drilling muds are solutions of natural or man-made materials introduced as a slurry to reduce friction during drilling and can be either water- or oil-based. The volume of cuttings generated is primarily a function of the depth and diameter of the well being drilled and can range anywhere from 0.2 to 2.0 bbl per vertical foot of well.

Disposal of drilling muds and cuttings can be problematic not only because of their potentially large volumes, but also because of the potential presence of trace contaminants, including mercury, cadmium, arsenic, and hydrocarbons. These contaminants are present in the natural materials from which the muds are made and also in the oil-bearing rock formations. Acidic aqueous wastes may also be generated during well installation if acid is introduced to control the buildup of scale.

Production Wastes. By far, the largest volume by-product of oil extraction is water that is removed from the formation together with the oil. In wells nearing the ends of their productive lives, water can make up 98% of the material brought to the surface. Water production rates can be as high as 8 barrels for every barrel of oil extracted. Although phase separation of oil and water fractions recovered from each well is easily accomplished, many of the hydrocarbons and trace metal contaminants present in the oil-bearing formation will be water soluble. Inorganic contaminants in production water can include chlorides and carbonates of sodium, calcium, magnesium, potassium, lead, arsenic, barium antimony, and zinc, and various sulfur compounds, including elemental sulfur and hydrogen sulfide. Organic contaminants routinely include benzene, naphthalene, toluene, phenanthrene, bromodichloromethane, and pentachlorophenol. Radionuclides can also be present in production waters as a result of the naturally occurring presence of uranium and thorium and their respective radioactive decay products in the oil-bearing formation. Additional discussions on oil field wastes containing radionuclide contaminants, often referred to as naturally occurring radioactive material (NORM) wastes, are presented below.

Underground Injection Wells. Well drilling wastes and production wastes on the North Slope are generally disposed of via underground injection. Class I disposal wells are regulated by the EPA.[4] On the North Slope, Class I wells are approved only for nonhazardous and RCRA-exempt wastes, such as produced fluids, nonhazardous chemicals, meltwater pumped from impoundments, and residues form spill cleanups. Some North Slope facilities also use Class I wells to inject treated sanitary and domestic waste. Class II disposal wells are regulated by the Alaska Oil and Gas Conservation Commission (AOGCC) and are used for waste that has come to the surface during the production of oil, and gas, including, produced fluids, cuttings, and drilling muds that have circulated in the well. Up to 8,000 bbl of muds and cuttings are generated per well installation. In the past on the North Slope, muds and cuttings were placed in surface impoundments; now, however, the cuttings from the upper portion of a well are washed and used as construction gravel for roads and pads, after meeting the state reuse criteria. The remaining cuttings are ground to a fine slurry in an on-site grind and inject plant and reinjected to an underground injection well (BPXA 2001).

Other wastes approved for Class II disposal include water that collects in well cellars and fluids used to protect wells and process lines from freezing. Class II recovery wells inject approved fluids directly into the oil-producing formation to maintain reservoir pressure and sweep residual oil from pore spaces in the rock. This process, known as enhanced oil recovery, is regulated by the AOGCC (BPXA 2001). The AOGCC also regulates injection of nonhazardous drilling wastes into the annulus of an oil or gas well. This process, called the Annular Disposal Program, is considered incidental to drilling and not subject to regulation under the underground injection control (UIC) program (Alaska Oil and Gas Association 2001).

Table C-12 shows the number of wells and barrels of fluid injected to date for disposal purposes for North Slope activities (Alaska Oil and Gas Association 2001).

C.7.2.3 Other Wastes Associated with North Slope Activities

Other wastes generated in association with North Slope oil exploration, development, and production include tank bottoms that result from the settling in of transfer lines and separation and processing equipment of solids suspended in liquids brought to the surface in the production wells, and a variety of wastes associated with well maintenance, including NORM wastes. Some wastes also result from the operation of the central gas separation facility and the operation and maintenance of housing facilities.

