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April 22, 2024

Peter Campbell
Alaska Department of Environmental Conservation
Division of Spill Prevention and Response
43335 Kalifornsky Beach Road, Suite 11
Soldotna, AK 99669

Subject: **Historical Records Review and Evaluation**
Former Chevron Kenai Refinery
Nikiski, Alaska
ADEC File No. 2323.38.040

Dear Mr. Campbell:

As discussed and agreed upon in prior communications with Alaska Department of Environmental Conservation (ADEC), Chevron Environmental Management Company (CEMC) has conducted an extensive historical records search for the Former Chevron Kenai Refinery site in Nikiski, Alaska, including retrieval and review of hundreds of files. Based on that review, CEMC concludes that there was no storage or use of PFAS-containing firefighting foams at the site. Based on this conclusion and given that there were no detections of PFAS in shallow groundwater other than estimated (J-flagged) results below the analytical quantitation limit of 2 parts per trillion (ppt) (as reported in our November 4, 2021 results summary report), there is no justification for further PFAS investigation at the site.

HISTORICAL RECORDS RESEARCH

Historical site maps ranging from original 1962 Plot Plans to a 1993 Simplified Plot Plan[1] document the location of fire water storage tankage, fire water pumps, and water hydrants; however, there is no evidence PFAS-containing foam was ever present. Thus, the maps and diagrams all support that only water and non-PFAS extinguishing agents were used. Further, no records indicate that any fires (based on inquiry to the local fire department and former employee interviews, including one who was a volunteer firefighter with Nikiski Fire Department from 1974-2000) have occurred at the site[2]. The only records of any foam present at the site (for training or emergencies) are for non-PFAS (fluorine-free) protein-based foam and a dry chemical extinguishing agent, as detailed below. These conclusions are further substantiated by former employee interviews conducted independently but in parallel to the records review. Excerpts from the relevant historical documentation are included as **Attachment 1**.

AOF 3% COLD FOAM (AOF 3CF) TECHNICAL DETAILS FOLLOWING ARCHIVES REVIEW

We reviewed comprehensive records of chemicals stored on-site at the time of facility decommissioning after operations ceased in 1991. These records included February 1992 inventories[2] of Aer-O-Foam 3% Cold Foam (noted as in the laboratory and in 5-gallon pails with 19 containers on-site in the boiler building) stored on-site at that time. Additionally, contemporary (circa 1986) product materials for Aer-O-Foam 3% Cold Foam (AOF 3CF) from the manufacturer (National Foam) were identified within company archives explaining AOF 3CF content[3]. Protein foams contain naturally occurring proteins, often derived from animal wastes such as ox blood, as the foaming agents. Thus, the only record of foam stored at the site is of a non-PFAS, cold-weather protein foam (i.e., AOF 3CF). The following additional external documents were reviewed, and all indicated that AOF 3CF is a fluorine-free, protein-based foam that does not contain PFAS:

- *A Firefighter's Guide to Foam* (January 2002) by National Foam[4] on page 19: Depicts the AOF 3CF approved uses in contrast to other firefighting foams and categorizes AOF 3CF as a protein foam.
- An exhibit to recent PFAS litigation[5] included an October 2008 addendum, *Perfluorocarbon-Containing Firefighting Foams and their Use in Firefighting Training in Minnesota* that also confirms (on Table 1, page 21) AOF 3CF (i.e., AOF 3% Cold) is a Class B protein foam.
- ITRC (2022[6]) notes in Figure 1 (reproduced below) of its *Aqueous Film-Forming Foam* fact sheet that protein foams are fluorine-free and do not contain PFAS.

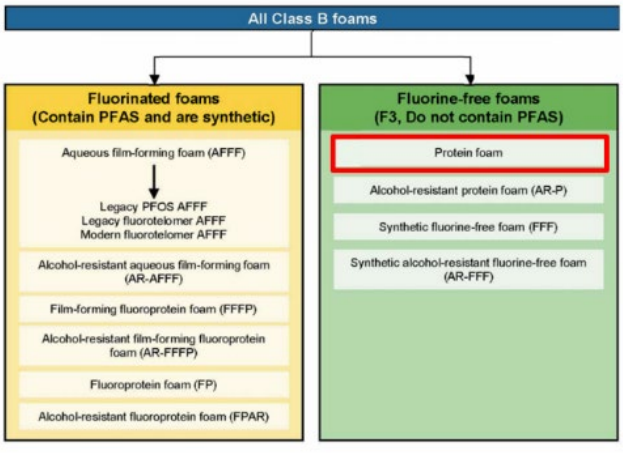


Figure 1. Types of Class B foams.
Source: S. Thomas, Wood, PLC. Used with permission. PFAS-1, Figure 3-2.

Based on a review of all available information, AOF 3% Cold Foam, the firefighting foam material identified in the historical site inventories, does not contain PFAS.

FIRE TRAINING AREA (FTA) RESEARCH FINDINGS

Known water-only training with a propane torch in June 1981 is included in the archival record[7]. For the period 1970-1980, a 1992 document reported annual diesel and "Special K" [sic][8] usage at the fire training area (FTA). **Attachment 2** includes additional information from archives regarding FTA operations and extinguishing agents[9]. Though not a "foam", this additional (dry chemical) fire extinguishing agent, Purple K, was also referenced as a firefighting foam in additional references[10] and in former employee interviews, including one with the site manager from the mid-1960s until the mid-1970s, who recalls only dry-chemical fire extinguishers used on-site. Many manufacturers have produced potassium bicarbonate-based Purple K over the years since its original development by the U.S. Navy in 1959, as an improvement over sodium bicarbonate for extinguishing oil and gasoline fires[11].

Based on one of the former employee interviews, sometime after 1978 (when the employee's tenure started), Chevron had a small, two-wheeled Master Stream fire wagon that could be hooked to the back of a truck or pushed by hand. Former employees do not recall any foam usage beyond AOF 3CF. All available information indicates that no storage, use, or training with any PFAS-containing foam was ever conducted on-site.

CONCLUSIONS

Based on the available information, the following conclusions regarding the potential for PFAS impacts from any historical operations can be made:

No PFAS Storage Occurred at the Former Chevron Refinery: Available information indicates that only non-PFAS foam was stored at the refinery during operation (i.e., before 1991). Fluorine-free AOF 3CF was listed as being on-site in 1992 during the chemical inventories and in 1993 when preliminary waste profiling began during decommissioning. Fluorine-free AOF 3CF is not a PFAS-containing foam.

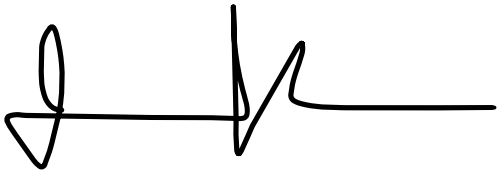
No PFAS Usage Occurred During Firefighting at the Former Chevron Refinery: No records of any PFAS release or use at the site were identified. No record of fire loss or response to any fires was identified based on fire department inquiry, available records, and interviews of long-time employees and local volunteer firefighter experience dating back to 1974.

No PFAS Was Used in Fire Training at the Former Chevron Refinery: Usage of dry chemical firefighting agent Purple K and non-PFAS protein foam (AOF 3% Cold Foam) identified at the site is not sufficient evidence to warrant PFAS sampling in site soils, particularly given the absence of any record indicating PFAS-containing foams were ever present or used on-site.

The conclusion from the extensive historical records search that there was **no identified on-site storage or use of PFAS-containing firefighting foams** is also consistent with the August 2021 monitoring well sampling results of *de minimis* estimated (J-flagged) trace concentrations of PFAS (all below the 2 ppt analytical quantitation limit)[12]. Based on this conclusion, there is no basis for requiring CEMC to prepare a PFAS soil investigation workplan, as there is no PFAS "source area" where there are no records of ever having stored or used PFAS-containing materials for firefighting or training purposes.

We appreciate your continued cooperation on this project. If you have any questions on this letter or need any additional information, please contact me at (925) 842-3220 or jkiernan@chevron.com.

Sincerely,



James P. Kiernan, P.E.
Project Manager

Cc: Dr. Shanna Clark, CEMC

Attachments:

1. Historical Records Excerpts
2. Fire Training Area Information

Notes:

