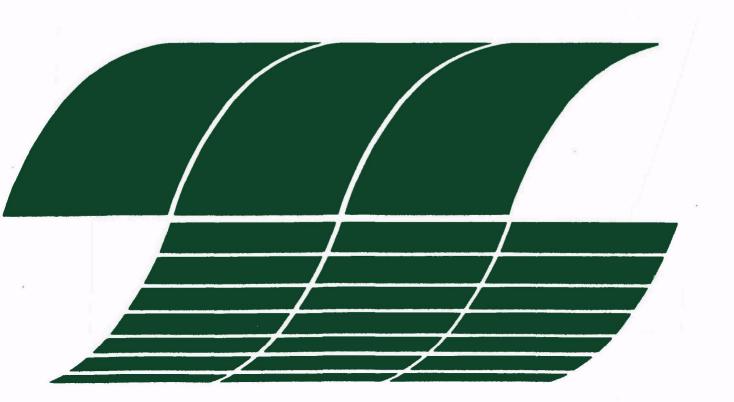
Research and Development



Oil Pollution Reports

Volume 5, No. 4 (October 1978 -December 1978)

Interagency Energy/Environment R&D Program Report



RESEARCH REPORTING SERIES

Research reports of the Office of Research and Development, U.S. Environmental Protection Agency, have been grouped into nine series. These nine broad categories were established to facilitate further development and application of environmental technology. Elimination of traditional grouping was consciously planned to foster technology transfer and a maximum interface in related fields. The nine series are:

- 1. Environmental Health Effects Research
- 2. Environmental Protection Technology
- 3. Ecological Research
- 4. Environmental Monitoring
- 5. Socioeconomic Environmental Studies
- 6. Scientific and Technical Assessment Reports (STAR)
- 7. Interagency Energy-Environment Research and Development
- 8. "Special" Reports
- 9. Miscellaneous Reports

This report has been assigned to the INTERAGENCY ENERGY-ENVIRONMENT RESEARCH AND DEVELOPMENT series. Reports in this series result from the effort funded under the 17-agency Federal Energy/Environment Research and Development Program. These studies relate to EPA's mission to protect the public health and welfare from adverse effects of pollutants associated with energy systems. The goal of the Program is to assure the rapid development of domestic energy supplies in an environmentally-compatible manner by providing the necessary environmental data and control technology. Investigations include analyses of the transport of energy-related pollutants and their health and ecological effects; assessments of, and development of, control technologies for energy systems; and integrated assessments of a wide range of energy-related environmental issues.

This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161.

OIL POLLUTION REPORTS
Volume 5, Number 4
(October 1978 - December 1978)

by

elmut Ehrenspeck, Elizabeth Sorenson, Barbara Searles,
Katherine Osteryoung and Ivana Roland
Marine Science Institute
University of California
Santa Barbara, California 93106

Principal Investigator

Dr. Henry W. Offen, Director Marine Science Institute

Grant No. R805803-01-0

Project Officer (

L. T. McCarthy, Jr.
Oil and Hazardous Materials Spills Branch
Industrial Environmental Research Laboratory
Edison, New Jersey 08817

INDUSTRIAL ENVIRONMENTAL RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

DISCLAIMER

This report has been reviewed by the Industrial Environmental Research Laboratory-Cincinnati, U.S. Environmental Protection Agency, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the U.S. Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

FOREWORD

When energy and material resources are extracted, processed, converted, and used, the related pollutional impacts on our environment and even on our health often require that new and increasingly more efficient pollution control methods be used. The Industrial Environmental Research Laboratory - Cincinnati (IERL-Ci) assists in developing and demonstrating new and improved methodologies that will meet these needs both efficiently and economically.

This report is a product of the above efforts. It cites current events, literature, research, patents, and other materials relevant to the oil pollution abatement program and is published in an abstract format on a quarterly basis. As such, it serves as a basic reference document for all those interested in oil spill and oil pollution control. This project is part of the continuing program of the Oil and Hazardous Materials Spills Branch, IERL-Ci, to assess and mitigate the environmental impact of oil pollution.

David G. Stephan
Director
Industrial Environmental Research Laboratory
Cincinnati

ABSTRACT

OIL POLLUTION REPORTS (formerly entitled OIL SPILL AND OIL POLLUTION REPORTS) is a quarterly compilation of abstracts of current oil pollution related literature, research projects, and meetings. Comprehensive coverage of terrestrial and aquatic oil pollution and its prevention and control is provided, with emphasis on the marine environment. The report contains (a) citations and summaries of 1976 to 1978 scientific and technical publications, and patents; (b) status and summaries of current research programs; and (c) information on current oil pollution related meetings. This report is submitted in partial fulfillment of EPA Grant No. R-805803-01-0 by the Marine Science Institute, University of California, Santa Barbara, under the sponsorship of the US Environmental Protection Agency.

CONTENTS

			<u>Page</u>
Abstr	act		
Ackno	wled	geme	nts
Intro	duct	ion	
Seria	ls L	isti	ng
Abbre	viat	ions	- Acronyms
<u>Secti</u>	ons		
I.	Rep	orts	, Publications, and Patents
	Α.	0il	Pollution Detection and Evaluation
		1.	Reporting
		2.	Monitoring
		3.	Remote Sensing
		4.	Sampling
		5.	Analysis
		6.	Source Identification
	В.	0i1	Pollution Prevention and Control
		1.	Spill Containment
		2.	Cleanup and Removal
		3.	Oil Transfer and Transport
		4.	Waste Treatment and Disposal Methods
		5.	Oil-Water Separation
		6.	Reclamation and Reuse
		7.	Personnel Training and Education
		8.	Contingency Planning
		9.	Prevention and Control Measures

С.	Asp	spects of Oil Pollution										
	1.	Biological Aspects	}									
	2.	Physical/Chemical Aspects 66	ĵ									
	3.	Social/Economic Aspects 67	7									
	4.	Environmental Restoration and Recovery 68	3									
	5.	General Aspects 69)									
D.	Aspects of Oil Exploration and Production											
	1.	Biological Aspects	2									
	2.	Physical/Chemical Aspects	2									
	3.	Social/Economic Aspects	3									
	4.	General Aspects	1									
	5.	Baseline and Environmental Impact Studies	õ									
Ε.	Fate of Oil in the Environment											
	1.	Biodegradation	5									
	2.	Physical/Chemical Changes	3									
	3.	General Fate of Oil	3									
	4.	Models and Predictions	}									
F.	0i1	Pollution Regulations										
	1.	Local/State Legislation)									
	2.	US Legislation)									
	3.	International Legislation	}									
	4.	Foreign Legislation	}									
	5.	Standards and Guidelines	}									
	6.	Agreements and Conventions	ļ									
G.	Bib	liographies	,									
Н.	Misc	cellaneous										

II.	Cur	rent F	Research Projects
	Α.	0i1 F	Pollution Detection and Evaluation
		1. N	Monitoring
		2. <i>I</i>	Analysis
	В.	0i1 F	Pollution Prevention and Control
		1. (Cleanup and Removal
		2. V	Waste Treatment and Disposal
		3. (Oil-Water Separation
		4. (Contingency Planning
	С.	Aspe	cts of Oil Pollution
		1. 1	Biological Aspects
		2. (General Aspects
	D.	Aspe	cts of Oil Exploration and Production
		1. 1	Biological Aspects
		2. 3	Social/Economic Aspects
		3. 1	Baseline and Environmental Impact Studies 125
	Ε.	Fate	of Oil in the Environment
		1. 1	Biodegradation
		2. (General Fate of Oil
		3. N	Models and Predictions
	F.	0i1 F	Pollution Regulations
	G.	Bibl	iographies
	н.	Misce	ellaneous
iII.	Cur	Conferences	
IV.	Int	roduct	tion to the Keyword Index

Master List o	of Keywords and Cross-Reference Gu	ide	•	•	•	•	•	•	•	•	•	•	143
Keyword Index	· · · · · · · · · · · · · · · · · · ·			•			•	•	•		•	•	148
Appendix A:	Periodicals Reviewed		•	•	•			•				•	185
	OIL POLLUTION REPORTS Availabilit												

ACKNOWLEDGEMENTS

The authors wish to thank the personnel of the Marine Science Institute, the Science Engineering Library, and the Interlibrary Loans office at the University of California, Santa Barbara, for their assistance during the research stages of this project.

INTRODUCTION

OIL POLLUTION REPORTS (formerly OIL SPILL AND OIL POLLUTION REPORTS) is a quarterly bulletin which reviews pertinent scientific and technical publications, research projects, and meetings, to provide its readers with current developments in the field of oil pollution. This issue contains summaries of articles, reports, patents, and other literature relating to oil pollution published since 1976 (Section I); summaries and status of current research projects (Section II); and current oil pollution related conferences (Section III). This document series is now identified by volume and issue number; issues prior to 1978 were identified by quarterly dates alone, as shown on the following page.

Subject coverage includes aquatic and terrestrial oil pollution with emphasis on the marine environment. Items in Section I are categorized by eight major subdivisions which are divided into thirty-seven specific subject categories. A list of the periodicals reviewed in preparing this series appears in Appendix A.

Section II presents titles of active or recently completed oil pollution research projects, summaries of project objectives, and current status information and/or resulting publications provided upon request by the principal investigators or performing organization. Notices of research projects are obtained primarily from the Smithsonian Science Information Exchange (SSIE). Entries are arranged according to the same subject categories as in Section I. Some of the projects listed in previous OIL POLLUTION REPORTS have been recently renewed. Those projects have been relisted with a current serial number, followed by the original number in parentheses.

Entries in Section I and II have separate serial numbers. The letters preceding the serial numbers designate the following: C, reports, publications, and patents; and R, research projects. Keyword, author, and patent indexes are provided at the end of the report.

Section III, Current Conferences, contains descriptive information on recently held and upcoming meetings relevant to any aspect of oil pollution. Conference dates are listed; and, when information is available, titles, authors, and abstracts of oil pollution related papers are included. All information for this section was obtained from the periodicals reviewed (Appendix A) and from responses to written inquiries concerning the meetings.

OIL POLLUTION REPORTS (Oil Spill and Oil Pollution Reports, 1974 to Vol. 5 No. 1)

Issues currently available, in press, or in preparation

	Dates Covered	Report Number
1974	July 74 - Oct. 74	EPA-670/2-75-003
1975	Nov. 74 - Feb. 75	EPA-670/2-75-044
	Feb. 75 - Apr. 75	EPA-670/2-75-059
	May 75 - July 75	EPA-600/2-76-129
	Aug. 75 - Oct. 75	EPA-600/2-76-113
1976	Nov. 75 - Jan. 76	EPA-600/2-76-185
	Feb. 76 - Apr. 76	EPA-600/2-76-215
	May 76 - July 76	EPA-600/2-76-266
	Aug. 76 - Oct. 76	EPA-600/2-77-037
1977	Nov. 76 - Jan. 77	EPA-600/2-77-075
	Feb. 77 - Apr. 77	EPA-600/2-77-111
	May 77 - July 77	EPA-600/2-77-243
	Aug. 77 - Oct. 77	EPA-600/2-78-005
Vol. 5 No. 1	Nov. 77 - Jan. 78	EPA-600/2-78-071
Vol. 5 No. 2	Feb. 78 - May 78	EPA-600/7-78-160
Vol. 5 No. 3	June 78 - Sep. 78	Submitted 10/78
Vol. 5 No. 4	Oct. 78 - Dec. 78	Submitted 1/79

For complete ordering information, please see Appendix B.

ABBREVIATIONS/ACRONYMS

°C mWPtSFt glCCCdhrinkkmnLbCDGT ggphhrinRgmnLbCDGTLNGT	barrel carbon degrees centigrade centimeter crude Oil Washing deepwater port dead weight ton environmental impact statement degrees Fahrenheit foot gram gallon gas chromatography gas-liquid chromatography gallons per day gallons per minute hectare hour inch infrared kilogram kilometers knot liter pound liquid chromatography lethal dose liquefied natural gas load on top	mT mm MS NO OCS OPR OZH PH PPBT SPC US US US VLCC WSF US WSF UJ	millimeter mass spectrometry nitrogen oxygen outer continental shelf OIL POLLUTION REPORTS, formerly OIL SPILL AND OIL POLLUTION REPORTS ounce polycyclic aromatic hydrocarbon the negative log of the H ion concentration part per billion part per million segregated ballast tank species thin-layer chromatography United Kingdom United States Union of Soviet Socialist Republics ultraviolet very large crude carrier versus water soluble fraction weight year micron microgram
LOT LPG	load on top liquefied petroleum gas		microgram percent
m mg	meter milligram	/	per

ABBREVIATIONS/ACRONYMS (continued)

API	American Petroleum Institute							
ASTM	American Society for Testing and Materials							
BLM	Bureau of Land Management							
CEQ	Council on Environmental Quality							
DOE	Department of Energy							
EPA	Environmental Protection Agency							
ERDA	Energy Research and Development Administration							
FOA	Food and Agricultural Organization							
FEA	Federal Energy Administration							
IMCO	International Maritime Consultative Organization							
NASA	National Aeronautics and Space Administration							
NBS	National Bureau of Standards							
NOAA	National Oceanic and Atmospheric Administration							
NTIS								
UN								
	United Nations Educational, Scientific and Cultural Organization							
USCG								
USDA	United States Department of Agriculture							
USDI								
USGS	and the second s							
USN	United States Navy							

SECTION I. REPORTS, PUBLICATIONS, AND PATENTS

A. OIL POLLUTION DETECTION AND EVALUATION

REPORTING

C-1175-78

AMLWCH HOSE RUPTURE AND SPILL (news brief) Anon. 1978.

Oil Spill Intelligence Report 1(2):2.

Oil transfer, Tankers, Spill cleanup, UK, Oil terminals, *Amlwch spill

On October 10, 1978, a floating hose from a single buoy mooring ruptured during offloading of an oil tanker cargo, resulting in a spill of 200 tons of light crude oil into the Irish Sea at northern Anglesey, Wales. Spill response measures and the movement of the oil slicks out to sea are briefly described.

C-1176-78

AMLWCH SLICK RETURNS TO SHORE (news brief)

Anon. 1978.

Oil Spill Intelligence Report 1(4):2.

Oil slicks, Shorelines, Beach cleanup, Dispersants, Spill cleanup, UK, *Amlwch spill

Oil slicks believed to have been controlled and dispersed earlier, started coming ashore on October 19, 1978, polluting 12 km of shoreline near Caernarvon, Wales. Beach cleanup operations involved the use of bulldozers and high pressure jets; additional dispersants were used to disperse offshore slicks.

C-1177-78

AMLWCH SLICK MOVES EASTWARD (news brief)

Anon. 1978.

Oil Spill Intelligence Report 1(5):2.

Oil slicks, Oil terminals, Dispersants, Biological effects, Birds, Estuaries, Coasts, UK, *Amlwch spill

Following a hose rupture and spill of about 100 to 240 tons of crude oil at the Amlwch Oil Terminal on October 10, 1978, several kilometers of coastline and estuary have been impacted by the oil. Use of dispersants may have formed emulsions that are difficult to clean up. In the River Conway estuary some 250 seriously oiled birds have been reported, but little damage to commercial mussel beds and intertidal organisms is apparent.

C-1178-78

ANOTHER OIL SUPERTANKER DISASTER NARROWLY AVERTED (news brief) Anon. 1978.

Marine Pollution Bulletin 9(8):199.

Tankers, English Channel, Surveillance, Safety, *Traffic control A 267,000 ton Kuwaiti oil tanker, carrying a fifth more oil than the Amoco Cadiz, nearly grounded in the Dover Straits only five weeks after the Amoco Cadiz spill due to a gyro compass failure. The captain did prevent the accident once alerted by the coast-guard who noted the dangerous position on their radar. The incident illustrates the necessity for making the traffic control reporting system in the English Channel mandatory.

C-1179-78

CHRISTOS BITAS GROUNDING AND SPILL (news brief)

Anon. 1978.

Oil Spill Intelligence Report 1(3):1.

Oil spills, UK, Tankers, Oil transfer, Dispersants, *Christos Bitas spill

On October 12, 1978, the Greek tanker <u>Christos Bitas</u> began spilling an estimated 3000 tons of Iranian crude oil, after grounding about 16 km off Milford Haven, Pembrokeshire, Wales. By October 13, several tugs were spraying dispersants onto the resulting oil slicks, and oil transfer and lightering operations were initiated the following day.

C-1180-78

CHRISTOS BITAS SALVAGE OPERATIONS CONTINUE (news brief)

Anon. 1978.

Oil Spill Intelligence Report 1(4):1.

Oil spills, UK, Tankers, Oil transfer, Environmental effects, Birds, *Christos Bitas spill, *Salvage operations

The Greek tanker <u>Christos</u> <u>Bitas</u> spilled an estimated 3000 tons of crude oil into <u>St. Georges</u> Channel off Milford Haven, beginning on October 12, 1978. By October 21, nearly 36000 tons of the remaining cargo had been offloaded, leaving nearly 1000 tons in the damaged tanker. Environmental impact was significant; a total of about 1400 to 2300 birds are believed to have been oiled and killed by the incident.

C-1181-78

CHRISTOS BITAS SINKING (news brief)

Anon. 1978.

Oil Spill Intelligence Report 1(5):1.

Oil spills, Oil slicks, UK, Tankers, Shorelines, *Christos Bitas spill

After grounding and spilling about 3000 tons of crude oil on October 12, 1978 the tanker <u>Christos Bitas</u> was found to be unsuitable for salvage or repair and was towed to a sinking site nearly 500 km west of Fastnet Rocks, Ireland. With all but 1000 tons of cargo successfully transferred, the tanker was sunk on October 31. Despite dispersant operations after the initial spillage, oil slicks damaged over 50 km of shoreline at North Devon on October 27.

C-1182-78

CORRODED PIPELINE SPILLS OIL IN CISNE, ILLINOIS (news brief) Anon. 1978.

Oil Spill Intelligence Report 1(8):2.

Spill cleanup, Pipelines, Oil spill, EPA, Illinois, Rivers

About 318,000 L (84,000 gals) of crude oil spilled into a small tributary of the Elm River in Cisne, Illinois on November 16, 1978, caused by pipeline failure due to corrosion. Containment booms and EPA-coordinated cleanup crews were quickly deployed at the scene; by November 20, all but about 30,000 L (8000 gals) had been removed from the river and its tributary.

C-1183-78

ELENI V FIASCO (news brief)

Anon. 1978.

Marine Pollution Bulletin 9(7):170.

Oil spills, Spill cleanup, Government agencies, Coasts, England, *Eleni V

On May 6,1978 the 1600 ton Greek tanker, Eleni \underline{V} , collided with a freighter off the coast of England and was sliced in two. Approximately 3000 tons of oil spilled, polluting 20 mi of coastline. The

lack of one single government department that is responsible for control of both salvage and cleanup operations is partially the reason for the inadequate emergency operations.

C-1184-78

"ELLA HEWITT" OIL RELEASE (news brief)

Anon. 1978.

Oil Spill Intelligence Report 1(1):2.

Spill cleanup, Oil discharges, Leakage, Contamination, Ships, Ireland, Environmental effects

The sunken British trawler <u>Ella Hewitt</u> released up to 136,400 L (36,000 gal) of diesel fuel after detonation of the wreck by the British Navy. Since sinking in 1962 with 180 tons of diesel fuel onboard, the submerged trawler had released repeated oil slicks that fouled nearby Irish coastlines, killed thousands of seabirds, and contaminated fishermen's catches. Pollution control vessels cleaned up the oil released by the explosion.

C-1185-78

FAULTY VALVE LEAKS OIL AT YOKKAICHI, JAPAN (news brief) Anon. 1978.

Oil Spill Intelligence Report 1(7):1.

Tankers, Oil spills, Leakage, Spill containment, Japan, Oil transfer, *Ryuyo Maru spill

The Japanese tanker Ryuyo Maru spilled about 50,000 L (13,000 gals) of crude oil on November 8, 1978 as the cargo was being unloaded. A faulty valve was blamed for the leakage. Although containment booms and 17 spill recovery vessels were deployed, some oil washed over the containment boom and damaged a nearby seaweed farm.

C-1186-78

GRAND BAY PIPELINE RUPTURE AND SPILL (news brief)

Anon. 1978.

Oil Spill Intelligence Report 1(3):2.

Pipelines, Leakage, Spill containment, Louisiana

On October 12, 1978 about 94,500 L (25,000 gals) of oil spilled from a ruptured pipeline into a canal near Venice, Louisiana. Containment booms were quickly deployed and contained nearly all of the oil. Mechanical and manual cleanup operations were expected to last into late October.

C-1187-78

HYGRADE BARGE SPILL (news brief)

Anon. 1978.

Oil Spill Intelligence Report 1(2):2.

Spill cleanup, Ships, Rivers, USCG, New York, *Hygrade No. 2 barge spill

Up to 34,000 L (9000 gal) of No. 2 fuel oil spilled into the Hudson River in New York when the oil barge $\underline{\text{Hygrade No. 2}}$ grounded on October 6, 1978 and ruptured two tanks. USCG-initiated spill containment and cleanup measures are briefly described, and the USCG said the spill caused no significant environmental damage.

C-1188-78

INQUEST ON AMOCO CADIZ CONTINUES (news brief)

Anon. 1978.

Marine Pollution Bulletin 9(8):199.

Amoco Cadiz spill, Liability, *Inquest

Three causes for the Amoco Cadiz grounding were cited by the council for Liberia Captain Frank Wiswall at the conclusion of the Liberian government inquiry. They were failure of the ship's steering gear, lack of effective assistance once the ship grounded, and bad weather which inhibited effective aid from tugs. The inquiry was told earlier that the captain made several "excusable errors in judgement."

C-1189-78

NEWTOWN CREEK LEACHING FROM UNKNOWN SOURCE (news brief)

Anon. 1978.

Oil Spill Intelligence Report 1(3):2.

Leakage, Detection, spill cleanup, USCG, New York

Oil from an unknown source has been leaking into Newtown Creek, an industrial waterway in Brooklyn, New York. The spillage was detected on September 2, 1978 by USCG overflights; since that time, 151,000 L (40,000 gals) of an oil-water mixture have been recovered by cleanup contractors.

C-1190-78

OIL WASHES ONTO TRINIDAD BEACHES (news brief)

Anon. 1978.

Oil Spill Intelligence Report 1(7):2.

Oil slicks, Sources, Movement, Beaches, *Trinidad

After an oil slick was discovered off Trinidad's northwest peninsula on October 31, 1978 winds and currents pushed the oil onto beaches and fouled small boats and fishing nets. The source of the spill is unknown but is believed to have been caused by a ship near Port-of-Spain.

C-1191-78

PORT SUTTON SPILL FROM UNKNOWN SOURCE (news brief)

Anon. 1978.

Oil Spill Intelligence Report 1(2):1.

Spill cleanup, Ports, Bays, Intertidal zone, Florida, USCG, Environmental effects, *Port Sutton spill

On October 5, 1978, a large quantity of oil, later estimated to total about 150,000 L (40,000 gal) began to spill into the Port Sutton area near Tampa, Florida, from an unidentified source. This article briefly reviews the USCG-initiated spill response measures, conducted by 4 Florida cleanup companies. The spreading slick caused heavy damage to mangrove swamps and intertidal animals, especially crustaceans. By October 11 nearly 120,000 L (31,000 gal) oil had been recovered, and cleanup operations were expected to continue until early November 1978.

C-1192-78

PORT SUTTON SPILL UPDATE (news brief)

Anon. 1978.

Oil Spill Intelligence Report 1(3):2.

Spill cleanup, Ports, Source identification, USCG, EPA, Florida, *Port Sutton spill, *Cleanup costs

Cleanup operations are continuing in Tampa, Florida, following an oil spill in Port Sutton on October 5, 1978. As of October 17, about 132,000 L (35,000 gals) of Bunker C and diesel oil were collected at a cleanup cost of \$300,000 so far. EPA is assessing the environmental impact of the spill, and the USCG is conducting analyses of spill samples in order to identify the responsible party.

C-1193-78

VIOLATOR DETERMINED IN PORT SUTTON SPILL (news brief) Anon. 1978.

Oil Spill Intelligence Report 1(6):1.

Source identification, Law enforcement, USCG, Florida, Liability, *Port Sutton spill, *Cleanup costs

The USCG has pinpointed the source of the Port Sutton, Florida, oil spill of October 5, 1978 but will not release the name of the vessel pending notification of the owners. Cleanup costs for the spill, presently in excess of \$700,000, are currently paid by federal funds. Now that the spill violator is known, the USCG will take action to recover the money.

C-1194-78

USCG IDENTIFIES PROBABLE SOURCE OF PORT SUTTON SPILL (news brief) Anon. 1978.

Oil Spill Intelligence Report 1(8):1.

Source identification, Law enforcement, USCG, Florida, Sampling, Liability, Tankers, *Port Sutton spill

The Panamanian bulk carrier <u>Howard Star</u> has been identified as the vessel responsible for the Port Sutton, Florida oil spill of October 5, 1978, based on matches of the spill samples with oil samples from nearby vessels. The various penalties that can and may be levied against the vessel's owners and operators by the USCG and Florida state authorities are briefly discussed.

C-1195-78

ROUND-THE-WORLD-NEWS: ISRAEL (news brief)

Anon. 1978.

Marine Pollution Bulletin 9(8):202.

Oil spills, Pollution control, Israel

Fourteen cases of oil spill pollution were reported for 1976 in the Eilat area, according to the Fourth Annual Report by the Environmental Protection Service. A lack of proper equipment for dealing with marine pollution still exists.

C-1196-78

RUPTURED PIPELINE SPILLS OIL NEAR FARMINGTON, UTAH (news brief) Anon. 1978.

Oil Spill Intelligence Report 1(7):1.

Pipelines, Oil spills, Inland, Spill containment, Incineration, *Utah

Between 227,000 and 400,000 L (60,000 to 105,000 gals) of light crude oil started to spill from a ruptured Amoco pipeline on November 8, 1978. The spill traveled through a marsh, small pond and culvert into canals connecting with Farmington Bay. a freshwater inlet of the Great Salt Lake. Rapid deployment of booms and other measures prevented all but about 40 to 60 L of oil from reaching the Bay. Controlled burns were agreed upon as the fastest, most efficient way to rid the affected areas of the oil.

C-1197-78

FARMINGTON BAY CLEANUP NEARS COMPLETION (news brief)

Anon. 1978.

Oil Spill Intelligence Report 1(8):1.

Spill cleanup, Incineration, Pipelines, Inland, *Utah

By November 24, 1978 controlled burns and cleanup crews had removed over 85% of the 404,400 L (107,100 gals) of crude oil spilled from a ruptured Amoco pipeline near Farmington Bay, Utah, on November 8. An improper valve change on the pipeline had caused the spillage. Manual cleanup will continue into December.

C-1198-78

SPOTTING POTENTIAL POLLUTERS BY COMPUTER

Anon. 1977.

Tanker & Bulker International 3(8):23-25.

Information systems, Tankers, Safety, Statistical analysis, Pollution prevention, *Risk analysis, *Marine Mangement Systems Inc.

"Marine Management Systems, Inc. (MMS) of Stamford, Connecticut, recently began a computer service which provides current information on the casualty and safety performance of tankers, combination carriers, and LNG vessels to assist the charterer in the selection of ships with the best performance records to minimize the risk of tanker oil spills and other seagoing casualties. The service is part of MMS' global Marine Information Service (MIS) which uses GEC's worldwide remote computing network."

[from Oceanic Abstracts 15(2):#78-02059. 1978]

C-1199-78

STAWANDA SPILL (news brief)

Anon. 1978.

Oil Spill Intelligence Report 1(2):2.

Spill cleanup, Dispersants, Tankers, Harbors, *South Africa, *Stawanda spill

Oil spilled from the Greek motor tanker <u>Stawanda</u> into the harbor at Durban, South Africa, while the vessel was loading its cargo on October 3, 1978. In response, a cleanup vessel sprayed dispersants both inside the harbor and at the entrance for 8 hours.

C-1200-78

TANKER IRENE S. LEMOS COLLIDES ON MISSISSIPPI (news brief)
Anon. 1978.

Oil Spill Intelligence Report 1(7):2.

Oil spills, Tankers, USCG, Louisiana, Spill cleanup, Mississippi River, *Irene S. Lemos spill

About 5700 to 7600 L (1500 to 2000 gals) of Bunker C oil spilled from the Greek tanker Irene S. Lemos into the Mississippi River after the vessel collided with another ship on November 9, 1978, near Belle Chasse, Louisiana. Spill cleanup efforts included extensive use of booms, skimmers, portable pumps, and vacuum trucks; the cleanup activities were overseen by USCG personnel.

C-1201-78

TAR BALLS IMPACT SWEDISH COAST (news brief)

Anon. 1978.

Oil Spill Intelligence Report 1(8):2.

Tar, Coasts, Environmental effects, Birds, Sweden

Tar balls began washing ashore on November 20, 1978 along the western coast of Sweden between Lysekil and Koster. The Swedish Coast Guard sampled and identified the material as weathered crude oil. Some 1000 birds were found fouled and dead, and the Coast Guard shot another 1000 oiled birds.

C-1202-78

TAR BALLS WASH ASHORE AT CHESAPEAKE BAY (news brief) Anon. 1978.

Oil Spill Intelligence Report 1(6):2.

Tar, Coasts, Chesapeake Bay, Beach cleanup, Source identification, USCG

On November 4, 1978 tar balls totalling an estimated 23,000 L (6000 gals) of oil polluted an area near Cove Point, Maryland, on the west side of Chesapeake Bay. Beach cleanup was initiated by the USCG, and tar samples were gathered for analysis and possible source identification.

C-1203-78

WEST HACKBERRY BLOW-OUT AND SPILL (news brief) Anon. 1978.

Oil Spill Intelligence Report 1(1):1.

Blowouts, Spill containment, Spill cleanup, Oil wells, Lakes, Louisiana, USCG, DOE, *Strategic Petroleum Reserve

Federal spill cleanup measures taken in response to a well blowout on September 21, 1978 at West Hackberry, Louisiana, are described. The blowout occurred at Well No. 6 of the US Strategic Petroleum Reserve, resulting in a spill of 40,000-45,000 bbl of crude oil around the pad and in nearby Black Lake. types and configurations of booms were applied to contain the oil, and skimming operations removed about 30,800 bbl of oil by September 27. The environmental impacts of the spill and of an associated oil fire are currently being assessed by a DOE environmental team.

C-1204-78

WEST HACKBERRY BLOW-OUT AND SPILL UPDATE (news brief) Anon. 1978.

Oil Spill Intelligence Report 1(2):1.

Blowouts, Spill cleanup, Oil wells, Lakes, Louisiana, USCG, DOE, *Strategic Petroleum Reserve

Coordianted USCG-DOE federal spill cleanup operations at the US Strategic Petroleum Reserve in West Hackberry, Louisiana, were completed on October 11, 1978, following a well blowout on September 21. At a public hearing on the incident, "local environmentalists testified that the oil spill caused negligible environmental damage to Black Lake and that DOE did a good job containing the pollution." In total, nearly 50,000 bbl of oil were recovered from Black Lake and the well pad.

2. MONITORING

C-1205-78

INSTALLATIONS FOR MONITORING OIL CONTENT [Bailey Meters & Contractors Ltd.]. 1977. Australian Patent 485,370

Monitoring, Tankers, Ballast, Oil discharges, Equipment, Patent, Analytical techniques, Detection

A device for monitoring the oil content of tanker ballast discharge is described. The system involves sampling of a fraction of the discharge flow, exposure of the sample to ultraviolet radiation, and detection of fluorescence by a photoelectric cell. An alarm is sounded when the cell receives radiation greater than a predetermined value.

[from Petroleum Abstracts 17(51):#242,219. 1977]

C-1206-78

OIL DETECTOR/ALARM (product information)

[Baird-Atomic]. 1978.

Environmental Science and Technology 12(5):602.

Monitoring, Detection, Wastewaters, Oil discharges, Product information, Equipment

"The instrument continuously monitors effluent discharges to detect trace levels of oil in water. Oil concentration is displayed, in ppm, on a meter on the front panel. Two adjustable threshold alarms are part of the unit."

C-1207-78

PETRO-TRACK MEASURES SUBSURFACE OIL Bender, E. 1978.
Sea Technology 19(4):28.

Monitoring, Equipment, Hydrocarbons, Product information, *Fluoro-metry, *Petro-track system, Detection

With an operating depth of 0 to 100 m (0-327.5 ft) the 925 Petrotrack underwater fluorometer system continuously monitors and prints out information on oil concentration, time, position, temperature, and depth. It is based on detection of low boiling point aromatic hydrocarbons. Developed by Environmental Devices Corporation (ENDECO), the Petro-track system has performed successfully in field trials.

C-1208-78

OIL-IN-WATER MONITOR (product information)

[Biospherics]. 1978.

Environmental Science and Technology 12(5):601.

Monitoring, Dispersions, Equipment, Product information, *Oil-in-water

"The unit monitors dispersed oil in water by forward light scattering and transmittance techniques. The monitor identifies and provides alarm and control action for 1 part oil in 1 million parts water."

C-1209-78

BENZENE MONITOR

[GOW-MAC Instrument]. 1978.

Environmental Science and Technology 12(6):728.

Monitoring, Product information, Equipment, Chromatography, Aromatic hydrocarbons, *Benzene

"The FID gas chromatograph can perform chromatographic analysis of 1 ppm benzene with 3 min." [possibly oil pollution related]

C-1210-78

BIOINDICATORS OF POLLUTION (A BIBLIOGRAPHY WITH ABSTRACTS)

Harrison, E.A. 1977.

Report NTIS/PS-77/0993. 248 p. Report for 1964 - Nov 77. (Supersedes NTIS/PS-76/0868, NTIS/PS-75/796, and NTIS/PS-75/024.)