Gas Separation Facility. Materials retrieved from each onshore production well (production water, oil, and gas) are delivered without separation to the North Slope central processing facility (also known as the Gathering Facility) for separation of the various fractions. Similar initial separations of crude oil, production water, and gas are performed at the offshore facilities. Crude oil is delivered from the Gathering Facility to PS 1 of the TAPS, where it is analyzed, categorized as to its quality, and metered into the TAPS pipeline. Production waters are returned to the wellhead for re-injection or to the Class II injection well for disposal. Natural gas undergoes dehydration or “sweetening” before being sent to the fuel gas pipeline or is disposed of by incineration in a flare stack. (Flaring of natural gas may also occur at the wellhead when necessary to maintain safe working conditions.) Sweetening routinely involves reacting the gas with a glycol (typically, triethylene glycol) that acts as a desiccant. Glycols can be recycled and reused,

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4 Underground injection control (UIC) wells are authorized by the Safe Drinking Water Act (SDWA). Class II UIC wells are wells that inject fluids that are brought to the surface in connection with natural gas storage operations or conventional oil or natural gas production and may be commingled with wastewaters from gas plants that are an integral part of production operations, unless those waters are classified as hazardous waste at the time of injection (see 40 CFR 144.6). In Alaska, the Alaska Oil and Gas Conservation Commission (AOGCC) has been granted primacy for regulation of Class II UIC wells (see 40 CFR Part 145).

TABLE C-12 North Slope Injection Wells

Type of Injection Well	Number of Wells	Type of Waste Fluid	Volume of Waste Fluid Injected (bbl)
Class II Disposal	21	Produced water (E&P[a] exempt)	1.5 billion
Class II Disposal	8	Muds/cuttings and associated E&P exempt wastes	70 million
Class I Industrial	6	Nonexempt, nonhazardous, and exempt E&P wastes	13 million

[a] E&P = exploration and production.

but ultimately, would need to be disposed of. Because no disposal facility exists on the North Slope that can properly handle spent glycol, this waste is shipped off-site for proper treatment or disposal. Other wastes related to gas sweetening such as molecular sieves, recovered sulfur, or spent amine solutions (also used to remove water) may also be generated. All such wastes would be sent to off-site treatment or disposal facilities.

Tank Bottoms. Sands and other insoluble particulates that settle from production waters and oil brought to the surface will collect in various production vessels and equipment at the gas/water/oil separation facility.[5] (Similar tank bottoms will accumulate in separation equipment at offshore facilities.) These tank bottoms (also sometimes referred to as basic sediments and water [BS&W]) are primarily inert rock or sand particles but may contain trace metallic and hydrocarbon contaminants. Often, tank bottoms that settle from oil will exhibit characteristics of hazardous wastes, primarily because of the presence of benzene. Tank bottoms can safely accumulate in process equipment until that point where their presence affects the proper functioning of that equipment. At that point, the equipment must be cleaned and this “material in process” must be removed, characterized for its hazardous or nonhazardous properties, and managed accordingly. Any tank bottoms produced at the North Slope that exhibit hazardous waste characteristics would be transported out-of-state to permitted TSDFs. Tank bottoms that are nonhazardous can be disposed of at the Oxbow Landfill.[6]

Maintenance Wastes. Infrastructure maintenance involves the use of various paints and coatings for corrosion control of equipment and structures and solvents and cleaning agents for equipment cleaning or surface preparation prior to the application of corrosion control coatings. While some of these maintenance-related wastes may be hazardous, collectively, infrastructure maintenance activities generate only relatively small amounts of wastes. Maintenance-related wastes that are RCRA wastes would be transported to out-of-state RCRA-permitted TSDFs. Nonhazardous maintenance wastes would be disposed of in the Oxbow Landfill.

Throughout their working lives, production wells require routine maintenance, rejuvenation,

5 Despite the name commonly assigned to this waste stream, there are no crude oil “storage” tanks on the North Slope. However, separation of the recovered fractions involves the use of various flow-through or surge tanks from which tank bottoms are typically recovered.