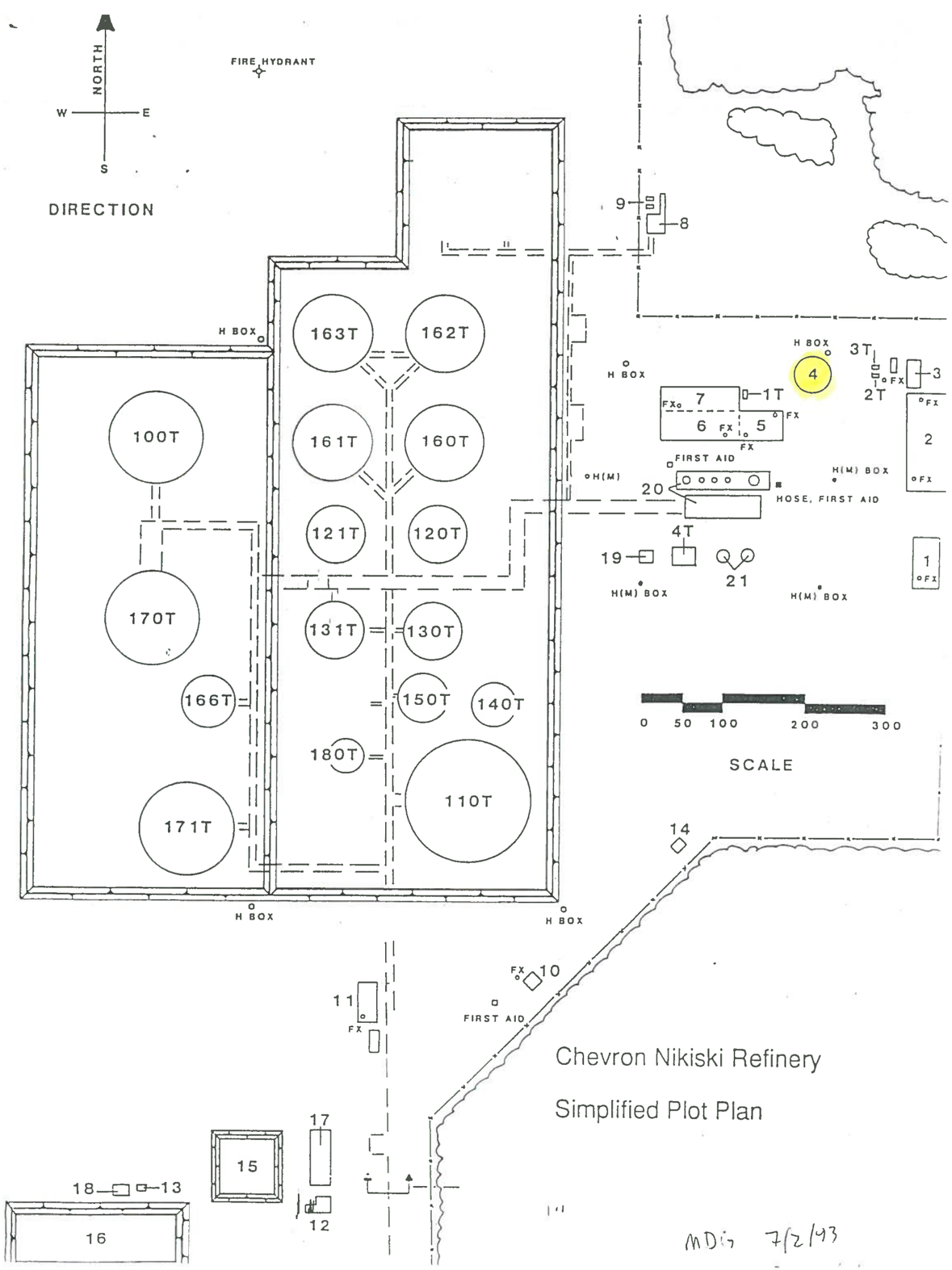
1. See Attachment 1, Plot Plan (1962) and Simplified Plot Plan (1992)
2. See Attachment 1, Chevron (1992a) *1991 Hazardous Substance Inventory for Refinery:* Chemicals Previously Used at the Refinery (dated 2/1/1992) and Chevron (1992b) *Hazardous Substance Inventory* data as of 2/12/1992
3. See Attachment 1, National Foam (circa 1986), Chapter 2 excerpt
4. http://www.foamtechnology.us/Firefighters.pdf
5. https://www.pca.state.mn.us/sites/default/files/pfc-foamreport-addendum.pdf
6. https://pfas-1.itrcweb.org/wp-content/uploads/2022/09/AFFF_PFAS_FactSheet_082522_508.pdf
7. See Attachment 2, Section 4.28 "SWMU 28: Fire Training Area Number 1" (text excerpt from page 49 of USEPA [1992] RCRA Facility Assessment Final Report prepared by PRC, November 23)
8. Believed to refer to Purple K, a contemporary dry chemical fire extinguishing product reportedly used (according to former employees) at the site and found elsewhere in the historical archival records.
9. See Attachment 2, Section 4.29 "SWMU 29: Fire Training Area Number 2" (text excerpt from page 50 of USEPA [1992] RCRA Facility Assessment Final Report prepared by PRC, November 23)
10. See Attachment 2, Section 3.2.23 "Fire Training Area" (text excerpt from page 3-21 of ENSR [1992] Phase II Site Assessment Workplan, August; "RCRA Information Needs" table revised 8/16/92)
11. See page 98 of Corbett (2009) *Fire Engineering's Handbook for Firefighter I and II*.
12. See Table 2 of Arcadis (2021). *Per- and Polyfluoroalkyl Substances Sampling Results Summary Letter – Former Chevron Kenai Refinery, Nikiski, Alaska*. Submitted and received by ADEC on 11/4/21.

Simplified Plot Plan

1. Office
2. Maintenance Shop
3. Lube Oil Storage
4. Fire Water Tank
5. Lab
6. Control Room
7. Boiler
8. Asphalt Loading Racks
9. Asphalt Additive
10. Light Product Loading Racks
11. P300 Pump Station
12. Chemical Building for Water Treatment
13. Electric Shed
14. Radio/Telephone Shed
15. Storm Surge Pond
16. Water Treatment Pond
17. APT Seperator
18. B10 Disc Treater
19. Fuel Additive Pump Shed
20. Crude Unit
21. Fired Heaters

TANKS

1T	100	Gal. Gasoline
2T	500	Gal. Unleaded Gasoline
3T	500	Gal. Leaded Gasoline
4T	Fuel	Additive Tank
100T	93	MB Crude Oil
110T	155	MB Unfinished Gasoline/Diesel
120T	31	MB Military Jet Fuel
121T	31	MB Military Jet Fuel
130T	27	MB Jet Fuel
131T	27	MB Av. Gas
140T	15	MB Diesel
150T	21	MB Jet Fuel
160T	53	MB Diesel
161T	53	MB Diesel
162T	53	MB Diesel
163T	53	MB Diesel
166T	19	MB Residual Fuel Oil / Asphalt
170T	72	MB Residual Fuel Oil
171T	102	MB Residual Fuel Oil / Asphalt Charge Stock
180T	10	MB Mixed Fuel


NORTH
W
E
S
DIRECTION
FIRE HYDRANT
H BOX
163T
162T
161T
160T
121T
120T
131T
130T
150T
140T
180T
110T
100T
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171T
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FIRST AID
H(M)
H(M) BOX
20
HOSE, FIRST AID
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19
21
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SCALE
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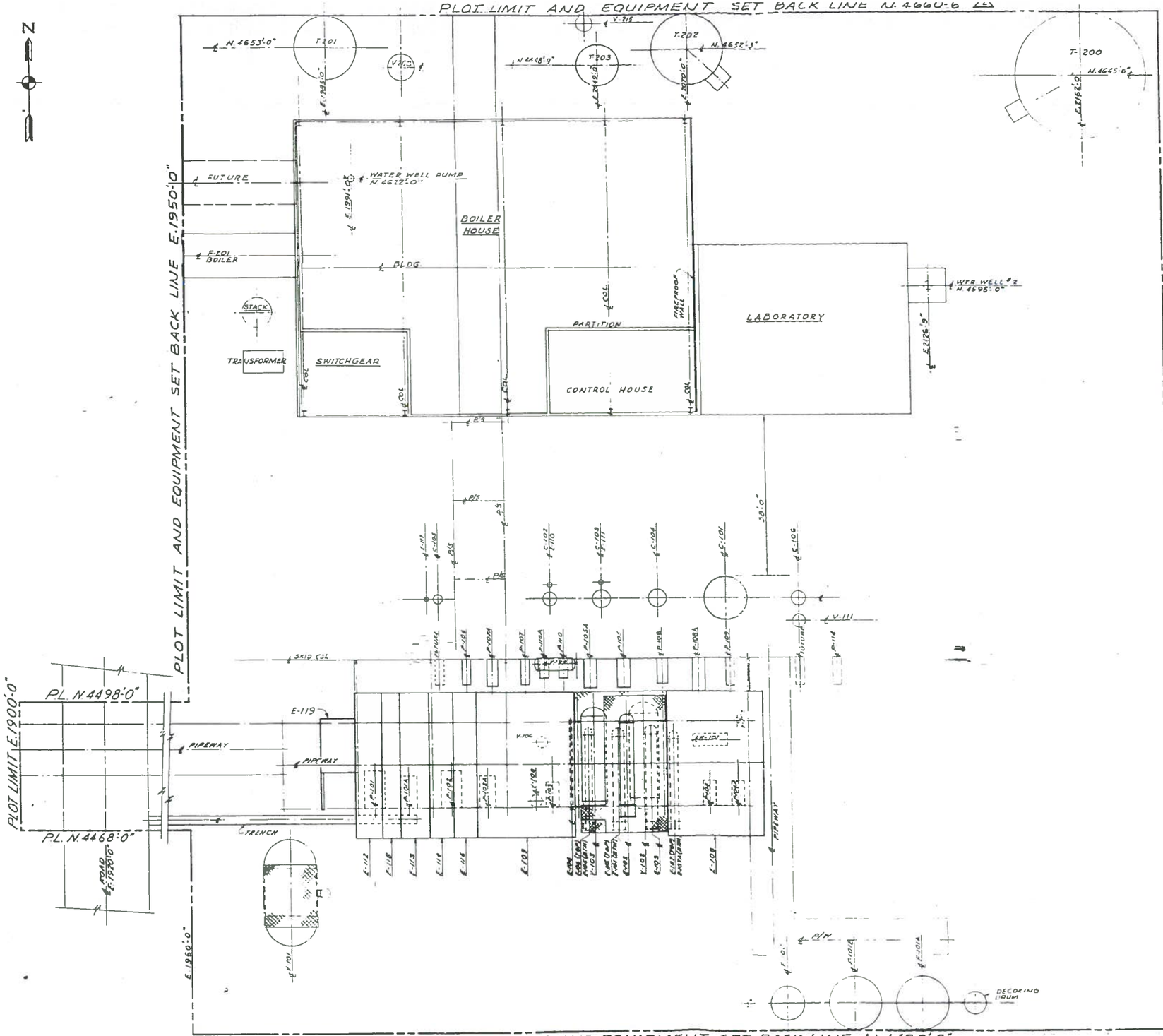
16
12
Chevron Nikiski Refinery
Simplified Plot Plan
MDG 7/2/93



COLUMNS
- C-101 ATMOSPHERIC COLUMN
- C-102 HEAVY ST. RUN GASOLINE STRIPPER
- C-103 CATF. BASE STRIPPER
- C-104 DIESEL FURNACE OIL STRIPPER
- C-105 STABILIZER
- C-106 TURBINE FUEL STRIPPER