Monitoring, Detection, Bioindicators, Microorganisms, Marine organisms, Bibliographies

This updated bibliography contains 243 abstracts (with 54 entries new to previous editions) concerning the use of microorganisms, animals, plants, and fishes for air and water pollution detection. Among the organisms discussed are algae, bacteria, aquatic plants, oysters, snails, clams, insects, annelids, amphibians, and fungi. [possibly oil pollution related]

[from Government Reports Announcements 78(2):#NTIS/PS-77/0993/4GA. 1978]

C-1211-78

SPECIFIC BIOLOGICAL METHODS FOR PETROLEUM BASELINE AND POLLUTION MONITORING

Penrose, W.R. 1978.

Marine Pollution Bulletin 9(9):231-234.

Monitoring, Bioindicators, Analytical techniques, Baseline studies, Hydrocarbons, Bacteria, Fish, Oceans, Freshwater

The production of the liver enzyme aryl hydrocarbon hydroxylase (AHH) is a specific response, in vertebrates, to the ingestion of oil, reflecting the degree of pollution as well. Lower cost and greater efficiency are advantages bioassay for AHH offers over chemical analysis of water for hydrocarbons at trace levels. Another sensitive and specific biological indicator is the proportion of oildegrading bacteria to total heterotrophic bacteria.

C-1212-78

OIL SENSOR (product information)

[Rambie, Inc.]. 1977.

Environmental Science and Technology 11(12):1123.

Monitoring, Equipment, Product information, Hydrocarbons, *Infrared sensor

Operating continuously and unaffected by floating debris, waves, water level changes and other infrared sources, the infrared sensor scans a water surface area of any length up to 160 m (500 ft). Floating hydrocarbons activate an alarm.

C-1213-78

SELF-CLEANING OIL DETECTOR [Safare Crouzet SA]. 1977. French Patent 2,327,534

Monitoring, Detection, Leakage, Equipment, Patent, Hydrocarbons,

An apparatus designed to detect heavy hydrocarbons in water is described. Applications include detection of oil leaks around submerged pipelines and tanks, and signaling of oil spills.

[from Petroleum Abstracts 17(39):#238,791. 1977]

C-1214-78-78

APPARATUS FOR MONITORING PUMPS AND PIPELINES Schierhorn, M. 1977.
German Patent 1,775,046

Monitoring, Pipelines, Oil transfer, Leakage, Detection, Patent

The device monitors pipelines for leaks by continually measuring pressure and flow rate. An alarm is triggered when an increased flow rate and decreased trend in pressure occur simultaneously.

[from Petroleum Abstracts 17(51):#242,212. 1977]

C-1215-78

CHEMICO-OCEANOLOGICAL STUDIES [in Russian]
Skopintsev, B.A., and V.N. Ivanenkov (eds.). 1977.
Moskva, USSR, Nauka, 1977. 224 p. Proceedings of: 7 Vsesoyuznaya konferentsiya po khimii okeana, Moskva, USSR, March 1975.

Monitoring, Oceans, Sorbents, Detection, Contaminants

"The proceedings of the 7th All-Union Conference on the chemistry of seas and oceans deals with chemical air-water interaction, chemical composition of atmospheric precipitation, the cyles of N and P compounds, accumulation of microelements in sea water and

their extraction using selective, sorbents methods of determining pollutants and oil pollution monitoring." [sic]

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #3416-108. 1978]

C-1216-78

AUTOMATING POLLUTION MEASUREMENTS

Snape, F. 1976.

International Laboratory (September/October):42-49.

Monitoring, *Automation, Sampling, Equipment, *Data processing

A discussion is presented on the considerations involved in computerized monitoring of the air and water environments. The importance and purposes of pollution measurements are outlined and some of the problems associated with water sampling, including monitor siting, monitor inlet position, and choice of sampling device are reviewed. A microprocessor-based pollution data reductor is suggested as a means for handling the large volume of data resulting from automated pollution monitoring. [possibly oil pollution related]

C-1217-78

OIL IN WATER ANALYSIS SYSTEM (product information) [Teledyne Analytical Instruments]. 1978. Environmental Science and Technology 12(2):226.

Monitoring, Analytical techniques, Equipment, Wastewaters, Refineries, Product information, *Photometric analyzer

"This dual wavelength photometric analyzer was developed for monitoring recycled cooling water, effluent from refineries and discharges from wastewater treatment plants. Variations of 0.1 ppm in process streams can be detected with an accuracy better than $\pm 2\%$."

C-1218-78

IDENTIFICATION, INDEXING AND EXCHANGE OF DATA ON ENVIRONMENTAL POLLUTANTS

Thompson, G.L. 1977.

Joint Conference on Sensing of Environmental Pollutants. Washington, DC, American Chemical Society, 1978. p. 238-240.

Monitoring, Contaminants, Information systems, Source identification, *National Water Data Exchange

"The National Water Data Exchange (NAWDEX) program for identification and monitoring [of] water pollutants is discussed." [possibly oil pollution related]

[from Chemical Abstracts 88(26):#197306a. 1978]

C-1219-78

APPARATUS FOR DETERMINING FREE OIL IN OIL-CONTAINING SLUDGE Uematsu, Y., and T. Morimura. 1977.

Japanese Kokai (unexamined patent application) 77,119,293

Monitoring, Design-engineering, Wastewaters, Sludge, *Lasers, *Oil film, Patent

"A water tank is stirred slowly to a state as if the sludge were flowing. A constant amount of sample is supplied to it and oil is separated. A visible light or a laser light irradiates the oil floating on the liquid surface. From the resulting reflected light, the oil film is measured. The method is especially useful for determining oil contents on river water and industrial wastewaters."

[from Chemical Abstracts 88(24):#176965z. 1978]

3. REMOTE SENSING

C-1220-78

FRENCH PROGRESS IN TELEDETECTION OF OIL SPILLS de Castro, G. 1977.
Ship and Boat International 30(10):35.

Remote Sensing, Oil spills, Surveillance, France, Equipment

"The French equipment is manufactured for their own particular requirements, their economic situation, and non-continental size of the country. The scanning method, which is described in detail, is very effective and quick. From cross-checking signals the exact position of the offending vessel can be located."

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #4585-1Q8. 1978]

C-1221-78

TRACKING POLLUTANTS FROM A DISTANCE Melfi, S.H., J.D. Koutsandreas, and J. Moran. 1977. Environmental Science and Technology 11(1):36-39.

Remote Sensing, Source identification, Oil slicks, EPA, Monitoring, Analytical techniques, Pollution control, *Laser fluorescence

The application by EPA of remote sensing methods to pollution monitoring is discussed. One pollutant-specific method under development is laser fluorescence which can monitor oil on a water surface.

4. SAMPLING

C-1222-78

ENUMERATION OF PETROLEUM-DEGRADING MARINE AND ESTUARINE MICRO-ORGANISMS BY THE MOST PROBABLE NUMBER METHOD Mills, A.L., C. Breuil, and R.R. Colwell. 1978. Canadian Journal of Microbiology 24(5):552-557.

Sampling, Microorganisms, Biodegradation, Analytical techniques, *Enumeration, *Most probable number method

"Several media designed for use in a most probable number (MPN) determination of petroleum-degrading microorganisms were compared. The best results, i.e., largest numbers, were obtained using a buffered (32 mM PO_4^{\pm}) liquid medium containing 1% hydrocarbon substrate."

5. ANALYSIS

C-1223-78

THE USE OF GAS-LIQUID-SOLID CHROMATOGRAPHY IN ENVIRONMENTAL AND TRACE ANALYSIS

Bertoni, G., P. Ciccioli, C. Severini, and F. Bruner. 1978. Chromatographia 11(12):55-58.

Chromatography, Chemical analysis, *Trace analysis

The separation of industrial trace products as well as separations of environmental concern are demonstrated. The column characteristics for obtaining the best separation power are discussed. [possibly oil pollution related]

[from Chemical Abstracts 88(24):#176302f. 1978]

C-1224-78

ENVIRONMENTAL ANALYSIS

Ewing, G.W. 1977.

New York, Academic Press, 1977. 344 p.

Analytical techniques, Chromatography, Spectroscopy, *Case histories

Papers presented at the Third Annual Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies in Philadelphia, Pennsylvania, 1976, are contained in this book. "The papers provide a background on current techniques and procedures, or present a case history of a particular application." [possibly oil pollution related]

[from New Technical Books 63(2):#287. 1978]

C-1225-78

SOPHISTICATED EQUIPMENT FINGERPRINTS CRUDE OILS

Flory, D.A., A.E. Rubenstein, H.A. Lichtenstein, C.B. Koons, et al. 1978.

0il and Gas Journal 76(8):102-107.

GC/MS, Analytical techniques, Crude oil, Oil spills, Source identification

Computerized GC/MS analysis of selected crude oil fractions, primarily the higher molecular weight saturated hydrocarbons, permit correlation of various crude oils in relation to the reservoir zones from which they originate. Details of the analytical techniques and applications are presented. The technique should be applicable for fingerprinting oil spills.

[from Chemical Abstracts 89(4):#27061v. 1978]

C-1226-78

FLUORIMETRIC DETERMINATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN LEAVES, BLOOMS, AND PHYTOPLANKTON [English summary] Hellmann, H. 1977.

Fresenius Zeitschrift fuer Analytische Chemie 287(2-3):148-151.

Chemical analysis, PAH, Phytoplankton, Spectrometry, *Fluorimetric determination

"The concentration of polycyclic aromatic hydrocarbons in photo-assimilating organisms is very small (ppb-range). It can only be determined after separation of accompanying polar components and the saturated hydrocarbons, among others by fluorescence spectrometry." [possibly oil pollution related]

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #4538-108. 1978]

C-1227-78

INTERLABORATORY COMPARISON OF DETERMINATIONS OF TRACE LEVEL PETROLEUM HYDROCARBONS IN MARINE SEDIMENTS

Hilpert, L.R., W.E. May, S.A. Wise, S.N. Chesler, and H.S. Hertz. 1978.

Analytical Chemistry 50(3):458-463.

Hydrocarbons, Chemical analysis, Sediments, Baseline studies,
*Interlaboratory comparison

"Results of the determination of petroleum hydrocarbons at the $\mu g/kg$ (ppb) level in marine sediments have been compared among eight laboratories. Values for concentrations of total extractable hydrocarbons scattered between 9 to 500 $\mu g/kg$ and 49 to 6625 $\mu g/kg$ for the two sites examined. Scatter of results for hydrocarbons in the gas chromatographic elution range, the most abundant aliphatic and

aromatic hydrocarbons, and total polynuclear aromatic hydrocarbons (four rings and larger) were similar....The data are discussed with regard to the reliability and comparability of current methods for environmental baseline measurements."

C-1228-78

HYDROCARBONS IN SURFICIAL SEDIMENTS FROM THE SCOTIAN SHELF Keizer, P.D., J. Dale, and D.C. Gordon, Jr. 1978. Geochimica et Cosmochimica Acta 42(2):165-172.

Hydrocarbons, Atlantic Coast, Biogenic hydrocarbons, Offshore drilling, Sediments, Sources, Contamination, *Nova Scotia

Surface marine sediments from the Scotian Shelf, some from near abandoned well drilling sites, were analyzed for hydrocarbon contents and compositions. Most hydrocarbons were derived from biogenic sources, showing an inverse concentration correlation with increasing distance from the mainland and a strong odd C preference in the n-alkanes. Contamination from petroleum sources was most apparent between Halifax and Emerald Bank, and at the abandoned drill sites there was evidence of slight alteration in the hydrocarbon composition.

[from Chemical Abstracts 89(4):#27943j. 1978]

C-1229-78

DETERMINATION OF THE SOLUBILITY OF HYDROCARBONS IN WATER [in Russian]

Korenman, I.M., and R.P. Aref'eva. 1978. Zhurnal Prikladnoi Khimii (Leningrad) 51(4):957-958.

Hydrocarbons, Aromatic hydrocarbons, Solubility, Chemical analysis, Surfactants

"The solubilities of hexane, cyclohexane, C_6H_6 , PhMe, and PhEt were determined in H_2O and aqueous NcCl (0-2 M) at $25^{\rm O}$. NaCl has a salting-out effect on hexane and C_6H_6 . An indicator acid in H_2O was extracted by the organic phase as soon as 2 phases formed resulting [in] a large pH increase for the aqueous phase and thus allowing a solubility titration to be carried out. Another method involved determination of concentration changes in unsaturated solutions on adding a surfactant." [possibly oil pollution related]

[from Chemical Abstracts 88(26):#198636v. 1978]

C-1230-78

OIL POLLUTION ANALYSIS FOR WATER LABORATORIES Matthews, P.J. 1977.

Institute of Petroleum Report, No. 3. Report IP 77-003. 21 p.

Analytical techniques, Industries, Pollution prevention, Water quality

An increased interest in the problems caused by oil pollution has resulted in cooperation by the petroleum and water industries on methods of prevention and on oil pollution analysis. "The reorganization of the water industry into large authorities dealing with all aspects of the water cycle afforded an opportunity to bring together the analytical methodology of quantification and identification." This paper reviews the 'state of the science' and summarizes the methods available to water laboratories in either industry.

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #4470-108. 1978]

C-1231-78

AN ANALYSIS OF PETROLEUM HYDROCARBONS IN THE MARINE ENVIRONMENT: RESULTS OF AN INTERLABORATORY COMPARISON EXERCISE May. W.E., S.N. Chesler, B.H. Gump, And H.S. Hertz. 1978. Journal of Environmental Science and Health A 13(5&6):403-410.

Analytical techniques, Sampling, Hydrocarbons, *Exxon, *NBS, *Interlaboratory comparison

"An interlaboratory comparison exercise, carried out by Exxon Research and Engineering and the National Bureau of Standards, is described. Marine water samples obtained on a joint cruise using both laboratories' water samplers were split and analyzed at both laboratories. Both samplers were found to be acceptable for the determination of hydrocarbons at $\mu g/kg$ (ppb) levels. Differences in analyses were traceable to the analytical schemes employed by each laboratory."

C-1232-78

DIRECT DETERMINATION OF TRACE AMOUNTS OF HYDROCARBONS AND NAPHTHENIC ACIDS IN WASTE AND SURFACE WATERS
Mosescu, N., G. Kalmutchi, and I.V. Pop. 1976.
Romanian Patent 60,217

Analytical techniques, Detection, Spectroscopy, Hydrocarbons, Wastewaters, Patent

"Trace amounts of hydrocarbons and naphthenic acids were detected in waste and surface waters by absorption spectroscopy at 200-345 nm. The accuracy and sensitivity of the method were 1% and 0.08 mg/L, respectively.

[from Chemical Abstracts 88(26):#197389e. 1978]

C-1233-78

STUDIES OF FUEL OIL COMPONENTS IN FOOD. EFFECT OF ULTRAVIOLET IRRA-DATION ON ORGANIC SULFUR COMPOUNDS IN FUEL OIL [in Japanese] Nakamura, A., and T. Kashimoto. 1977.

Osaka-furitsu Koshu Eisei Kenkyusho Kenkyu Hokaku, Shokuhin Eisei Hen. Vol. 8:111-115.

Chemical analysis, Contamination, Chromatography, Fuel oil, Food web, *Dibenzothiophenes, *Seafood tainting

The UV stability of organic sulfur compounds in heavy fuel oils was studied in order to determine the route of seafood pollution from fuel oil spilled at sea. Absorption peaks of dibenzothiophenes on gas chromatographs after exposure to UV radiation was decreased. Absorbents and impurities retarded decomposition of dibenzothiophene by UV radiation.

[from Chemical Abstracts 88(25):#188315a. 1978]

C-1234-78

POLLUTION EVALUATION; THE QUANTITATIVE ASPECTS

Pickering, W.F. 1977.

New York, Dekker, 1977. 199 p. (Environmental Science and Technology Series, Vol. 2).

Analytical techniques, Sampling, Chromatography, Spectroscopy, Statistics

The principles involved in the analysis and evaluation of environmental pollution are covered. Included are chapters on significance of sampling and statistics, and principles of emission spectroscopy, gas chromatography, mass spectrometry, and neutron activation analysis. [possibly oil pollution related]

[from New Technical Books 63(2):#289. 1978]

C-1235-78

CONTRIBUTION TO THE IMPROVEMENT OF HYDROCARBON DETERMINATION IN WATER Ranchet, J., and P. Clement. 1977.

Bulletin de Liaison des Laboratoires des Ponts et Chaussees, Vol. 91:67-71.

Chemical analysis, Hydrocarbons, Chromatography, Spectrometry, *IR analysis

Chromatographic separation of hydrocarbons in surface water is recommended before detection by IR spectrometry. The adsorbent used should be rinsed thoroughly enough for total recovery of the hydrocarbons. Absorption peaks at 2962, 2926, 2853, and, when aromatics are present, $3040~\rm{cm}^{-1}$ should be included in the calculations for accurate results.

[from Chemical Abstracts 88(26):#197319g. 1978]

C-1236-78

PROCESSING FOR DETERMINING HYDROCARBONS AND HALOGENATED HYDRO-CARBONS DISSOLVED IN WATER Schmidt, W. 1977. German Patent 1,773.510

Analytical techniques, Chromatography, Hydrocarbons, Patent

A process is described using gas chromatographic analysis of the vapor phase, for the determination of hydrocarbons and halogenated hydrocarbons in water. [possibly oil pollution related]

[from Petroleum Abstracts 17(50):#241,966. 1977]

C-1237-78

QUANTITATIVE DETERMINATION OF PETROLEUM PRODUCTS IN SURFACE WATERS [in Russian]

Semenov, A.D., A.G. Stradomskaya, and L.F. Pavlenko. 1977. Problemy Analiticheskoi Khimii, No. 5:157-168.

Chemical analysis, Petroleum products, *Surface waters Summary not available.

[from Chemical Abstracts 88(24):#176790p. 1978]

C-1238-78

DETERMINATION OF OILS IN WATER USING IR ABSORPTION SPECTROMETRY AND THIN-LAYER CHROMATOGRAPHY. PART 1. [in Japanese] Uekaki, A., K. Terada, T. Sato, H. Sato, and M. Sone. 1976. Miyagi-Ken Kogai Gijutsu Senta Hokoku, Vol. 4:94-97.

Analytical techniques, Spectrometry, Chromatography, *IR analysis

A 5 cm or 10 cm quartz cell was used for IR analysis of various oils including petroleum oils. The solvent used for the chromatography was 90:10:0.5 n + $\rm C_7H_{14}$ + petroleum ether--Et $_2\rm O$, followed by treatment with I $_2$ vapor, UV light, and 50% H $_2\rm SO_4$ spray, resulting in >90% recovery. "The differentiation of various lipids was possible using the additive nature of IR."

[from Chemical Abstracts 88(24):#176881u. 1978]

C-1239-78

HYDROCARBONS OF A CHITON

Yasuda, S., and N. Fukamiya. 1977.

Bulletin of the Japanese Society of Scientific Fisheries 43(10):1249.

Chromatography, Hydrocarbons, Mollusks, Biogenic hydrocarbons, *Chiton

The hydrocarbons of the mollusk <u>Liolophura japonica</u>, were analyzed because this organism feeds on algae scraped from the surface of rocks. "The unresolved peak envelope of a gas chromatogram of the n-alkanes...suggested that the animals were polluted by low levels of oil. However, the presence of considerable amounts of alkenes and squalene indicated that the major part of the hydrocarbons are biogenic."

C-1240-78

HYDROCARBONS OF GONADS OF SEA URCHINS Yasuda, S., and N. Fukamiya. 1977.

Bulletin of the Japanese Society of Scientific Fisheries 43(10): 1175-1180.

Chromatography, Hydrocarbons, Echinoderms, Biogenic hydrocarbons, *Sea urchin gonads

The hydrocarbons of gonads of the sea urchins, <u>Temnopleurus</u> toreumaticus and <u>Anthocidaris crassispina</u>, were examined by gas liquid chromatography. The similarity of most of the hydrocarbons found in the urchin gonads with those of green algae suggests a dietary origin. "...Biological origin of the hydrocarbons and the absence of pollution by oil in the gonads of sea urchins used were clearly indicated by the predominance of C-17 n-alkane and C-17 n-alkene, the absence of phytane, and the lack of an unresolved envelope in their GLC."

C-1241-78

ELECTROANALYTICAL ESTIMATION OF SEAWATER POLLUTION BY ORGANIC SUB-STANCES. ANALYSIS OF NORTH ADRIATIC SAMPLES

Zyonaric, T., Z. Kozarac, V. Zutic, B. Cosovic, and M. Branica

Zvonaric, T., Z. Kozarac, V. Zutic, B. Cosovic, and M. Branica. 1976.

Rapport et procès-verbaux des réunions. Commission internationale pour l'exploration scientifique de la Mer Méditerranée, Monaco, 23(7):55-56.

Analytical techniques, Contaminants, Seawater, Surfactants, Source identification, Mediterranean Sea, *Electroanalysis

"Surfactant activity of organic pollutants and of surfactants of biological origin were studied by electroanalytical methods. ... The applicability of the electroanalytical methods for simple and rapid estimation of source and level of pollution of seawater by organic substances is discussed." [possibly oil pollution related]

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4):#4476-1Q8. 1978]

6. SOURCE IDENTIFICATION

C-1242-78

WHO SPILLED THE OIL

Bentz, A.P. 1978.

Analytical Chemistry 50(7):655A-658A.

Source identification, Analytical techniques, Chromatography, Spectroscopy, *Fluorescence, *IR analysis

The analytical methods used in oil spill source identification are discussed; those most suitable for analysis of weathered oils are thin-layer chromatography, gas chromatography, fluorescence, and IR spectroscopy. The use of more than one method assumes statistical confidence in the analysis and eliminates the effects produced by contaminants on individual methods.

C-1243-78

INVESTIGATION ON DRILLING CORES OF SEDIMENTS OF LAKE CONSTANCE. I. PROFILES OF THE POLYCYCLIC AROMATIC HYDROCARBONS. N-CONTAINING POLYCYLIC AROMATIC HYDROCARBONS, POLYCYCLIC AROMATIC HYDROCARBONS-PROFILE AND SOURCE OF EMISSION, HIGH BURDENED LAYERS 1965-1970 [English summary]

Grimmer, G., and H. Bohnke. 1977.

Zeitschrift fuer Naturforschung 32c(9-10):703-711.

Source identification, PAH, Sediments, Lakes, Germany, *Lake Constance

Thirty-two PAHs and 10 nitrogen-containing PAHs were identified from sediment layers in areas of Lake Constance, Germany, differently exposed to environmental burden. A comparative profile analysis is presented, and the qualitative and quantitative composition of the PAH fraction (PAH-profile) is determined. Results indicate that potential sources such as automobile traffic, petroleum, fuel oil, and used lubricating oil can be excluded. "Coal combustion smoke gas" appears to be the primary source.

C-1244-78

CHARACTERIZATION OF TAR BALLS BY HIGH SPEED GEL PERMEATION CHROMA-TOGRAPHY

Higashi, K., and K. Hagiwara. 1977.

Bunseki Kagaku 26(11):743-747.

Source identification, Chemical analysis, Chromatography, Tar, Crude oil, Fuel oil, *High speed gel permeation method

Chromatography of tar balls and detection at 254 nm resulted in chromatograms that enabled recognition of the tar balls as originating from crude oil, fuel oil B, or fuel oil C. The method shows satisfactory sensitivity and reproducibility.

[from Chemical Abstracts 88(26):#197310x. 1978]

C-1245-78

METHODS OF IDENTIFYING SOURCE OF PETROLEUM FOUND IN THE MARINE ENVIRONMENT. REPORT II

Scolnick, M.E., A.C. Scott, and M. Anbar. 1976.

Perport USCG-D-37-77 CGR/DC-11/77 Contracts DOT-CG-81-74-1187

Report USCG-D-37-77, CGR/DC-11/77, Contracts DOT-CG-81-74-1187, DOT-CG-22996-A. 94 p. Final report 26 Jun 72 - 17 May 76.

Source identification, Fuel oil, Petroleum products, Spectrometry, Models, Detection, Statistical analysis

"The identification of oils by field ionization mass spectrometry is reported. Two multivariate data analysis models are described; a parametric statistical model that is based on the assumption of stochastic independence and an empirical model that can be used in a 'learning machine' mode. The results of applying the empirical model to 154 quadrupole spectra and 42 sector magnet spectra are reported."

[from Government Reports Announcements 78(2):#AD-A046 256/4GA. 1978]

C-1246-78

CONTENT AND CRITERIA FOR THE IDENTIFICATION OF NATURAL HYDROCARBONS IN SURFACE WATERS [in Russian]
Semenov, A.D., A.G. Stradomskaya, and L.F. Pavlenko. 1977.
Gidrokhimicheskie Materialy, Vol. 66:96-103.

Source identification, Hydrocarbons, Biogenic hydrocarbons, Seawater, Freshwater, Phytoplankton, Bacteria, *Review

"This review, with 24 references, shows that substantial amounts of hydrocarbons can be produced by phytoplankton and bacteria; concentrations in seawater and fresh water may be \leq 200 μ g/L." [possibly oil pollution related]

[from Chemical Abstracts 89(6):#48538w. 1978]

B. OIL POLLUTION PREVENTION AND CONTROL

1. SPILL CONTAINMENT

C-1247-78
ANTIPOLLUTION FLOATING BARRIER
Schluep, C.A. 1977.
French Patent 2,329,808

Spill containment, Booms, Equipment, Beaches, Hydrocarbons, Patent The barrier, which contains a hydrophobic absorbing material, "is intended for the protection of beaches and river banks from debris and from hydrocarbon spills."

[from Petroleum Abstracts 17(42):#239,535. 1977]

C-1248-78

OIL SLICK RETAINING BOOM FOR OFF-SHORE WELLS Sessions, B.J. 1977.
US Patent 4,043,131

Spill containment, Booms, Platforms, Patent, Equipment

"A floating barrier for disposition upon a body of water and surrounding an offshore oil well is described."

[from Petroleum Abstracts 17(47):241,041. 1977]

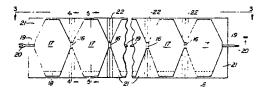
4,043,131 OIL SLICK RETAINING BOOM FOR OFF-SHORE OIL WELLS

Byron J. Sessions, 4939 Havasu Way, Salt Lake City, Utah 84120

> Filed Apr. 9, 1976, Ser. No. 675,253 Int. Cl.² E02B 15/04

U.S. Cl. 61-1 F

8 Claims



C-1249-78

FLOATING LOADER FOR A FLEXIBLE ANTIPOLLUTION BARRIER Soler, C., and G.R. Delamare. 1977. French Patent 2,324,504

Spill containment, Pollution control, Booms, Patent, Equipment An invention for deploying an antipollution barrier is described. [from Petroleum Abstracts 17(39):#238,796. 1977]

C-1250-78

FIELD TRIALS-OPERATION PREPAREDNESS, ST. LAWRENCE RIVER, LISBON BEACH, JUNE 19-23, 1978

Vanderkooy, N. 1978.

Spill Technology Newsletter 3(4):27-42.

Spill containment, Pollution control, Booms, Equipment, Product information, US, Canada, *Field trials

As part of a joint US-Canadian spill preparedness program, field trials of three commercially available containment booms were conducted at Lisbon Beach. The objectives were to: 1) determine any correlation between the present boom evaluation trials and similar trials held in 1974-1975; 2) evaluate barriers not previously included; and 3) develop operational deployment procedures at the Lisbon Beach site. The results of testing the Flexy Standard No. 2 boom, the Guard SUP 75x25 boom, and the ZOOM Series 12 boom are illustrated and discussed.

2. CLEANUP AND REMOVAL

C-1251-78

ARMADILLO SKIRTS: SSACV STRADDLE CARGO TRANSPORTER: SSACV OIL SKIMMER

Anon. 1977.

Hovering Craft & Hydrofoil; The International Review of Air Cushion Vehicles and Hydrofoils 16(7-8).

Equipment, Product information, Skimmers, Spill removal, *SSACV Oil Skimmer, Patent, Design-engineering

The three title products are explained, and their applications are listed. The Semi-Submerged Air Cushion Vehicle (SSACV) Oil Skimmer is a composite vehicle capable of spill removal by two methods: the pressure skimming method and the suction skimming method. Tests on the products are forthcoming and patents are applied for.

[from Oceanic Abstracts 15(2):#78-02054. 1978]

C-1252-78

BAY SKIMMER: CONVENTIONAL HULL OIL SKIMMER WILL SEE DUTY ON IRELAND'S BANTRY BAY

Anon. 1977.

Work Boat 34(8):70-71.

Skimmers, Equipment, Design-engineering, Deepwater ports, Product information, Ireland, *Bay Skimmer

The <u>Bay Skimmer</u> is a 68'-long, \$1 million vessel designed and engineered by JFB Scientific Corporation, constructed by Blount Marine Corporation, and used by Gulf Oil Corporation, which operates a deepwater port in the title area. Designed to collect oil in 4' seas and make headway in 8' seas, the skimmer collects oil by forcing it under the surface of water, based on the Dynamic Inclined Plane concept.

[from Oceanic Abstracts 15(1):#00627. 1978]

C-1253-78

NEW BOATS

Anon. 1977.

Work Boat 34(7):19,37.

Skimmers, Equipment, Design-engineering, Product information, Spill cleanup, Ireland, *Bantry Bay

The 68 ft <u>Bay Skimmer</u> is a custom-built deepwater oil cleanup vessel and is operated by Gulf Oil in Ireland's Bantry Bay. The boat is desgined to also serve as a patrol and fire vessel.

[from Oceanic Abstracts 14(6):#77-05938. 1977]

C-1254-78

PERFECTION OF A SKIMMER FOR RECOVERY OF OIL SPILLS [in Spanish] Anon. 1977.

Petroleum International 35(9):46.

Spill removal, Equipment, Design-engineering, Skimmers, Product information

A paddlewheel skimmer developed by Lockheed is capable of recovering spilled oil at a rate of 3800 L/min.

[from Petroleum Abstracts 17(48):#241,470. 1977]

C-1255-78

POLLUTION REVIEW

Anon. 1977.

Shipping World and Shipbuilder 170(3925):121,125,127,129,131.

Equipment, Pollution prevention, Spill containment, Spill removal, Design-engineering, Product information

Development of antipollution technology is in three main areas: prevention of discharge of oily water into the ocean, containment, and removal. New prevention devices include an antipollution valve, a vacuum sewage system, and a Bailey Bilge Monitor. New containment equipment includes the Seaboom system for refineries, the Drizit for mopping-up oil spills, the Vikoma Seapack, and the

mobile response trailer. Removal developments include the Seaskimmer system, the Mark 4 Skimmer, and the oil spill recovery vessel, Clean Sounder.

[from Oceanic Abstracts 14(5):#77-04751. 1977]

C-1256-78

A REVOLUTIONARY SKIMMER WITH A CATAMARAN HULL

Anon. 1977.

Work Boat 34(7):26-27.

Skimmers, Equipment, Design-engineering, Spill removal, Product information, *Dynamic Oil Skimmer

Developed jointly by Oil Mop Inc. and Lantana Boatyard, Inc., the Dynamic Oil Skimmer is a 38 ft long aluminum catamaran powered by two diesel engines. The skimmer consists of a series of 10 in diameter rope mops in continuous loops between hulls. As the vessel moves through the water, the mops are pulled from the bow where oil is absorbed to the stern where wringers squeeze oil from the mops; the oil collects in a trough on deck. Each mop can pick up >40 bbl/hr, and a total of 250 bbl/hr is possible.

[from Oceanic Abstracts 14(6):#77-05940. 1977]

C-1257-78

NOFI-FENCE AND FRAMO-SKIMMER - THE ONLY EQUIPMENT OF ANY USE DURING THE BRAVO INCIDENT (product information) Author unknown. 1977.

Scandinavian Oil-Gas Magazine 5(5-6):13-14.

Spill cleanup, Product information, Design-engineering, Equipment, Skimmers, Ekofisk blowout

The title fence and skimmer, of Norwegian design, are described. The skimmer has a capacity of 400 tons per hr and is useful in waves up to 4 m and winds up to 30 knots. These were the only fence and skimmer to function satisfactorily during the Ekofisk Bravo blowout in the North Sea.

[from Petroleum Abstracts 17(38):#238,466. 1977]

C-1258-78

PROCESS AND APPARATUS FOR RECOVERY OF OIL LEAKS Albano, R.R., and [Obras Maritimas Civil CA]. 1977. French Patent 2,328,801

Spill removal, Design-engineering, Equipment, Patent

A floating vehicle with rotating collector cylinders, collector wipers, and a storage compartment is designed for the recovery of oil spills.

[from Petroleum Abstracts 17(50):#241,927. 1977]

C-1259-78

COMPOSITION FOR REMOVING PETROLEUM AND PETROLEUM PRODUCTS FROM WATER SURFACES

Antonova, N.M., T.M. Gel'fer, O.S. Mochalova, K.G. Mizuch, et al. 1978.

USSR Patent 596,547

Spill removal, Dispersants, Crude oil, Petroleum products, Patent

The efficiency of removal of crude oil and petroleum products is increased by the addition of 50-90 weight % of N-containing polyethylene polypropylene glycol to a specified dispersant composition.

[from Chemical Abstracts 89(6):#48749r. 1978]

C-1260-78

NEW PROCEDURES FOR THE TOXICITY TESTING OF OIL SLICK DISPERSANTS IN THE UNITED KINGDOM

Blackman, R.A.A., F.L. Franklin, M.G. Norton, and K.W. Wilson. 1978. Marine Pollution Bulletin 9(9):234-238.

Dispersants, Oil slicks, Toxicity, Analytical techniques, Environmental effects, *Licensing, Spill cleanup, Beach cleanup, UK

The authors present technical descriptions of the different methods used to test dispersants used on the open sea and those applied to oiled beaches. Results of the sea test show that conventional dispersants tend to neutralize or inhibit the toxicity of dispersed oil, whereas concentrates may increase the toxicity. In the beach test mortalities of limpets exposed to crude oil alone range from 67 to 93%; the addition of dispersant leads to a wider range, 22 to 96%. Licensing standards and procedures for dispersant use in the UK under the Dumping at Sea Act 1974 are given.