6 The Oxbow Landfill is a Class I landfill permitted by the ADEC to accept nonhazardous industrial solid wastes and domestic solid wastes from North Slope activities. Class I landfills are defined in ADEC regulations as facilities that accept for disposal 20 tons or more of municipal solid waste daily, based on an annual average (see 18 AAC 60.300).

or rebuilding. Wastes from these activities, together with wastes from initial well installation and development are collectively known as “Associated Wastes.” Water contained in formations normally exists at elevated temperatures and pressures, thereby enhancing the solubility of inorganic and polar organic species also present in the formation. As this water is brought to the surface along with oil and gas, its pressure and temperature begin to equilibrate to ambient conditions. Chemicals dissolved in the water then begin to precipitate, forming scale on downhole[7] equipment and aboveground wellheads and other production equipment that comes in contact with this water. If allowed to build up, this scale will ultimately interfere with production rates. One of the primary purposes of periodic rejuvenation of production wells is the removal of accumulated scale. Because the scale primarily consists of sodium and calcium chlorides and carbonates, with trace amounts of barium salts, strong mineral acids such as hydrochloric and hydrofluoric are often used to “descale” the well. Well maintenance may also involve replacing segments of well casings or downhole equipment and the introduction of corrosion inhibitors, typically containing zinc carbonate and aluminum bisulfate. Additional acids may be introduced into the well after maintenance or rebuilding to stimulate future oil production. In most instances, the acidic descaling solutions are reinjected into the well or delivered to the North Slope Class II injection well for disposal.

NORM Wastes. As stated previously, scale formation is a continuing occurrence at each production well. Scale can also form on equipment at the Gathering Facility. When the oil-bearing formation contains naturally occurring radioactive species, such as radioactive isotopes of uranium or thorium and their respective radioactive decay products (or daughters), the scale that forms will exhibit radioactive properties and may require special management for the purposes of both controlling worker exposures to radioactivity and providing for proper ultimate disposal. The extent to which NORM wastes will form and the levels of radioactivity they display are functions primarily of the natural occurrence and mobility of the radioactive species in the oil-bearing formation, and the amount of water produced in conjunction with the hydrocarbons. The radioactive species of greatest concern (from a worker exposure perspective) are radium-226 and radium-228, the salts of which exhibit generally high solubilities in production waters. Other radionuclides of concern, especially in natural gas processing, are lead-210 and radon-222, which is often present in natural gas (Smith 1992).

The incidence of naturally occurring uranium and thorium in the oil-bearing formations on the North Slope is relatively low; consequently, while NORM species will be present in production waters and NORM scale will form on well equipment, the resulting activity levels are relatively low. No federal or state regulations currently exist that speak directly to the management of NORM wastes in Alaska.[8] Nevertheless, North Slope drillers have established formal procedures for managing potentially NORM-contaminated by-product streams and solid wastes (BP Amoco Alaska 2001). These procedures call for routine surveys of work environments at the wellheads and the gas processing plant to determine worker exposure levels, establishing handling procedures for NORM-contaminated equipment, and the provision of general worker training regarding potential NORM hazards and proper avoidance techniques. In past years, NORM-contaminated wastes were cleaned at BP Amoco’s centrally located Mukluk Cold Storage Yard by a special services contractor and cleaning solutions containing NORM species were disposed of in the Class II injection well (Johnson 1991). Under current procedures,

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7 Downhole equipment includes safety valves, gas lift mandrills, downhole pumps, and production well tubulars (casings).