VESSELS
- V-101 DESALTER
- V-102 ATMOSPHERIC OVERHEAD FIRST SEPARATOR
- V-103 ATMOSPHERIC OVERHEAD SECOND SEPARATOR
- V-104 STABILIZER OVERHEAD SEPARATOR
- V-105 SUCTION KNOCK-OUT DRUM
- V-106 FUEL GAS KNOCK-OUT DRUM
- V-107 CORROSION INHIBITOR SOLUTION DRUM
- V-108 OILY BREAK WATER TANK
- V-201 DEAERATOR
- V-202 UTILITY AIR RECEIVER
- V-203 INSTRUMENT AIR RECEIVER
- V-204 BOILER BLOWDOWN DRUM
- V-205 INSTRUMENT AIR DRYER
- V-206 UTILITY AIR DRYER
- V-207 WATER SOFTENER
- V-208 HOT WELL
- V-109 GLYCOL SURGE TANK
- V-110 STEAM CHECKOUT DRUM
- V-111 STRIPPING STEAM K.O. DRUM

EXCHANGERS
- E-101 RESIDUUM TO CRUDE EXCHANGER
- E-102 ATMOSPHERIC OVERHEAD CRUDE EXCHANGER
- E-103 RESIDUUM TO CRUDE EXCHANGER
- E-104 DESALTER WATER EXCHANGER
- E-105 DIESEL FURNACE OIL TO CRUDE EXCHANGER
- E-106 CATF. BASE TO CRUDE EXCHANGER
- E-107 RESIDUUM TO CRUDE EXCHANGER
- E-108 ATMOSPHERIC OVERHEAD REFLUX CONDENSER
- E-109 ATMOSPHERIC OVERHEAD PRODUCT CONDENSER
- E-110 HEAVY ST. RUN GASOLINE REBOILER
- E-111 CATF. BASE STRIPPER REBOILER
- E-112 HEAVY ST. RUN GASOLINE PRODUCT COOLER
- E-113 CATF. BASE PRODUCT COOLER
- E-114 DIESEL FURNACE OIL PRODUCT COOLER
- E-115 STABILIZER FEED TO BOTTOMS EXCHANGER
- E-116 STABILIZER OVERHEAD
- E-117 STABILIZER REBOILER
- E-118 LIGHT ST. RUN GASOLINE PRODUCT COOLER
- E-103A FUEL OIL HEATER
- E-103B FUEL OIL HEATER
- E-119 TURBINE FUEL COOLER
- E-120 GLYCOL COOLER

HEATERS
- F-101 CRUDE HEATER
- F-101A CRUDE HEATER
- F-103 DIESEL FURNACE STRIPPER HEATER
- F-201 BOILER

PUMPS
- P-101A CRUDE CHARGE PUMP & SPARE
- P-102A CRUDE BOOSTER PUMP & SPARE
- P-103 WATER DRAW OFF PUMP
- P-104A CRUDE COLUMN REFLUX PUMP & SPARE
- P-105A STABILIZER FEED PUMP & SPARE
- P-106 HEAVY ST. RUN GASOLINE PUMP
- P-107A CATF. BASE STRIPPER BOTTOMS PUMP & SPARE
- P-108A DIESEL FURNACE STRIPPER BOTTOMS PUMP & SPARE
- P-109 CRUDE COLUMN BOTTOMS PUMP
- P-110A STABILIZER REFLUX PUMPS & SPARE
- P-111 INHIBITER INJECTION PUMP
- P-112 DESALTER INJECTION PUMP
- P-101A,B,C WATER WELL PUMP & SPARES
- P-202A-B FIRE WATER PUMP & SPARES
- P-114 TURBINE FUEL STRIPPER BOTTOMS PUMP & SPARE
- P-115A GLYCOL CIRCULATION PUMP & SPARE
- P-204A-205A BOILER FEED WATER PUMP & SPARE
- P-105 CONDENSATE PUMP
- P-206A-207A FUEL OIL PUMP & SPARE
- P-208 CHEMICAL INJECTION PUMP
- P-209 A & B TURBINE FUEL PUMP & SPARE

COMPRESSORS
- K-101 ATMOSPHERIC OVERHEAD GAS COMPRESSOR
- K-201 INSTRUMENT AIR COMPRESSOR
- K-202 UTILITY AIR COMPRESSOR
- K-203 EMERGENCY GENERATOR

BUILDINGS
- CONTROL HOUSE
- BOILER HOUSE
- LABORATORY BUILDING
- SWITCHGEAR

TANKS
- T-200 RAW WATER TANK
- T-201 TREATED WATER TANK
- T-202 FUEL OIL STORAGE TANK
- T-203 TURBINE FUEL DAY TANK

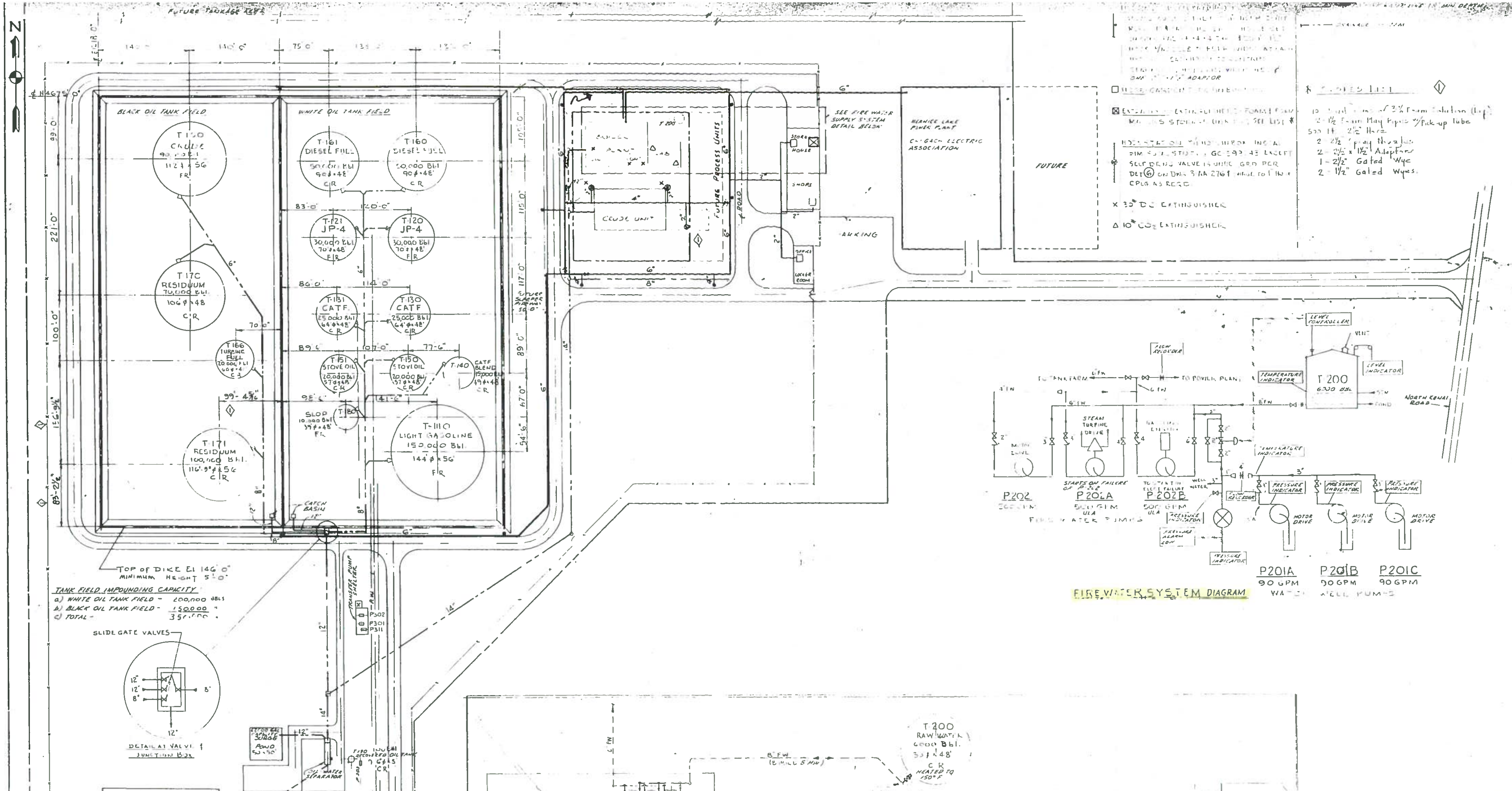
REVISIONS
1. REDRAWN

STANDARD OIL COMPANY (DELAWARE)
(ENGINEERING OPERATIONS) ALASKAN REFINERY
Engineering Department
9468

SCALE 1"=10'-0" DATE 4-6-62
DR. AB CH. JC ENGR. JC
OPER'G. DEPT. APPROVED
ENG. DEPT.

PLOT PLAN
ON PLOT
PLANTS No. 182
ALASKAN REFINERY PROJECT NIKISKI

W. O. A 1-AA-182-3
B. O.



REVISIONS
① Dimensions 94'-2½" was 91'-0" / 156-9½ " 159'-0" / 99-4½ " 96'-0" / Added ... Added Stores List / Revised 8" line

STANDARD OIL COMPANY OF CALIFORNIA
WESTERN OPERATIONS, INC. ALASKAN REFINERY
Engineering Department San Francisco

SCALE 1" = 60'
DR J.A.N. CH
DATE
ENGR
APPROVED
OPR'G DEP.
ENG DEPT.

FIRE PROTECTION & DRAINAGE SYSTEM LAYOUT

ALASKAN REFINERY PROJECT NIKISKI

W.O. 4227
S.O.