C-1261-78

DEVICE FOR SUCKING THE UPPER LAYER OF A POLLUTED WATER SURFACE Chaston-Bagnis, L. 1977. US Patent 4,008,156

Spill removal, Skimmers, Equipment, Design-engineering, Oil-water separation, Patent, *Vacuuming

"A device is described for vacuuming the upper layer of polluted water surfaces... The water and oil in the storage compartment separate by flotation."

[from Petroleum Abstracts 17(45):#240,499. 1977]

4,008,156

DEVICE FOR SUCKING THE UPPER LAYER OF A POLLUTED WATER SURFACE

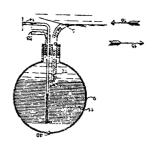
Lucien Chastan-Bagnis, 21 Avenue Isola Bella, 06400 Cannes,

France

Filed July 3, 1975, Ser. No. 592,904 Claims priority, application France, July 4, 1974, 74.24592

Int. Cl.² E02B 15/04 U.S. Cl. 210—242 R

3 Claims



C-1262-78

SPILLED OIL RETRIEVER AND ANTI-WATER POLLUTION WATER CRAFT Cocjin, D.L, and A.M. Masongsong. 1977. US Patent 4,033,876

Spill removal, Design-engineering, Skimmers, Oil-water separation, Equipment, Patent

The design of this water craft allows oil to be scooped up from the water surface and deposited into an oil-water separation tank in the rear of the hull.

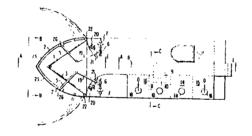
[from Petroleum Abstracts 17(45):#240,498. 1977]

4,033,876 SPILLED OIL RETRIEVER AND ANTI-WATER POLLUTION WATER CRAFT

Diosdado L. Cocjin, Quezon City, and Artemio M. Masongsong, Manila, both of Philippines, assignors to Diosdado L. Cocjin, Quezon City, Philippines Filed Feb. 6, 1976, Ser. No. 655,937 Int. Cl.² E02B 15/04

U.S. Cl. 210-242 S

3 Claims



C-1263-78

PROCESS AND APPARATUS FOR THE RECOVERY OF SHEETS OF POLLUTING MATERIAL FLOATING ON THE SURFACE OF A BODY OF WATER Delamare, G.R. 1977.

French Patent 2,324,807

 $\label{thm:local_problem} \begin{tabular}{llll} Hydrocarbons, Spill cleanup, Skimmers, Design-engineering, Patent, \\ Equipment \end{tabular}$

"This apparatus consists of a tank with at least 2 elements carried at the top of a transversal beam. The beam carries on both sides of the tank at least 2 cyclone separators. The apparatus is used to recover hydrocarbons spilled onto the surface of the sea, rivers, and lakes."

[from Petroleum Abstracts 17(39):#238,793. 1977]

C-1264-78
WATERCRAFT FOR SCAVENGING OIL SPILLAGE
Fletcher, G.M. 1978.
US Patent 3,929,644

Spill removal, Oil-water separation, Skimmers, Patent, Equipment "A floating vessel with scooping of a surface layer of oil and water, followed by separation within the vessel." [sic]

[from Environmental Technology & Economics No. 16:6. 1978]

3,929,644
WATERCRAFT FOR SCAVENGING OIL SPILLAGE
George M. Fletcher, 456 Lee St., Oakland, Calif. 94610
Filed Dec. 28, 1970, Ser. No. 101,964
Int. Cl.² E02B 15/04
U.S. Cl. 210—242

5 Claims

24 266 42a 49a 42a 49a 42a 28a 62a 62a

C-1265-78
DISPERSING AN OIL SPILL
[Imperial Chemical Industries Ltd.]. 1977.
Netherlands Application 76 14,136

Dispersion, Surfactants, Oil spills, Design-engineering, Patent, Equipment

Surface water contaminated by oil is passed through a Venturi-type device in which the pressure is reduced. "The flow velocity of the water is 22.5 225 L/min. The apparatus used comprises a Venturi ejector whose inlet is connected to the water supply, where the outlet has means for spraying the mixture of water and the surfactant. The flow of water and the surfactant is controlled by valves and means for measurement."

[from Chemical Abstracts 88(24):#176768m. 1978]

C-1266-78

PROCESS AND APPARATUS FOR REMOVING POLLUTING SUBSTANCES FROM THE SURFACE OF WATER BY ULTRASONIC MEANS Koblanski, J.N. 1977.
French Patent 2,324,808

Spill cleanup, Equipment, *Ultrasonic transducer, Patent

An ultrasonic transducer, driven by an A-C source, is maintained below the water surface. The pollutant is forced upward by the ultrasonic waves and is collected before falling back onto the water surface. The method can be applied for oil spill cleanup.

[from Petroleum Abstracts 17(39):#238,790. 1977]

C-1267-78

COMPOUND AND PROCEDURES FOR DISPERSAL OF OIL PRODUCT SPILLS [Lankro Chemicals Group Ltd.]. 1977. French Patent 2,330,653

Spill cleanup, Dispersants, Emulsifiers, Patent

A solvent mixture of an emulsifying agent, a diester-type solvent, and an agent which lowers the drop point, is diluted with seawater and used to disperse an oil spill at sea.

[from Petroleum Abstracts 17(50):#241,928. 1977]

C-1268-78

COASTAL OIL POLLUTION

McGee, R. 1977.

Technology Ireland, June 1977:45-46.

Spill cleanup, Booms, Skimmers, Dispersants, Contingency planning, Government agencies, Tankers, Coasts, Ireland

This article provides a brief review of the risks involved in oil transport along the coast, the handling of spilled oil, the methods and equipment employed in spill cleanup, and the agencies responsible for developing and implementing contingency plans in the event of an oil spill off the Irish coast.

C-1269-78

OIL SKIMMER (product information)
[Marine Construction and Design]. 1978.
Environmental Science and Technology 12(12):1334.

Skimmers, Equipment, Safety, Product information

Designed for use in potentially explosive environments, the rotating disc oil-spill skimmer consists of an explosion-proof electric motor-driven hydraulic power unit and pump. Diesel or gasoline hydraulic-powered units, and pneumatic or electrohydraulic powered units are available.

C-1270-78

USE OF MICROORGANISMS IN COMBINATION WITH SURFACE ACTIVE AGENTS TO SYNERGISTICALLY DISPERSE OIL SLICKS Mohan, R.R., M.L. Robbins, A.I. Laskin, and L.A. Naslund. 1977. British Patent 1.484.512

Spill cleanup, Dispersants, Microorganisms, Biodegradation, Patent

A chemical dispersant chosen from sorbitan monooleates, polyoxyalkylene adducts of sorbitan monoesters, polyethoxylated fatty acid amides and dialkylsulfosuccinate is used in conjunction with a microorganism for dispersing an oil spill.

[from Petroleum Abstracts 17(50):#241,929. 1977]

C-1271-78

HYDROCARBON SPILL CLEANER (product information) [Natural Hydrocarbon Elimination Co.]. 1978. Environmental Science and Technology 12(4):478.

Hydrocarbons, Spill cleanup, Bacteria, Ballast, Biodegradation, Product information, Oil discharges, Seawater, Freshwater

"This biological additive, consisting of strains of hydrocarbon-consuming bacteria, can be used to clean up oil slicks and other hydrocarbon spills in marine or fresh waters. It can also be used as a preventative treatment of bleedwater and overboard discharges from offshore wells or to eliminate hydrocarbons from tanker ballast."

C-1272-78

REMOVING CRUDE OIL, PETROLEUM PRODUCTS, AND THEIR DERIVATIES FROM POTABLE WATER AND SALT WATER Olivieri, R., A. Robertiello, and L. Degen. 1978. German Offenlegungsschriften (unexamined patent application) 2,739,428

Freshwater, Seawater, Biodegradation, Spill removal, Patent *P and N compositions

"Oil spills are removed from natural and salt waters by using compositions containing P and N in a form which can be assimilated easily by petroleum degrading microorganisms, e.g., lecithin, posphatides, hydantoins, ureido derivatives of aldehydes, and amides."

[from Chemical Abstracts 89(2):#11920p. 1978]

C-1273-78 OIL MOP Rhodes, H.M. 1977. Canadian Patent 1.011,658

Spill removal, Design-engineering, Equipment, *0il mop, Patent An oil mop for the removal of oil from a water surface is described. [from Petroleum Abstracts 17(46):#240,804. 1977]

C-1274-78

BUZZARDS BAY OIL SPILL - AN ARCTIC ANALOGUE Ruby, C.H., L.G. Ward, I.A. Fischer, and P.J. Brown. 1977. International Conference on Port and Ocean Engineering Under Arctic Conditions, 4th, Memorial University of Newfoundland, September 26-30, 1977. Preprint.

Bouchard 65 spill, Spill cleanup, Ice, Fate, Behavior, Fuel oil, Buzzards Bay

The barge <u>Bouchard</u> <u>65</u> spilled 81,000 gal of #2 fuel oil into Buzzards Bay, Massachusetts on January 28, 1977. This paper analyzes that spill and the cleanup efforts with special attention to the behavior of oil in a costal area with winter ice cover. Considerations specific to dealing with oil-contaminated ice include slower oil dispersal, potential protection of beach and shore areas, confinement of oil within restricted zones, drift of contaminated ice, secondary pollution when the ice melts, and constrained cleanup methods and effectiveness.

C-1275-78
ABSORBING LIQUIDS
[Serlachius (G A) 0/Y]. 1976.
British Patent 1.456.891

Oil slicks, Spill cleanup, Incineration, *Combustion, Patent
A phenolic foamed resin agent is set afire on an oily water surface
and acts as a wick by sucking up burning oil and thereby causing
complete combustion of the oil.

[from Petroleum Abstracts 17(40):#239,050. 1977]

C-1276-78

OIL SPILL ABSORBENT

Tsushi, H. 1977.

Japanese Kokai (unexamined patent application) 77 72,387

Spill cleanup, Absorption, Patent, *Magnetic sorbent powder

"A powdery absorbent useful for removal of spilled oils from water is made by mixing a porous powder such as sawdust with ferrite, dividing into suitable sizes, and coating with an oleophilic substance such as paraffin." Spilled oil penetrates the paraffin and is absorbed by the sawdust. The ferrite allows the sorbed material to be collected easily by using a strong magnet.

[from Chemical Abstracts 89(2):#11904m. 1978]

OIL TRANSFER AND TRANSPORT

C-1277-78

EXXON TECHNIQUE WILL KEEP OIL OUT OF MARINE ENVIRONMENT Anon. 1977.

Environmental Science and Technology 11(12):1046-1047.

Tankers, Crude oil washing, Ballast, Oil discharges, Oil terminals, Oil transfer, Pollution prevention

Exxon has found that crude oil washing applied to cargo tanks in port reduces the oil residues retained on board ship by at least two-thirds the amount which remains following a conventional water washing. Spraying cargo tanks with a strong jet of crude oil dissolves sludge and clingage (layers of residues on vertical surfaces) which resist water washing. The crude oil washings are pumped ashore along with the rest of the cargo.

C-1278-78

APPARATUS AND METHOD FOR DETECTING, LOCATING, AND OPTIONALLY IN-DICATING LEAKS IN PIPELINE SEGMENTS Brandes, B. 1977. British Patent 1,481,850

Pipelines, Leakage, Detection, Patent

An apparatus is described for detecting, locating, and optionally indicating leaks in electrically conductive pipelines. [possibly oil pollution related]

[from Petroleum Abstracts 17(50):#241,907. 1977]

C-1279-78

STRATEGIC PETROLEUM RESERVE FOR WEEKS ISLAND/COTE BLANCHE MINES Federal Energy Administration. 1977.

Report FEA/S-77/228, FEA/7677-7-Sup. 258 p. Final environmental impact statement. (Supplement to PB-263 051 and PB-263 075.)

Crude oil, Storage, Oil transfer, Pipelines, Louisiana, FEA, *Strategic Petroleum Reserve

An 89 million bbl crude oil storage facility at the Weeks Island Mine and a 27 million bbl crude oil storage facility at the Cote Blanche Island Mine are being developed. The oil transportation systems proposed in the Final EIS's were revised to provide direct connection by pipeline to the existing oil distribution system at St. James, Louisiana. This supplement deals with the construction and operation of the revised system. [possibly oil pollution related]

[from Government Reports Announcements 78(1): #PB-272 765/9GA. 1978]

C-1280-78

SEA TRANSPORT OF OIL FROM VALDEZ (editorial) Waldichuk, M. 1978.
Marine Pollution Bulletin 9(9):225-226.

Ports, Pipelines, Pollution prevention, Canada, Washington, *Pacific coast, *Risk analysis, *Trans-Alaska Pipeline

Alternative routes to the world markets for the crude oil delivered through the Trans-Alaska Pipeline to its terminal point, Valdez, on the south coast of Alaska are scrutinized with regard to the risks of oil pollution on the British Columbia coast. The author favorably reviews a Canadian government report Potential Pacific Coast Oil Ports: A Comparative Environmental Risk Analysis (March 1978) which ranks eleven ports on the basis of biological risk, economic risk, and social risk indices.

4. WASTE TREATMENT AND DISPOSAL METHODS

C-1281-78

ANTI-POLLUTION SYSTEM (product information)

Anon. 1977.

Marine Engineers Review, July 1977:37.

Sludge, Incineration, Ships, Product information, Pollution prevention, *EDCO/CITEX system

EDCO GmbH, Hamburg, and the CITEX Gastechnik, Hamburg, have developed and constructed the EDCO/CITEX marine system for preventing pollution, which claims to handle all wastes, solids, galley garbage, and sludge on board ships and kills all bacteria in the sewage water for overboard pumping. The system is composed of a Type CEAK sewage treatment plant and a type CEAV incinerator. The incinerator burns all types of wastes, galley garbage, packing, solids from the sewage treatment plant, and oil sludge.

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #4459-108. 1978]

C-1282-78

A STRONG ATTACK ON THE PROBLEM OF OIL POLLUTION Anon. 1978.

Environmental Science and Technology 12(4):373.

Oil-water separation, Flotation, Wastewater treatment, Product information, *Asphalt plant, *Ohio River

Use of a dispersed air flotation unit was initiated at Chevron's asphalt plant at Cincinnati, Ohio. Despite the use of an API oil/water separator some oil previously remained in the factory effluent. Now the oil remnant is handled with a polyelectrolyte, which aids coagulation and breaks up emulsions. Flotation is the next step, and the resulting clean water is retained for a minimum of 8 hours before discharge to the Ohio River.

C-1283-78

ANALYSIS OF REFINERY WASTEWATERS FOR THE EPA PRIORITY POLLUTANTS American Petroleum Institute. 1978. API Publication 4296. - p.

Wastewaters, Refineries, Contaminants, EPA, API, Sampling, Analytical techniques

"Intake waters, wastewater feed to biotreatment units, and final effluent streams from 17 petroleum refineries were sampled by the EPA within the past year to screen for the presence or absence of the 129 substances on the EPA Priority Pollutant list. Concurrently, an API contractor and/or various individual petroleum companies sampled nine of the 17 refineries.... Although the combined EPA-API data base is limited both in scope and accuracy, it does indicate that many (approximately 65%) of the Priority Pollutants are not present in refinery effluents. In addition, most of the pollutants detected are generally found at extremely low levels and are not uniformly present among refineries sampled nor in replicate samples taken within a single refinery."

C-1284-78

WASTEWATER TREATING AGENTS

Arita, H. 1977.

Japanese Kokai (unexamined patent application) 77 99,647

Wastewater treatment, Absorption, Sorbents, Patent

An inorganic absorbent, fibrous organic matter or its dry distillate, activated carbon or ash, and $CaSO_4$ are used to prepare the treating agent. When 1 L of a suspension of kerosine, soy bean oil, and surfactant was passed through a column containing the agent, the treated effluent was transparent.

[from Chemical Abstracts 88(26):#197191j. 1978]

C-1285-78

INDUSTRIAL PROCESS PROFILES FOR ENVIRONMENTAL USE: CHAPTER 3. PETROLEUM REFINING INDUSTRY

Dickerman, J.C., T.D. Raye, J.D. Colley, and R.H. Parsons. 1977. Report EPA/600/2-77/023c, Contract EPA-68-02-1319. 148 p. Initial report Aug 75 - Nov 76.

Refineries, Environmental effects, Wastewaters, *Processing, *Catalog

The catalog chapter discusses the title industry in five sections: crude oil separation, light hydrocarbon processing, middle distillate processing, residual hydrocarbon processing, and auxiliary processes. Thirty-two process descriptions include data on input materials, operating parameters, utility requirements, and waste streams. The catalog was produced to aid in defining the environmental impacts of US industries. [possibly oil pollution related]

[from Government Reports Announcements 78(2): #PB-273 649/4GA. 1978]

C-1286-78

SLUDGE SEPARATION

Ito, M., O. Yamamoto, and K. Horiuchi. 1977. Japanese Kokai (unexamined patent application) 77 49,749

Sludge, Dispersion, Precipitation, Filtration, Patent

Oily sludges are dispersed in water, followed by precipitation and separation of the sludge by filtering, screening, or passing through a packed column.

[from Chemical Abstracts 89(6):#48485b. 1978]

C-1287-78

WASTE WATER PURIFICATION BY FLOTATION

Jobski, H. 1978.

German Offenlegungsschriften (unexamined patent application) 2,652,329

Wastewater treatment, Refineries, Flotation, Equipment, Patent, *Aeration turbine

Refinery wastewaters containing hydrocarbons are treated by air bubble flotation, using an aeration turbine which results in a hydrocarbon separation of 80-90%.

[from Chemical Abstracts 89(6):#48529u. 1978]

C-1288-78

PRODUCT, WHICH ACCELERATES THE BIOLOGICAL DEGRADATION OF HYDRO-CARBONS, IN WHICH CALCIUM LIGNIN SULFONATE DISSOLVES IN WATER AND COMPLEXES WITH A SALT OF A RARE EARTH METAL AND AN ABSORPTIVE SUBSTANCE

Jodehl, A.P. 1977.

Swedish Patent 395,471

Waste oil treatment, Biodegradation, Patent, *Catalyst

Preparation of the title product is described. When added to oil-containing waste, the degradation rate of the oil was doubled.

[from Chemical Abstracts 88(26):#197150v. 1978]

C-1289-78

REMOVAL OF OILS FROM WASTEWATER BY REVERSE OSMOSIS APPARATUS Kijima, J. 1977.

Japanese Patent 77 43.629

Wastewater treatment, Oil-water separation, *Reverse osmosis, Patent

Degraded membrane modules and membranes used for desalinization are installed in the reverse osmosis apparatus to improve oil removal efficiency.

[from Chemical Abstracts 88(26):#197147z. 1978]

C-1290-78

ULTRAFILTRATION: AN EMERGING UNIT OPERATION

Klinkowski, P.R. 1978.

Chemical Engineering 85(11):164-173.

Waste oil treatment, Ultrafiltration, Emulsions, Wastewaters

A discussion is presented on ultrafiltration and its applications in oil-emulsion waste treatment and other processes.

[from Chemical Abstracts 89(4):#26579h. 1978]

C-1291-78

BREAKING EMULSIONS IN NAVY BILGE COLLECTION AND TREATMENT SYSTEMS Little, R.C., and R.L. Patterson. 1978. Environmental Science and Technology 12(5):584-590.

Oil-water separation, Bilges, USN, Wastewater treatment, Emulsions, *Demulsification

In order to conform with new EPA regulations the Navy has radically altered its bilge waste collection and treatment system. Results of the search for a suitable chemical demulsifier to use in conjunction with the new system are reported in detail in this article. Certain quaternary ammonium compounds were effective in breaking oil-in-seawater emulsions.

C-1292-78

ELECTROFLOTATION-COAGULATIONAL PURIFICATION OF OIL EMULSION WASTE WATERS CONTAINING A NONIONIC EMULSIFIER [in Russian] Men, S.K., T.P. Bondaryuk, T.G. Shelektina, and T.I. Subbota. 1977. Ochistka Vodnogo i Vozdushnogo Basseinov na Predpriyatiyakh Chernoi Mettallurgi, No. 6:17-20.

Wastewater treatment, Flotation, *Coagulation, Emulsifiers, Oil-water separation

Summary not available.

[from Chemical Abstracts 88(24):#176739d. 1978]

C-1293-78

TREATMENT OF WASTE WATER

Mohri, M., H. Takeda, M. Tsunemi, T. Uchiumi, and T. Kanda. 1978. German Offenlegungsschriften (unexamined patent application) 2,740,768

Wastewater treatment, *Fluidized beds, Patent

"Wastewater containing oil is degraded in fluidized beds containing active C; the beds also contain porous packing materials to prevent C loss."

[from Chemical Abstracts 88(26):#197178k. 1978]

C-1294-78

PILOT-SCALE STUDIES OF THE LEACHING OF INDUSTRIAL WASTES IN SIMULATED LANDFILLS

Newton, J.R. 1977.

Water Pollution Control (Maidstone, England) 76(4):468-480.

Waste oil, Disposal, *Landfills, Emulsions, Industries, *Leaching, *Pilot study

An aqueous-oil emulsion was one of 3 industrial wastes studied. After 2.5 years, the quantity of oil leached was <2% of that added and the concentration in the leachate did not exceed 30 mg/L.

[from Chemical Abstracts 88(26):#197053r. 1978]

C-1295-78

PETROCHEMICAL EFFLUENTS: THE EUROPEAN EXPERIENCE OF TREATING WASTEWATERS BY BIOLOGICAL TREATMENT SCHEME Niist, S.J. 1978.

Environmental Science and Technology 12(6):652-656.

Wastewaters, Petrochemicals, Models, Biological treatment, Cost analysis, Europe

Evaluating treatment methods for effluent from petrochemical plants by the use of models, the Petrochemicals/Ecology Sector Group of CEFIC, the European Council of Chemical Manufacturers' Federations, rated biological treatment highest. Even though the most cost/effective method, it represented 10 to 20% of the annual profits.

C-1296-78

PLANT-SOIL ASSIMILATIVE CAPACITY FOR OILS

Pal, D., and M.R. Overcash. 1978.

AIChE National Meeting, 85th, Philadelphia, Pennsylvania, June 1978. Preprint.

Waste oil, Disposal, Design-engineering, Environmental effects, Vegetation, Soil, *Land application

Research efforts included the evaluation of the practice of oil waste land application, the assessment of performance and design criteria, and the establishment of basic environmental constraints for this process. This paper describes the elements of the land receiver, discusses the processes involved in plant-soil assimilation of petroleum oils, and details the basic design criteria.

C-1297-78

ADSORBENT FOR WASTEWATER TREATMENT Sato, H., F. Itani, and S. Saiki. 1977.

Japanese Kokai (unexamined patent application) 77,105,653

Wastewater treatment, Oil-water separation, Sorbents, Adsorption, Patent, *Sorbent fibers

"A mixture containing fiber forming acrylonitrile polymer and Mg(OH)₂ at (2-10)-fold of the polymer is spun to fibers...to obtain the agent for treating wastewaters....The fibers were packed in a glass column, then 450 ppm turbidity oil-containing wastewater was passed through the column to contain 0 ppm turbidity."

[from Chemical Abstracts 88(26):#197193m. 1978]

C-1298-78

ADSORBENT FOR WASTEWATER TREATMENT

Sato, H., F. Itani, and S. Saiki. 1977.

Japanese Kokai (unexamined patent application) 77,105,654

Wastewater treatment, Oil-water separation, Adsorption, Sorbents, Patent, *Sorbent fibers

"A mixture containing polystyrene [9003-53-6] and MgO at (2-10)-fold of the polystyrene is granulated or extruded to $500-5000\mu$ diameter to obtain an adsorbent for wastewater treatment." Adsorption capacity of the fibers is 0.02 g oil/g fiber.

[from Chemical Abstracts 88(26):#197194n. 1978]

C-1299-78

OIL-CONTAINING WASTEWATER TREATING AGENT

Sato, H., F. Kotani, and H. Uchida. 1977. Japanese Kokai (unexamined patent application) 77,101,860

Wastewater treatment, Adsorption, Sorbents, Patent

An oil-containing wastewater is treated with an agent containing the inorganic adsorbent $Mg(OH)_2$ and a hydrophilic organic substance such as cellulose. In a test, the adsorption capacity of the material was 0.13 g oil/q adsorbent.

[from Chemical Abstracts 89(2):#11677q. 1978]

C-1300-78

WASTEWATER TREATING AGENT

Sato, H., F. Kotani, and S. Saiki. 1977.

Japanese Kokai (unexamined patent application) 77,101,859

Adsorption, Wastewater treatment, Patent, Sorbents

A granular wastewater treating agent, useful in adsorbing oils and other pollutants, is made from a mixture of MgO and a hydrophilic organic compound, such as cellulose.

[from Chemical Abstracts 89(2):#11676p. 1978]

C-1301-78

SPILL BOOM (product information)

[Slickbar]. 1978.

Environmental Science and Technology 12(10):1214.

Booms, Product information, Equipment

"The spill boom may be used as a permanent barrier in waste ponds, lagoons and at outflows; it is resistant to most hazardous and corrosive materials."

C-1302-78

OIL SPILL: DECISIONS FOR DEBRIS DISPOSAL. VOLUME II. LITERATURE REVIEW AND CASE STUDY REPORTS

Stearns, R.P., D.E. Ross, and R. Morrison. 1977.

Report EPA/600/2-77/153b, Contract EPA-68-03-2200. 166 p. Final report Jun 75 - Aug 76.

Bibliographies, Disposal, Decomposition, Biodegradation, Soils, Environmental effects, *Case studies, *Oil spill debris

A bibliography and summary of current literature concerning oily waste decomposition, migration through soils, and environmental effects are presented. The theoretical limitations on degradation are indicated by calculations. Descriptions and evaluations of effectiveness are also provided for case studies of two sites which used a land cultivation disposal method and of two sites where debris was buried in specially constructed cells.

[from Government Reports Announcements 78(1): #PB-272 953/1GA. 1978]

C-1303-78

REMOVAL OF OILS FROM WASTEWATERS

Uebashi, T., A. Zenno, I. Maruyama, and H. Shiono. 1977. Japanese Kokai (unexamined patent application) 77,116,646

Wastewater treatment, Oil-water separation, Adsorption, Sorbents, Patent, *Sorbent fibers

"Oil adsorbents for removal of oils from wastewaters are made from coarse linter by mixing with 10-30% thermoplastic synthetic fibers and/or semi synthetic fibers such as ethylene-propylene copolymer or 5-30% natural fibers, and by shaping."

[from Chemical Abstracts 89(6):#48458v. 1978]

C-1304-78

OIL CONTAINING WASTE WATERS AND METHODS FOR THEIR PURIFICATION [in Russian]

Yuzhaninov, A.G. 1977.

Okhrana Prirody i Vod Urala, No. 9:7-13.

Wastewater treatment, Oil-water separation, *Purification Summary not available.

[from Chemical Abstracts 89(6):#48437n. 1978]

5. OIL-WATER SEPARATION

C-1305-78
AGENT AND METHOD OF PURIFICATION
[Agence Nat Valor Rech]. 1976
British Patent 1,456,985

Oil-water separation, Hydrocarbons, *Purification agent, Patent Particles of an inorganic solid to which polymer chains have been grafted comprise the purification agent. Hydrocarbons may be removed from polluted water by dispersing the agent in the water or by passing the water through a cartridge in which the agent is housed.

[from Petroleum Abstracts 17(40):#239,051. 1977]

C-1306-78

METHOD AND APPARATUS FOR SEPARATING A MIXTURE Ballast-Nedam Groep N. V. Skimovex B.V. 1977. Belgian Patent 848,519

Oil-water separation, Patent, Equipment, *Packed beds

"A procedure is presented for separating 2-phase systems, e.g., water and oil, by 2 packed beds, in which 1 of the beds is being used in the separating stage while the other bed is being washed."

[from Chemical Abstracts 88(26):#193686b. 1978]

C-1307-78

METHOD AND APPARATUS FOR SEPARATING LIQUID/LIQUID DISPERSIONS Bayley, D.P. and G.A. Davies. 1976. British Patent 1.445.692

Oil-water separation, *Dispersions, Patent, Equipment

"A method is described of separating the component liquids of a liquid/liquid dispersion containing suspended solids and of which one component liquid is less dense than the other component, e.g., oil and water."

[from Petroleum Abstracts 17(38):#238,468. 1977]

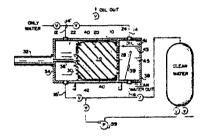
C-1308-78 OIL-WATER SEPARATION APPARATUS Fruman, D.H. 1977. US Patent 4,022,694

Oil-water separation, Filtration, Patent, Equipment, Design-engineering

A device for the separation of oil and water is described. The separator is a flow-through system containing a foam block filter which can be renewed by squeezing.

[from Petroleum Abstracts 17(38):#238,469. 1977]

4,022,694
OIL-WATER SEPARATION APPARATUS
Daniel H. Fruman, Le Pecq, France, assignor to Hydronautics, Incorporated, Laurel, Md.
Continuation-in-part of Ser. No. 467,466, May 6, 1974, abandoned. This application Dec. 3, 1975, Ser. No. 637,131
Int. CL² B01D 29/38
U.S. Cl. 210—350
8 Claims



C-1309-78
SEPARATION SYSTEMS
Gibson, R.R. 1976.
British Patent 1,447,037

Oil-water separation, Spill cleanup, Patent, Equipment

Described is a liquid-surface-layer extraction apparatus for oil spill cleanup. The apparatus floats such that a collection opening is situated at the liquid-liquid interface and conveys away the oil that is entrained and captured by another part of the apparatus.

[from Petroleum Abstracts 17(38):#238,470. 1977]

C-1310-78

COALESCENCE OF OIL IN OIL/WATER EMULSIONS [Imperial Chemical Industries Ltd.]. 1977.

Australian Patent 484,456

Oil-water separation, Emulsions, Coalescence, Patent, *Siliconecoated fibers

"A method for the removal of oil from an oil-in-water emulsion consists of passing the emulsion through a fibrous structure comprising fibers having finely divided particles of silicone-coated silica which exhibit oleophilic and hydrophobic properties penetrating their outer surfaces and removing coalesced oil droplets so formed."

[from Petroleum Abstracts 17(50):#241,926. 1977]

C-1311-78

OIL ADSORBENT

Kobayashi, Y., R. Matsuo, and M. Nishiyama. 1977. Japanese Kokai (unexamined patent application) 77,138,081

Oil-water separation, Adsorption, Sorbents, Patent, *Kapok fibers

Kapok fibers used as a mat, block, band, or screen, absorb from 1.5 to 2.0 times as much oil, including emulsions, as polypropylene fibers.

[from Chemical Abstracts 89(2):#11905n. 1978]

C-1312-78

DEGREASING WITH A BUILT-IN CLEANING STAGE Larrson, R. 1977. Swedish Patent 393,996

Oil-water separation, Emulsifiers, Solvents, Equipment, Patent

"The metal part is treated 1st with a solvent and an emulsifier, followed by a water wash. The oil removed flows into a separator where it drains out of the system automatically through a water layer. The separator removes oil completely."

[from Chemical Abstracts 88(24):#172728b. 1978]

C-1313-78

OIL WATER SEPARATOR

McCarthy, P.M., G.T. McTighe, and R.T. McTighe. 1977. US Patent 4,042,512

Oil-water separation, Wastewater treatment, Patent, Equipment, Design-engineering

A device for the separation of oil and water is described. The apparatus utilizes sloping baffles and corrugated plates over which the fluid flows.

[from Petroleum Abstracts 17(46): #240,806. 1977]

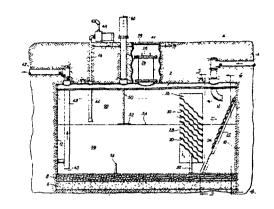
4,042,512 OIL WATER SEPARATOR

Patrick M. McCarthy, 486 Sayville Bivd., Sayville, Long Island, N.Y. 11782; Gilbert T. McTighe, 804 N. Windsor, Apt. 10, and Robert T. McTighe, 804 N. Windsor, Apt. 6, both of Mitchell, S. Dak. 57301

Filed Oct. 27, 1976, Ser. No. 736,247 Int. Cl.² B03D 3/00

U.S. Cl. 210-519

6 Claims



C-1314-78

OIL-WATER SEPARATOR (product information)
[McTighe Industries]. 1978.
Environmental Science and Technology 12(9):1092.

Oil-water separation, Equipment, Product information

"The unit consists of a separate sludge or separation compartment/ area, a main separation chamber and a third chamber through which purified water is discharged to a weir-type outlet."

C-1315-78

COMPARISON OF ASSOCIATIONS OF DIFFERENT HYDROCARBONS WITH CLAY PARTICLES IN SIMULATED SEAWATER Meyers, P.A., and T.G. Oas. 1978. Environmental Science and Technology, 12(8):934-937.

Oil-water separation, Hydrocarbons, Adsorption, Seawater, Sedimentation, *Fractionation, Analytical techniques

The title comparison showed identical association behaviors with smectite clay by n-eicosane and n-eicosene with the association increasing "linearly with increasing hydrocarbon concentration in water. The amount of n-alkane associated with smectite increased with carbon chain length from C_{17} to C_{28} , reaching a maximum of 70% removal from water...The level of association of aromatic hydrocarbons was generally low, and isoalkanes were more effectively removed from water than n-alkanes of the same number of carbons."

C-1316-78

OPC-3000 COALESCING PLATE OIL/WATER SEPARATOR EVALUATION Mittleman, J. 1977.

Report NCSL-TM-212-77. 62 p. Technical memorandum.