8 NORM wastes are excluded from regulation as RCRA wastes by basic statutory construction. The State of Alaska has not developed rules that apply to the management and disposal of NORM wastes. Regulations promulgated by the U.S. Nuclear Regulatory Commission potentially apply to disposal of NORM wastes. However, NORM wastes have activity levels ranging from 526 to 12,000 pCi/g and average 7,690 pCi/g, levels that are below regulatory concern.

all scale-encrusted equipment retrieved from all North Slope wells is stored at the Mukluk Cold Storage Yard until being removed for cleaning and disposal (Kany 2001). The area is posted, equipment is wrapped in plastic or otherwise plugged to prevent the airborne release of the scale, and the ground surface is routinely surveyed by BP Amoco health physicists for evidence of release of radioactive species. Surveys conducted in June 2000 clearly indicate that migration of radioactive contamination is not occurring (BP Amoco Alaska 2000; McArthur 2000). Periodically, NORM-contaminated equipment is transported by contractor to a commercial firm in Louisiana for cleaning. NORM-contaminated scale is disposed of in a Class II injection well in east Texas, and the cleaning company takes possession of the cleaned equipment for salvage value as partial compensation for its services. The cleaning contractor routinely provides BP Amoco Alaska with completed waste transportation manifests as well as quality control analytical results (Taylor 2001b; ARS 2001).

North Slope Support Facilities. Various suppliers of oil field equipment maintain storage areas in Deadhorse. Likewise, numerous special service contractors (e.g., well installation contractors) maintain offices and business units in Deadhorse. Wastes associated with maintaining living quarters for these individuals include domestic solid wastes (from residences and food service facilities) and domestic and sanitary wastewaters.[9] Solid wastes are disposed of at the Oxbow Landfill. Domestic and sanitary wastewaters are combined with similar wastes generated from living quarters and business locations maintained by the drilling companies. Management of those wastewaters is discussed below.

North Slope support facilities also include aboveground transfer pipeline maintained by the various North Slope drilling companies that interconnect onshore wellheads, the Central Gathering Facility, and TAPS PS 1 and submarine transfer pipelines that interconnect the offshore wellheads with PS 1. Collectively, these transfer pipelines constitute approximately 1,123 mi in length (USACE 1999). Although these pipelines are smaller in scale and less sophisticated in their overall designs than the TAPS, their maintenance requirements are assumed to be similar to those for the TAPS. Because the pipelines traverse relatively small distances over virtually level grades, pumping systems do not need to be as technically complex at those at TAPS pump stations and their maintenance is much less involved. Procedures for maintaining corrosion control, preventing unacceptable degrees of curvature or deformation, maintaining pipeline VSMs, and maintaining overall asset integrity result in maintenance-related wastes. Similarly to the TAPS, most maintenance-related wastes for the North Slope transfer pipelines are expected to be non-hazardous and are likely to be eligible for disposal in the Oxbow Landfill. However, residues recovered from internal cleaning of these pipelines may exhibit hazardous waste characteristics. In addition to solid and/or hazardous wastes, maintenance of these transfer pipelines are likely to result in the generation of wastewaters from hydrostatic testing that routinely occurs. As with the TAPS, it is assumed that hydrostatic test water is eligible for discharge to the ground surface at the point where it is generated under the authority and control of an NPDES permit. Alternatively, hydrostatic test water may be eligible for disposal in the North Slope Class II injection well. Response to spills or leaks from these pipelines would result in remediation waste, some of which may display hazardous characteristics, however. All such hazardous waste resulting from spill response must be sent to out-of-state RCRA TSDFs.

North Slope Workforce. The exigencies of weather on the North Slope together with the remoteness of the area require that the North Slope oil field workers reside at or near their work sites. Consequently, all North Slope oil field workers reside in dormitories at Deadhorse or at offshore oil platforms. Maintenance of these housing facilities results in the generation of domestic solid wastes (including food preparation wastes) and domestic and sanitary wastewaters. Solid wastes are disposed of in the Oxbow Landfill at

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9 Domestic wastewaters are waters from sinks, showers, and laundry and food preparation areas. Sanitary wastewaters are generated from toilets and routinely contain fecal coliform bacteria.