S 3-AA-112-1

CHEVRON U.S.A. INC. FACILITY: MNKE - KENAI REFINERY
CHEMICAL INVENTORY SYSTEM REPORT 106 - 02/01/92
INVENTORY BY WORK LOCATION

WORK LOCATION NAME	SUBSTANCE NAME	MFGR	CENTRAL MSDS #	SUBSTANCE ID
LABORATORY	ACETIC ACID		000561	C64197
	ACETONE		001533	C67641
	ACTIVATED ALUMINA		X8272	S8272
	AER-O-FOAM 3% COLD FOAM	NTL FOAM		S18191
	AEROSOL OT SOLN 75% AQUEOUS	FISHER SCI		S35002
	AERSOL OT,SOLID	FISHER SCI		S8923
	ALCO JET	ALCONOX		S6746
	ALCOHOL	-PA-LAB		S13870
	AMMONIUM CHLORIDE		Y00128	C12125029
	AMMONIUM HYDROXIDE		000334	C1336216
	AMMONIUM THIOCYANATE		Y00036	C1762954
	ANILINE		Y00007	C62533
	ARSENIC TRIOXIDE		Y00035	C1327533
	ASCARITE		X2786	S2786
	ASCORBIC ACID	MALLINCKRT	X19392	S19392
	ASPHALT			C68516212
	BARIUN HYDROXIDE OCTAHYDRATE	JT BAKER	X35004	S35004
	BECKMAN ELECTRODE SOAKING SOL	BECKMAN		S18159
	BETZ BALANCED POLYMER 7110	BETZ LABS		S34544
	BETZ CONDUCTIVITY STANDARD	BETZ LABS	X3992	S3992
	BETZ ENCHEM DX-972	BETZ LABS	X24490	S24490
	BETZ HARDNESS BUFFER	BETZ LABS	X3301	S3301
	BETZ MAGNIFORM 304P	BETZ LABS		S15453
	BETZ MOLYVER 2 REAGENT PILLOWS	BETZ LABS		S11138
	BETZ PETROMEEN OS-16	BETZ LABS		S28900
	BETZ PROCHEM 4HL	BETZ LABS	X8009	S8009
	BETZ RESIN CLEANER	BETZ LABS		S34409
	BORIC ACID		001194	C10043353
	BUFFER PH 10.0		X2839	S2839
	BUFFER PH 4		X2836	S2836
	BUFFER PH 7		X2837	S2837
	CARBON DIOXIDE		000864	C124389
	CELITE (FILTER AIDS) 96003500			CC96003500
	CHEVRON AVGAS 100	CHEVRON	000607	CPS200205
	CHEVRON CUSTOM M/O SAE 10W30	CHEVRON	001457	CPS220104
	CHEVRON DETERGENT	CHEVRON	000869	CPS213502
	CHEVRON DIESEL FUEL (NOC)	CHEVRON	X6708	S6708
	CHEVRON GST OIL 46	CHEVRON	000280	CPS234230
	CHEVRON JET FUEL A-50	CHEVRON	000545	CPS216100
	CHEVRON JET FUEL JP-4	CHEVRON		CPS102200
	CHEVRON SOLVENT 51-L	CHEVRON	000162	CPS211150
	CHEVRON THINNER 225R	CHEVRON	000057	CPS210115
	CHEVRON WHITE OIL NO. 15 USP	CHEVRON	000332	CPS249407
	CHLOROFORM		000563	C67663
	CHLOROTHENE	RICCA CH		S33432
	CITRI PLUS	WITCO		S35006
	CRUDE OIL		002493	CPS296000
	CUPRIC SULFATE		Y00089	C7758987
	DRIERITE INDICATOR	HA HAMMOND	X21548	S21548
	DUOSEAL PUMP OIL	SARG-WELCH	X2925	S2925

1991 HAZARDOUS SUBSTANCE ~~LIST~~ INVENTORY FOR REFINERY —

CHEMICALS PREVIOUSLY USED AT REFINERY

CHEVRON U.S.A. INC. FACILITY: MNKE - KENAI REFINERY
CHEMICAL INVENTORY SYSTEM REPORT 106 - 02/01/92
INVENTORY BY WORK LOCATION

WORK LOCATION NAME	SUBSTANCE NAME	MFGR	CENTRAL MSDS #	SUBSTANCE ID
LABORATORY	ERIOCHROME BLACK T	BAKER	X19360	S19360
	ETHYLENE GLYCOL			CPS310850
	FERROIN			C14708997
	FERROUS AMMONIUM SULFATE			C10045893
	FLUORESCANT REAGENT INDICATOR	UDP		S9492
	FREON 13	VARIOUS		S29804
	FREON 22		Y00010	C75456
	FULLERS EARTH			C8031183
	GALLIC ACID		Y00196	C149917
	GLYCEROL (GLYCERIN)		Y00199	C56815
	HEAVY OILS/RESIDUUM		002637	S15622
	HELIUM		Y00029	C7440597
	HEPTANE-N		000523	C142825
	HEXANE		001534	C110543
	HYDROBAC MUTANT BACTRL HYDRCRB	POLYBAC		S22302
	HYDROCHLORIC ACID		000514	C7647010
	HYDROGEN PEROXIDE		Y00087	C7722841
	IODINE		Y00203	C7553562
	ISOOCTANE		Y00070	C26635643
	ISOPROPYL ALCOHOL		000217	C67630
	LEAD OXIDE			C1309600
	LIQUI-NOX DETERGENT	ALCONOX		S16241
	MAGNESIUM CHLORIDE		Y00091	C7786303
	MANGANOUS SULFATE MONOHYDRATE		Y00124	C10034965
	MANOSTAT CHROMERGE	MANOSTAT		S17672
	MERCURIC CHLORIDE		Y00024	C7487947
	MERCURIC SULFATE		Y00126	C7783359
	MERCURY		Y00141	C7439976
	METHYL ALCOHOL			C67561
	METHYL ORANGE INDICATOR			S9552
	METHYL PURPLE INDICATOR		X1474	S1474
	METHYL RED		Y00221	C493527
	METHYLENE BLUE SOLUTION	MILCHEM	X28699	S28699
	METHYLENE CHLORIDE		000627	CC11570800
	MOLECULAR SIEVE		X2704	S2704
	MUSCOVITE TALC		Y00274	C1318941
	N-BUTYL ALCOHOL		Y00078	C71363
	NALCO 5606	NALCO		S34438
	NATURAL GAS	CHEVRON	000923	CPS262299
	NITRIC ACID		000492	C7697372
	NITROGEN		000950	S17955
	PETROLEUM ETHER		Y00249	C8032324
	PHENOL		000003	C108952
	PHENOLPHTHALEIN		Y00143	C77098
	PHOSPHORIC ACID		000477	C7664382
	POTASSIUM BIPHTHALATE		Y00129	C877247
	POTASSIUM CHROMATE		Y00127	C7789006
	POTASSIUM DICHROMATE	EM REAGENT	X33236	S33236
	POTASSIUM FERROCYANIDE		Y00217	C13943583
	POTASSIUM HYDROXIDE	VARIOUS		S15828

CHEVRON U.S.A. INC. FACILITY: MNKE - KENAI REFINERY
CHEMICAL INVENTORY SYSTEM REPORT 106 - 02/01/92
INVENTORY BY WORK LOCATION

WORK LOCATION NAME	SUBSTANCE NAME	MFGR	CENTRAL MSDS #	SUBSTANCE ID
LABORATORY	POTASSIUM HYDROXIDE (SOLID)		003374	C1310583
	POTASSIUM IODIDE		Y00234	C7681110
	POTASSIUM PHOSPHATE, DIBASIC		X8485	S8485
	POTASSIUM THIOCYANATE			C333200
	PROPANE		000479	C74986
	SILICA GEL		Y00384	C63231674
	SILICA, AMORPHOUS			S743
	SILICONE OIL			S9885
	SILVER NITRATE		Y00133	C7761888
	SILVER SULFATE		Y00258	C10294265
	SODIUM AZIDE			C26628228
	SODIUM BISULFITE		Y00318	C7631905
	SODIUM BORATE		Y00275	C13333739
	SODIUM CARBONATE		Y00293	C497198
	SODIUM CHLORIDE		Y00328	C7647145
	SODIUM CHROMATE			C7775113
	SODIUM HYDROXIDE		Y00270	C1310732
	SODIUM HYDROXIDE SOLUTIONS		000106	CPS295008
	SODIUM IODIDE		Y00132	C7681825
	SODIUM SULFATE		Y00009	C7757826
	SODIUM THIOSULFATE (0.1N)	SHAPE PROD		S22905
	SOLAR SALT WATER SOFTENER	CARGILL		S8042
	STADIS 450 CONDUCTIVITY INPROV	DUPONT	X31841	S31841
	STARCH		Y00335	C9005258
	STARCH INDICATOR		X9505	S9505
	SULFUR		000423	C7704349
	SULFURIC ACID		000446	C7664939
	SWS-101 SILICONE FLUID	SWS SLCON		S35005
	TOLUENE		000632	C108883
	TRETOLITE C-10	PETROLITE	X3127	S3127
	TRIFLUOROTRICHLOROETHANE	JT BAKER		S35003
	XYLENE	BAKER		S18919
	XYLENE/DIMETHYL BENZENE		PE0014	C1330207
	ZINC (METAL)		Y00023	C7440666
	1,1,1-TRICHLOROETHANE		000544	C71556
	4-AMINOANTIPYRENE		Y00330	C83078

TOTALS FOR: LABORATORY
TOTAL SUBSTANCES 136
TOTAL SUBSTANCES WITH CHEVRON MSDS'S: 32
TOTAL SUBSTANCES WITHOUT CHEVRON MSDS'S: 104

CHEVRON U.S.A. INC. FACILITY: MNKE - KENAI REFINERY
CHEMICAL INVENTORY SYSTEN REPORT 106 - 02/01/92
INVENTORY BY WORK LOCATION