Oil-water separation, Ballast, Design-engineering, Coalescence, Equipment, USN

The title device for deballasting applications was designed and produced by Naval Coastal Systems Laboratory and is in use at the Craney Island Fuel Depot, Portsmouth, Virginia. Design, system installation, and performance evaluation details are reported.

[from Government Reports Announcements 78(2):#AD-A046 123/6GA. 1978]

C-1317-78

TECHNIQUE FOR REMOVAL OF DISSOLVED AND DISPERSED HYDROCARBONS FROM BIOASSAY EFFLUENTS

Moore, W.S., J.L. Hyland, B.D. Meizian, W. Galloway, and P. Rogerson. 1978.

Environmental Science and Technology 12(5):595-596.

Oil-water separation, Hydrocarbons, Bioassay, Filtration, Wastewaters, *Bioassay effluent, *Sorbent fibers

The authors describe a method for filtering oil-contaminated effluent through polymer-based fibers. This technique efficiently reduces the concentrations of hydrocarbons in the bioassay effluent, discharged at rates from 17 to 26 L/min, from an average of 17 to approximately 1 ppm.

C-1318-78

OIL SEPARATION FROM OIL-WATER EMULSION Mori, M. 1977.

Japanese Kokai (unexamined patent application) 77,133,881

Oil-water separation, Emulsions, Adsorption, Patent, *Sorbent powder

Water containing emulsified oil is passed through an oil adsorbent powder layer, such a glass bead layer, to collect the oil in a large drop which then automatically rises to the surface for separation.

[from Chemical Abstracts 89(4):#30379k. 1978]

C-1319-78

OIL SEPARATION FROM WATER

Musha, M., T. Sawa, J. Yasui, O. Kato, et al. 1977. Japanese Kokai (unexamined patent application) 77,111,471

Oil-water separation, Wastewater treatment, Fuel oil, Patent, *Sorbent fibers

"Oil-containing water is passed through fiber layers of thickness 3-100 cm and density 0.10-0.45 g/cm³, made from hydrophilic single and spun fibers of 10-3000 deniers." In a test, water containing 10,000 ppm fuel oil was passed through the fiber layers, and the treated water contained 2.5 ppm oil.

[from Chemical Abstracts 88(26):#197409m. 1978]

C-1320-78

PLANT FIBER OIL ABSORBENT

Nakarai, W., K. Sato, T. Azuma, K. Ota, et al. 1977. Japanese Kokai (unexamined patent application) 77,148,493

Oil-water separation, Absorption, Sorbents, Patent, *Plant fiber mats

Plant fibers are mixed with polyolefin fibers or powder, shaped, compacted and sewn into mats, and surface-treated with rubber latex solutions or emulsions.

[from Chemical Abstracts 89(4):#30530c. 1978]

C-1321-78

AGENTS FOR PREVENTING EMULSIFICATION OF CRUDE OIL Popescu, F., and T.D. Basarabescu. 1976. Romanian Patent 62,129

Oil-water separation, Emulsions, Patent, Crude oil, *Demulsifiers

"Demulsifiers for crude oil emulsions were prepared by treating glycerol or ethylenediamine with ethylene oxide and propylene oxide at 145° in the presence of alkali catalysts." [possibly oil pollution related]

[from Chemical Abstracts 89(4):#27318j. 1978]

C-1322-78

OIL-COLLECTING MATTE

Saida, T. 1977.

Japanese Kokai (unexamined patent application) 77,149,290

Oil-water separation, Absorption, Sorbents, Patent, *Plant fiber mats

"Plant fiber is dispersed in air, filtered on a moving net, impregnated with aqueous paraffin wax emulsion (1-5%) by either or both of 2 rollers, heated above the melting point of the wax, then impregnated with aqueous rubber latex emulsion (0.5-1%) heated again and cut."

[from Chemical Abstracts 89(4):#30531d. 1978]

C-1323-78

SEPARATING AN EMULSION INTO WATER AND OIL PHASES Toriya, Y., and T. Koba. 1977.

Japanese Kokai (unexamined patent application) 77,142,666

Oil-water separation, Equipment, Emulsions, Patent, Evaporation, *Condensation

A separatory apparatus is described in which the oil-water emulsion is heated, the vapor generated is collected and condensed, and the condensate is separated into a water phase and an oil phase. The phase separation is enhanced by the condensation process.

[from Chemical Abstracts 89(6):#48492b. 1978]

C-1324-78

BREAKING EMULSIONS WITH RESPECT TO ENVIRONMENTAL PROTECTION [English summary]

Weidel, D., and E. Will. 1977.

Technik und Umweltschutz 17 (Nutz. Ind. Abprod.):95-103.

Oil-water separation, Emulsions, *Review

"A review with 10 references, of emulsion breaking by acids and salts." [possibly oil pollution related]

[from Chemical Abstracts 88(24):#176594c. 1978]

C-1325-78

URETHANE FOAM FOR SEPARATION OF OIL FROM WATER Yoshida, C., S. Yoshimura, and T. Nagai. 1978. Japanese Kokai (unexamined patent application) 78 42,191

Oil-water separation, Absorption, Sorbents, Patent, *Urethane foam

"Homogeneous oleophilic soft urethane foams are prepared from an oleophilic polyol (I) (or a polyol containing (I) as a main component), polyisocyanate, catalyst, and crosslinking and foaming agents (containing no silicon) and are compressed 1.5- to 4-fold to make a column" with specified shape factor and bulk density.

[from Chemical Abstracts 89(4):#25811r. 1978]

C-1326-78

OIL ABSORBENT

Zenno, A., T. Uebayashi, I. Maruyama, and H. Shiono. 1977. Japanese Kokai (unexamined patent application) 77 69,884

Oil-water separation, Absorption, Sorbents, Patent, *Sorbent mats

"Crude linters, optionally with synthetic thermoplastic and/or half/synthetic polymer 10-30% as binder, are formed into mats for oil removal from water."

[from Chemical Abstracts 89(2):#11666k. 1978]

6. RECLAMATION AND REUSE

C-1327-78

WASTES FROM PETROLEUM REFINERIES AND PETROCHEMICAL PLANTS [in Japanese]

Iijima, T. 1978.

Kagaku No Ryoiki. 32(1):58-73.

Waste oil, Wastewaters, Refineries, Petrochemicals, Reclamation, Reuse

"Wastes produced from petroleum refineries and petrochemical plants were investigated and the possibility and conditions for their reuse were discussed."

[from Chemical Abstracts 89(4):#30315m. 1978]

C-1328-78

INSTANTANEOUS EVAPORATOR

Iwamoto, T. 1977.

Japanese Kokai (unexamined patent application) 77,139,674

Waste oils, Reclamation, Reuse, Evaporation, Distillation, Equipment, Patent

Waste oils are heated in the bottom of a vessel which forms an oil bed; in this manner the low boiling point light oils are distilled and reclaimed, the water is boiled off, and hard sludges are deposited.

[from Chemical Abstracts 89(6):#48480w. 1978]

C-1329-78

OIL SKIMMER/COLLECTOR (product information) [Pollution Control Engineering]. 1978. Environmental Science and Technology 12(8):971.

Reclamation, Spill removal, Skimmers, Product information, Equipment

"The semi-portable skimmer is designed for use in reclaiming oils of differing viscosities. It is suitable for applications where the need for oil collection is less than 1200 gal/day."

C-1330-78

LUBRICATING OIL FROM USED WASTE LUBRICATING OIL Whisman, M.L., J.W. Reynolds, J.W. Goetzinger, and F.O. Cotton. 1978. US Patent 4,073,719

Waste oil, Lubricating oil, Reclamation, Patent, *Regeneration, *Vacuum stripping

Used lubricating oils can be regenerated by "stripping in vacuo, solution in BuOH, 2-propanol, and MeCOEt, removal of resulting sludge, fractional distillation in vacuo, and decolorization and deodorization by contact with Filtrol bleaching clay."

[from Chemical Abstracts 89(2):#8697r. 1978]

C-1331-78

RECLAIMING WASTE LUBRICATING OILS Whisman, M.L., J.W. Goetzinger, and F.O. Cotton. 1978. US Patent 4,073,720

Reclamation, Waste oil, Lubricating oil, Solvents, Patent, Distillation, *Vacuum stripping

"A used lubricating oil was regenerated by stripping in vacuo, solution in BuOH 2, 2-propanol 1, and MeCOEt 1 part, removal of the resulting sludge and fractional distillation in vacuo. Three parts of solvent mixture were used for each part of stripped oil."

[from Chemical Abstracts 89(2):#8696q. 1978]

7. PERSONNEL TRAINING AND EDUCATION

C-1332-78

WEAPONS AGAINST OIL POLLUTION

Anon. 1977.

Dock and Harbor Authority 58(680):114-116.

Personnel training, Dispersants, IMCO, Manuals, Booms, Skimmers, Sinking agents, Sorbents, Spill cleanup

Published by the IMCO, the <u>Manual on Oil Pollution</u> outlines basic principles for avoiding pollution, including personnel duties and requirements. The use and various methods of application of dispersants are explained. Oil booms and skimmers, mechanical techniques for controlling spills, sinking agents, and absorbents are also described.

[from Oceanic Abstracts 15(2):#78-02053. 1978]

C-1333-78

"RED RIVER RUN" - A SPILL PREPAREDNESS EXERCISE IN MANITOBA Mansfield, B.H. 1978.
Spill Technology Newsletter 3(4):44-49.

Personnel training, Contingency planning, Pollution control, Canada, Oil industry, *Field exercise

A one-day field exercise for oil spill preparedness was held in September 1978 near Winnepeg, Manitoba, as part of a cooperative federal/provincial/industry exercise of reporting and communications arrangements, available spill equipment, and of designated industry, contractor, and government personnel. This article describes planning and participation, the spill simulation and response activities, the site, scenario, and field operations, and the results and recommendations.

8. CONTINGENCY PLANNING

C-1334-78

ANTI-OIL POLLUTION POST (news brief)

Anon. 1978.

Marine Pollution Bulletin 9(9):227-228.

Contingency planning, Pollution prevention, Spill cleanup, Government agencies, England

Based on recommendations made in a British government report on the $\underline{\mathsf{Amoco}}\ \underline{\mathsf{Cadiz}}\ \mathsf{and}\ \underline{\mathsf{Eleni}}\ \underline{\mathsf{V}}\ \mathsf{disasters},\ \mathsf{a}\ \mathsf{new}\ \mathsf{Contingencies}\ \mathsf{Planning}\ \mathsf{and}\ \mathsf{Operations}\ \mathsf{Unit}\ \mathsf{will}\ \mathsf{be}\ \mathsf{established}\ \mathsf{by}\ \mathsf{fall}\ \mathsf{1978}.\ \mathsf{Both}\ \mathsf{pre-ventive}\ \mathsf{measures}\ \mathsf{and}\ \mathsf{a}\ \mathsf{greater}\ \mathsf{efficiency}\ \mathsf{of}\ \mathsf{communications}\ \mathsf{and}\ \mathsf{operations}\ \mathsf{in}\ \mathsf{case}\ \mathsf{of}\ \mathsf{oil}\ \mathsf{spills}\ \mathsf{will}\ \mathsf{be}\ \mathsf{stressed}.$

C-1335-78

ARABIAN GULF ACTION PLAN (news brief)

Anon. 1978.

Marine Pollution Bulletin 9(7):171.

Contingency planning, Pollution control, Monitoring, *Persian Gulf, *Action Plan

A \$6 million trust fund will finance an Action Plan to protect the Arabian coastline. The area is a high pollution risk because 60% of the world's oil shipments pass through the Gulf. Included in the Action Plan are contingency plans for a marine emergency center in Bahrain.

C-1336-78

HOW TO WRITE SPCC PLANS FOR ALASKA LAND RIGS Willits, K.L. 1977.

Petroleum Engineering 49(10):100, 102.

Contingency planning, US, Regulations, Pollution prevention, Pollution control, Oil wells, Inland, Alaska

US regulations prohibiting the discharge of oil into federal waters contain broad enough definitions as to extend to land spills in the Alaskan wilderness. To comply with these regulations, land rig operators must therefore maintain valid spill prevention, control and countermeasure (SPCC) plans in order to avoid a \$5000/day penalty for each day of operation without such a plan. The format of and information included in the plan are described.

[from Petroleum Abstracts 17(52):#242,524. 1977]

9. PREVENTION AND CONTROL MEASURES

C-1337-78

OFFSHORE SAFETY AND ITS COST TO UNDERWRITERS Anon. 1977.

Shipping World and Shipbuilder 170(3930):511.

Liability, Safety, Insurance, Offshore development, Compensation, Pollution control

The Ekofisk Field blowout, the Bravo rig accident, and 2 onshore calamities in the Middle East renewed calls for action on substandard ships. The Carter administrations's moves against off-shore spills spurred a reevaluation of safety and availability of facilities to combat pollution. Britain, Norway, and the Netherlands signed an offshore pollution liability convention, subject to ratification, which provides that North Sea and other European oil operators will be liable to pay up to \$35 million compensation/pollution incident and must insure themselves for \$25 million to meet possible claims.

[from Oceanic Abstracts 15(2):#78-02240. 1978]

C-1338-78

SMALL STEPS TOWARD A CLEANER MEDITERRANEAN Anon. 1978.

New Scientist 77(1086):141.

Pollution control, Environmental protection, Economics, Mediterranean Sea, *Treaty, *Standards

A Mediterranean pollution treaty may be ready for signing in 1979. The draft treaty will be a crucial step towards controlling Mediterranean pollution, as nearly 80% of it is land-based. The total bill to implement the treaty may reach US \$10 billion, most of which would be paid by the higher polluting northern states. A system of common environmental standards is being approached which would allow emission standards to vary from nation to nation, depending upon the receiving capacity of the local sea. [possibly oil pollution related]

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): 4440-108. 1978]

C-1339-78

IMPROVEMENTS IN OR RELATING TO THE PREVENTION OF POLLUTION BY LEAKAGE FROM A STORAGE TANK Andersen, L.J. 1977.
British Patent 1,485,716

Storage, Pollution prevention, Leakage, Patent

An impermeable wall surrounds the storage tank and extends below the water table level into the ground underneath the tank. A pump creates a vacuum in the ground between the wall and the tank and carries away any leakage from the tank.

[from Petroleum Abstracts 17(52):#242,715. 1977]

C-1340-78
MARINE POLLUTION TIMETABLE
Bartlett, T. 1977.
Dock and Harbour Authority 58(680):108-110.

Pollution prevention, International agreements, International conventions, Regulations, Tankers, Safety

The history and the current status of efforts to form international agreements on pollution prevention are presented. In 1886 the first modern oil tanker was launched, and in 1926 the first international pollution conference established zones where no oil should be discharged. Since then, oily discharges have been further regulated, tanker size limits have been established, and compensation funds for oil-damaged victims have been created. Tanker safety technologies are currently proposed.

[from Oceanic Abstracts 15(2):#78-02051. 1978]

C-1341-78
MEDITERRANEAN COUNTRIES COME CLEAN Bugler, J. 1978.
New Scientist 77(1084):4.

Pollution control, Legislation, Monitoring, Environmental management, Mediterranean Sea, UN, *UNEP

Delegates from the governments of nearly all the Mediterranean countries met in Monaco, January 9-14, 1978, to review the Mediterranean Action Plan. The UN Environmental Programme (UNEP) administers the plan as one part of an eight-sea program to stop the deterioration of the seas. The Action Plan covers legislation, monitoring and research, and the management of future growth for the Mediterranean, where pollution problems are increasing. [possibly oil pollution related]

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #4439-108. 1978]

C-1342-78

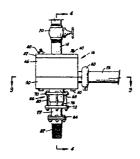
APPARATUS FOR SHUTTING OFF AND CONTROLLING WELL BLOWOUTS Burrow, M. 1977.
US Patent 4,026,354

Blowouts, Pollution control, Patent, Equipment, Design-engineering

A device for the control of well blowouts is described. The apparatus is designed to be temporarily attached to the top of a conduit string in a well bore after a blowout has occurred.

[from Petroleum Abstracts 17(36):#238,402. 1977]

4,026,354
APPARATUS FOR SHUTTING OFF AND CONTROLLING
WELL BLOWOUTS
Melvin Burrow, P.O. Box 127, Rte. No. 1, Tryon, Okla. 74875
Filed May 5, 1975, Ser. No. 575,048
Int. Cl.² E21B 33/03
U.S. Cl. 166—95
8 Claims



C-1343-78

OIL POLLUTION CONTROL EQUIPMENT IN FRANCE de Castro, G. 1977. Ship & Boat International 30(9):39-40.

Equipment, Pollution control, France, Oil-water separation, Skimmers, Sorbents, Sinking agents, Oil discharges, Detection, Product information

Three products manufactured by Nemo International are described: the Vortex oil drinker intended for use in enclosed areas, the Cyclonet which removes surface oil and separates it by a hydrocyclone effect, and towed tanks. Omya Company manufactures Nautex Hydrophobe, a non-toxic product which uses chalk and a hydrophobe to absorb hydrocarbons. The Societe Anonyme de Telecommunications manufactures the French teledetection system which is designed to protect against illegal oil discharging.

[from Oceanic Abstracts 15(2):#78-02063. 1978]

C-1344-78
BLOWOUT (AND OIL SPILL) PREVENTIVE REGULATIONS E1-Defrawy, M.K. 1978.
Spill Technology Newsletter 3(4):19-20.

Blowout prevention, Drilling, Inland, Regulations, Government agencies, Pollution prevention, Contingency planning, Canada

New Canadian oil and gas drilling regulations, soon to be promulgated, will require submittal of an Oil Spill Contingency Plan, as well as a Blowout and Major Rig Fire Contingency Plan to the responsible federal authorities, before any drilling program can be undertaken on Canada's federal lands. In addition to requiring adequate corrective measures, the new regulations also call for a number of preventive measures, designed to prevent well blowouts below- and above-ground.

C-1345-78

PIPELINE LEAK DETECTOR WITH BAFFLES Fechter, H.R., and G.B. Walker. 1977. US Patent 4,020,674

Pipelines, Leakage, Detection, Equipment, Design-engineering, Patent

The apparatus contains a differential pressure measuring device that senses reduced pressure at the point of a leak as it is propelled through the pipe. The location of the leak is simultaneously recorded.

[from Petroleum Abstracts 17(36):#237,974. 1977]

C-1346-78

ADMINISTRATIVE AND LEGAL ASPECTS OF WASTE DISPOSAL Small, W.R. 1977.

Chemistry and Industry (London), Vol. 14:600-605. (Annual meeting of the Society of Chemical Industry, Southampton, UK, 14 July 1977.)

Pollution control, Monitoring, Surveillance, UK, Europe, Foreign governments

The following concerns of the Ministry of Agriculture, Fisheries, and Food (MAFF) are described: measures to aid in controlling marine pollution, the basis upon which control procedures have been established, methods of surveying and monitoring the environment, the responsibilities of the MAFF, and the role of the MAFF in European pollution monitoring schemes.

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #4589-108. 1978]

ASPECTS OF OIL POLLUTION

1. BIOLOGICAL ASPECTS

C-1347-78

HAZARDS REMAIN AFTER OIL SPILL CLEANUP Anon. 1977. World Dredging 13(12):39.

Hydrocarbons, Toxicity, Oil spills, Estuaries, *Photo-oxidation

A. Scheier of the Academy of Natural Sciences exposed various aquatic organisms to water taken from beneath simulated oil spills as part of a study on the impact of oil on the Delaware Estuary. It was found that photo-oxidation reactions transform hydrocarbons into soluble toxic peroxides, phenols, and acids. The most toxic effects appeared after 24 hr and remained throughout the experiment. Certain crude oils containing sulphur compounds may not be as toxic as others.

[from Aquatic Sciences and Fisheries Abstract, Part 1, 8(4): #4484-108. 1978]

C-1348-78

CRUDE OIL IN THE DIET HAS LITTLE EFFECT ON TROUT REPRODUCTION Author unknown. 1977.

NOAA Science and Engineering News Report, No. SEN-70. 13 p.

Toxicity, Fish, Reproduction, Crude oil, Biological effects, *Rainbow trout

Fertility in adult male rainbow trout was found not to be affected after fish received food coated with Prudhoe Bay crude oil. Survival through hatching was 86% for test eggs and 90% for controls and from hatching to the swim-up fry stage was 76% for test lots and 91% for controls, "a statistically non-significant difference." Reproduction in fish was concluded to be unimpaired after exposure to large amounts of crude oil in the diet based on the results of this study.

[from Petroleum Abstracts 17(48):#241,475. 1977]

C-1349-78

FISH ACCUMULATE BENZENE AND TOLUENE - WATER-SOLUBLE COMPONENTS OF CRUDE OIL - AFTER BRIEF CONTACT

Author unknown. 1977.

US Department of Commerce News Announcements, No. SEN-68. 7 p.

WSF, Biological effects, Chronic effects, Fish, Uptake, Crude oil, Aromatic hydrocarbons, *Benzene, *Toluene

"Chronic exposure to low levels of petroleum hydrocarbons are probably more harmful to fish than are spills and blowouts. A recent study in which the uptake and persistence of benzene and toluene (the two most prevalent components of crude oil) in Pacific herring were examined indicates that toluene poses the greater threat. It can rapidly accumulate to high levels in fish even after a relatively brief contact."

[from Petroleum Abstracts 17(45):#240,497. 1977]

C-1350-78

THE EFFECTS OF PETROLEUM ON DIFFERENT STAGES OF INCUBATION IN BIRD FGGS

Albers, P.H. 1978.

Bulletin of Environmental Contamination and Toxicology 19(5):624-630.

Birds, Fuel oil, Crude oil, Toxicity, Biological effects, *Hatch-ability. *Incubation stages

Two experiments were conducted on the effects of No. 2 fuel oil and Southern Louisiana crude oil applied to the surface of domestic mallard eggs in 5 μ L quantities. Hatchability of these eggs decreased as the age of the embryo at treatment decreased, embryos being most sensitive during the first 10 days of incubation. Southern Louisiana crude oil had a more toxic effect than the No. 2 fuel oil.

C-1351-78

THE EFFECTS OF CRUDE OIL AND THE DISPERSANT, OILSPERSE 43, ON RESPIRATION AND COUGHING RATES IN ATLANTIC SALMON (SALMO SALAR) Barnett, J., and D. Toews. 1978. Canadian Journal of Zoology 56(2):307-310.

Crude oil, Emulsions, Dispersants, Metabolism, Fish, Sublethal effects, Toxicity, Weathering, *Salmo salar

Emulsions of unweathered and weathered Venezuelan crude oil and the dispersant Oilsperse 43 increased the coughing rate of postsmolt Atlantic salmon in fresh water at 0.01-0.7 toxic units in 12-hr tests. "Coughing rates increased on a concentration- and time-related basis, while respiration rates declined at the higher sublethal levels. At most concentrations tested, there were no differences between the physiological responses in either unweathered or artificially weathered emulsions."

[from Chemical Abstracts 89(1):#1200q. 1978]

C-1352-78

TOXIC EFFECT OF WATER-SOLUBLE FRACTIONS OF CRUDE, REFINED, AND WEATHERED OILS ON THE GROWTH OF A MARINE BACTERIUM Calder, J.A., and L.F. Griffin. 1977.
Applied and Environmental Microbiology 33(5):1092-1096.

Bacteria, Toxicity, WSF, Crude oil, *Refined oils, *Weathered oils

WSF's of crude and refined oil samples reduced the growth rate and the maximum cell density of <u>Serratia marinorubra</u> grown in batch culture. WSFs of laboratory weathered crude and refined oils were more toxic to <u>S. marinorubra</u> than the parent unweathered oils. Toxicity did not correlate with the concentration of total WSF or of aromatic hydrocarbons in the WSF.

[from Oceanic Abstracts 15(1):#00602. 1978]

C-1353-78

ECOLOGICAL STUDIES OF THE COASTAL ZONE AFFECTED BY POLLUTION FROM THE 'NORTHERN BREEZE'. 1. GENERAL INTRODUCTION AND BEACH COMMUNITIES AT ARENA [English summary] Castilla, J.C., M. Sanchez, and O. Mena. 1977. Medio Ambiente 2(2):53-64.

Invertebrates, Beaches, Shorelines, Oil spills, Biological effects, Chile, *Northern Breeze spill

Presented are the results of an ecological survey of a part of Chilean sandy beaches affected by the oil spillage of the Liberian merchant ship Northern Breeze at Farellones de Quintero, September 15, 1975. At the time of the study, October 4-7, 1975, about 200 tons of petroleum had spilled and affected ~46 km of coastal zone, 1/2 of which were sandy beaches already covered by 7.1 tons, and 1/2 rocky shores. Sandy beach invertebrate macro-fauna studies showed changes in the typical vertical zonation patterns of some invertebrates, "lowered specific diversity," and probable lethal effect on the "smaller individuals of the most typical invertebrates (i.e., Emerita analoga)."

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #4489-108. 1978]

C = 1354 - 78

HISTOPATHOLOGICAL AND PHYSIOLOGICAL RESPONSES OF <u>FUNDULUS</u> HETEROCLITUS TO NAPHTHALENE EXPOSURE

DiMichelle, L., and M.H. Taylor. 1978.

Journal of the Fisheries Research Board of Canada 35(8):1060-1066.

Toxicity, Biological effects, Fish, Aromatic hydrocarbons, Uptake, *Naphthalene, *Fundulus heteroclitus

Exposure of the title organism to concentrations of naphthalene as low as 0.2 mg/L for 15 days resulted in major effects on the brain, liver, and pancreas, and in evidence of neurosensory damage and metabolic stress. At two concentrations, ¹⁴C-naphthalene accumulated "in significant amounts in organs most susceptible to pathology."

C-1355-78

FATE OF ¹⁴C-BENZENE IN EGGS AND LARVAE OF PACIFIC HERRING (CLUPEA HARENGUS PALLASI)

Eldridge, M.B., T. Echeverria, and S. Korn. 1978. Journal of the Fisheries Research Board of Canada 35(6):861-865.

Fish, Uptake, Aromatic hydrocarbons, Biological effects, Food web, *Clupea harengus pallasi, *Benzene, *Biomagnification

Under experimental conditions, accumulation of benzene, a relatively abundant and soluble aromatic component of crude oil, in the tissue of the title organism was inversely related to age: "eggs accumulated up to 10.9 times the initial concentration, yolk-sac larvae up to 6.9 times, and feeding larvae to 3.9 times." The authors also determined that biomagnification of petroleum-based hydrocarbons occurs, stating that certain types of "zooplankters...do accumulate hydrocarbons to amounts in excess of the exposure concentrations... and provide a pathway that may be more significant than through the water."

C-1356-78

DIRECT MORTALITY AND RELATED FACTORS AFFECTING WATERFOWL IN NORTH AMERICA

Linduska, J.P., and H.M. Reeves. 1976.

International Conference on Conservation of Wetlands and Waterfowl, Heiligenhafen, Federal Republic of Germany, 2-6 December 1974.

M. Smart (ed.). Slimbridge, England, International Waterfowl Research Bureau, 1976. p. 437-443.

Birds, Mortality, Sublethal effects, Acute effects, Contamination, Habitats, *Waterfowl

The title topic includes references to the impact of oil on waterfowl. The authors mention the risk of offshore oil exploration and production to estuarine and coastal waterfowl habitats, the cessation of egg laying from hens ingesting oil due to preening oil-contaminated feathers, the reduced hatchability of duck eggs as a result of oil coating the eggs, and the direct loss of waterfowl from oil spills.

C-1357-78

THE ACUTE EFFECT OF BUNKER C OIL AND AN OIL DISPERSANT ON SERUM GLUCOSE, SERUM SODIUM AND GILL MORPHOLOGY IN BOTH FRESHWATER AND SEAWATER ACCLIMATED RAINBOW TROUT (SALMO GAIRDNERI) McKeown, B.A., and G.L. March, 1978. Water Research 12(3):157-163.

Crude oil, Dispersants, Fish, Acute effects, *Salmo gairdneri, *Serum glucose and sodium, *Gill morphology

In the title study, both compounds tended to decrease serum glucose levels with Bunker C causing the more significant decrease and indicating possible dysfunction of the kidney. Freshwater trout showed a decrease in Na levels, and saltwater-acclimated fish showed a marked increase in Na levels when treated with a dispersant. Gill tissues showed severe damage caused by dispersant and oil/dispersant mixtures; Bunker C exposure alone caused less damage to these tissues.

[from Chemical Abstracts 89(5):#37643a. 1978]

C-1358-78

BIOLOGICAL CONSEQUENCES OF OIL SPILLS

Nelson-Smith, A. 1977.

Environment and Man, Volume 5. The Marine Environment. J. Lenihan and W.W. Fletcher (eds.). New York, Academic Press, 1977. p. 46-69.

Biological effects, Environmental effects, Oil spills, Birds, Fish

Offshore oil production and transportion of greater quantities of oil have led to increases in oil pollution over the past 50 years. Approximately 2 million tons of oil enter the ocean environment annually. Marine birds tend to be severely affected, while fish in general can avoid the consequences. Harmful effects on plants, shellfish, and mammals vary in intensity.

C-1359-78

EXPOSURE OF MARINE BIRDS TO ENVIRONMENTAL POLLUTANTS Ohlendorf, H.M., R.W. Risebrough, and K. Vermeer. 1978. Washington, DC, US Department of the Interior, Fish and Wildlife Service, 1978. 40 p. (Wildlife Research Report 9)

Birds, Contamination, Hydrocarbons, Mortality, Toxicity, Surfactants, Sources, Fate, *Review

The effects of petroleum hydrocarbons, organochlorides, heavy metals, and other contaminants on marine birds are reviewed. Adverse effects of oil pollution include mortality due to oiled feathers, death by dehydration after ingestion of oil, toxic effects of surfactants, and death or poisoning of the birds' food supply. Sources of oil in US waters and the transfer and dissipation of oil at sea are also discussed. Comprehensive references are provided.

C-1360-78

TOXICITY OF POLYNUCLEAR AROMATIC HYDROCARBONS TO THE POLYCHAETE NEANTHES ARENACEODENTATA
Rossi, S., and J.M. Neff. 1978.

Marine Pollution Bulletin 9(8):220-223.

Bioassay, Polychaetes, Aromatic hydrocarbons, Solubility. *PNA, *Neanthes arenaceodentata, Toxicity

The toxicity of ten polynuclear aromatic hydrocarbons (PNAs) to the title organism, a sediment-dwelling marine worm, was investigated. Replicate 96 hr bioassays were performed with specific hydrocarbons in solution. Toxicity of PNA appears to be related to both solubility and residence time in test solutions.

C-1361-78

THE ACCUMULATION OF LOW MOLECULAR WEIGHT AROMATIC HYDROCARBONS OF CRUDE OIL BY COHO SALMON (ONCORHYNCHUS KISUTCH) AND STARRY FLOUNDER (<u>PLATICHTYS STELLATUS</u>)
Roubal, W.T., S.I. Stranahan, and D.C. Malins. 1978.

Archives of Environmental Contamination and Toxicology 7(2):237-244

Fish, WSF, Crude oil, Accumulation, Aromatic hydrocarbons, *Oncorhynchus kisutch, *Platichtys stellatus

The title organisms were exposed for two weeks to 0.9 ppm of a water soluble fraction (WSF) of Prudhoe Bay crude oil in flowing Both species accumulated a complex spectrum of lowmolecular weight hydrocarbons, but in flounder the bioconcentration factor in muscle tissue was significantly higher (17 ppm) than in salmon (1.5 ppm). Complex mixtures of hydrocarbons were present in liver and gill tissues of both species, and substantial variations were found in the bioconcentration factors for individual hydrocarbons in both species.

[from Chemical Abstracts 89(5):#37619x. 1978]

C-1362-78

ECOLOGICAL STUDIES OF THE COASTAL ZONE AFFECTED BY POLLUTION FROM THE 'NORTHERN BREEZE'. 2. COMMUNITIES OF ROCKY BEACHES [English summary]

Santelices, B., J. Cancino, S. Montalva, R. Pinto, and E. Gonzales.

Medio Ambiente 2(2):65-83.

Habitats, Biological effects, Intertidal zone, Marine organisms, Oil spills, Chile, *Northern Breeze spill

The ecological destruction caused by the Northern Breeze spill, September 15, 1975, was studied in two habitats near Caleta Horcon, central Chile. The habitats differ in wave exposure and substratum slope, but at both habitats the maximum cover, biomass per unit area, stratification, and diversity (number of sp.) were found at the lower levels of the beach. About 1-2% of the intertidal rocks were contaminated by the oil spill, affecting the upper intertidal organisms (e.g. Chthamalus cirratus and Porphyra columbina). "The quantitative description of intertidal communities reported here [is] the first along the Pacific South American coast."

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #4564-108. 1978]

C-1363-78

PLANKTON PROCESSES IN MID-ATLANTIC NEARSHORE AND SHELF WATERS AND ENERGY-RELATED ACTIVITIES

Smavda, T.J. 1976.

Effects of Energy-Related Activities on the Atlantic Continental Shelf Conference, Upton, NY, 10-12 November 1975. p. 70-95.

Biological effects, Plankton, Offshore development, Hydrocarbons, Fate, Atlantic Ocean

Petroleum hydrocarbons, as well as other compounds, may be released into the sea as a result of energy-related activities in the Atlantic. The impact of these on plankton will depend upon the natural processes occurring in the area of release.

[from Petroleum Abstracts 17(43):239,710. 1977]

C-1364-78

LABORATORY RESEARCH ON SEA-BIRDS: REPORT ON A PRACTICAL INVESTIGATION INTO THE POSSIBILITY OF KEEPING SEA-BIRDS FOR RESEARCH PURPOSES Swennen, C. 1977.

Texel, Netherlands, Netherlands Institute for Sea Research, 1977. 45 p.