Deadhorse. A small incinerator is also operational at the Oxbow Landfill in which combustible, nonhazardous solid wastes can be burned before being placed in the landfill. Domestic and sanitary wastewaters are combined with similar wastes generated from North Slope special service contractor facilities for treatment and disposal. A number of management options are available. The wastewaters undergo biological treatment, and treated effluents are discharged under NPDES permits to either area lakes or to the Beaufort Sea. When those discharge options are not available (because of weather, access, or frozen receiving water bodies), treated wastewaters can also be injected into the Class II injection well on the North Slope that routinely receives production waters (Kitagawa 2002).

Individual NPDES permits also cover the discharge of seawater treatment plant residues (natural salts and solids removed from seawater as it is processed for industrial and potable use) and fire-control system test water (intermittent fresh or saltwater discharges from fire-control equipment (BPXA 2001). The EPA and ADEC have developed a general NPDES permit for oil and gas facilities on the North Slope. The North Slope General Permit covers the temporary or intermittent discharges of sanitary wastewater (up to 15,000 gal/d); domestic wastewater; gravel pit dewatering (up to 1.5 million gal/d) to tundra, water bodies, or for use in road watering and ice road/ice pad construction; construction dewatering; and hydrostatic test water (from new pipelines only, not from pipelines that have carried oil) (BPXA 2001). NPDES storm-water permits allow discharges of uncontaminated rainwater and snowmelt. Arctic drilling and production pads do not have conventional storm drains, so storm-water discharges are in the form of surface runoff during the brief spring thaw season (BPXA 2001).

C.7.3 Wastes Associated with Oil Refining Operations

Currently, four petroleum refineries are operating in Alaska: the Petro-Star Refinery on the Kenai peninsula, the Petro-Star Valdez Refinery, Petro-Star North Pole Refinery, and Williams Alaska Petroleum Co. North Pole Refinery (formerly, the MAPCO Refinery). Of these, only the last three receive crude oil from the TAPS. Consequently, only activities at the three refineries in North Pole and Valdez are considered to be within the area of interest and to result in cumulative impacts for the purpose of this EIS. Petroleum refining is the physical, thermal, and chemical separation of crude oil into its major distillation fractions, which are then processed through a series of separation and conversion steps into finished petroleum products. Unless otherwise noted, the generic descriptions and data for petroleum refining that are presented below were obtained from the EPA Office of Compliance Sector Notebook Project “Profile of the Petroleum Refining Industry” (EPA 1995). Oil refining is in SIC 2911.

Refinery Products. The primary products of petroleum refineries fall into three major categories: fuels (e.g., motor gasoline, diesel and distillate fuel oil, liquefied petroleum gas, jet fuel, residual fuel oil, kerosene, and coke); finished nonfuel products (e.g. solvents, lubricating oils, greases, petroleum wax, petroleum jelly, and asphalt); and chemical industry feedstocks (e.g., naphtha, ethane, propane, butane, ethylene, propylene, butylenes, butadiene, benzene, toluene, and xylene).[10] Petroleum refineries are complex and consist of multiple physical and chemical operations depending upon the properties of the crude oil being refined and the desired products. For these reasons, no two refineries are alike. Portions of the outputs from some processes are fed back into the same process, fed to new processes, fed back to a previous process, or blended with other outputs to form finished products. Refining crude oil into useful petroleum products can be separated into two phases and a number of supporting operations. The first phase is desalting of crude oil and the subsequent distillation into its various components or “fractions.” The second phase is made up of three different types of “downstream” processes: combining, breaking, and reshaping. Downstream processes convert some of the

10 Some chemicals commonly categorized within the refining industry as feedstock chemicals can also be used as fuels (e.g. ethane, propane, butane) and solvents (e.g. benzene, toluene, xylene).

distillation fractions into petroleum products through any combination of different cracking, coking, reforming, and alkylation processes. Supporting operations may include wastewater treatment, sulfur recovery, additive production, heat exchanger cleaning, blowdown systems, blending of products, and storage of products.