WORK LOCATION NAME	SUBSTANCE NAME	MFGR	CENTRAL MSDS #	SUBSTANCE ID
MAINTENANCE SHP	ACETYLENE		000907	C74862
	ACTIVSOL T-776	DUBOIS CM		S34998
	AMCOTE 1200	RAMCO INSL		S3500I
	ASBESTOS		000302	C1332214
	ATLAS ELECTROLYTE BATTERY FLD	ATLAS SPLY		S7187
	CARBON MONOXIDE		000427	C630080
	CHEVRON ARCTIC GEAR LUBE 75W90	CHEVRON	001157	CPS250201
	CHEVRON ATF SPECIAL	CHEVRON	000404	CPS226587
	CHEVRON DELO 400 M/O SAE 10W	CHEVRON	000019	CPS225001
	CHEVRON DELO 400 M/O SAE 15W40	CHEVRON	001210	CPS225006
	CHEVRON DETERGENT	CHEVRON	000869	CPS213502
	CHEVRON DIESEL FUEL NO. 2	CHEVRON	000525	CPS272102
	CHEVRON GEAR OIL SAE 90	CHEVRON	000328	CPS250402
	CHEVRON GST OIL 32	CHEVRON	000221	CPS234229
	CHEVRON INDUSTRIAL GREASE NED	CHEVRON	000137	CPS253005
	CHEVRON MULTI-MOTIVE GREASE 1	CHEVRON	000261	CPS250701
	CHEVRON STARTING FLUID SPRAY	CHEVRON	000386	CPS213105
	FX-75 BONDING AGENT	FOX IND		S35080
	LIQUID AIR COMPRESSED OXYGEN	LIQUID AIR		S18192
	ROCKWELL LUBRICANT	BTR/ROCK		S2633
	S-C SUPER CONCENTRATE DEGREASR	RADIATOR S		S1526
	WAGNER PREMR PLUS BRAKE FLUID	WAGNER CM		S34999
	WELDING&CUTTING : FUMES&GASES		002710	S15628
	YELLOW 77 WIRE LUBE	ZDESL		S33718

TOTALS FOR: MAINTENANCE SHP
TOTAL SUBSTANCES 24
TOTAL SUBSTANCES WITH CHEVRON MSDS'S: 15
TOTAL SUBSTANCES WITHOUT CHEVRON MSDS'S: 9

CHEVRON U.S.A. INC. FACILITY: MNKE - KENAI REFINERY
CHEMICAL INVENTORY SYSTEM REPORT 106 - 02/01/92
INVENTORY BY WORK LOCATION

WORK LOCATION NAME	SUBSTANCE NAME	MFGR	CENTRAL MSDS #	SUBSTANCE ID
OPERATIONS GENERAL	ACTIVATED ALUMINA 4-8 MESH			S9044
	ASBESTOS		000302	C1332214
	ATTAPULGUS CLAY			S18219
	BENZENE		000151	C71432
	BETZ CORRSHIELD 736	BETZ LABS	X11126	S11126
	CARBON MONOXIDE		000427	C630080
	CHEVRON ASPH CEMT AC-5	CHEVRON	001808	CPS291700
	CHEVRON DETERGENT	CHEVRON	000869	CPS213502
	CHEVRON DIESEL FUEL NO. 2	CHEVRON	000525	CPS272102
	CHEVRON GST OIL 32	CHEVRON	000221	CPS234229
	CHEVRON JET FUEL A-50	CHEVRON	000545	CPS216100
	CHEVRON REGULAR GASOLINE	CHEVRON	000363	CPS201305
	CHEVRON UNLEADED GASOLINE	CHEVRON	000372	CPS201110
	COMPRESSED GASES		002703	S15626
	CRUDE OIL		002493	CPS296800
	DOW ION EXCHANGE RESIN HCRS-NA	DOW CM		S18220
	DUPONT METAL DEACTIVATOR DMD-2	DUPONT	K00020	CPS267312
	HEAVY OILS/RESIDUUM		002637	S15622
	HYDROCARBON LIQUID-COMBUSTIB		002641	S15620
	HYDROCARBON LIQUID-EXTREM FLAM		002643	S15618
	HYDROCARBON LIQUID-FLAMMABLE		002642	S15619
	HYDROGEN SULFIDE (H2S)		000301	C7783064
	NALCO CUPROUS	NALCO		S18194
	NALCO 5375 POUR DEPRESSANT	NALCO		S15329
	NATURAL GAS	CHEVRON	000923	CPS262299
	NON-HYDROCARBON GASES		002640	S15623
	PAVEBOND ANTISTRIPP ADD	MORT THIO		S18199
	PROCESS GASES	CHEVRON	002644	S15617
	PROPANE		000479	C74986
	TECHROLINE GASOLINE ADDITIVE	CHEVRON	001272	CPS266308
	TURBINE FUEL, AVIATION JP-4	CHEVRON	000553	CPS202260
	UTILITY WATERS		002639	S15624
	WASTE WATERS/OILS		002638	S15625
	WELDING&CUTTING : FUMES&GASES		002710	S15628

TOTALS FOR: OPERATIONS GENERAL
TOTAL SUBSTANCES 34
TOTAL SUBSTANCES WITH CHEVRON MSDS'S: 26
TOTAL SUBSTANCES WITHOUT CHEVRON MSDS'S: 8

A-8215-03

CHEMICAL INVENTORY SYSTEM REPORT 106 - 02/12/92
FACILITY: MNKE-KENAI REFINERY
INVENTORY BY WORK LOCATION

HSI Date
2-12-92

WORK LOCATION NAME	SUBSTANCE NAME	MFGR	QUANITY	CENTRAL MSDS #	SUBSTANCE ID
BOILER BUILDING	ACTIVATED ALUMINA		1-DRUM		
	AER-O-FOAM (3% COLD FOAM)		19-5gal BUCKETS		
	BETZ BALANCED POLYMER 7110		TANK		
	BETZ MAGNIFORM 304P		TANK (2340 lbs)		
	BETZ MAGNIFORM 304P		1-55gal DRUM		
	BETZ PETROMEEN OS-16		TANK (2080lbs)		
	BUFFER PH 7				
	CHEVRON GST OIL 32	CHEVRON	1-55gal DRUM		
	CITRI PLUS				
	DELO 400 MOTOR OIL (SAE 30)		1/4-55gal DRUM		
	ETHYLENE GLYCOL (USED)		6-55gal DRUMS		
	GASOLINE (EMERGENCY GENERATOR)				
	MISC. PAINTS & SOLVENTS		5gal		
	MOLECULAR SIEVE		1-55gal DRUM		
	SALT		432-80lbs BAGS		
	SALT (COARSE, SOLAR)		34-80lbs BAGS		
	SILICA GEL		2-DRUMS		
	WASTE OIL (East Forelands)		1-55gal DRUM		
NOTE: Not for SARA reporting.	SALVAGE DRUMS		6-55gal DRUM		
	USED DRUMS		2-55gal DRUMS		
LABORATORY	1,1,1 TCA CHLOROETHENE		5gal		
	1-BUTANOL		16pints		
	FREON 13		1-SMALL CYLINDER		
	GALLIC ACID		3lbs		
	HYDROBAC - S	POLYBAC CORP.	25lbs		
	HYDROCHLORIC ACID		1L		
	HYDROGEN PEROXIDE		1gal		
	MANGANOUS SULFATE MONOHYDRATE		6lbs		
	METHYLENE CHLORIDE		10L		
	POTASSIUM PHOSPHATE, DIBASIC		2000g		
	SILICONE OIL		5gal		
	SODIUM BISULFITE		700g		
	SODIUM HYDROXIDE		1lb		
	TRICHLOROETHYLENE		1L		
	UNKNOWN OIL		5gal		
NOTE: Not for SARA reporting.	RESIDUAL SAMPLE OIL		5gal		
	SAMPLE CONTAINERS		--		
	SOIL SAMPLES FROM DRILLING OPERATIONS		--		
TANK 200	ACETONE		1-55gal DRUM		
	DUPONT METAL DEACTIVATOR	DUPONT	1-55gal DRUM		
NOTE: Not for SARA reporting.	EMPTY DRUMS		3-DRUMS		
MAINTENANCE SHOP	ACETYLENE		1 TANK		
	CHEVRON GST 32 OIL	CHEVRON	1-55gal DRUM		
	CHEVRON H.D. CLEANER	CHEVRON	2-35lbs CONTAINER		

CHEMICAL INVENTORY SYSTEM REPORT 106 - 02/12/92
FACILITY: KENAI PIPELINE FACILITY
INVENTORY BY WORK LOCATION

WORK LOCATION NAME	SUBSTANCE NAME	MFGR	QUANITY	CENTRAL MSDS #	SUBSTANCE ID
MAINTENANCE SHOP	CHEVRON MOTOR OIL	CHEVRON	1-55gal DRUM		
	CHEVRON SRI GREASE-2	CHEVRON	1-35lbs CONTAINER		
	CHEVRON DETERGENT	CHEVRON	1.5-55gal DRUM		
	FOSTER FIBEROUS ADHESIVE	H.B. FULLER	1-5gal BUCKET		
	HYDRAULIC OIL		2-35lbs CONTAINER		
	LP GAS		1 TANK		
	MOTOR OIL (DELO 400 PLUS)		1-55gal DRUM		
	OXYGEN		1 TANK		
	SHELLZONE ANTIFREEZE		1-55gal DRUM		
CRUDE UNIT BUILDING	NALCO 5375		1 TANK (EMPTY?)		
IAF BUILDING	BETZ DX-972 (#4446)		1 TANK		
BIODISK BUILDING	CUPROS ALGAECIDE (COPPER SULFATE)		41/4-50lbs BAGS		