Birds, Mortality, *Oiled birds, *Successful rearing, *Captivity

Successful rearing of seabirds in captivity requires maintaining water surface quality and surface tension measurements similar to natural environmental conditions. Attention to the condition of feathers of captive seabirds is important as they lose their water repellency; seabirds succumb to exposure and exhaustion when losing their buoyancy. Rehabilitated oiled seabirds had a five times greater mortality rate following recovery than birds raised from chicks under the same conditions.

[from Oceanic Abstracts 14(5):#77-04404. 1977]

C-1365-78

THE TOXICITY OF OILS AND PETROLEUM HYDROCARBONS TO ESTUARINE CRUSTACEANS

Tatem, H.E., B.A. Cox, and J.W. Anderson. 1978. Estuarine and Coastal Marine Science 6(4):365-373.

Biological effects, Hydrocarbons, Aromatic hydrocarbons, Crustaceans, Bioassay, Toxicity, Metabolism, *Estuarine shrimp

Bioassay experiments with various life stages of 3 estuarine shrimp species and soluble petroleum hydrocarbons revealed that Bunker C oil and refined No. 2 fuel oil were more toxic than 2 crude oils tested. Shrimp exposed to the petroleum hydrocarbons in conjunction with salinity and temperature changes were more susceptible to the hydrocarbons. Of the hydrocarbons utilized in the bioassay, the naphthalenes were most highly toxic, and the toxicity of petroleum products is closely related to the aromatic hydrocarbons content, especially that of naphthalenes and related types.

[from Chemical Abstracts 89(4):#18005c. 1978]

2. PHYSICAL/CHEMICAL ASPECTS

C-1366-78

EVAPORATION OF PETROLEUM OIL FILMS (2ND REPORT); EFFECTS OF MOLECULAR WEIGHT DISTRIBUTION OF OILS ON EVAPORATION [in Japanese] Hirano, F., T. Sakai, and N. Yamagata. 1977. Junkatsu 22(11):726-733.

Spreading, Evaporation, Behavior, *Oil films

Spreading and evaporation characteristics of two base oils and various base oil mixtures of differing molecular weight distributions were studied on a horizontal heating surface. Minimum and maximum evaporation times of the blended oils differed from those of the base oils.

The spreading film diameters were increased in the blended oils due to evaporation of the low molecular weight components, and patterns of the blended oil spreading films were very complex. [possibly oil pollution related]

[from Chemical Abstracts 88(24):173182f. 1978]

C-1367-78

REVIEW OF OIL SPREADING ON THE SEA

Hoult, D.P. 1976.

Effects of Energy-Related Activities on the Atlantic Continental Shelf Conference, Upton, NY, 10-12 November 1975. p. 64-69.

Oil slicks, Spreading, Drift, Fate

The physical factors influencing the rate of spreading and the drift of an oil slick on a water surface are discussed.

[from Petroleum Abstracts 17(43):#239,706. 1977]

3. SOCIAL/ECONOMIC ASPECTS

C-1368-78

WHY CLEAN UP OIL SPILLS?

Mackay, D. 1978.

Spill Technology Newsletter 3(4):11-16.

Spill cleanup, Arctic, Social effects, Economics, Environmental effects, *Remote regions

The author examines emerging social attitudes and implications of oil spill cleanup in remote arctic regions, where a spillage might cause little economic loss, have only a transient or slight ecological effect, pose no risk to endangered species and have a negligible effect on human health. He concludes that the basic imperative for oil spill cleanup is that society regards an oiled environment as offensive; and while there may be economic, aesthetic, or ecological incentives for cleanup, they are incidental to that basic, simple imperative.

C-1369-78

ECOLOGICAL STUDIES OF THE COASTAL ZONE AFFECTED BY POLLUTION FROM THE 'NORTHERN BREEZE'. 3. ECOLOGICAL DATA AND DESTRUCTION OF RESOURCES. [English summary] Santelices, B., and J.C. Castilla. 1977. Medio Ambiente 2(2):84-91.

Economic effects, Fish, Invertebrates, Algae, Oil spills, Chile, *Northern Breeze spill

This report evaluates the marine resource damage resulting from the Northern Breeze oil spill, September 15, 1975, along 46 km of sandy and rocky shores in central Chile. About 6% of the intertidal surface was covered by oil. Destruction of 6% of the economically important macro-algae resulted in losses of about US \$14,000. The economic importance of invertebrates could not be evaluated. However, the fish and shellfish extracted from the endangered area in 1975 were equivalent to US \$440,000, supporting a labor force of 478 fishermen and their families, and these resources were jeopardized by the oil spill.

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #4565-108. 1978]

4. ENVIRONMENTAL RESTORATION AND RECOVERY

C-1370-78

RECOVERY AND RESTORATION OF DAMAGED ECOSYSTEMS
Cairns, J., Jr., K.L. Dickson, and E.E. Herricks (eds.). 1977.
Charlottesville, University Press of Virginia, 1977. x + 531 p.

Recovery, Ecosystems, Environmental deterioration, Resource management, Restoration

Three major topics are covered in this book on environmental recovery from anthropogenic degradation: "the nature of recovery processes for various ecosystems; identification of the elements common to the recovery processes for all ecosystems, as well as the unique attributes in different kinds of ecosystems; and the prospects for accelerated recovery and restoration by human intervention and management." This book is an outgrowth of a 1975 symposium, and includes three chapters which deal specifically with oil pollution: "The Santa Barbara Oil Spill: An Ecological Disaster?" (Foster and Holmes); "Recovery of Some British Rocky Seashores from Oil Spills and Cleanup Operations" (Nelson-Smith); and "Changes in the Vegetation of an Oiled Southampton Water Salt Marsh" (Dicks). [Papers were abstracted separately in OPR Aug-Oct 1977.]

C-1371-78
OIL ON NORTHERN ECOSYSTEMS (book review)
Clark, R.B. 1978.
Marine Pollution Bulletin 9(7):196.

Fate, Recovery, Restoration, Marine organisms, Intertidal zone, Chronic effects, Book review, *Proceedings

A favorable review is given of Recovery Potential of Oiled Marine Northern Environments [Journal of the Fisheries Research Board of Canada 35(5):499-795. 1978 (Special issue)], the proceedings of an international conference held in Halifax, Nova Scotia, in October 1977. The conference and subsequent proceedings were divided into three sections: long-term fate of petroleum hydrocarbons following a spill, physiological stresses and response to chronically oiled organisms, and long-term effects of oil spills on intertidal communities.

5. GENERAL ASPECTS

C-1372-78

GESAMP HAS ITS TENTH BIRTHDAY (news brief) Anon. 1978. Marine Pollution Bulletin 9(9):227.

Environmental protection, Biological effects, Pollution prevention, Ships, Monitoring, UN, *Conference, *GESAMP

Among the topics reviewed at the recent tenth session of the United Nations Joint Groups of Experts on the Scientific Aspects of Marine Pollution (GESAMP) were the evaluation of the hazards of harmful substances carried by ships, the monitoring of biological variables, and the protection of particularly sensitive marine regions. [possibly oil pollution related]

C-1373-78

POLLUTION THREATENS MEDITERRANEAN COAST LINE Anon. 1977. World Dredging 13(12):34-35.

Contamination, Mediterranean Sea, Shorelines, Sources, Tar, Pollution control, Environmental deterioration

Aquatic pollution affecting Spain, France, Italy, Greece and Yugos-lavia was assessed in a 296-page study by Frost and Sullivan, Inc., a New York based firm specializing in technological market research. The conclusions follow: the majority of beaches and harbors along

the Mediterranean coast, where tar residues are a common problem, are severely contaminated; the critical level of pollution results from sources such as untreated domestic sewage, industrial effluents, and oil spills and discharges; and drinking water supplies have become a concern. Some of the pollution prevention and control measures being undertaken by these countries are also described.

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #4483-108. 1978]

C-1374-78

REPORT OF THE EIGHT SESSION ROME, 21-27 April 1976

Anon. 1976.

GESAMP (IMCO/FAO/UNESCO/WMO/IAEA/UN Joint Group of Experts on the Scientific Aspects of Marine Pollution), 1976. 39 p. (Reports and Studies, No. 4)

Environmental effects, Oil spills, Offshore exploration, Offshore development, Wastewaters, Biological effects, UN, *GESAMP

A review and evaluation of the harmful substances in the marine environment are presented, and a special report on the environmental impact of oil spills is included. Other relevant topics examined include scientific aspects of pollution arising from the exploration and the exploitation of the seabed, scientific aspects of removal of harmful substances from wastewater, and monitoring biological parameters of marine pollution.

[from Oceanic Abstracts 15(2):#78-02659. 1978]

C-1375-78

THE HUMBER ESTUARY

Jones, N.V. (ed.). 1977.

Hull, UK, University of Hull, 1977. n.p. A Joint Symposium: The Humber Estuary, Cottingham, UK, 12 Dec 1973.

Estuaries, Oil industry, Fisheries, Water quality, Environmental management, *Proceedings

"The proceedings presents 18 papers dealing with the uses and investigations of the Humber Estuary, including industrial development, oil industry, amenity and recreation, salmon and freshwater fisheries, and estuarine and coastal fisheries. Environmental studies are included on water quality, physical characteristics, sedimentology, invertebrate distribution, distribution of heavy metals in the Estuary and its organisms, biology of young fish, and birds of the Estuary." [possibly oil pollution related]

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #4477-108. 1978]

C-1376-78

ENVIRONMENT AND MAN, VOLUME 5. THE MARINE ENVIRONMENT Lenihan, J., and W.W. Fletcher (eds.). 1977. New York, Academic Press, 1977. xiv + 170 p.

Environmental effects, Oil spills, Oceans, *Book

The book deals with problems related to the marine environment. One chapter is devoted to the subject of oil spills.

[from Biological Abstracts 65(10):#58482. 1978]

C-1377-78

POLLUTION BY HYDROCARBONS: SOME ORIGINAL SOLUTIONS [in French] Margara, A. 1977.

Industrie du Petrole dans le Monde-Gaz-Chimie 45(481):35,37,39.

Hydrocarbons, Detection, Sources, Biological effects, Biodegradation, Oceans, Freshwater, Industries, Pollution control, Wastewaters

The following topics are discussed: detection of hydrocarbon pollutants in surface water by thermographic means; sources and annual input of ocean pollutants; biodegradation; effects of river and lake pollution; and cleanup of industrial effluents.

[from Petroleum Abstracts 17(36):#238,002. 1977]

C-1378-78

PETROLEUM HYDROCARBONS IN MARINE SEDIMENTS AND ANIMALS FROM THE ISLAND OF MALTA Sammut, M., and G. Nickless. 1978. Environmental Pollution 16(1):17-30.

Hydrocarbons, PAH, Sediments, Marine organisms, Biological effects, Tar, Sources, Tankers, Mediterranean Sea

Results of field sampling and analysis indicate that marine sediments and organisms from the Maltese coast contain petroleum hydrocarbons. The primary source is probably minute tar balls originating from flushing operations of oil tankers using the heavily traveled shipping lanes of the nearby Mediterranean narrows; pleasure craft and sewage effluent are also contributing sources. Polynuclear aromatic hydrocarbons (PAHs) were found in appreciable amounts in some of the marine sediments, and were also detected in the gut of the grey mullet (Mugil cephalus).

D. ASPECTS OF OIL EXPLORATION AND PRODUCTION

1. BIOLOGICAL ASPECTS

C-1379-78 ECOLOGICAL ASPECTS OF GLOBAL SEA POLLUTION Patin, S.A. 1977. Oceanography 16(4):354-357.

Sources, Toxicity. Oceans, Petroleum products, Crude oil, Biological effects, Food web, Phytoplankton, *Nekton

The sources and degree of toxicity of the main groups of global toxicants, including crude oil and petroleum products, are presented; levels of concentration are reported for both pelagic and shelf waters. A decrease in photosynthesis and in biomass of phytoplankton and a subsequent decrease in nekton production may endanger the food web. [also published in Okeanologiia 16(4):621-626. 1976]

[from Oceanic Abstracts 14(6):#77-05663. 1977]

2. PHYSICAL/CHEMICAL ASPECTS

C-1380-78

FACTORS THAT INFLUENCE THE LEACHING OF ORGANIC MATERIAL FROM IN SITU SPENT SHALE

Amy, G., and J. Thomas. 1977.

Interamerican Confederation of Chemical Engineering and Asian Pacific Confederation of Chemical Engineering, Pacific Chemical Engineering Congress, 2nd, Denver, 1977. Volume 1. p. 398-402.

Oil shale, Groundwater, Contamination, *Leaching

"A series of batch and continuous flow experiments was run in order to assess the potential for contamination of ground water by organic material leached from in situ spent shale...Factors that significantly influenced the concentration of organic material present in leachate included (1) retorting conditions associated with spent shale, (2) spent shale particle size, (3) water temperature, and (4) leaching time."

[from Petroleum Abstracts 17(49):#241,648. 1977]

C-1381-78

ENVIRONMENTAL ASPECTS OF A WELL BLOWOUT IN THE GULF OF MEXICO Brooks, J.M., B.B. Bernard, T.C. Sauer, Jr., and H. Abdel-Reheim. 1978.

Environmental Science and Technology 12(6):695-703.

Blowouts, Hydrocarbons, Sediments, Environmental effects, Chemical analysis, Texas, Gulf of Mexico

Results of studies conducted four months after a well blowout on the Texas continental shelf are presented. They include: seep rate and composition of escaping gas; current measurements of the blowout crater; and concentrations of hydrocarbon compounds in the water and in the redeposited sediments. "The impact of the blowout on temperature, salinity, dissolved oxygen, DOC, POC, TSM, helium, CO_2 , $\mathrm{\Sigma}\mathrm{CO}_2$, and sulfate in the waters and sediment" are also evaluated.

SOCIAL/ECONOMIC ASPECTS

C-1382-78

1976 - DISASTER YEAR FOR MARINE UNDERWRITERS Anon. 1977.

Naval Architect, No. 2:46.

Economic effects, Insurance, Oil industry, Tankers, Development, Oil spills, *Claims

The shipping slump, depressed premium rates, currency problems and widespread inflation, and merchant shipping casualties plagued marine underwriters in 1976. Tanker disasters included the Berge Istra, the Olympic Bravery, the Sansinena, and the Argo Merchant; offshore losses included the grounding of the semisubmersible Deep Sea Driller. "Twenty-four markets were involved in claims from what has been described as the biggest single marine loss in recent years."

[from Oceanic Abstracts 15(1):#00927. 1978]

C-1383-78

PRIMARY RISK EVALUATION FOR OFFSHORE FIELDS IN THE NORTH SEA Roxburgh, G. 1977.

Petroleum Times 81(2049):69, 71-72.

Offshore development, *Risk analysis, Platforms, Safety, Economic effects, Oil industry. North Sea

The author distinguishes between the primary, secondary, and tertiary levels of risk involved in the development of offshore oil and gas. He suggests that primary risks, which include platform failure, well blowout, storage vessel failure, enemy attack, seismic failure, iceberg impact, major fire and explosion, major design failure, and major pipeline failure, should be given overriding consideration in future plans for exploitation of North Sea energy resources. A discussion and table are presented of the various platform types and associated primary risks based on the degree of platform fixity to the sea bed.

4. GENERAL ASPECTS

C-1384-78

ENERGY AND THE OCEANS

Borgese, E.M. 1977.

Energy Technology and Global Policy. S.A. Saltzman and E.M. Borgese (eds.). Santa Barbara, California, Clio Books, 1977. p. 217-230.

Offshore development, Drilling, Oceans, Biological effects, Environmental management, Sources, Regulations, Monitoring

A brief history of offshore oil production is given and several other energy sources involving the ocean, including ocean-based nuclear power plants, are discussed. Contributing sources of oil pollution and some of its biological effects are briefly outlined. The need for international regulations and monitoring programs is emphasized.

C-1385-78

OIL AND GAS USE CHARACTERIZATION, IMPACTS, AND GUIDELINES Conner, W.H., J.H. Stone, L.M. Bahr, V.R. Bennet, and J.W. Day, Jr. 1976.

Louisiana State University Sea Grant Publication No. LSU-T-76-006. 157 p.

Production, Industries, Guidelines, Environmental effects, *Review, *Wetlands

"A nontechnical survey of oil and gas activities and their impacts on wetland, and a discussion of preliminary guidelines for optimizing production and minimizing impact are presented." [possibly oil pollution related]

[from Petroleum Abstracts 17(52):#242,709. 1977]

C-1386-78

SURFACE SAFETY SYSTEMS FOR OFFSHORE PLATFORMS Latham, W.T. 1976.

Automation in Offshore Oil Field Operations. F.L. Galtung, K. Roesandhaug, and T.J. Williams (eds.). Amsterdam, Netherlands, North-Holland Publishing Company, 1976. p. 83-88. (Computer Applications in Shipping and Shipbuilding, Vol. 3)

Platforms, Offshore development, Design-engineering, Safety, Pollution control, Regulations

Increased government codes, rules, and regulations have established strict requirements for installation, operation, testing, and maintenance of surface safety equipment on offshore production platforms. These criteria are leading towards the standardization of platform sytems. Pneumatic/hydraulic equipment and systems designs currently operating in US waters meet or exceed federal regulations; systems are adaptable to international platforms to provide the same high degree of safety and pollution control.

[from Oceanic Abstracts 14(5):#77-04775. 1977]

C-1387-78 DEEPWATER PORTS Loughry, T. 1977. Surveyor 11(1):18-23.

Deepwater ports, *LOOP, *Seadock, Spill cleanup, Compensation, Pollution prevention, Gulf of Mexico

Licenses filed December 1976 with the CEQ permit the construction and operation of two DWPs in the Gulf of Mexico: the Louisiana Offshore Oil Port (LOOP) and the Seadock facility. A proposed 2-cent levy per barrel of crude oil brought ashore will contribute towards building a \$100 million fund for cleanup of any spills should they occur. The best available preventative technology is mandated in design and construction of the facilities.

[from Oceanic Abstracts 14(6):#77-05862. 1977]

C-1388-78

INVENTORY OF ENERGY RESEARCH AND DEVELOPMENT: 1973-1975. Volume III. Serial U.

US Congress. House. Committee on Science and Technology. 1976. Report NSF/RA-760495, Grant NSF-AER74-18999-A01. (Supersedes N77-13527).

Exploration, Production, Economic effects, Legislation, Regulations, Oil spills, Disposal, *Overview

"This inventory provides an overview of the [research and development] being performed in every aspect of energy exploration, production, distribution, use and conservation." The section entitled "Economic and Legal Aspects" includes a chapter on policy, legislative, and regulatory aspects. The section entitled "Environmental and Health - Energy Related" contains chapters on water pollution, oil spills, and waste product utilization and disposal.

[from Government Reports Announcements 77(10):#PB-265 127/1GA. 1977]

5. BASELINE AND ENVIRONMENTAL IMPACT STUDIES

C-1389-78

FINAL ENVIRONMENTAL STATEMENT. OCS SALE NO. 42
Bureau of Land Management. 1977.
Washington, DC, US Department of the Interior, 1977. 653 p. Volume 1.
EIS, OCS, Environmental effects, Oil-gas leasing, Socioeconomic effects, Atlantic Coast

The environmental impacts of the proposed sale of oil and gas leases on the North Atlantic Outer Continental Shelf are analyzed. "All tracts offered pose some degree of pollution risk to the environment." Accidental and chronic spillages are included among the possbile sources of pollution. Certain tracts will pose a particular risk to pelagic birds and commercial fishing. Local socioeconomic and environmental effects may also result.

[from Petroleum Abstracts 17(48):#241.461. 1977]

C-1390-78

FINAL ENVIRONMENTAL STATEMENT. OCS SALE NO. 42

Bureau of Land Management. 1977.

Washington, DC, US Department of the Interior, 1977. 564 p. Volume 2.

EIS, OCS, Offshore development, Environmental effects, Oil-gas leasing, Onshore impacts, Atlantic Coast

Included in this EIS for the proposed sale of oil and gas leases on the Atlantic Outer Continental Shelf are sections on the following: impact on the environment and basic assumptions regarding causes of offshore environmental impacts; impact of oil and gas operations on the offshore environment; and onshore impacts of oil and gas operations.

[from Petroleum Abstracts 17(48):#241,462. 1977]

C-1391-78

OUTER CONTINENTAL SHELF (OCS) OIL AND GAS LEASE SALE NO. C1:

LOWER COOK INLET. VOLUME 1, PART 1

Bureau of Land Management. 1976.

Report BLM/ME-78-04a. 589 p. Final environmental impact statement.

EIS, Oil-gas leasing, OCS, Offshore development, Alaska, BLM, *Lower Cook Inlet

A sum of 152 tracts (0.36 million hectares) off the coast of the Kenai Peninsula are proposed to be leased for exploration, development, and production of oil and gas. This document includes the Proposal, Description of the Environment, and Impact of the Proposal.

[from Government Reports Announcements 78(1):#PB-272 966/3GA. 1978]

C-1392-78

OUTER CONTINENTAL SHELF (OCS) OIL AND GAS LEASE SALE NO. C1:

LOWER COOK INLET. VOLUME 1, PART 2

Bureau of Land Management. 1976.

Report BLM/ME-78-04b. 574 p. Final environmental impact statement.

EIS, Oil-gas leasing, OCS, Offshore development, Alaska, BLM, *Lower Cook Inlet

A sum of 152 tracts (0.36 million hectares) off the coast of the Kenai Peninsula are proposed to be leased for exploration, development, and production of oil and gas. This volume includes the Proposal, Description of the Environment, and Impact of the Proposal.

[from Government Reports Announcements 78(1):#PB-272 967/1GA. 1977]

C-1393-78

OUTER CONTINENTAL SHELF (OCS) OIL AND GAS LEASE SCALE NO. C1:

LOWER COOK INLET. VOLUME 2

Bureau of Land Management. 1976.

Report BLM/ME-78-05. 900 p. Final environmental impact statement.

EIS, Oil-gas leasing, OCS, Offshore development, Alaska, BLM, *Lower Cook Inlet

A sum of 152 tracts (0.36 million hectares) off the coast of the Kenai Peninsula are proposed to be leased for exploration, development, and production of oil and gas. Volume 2 reviews "adverse and irretrievable impacts and resource loss," short- and long-term consequences of the proposal, mitigation, and alternatives.

[from Government Reports Announcements 78(1): #PB-272 968/9GA. 1978]

C-1394-78

STRATEGIC PETROLEUM RESERVE

Federal Energy Administration. 1977.

Report FEA/S-77/329, FES-76/2 - Draft Supplement. Final environmental impact statement (draft supplement).

EIS, Storage, Crude oil, Environmental effects, *Strategic Petroleum Reserve

The final programmatic EIS and the Strategic Petroleum Reserve (SPR) Plan evaluated the impacts of storing one hundred fifty million barrels (MMB) of oil by 1978 and five hundred MMB by 1982. The environmental impacts of the proposed SPR expansion to store a total of 1,000 MMB are addressed in this supplement.

[from Government Reports Announcements 78(2):#PB-273 487/9GA. 1978]

C-1395-78

STRATEGIC PETROLEUM RESERVE: CAPLINE GROUP SALT DOMES. BAYOU CHOCTAW EXPANSION. CHACAHOULA, IBERIA, NAPOLEONVILLE, WEEKS ISLAND EXPANSION. VOLUME I

Federal Energy Administration. 1977.

Report FEA/S-77/339, DES-77/9-Vol-1. 374 p. Draft environmental impact statement.

EIS, Storage, Crude oil, Environmental effects, Louisiana, *Strategic Petroleum Reserve

This site-specific EIS for 5 candidate sites comprising the Capline Group of salt domes located in the Gulf Coast region of south central Louisiana analyzes the environmental impacts which could occur during site preparation and operation. The primary site for SPR development in this area is the Napoleonville salt dome located in Assumption Parish, Louisiana. Two of the other potential sites are new, and two are expansions of Early Storage Reserve facilities.

[from Government Reports Announcements 78(2): #PB-273 542/1GA. 1978]

C-1396-78

STRATEGIC PETROLEUM RESERVE: CAPLINE GROUP SALT DOMES. BAYOU CHOCTAW EXPANSION, CHACAHOULA, IBERIA, NAPOLEONVILLE, WEEKS ISLAND EXPANSION. VOLUME II

Federal Energy Administration. 1977.

Report FEA/S-77/340, DES-77/9-Vol-2. 450 p. Draft environmental impact statement.

EIS, Storage, Crude oil, Environmental effects, Louisiana, *Strategic Petroleum Reserve

This site-specific EIS for 5 candidate sites comprising the Capline Group of salt domes located in the Gulf Coast region of south central Louisiana analyzes the environmental impacts which could occur during site preparation and operation. The primary site for SPR development in this area is the Napoleonville salt dome located in Assumption Parish, Louisiana. Two of the other potential sites are new, and two are expansions of Early Storage Reserve facilities. Volume II contains Appendixes A and B which describe the project and the environment. [possibly oil pollution related]

[from Government Reports Announcements 78(2): #PB-273 543/9GA. 1978]

C-1397-78

STRATEGIC PETROLEUM RESERVE: CAPLINE GROUP SALT DOMES. BAYOU CHOCTAW EXPANSION, CHACAHOULA, IBERIA, NAPOLEONVILLE, WEEKS ISLAND EXPANSION. VOLUME III

Federal Energy Administration. 1977.

Report FEA/S-77/341, DES-77/9-Vol-3. 549 p. Draft environmental impact statement.

EIS, Storage, Crude oil, Environmental effects, Louisiana, *Strategic Petroleum Reserve

This site-specific EIS for 5 candidate sites comprising the Capline Group of salt domes located in the Gulf Coast region of south central Louisiana analyzes the environmental impacts which could occur during site preparation and operation. The primary site for SPR development in this area is the Napoleonville salt dome located in Assumption Parish, Louisiana. Two of the other potential sites are new, and two are expansions of Early Storage Reserve facilities. Appendixes C through J are contained in this volume. [possibly oil pollution related]

[from Government Reports Announcements 78(2): #PB-273 544/7GA. 1978]

C-1398-78

STRATEGIC PETROLEUM RESERVE. FINAL ENVIRONMENTAL IMPACT STATEMENT FOR KLEER MINE

Federal Energy Administration. 1977.

Report FEA/S-77/324, FES 77-2. 584 p.

EIS, Storage, Oil transport, Oil spills, *Strategic Petroleum Reserve Among the adverse effects that could result from the development of the proposed oil storage facility at Kleer Mine, Texas, is the potential for increased frequency of oil spills along the transportation corridors.

[from Petroleum Abstracts 17(48):#241,442. 1977]

C-1399-78

STRATEGIC PETROLEUM RESERVE. SEAWAY GROUP SALT DOMES. BRYAN MOUND EXPANSION, ALLEN, DAMON MOUND, NASH, WEST COLUMBIA Federal Energy Administration. 1977.

Report FEA/S-77/344, DES 77-10. 143 p. Draft environmental impact statement. Volume 1.

EIS, Storage, Environmental effects, *Strategic Petroleum Reserve This site-specific EIS assesses the potential environmental effects of development of a Strategic Petroleum Reserve facility at any of the five title candidate locations.

[from Petroleum Abstracts 17(48):#241,445. 1977]

C-1400-78

STRATEGIC PETROLEUM RESERVE. SEAWAY GROUP SALT DOMES. BRYAN MOUND EXPANSION, ALLEN, DAMON MOUND, NASH, WEST COLUMBIA Federal Energy Administration. 1977.
Report FEA/S-77/346, DES 77-10. 319 p. Draft environmental impact.

Report FEA/S-77/346, DES 77-10. 319 p. Draft environmental impact statement. Volume 2.

EIS, Storage, Oil spills, *Brine spills, *Risk analysis, *Strategic Petroleum Reserve

Included in this EIS on the proposed Bryan Mound site and the four alternate sites for the development of a Strategic Petroleum Reserve facility is a section on oil and brine spill risk analysis.

[from Petroleum Abstracts 17(48):#241,446. 1977]

C-1401-78

STRATEGIC PETROLEUM RESERVE. TEXOMA GROUP SALT DOMES. VOLUME 1. WEST HACKBERRY EXPANSION, BLACK BAYOU, VINTON, BIG HILL Federal Energy Administration. 1977.

Report DES 77-8, FEA/S-77/323. 389 p. Draft environmental impact statement.

EIS, Storage, Environmental effects, *Strategic Petroleum Reserve

The proposed plan for Strategic Petroleum Reserve development in the Texoma salt dome group involves the expansion of the West Hackberry Early Storage Facility. One or a combination of the other three title sites may be developed as an alternative. The environmental impacts of development are analyzed for each site in this EIS.

[from Petroleum Abstracts 17(45):#240,474. 1977]

C-1402-78

STRATEGIC PETROLEUM RESERVE. TEXOMA GROUP SALT DOMES. VOLUME 2. APPENDIX C. WEST HACKBERRY EXPANSION, BLACK BAYOU, VINTON, BIG HILL

Federal Energy Administration. 1977.

Report DES 77-8, FEA/S-77/323. 500 p. Draft environmental impact statement.

EIS, Storage, Oil spills, Oil transport, Oil terminals, *Risk analysis, *Strategic Petroleum Reserve

This section of the EIS assesses the potential for the occurrence of accidents with emphasis on oil spill potential at the West Hackberry site where expansion of the Early Storage Reserve facility is proposed and at the three alternative sites. The risk of spills greater than 1,000 bbl is generally less than 1% except during tanker transport in the Sabine-Neches Channels and at the Sun Terminal dock.

[from Petroleum Abstracts 17(45):#240,476. 1977]

C-1403-78

STRATEGIC PETROLEUM RESERVE. TEXOMA GROUP SALT DOMES. VOLUME 4. APPENDICES. WEST HACKBERRY EXPANSION, BLACK BAYOU, VINTON, BIG HILL Federal Energy Administration. 1977.

Report DES 77-8. FEA/S-77/323, 750 p. Draft environmental impact statement.

EIS, Storage, Environmental effects, Oil spills, *Risk analysis, *Strategic Petroleum Reserve

Included in these appendices is information on oil spill risk, oil pollution, and ecological impacts of oil spills, as well as other data relevant to the Strategic Petroleum Reserve development in the Texoma group of salt domes.

[from Petroleum Abstracts 17(45):#240,478. 1977]

C-1404-78

COASTAL MORPHOLOGY AND SEDIMENTATION, LOWER COOK INLET, ALASKA, WITH EMPHASIS ON POTENTIAL OIL SPILL IMPACTS Hayes, M.O., P.J. Brown, and J. Michel. 1976. Technical Report No. 12-CRD, University of South Carolina. - p.

Baseline studies, Shorelines, Sedimentation, Oil spills, Fate, Ecosystems, Alaska, *Vulnerability index, *Lower Cook Inlet

Erosional, depositional, or neutral categories were assigned to 1,200 km of shoreline at the title area on the basis of ground studies at 57 localities and more detailed sediment and morphologic studies at 10 selected sites. Neutral and depositional shorelines appear to be the areas of greatest longevity of oil spills based on studies of the Metula spill in the Strait of Magellan. Salt marshes and tidal flat areas of the west shore of the inlet and the gravel-paved intertidal zone of the lower shoreline of Kachemak Bay are especially susceptible.

C-1405-78

VULNERABILITY OF COASTAL ENVIRONMENTS OF LOWER COOK INLET, ALASKA TO OIL SPILL IMPACT

Hayes, M.O., J. Michel, and P.J. Brown. 1977.

International Conference on Port and Ocean Engineering Under Arctic Conditions, 4th, Memorial University of Newfoundland, September 26-30, 1977. - p. Preprint.

Baseline studies, Shorelines, Sedimentation, Oil spills, Fate, Ecosystems, Alaska, *Vulnerability index, *Lower Cook Inlet

A field study of the coastal morphology and sediments of the title area was conducted in June 1976, with emphasis on the behavior of potential oil spills. Classification of 1216 km of shoreline was by erosional (45%), neutral (38%), and depositional (17%) types, with 16 subclasses. The longevity of oil in different coastal environments was predicted by use of this classification in conjunction with a vulnerability index of potential oil spill damage, developed through study of 2 major oil spills. Values were assigned from a longevity scale of 1-10, with 45\% of the shoreline receiving values of 1-4 (dispersion by natural processes within less than 6 months), and 41.5% receiving a 6-10 rating (oil contamination to remain 2-10 years).

C-1406-78

RECOMMENDATIONS FOR MICROBIOLOGICAL STUDIES IN THE CONTINENTAL SHELF AREAS

National Oceanic and Atmospheric Administration. Environmental Research Laboratories. 1977.

Report NOAA-TM-ERL-MESA-16. 50 p. NOAA Technical Memorandum. Marine Ecosystems Analysis Program.

Baseline studies, Guidelines, Biodegradation, Microorganisms, OCS, Offshore development, Analytical techniques, NOAA, Alaska

During the preparation of a 5-yr plan for the BLM-supported studies to be conducted on the Alaskan OCS before oil and gas development proceeded, workshop participants were asked to propose techniques for the following studies: Characterization of the existing microbial populations; the anthropogenic effect on natural microbiological communities; the effect of those communities on OCS activities; and requirements for supporting data and information on related processes. This report compiles a detailed list of microbiological studies that the group agreed should be included in marine assessment programs, and describes standardized sampling procedures and requirements.

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #4586-108. 1978]

C-1407-78

THE INTERTIDAL AND SHALLOW SUBTIDAL BENTHOS OF THE STRAIT OF JUAN DE FUCA

Nyblade, C.F. 1978.

NOAA Technical Memorandum ERL MESA-26. 151 p. (est.) Spring 1976 - Winter 1977.

Baseline studies, Benthos, Habitats, Marine organisms, Environmental effects, Oil transport, Oil transfer, Puget Sound

The first year's report is presented for this component of a larger baseline study project designed to identify the potential environmental consequences of increased petroleum transport and transfer activities anticipated for the greater Puget Sound region. Research objectives include: definition of habitat types present in the title area, largely according to substratum/exposure; selection of 10 representative sites along the length of the Strait; quarterly determination of community composition at each site; and determination of the vertical distribution of the habitat organisms.