Refinery Wastes. The nature and volumes of wastes generated at refineries are functions of the quality and throughput of the raw materials (crude oil) as well as the products being generated. Recent crude oil throughputs for the refineries within the area of interest are provided in Section 4.7.4.2. Because operations at refineries change frequently in response to market demands, a review of the historical waste generation data for one of the Alaska refineries is considered to be sufficiently descriptive of wastes that may be generated at any of the Alaska refineries in future years. The following discussions, therefore, incorporate information and data specific to the Williams North Pole Refinery, but are intended to be generally representative of wastes from any of the other two refineries within the area of interest for this EIS.

Wastewater. The petroleum refining industry uses relatively large volumes of water. Four types of wastewater are produced: surface water runoff (precipitation draining from industrialized land areas), cooling water, process water, and domestic/sanitary wastewaters.[11] Surface water runoff is intermittent and will contain constituents from spills to the surface, leaks in equipment, and any materials that may have collected in drains. Storm-water runoff from oil refineries would be controlled by the facility's NPDES permit for storm water associated with industrial activity and would normally be routed to the nearest surface water body. Federal regulations governing the discharge of storm water from industrial areas[12] requires the capture and treatment of storm water at all petroleum refineries, including removal of large fraction of both conventional pollutants, such as suspended solids and constituents that contribute to the water's biological oxygen demand (BOD), as well as toxic pollutants, such as certain metals and organic compounds.

A large portion of water used in petroleum refining is used for cooling. Cooling water typically does not come into direct contact with process oil streams and therefore has less potential for hydrocarbon contamination than do process wastewaters. Most cooling water is recycled with only a small bleed or blowdown stream diverted to the wastewater treatment unit at each cooling water cycle to control the concentration of contaminants and the solids content. The water used for cooling often contains chemical additives such as chromates, phosphates, and antifouling biocides to prevent scaling of pipes and biological growth. It may also contain some level of oil contamination caused by leaks in the process equipment. Process wastewater arises from desalting of crude oil, steam stripping operations, drainage from product fractionation operations, and boiler blowdown. Because process water comes into contact with the oil process streams, it is usually highly contaminated with the polar hydrocarbons routinely present in oil. Oily water generated during routine heat exchanger cleaning is also considered process water.

Petroleum refineries typically utilize primary and secondary wastewater treatment. Primary wastewater treatment consists of separation of oil, water, and solids in two stages. The first stage is an oil/water separator where the oil is allowed to float to the surface and be skimmed off, and solids settle to the bottom to be scraped off into a sludge hopper. The second stage may be a series of settling ponds or DAF, where air is bubbled through the wastewater and both oil and suspended solids are skimmed off the top. Chemicals, such as ferric hydroxide or aluminum hydroxide, can be used to coagulate impurities into a froth or sludge that can be skimmed off the top. After primary treatment, wastewater can be discharged to a POTW or undergo secondary treatment before being discharged directly to surface waters under an appropriate NPDES permit. Some refineries use an additional stage

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11 See footnote 9.

12 Industrial areas are defined in 40 CFR 122.26(b)(14)(ii) and include facilities in SIC 29.

of wastewater treatment, called polishing, to meet NPDES permit pollutant discharge limits. Polishing usually includes filtering (e.g., carbon, anthracite, or sand).

Williams North Pole Refinery holds an NPDES permit issued by EPA Region 10, for the discharge of wastewater into a former gravel pit located on the Williams property. In addition, process wastewater is discharged to the City of North Pole Municipal Sewage Treatment Plant (EPA 2002).

Hazardous and Solid Wastes. Primary wastewater treatment generates wastes that may be considered hazardous, including oil/water separator sludge, primary treatment sludge, sludges from other gravitational separation techniques, float from DAF units, and wastes from settling ponds. Secondary wastewater treatment also generates wastes, including biomass waste that is typically treated through digestion by anaerobic bacteria and then dewatered. This oily wastewater treatment waste may contain contaminants (e.g., chromium or lead) that would require it to be managed as a RCRA hazardous waste. The periodic cleaning of heat exchangers may produce hazardous waste sludges because of the use of chromium as an additive to cooling water.