SECTION II
FOAM LIQUID

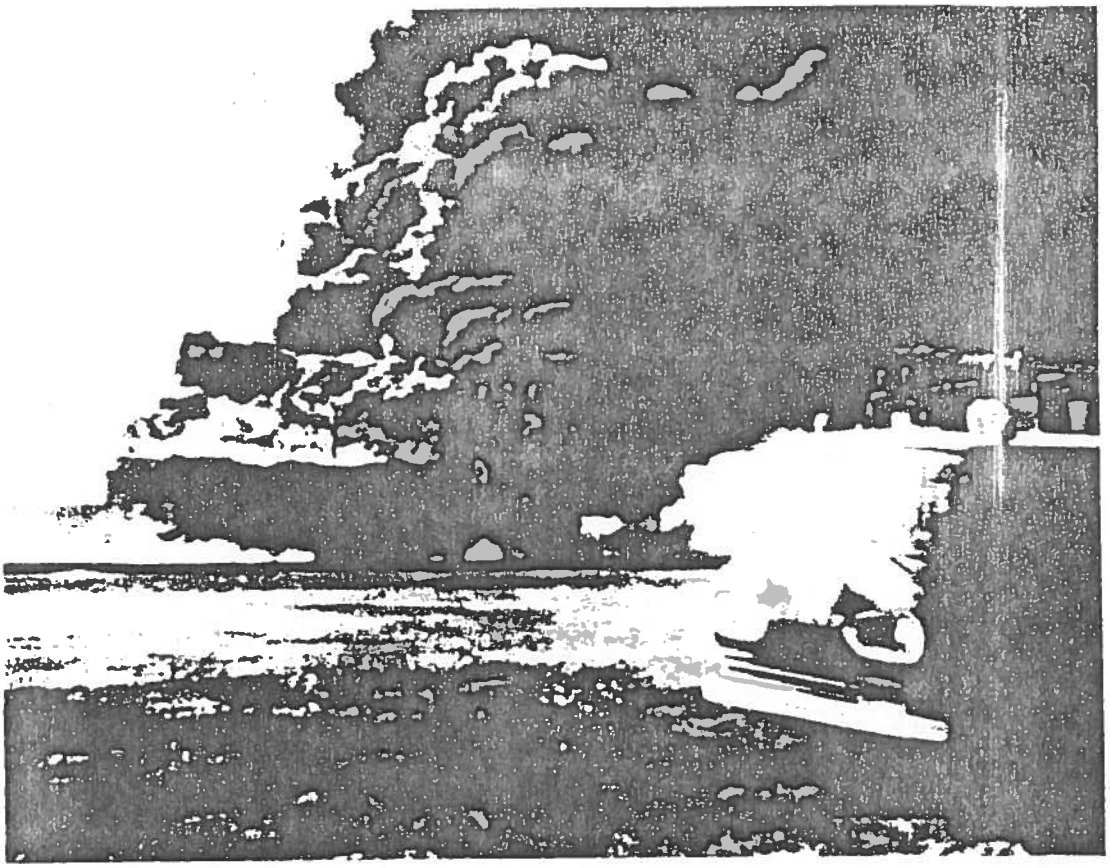


Figure 2-1. National Foam liquid and equipment extinguished this 114 ft. diameter crude oil fire in less than 1 hour, saving 50,000 barrels of product, the tank shell, and preventing a "boil over".

2.1 GENERAL

All foam systems, regardless of size, consist of a water supply, a proportioning device, an air aspirating foam maker(s) and a foam liquid supply. While all the components must function properly to assure system performance, the foam liquid is unquestionably the most vital component of the system.

National Foam System, Inc. has been a pioneer in the development of mechanical foam liquids and a world leader in fire fighting foam technology for more than fifty years. National Foam products have extinguished hundreds of flammable and combustible liquid fires, real fires "in anger" involving hazards such as storage tanks, process areas, marine tankers, loading facilities, and spills resulting from aircraft and automotive crashes. A performance record unparalleled in the industry. In every corner of the world, there are National Foam liquids and equipment, some in service for more than thirty years — month after month, year after year — providing reliable, proven flammable liquid fire protection.

2.2 CHOOSING A FOAM LIQUID

With more than one thousand different flammable liquid materials being manufactured and consumed; and with more than twelve separate fire fighting foams available for their protection — the choice of the most suitable foam to protect a particular hazard may appear difficult. However, this choice becomes objective and measurably simplified when dealing with a manufacturer that produces every type of foam liquid and all the appliances required for their use. National manufactures the longest and most comprehensive line of fire fighting foams available to the industry. Whether the hazard is a small marketing installation or a sophisticated storage and process facility, National's diverse product line simplifies selection of the best, most cost-effective foam liquid.

Basically, there are two general classes of foam liquid: the regular protein based type and the synthetic type. Within each class are modified forms which provide a specific foam to best meet the requirements of a particular hazard.

Protein Based Types

Aer-O-Foam 3% Regular
Aer-O-Foam 6% Regular
Aer-O-Foam 3% Cold Foam
Aer-O-Foam 6% Cold Foam
Aer-O-Foam XL-3 3% Fluoroprotein
Aer-O-Foam XL-6 6% Fluoroprotein
Aer-O-Foam XL-6 6% Fluoroprotein Cold Foam
Aer-O-Foam "99" 6% Alcohol Resistant

Synthetic Types
Aer-O-Water 6 — 6% AFFF
Aer-O-Water Plus — 3% AFFF
(Available in Cold Foam)
Aer-O-Water PSL — 6%-10% AFFF and
Alcohol Resistant
Universal — 3%-10% Multi-Purpose
High Expansion — 1½%-3% Syndet

Basically, there are two general classes of flammable liquids; hydrocarbons and polar solvents. Hydrocarbons are non-water miscible products such as crude oil, gasoline, hexane, naphtha, diesel oil, etc. Polar solvents are generally water miscible products such as alcohols, esters, ketones, etc. Some industrial solvents are a mixture of both classes.

The following information should be available for consideration in order to properly choose the most suitable foam liquid:
1. Principal flammable liquids requiring protection (actual chemical title).
2. Foam solution application rates (determines water supply requirements).
3. Foam liquid cost.
4. System components and field piping cost.
5. Projected cost of foam system maintenance.

A few dollars in foam liquid cost can save tens of thousands of dollars in field piping and maintenance expense. Conversely, protection systems can be over-designed around costly foam liquid, when a less expensive foam will provide totally acceptable protection. Table 2-1 lists foam liquids, the hazards they protect, and methods of application.

2.3 TESTING AND APPROVALS

All National Foam products undergo extensive testing from their conception in the research laboratory through rigid quality control standards prior to market. Foam liquid that is physically and chemically stable assures a long storage life and optimum fire performance. In this regard, National's foam liquid products are approved and listed by independent testing agencies such as Underwriters' Laboratories and Factory Mutuals. Certain liquids are also approved by the U.S. Coast Guard and other Federal agencies. These approvals are the customers' guarantee that National has demonstrated through extensive fire testing and evaluations that the product complies with the rigid requirements and specifications of the testing authority. We note further, any deviation from these standards can lead to a revocation of said listings or approval. In special cases, fire tests are conducted to determine the effectiveness of the foam on a particular flammable liquid and to compute the minimum application rates the hazard requires. NFPA Standards 11, 11B, 16 and 409 provide the guidelines for determining application rates. Some application rates for polar solvent or alcohol type fuels are determined by the foam liquid manufacturer through actual fire testing. The approvals for each particular foam liquid are provided in their descriptive paragraphs.

Table 2-1. Recommended Foams, Proportioning % and Application Methods for Various Hazards

FOAM LIQUID	HYDROCARBON HAZARDS (Reference — N.F.P.A. Standards 11 & 11B)			POLAR SOLVENT (ALCOHOL) HAZARDS	
	Storage Tanks (See Section VI) .10 GPM/Ft² (4 LPM/m²) Application Rate		Spill Fires — .16 GPM/Ft² (6 LPM/m²)	Storage Tanks (See Section VI)	Spill Fires Nozzles, Monitors, Overhead Devices
	N.F.P.A. Type II Fixed Topside Chambers	Subsurface Injection	Nozzles, Monitors, Overhead Devices	See Table 2-2 for Details on Application Rates and Proportioning Requirements	
Fluoroprotein					
Aer-O-Foam XL-3	3%	4%	3%	NR	NR
Aer-O-Foam XL-6 (& Cold Foam)	6%	6%	6%	NR	NR
Regular Protein					
Aer-O-Foam 3% (& Cold Foam)	3%	NR	3%	NR	NR
Aer-O-Foam 6% (& Cold Foam)	6%	NR	6%	NR	NR
Aer-O-Water (AFFF)					
Aer-O-Water Plus (& Cold Foam)	3%	NR	3%*	NR	NR
Aer-O-Water 6	NR	NR	6%*	NR	NR
Universal	3%	4%	3%*	6%-10% (Type II)	6%-10%
Aer-O-Water PSL	6%	NR	6%*	6%-10% (Type II)	6%-10%
Aer-O-Foam "99"	6%	NR	6%	6% (Type I)	6% (Skin Spills Only)

*N.F.P.A. 11B allows a minimum application rate of .10 gpm/ft² (4 lpm/m²) for nozzle applications. NR = Not Recommended

Figure 2-2. Proven again in action. National's XL-3 readily extinquished this gas-oil intermediate fire involving two 45 ft. diameter tanks and their common dike area. Foam-dry chemical truck built by National in 1968.

2.4 NATIONAL AER-O-FOAM XL FLUOROPROTEIN LIQUIDS

XL Fluoroprotein foam liquids represent the single most significant improvement in foam technology since mechanical foams were first introduced. By the combination of selected fluorocarbon surfactants with a quality protein hydrolysate base, a foam liquid with dramatically improved performance characteristics is produced. These improved characteristics include:

1. Increased extinguishment ability
2. Increased fluidity
3. Dry chemical compatibility
4. Superior sealability and burnback resistance
5. Vastly improved olephobic properties

These olephobic properties are so pronounced that they permit subsurface injection of XL foams into hydrocarbon storage tanks. (See Section VI, Storage Tank Protection.)

Since its development in 1965, Aer-O-Foam XL has repeatedly established itself as the best foam agent available for subsurface and topside storage tank protection. In its history there have been no performance failures in real emergencies and no reported failures due to natural deterioration in storage. The performance record of XL foams is in fact so unparalleled that more of the world's major oil and chemical companies rely on National Aer-O-Foam XL for protecting their flammable hydrocarbon products, than on any other foam.

XL Fluoroprotein foams are available for 3% and 6% proportioning and are suitable for use with fresh or sea water.