C-1408-78

COASTAL MORPHOLOGY, SEDIMENTATION AND OIL SPILL VULNERABILITY, NORTHERN GULF OF ALASKA

Ruby, C.H. 1977.

Technical Report No. 15-CRD, University of South Carolina. 223 p.

Baseline studies, Shorelines, Sedimentation, Oil spills, Ecosystems, Gulf of Alaska, *Vulnerability index

The 986 km of shoreline studied were classified as erosional (23%), depositional (19%), and neutral (58%) shorelines, with 11 subclasses. These geomorphic baseline studies were used in conjunction with field work at 5 oil spills in various coastal environments to evaluate the title area in terms of potential oil spill impacts. The oil spill vulnerability is based primarily on the longevity of spilled oil within each geomorphic subenvironment, with consideration of biologic sensitivity as well. Risk classification ratings are given.

C-1409-78

HYDROCARBONS IN THE MARINE ENVIRONMENT OF PORT VALDEZ, ALASKA Shaw, D.G., and B.A. Baker. 1978.

Environmental Science and Technology 12(10):1200-1205.

Baseline studies, Hydrocarbons, Tankers, Ballast, Biological effects, Alaska, *Trans-Alaska Pipeline, *Port Valdez

Sampling and analysis of biota, water, and sediments of Port Valdez for saturated and unsaturated hydrocarbons were performed during the year prior to the completion of the trans-Alaska pipeline. The results show "kinds and amounts of hydrocarbons typical of unpolluted nearshore environments. Common, prominent compounds include pristane, heptadecane, odd chain length normal alkanes with 21-31 carbon atoms, and a triterpene tentatively identified as squalene." This study provides baseline data for evaluating the fate and effects of oil entering the environment through the operation of the tanker loading facility.

FATE OF OIL IN THE ENVIRONMENT

BIODEGRADATION

C-1410-78

MICROORGANISMS AND PETROLEUM POLLUTANTS Atlas, R.M. 1978.
Bioscience 28(6):387-391.

Biodegradation, Hydrocarbons, Spill cleanup, Pollution control, Environmental management, Microorganisms

Microorganisms play a key role in degrading petroleum pollutants. The rates and thoroughness of degradation depend on the molecular structures of the different classes of hydrocarbons, the hydrocarbons present in a mixture, and whether the source of pollution is acute or chronic. The author also discusses seeding techniques and environmental modifications which enhance the process of microbial biodegradation.

C-1411-78

THE MICROBIOLOGY OF AQUATIC OIL SPILLS
Bartha, R., and R.M. Atlas. 1977.
Advances in Applied Microbiology. D. Perlman (ed.). New York,
Academic Press, 1977. Vol. 22:225-265.

Biodegradation, Microorganisms, Oil spills, Oil discharges, Sources, Behavior, Emulsification, Spill cleanup, *Review

A literature review with 156 references is presented, dealing with microbiological aspects of accidental or routine oil discharges into aquatic environments. The following topics are covered: the sources and behavior of oil pollutants; effects of petroleum hydrocarbons on microbial populations and their diversity; microbial emulsification and degradation of petroleum components; the effects of cleanup techniques on biodegradation; and the use of stimulated oil biodegradation in oil pollution abatement.

C-1412-78

HYDROCARBON DEGRADATION (book review) Corner, E.D.S. 1978.
Marine Pollution Bulletin 9(8):224.

Biodegradation, Hydrocarbons, Oil spills, Oil slicks, Dispersion, Evaporation, Book review

A favorable review is given of the book <u>Developments in Biodegradation of Hydrocarbons-1</u> [R.J. Wilkinson (ed.). London, Applied Science Publishers Ltd., 1978.x + 232 p.]. Chapter six addresses the subject of degradation of oil spills at sea, and emphasizes that dispersal mechanisms, especially evaporation, are mainly responsible for removing oil slicks.

C-1413-78

INTERMEDIATES FROM THE MICROBIAL OXIDATION OF ALIPHATIC HYDROCARBONS Markovetz, A.J. 1978.

Journal of the American Oil Chemists' Society 55(4):430-434.

Biodegradation, Hydrocarbons, Microorganisms, Bacteria, Yeasts, Fungi, Oxidation, *Review

"A review, with 34 references, of the oxidation of saturated and unsaturated aliphatic hydrocarbons by bacteria, yeasts, and fungi."

[from Chemical Abstracts 88(25):#188000u. 1978]

C-1414-78

ENHANCEMENT OF MICROBIAL DEGRADATION OF OIL POLLUTANTS USING LIPO-PHILIC FERTILIZERS

Olivieri, R., A. Robertiello, and L. Degan. 1978. Marine Pollution Bulletin 9(8):217-220.

Biodegradation, Microorganisms, Spill cleanup, *Fertilizer, *Nitrogen, *Phosphorus

Lipophilic phosphorus and nitrogen containing compounds were screened to attain a viable fertilizer to enhance the microbial degradation of oil pollutants in the aquatic environment. Laboratory investigations proved that soya-bean lecithin and ethyl allophanate were good sources of phosphorus and nitrogen for degrading microorganisms. Simulated field experiments are in progress to verify findings.

C-1415-78

RECOMMENDATIONS FOR MICROBIOLOGICAL STUDIES IN THE CONTINENTAL SHELF AREAS

Outer Continental Shelf Environmental Assessment Program. 1977. NOAA Technical Memorandum ERL MESA-16. 45 p. Results from two workshops convened 10-11 August 1976 and 19-20 October 1976 in Boulder, Colorado.

Biodegradation, Microorganisms, OCS, Oil spills, Acute effects, Chronic effects, Sampling

Presented are studies and techniques recommended by workshop participants for use in the following areas: 1) general characterization of the existing microbial populations; 2) anthropogenic effects on natural microbiological communities and their functioning (including acute and chronic oil spills); 3) effects of natural microbial communities on OCS activities (including pipeline corrosion and hydrocarbon degradation); and 4) requirements for supporting data and information on related processes. Sampling procedures and requirements are also covered.

C-1416-78

ANAEROBIC OXIDATION OF HYDROCARBONS BY <u>DESULFOVIBRIO</u> <u>DESULFURICANS</u> [English summary]

Stanev. Ts. 1977.

Izvestiya-Institut po Ribni Resursi, Varna/Izvestiya-Institut Rybnykh Resursov, Varna/Proceedings-Institute of Fisheries, Varna, Vol. 5:115-120.

Biodegradation, Bacteria, Oxidation, Hydrocarbons. *Desulfovibrio desulfuricans, *Wadden Sea

"Data are presented which indicate a slow oxidation of glucose, pentane, hexane, benzene and light petrol by \underline{D} . desulfuricans isolated from the Wadden Sea (Holland)."

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #4591-108. 1978]

C-1417-78

OIL DECOMPOSING BACTERIA IN VARNA BAY SEA WATER [English summary] Stanev, Ts. 1977.

Izvestiya-Institut po Ribni Resursi, Varna/Izvestiya-Institut Rybnykh Resursov, Varna/Proceedings-Institute of Fisheries, Varna, Vol. 5:121-126.

Biodegradation, Microorganisms, Bacteria, Distribution, USSR, *Varna Bay

"From marine waters of Varna Bay bacteria that are capable of growth on different kinds of oils were isolated. Distribution and number of oil decomposing microorganisms were also established."

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #4590-108. 1978]

C-1418-78

HYDROCARBON BIODEGRADATION IN HYPERSALINE ENVIRONMENTS Ward, D.M. and T.D. Brock. 1978.
Applied and Environmental Microbiology 35(2):353-359.

Biodegradation, Hydrocarbons, Tar, Natural seepage, Chromatography, *Hypersaline environments

Experiments in which oil was added to natural samples of varying salinity (3.3-28.4%) indicated that microbial metabolism of the oil decreased with increasing salinity. Gas chromatographic examination of tar samples from natural seeps in Great Salt Lake showed no biodegradation of the isoprenoid alkanes that are subject to degradation in normal environments. These observations "raise doubt about the biodegradation of hydrocarbons in hypersaline environments."

[from Chemical Abstracts 88(2):#11818m. 1978]

2. PHYSICAL/CHEMICAL CHANGES

C-1419-78

LIGHT REFINED OILS DISCHARGED ON WATER SURFACE [English summary] Namie, S., Y. Ueta, and H. Yamanouchi. 1978.
Nippon Hakuyo Kikan Gakkaishi 13(2):156-163.

Fate, Behavior, Petroleum products, Evaporation, Solubility, WSF, *Light refined oils

In experiments, the evaporation rates and aqueous solubilities of various light petroleum products were determined. Evaporation rates (from highest to lowest) were as follows: naphtha, gasoline, kerosine, Iranian light crude oil, and gas oil. Aqueous fractions consisted mainly of light paraffins and light aromatic hydrocarbons. The hydrocarbon contents of the WSFs were in almost the same order for gasoline, kerosine, and crude oil and increased as evaporation rates decreased.

[from Chemical Abstracts 89(4):#27192p. 1978]

3. GENERAL FATE OF OIL

C-1420-78

TWO YEARS AFTER THE METULA OIL SPILL, STRAIT OF MAGELLAN, CHILE: OIL INTERACTION WITH COASTAL ENVIRONMENTS Blount, A.E. 1978.

Technical Report No. 16-CRD, University of South Carolina. 214 p.

Metula spill, Contamination, Ecosystems, Behavior, Fate, Movement, Distribution, *Coastal environments

The site of the Metula oil spill (August 9, 1974) was visited 12, 18, and 24 months after the spill to observe temporal changes in oil conditions. The most heavily polluted areas were two estuaries in the First Narrows, within 20 km of the site. The least amount of oil contamination was seen at wave-cut platforms and exposed tidal flats. "Oil retention in affected coastal environments has been a function of distance from the spill site, initial amount of oil contamination, tidal range, tidal phase at the time of deposition, wave energy, exposure to strong west winds, and sedimentological character."

C-1421-78

THE TRANSPORT AND FATE OF HYDROCARBONS IN BENTHIC ENVIRONMENTS Boehm, P.D. 1977.

Dissertation Abstracts International, B, 38(4):1503-1504.

Hydrocarbons, Uptake, Fate, Sedimentation, Benthos, Biological effects, Atlantic Coast, Rhode Island, Mollusks

The author performed both laboratory analyses and field observations on the uptake of hydrocarbons by filter-feeders and a detailed study of Rhode Island Sound's benthic environments in order to determine hydrocarbon transport routes in the benthos and the relation between bivalves and the sediments in which they live. Recent sedimentation rates in the Sound were calculated on the basis of the presence of two anthropogenic chemical markers, petroleum hydrocarbons and PCBs, in one sample core and the known date of their introduction into the environment.

C-1422-78

HYDROCARBON BUDGETS FOR LAKE WASHINGTON Wakeham, S.G. 1977.
Limnology and Oceanography 22(5):952-957.

Hydrocarbons, Lakes, Sources, Rivers, Sedimentation, Washington, *Runoff

"Fluxes of hydrocarbons through Lake Washington show that urban stormwater runoff and river runoff are the major sources of petro-leum hydrocarbons to the lake. Sedimentation is the primary removal process for these hydrocarbons."

4. MODELS AND PREDICTIONS

C-1423-78

KEEPING UP WITH TECHNOLOGY - RISK EVALUATION Eri, J. 1977.
Northern Offshore 6(2):24-25, 28-30.

Safety, *Risk analysis, Offshore development, Statistics, Industries

In evaluating risks, probabilities are assigned to events causing risks or hazards and to the chances of risk occurrence. Risk levels differ widely from industry to industry, and acceptable risk levels seem to vary in inverse proportion to the technical sophisitication and the recentness of industry establishment. Risk analysis of offshore oil and gas structures depends on a combination of factors including environmental phenomena, structural response, and strength capacity.

C-1424-78

A PROBALISITC MODEL FOR DISPERSIVE OIL LOSSES BENEATH OIL BOOMS Fallah, M.H., and R.M. Stark. 1976. Ocean Engineering 3(6):383-390.

Models, Booms, *Dispersive oil losses, Oil slicks, *Theoretical research

Wave action and current turbulence can cause substantial oil losses from a deployed oil boom. Vertically displaced oil, when carried by a current, escapes beyond the perimeter of the boom. These "dispersive oil losses" are studied using a random-walk model; probalistic descriptions are derived for the volume of oil losses. A hypothetical oil slick demonstrates an application of the model.

[from Oceanic Abstracts 14(6):#77-05681. 1977]

C-1425-78

OIL SPILL MODELLING: PROBLEMS AND PURPOSES Mackay, D. 1978.

Spill Technology Newsletter 3(4):21-27.

Models, Oil spills, Behavior, Fate

An informal background paper is presented for the Oil Spill Modelling Workshop [Toronto, Canada, November 7-8, 1978]. Major objectives of the workshop are to evaluate the five major types of oil spill models, so that those which best meet the needs of different users and time considerations can be further developed. Other objectives are to coordinate modelling development, identify gaps in data acquisition, establish input and output requirements, and validate models.

C-1426-78

LONG-TERM DISPERSION OF CONTAMINANTS IN SMALL ESTUARIES Smith, R. 1977.

Journal of Fluid Mechanics 82(1):129-146.

oddina of fluid mechanics 62(1):129-140.

Contaminants, Dispersion, Models, Estuaries

The analysis of contaminant dispersion in small estuaries is simplified by the use of axes moving with the tide. The dominant mechanism for dispersion was found to be the transverse shear rather than the vertical shear. [possibly oil pollution related]

[from Petroleum Abstracts 17(45):#240,489. 1977]

C-1427-78

AMOP EXPERIMENTAL OIL SPILL PLANNING UPDATE Thornton, D.E. 1978.
Spill Technology Newsletter 3(4):17-18.

Fate, Behavior, Arctic, Incineration, Dispersants, Spill cleanup, Ice, Estuaries, *Experimental oil spills

A project is underway to identify studies requiring experimental spillage of oil into arctic or sub-arctic marine environments. High priority study topics already selected for the use of experimental oil spills include: burning of oil in melt pools, against obstacles (booms, ice edges) and in East Coast ice; field testing of dispersant effectiveness; shoreline cleanup methods, and fate and effects of oil in pack ice and in arctic estuaries.

C-1428-78

INITIAL BEHAVIOR OF OIL SLICKS
Unno, J., and I. Inoue. 1978.
Journal of Chemical Engineering of Japan 11(1):13-18.

Oil slicks, Spreading, Behavior, Distribution, Fate, Models, *Prediction

"A theoretical study of oil slicks which predicts the spreading velocity and the distribution of film thickness was made. Limited agreement with experimental data indicates that further study is needed."

[from Chemical Abstracts 88(24):#173129u. 1978]

F. OIL POLLUTION REGULATIONS

1. LOCAL/STATE LEGISLATION

[No entries.]

2. US LEGISLATION

C-1429-78

LEGISLATIVE BILL TO MONITOR OCEAN POLLUTION PASSED IN SENATE Anon. 1977.

World Dredging 13(12):37.

Legislation, Contamination, Oceans, Environmental effects, Monitoring, NOAA, US, *Research

The US Senate has unanimously passed a bill (S. 1617) to establish an ocean pollution research and monitoring program in NOAA. Assessment of the short- and long-term effects of pollutants, including oil, on the marine environment would be included in the program. The legislation requires a 3-yr federal plan for the program and annual report to Congress and the President on its progress.

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #3380-108. 1978]

C-1430-78

CONTROLLING THE ENTRANCE OF TOXIC POLLUTANTS INTO U.S. WATERS Barrett, B.R. 1978.

Environmental Science and Technology 12(2):154-162.

Legislation, Contingency planning, Health hazards, Pollution control, Environmental protection, Oceans, Freshwater, US

Nine federal laws regulating toxic pollutants in aquatic environments are reviewed in depth. Several are directly concented with oil: Federal Water Pollution Control Act (FWPCA), especially Section 311, Oil and Hazardous Substance Liability, which includes a National Contingency Plan; Marine Protection, Research, and Sanctuaries Act of 1972 (Ocean Dumping Act); Resource Conservation and Recovery Act of 1976; Hazardous Materials Transportation Act of 1974; and the Ports and Waterways Safety Act of 1972.

3. INTERNATIONAL LEGISLATION

C-1431-78

INTERNATIONAL SAFETY MEASURES FOR TANKERS ADOPTED BY IMCO (news brief) Anon. 1978.

Sea Technology 19(4):40.

Safety, Tankers, IMCO, Pollution prevention, Crude oil washing, Segregated ballast, *Inert gas systems, Guidelines, Surveillance

Among the measures adopted at the International Conference on Tanker Safety and Pollution Prevention were requirements for: crude oil washing (COW) systems and segregated ballast tanks (SBTs) systems for new crude oil vessels; either COW systems or SBTs for existing vessels; and inert gas systems (IGSs) installation for existing product carriers, within a time schedule which varies according to vessel size. US proposals for inspection and certification, backup radar, and improved emergency steering standards were also adopted. Additionally, IMCO was requested to develop standards for collision avoidance systems.

4. FOREIGN LEGISLATION

[No entries.]

5. STANDARDS AND GUIDELINES

C-1432-78

GREATER OIL POLLUTION OFF BRITISH COASTLINE (news brief)

Marine Pollution Bulletin 9(7):170-171.

Pollution prevention, Guidelines, Regulations, Ships, Contingency planning, Spill cleanup, UK

An increase in the number of pollution incidents off the British coastline was stressed by Lord Ritchie-Calder, Chairman of the Advisory Committee on Oil Pollution of the Sea. In the Committee's 1977 Annual Report, the Government's anti-pollution standards are criticized as less effective than those advocated by other nations. The Committee urges the Government to campaign against sub-standard vessels, primarily flag-of-convenience ships, to research alternative cleanup devices, as Britain relies chiefly on dispersants, and to

incorporate the concept of sea-use planning in Britain's maritime policy.

C-1433-78

POLICIES, PRACTICES, AND RESPONSIBILITIES FOR SAFETY AND ENVIRON-MENTAL PROTECTION IN OIL AND GAS OPERATIONS ON THE OUTER CONTINENTAL SHELF

US Geological Survey. 1977.

Washington, DC, US Geological Survey, 1977. 28 p.

OCS, Offshore development; Government agencies, Regulations, Safety. Environmental protection, USCG

This report details the policies, practices, and responsibilities of the US Geological Survey in overseeing the safe operation of activities related to oil and gas extraction on the Outer Continental Shelf.

[from Petroleum Abstracts 17(36):#238,001. 1977]

6. AGREEMENTS AND CONVENTIONS

C-1434-78

IMCO'S 1969 AMENDMENTS OPERATIVE IN 1978

Anon. 1977.

Marine Engineers Review, June 1977:28.

International conventions, IMCO, Pollution prevention, Ships, Oil discharges, *Amendments

The 1969 Amendments to the 1954 International Convention for the Prevention of Pollution of the Sea by Oil are designed to reduce the quantity of operational oil discharges permitted by ships and will come into effect on January 20, 1978. The original 1954 Convention banned the discharge of oil and water containing 100 ppm of oil within 50 mi of land, and in certain vulnerable zones. The 1962 Amendments, enforced in 1967, extended the prohibited zones, and attempted to ban all discharges from new ships of 20,000 grt and above. The 1973 Convention is yet to be enforced.

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #4583-108. 1978]

C-1435-78

POLLUTION PREVENTION: THE PROBLEM OF INTERNATIONAL AGREEMENT Bartlett, T. 1977.

Dock and Harbor Authority 58(680):110-112.

IMCO, Regulations, International conventions, *Marine pollution convention

"Critical problems surrounding IMCO's 1973 Marine Pollution Convention are examined under the following headings: technology, politics, reception facilities, inspection, enforcement, penalties, and the future. The area of greatest general concern is the hastening of the International Convention ratification process." [possibly oil pollution related]

[from Oceanic Abstracts 15(2):#78-02050. 1978]

C-1436-78

EEC MOVES AGAINST MARINE POLLUTION (news brief) Jenkins, S.H. 1978.
Marine Pollution Bulletin 9(7):172-173.

Pollution control, International conventions, Europe, Information systems, Compensation, *European Economic Community

In the May 2, 1978 issue of <u>Euroform</u>, the Commission of the European Communities advocates an anti-pollution program and continues to promote international action to prevent oil pollution. The Communities' action plan includes: processing and disseminating relevant information; strengthening cooperation between anti-pollution teams in its member countries; studying legal methods to insure compensation for spill cleanup and loss of income; and conducting research on short- and long-term effects of oil pollution on the marine environment.

C-1437-78

THE EEC AND THE LAW OF THE SEA Reynolds, P.D. 1977.
Marine Policy 1(2):118-131.

International conventions, Foreign governments, Resource management, *European Economic Community, *Law of the Sea, *Jurisdiction

The European Economic Community (EEC) participation in a future Law of the Sea convention is debated. Authority of the Community in matters related to law of the sea includes those of fishing, oil and gas exploration and exploitation, shipping and sea transport, mining of the continental shelf, marine pollution, and commodity agreements and tariffs. The debate over EEC jurisdiction and a possible resolution are described.

[from Oceanic Abstracts 15(1):#00840. 1978]

C-1438-78

A DECADE LATER AND THE STRENGTHENING OF INTERNATIONAL LAW Sasamura, Y. 1977.

Safety at Sea International, No. 104:21-24.

International conventions, Pollution control, Ships, IMCO, UN

During the decade since the <u>Torrey Canyon</u> spill, IMCO has adopted the International Convention for the Prevention of Pollution from Ships while intensifying its pollution control activities. "In this extract from a paper delivered at a seminar organised by the United Nations Environment Programme in Paris the author gives a personal view of the provisions dealing with pollution by oil - and the problems which have to be solved before the Convention can be effectively implemented. The 1973 Convention is summarized and problems and solutions that arose from it are discussed."

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #4448-108. 1978]

BIBLIOGRAPHIES

C-1439-78

OCEAN LAW (A BIBLIOGRAPHY WITH ABSTRACTS)

Brown, R.J. 1977.

Report NTIS/PS-77/0948. 315 p. Report for 1964-Oct 77. (Supersedes NTIS/PS-76/0834, NTIS/PS-75/712, and NTIS/PS-74/134.)

Bibliographies, Legislation, Oceans, Offshore drilling, Pollution control

"This bibliography cites national and international laws on fishing, undersea mining, shipping, dredging, territorial waters, navigation regulations, seafloor minerals, offshore drilling, and water pollution. (This updated bibliography contains 310 abstracts, 79 of which are new entries to the previous edition.)"

[from Government Reports Announcements 78(1):#NTIS/PS-77/0948/8GA. 1978]

C-1440-78

WASTE PROCESSING AND POLLUTION IN THE CHEMICAL AND PETROCHEMICAL INDUSTRIES. VOLUME 2. 1975-AUGUST 1977. (A BIBLIOGRAPHY WITH ABSTRACTS) Cavagnaro, D.M. 1977.

Report NTIS/PS-77/0706. 352 p. Report for 1975-August 1977. (Supersedes NTIS/PS-76/0607, NTIS/PS-75/541, and NTIS/PS-74/118.)

Bibliographies, Wastewater treatment, Refineries, Petrochemicals, Industries, Economics, Pollution control

This updated bibliography contains 347 abstracts, 188 of which are new entries, covering control processes, emissions, economics, pollution effects, and abatement strategies pertaining to the title industries.

[from Government Reports Announcements 77(21):#NTIS/PS-77/0706/0GA. 1977]

C-1441-78

OFFSHORE DRILLING (A BIBLIOGRAPHY WITH ABSTRACTS)

Habercom, G.E., Jr. 1977.

Report NTIS/PS-77/0703. 193 p. Report for 1964-July 1977. (Supersedes NTIS/PS-76/0627, NTIS/PS-75/540, and NTIS/PS-74/103.)

Bibliographies, Offshore drilling, Oil wells, Environmental effects, Legislation, Equipment

This report contains 188 abstracts, 34 of which are new, covering drilling procedures, equipment, environmental aspects, and legal implications involved in oceanic mineral resources recovery.

[from Government Reports Announcements 77(21):#NTIS/PS-77/0703/7GA. 1977]

C-1442-78

OFFSHORE STRUCTURES (A BIBLIOGRAPHY WITH ABSTRACTS)

Habercom, G.E., Jr. 1977.

Report NTIS/PS-77/0716. 194 p. Report for 1964-July 1977. (Supersedes NTIS/PS-76/0626, NTIS/PS-75/684, and NTIS/PS-74/123.)

Bibliographies, Offshore development, Design-engineering, Environmental effects

This updated bibliography contains 189 abstracts, 39 of which are new entries, concerning the feasibility, design, construction, and environmental impact of offshore structures. [possibly oil pollution related]

[from Government Reports Announcements 77(21):#NTIS/PS-77/0716/9GA. 1977]

C-1443-78

CONTINENTAL SHELF DEVELOPMENT: A BIBLIOGRAPHIC BACKGROUND FOR ALASKA. VOLUME I, AND VOLUME II

Rosier, K. 1977.

Report PB-273 534, Grant NOAA-04-6-158-44029. 423 p. Final report.

Bibliographies, Offshore development, OCS, Onshore impacts, Alaska, Industries, Socioeconomic effects, Legislation

This bibliography contains 2176 citations on offshore oil development in Alaska and the related onshore impacts. The following categories are covered: 1) directories, encyclopedias, and indexes, 2) bibliographies and abstracts, 3) general works, 4) physical and earth sciences, 5) biological sciences, 6) technology, 7) industries, 8) pollution, 9) social and economic considerations, and 10) law and legislation.

[from Government Reports Announcements 78(2): #PB-273 534/8GA. 1978]

C-1444-78

OIL POLLUTION DETECTION AND SENSING. VOLUME 1. 1964 - 1975 (A BIBLIOGRAPHY WITH ABSTRACTS)

Smith, M.F. 1977.

Report NTIS/PS-77/0933. 214 p. Report for 1964-75.

Bibliographies, Monitoring, Detection, Sampling, Analytical techniques, Chemical analysis, Oil spills, *Industrial wastes

"Research on oil and hydrocarbon detection, sampling, and monitoring methods and instrumentation are cited. Techniques related to chromatography, infrared spectroscopy, light scattering, fluorescence, mass spectroscopy, and remote sensing are included. The majority of abstracts deal with oil spills; however, abstracts on oil detection in industrial wastes and sewage are also covered. (This updated bibliography contains 209 abstracts, none of which are new entries to the previous edition.)"

[from Government Reports Announcements 78(1):#NTIS/PS-77/0933/0GA. 1978]

C-1445-78

OIL POLLUTION DETECTION AND SENSING. VOLUME 2. 1976-NOVEMBER 1977 (A BIBLIOGRAPHY WITH ABSTRACTS)

Smith, M.F. 1977.

Report NTIS/PS-77/0934. 107 p. Report for 1976-Oct 77. (Supersedes NTIS/PS-76/0701, and NTIS/PS-75/595.)

Bibliographies, Sampling, Detection, Chemical analysis, Remote sensing, Analytical techniques, Oil Spills, *Industrial wastes

"Citations of research on sampling, detection, and chemical analysis of oil in water are presented. Studies on remote sensing principally using radar, ocean wave damping, and infrared detection are included. The classification, pattern recognition, luminescence, gas chromatography, and neutron activation analysis of oils are reported in these abstracts. The majority of these citations concern oil spills, but studies on oil wastes, industrial wastes, bilge water, and sewage are also covered. (This updated bibliography contains 102 abstracts, 76 of which are new entries to the previous edition.)"

[from Government Reports Announcements 78(1):#NTIS/PS-77/0934/8GA. 1978]

C-1446-78

OIL WATER SEPARATORS (A BIBLIOGRAPHY WITH ABSTRACTS)

Smith, M.F. 1977.

Report NTIS/PS-77/1004. 145 p. Report for 1964-Nov 77. (Supersedes NTIS/PS-76/0863, and NTIS/PS-75/710.)

Bibliographies, Oil-water separation, Equipment, Spill removal, Ballast, Bilges, Pollution control

Federally-sponsored research on the title equipment for oil pollution control is cited in 140 abstracts (19 new entries to previous editions). Operation, testing, and performance reports are given for these devices which include centrifuge separators, coalescers, filters, and skimmers. Oil recovery from oil spills and separation from ballast and bilge water are also covered.

[from Government Reports Announcements 78(2):#NTIS/PS-77/1004/9GA. 1978]

C-1447-78

THE SEA: A SELECT BIBLIOGRAPHY ON THE LEGAL, POLITICAL, ECONOMIC AND TECHNOLOGICAL ASPECTS, 1975-1976

United Nations. 1976.

New York, United Nations, 1976. 31 p. (UN ST/LIB/SER-B/21. Bibliogr. Series Dag Hammarskjold Library)

Bibliographies, Oceans, Legislation, Economics, UN, *Law of the Sea Conference

"This bibliography has been compiled for the Third United Nations Conference on the Law of the Sea held in New York, USA (15 Mar-7 May 1976). It is a supplement to the three bibliographies prepared by the Dag Hammarskjold Library for the second session of the Conference held in

1974 (Caracas, Venezuela). It covers the Library's holdings of monographic and periodical literature published since 1975."

[from Aquatic Sciences and Fisheries Abstracts, Part 1, 8(4): #3372-108. 1978]

MISCELLANEOUS

C-1448-78

CHEMISTRY OF MARINE SEDIMENTS (book review)

Anon. 1978.

Environmental Pollution 16(3):241.

Sediments, Chemical analysis, Contaminants, Book review

The title book [Yen, T.F. (ed.). Ann Arbor, Michigan, Ann Arbor Science, 1977. vi + 265 p.] is recommended as "of interest to marine scientists in particular, and to environmentalists generally" for its study of an important, but relatively neglected topic. Besides describing the potential of sediments as energy and metal resources, it also discusses the way in which pollutants behave in the sediments. [possibly oil pollution related]

C-1449-78

GRZIMEK'S ENCYCLOPEDIA OF ECOLOGY Grzimek, B., J. Illies, and W. Klausewitz. 1977. New York, Van Nostrand Reinhold, 1977. 705 p.

Biological effects, Environmental effects, Development, *Encyclopedia

Approximately 50 contributors to this book illustrate the interactions between technological applications and living organisms. The book is divided into two sections entitled "The Environment of Animals" and "The Environment of Man." Included are chapters on the environmental crisis, animals in the changed environment, the sea in danger, and biological equilibrium. [possibly oil pollution related]

[from New Technical Books 62(9):#1564. 1977]

C-1450-78

PORT FACILITIES AND COMMERCE

Hammon, A. 1976.

MESA New York Bight Atlas. Monograph 20. 41 p.

Ports, Oil discharges, Safety, Deepwater ports, Development, New York

The Port of New York channel systems, navigation safety, major ocean terminal developments, harbor shoreline, and shipboard pollution are discussed. Discharge of ship pollutants, including oily wastes and sewage, into harbor waters are subject to federal law. The feasibility of deepwater oil terminals has been studied, but no facility is currently planned due to public concern for oil pollution and uncontrolled shoreline industrial development.

[from Oceanic Abstracts 14(6):#77-05853. 1977]

C-1451-78

SEDIMENTARY POLYCYCLIC AROMATIC HYDROCARBONS: THE HISTORICAL RECORD Hites, R.A., R.E. LaFlamme, and J.W. Farrington. 1977. Science 198(4319):829-831.

Sediments, Aromatic hydrocarbons, PAH, Sources, Fossil fuels, Buzzards Bay, Massachusetts, *Combustion

Analysis of a sediment core from Buzzards Bay, Massachusetts was performed by GC/MS. Comparison of "the absolute and relative concentrations of the unsubstituted PAH species and the relative abundances of the alkyl homologs" indicates that the source of the PAHs has been the same for the three dated sections (1850, 1900, 1970) with a marked increase in intensity between 1850 and 1900. The authors' conclusion that the source is the anthropogenic combustion of fossil fuels is consistent with previous studies. [possibly oil pollution related]

C-1452-78

INTEGRATED GLOBAL OCEAN STATION SYSTEM: GENERAL PLAN AND IMPLEMENTATION PROGRAMME 1977-1982

[Intergovernmental Oceanographic Commission]. 1977.

Intergovernmental Oceanographic Commission, 1977. 37 p. (Technical Series, 16)

Monitoring, Remote sensing, Pollution prevention

The title System (IGOSS) plans are presented and discussed. Phase II outlines the expansion and improvements of the new plans by the monitoring of marine pollutants, the incorporation of oceanographic data gathered via satellites and buoys, the automation of shipboard observing techniques, and the implementation of a synoptic analysis and prediction system. [possibly oil pollution related]

[from Oceanic Abstracts 15(2):#78-01986. 1978]

C-1453-78

HYDROGRAPHIC CONDITIONS IN HARIMANADA OF THE SETO INLAND SEA WITH REFERENCE TO CHEMICAL ELEMENTS AND PLANKTON IN FEBRUARY 1975 [English summary]

Kuroda, K., N. Baba, and H. Takahashi. 1976. Umi To Sora 51(3-4):51-64.

Sampling, Monitoring, Plankton, Japan, *Hydrology, *Seto Inland Sea

Oceanographic observations were conducted to determine the basic hydrology in the title area which was extremely polluted by an oil outflow accident at Mizushima on December 18, 1974. Observations were carried out on board the Shumpu Maru III of the Kobe Marine Observatory on February 25-26, 1975. Some distributional properties of observed elements are reported.

[from Oceanic Abstracts 14(6):#77-05690. 1977]

C-1454-78

FUEL AND THE ENVIRONMENT. X. [in Japanese] Watanabe, S. 1977.
Nenryo Oyobi Nensho 44(10):922-932.

Mem yo oyob! Nensho 44(10):322-332.