Other refinery wastes include various types of sludge (e.g., oily waste sludge, tank bottoms, calcium chloride sludge from isomerization processes and neutralized sulfuric acid, or calcium fluoride sludge from alkylation processes), spent process catalysts, and spent clay filtering media. Treatment of these wastes includes incineration, land treating off-site, land filling on-site, land filling off-site, chemical fixation, neutralization, and other treatment methods. A number of wastes commonly generated at refineries are EPA listed hazardous wastes, including oil separator sludge (EPA Hazardous Waste No. K051); slop oil emulsion solids (EPA Hazardous Waste No. K049); dissolved air flotation floats (EPA Hazardous Waste No. K048), and heat exchanger bundle sludge (EPA Hazardous Waste No. K050). In addition, some wastes may contain hazardous constituents (e.g., lead, chromium, or benzene) and must be managed as hazardous waste. Because there are no EPA-permitted hazardous waste treatment or disposal facilities located in Alaska, oil refinery wastes that are characterized or listed as hazardous wastes would have to be shipped off-site and out of state for treatment and final disposal.

Williams North Pole Refinery is a large quantity generator of RCRA hazardous wastes. In 1997, Williams North Pole Refinery generated 43 tons of hazardous waste (EPA 2002), which was all shipped off-site to out-of-state TSDFs. These hazardous wastes included benzene-contaminated wastes; heat exchanger bundle cleaning sludge; ignitable, reactive sludge; used solvents contaminated with lead and benzene; laboratory wastes; used filter media; tank removal sludge; used batteries; paint wastes; and contaminated air stripping media. Some wastes from Williams North Pole Refinery are shipped off-site for energy recovery.

Those solid wastes characterized as nonhazardous wastes (e.g., packing materials or nonhazardous sludge) can be disposed of in on-site landfills; in off-site, local solid waste landfills; or shipped out-of-state to appropriately permitted landfills. Some outputs, such as sulfur, acetic acid, phosphoric acid, and recovered metals, are sold as by-products and transported off-site.

C.7.4 Waste Impacts from Tanker Operations at the Valdez Marine Terminal

Wastes associated with oil tanker visits to the Valdez Marine Terminal include tanker ballast and bilge water and domestic solid wastes generated on board (including some potential medical wastes) during the ship's voyage to the Valdez Marine Terminal.

Oil tankers berthing at the Valdez Marine Terminal discharge their ballast and bilge waters to the BWTF at the Valdez Marine Terminal for treatment before discharge to Prince William Sound (e.g., removal of oil). Average inflows of tanker ballast and bilge water are 400,000 bbl/d. A number of factors influence this total, including, primarily, the frequency of tanker visits (in general, a function of crude oil pipeline throughput as well as the capacities of each tanker) and the design of the tankers. The Oil

Pollution Act of 1990 requires that, after January 1, 2015, all vessels operating in the United States navigable waters or the Exclusive Economic Zone of the U.S. be equipped with a double hull, or double containment system. The statute also establishes a schedule by which conversions of existing vessels must occur, on the basis of the vessel's year of commissioning, gross tonnage, and salvage value. It is anticipated that some double-hulled tankers will also have segregated ballast tanks (i.e., ballast tanks that are separate from crude oil tanks). For these vessels, the volume of ballast water requiring treatment at the BWTF would be dramatically reduced since the potential for oil contamination of the seawater ballast does not exist. However, it is also possible that other vessels without segregated ballast tanks that still comply with the double-hull requirement may also still be part of the Valdez Marine Terminal fleet and would require treatment of their ballast water before discharge to Prince William Sound. Further, double-hulled tankers with segregated ballast tanks may still need to use cargo tanks for additional ballast storage to ensure stability in certain open sea conditions. Thus, conversion of the Valdez Marine Terminal tanker fleet to comply with double-hull requirements would dramatically reduce, but would not completely eliminate, the volume of ballast water treated in the BWTF. It can be reliably assumed that the maximum reduction in ballast water volumes would be realized by January 2015. However, a schedule for reductions in the interim period is difficult to predict since many vessel owners are reconfiguring their fleet, or purchasing new vessels on more aggressive schedules than those required by the statute. Regardless of their hull design, tankers visiting the Valdez Marine Terminal would still have bilge water that would require treatment before discharge.