2.4.1 General Properties

Aer-O-Foam XL-3

Specific Gravity @ 60°F (15.5°C)	1.158 to 1.164
pH	7.1 to 7.5
Viscosity in Centistokes @ 20°F (−6.6°C)	400 csks
Minimum Usable Temperature	20°F (−6.6°C)
Maximum Usable Temperature	120°F (48.8°C)
Recommended Maximum Storage Temperatures	100°F (37.7°C)
Recommended Storage Container Material	Mild Steel
Approvals	Underwriters' Laboratories U. S. Coast Guard Factory Mutual New York Board of Standards SBG — Germany

Aer-O-Foam XL-6

Specific Gravity @ 60°F (15.5°C) .... 1.147 to 1.153
pH ..... 7.1 to 7.5
Viscosity in Centistokes
@ 20°F (−6.6°C) ..... 200 csks
Minimum Usable Temperature ..... 20°F (−6.6°C)
Maximum Usable Temperature ..... 120°F (48.8°C)
Recommended Maximum Storage
Temperatures ..... 100°F (37.7°C)
Recommended Storage Container
Material ..... Mild Steel
Approvals ..... U. S. Government
Underwriters' Laboratories

Aer-O-Foam XL-6 Cold Foam

Specific Gravity @ 60°F (15.5°C) ..... 1.11 to 1.15
pH ..... 7.1 to 7.5
Viscosity in Centistokes
@ −20°F (−29°C) ..... 1200 csks
Minimum Usable Temperature .... −20°F (−29°C)
Maximum Usable Temperature ..... 120°F (48.8°C)
Recommended Maximum Storage
Temperatures ..... 100°F (37.7°C)
Recommended Storage Container
Materials ..... Mild Steel
Approvals ..... Underwriters' Laboratories

2.4.2 Approximate Shipping Weights

5 Gallon (19 litre) Pails
(Plastic or Steel) ..... 53 lbs (24 kg)
55 Gallon (208 litre) Steel Drums ... 570 lbs (259 kg)
Wt. Per Gallon (3.78 litre) in Bulk ... 9.7 lbs (4.4 kg)

NOTE: Please indicate packaging preference on purchase order.

2.5 NATIONAL'S AER-O-FOAM REGULAR LIQUIDS

Three types of Aer-O-Foam Regular Liquids are available. These liquids are manufactured from pure protein hydrolysate, compounds for foam stabilization, freezing point depressants, and preservatives. All are carefully blended to produce a homogenous, highly stable foam liquid. Regular Aer-O-Foams are designed for use on hydrocarbon type flammable liquid fires through N.F.P.A. Type II devices and air aspirating foam nozzles. Available in both 3% and 6% concentrations. Regular Liquids can be used with fresh or sea water. Special "cold foams" are available for use in frigid climates or where heating of the foam liquid in storage is not feasible.

2.5.1 General Properties

Aer-O-Foam 3% Regular

Specific Gravity @ 60°F (15.5°C) ... 1.158 to 1.164
pH ..... 7.1 to 7.5
Viscosity in Centistokes
@ 20°F (−6.6°C) ..... 400 csks
Minimum Usable Temperature ..... 20°F (−6.6°C)
Maximum Usable Temperature ..... 120°F (48.8°C)
Recommended Maximum Storage
Temperature ..... 100°F (37.7°C)
Recommended Storage Container
Material ..... Mild Steel
Approvals ..... Underwriters' Laboratories
U. S. Coast Guard
Factory Mutual
SBG — Germany
Norsk Veritas — Norway
Norwegian Maritime Directorate

Aer-O-Foam 6% Regular

Specific Gravity @ 60°F (15.5°C) .... 1.139 to 1.145
pH ..... 7.1 to 7.5
Viscosity in Centistokes
@ 32°F (0°C) ..... 80 csks
Minimum Usable Temperature ..... 20°F (−6.6°C)
Maximum Usable Temperature ..... 120°F (48.8°C)
Recommended Maximum Storage
Temperatures ..... 100°F (37.7°C)
Recommended Storage Container
Material ..... Mild Steel
Approvals ..... U. S. Government
U. S. Coast Guard
Factory Mutual

Aer-O-Foam 3% Cold Foam

Specific Gravity @ 60°F (15.5°C) ..... 1.11 to 1.15
pH ..... 7.1 to 7.5
Viscosity in Centistokes
@ −20°F (−29°C) ..... 1200 csks
Minimum Usable Temperature .... −20°F (−29°C)
Maximum Usable Temperature ..... 120°F (48.8°C)
Recommended Maximum Storage
Temperatures ..... 100°F (37.7°C)
Recommended Storage Container
Material ..... Mild Steel
Approvals ..... Underwriters' Laboratories

3% and 6% Cold Foams to −40°F (−40°C) are available upon request.

2.5.2 Approximate Shipping Weights

5 Gallon (19 litre) Pails
(Plastic or Steel) ..... 53 lbs (24 kg)
55 Gallon (208 litre) Steel Drums ... 570 lbs (259 kg)
Wt. Per Gallon (3.78 litre) in Bulk ... 9.7 lbs (4.4 kg)

NOTE: Please indicate packaging preference on purchase order.

2.6 NATIONAL AER-O-WATER LIQUIDS (AFFF)

Aqueous Film Forming Foams (AFFF) were developed by the U.S. Navy in the middle 1960's. AFFF's are a combination of fluorocarbon surfactants and synthetic foaming agents that add a new dimension to crash rescue fire fighting: the aqueous film. This film is a thin layer of foam solution that rapidly spreads across the surface of a hydrocarbon fuel causing dramatic fire "knock down," an important factor in crash rescue fire fighting. The aqueous film is produced by the action of the fluorocarbon surfactant reducing the surface tension of the foam solution to a point where the solution can actually be supported by the surface tension of the hydrocarbon fuel. The effectiveness and durability of the aqueous film is directly influenced by the surface tension of the hydrocarbon. AFFF's are more effective on fuels with higher surface tension coefficients such as kerosene, diesel oil and jet fuels; less effective on fuels with low surface tension coefficients like hexane and high octane gasolines. AFFF foams are constructed to drain foam solution quickly from the foam bubble to produce optimum filming for rapid fire extinguishment. Long term sealability and burnback resistance are sacrificed by this rapid drainage.

National's contributions to the development of AFFF's has been significant. The greatest development to date was the introduction of Aer-O-Water Plus; designed for 3% proportioning, and patented by National Foam.

By design, Aer-O-Water Plus requires a very low enegry input to produce a good quality foam and a long lasting blanket. When used through aspirating foam nozzles, the foam shows increased extinguishment ability and burnback resistance. Aero-O-Water Plus demonstrates such pronounced foam making ability that it will produce foam from non-aspirating equipment which has an impinging stream action to help entrain air. When used through certain water fog nozzles, Aer-O-Water Plus produces quality foam with overall improvement in fire "knockdown" and control when compared to conventional AFFF. Of even greater significance, Aer-O-Water Plus produces foam from standard water sprinkler heads. The foam produced is of sufficient quality to meet the requirements of Underwriters Laboratories, Inc. for AFFF, and is listed without limitation for use with most major standard sprinkler heads. Aer-O-Water Plus will also produce adequately expanded foam through many directional and spray nozzles used in special hazards systems. Existing water deluge systems are readily converted to Aer-O-Water Plus foam systems by merely adding the appropriate proportioning equipment.

Aer-O-Waters can be used with fresh or sea water, and Aer-O-Water Plus "Cold Foam" is available upon request. All Aer-O-Waters perform as excellent wetting agents on "Class A" fires, and are compatible with dry chemical agents.

2.6.1 General Properties

Aer-O-Water Plus

Specific Gravity @ 77°F (25°C)	1.05 to 1.07
pH	7.4 to 8.0
Viscosity in Centistokes @ 77°F (25°C)	15 csks
Minimum Usable Temperature	25°F (−3.8°C)
Maximum Usable Temperature	120°F (48.8°C)
Recommended Maximum Storage Temperatures	100°F (37.7°C)
Recommended Storage Container Material	Mild Steel (3/16")
	304 Stainless Steel
Approvals	Underwriters' Laboratories
	Factory Mutual
	Conforms to fire performance of MIL-F-24385

Aero-O-Water Plus is available as a Cold Foam −20°F (−29°C)

Aer-O-Water 6

Specific Gravity @ 60°F (15.5°C)	1.02 to 1.04
pH	7.4 to 8.0
Viscosity in Centistokes @ 77°F (25°C)	4 csks
Minimum Usable Temperature	30°F (−1.1°C)
Maximum Usable Temperature	120°F (48.8°C)
Recommended Maximum Storage Temperature	100°F (37.7°C)
Recommended Storage Container Materials	Mild Steel (3/16")
	304 Stainless Steel
Approvals	Military Specification MIL-F-24385
	Underwriters' Laboratories

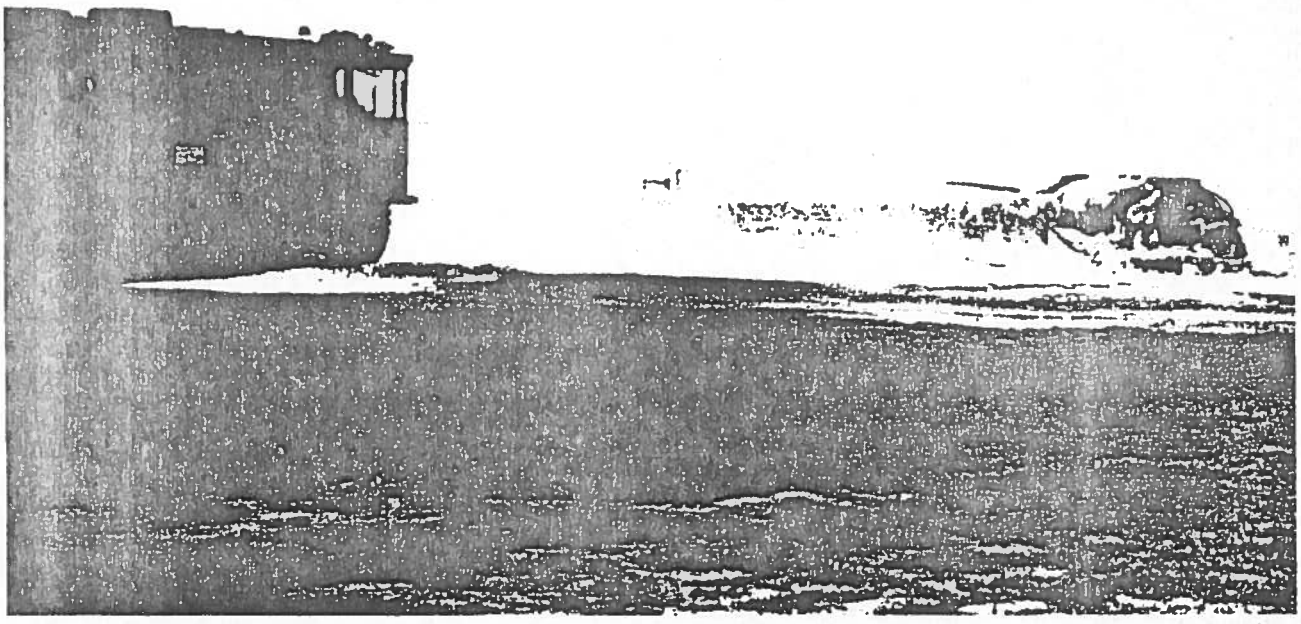


Figure 2-3. 7200 sq. ft. of JP-4 spill fire. Totally extinguished by Aer-O-Water Plus in 37 seconds. Application rate .07 gpm/ft.² (3 lpm/m²).