Fuels, Environmental effects, *Review

"A review with 10 references." [possibly oil pollution related] [from Chemical Abstracts 88(26):#193994a. 1978]

C-1455-78

FUEL AND THE ENVIRONMENT. XI. [in Japanese] Watanabe, S. 1977.
Nenryo Oyobi Nensho 44(11):1014-1026.

Fuels, Environmental effects, *Review

"A review with 17 references." [possibly oil pollution related] [from Chemical Abstracts 88(26):#193993z. 1978]

SECTION II: CURRENT RESEARCH PROJECTS

Title, contract information, and a summary of project objectives are provided in each entry. Sources of project notices include: The Smithsonian Science Information Exchange (SSIE); API Environmental Research Annual Status Report; Maritime Research Information Service Abstracts; Scientific and Technical Aerospace Reports; Department of Environment, Canada, Spill Technology Newsletter; Northwest and Alaska Fisheries Center Monthly Report; and written inquiries to organizations and researchers. Current status information and publications resulting from the projects are presented when such information is available from the principal investigators or performing organizations. The source of status information is given at the end of each entry.

Entries are grouped according to subject and then ordered sequentially with a citation number R- -78. Some of the projects listed in previous Oil Pollution Reports have been recently renewed. These projects have been relisted with a current serial number, followed by the original number in parentheses. To locate the original entry, refer to the following list:

<u>Citation Numbers</u>	<u>Dates Covered</u>	Report Number
R-001-74 to R-165-74	July 74 - Oct. 74	EPA-670/2-75-003
R-166-74 to R-244-74	Nov. 74 - Feb. 75	EPA-670/2-75-044
R-245-74 to R-268-74	Feb. 75 - Apr. 75	EPA-670/2-75-059
R-269-74 to R-342-74	May 75 - July 75	EPA-600/2-76-129
R-269-75 to R-304-75	Aug. 75 - Oct. 75	EPA-600/2-76-113
R-001-76 to R-035-76	Nov. 75 - Jan. 76	EPA-600/2-76-185
R-036-76 to R-063-76	Feb. 76 - Apr. 76	EPA-600/2-76-215
R-064-76 to R-123-76	May 76 - July 76	EPA-600/2-76-266
R-124-76 to R-175-76	Aug. 76 - Oct. 76	EPA-600/2-77-037
R-001-77 to R-022-77	Nov. 76 - Jan. 77	EPA-600/2-77-075
R-023-77 to R-039-77	Feb. 77 - Apr. 77	EPA-600/2-77-111
R-040-77 to R-075-77	May 77 - July 77	EPA-600/2-77-243
R-076-77 to R-096-77	Aug. 77 - Oct. 77	EPA-600/2-78-005
R-001-78 to R-020-78 5(1)	Nov. 77 - Jan. 78	EPA-600/2-78-071
R-021-78 to R-057-78 5(2)	Feb. 78 - May 78	EPA-600/7-78-160
R-058-78 to R-150-78 5(3)	Jun. 78 - Sep. 78	Submitted 10/78

OIL POLLUTION DETECTION AND EVALUATION

MONITORING

R-151-78

PRINCE WILLIAM SOUND HYDROCARBON MONITORING

Principal Investigator: MacLeod, W.

Performing Organization: US Dept. of Commerce, Environmental Con-

servation Division, 2725 Montlake Blvd. E,

Seattle, WA 98112

Supporting Organization: US Dept. of Commerce, NOAA, NMFS,

Washington, DC. No. NWC-035

Period: 10/77 - 9/78

Funds: \$8,320

Monitoring, Aromatic hydrocarbons, Hydrocarbons, Seawater, Sediments, Mollusks, Sampling

"Port Valdez and Prince William Sound are being monitored for saturated and aromatic hydrocarbon levels in water, sediments, and mussels. Six sites will be sampled in the spring, summer, and fall of 1978."

[SSIE No. ZBP-1498]

ANALYSIS

R-152-78

CHARACTERIZATION OF REFRACTORY ORGANICS OF POSSIBLE CARCINOGENIC SIGNIFICANCE IN RECYCLED WASTEWATER

SIGNIFICANCE IN RECICLED MASIEMATER

Principal Investigator: Burbank, N.C. and R.E. Green

Performing Organization: University of Hawaii, Water Resources Re-

search Center, 2540 Dole St., Room 283,

Honolulu, HI 96822

Supporting Organization: US Dept. of the Interior, Office of Water

Research & Technology, 19th & C Sts. NW,

Washington, DC 20240. No. A-058-HI

Period: 7/75 - 12/77

Funds: \$7,439

Chemical analysis, Wastewaters, Recycling, Carcinogens, Chromatography, *IR Spectrography, *Organics

By carbon adsorption and selective solvent extraction techniques, this study will remove organics from treated sewage prepared for recycling for irrigation and ground recharge. A more exact character of the organic compounds will be determined by gas and thin layer chromatography, and infrared spectrography. "Gross determinations

have developed that these may be terpenes and compounds resembling, to a degree, carcinogens." [possibly oil pollution related]
[SSIE No. GUY-381-2]

R-153-78 (R-002-76)

HYDROCARBON STUDIES IN PUGET SOUND AND OFF THE WASHINGTON COAST

Principal Investigator: Carpenter, R.

Performing Organization: University of Washington, School of Arts & Sciences, C301 Health Sciences Building.

Seattle, WA 98105

Supporting Organization: US Dept. of Energy, Division of Biomedical

& Environmental Research, 1717 H St. NW,

Washington DC 20545. No. 008014

Period: 6/75 - 1/80 Funds: Unknown

Chemical analysis, Hydrocarbons, Plankton, Neuston, Sediments, Sampling, Puget Sound, Washington

This research project will collect samples of phytoplankton, zoo-plankton, neuston, and sediment cores; extract hydrocarbons from the samples; and perform analyses by GC, high pressure LC, UV fluorescence spectroscopy, mass spectroscopy, GC/MS, and /Sup 14/C//Sup 12/C and /Sup 13/C//Sup 12/C ratios.

[SSIE No. GPE-5809-2]

R-154-78 (R-042-77)

CHEMICAL INTERACTION OF ATMOSPHERIC PETROLEUM RESIDUES WITH LAKE SURFACE ORGANIC MICROLAYERS

Principal Investigator: Eisenreich, S.J.

Performing Organization: University of Minnesota, School of Engi-

neering, 105 Morrill Hall, Minneapolis,

MN 55414

Supporting Organization: American Chemical Society, 1155 16th St.

NW, Washington, DC 20036. No. 9116-G517

Period: 9/76 - 8/79

Funds: \$3,000

Chemical analysis, Lakes, GC/MS, *Atmospheric petroleum residues, PAH

The objective of this research is to investigate the chemical interaction of petroleum residues (PR) originating from atmospheric and in-lake sources with surface organic microlayers (SOM) in freshwater lakes. GC/MS techniques and IR spectroscopy will be used in quantifying and identifying petroleum residues. Ultimately, the effect of atmospheric inputs of PR and enrichment in SOM will be related to the accumulation of hydrocarbon-soluble hazardous organics (PCB's, pesticides, PAH) in aquatic systems.

[SSIE No. PCS-2607-2]

R-155-78

NAVY ENVIRONMENT: NEW ANALYTICAL METHODS Principal Investigator: Hieftje, G.M.

Performing Organization: Indiana University, School of Arts &

Sciences, Memorial Hall, Bloomington,

IN 47401

Supporting Organization: US Dept. of Defense, Navy, Office of

Naval Research, 800 N. Quincy St., Arlington, VA 22217. Contract DN675628, N00014-76-C-0838

Period: 5/76 - Continued

Funds: \$40,412

Analytical techniques, Detection, Residual oils, Seawater, USN

Enhanced analytical capabilities are required in the Navy for several areas including analysis of environmental samples such as seawater and oil residues. This project will investigate instrumentation for rapid multielement analysis based on atomic absorption and emission spectroscopy, examine various methods of signal processing to handle background corrections and spectral interference, and measure detection limits and sensitivities for a large number of elements.

[SSIE No. GQN-675628-1]

R-156-78 (R-070-76)

MARINE CHEMICAL PROCESSES

Principal Investigator: Wasik, S.P.

Performing Organization: US Dept. of Commerce, National Bureau of

Standards, Washington, DC 20234

Supporting Organization: Same as above. No. 3163136

Period: 10/76 - 12/79

Funds: \$155,000

Contaminants, Fossil fuels, Solubility, Chemical analysis, Analytical techniques, Source identification, *Organic compounds

The project objectives are: to measure solubility of organic compounds in water; to measure partitioning of organic compounds in water with other phases in the marine environment (e.g., lipids, sediments, and atmosphere); to measure vapor pressure of organic compounds; and to develop new techniques for determining and identifying trace amounts of contaminants in water. One of the results of this research will be the realization of a method for sub-minute fingerprinting and quantification of fossil fuels, using a modified mass spectrometry analysis.

[SSIE No. ZBA-7040-2]

R-157-78 (R-026-78)

IN SITU POLLUTANT MEASUREMENTS

Principal Investigator: Wogman, N.A.

Performing Organization: US Dept. of Energy, Battelle Pacific NW

Lab., PO Box 999, Richland, WA 99352

Supporting Organization: US Dept. of Energy, Div. of Biomedical &

Environmental Research, 1717 H St. NW, Washington, DC 20545. No. 001287

Period: 10/76 - N/A Funds: Unknown

Contaminants, Sediments, Ecosystems, Seawater, Freshwater, Analytical techniques, *In situ analysis

"Three areas will be emphasized: 1) in situ analysis of toxic trace elements; 2) in situ analysis of radionuclides; and 3) in situ analysis of organic pollutants.... Depth profile capabilities will be improved to allow in situ analysis of energy-related pollutants which have been deposited over a period of tens of years. Carbon and Ni pollutants from oil-related materials will be measured with a portable 14 MeV neutron generator. This program allows the in situ analysis of pollutants in sediments and therefore allows studies of the stress of ecosystems within well characterized marine and fresh water environments."

[SSIE No. ZPE-11589-2]

OIL POLLUTION PREVENTION AND CONTROL

CLEANUP AND REMOVAL

R-158-78 (R-136-78)

SOLUBILIZATION AND BIODEGRADATION OF HYDROCARBONS

Principal Investigator: Barnett, S.M. C.W. Houston, and A.R.

Thompson

Performing Organization: University of Rhode Island, School of

Engineering, Administration Bldg.,

Wakefield, RI 02881

Supporting Organization: US Dept. of the Interior, Office of Water

Research & Technology, 19th & C Sts. NW, Washington, DC 20240. No. B-073-RI

Period: 7/78 - 9/78

Funds: Unknown

Hydrocarbons, Surfactants, Biodegradation, Wastewater treatment, Spill cleanup, *Solubilization

The proposed study will concentrate on the transport of hydrocarbons through the aqueous media, which is believed to be the rate controlling factor in the treatment of hydrocarbons. The investigator will identify surfactant characteristics which promote hydrocarbon solubilization, transport and biodegradation, and suggest surfactants for use in waste treatment plants and in natural environments.

[SSIE No. GUY-523-2]

R-159-78

GRAFT POLYMERS OF STARCH FOR AGRICULTURAL CHEMICALS AND ABSORBENTS

Principal Investigator: Fanta, G.F. and W.M. Doane

Performing Organization: US Dept. of Agriculture, Cereal Products

Lab, 1815 N. University St., Peoria, IL

61604

Supporting Organization: US Dept of Agriculture, Agricultural Re-

search Service, Northern Regional Research Center, 1815 N. University St., Peoria, IL

61604. No. 0043849, 3102-20540-025

Period: 6/77 - 6/82 Funds: Unknown

Hydrocarbons, Absorption, Spill cleanup, *Starch polymers

The objectives of this research are to: "exploit principles elaborated in the successful development of hydrophilic starch polymers (Super Slurper) by preparing starch polymers for agricultural uses, absorption of hydrocarbons (oil spills), and extruded or molded plastics and rubbers; and [to] elucidate structure-property relationships for starch-based polymers."

[SSIE No. GY-43849]

R-160-78 (R-048-77)

SURFACE TREATMENT AGENTS FOR SHORELINE PROTECTION

Principal Investigator: Foget, C.R.

Performing Organization: American Petroleum Institute, 2101 L St.

NW, Washington, DC 20037

Supporting Organization: US Environmental Protection Agency,

Office of R & D, Industrial Environmental Research Lab, 5555 Ridge Ave., Cincinnati,

OH 45268. No. R804639-02, B746-001

Period: 8/76 - 8/78 Funds: \$79,000

Beach cleanup, *Surface treatment agents, Surfactants, Dispersants, Environmental protection, *Field tests

A literature review was conducted, and preliminary field tests of surface treatment agents were performed for agent effectiveness, toxicity, and application techniques on salt-marsh sections and simulated beaches. The agents tested were film-forming agents, surfactant/dispersing agents, a surfactant/collecting agent, and a flowing film of water. The results of the preliminary field tests recommended two film-forming agents, polyvinyl acetate and xanthan gum, and the surfactant/collecting agent, Shell Oil Herder, for full-scale field tests.

[SSIE No. GMA-4822]

2. WASTE TREATMENT AND DISPOSAL

R-161-78

BIOLOGICAL EVALUATION OF "BEST PRACTICABLE" & "BEST AVAILABLE" TREAT-MENT CONTROL TECHNOLOGIES APPLIED TO PETROLEUM REFINERY WASTEWATERS

Principal Investigator: Burks, S.L.

Performing Organization: Oklahoma State University, School of Arts

& Sciences, Agriculture Hall, Stillwater,

OK 74075

Supporting Organization: US Dept. of the Interior, Office of Water

Research & Technology, 19th & C Sts. NW,

Washington, DC 20240

Period: 7/75 - N/A Funds: Unknown

Wastewater treatment, Refineries, Bioassay, Marine organisms

"Proposed technologies for treatment of petroleum refinery wastewaters were evaluated for effectiveness in removing toxic components by biological assays with fathead minnows, benthic macroinvertebrate organisms and periphyton. This project is also supported by: Oklahoma Oil Refiners Waste Control Council."

[SSIE No. GUY-937-1]

R-162-78 (R-083-78)

LAND APPLICATION OF INDUSTRIAL WASTES

Principal Investigator: Overcash, M.R., and P.W. Westerman Performing Organization: University of North Carolina, School of

Agriculture and Life Sciences,

Raleigh, NC 27607

Supporting Organization: US Dept. of the Interior, Office of Water

Research & Technology, 19th & C Sts. NW, Washington, DC 20240. No. B-100-NC

7/78 - 12/78 Period:

Funds: \$16,748

Wastewater treatment, Industries, Refining, *Land application

"The proposal objectives are: (1) to coordiante available fundamental and field scale information with actual treatment mechanisms and calculations to determine land loading rates for wastewater constituents of several industry categories [textiles, seafood processing, and petroleum refining]; (2) to optimize the end-of-the-pipe data of objective (1) by including pretreatment unit processes which precede the plant-soil receiver so that minimum cost is achieved for the total system and maximum advantage is gained from the land receiver."

[SSIE No. GUY-789-2]

OIL-WATER SEPARATION

R-163-78 (R-281-75)

SEPARATION OF FREE OIL FROM WATER FOLLOWING COALESCENCE Gloyna, E.F., and C.J. Wu Principal Investigator:

University of Texas, School of Engineering, Performing Organization:

200 W. 21 St., Austin, TX 78712 University of Texas, 601 Colorado St., Supporting Organization:

Austin, TX 78701

1/77 - N/APeriod: Unknown Funds:

Oil-water separation, Coalescence, Models, *Evaluations

Six oil-water separators were evaluated with emphasis on oil removal efficiency and headloss. Laboratory results indicate that Model I was effective under low flow rate conditions, and Model VI was successful under high flow rate conditions. Oil concentrations were reduced from 50 mg/L to 1 mg/L, or 98% removal; and coalescence occurred using a polyester mat and a flow rate of 6.8 Lps/ m^2 (10 gpm/ft²).

[SSIE No. NTX-908]

4. CONTINGENCY PLANNING

R-164-78

NATIONAL OIL SPILLS

Principal Investigator: Robinson, J.

Performing Organization: US Dept. of Commerce, Environmental Re-

search Labs, Boulder, CO 80302

Supporting Organization: US Dept. of Commerce, NOAA, Environmental

Research Labs, Boulder, CO 80302.

No. 87121488

Period: 3/78 - 9/78 Funds: \$82,680

Contingency planning, Oil spills, US, *Research funds

This project has been established to hold money for studies of spills that might occur in the US during 1978. These funds will be transferred to a specific project for each spill occurrence.

[SSIE No. ZBP-1447]

C. ASPECTS OF OIL POLLUTION

1. BIOLOGICAL ASPECTS

R-165-78

THE EFFECTS OF SUBLETHAL LEVELS OF HEAT AND OIL ON THE BEHAVIOR OF

AQUATIC ANIMALS

Principal Investigator: Atema, J.

Performing Organization: Boston Univeristy, School of Arts & Sciences,

881 Commonwealth Ave., Boston, MA 02215

Supporting Organization: US Dept. of Energy, Division of Biomedical & Environmental Research, 1717 H St. NW.

Washington, DC 20545. No. 006967

Period: 1/76 - N/A Funds: Unknown

Fuel oil, Marine organisms, *Heat, Sublethal effects, Behavior, *Chemoreception, Models

Alterations in feeding and social behavior of test organisms will be measured to determine pollutant effects, and changes in neurophysiological responses of chemoreceptors will be monitored to understand the mechanism of action on the organism. Nassarius obsoletus, Homarus americanus, and Ictalurus nebulosus will be exposed to the following pollutants: 1) No. 2 fuel oil; whole oil and oil fractions at concentrations from 10 ppm to 50 ppm, and 2) heat; applied in 5° C increases over baseline values from 10-30° C. "Changes in behavior may be the essential areas to be reflected at the population level and effects on chemoreception may be generalized across different species. If such a generalized model of oil interference proves to be valid, realistic safety standards can be set up based on these experimental data."

[SSIE No. GPE-5593-3]

R-166-78 (R-092-78)

EFFECTS OF PETROLEUM HYDROCARBONS ON MARINE ORGANISMS

Principal Investigator: Caldwell, R.S.

Performing Organization: Oregon State Higher Educ. Sys., Agri-

cultural Experiment Station, 126 Agriculture Hall, Corvallis, OR 97331

Supporting Organization: Oregon State Government, 240 Cottage St.

SE, Salem, OR 97310. No. 0072451, ORE00365

Period: 10/77 - 9/78

Funds: Unknown

WSF, Crude oil, Petroleum products, Toxicity, Marine organisms

The relative toxicity of the principal water extractable hydrocarbons of crude and refined oils will be determined, and the contribution of each to the toxicity of WSFs of oil will be evaluated. The possibility that some of the hydrocarbon components may have synergistic

toxicity when present together in WSFs will also be examined. The study will test the hypothesis that "hydrocarbon compounds capable of inducing the mixed function oxidase enzymes of the endoplasmic reticulum interfere with the adaptive responses of poikilothermic marine organisms to temperature by the interference with the activity of the fatty acid desaturate enzyme system."

[SSIE No. GY-72451]

R-167-78

RELATION BETWEEN HYDROCARBON CONTAMINATION AND TUMORS IN MYA ARENARIA

Principal Investigator: Dow, R.L, J.W. Hurst, E. Gilfillan,

S. Hanson, et al.

Performing Organization: State Dept. of Marine Resources, State

House Annex, Augusta, ME 04333

Supporting Organization: US Environmental Protection Agency, Office

of R & D, Environmental Research Lab, S. Ferry Rd., Narragansett, RI 02882.

No. R804745-01, P608C-31

Period: 9/77 - 9/78 Funds: \$100,000

Fuel oil, Mollusks, Biological effects, *Tumors, *Mya arenaria, Maine

The purpose of this study is to determine whether or not there is a causal relationship between a March 1971 oil spill into a <u>Mya</u> arenaria growing area at Long Cove, Searsport, Maine and the continuing development of tumors in the surviving clam population.

[SSIE No. GMA-4830]

R-168-78

OIL AND THE OYSTER INDUSTRY IN THE DELAWARE ESTUARY

Principal Investigator: Haskin, H.H.

Performing Organization: Rutgers the State University, Agricultural

Experiment Station, Old Queens Bldg., New

Brunswick, NJ 08903

Supporting Organization: New Jersey State Government, 1035 Parkway

Ave., Trenton, NJ 08625. No. 0072771,

NJ00782

Period: 10/77 - 9/78

Funds: Unknown

Hydrocarbons, Petroleum products, Mollusks, Toxicity, Bioassay, Delaware Bay, Estuaries, *Oyster industry

The purpose of this study is to assess present hazards in the Delaware Bay to oyster production, estimate possible additional hazards of expanded petroleum-related operations in the area, and identify substances particularly toxic to oysters. Bioassays for adult oysters

and larvae will be performed with petroleum and its products, and heavy metals. Possible synergism between heavy metals and petroleum hydrocarbons will be examined.

[SSIE No. GY-72771]

R-169-78

CONTAMINANT EFFECTS ON LIFE PROCESSES Principal Investigator: Hodgins, H.

Performing Organization: US Dept. of Commerce, Environmental Con-

servation Division, 2725 Montlake Blvd. E.

Seattle, WA 98112

Supporting Organization: US Dept. of Commerce, NOAA, NMFS, Washington,

DC. No. NWC-032

Period: 10/77 - 9/78

Funds: \$1,664

Fish, Marine organisms, Biological effects, Behavior, *Chemoreception, Pacific Ocean

Immediate objectives for this project are to: "1) determine nature and incidence of diseases of marine fishes and invertebrates of the North Pacific; 2) determine effects of petroleum on fish health; 3) identify populations of salmon and demersal marine fish; and 4) determine effects of petroleum on behavioral and chemosensory modalities in selected Pacific marine species."

[SSIE No. ZBP-1486]

R-170-78

ENVIRONMENTAL IMPACTS - PHYSIOLOGY - BIOASSAY

Principal Investigator: Karinen, J.

Performing Organization: US Dept. of Commerce, Auke Bay Fisheries

Lab, PO Box 155, Auke Bay, AK 99821

Supporting Organization: US Dept. of Commerce, NOAA, NMFS, Washing-

ton, DC. No. NWC-301

Period: 10/77 - 9/78 Funds: \$178,600

WSF, Crude oil, Marine organisms, Toxicity, Bioassay. Chemical analysis, Alaska

This study will expose a variety of Alaskan species to oil and will investigate: 1) acute and sublethal bioassays, 2) the effects of pollutants on behavior, and 3) the sublethal effects measured by several physiological parameters. Detailed chemical monitoring (UV, IR, and GC) of test solutions is stressed. Emphasis is placed on determining the relative importance of toxic components in the WSF of crude oil, using static and flow-through tests to compare the short- and long-term effects. Future emphasis will be on larval studies.

[SSIE No. ZBP-1509]

R-171-78 (R-010-78)

MEMBRANE TOXICITY THEORY AND ENVIRONMENTAL POLLUTANTS

Principal Investigator: Kinter, W.B., D.S. Miller, D.B. Peakall,

and R.G. Butler

Performing Organization: Mount Desert Island Biol. Lab.,

Old Bar Harbor Rd., Salsbury Cove,

ME 04672

Supporting Organization: US Dept. of Health, Education & Welfare,

Public Health Service; National Inst. of Health, National Inst. of Environmental Health Sciences, PO Box 12233, Research Triangle Park, NC 27709. No. ROI ES

00920-06

Period: 6/77 - 5/79 Funds: \$60,380

Hydrocarbons, Toxicity, Birds, Fish, Health hazards, *Altered membrane

"The immediate objective is comprehensive physiological-biochemical-morphological evaluation of the effects of heavy metal, petroleum and organochlorine pollutants on osmoregulatory and nutritive membrane functions in selected species of aquatic birds and fish." The long-term objective is the evaluation of the role of altered membrane as one of the primary mechanisms of pollutant toxicity. The cell membrane theory of toxicity is an approach to: 1) explaining toxicities of known pollutants; 2) designing indicator tests for environmental warning; and 3) predicting future health hazards including synergistic effects. Current work focuses on petroleum and a new technique for working with seabird nestlings in the field.

Reports and Publications

CRUDE OIL INGESTION: SUB-LETHAL EFFECTS IN HERRING GULL CHICKS

Miller, D.S., D.B. Peakall, and W.B. Kinter. 1978. Science 199(4326):315-317.

For summary see OPR 5(2):#C-0565-78.

POLLUTANT TOXICITY IN SEA BIRDS: EVALUATION OF A NEW EXPERIMENTAL APPROACH

Miller, D.S., D.B. Peakall, and W.B. Kinter. 1978.

Federation Proceedings Vol. 37:248.

[SSIE No. 1ES-920-6]

R-172-78

EVALUATION OF THE ACUTE TOXICITY OF SECONDARILY TREATED OIL REFINERY

EFFLUENTS TO FISH

Principal Investigator: Kleinholz, C.W., and S.L. Burks

Performing Organization: Oklahoma State University, Graduate School,

211-215 Whitehurst Hall, Stillwater, OK

74075

Supporting Organization: Oklahoma Oil Refinery & Waste Control

Council, PO Box 2039, Tulsa, OK 74102

Period: 1/77 - N/A Funds: Unknown

Acute effects, Toxicity, Bioassay, Refineries, Wastewaters, Fish, *Mobile laboratory

"A mobile bioassay laboratory trailer equipped for performance of state and continuous-flow bioassays is used for on-site toxicity evaluation of oil refinery effluents and effectiveness of treatment technologies."

[SSIE No. DH-92]

R-173-78

BIOLOGY - CHEMISTRY

Principal Investigator: Larrance, J.

Performing Organization: US Dept. of Commerce, Environmental Re-

search Labs, Boulder, CO 80302

Supporting Organization: US Dept. of Commerce, NOAA, Environmental

Research Labs, Boulder, CO 80302.

No. 87131728 10/77 - 9/78

Period: 10/77 - 9/7 Funds: \$315,000

Biological effects, Chemical effects, Chronic effects, Contamination

The main project objective is to initiate and develop plans and research pertinent to a future "long-range effects" program. Current work is in support of biological and chemical research pertaining to timely environmental issues such as oil pollution.

[SSIE No. ZBP-1348]

R-174-78

FACTORS WHICH UNDERLIE THE EFFICIENCY AND FUNCTIONING OF THE PROCESSES COUPLING MATERIALS AND ENERGY IN BENTHIC MARINE FOOD WEBS

Principal Investigator: Lee, J.J.

Performing Organization: City University of New York, School of

Arts & Sciences, Convent Ave. & 138 St.,

New York, NY 10031

Supporting Organization: US Dept. of Energy, 17th & Pennsylvania

Ave. NW, Washington, DC 20006.

No. COO-3254

Period: 9/73 - Continued

Funds: \$150,000

Food web, Ecosystems, Benthos, Coasts, Fisheries, Marshes

The proposed research focuses on the identification and characterization of the processes by which energy and materials are channeled through lower and intermediate steps of the marine detrital food web. This food web links the primary production of marsh and sea grasses to the secondary production which underlies many of our coastal fisheries. Seven sub-projects comprise this three-year project; one of these consists of field and laboratory experiments aimed at studying the effects which chronic stresses of various kinds (including crude oil and petrochemicals) impose on the initial colonization and decomposition of community trajectories and function. One of the field areas selected for study is an oil-soaked marsh at Winsor Cove, Bourne, Massachusetts, and a nearby control site.

[SSIE No. DI-52-1]

R-175-78 (R-058-77)

Period:

Funds:

SUBLETHAL BIOCHEMICAL EFFECTS OF CONTAMINANTS

Principal Investigator: Malins, D.C.

Performing Organization: US Dept. of Commerce, Environmental Conser-

vation Div., 2725 Montlake Blvd. E,

Seattle, WA 98112

Supporting Organization: US Dept. of Commerce, NOAA, NMFS, 9450

Gandy Blvd., St. Petersburg, FL 33702.

No. NWC-031 10/77 - 9/78 \$346,000

Hydrocarbons, Fish, Sublethal effects, Contaminants, Metabolism, *Biochemical effects

This project proposes to determine the impact of petroleum hydrocarbons and their metabolites on various life stages of pelagic fish, flatfish, and shellfish. The research will include studies on the following: exposure of organisms to multiple pollutants; the mechanisms by which the organisms respond and/or adapt to exposure; synergistic-antagonistic actions that occur in the presence of a number of "ubiquitous contaminants" including petroleum hydrocarbons; the role of mucus in the response to aromatic hydrocarbons; and the effect of metabolites from both PCB's and petroleum hydrocarbons on biochemical mechanisms.

[SSIE No. ZBP-916-3]

R-176-78

BIOLOGICAL INDICATORS OF ENVIRONMENTAL INSULTS TO AQUATIC RESOURCES

Principal Investigator: Mayer, F.L.

Performing Organization: US Dept. of the Interior, Fish & Wildlife

Service, Route #1, Columbia, MO 65201

Supporting Organization: US Dept. of the Interior, Fish & Wildlife

Service, Div. of Fishery Research, 19th &

C Sts. NW, Washington, DC 20240.

No. 86410-921 10/77 - 9/78

Period: 10/77 - 9 Funds: \$157,800

Bioindicators, Contaminants, *Aquatic organisms, Biological effects, Resource management

Much of the laboratory research involving the impact of environmental pollutants, including oil spills, on aquatic organisms, lacks field verification and the true impact of contaminants in the wild is poorly understood. "To adequately assess the influence of contaminants on the aquatic environment, techniques are desirable that can be used as biological indicators or predictors in the field for estimating the 'health' of a particular resource. The development of biological indicators and predictors will require detailed research into growth and development, reproduction, stress adaptation, and behavior of aquatic plants, invertebrates, and fish." Results of this research will be applied to field monitoring programs of the Field Research Units and to providing the Field Research Coordination Unit with the technical ability to detect and analyze present and future pollutant effects on aquatic resources.

[SSIE No. ZUV-291]

R-177-78

ECOLOGICAL AND PHYSIOLOGICAL/TOXICOLOGICAL EFFECTS OF OIL ON BIRDS

Principal Investigator: Stickel, L.F.

Performing Organization: US Dept. of the Interior, Fish & Wildlife

Service, Laurel, MD 20811

Supporting Organization: US Environmental Protection Agency, Office

of Energy, Minerals & Industry, 401 M St. SW. Washington, DC 20460. Interagency

No. D7-E685, V625A-82

Period: 1/77 - N/A Funds: \$440.000

Biological effects, Crude oil, Hydrocarbons, Toxicity, Birds, Reproduction, Sublethal effects, Uptake, *Eggs

Objectives of the project are "to evaluate the effects on birds of exposure to petroleum and/or components by dietary intake or by exposure of eggs. Effects measured include physiological functions, reproductive performance, survival, and tissue accumulation."

[SSIE No. GMA-4773]

R-178-78

EFFECTS OF HYDROCARBONS ON DEFENSE MECHANISMS

Tripp, M.R. Principal Investigator:

University of Delaware, School of Arts & Performing Organization:

Sciences, Newark, DE 19711

US Dept. of Health, Education & Welfare, Supporting Organization:

Public Health Service, National Institute of Health, National Inst. of Environmental Health Sciences, PO Box 12233, Research

Triangle Park, NC 27709. No. ROI ES 01531-02

Period: 4/77 - 3/79\$59,321 Funds:

WSF, Hydrocarbons, Mollusks, Crustaceans, Fish, Biological effects, Sublethal effects, Toxicity, *Defense mechanisms

Three animal species will be studied to show how hydrocarbons adversely affect them, by causing disease and by making organisms more susceptible to disease. Histological and physiological effects will be studied after the hard clam (Mercenaria mercenaria), blue crab (Callinectes sapidus), and mummichog (Fundulus heteroclitus) are chronically exposed to nonlethal concentrations of phenol, naphthalenes, and water soluble petroleum extracts.

[SSIE No. 1ES-1531-2]

R-179-78 (R-050-78)

FATE AND EFFECTS OF PETROLEUM HYDROCARBONS IN MARINE COASTAL ECO-

SYSTEMS

Vanderhorst, J.R. Principal Investigator:

Performing Organization: US Dept. of Energy, Battelle Pacific NW

Lab, PO Box 999, Richland, WA 99352

Supporting Organization: US Dept. of Energy, Div. of Biomedical

& Environmental Research, 1717 H St. NW,

Washington, DC 20545. No. 000838

Period: 1/78 - N/AFunds: Unknown

Hydrocarbons, Bioassay, Bioindicators, Chronic effects, Analytical techniques, Fate, Ecosystems, Intertidal zone

"A continuous-flow petroleum metering system for bioassay work has been developed and tested using chemical measurement methods and bioassay organisms. Preliminary tests and a six-month continuous exposure have been conducted using a No. 2 fuel oil and fieldcolonized artificial substrates. Minimally the approach provides a highly efficient screening device to determine oil-sensitive species. It is anticipated that the study will be extended to other oils and that the resulting community structures will be diagnostic of oil contamination.

[SSIE No. ZPE-11592-2]

R-180-78

POLLUTANT FLOW THROUGH THE MARINE FOOD WEB

Principal Investigator: Young, D.R.

Performing Organization: Southern California Coastal Water, 1500 E.

Imperial Hwy., El Segundo, CA 90245

Supporting Organization: US National Science Foundation, Div. of

Advanced Environmental Research & Technol-

ogy, 1800 G. St. NW, Washington, DC

20555. No. ENV77-15376

Period: 2/78 - 7/79 Funds: \$69,980

Wastewaters, Contaminants, Hydrocarbons, Food web, Marine organisms, California, *Pollutant flow

A major purpose of this project is to test the assumption that toxic pollutants, including petroleum hydrocarbons, move upward through the marine food web, becoming more concentrated with each increase in trophic level. This project is pursuing field studies off the coast of Southern California to determine if structured food webs exist in a major wastewater disposal zone, and to what extent pollutant concentrations in several classes follow any structure that is identifiable. Various species at different life stages are being collected from control sites and in the disposal zone and analyzed for a number of inorganic and organic contaminants, including petroleum derivatives. These and other data will serve as the basis for examining the food chain amplification concept.