Domestic solid wastes generated on board are managed as "International Wastes" and treated as potentially biohazardous. As a service to the berthing tankers, upon request, the Valdez Marine Terminal accepts domestic solid wastes, separately bags those wastes, and delivers them to a commercial firm for sterilization and ultimate disposal in a municipal landfill. The quantities of domestic waste are very limited. Valdez Marine Terminal personnel report that requests from vessel captains for assistance with disposal of domestic solid wastes are rare (Edwards 2002b).

Personnel at Valdez Marine Terminal report that it does not treat domestic and sanitary wastewaters generated by the tankers. These wastewaters are treated according to existing U.S. Coast Guard and ADEC regulations and discharged to the ocean. None of the tankers commingle domestic or sanitary wastewaters with ballast waters (Edwards 2002b). Finally, wastes generated during the vessel's trip to Prince William Sound as a result of maintenance or repair of on-board mechanical systems are not off-loaded at Valdez but rather return with the vessel to its home port for treatment or disposal (Edwards 2002b).

C.7.5 Wastes Associated with Natural Gas Pipelines

The proposed construction and operation of the natural gas pipeline would have the potential to generate wastes. Waste impacts would be both short term, associated with initial construction, and long term, associated with subsequent operation. During construction, substantial amounts of domestic solid waste and domestic and sanitary wastewaters would be generated in support of the construction workforce. In addition to the pipeline, the natural gas system would involve construction of a natural gas separation and treatment facility on the North Slope and compressor stations along the pipeline route. If natural gas was brought to Valdez, a gas liquefaction facility and marine terminal might be located at Anderson Bay in Prince William Sound. Because the temperature of the gas could be controlled before the gas would be introduced into the pipeline, the entire length of the pipeline could be buried, notwithstanding localized factors that would preclude burial.

Wastes associated with operation of a natural gas system would include wastes resulting from the support of a workforce and wastes associated with maintenance of the pipeline. Although less complex in its design than the TAPS, the natural gas pipeline would still require maintenance, and such activities would also generate wastes, many of which would be similar to those resulting from maintenance of the natural gas TAPS. Because the natural gas project is only at a preliminary conceptual stage, no additional details can be provided about the amounts or types of operation wastes that would result or about their ultimate disposal.

The liquefied natural gas (LNG) plant would generate industrial wastewaters related to plant operations as well as domestic and sanitary wastewater in support of the workforce. In addition, LNG tankers visiting the LNG plant could generate bilge/ballast wastewaters that would have to be treated and discharged into Prince William Sound under the auspices of appropriate NPDES permits. Prince William Sound would then receive treated wastewaters from both the Valdez Marine Terminal and any new LNG plant.

In addition, the LNG plant would generate solid wastes that could be disposed of in the City of Valdez municipal landfill. They would be in addition to any solid wastes generated at the Valdez Marine Terminal and disposed of at the municipal landfill. Under the no-action alternative, solid wastes from the LNG plant could continue to be disposed of at the municipal landfill, even though Valdez Marine Terminal operations ceased. However, under the no-action alternative, solid wastes generated during pipeline and Valdez Marine Terminal closure and dismantlement could also be disposed of at the municipal landfill.

Finally, the construction and operation of the LNG plant might cause an increase in the population of Valdez and other nearby communities, together with increases in domestic solid wastes and domestic and sanitary wastewaters, the management of which represents cumulative impacts in addition to those already resulting from other activities, including those associated with the Valdez Marine Terminal operational workforces. Under the no-action alternative, these cumulative impacts would be less as employment related to the Valdez Marine Terminal declined.

C.8 References for Appendix C

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