Synthetic foam liquids may require additional tests to evaluate surface tension, viscosity and the effectiveness of the aqueous film or polymeric membrane.

The Technical Service Report will list the results of all these tests. If the foam liquid sample produces results consistent with is original specifications, it is considered satisfactory and suitable for fire service. Significant deviation from the original specifications in any of the test results usually indicates one of the following problems:

1. Contamination
2. Improper Storage Procedures
3. Microbial Decomposition
4. Product Degradation
5. Any combination of the above

At this point, fire testing is recommended. The actual fire performance of a foam sample will determine its suitability for fire service.

2.11.2 Fire Tests

Various size tests can be devised depending upon agent and characteristics being evaluated. A test commonly employed is a modification of a Federal Specification (OF-555C) for Mechanical Foam Liquids intended for storage tank protection and industrial use.

A foam liquid is scored satisfactory if the fire is extinguished within 5 minutes application time. The resulting foam blanket must form a seal against reignition for 15 minutes when tested with a flaming torch. A void is then cut in the blanket and ignited. The opening must not enlarge significantly within an additional 5 minutes burn period.

Alcohol or polar solvent type foams are similarly fire tested on a polar fuel such as isopropanol. Aer-O-Foam "99" is tested via a Type I application, while Universal and Aer-O-Water PSL use a Type II method. AFFF (Aer-O-Water Plus and Aer-O-Water 6) are fire tested according to test procedures in Federal Military Specification MIL-F-24385.

2.11.3 Sample Collection

Obviously, the foam sample submitted must be representative of the foam liquid storage, whether in tanks or drums. Proper foam liquid sampling is of concern to the analyst in a twofold way. First, the original sample collected from storage and submitted for analysis, and secondly, the proper sampling of the submitted sample for test purposes. Depending upon the maintenance program adopted, foam liquid samples are collected in one of the following ways:

1. Collect one sample— bottom only
2. Collect two samples — one top and one bottom
3. Collect three samples — one each from top, bottom and middle
4. Collect one sample — composite after recirculating contents

All samples should be submitted in a clean one pint (500 ml) plastic bottle or steel can. If fire testing is recommended a larger sample will be requested. "Request for Analysis" forms are available from our local representative or from our home office.

Bottom Sampling

Since the bottom of the tank may collect sediment such as rust, scale, or degradation products, it is important that these excessive contaminants be separated when drawing a sample.

A suggested procedure is as follows:

1. Open the bottom-most drain and flush out one or two gallons of liquid into a large clean bucket.
2. Close down tightly on the valve and collect at least one pt (500 ml) in a clean plastic bottle. This is the sample to be submitted for analysis.
3. The initial flushings may be returned to the top of the tank by way of the filling funnel. A strainer will remove the excess sediment.

Composite Sampling

Composite sampling is a good technique to use where the number of samples being collected would get out of hand. However, the contents of a storage tank must not be recirculated where dilution is known or suspected to have occurred. Many fire protection engineers employ a periodic start-up of their pumps and recirculation of the foam liquid as part of their required maintenance program. Samples collected from the drain valve will, of course, be treated as bottom samples.

2.11.4 The Importance of Foam Liquid Sampling

It should be emphasized here, that if samples of foam liquid are sent to National's Technical Service Department on a regular basis, problems involving storage conditions can usually be detected and corrective measures recommended before the foam liquid is irreversibly damaged. Periodic sampling of foam liquid assures its ready status in a fire emergency.

2.11.5 Additional Technical Services

National's Technical Service Department is not limited to foam liquid analysis. While fire fighting foams find their main application in extinguishing flammable liquid fires, there are many other uses for foam liquids. As petrochemical processes and the products they produce become increasingly sophisticated, more and more applications for foam are being explored by the industry. Unique hazards require unique foams and special methods of application. Many non-flammable chemicals release caustic or toxic vapors. Specialized foams can be provided as vapor or fume suppressing agents. Some chemicals with vapor or flammability problems are violently reactive with water, the principal content of finished, expanded foam. Special techniques can be developed to attack these hazards. Our chemists and technicians are among the most knowledgeable and experienced in the industry. A modern laboratory complete with field test facility is devoted solely to the development and testing of foam agents. We are proud of National's record as a pioneer in the flammable liquid fire protection field, and are anxious and prepared to solve new problems born of advancing technology.

4.28 SWMU 28 - FIRE TRAINING EXERCISE AREA NUMBER 1

Unit Description

A fire training exercise is described in ADEC documents (1981a, 1981b). During the VSI, Chevron representatives described the nature and location of this fire training exercise as follows (PRC 1992b). A lit propane torch was used in conjunction with safety equipment to increase employee confidence in safety equipment. This training occurred at the southeast corner of the CRU. This is described as a small event, and no flammable materials were applied to soils.

Dates of Operation

This training exercise occurred once in June 1981.

Wastes Managed

Propane and water were used during this exercise. Wastes generated were gaseous and are expected to have dissipated by now.

History of Release/Release Controls

No release controls were used, although release to air may have occurred. An air permit was obtained from ADEC for a fire training exercise (ADEC 1981b).

Information Needs

The exact location of this SWMU should be provided on a map. No releases from this unit are expected to remain, so no further testing is recommended at this unit.

4.29 SWMU 29 - FIRE TRAINING EXERCISE AREA NUMBER 2

Unit Description

According to Chevron (1992d), this SWMU was an unlined pit south of the CRU. Every year, it was flooded with 50 gallons of diesel and water and set a fire. The fire was put out as a fire training exercise.

Dates of Operation

This training exercise was held annually from 1970 to 1980.

Wastes Managed

Some diesel and fire extinguishing material may remain in the soil matrix.

History of Release/Release Controls

No release controls are documented. An air permit was obtained from ADEC for a fire training exercise (ADEC 1981b). Activities at this SWMU probably resulted in a release to soils as well as air. Chevron plans surface soil sampling from this area (ENSR 1992c).

Information Needs

- Results from planned sampling and analysis of soils at this SWMU
- Description of any backfilling or soil removal which may have occurred

4.30 SWMU 30 - DISPOSAL AREA SOUTH OF CRU (Photograph 64)

Unit Description

A flat, graveled area used for disposal of facility equipment is south of the CRU and within the facility perimeter fence. This area was not mentioned in the Hart Crowser (1992a) report and may contain materials from the facility dismantling process.

3.2.22 Above-ground Fuel Tanks

Area Description

This area consists of the former locations of two, 300-500 gallon tanks of regular leaded and unleaded gasoline. The tanks were installed above a concrete containment pad and were surrounded by an 18" thick concrete wall.

Potential and Existing Sources/Types of Contamination

The potential that soil and groundwater contamination sourced from this area is highly unlikely.

Planned Course of Action; Phase II Assessment

No further sampling is planned in this area.

3.2.23 Fire Training Area

Area Description

This area was formerly an earthen pit in which fire-training exercises involving the use of diesel fuel were conducted. Once a year the pit was filled with water, and a 55 gallon drum of diesel fuel was pumped onto the surface of the water. This fuel was then ignited, and subsequently extinguished using "Special K" extinguisher (probable sodium bicarbonate). The water would then infilter into the ground, usually within a few hours.

Potential and Existing Sources/Types of Contamination

Unburned diesel fuel and dissolved hydrocarbons may have infiltered into soil at this location. No samples have been collected to date.

Planned Course of Action; Phase II Assessment

Samples will be collected from trench SS-5, following location of pit via airphotos analysis.

3.2.24 Crude Refining Unit

Area Description

This area is a complex, consisting of distillation towers, heat exchangers, pumps, a desalter, and furnaces. The crude unit is located on a concrete pad.

RCRA Information Needs (Cont'd)
SWMUs/AOCs on Chevron Alaskan Refinery
Kenai, Alaska

SWMU/AOC/ PAOC	Location	Unit Description (Narrative)	Dates of Operation	Operational Status	Waste Types	Waste Quantities	Waste Sources	Waste Disposition	Release Controls	Remarks
SWMU 26	Fire training area.	Unlined pit which was annually flooded with water and 50 gallons of diesel fuel. Fuel was ignited and fire was then extinguished using "Special K" (probably sodium bicarbonate).	Circa 1970 to 1980.	Abandoned.	Diesel, fire extinguisher.	On the order of 500 gallons of diesel fuel.	Fuel drums.	Still in place.	None	Pit was infilled after abandonment.
AOC 1	Wastewater treatment system (excluding designated SWMUs).	Boiler blowdown, east of 160t.	1963 to 1991.	Inactive.	Unknown.	Unknown.	Unknown.	Unknown.	None.	None.
AOC 2	Crude refining unit.	Series of pumps, heat exchangers, desalter, and furnaces.	1963 to 1991.	Inactive.	Crude oil and water.	Unknown.	Water stations, steam knockouts, and pumps.	Routed to API separator.	Monitored by operators.	1. Current concrete slab south of unit was not originally installed. 2. Prior to installation of slab extension, a large spill occurred south of the crude refining unit, east of the desalter.
AOC 3	Pipeline from dock to refinery	Numerous oil, water, steam, and condensate lines.	1963 to 1991.	Inactive.	Oil, refined products, and water.	Unknown.	Pipe leaks.	Still in place.	Spills recovered with vacuum trucks.	1. Possibly damaged by 1964 earthquake. 2. Two known leak incidents on the KPL site; under first bridge south of Chevron property and at stanchion #1(