[SSIE No. GSQ-1904]

2. GENERAL ASPECTS

R-181-78

ARGO MERCHANT

Principal Investigator: Robinson, J.

Performing Organization: US Dept. of Commerce, Environmental Research

Labs, Boulder, CO 80302

Supporting Organization: US Dept. of Commerce, NOAA, Environmental

Research Labs, Boulder, CO 80302.

No. 87121482

Period: 3/78 - 9/78 Funds: \$90,000

Chemical analysis, Sampling, Argo Merchant spill, Chronic effects,

Environmental effects

The main objective of this project is to determine effects of the <u>Argo Merchant</u> oil spill from samples taken over an adequate time period following its grounding and breakup. Current plans call for the analysis of samples collected over a period of several months.

[SSIE No. ZBP-1456]

R-182-78

BARGE 250 GASOLINE SPILL

Principal Investigator: Robinson, J.

Performing Organization: US Dept. of Commerce, Environmental Research

Labs, Boulder, CO 80302

Supporting Organization: US Dept. of Commerce, NOAA, Environmental

Research Labs, Boulder, CO 80302.

No. 87121483

Period: 3/78 - 9/78 Funds: \$17,320

Environmental effects, Gasoline, *Barge 250 spill, Rhode Island, Sampling, Chemical analysis

The project objective is to analyze the effects of a gasoline spill from the Barge 250 off the coast of Rhode Island, March 1978. Current plans include sampling and analysis of samples taken at the spill site.

[SSIE No. ZBP-1448]

R-183-78

FRENCH OIL SPILL

Principal Investigator: Robinson, J.

Performing Organization: US Dept. of Commerce, Environmental Research

Labs, Boulder, CO 80302

Supporting Organization: US Dept. of Commerce, NOAA, Environmental

Research Labs, Boulder, CO 80302.

No. 87121481

Period: 3/78 - 9/78 Funds: Unknown

Oil spills, France

Summary not available.

[SSIE No. ZBP-1455]

D. ASPECTS OF OIL EXPLORATION AND PRODUCTION

1. BIOLOGICAL ASPECTS

R-184-78 (R-108-76)

ECOLOGICAL INVESTIGATIONS OF ALASKAN NORTH SLOPE OIL FIELD DEVELOP-

MENT - ARCTIC AND RED FOX STUDIES

Principal Investigator: Hanson, W.C., L. Eberhardt, and D. Ritter Performing Organization: University of California, USDE Scientific

Lab., PO Box 1663, Los Alamos, NM 87545

Supporting Organization: US Dept. of Energy, Washington, DC 20545

Period: 11/76 - 11/77

Funds: Unknown

Oil fields, Development, Environmental effects, Animals, Alaska, *Foxes, Baseline studies

The ecological effects of Alaskan arctic coastal plain oil field development will be studied at Prudhoe Bay, Colville River Delta, Franklin Bluffs, and Happy Valley. Current research includes: tagging and telemetry studies of arctic foxes; epidemiology of rabies in arctic foxes; interspecific relationships between arctic and red foxes; ecology of birds and small mammals; and a study of lichen sensitivity to air pollution.

[SSIE No. DA-109]

R-185-78

MAJOR COASTAL ECOSYSTEM CHARACTERIZATION AND METHODOLOGY WITH EM-PHASIS ON FISH AND WILDLIFE AS RELATED TO OIL AND GAS DEVELOPMENT

Principal Investigator: Tait, H.

Performing Organization: US Dept. of the Interior, Fish & Wildlife

Service, 10th & Constitution Ave. NW,

Room 378, Washington, DC 20560

Supporting Organization: US Environmental Protection Agency, Office

of Energy, Minerals & Industry, 401 M St. SW, Washington, DC 20460. Interagency

No. D7-E685, V625A-81

Period: 1/77 - N/A Funds: \$600,000

Ecosystems, Coasts, Atlantic coast, *Pacific Northwest, Louisiana, Maine, Fish, Wildlife, Offshore development

The major objective is to develop a multi-year plan for ecological characterizations of coastal areas, and to prepare standardized methodologies and specifications for conducting the ecological characterizations. Currently, four selected coastal ecosystems (Southwestern Louisiana, Georgia/South Carolina, Maine, and Northwest Pacific Coast) are being characterized in order to evaluate factors with predictive potential.

[SSIE No. GMA-4772]

R-186-78 (R-017-77)

EFFECTS OF REFINERY WASTES AND OIL FROM TRANSFER FACILITIES ON

PACIFIC NORTHWEST MARINE COASTAL ECOSYSTEMS Principal Investigator: Vanderhorst, J.R.

Performing Organization: US Dept. of Energy, Battelle Pacific NW Lab., PO Box 999, Richland, WA 99352

Supporting Organization: US Dept. of Energy, Div. of Biomedical &

Environmental Research, 1717 H St. NW, Washington, DC 20545. No. 4116

Period: 10/76 - N/A Funds: Unknown

Mollusks, Ecosystems, Baseline studies, Refineries, Oil transfer, Oil terminals, Biological effects, Chronic effects, *Pacific Northwest

"Effects are being measured in terms of organic content of sediment, general community structure, and change in the age structure, recruitment, growth and mortality of an important clam species. The sites chosen for study include the Cherry Point region, an operating and developing refinery site; the Port Angeles region, an area for which a deep water port and pipeline terminus is proposed; and, the Sequim Bay region, an area to serve as an uncontaminated control. Anticipated effects would result from refinery wastes, chronic spillage of crude or refined oil, and the possible large spillage associated with tanker collision or grounding."

[SSIE No. ZPE-12362-1]

2. SOCIAL/ECONOMIC ASPECTS

R-187-78

POTENTIAL GEORGES BANK PETROLEUM DEVELOPMENT AND THE NEW ENGLAND FISHING INDUSTRY - AN ECONOMIC ANALYSIS

Principal Investigator: Grigalunas, T., and J. Sutinen

Performing Organization: University of Rhode Island, Agricultural

Experiment Station, Administration Bldg.,

Wakefield, RI 02881

Supporting Organization: Rhode Island State Government, Providence,

RI 02930. No. 0069086, RI 00135

Period: 10/77 - 9/78

Funds: Unknown

Georges Bank, Offshore development, Fisheries, Economic effects, Biological effects, EIS

This research examined the New England fishing industry, potential offshore petroleum activities, and the possible interactions between the two; recommendations are made based on the findings. The

final report, Petroleum and Fishing Interactions on Georges Bank: Volume II was to be published in 1977 [no further information available]. The report covers biological effects of spills, offshore physical interference and debris problems, and onshore competition for labor and port-related services; it is being used as part of the EIS process.

[SSIE No. GY-69086-1]

3. BASELINE AND ENVIRONMENTAL IMPACT STUDIES

R-188-78

ENVIRONMENTAL ASSESSMENT OF THE NORTH ATLANTIC OUTER CONTINENTAL

SHELF (GEORGES BANK)

Principal Investigator: Aaron, J.M.

Performing Organization: US Dept. of the Interior, Geological Sur-

vey, Woods Hole, MA 02543

Supporting Organization:

US Dept. of the Interior, Geological Survey, Geologic Division, 12201 Sunrise Valley Dr., Reston, VA 22092. No.

9450-01823

Period: 10/77 - 9/78 Funds: \$275,520

Offshore exploration, OCS, Environmental effects, Georges Bank, Baseline studies. *Risk analysis

The end product of this project will be the documentation of the major stresses and potential hazards that may be encountered in petroleum exploration and development on Georges Bank. mobility and sea floor stability will be assessed; the composition flux, and direction of suspended matter transiting the Bank will be estimated; and new current meter, meteorological, and other oceanographic data will be gathered. The result will be "a better three-dimensional picture of the hydrography of the Bank, which is critical in determining trajectories of oil spills and other pollutants."

[SSIE No. ZUA-4175-1]

R-189-78 (R-002-77)

SOUTHERN CALIFORNIA BORDERLAND - ENVIRONMENTAL

Principal Investigator: Greene, H.G.

Performing Organization: US Dept. of the Interior, Geological

Survey, 345 Middlefield Rd., Menlo Park,

CA 94025

Supporting Organization: US Dept. of the Interior, Geological

Survey, Geologic Division, 12201 Sunrise

Valley Dr., Reston, VA 22092. No.

9460-01650 10/77 - 9/78

Period: 10/77 - 9 Funds: \$145,530

Baseline studies, *Geologic hazards, Natural seepage, OCS, California, Santa Barbara Channel, Sediments, Development

A study is being conducted to identify, map, and report the geologic hazards and problems that exist in the southern California Borderland, specifically in areas where future development may take place. Geologic hazards consist of faults, submarine landslides and slumps, hydrocarbon seeps, salt water intrusion sites, contaminant pathways, and areas of anomalous high erosion and sedimentation. Areas to be looked at include the central part of Santa Rosa-Cortes Ridge, San Diego shelf, western Santa Barbara Channel, and miscellaneous OCS areas that lie in water depths shallower than 750 m.

[SSIE No. ZUA-3979-2]

R-190-78 (R-302-75)

ENVIRONMENTAL ORGANIC GEOCHEMISTRY OF OUTER CONTINENTAL SHELVES

Principal Investigator: Miller, R.E.

Performing Organization: US Dept. of the Interior, Geological Survey,

12201 Sunrise Valley Dr., Herndon, VA 22092

Supporting Organization: Same as above. No. 9450-01543

Period: 10/77 - 9/78

Funds: \$81.470

Baseline studies, OCS, Hydrocarbons, Sediments, Atlantic Coast, Gulf of Mexico, *Geochemistry

The principle objectives of this project are to determine quantitatively and distinguish qualitatively the low-level baseline concentrations of natural organic constituents such as hydrocarbons, asphaltics, fatty acids, sterols, and metallo-organic complexes in shelf and slope sediments; and to differentiate and classify those same substances that are related to specific geological and geochemical processes. The study area for this project encompasses the eastern seaboard Atlantic states and the Gulf of Mexico seaboard states.

[SSIE No. ZUA-3570-3]

E. FATE OF OIL IN THE ENVIRONMENT

BIODEGRADATION

R-191-78

THE MECHANISM AND KINETICS OF HYDROCARBON UTILIZATION BY MICRO-

ORGANISMS

Principal Investigator: Blanch, H.W.

Performing Organization: University of Delaware, School of Engineer-

ing, Newark, DE 19711

Supporting Organization: US National Science Foundation, Division

of Engineering, 800 G St. NW, Washington,

DC 20550. No. ENG75-16473 A01

Period: 5/78 - 12/78

Funds: \$7,960

Biodegradation, Microorganisms, Hydrocarbons, *Intracellular kinetics

"The objectives of this proposed research are to provide a composite picture of the mechanism, regulation, and intracellular kinetics of hydrocarbon utilization. A model system, <u>Candida tropicalis</u> growing in n-hexadecane, will be used."

[SSIE No. GSE-5372-3]

R-192-78 (R-299-75)

DEGRADATIVE HYDROCARBON PLASMIDS

Principal Investigator: Chakrabarty, A.M.

Performing Organization: General Electric Company, 1 River Rd.,

Schenectady, NY 12305

Supporting Organization: US National Science Foundation, Div. of

Physiology, Cellular & Molecular Biology,

1800 G St. NW, Washington, DC 20550.

No. PCM77-25450

Period: 5/76 - 9/81 Funds: \$32,000

Biodegradation, Hydrocarbons, Microorganisms, *Plasmid interaction, *Evolution

This research program continues studies initiated under Grant PCM75-10978 to further understand the mechanims of plasmid interaction, the evolution and formation of plasmid aggregates and cointegrates, and any selective amplification of such plasmids. The involvement of direct or inverted repeat sequences on such plasmids will be studied. "The transposition of hydrocarbon degradative genes from one plasmid to another is of immense significance in the evolution of degradation potential of chlorinated and non-chlorinated hydrocarbons among the aerobic soil microorganisms."

[SSIE No. GSB-16385-3]

2. GENERAL FATE OF OIL

R-193-78

TRANSPORT OF ENERGY-RELATED CONTAMINANTS IN THE NEARSHORE COASTAL

WATERS OF THE SOUTH ATLANTIC BIGHT

Principal Investigator: Blanton, J.O.

Performing Organization: Skidaway Institute of Oceanography, PO

Box 13687, Savannah, GA 31406

Supporting Organization: US Dept. of Energy, 17th & Pennsylvania

Ave. NW, Washington, DC 20006. Contract

EY-77-S-09-1025

Period: 8/77 - 8/78 Funds: \$47,000

Contaminants, Fate, Dispersion, Atlantic Coast, *Currents

"This research is concerned with determining conditions under which energy-related contaminants present in the coastal waters are trapped by coastal currents and prevented from diffusing offshore. Specific objectives are [to]: 1) describe the coastal current regimes within 20 km from the coast; 2) determine the role of nearshore fronts, Gulf Stream and shelf-water interactions and freshwater input in transporting and dispersing energy-related contaminants."

[SSIE No. DJ-1097-1]

R-194-78 (R-094-77)

PETROLEUM HYDROCARBONS IN THE SEDIMENTS OF THE BERMUDA PLATFORM

Principal Investigator: Butler, J.N.

Performing Organization: Harvard University, School of Arts &

Sciences, Cambridge, MA 02138

Supporting Organization: US National Science Foundation, Div. of

Ocean Sciences, 1800 G St. NW, Washington,

DC 20550. No. OCE77-18662

Period: 11/77 - 4/79

Funds: \$42,500

Sedimentation, Hydrocarbons, Fate, Chromatography, Spectrometry, Bermuda

"This research project will sample sediments on the slope of the Bermuda platform at depths from shallow lagoonal to abyssal, and characterize the hydrocarbons found in these sediments using column chromatography, gas chromatography, and mass spectrometry." It is speculated that one possible fate of petroleum residues in the open ocean is accumulation in the sediments. On the basis of chemical composition, the relative contribution of petroleum residues will be inferred, as distinct from biogenic hydrocarbons for example. Transitions in hydrocarbon composition with increasing depth will be analyzed.

[SSIE No. CY-337]

R-195-78 (R-124-76)

LIGHT HYDROCARBONS - OCS

Principal Investigator:

Cline, J.

Performing Organization: US Dept. of Commerce, Environmental Research

Labs, Boulder, CO 80302

Supporting Organization: US Dept. of Commerce, NOAA, Environmental

Research Labs, Boulder, CO 80302.

R7120841

Period: 10/77 - 9/78 Funds: \$104,780

Hydrocarbons, Sources, Fate, Sedimentation, Alaska, OCS, *Norton Sound

This research project will evaluate the sources and fates of low molecular wt hydrocarbons in Norton Sound, Alaska and will assess the transport capacity of suspended sediments for heavy hydrocarbons.

[SSIE No. ZBP-1405]

R-196-78 (R-140-78)

DISTRIBUTION AND FATE OF BIOGENIC AND PETROLEUM-DERIVED SUBSTANCES

IN MARINE SEDIMENTS

Principal Investigator: Kaplan, I.R.

Performing Organization: University of California, Inst. of Geophysics

& Planetary Physics, 405 Hilgard Ave.,

Los Angeles, CA 90024

US Dept. of Energy, Div. of Biomedical & Supporting Organization:

Environmental Research, 1717 H St., NW,

Washington, DC 20545. No. 6334

10/76 - N/A

Period: Funds: Unknown

Fate, Distribution, Biogenic hydrocarbons, Petrochemicals, Sedimentation, Oceans, GC/MS

Project studies include: evaluation of marine and terrestrial contributions of carbon compounds to ocean sediments; fluxes of carbon, nitrogen, phosphorus, and sulfur at the sediment-water interface; differentiation of marine biogenic and petrochemical hydrocarbons; and fate of hydrocarbons in the sediment column. Results thus far show that the use of N-15/N-14 and S-34/S-32 stable isotope ratios in crude oils and petroleums is an effective method for differentiation of their origin and source; GC and GC/MS are used for compound recognition of petroleum products in marine sediments.

[SSIE No. GPE-6130-1]

R-197-78 (R-126-76) PHYTOPLANKTON - OCS

Principal Investigator: Larrance, J.D.

Performing Organization: US Dept. of Commerce, Environmental Re-

search Labs, Boulder, CO 80302

Supporting Organization: US Dept. of the Interior, BLM, 19th & C

Sts. NW. Washington, DC 20240.

No. R7120844

Period: 10/77 - 9/78 Funds: \$127,800

Sedimentation, Benthos, Source identification, *Organic detritus, *Petroleum pollutants, Baseline studies, Alaska, OCS

The project objective is to examine the role of organic detritus in the Lower Cook Inlet ecosystem and its potential for transporting petroleum pollutants to the benthos. Immediate plans are to conduct a field investigation to assess the flux of organic detritus to the benthos, and identify the composition and origin of this detritus. A baseline study of phytoplankton and primary production in Lower Cook Inlet has been completed.

[SSIE No. GUK-70-3]

3. MODELS AND PREDICTIONS

R-198-78

STATISTICAL MECHANICS OF INHOMOGENEOUS FLUIDS

Principal Investigator: Davis, H.T.

Performing Organization: University of Minnesota, School of Engineer

ing, 105 Morrill Hall, Minneapolis, MN

55414

Supporting Organization: US National Science Foundation, Division

of Engineering, 1800 G St. NW, Washington,

DC 20550. No. ENG76-22190 A01

Period: 12/76 - 7/79

Funds: \$34,950

Models, Statistical analysis, Emulsions, Behavior, *Oil-surfactant-water systems

The project objective is "to elucidate the non-equilibrium behavior of microemulsion systems through theoretical investigations of molecular and statistical models of these systems. Specific problems to be studied include: 1) Mean field theory of the rates of formation of microstructures in oil-surfactant-water systems and of the stability of these microstructures; 2) Theory of diffusivity, electrical conductivity and viscosity of mono-continuous and bicontinuous

microemulsions; 3) Theory of interfacial tensions of long-lived, non-equilibrium states of microemulsion systems. 4) Theory of interfacial excess transport properties."

[SSIE No. GSE-4923-3]

R-199-78

ALASKA NUMERICAL MODELING

Principal Investigator: Galt, J.

Performing Organization: US Dept. of Commerce, Environmental Research

Labs, Boulder, CO 80302

Supporting Organization: US Dept. of Commerce, NOAA, Environmental

Research Labs, Boulder, CO 80302.

No. R7120845

Period: 10/77 - 9/78 Funds: \$150,000

Models, *Spill trajectory, Distribution, OCS, Alaska

Numerical models and simulations of the marine environment are being developed in order to: "1) explain dynamic processes controlling the possible distribution of substances in the ocean; 2) aid in the interpretation of observational data; and 3) develop computer graphics to facilitate the presentation of research results." These studies support the Alaskan Outer Continental Environmental Assessment Program. Progress includes the design of a general oil spill trajectory model and the development and testing of a diagnostic model for oceanic surface velocities in coastal regions.

[SSIE No. ZBP-1400]

R-200-78

ARCTIC OIL SPILL MOVEMENT

Principal Investigator: Lissauer, I.M., G.L. Hufford, and

J.P. Welsh

Performing Organization: US Dept. of Transportation, Coast Guard

R & D Center, Avery Point, Groton, CT 06340

Supporting Organization: US Dept. of Transportation, Coast Guard,

400 7th St. SW, Washington, DC 20590

Period: 10/77 - 10/78

Funds: Unknown

Oil spills, Drift, Movement, Ice, Models, Beaufort Sea

The area of study is the Beaufort Sea; the purpose of the project is to determine oil spill drift in ice-infested waters. Results of the study will be included in a predictive model.

[SSIE No. ZZF-126-1]

F.	OIL POLLUTION REGULATIONS		
	[No entries.]		
G	. BILBLIOGRAPHIES		
u.			
	[No entries.]		
	M70051 / 61/501/5		
н.	MISCELLANEOUS		

[No entries.]

SECTION III: CURRENT CONFERENCES

* Additional information not available at time of publication ** Possibly oil pollution related topic or paper FFI For further information

OCT 24- *United Nations Educational, Scientific and Cultural Organization
DEC 1 20th Session of the General Conference, Paris, 1978
Sponsored by the United Nations Educational, Scientific and
Cultural Organization (UNESCO)

FFI contact UNESCO, Place de Fontenoy, 75700 Paris, France.

OCT 24-27 Society of Petroleum Engineers European Offshore Petroleum Conference and Exhibition, London, 1978 Sponsored by the Society of Petroleum Engineers (SPE) and the Institute of Petroleum (IP)

Oil Pollution Related Papers

Session: Legislation/Environment

Paper No. 06

THE ROLE OF THE DEPARTMENT OF ENERGY IN THE SAFE DEVELOPMENT OF UK OFFSHORE OIL AND GAS RESOURCES George, H.R.

Paper No. 08

ENVIRONMENTAL PROTECTION IN THE CONTEXT OF NORTH SEA OIL DE-VELOPMENTS

Appelbee, J.F., and C.S. Johnston

Session: Offshore Loading Systems

Paper No. 67

**OFFSHORE TANKER TERMINAL BERTHING PROBLEMS
Macgregor, P.S., M. Capages, Jr., and J.F. O'Sullivan

FFI contact SPE European Offshore Petroleum Conference and Exhibition, 6200 North Central Expressway, Dallas, TX 75206; or Ms. Lynda Boothby, Institute of Petroleum, 61 Cavendish Street, London WIM 8AR, UK.

OCT 25-27 *Third International Symposium on Polynuclear Aromatic Hydrocarbons Columbus, Ohio, 1978
Sponsored by Battelle's Columbus Laboratories

FFI contact Dr. Philip Leber, Cochairman, Battelle's Columbus Laboratories, 505 King Avenue, Columbus, OH 43201

OCT 31- *National Symposium on Energy and the Oceans, Key Biscayne, NOV 1 Florida, 1978

Sponsored by the Institute on Man and the Oceans, the Bureau of National Affairs' Energy Users Report, and the Environment Reporter

FFI contact National Symposium Secretary, Room 413, 1231 25th Street, NW, Washington, DC 20037.

NOV 1-2 Spill Control Technology Seminar, Long Beach, California, 1978 Sponsored by the Spill Control Association of America

Oil Pollution Related Papers

ENFORCEMENT OF CALIFORNIA'S SPILL POLLUTION LAWS Dubiel, E.

ROLE OF COAST GUARD AND THE COAST GUARD'S 'FIRST AID' RESPONSE Fouts, J.G.D.

EPA'S ENFORCEMENT RESPONSIBILITIES Jaffe, J.

THE CALIFORNIA STATE SPILL CONTINGENCY RESPONSE PLAN Condit, R.

FISH AND GAME'S ROLE IN CALIFORNIA'S SPILL CONTINGENCY PLAN Simons, E.

CRITERIA TO USE IN SELECTING A SPILL CLEANUP/CONTROL COURSE Acuff, J.

A NEW PAIR OF EYES Katz, W.B.

HAZARDOUS MATERIAL RESPONSE EMERGENCY CASE STUDY Abernathy, P.

NATIONAL FIRE PROTECTION ASSOCIATION'S HAZARDOUS MATERIAL MARKING SYSTEM Connor, M.E.

THE ROLE OF THE SPILL CLEANUP CONTRACTOR Dalton, T.F.

GROUND WATER CLEANUP Raymond. R.L.

DEVELOPMENT OF HARDWARE SYSTEMS TO TRANSPORT AND DISPOSE OF OIL AND DEBRIS FROM MARINE SPILLS Ross, D.E.

GASOLINE SEWER SPILL - MILAN, MICHIGAN Connor, M.E.

LANDSPREADING OF OILY WASTES Raymond, R.L.

HAZARDOUS MATERIALS WASTE TREATMENT AND REGULATORY IMPACT Bauer, D.

DESIGN CRITERIA ANALYSIS OF MECHANICAL OIL RECOVERY SYSTEMS Lerch, D.W.

CONTRACT CO-OP RELATIONSHIPS Paulsen, B., and M. Craig

ALASKA CO-OP SPILL RESPONSE PLAN (ACOSRP) Allen, A.

DISPERSANTS - JUST HOW PRACTICAL? no author noted

FFI contact Marc K. Shaye, SCAA, 17117 West Nine Mile Road, Suite 1515, Southfield, MI 48075.

NOV* *Third Session of the Sub-Group of Experts on the IGOSS Marine Pollution (Petroleum) Monitoring Pilot Project, Paris, 1978 Sponsored by the Intergovernmental Oceanographic Commission

FFI contact Intergovernmental Oceanographic Commission, Place de Fontenoy, 75700 Paris, France.

NOV 2-3 *Offshore Oil Conference, Dallas, Texas, 1978 Sponsored by the Energy Bureau Inc.

FFI contact Jared Smith, Energy Bureau Inc., 101 Park Avenue, New York, NY 10017.

NOV 8-10 American Chemical Society 30th Southeastern Regional Meeting, Savannah, Georgia, 1978
Sponsored by the American Chemical Society (ACS)

Oil Pollution Related Papers

Session: Analytical

Paper No. 3 COMPUTERIZED DATA ANALYSIS FOR FINGERPRINTING OF OIL SPILLS BY HIGH-RESOLUTION GC WITH SELECTIVE DETECTORS Mayfield, H., and W. Bertsch Session: Symposium on Marine Chemistry

Paper No. 195

FATE OF PETROLEUM IN ESTUARINE WATERS AND SEDIMENTS OF THE SOUTHEASTERN US

Lee, R.F.

FFI contact Dr. John G. Brewer, Department of Chemistry and Physics, Armstrong State College, Savannah, GA 31406.

NOV 8-10 *Conference on Oil Tanker Transportation: An Interdisciplinary Analysis of National and International Policy and Practice, Georgetown, South Carolina, 1978

Sponsored by the Belle W. Garuch Institute for Marine Biology and Coastal Research, and the US Department of Transportation

FFI contact Ernest B. Altekruse, C-DPPCM, Moncrief Army Hospital, Fort Jackson, SC 29207.

NOV 13 *Effluent and Water Treatment and the Environmental Pollution Control Exhibition, Birmingham, United Kingdom, 1978

FFI contact Howard Philips, Brintex Exhibitions, Ltd., 178-202, Great Portland Street, London, WIN 6NH, UK.

NOV 13-17 *First Session of the Assembly of the International Oil Pollution Compensation Fund, London, 1978

Sponsored by the International Maritime Consultative Organization (IMCO)

FFI contact C.P. Srivastava, Secretary-General, IMCO, 101-104 Piccadilly, London, WIV OAE, UK.

NOV 17-18 *Pretreatment and Land Application for Industrial Wastes, Miami Beach, Florida, 1978 Sponsored by the American Institute of Chemical Engineers (AIChE)

FFI contact AIChE Continuing Education Department, 345 East 47th, New York, NY 10017.

NOV 21-22 The Effective Use of Petroleum, London, 1978 Sponsored by the Institute of Petroleum (IP)

Oil Pollution Related Papers

Session: Oil in Transport

**MARINE TRANSPORT Anketell-Jones, M.W. FFI contact Ms.Lynda Boothby, Institute of Petroleum, 61 New Cavendish Street, London WIM 8AR, UK.

NOV 24- *International Commission for the Scientific Exploration of the Mediterranean XXVI Congress and Plenary Assembly. Antalya, Turkey, 1978
Sponsored by the International Commission for Scientific Exploration of the Mediterranean (ICSEM)

FFI contact Secretary-General, ICSEM, 16bd de Suisse, Monte Carlo, Monaco.

NOV 27-29 *National Conference on Quality Assurance of Environmental Measurements, Denver, Colorado, 1978

Sponsored by the Hazardous Materials Control Research Institute and Information Transfer, Inc.

FFI contact Bobbie D. Zucker, Conference Coordinator, Information Transfer, Inc., 1160 Rockville Pike, Suite 202, Rockville, MD 20852.

NOV 28- *Meeting on Remote Sensing, Bangkok, Thailand, 1978
DEC 2 Sponsored by the Economic and Social Commission for Asia

FFI contact Economic and Social Commission for Asia, Sala Santitham, Rajad Amnern Avenue, Bangkok, Thailand.

NOV 29-30 *Recycled Oil Workshop, Gaithersburgh, Maryland, 1978 Sponsored by the National Bureau of Standards and the Energy Research and Development Administration

FFI contact D.E. Becker, B50 Physics Building, National Bureau of Standards, Washington, DC 20234.

DEC 4-8 *International Maritime Consultative Organization Marine Environmental Protection Committee, London, 1978 Sponsored by the International Maritime Consultative Organization (IMCO)

FFI contact Y. Sasamura, Director, IMCO Marine Environment Division, 101-104 Riccadilly. London WIV OAE, UK

DEC 11-15 *Legal Aspects of Pollution Resulting from Exploration and Exploration of the Continental Shelf and the Sea Bed and its Subsoil in the Mediterranean, Rome, 1978

FFI contact Environmental Law Unit, United Nations Environment Programme, PO Box 30552, Nairobi, Kenya.

DEC 12-14 *Southeastern Oil Spill Response Workshop, Kiawah Island, South Carolina, 1978
Sponsored by the National Oceanic and Atmospheric Administration (NOAA) and the Environmental Protection Agency (EPA)

FFI contact William P. Davis, EPA Bear Bluff Field Station, PO Box 368, Johns Island, SC 29455.

DEC 12-16 *Symposium on Development for Multi-Media Monitoring Environmental Pollution, Riga, USSR, 1978
Sponsored by the World Meteorological Organization

FFI contact World Meteorological Organization, Avenue G. Motta, 1211 Geneva, Switzerland.

JAN 5 The Amoco Cadiz Oil Spill Symposium, Houston, Texas, 1979 Sponsored by the American Association for the Advancement of Science (AAAS)

The symposium is part of the Annual Meeting of the American Association for the Advancement of Science,

FFI contact Elizabeth Zeutschel, Meetings Manager, AAAS, 1776 Massachusetts Avenue, NW, Washington, DC 20036.

- JAN 29 *American Society for Testing and Materials Committee D-19 Symposium on Water for Subsurface Injection. Ecological Assessments of Effluent Impacts on Communities of Indigenous Aquatic Organisms, Ft. Lauderdale, Florida, 1979
 Sponsored by the American Society for Testing and Materials (ASTM)

 FFI contact ASTM, 1916 Race Street, Philadelphia, PA 19103.
- FEB 18-22 *American Institute of Mining, Metallurgical and Petroleum Engineers 108th Annual Meeting, New Orleans, Louisiana, 1979
 Sponsored by the American Institute of Mining, Metallurgical and Petroleum Engineers (AIME)

FFI contact Alexander R. Scott, AIME, 345 East 47th Street, New York, NY 10017.

FEB 19-23 *American Society for Testing and Materials, Committee F-20 Meeting on Spill Control Systems, Tampa, Florida, 1979 Sponsored by the American Society for Testing and Materials (ASTM)

FFI contact Mr. Sam Bowman, Staff Manager, ASTM, 1916 Race Street, Philadelphia, PA 19103.

FEB 26-28 *Sixth Energy Technology Conference and Exposition '79, Washington, DC, 1979

FFI contact Martin Heavner, Government Institutes, 4733 Bethesda Avenue, NW, Washington, DC 20014.

MAR 3-7 *Oceanology International '80 and Oceanology International World Conference, Brighton, England, 1980

FFI contact BPS Exhibition Ltd., 4 Seaford Court, 220-222 Great Portland Street, London, WIN 5HH, UK.

MAR 19-22 1979 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), Los Angeles, California, 1979 Sponsored by the American Petroleum Institute (API), the Environmental Protection Agency (EPA), and the US Coast Guard (USCG)

The following are preliminary session topics:

Training and Prevention; Contingency Planning; Oil Spill Cooperatives; Tanker Pollution Control - Issues and Progress: Sensing and Monitoring: Birds and Scientific Response Teams; Spill Effects on Nekton and Plankton; Legal and Financial Aspects; Legal-Socio-Economic Aspects; Cold Weather Techniques; Oil Spills in Icy Rivers; Cleanup Techniques for Restricted Waters; Petroleum in Benthic Organisms; Petroleum in Bottom Sediments; Levels of Petroleum Hydrocarbons in the North Sea; Oil Spill Modeling Techniques; Contingency Planning in Varied Geographic Regions; Marine Developments; Dispersants: New Equipment and Techniques; Field Observations; and Case History: Amoco Cadiz.

FFI contact Dr. Charles C. Bates, Program Chairman, c/o US Coast Guard (G-DS/62), Washington, DC 20590.

MAR 26-29 *International Congress on Materials Aspects of World Energy Needs, Washington, DC, 1979 Sponsored by the National Academy of Sciences, and the National Academy of Engineering

FFI contact Dr. Richard S. Claassen, Sandia Laboratories, Albuquerque, NM 87115.

MAR 27-29 *Measurement and Control of Offshore Platforms and Land Terminals Symposium and Exhibition, Brighton, UK, 1979
Sponsored by the Institute of Measurement and Control (InstMC)
Topics will include blowout protection instrumentation, and fire and explosion protection systems.

FFI contact E. Eden, Secretary, InstMC, 20 Peel Street, London, W8N 7PD, UK.

APR 1-5

American Institute of Chemical Engineers 86th National Meeting and 10th Petrochemical and Refining Exposition, Houston, Texas, 1979

Sponsored by the American Institute of Chemical Engineers (AIChE)

The Environmental Section will include papers possibly related to oil pollution in the following sessions: Solid waste, Water, and General Wastewater Treatment.

FFI contact Robert F. Anderson, Director, Experimental Development Department, UOP Process Division, PO Box Drawer C, Riverside, IL 60546.

- APR 30MAY 1-2
 *Institute of Environmental Sciences Annual Technical Meeting and Exposition, Seattle, Washington, 1979
 Sponsored by the Institute of Environmental Sciences (IES)
 Theme of the meeting is "Learning to Use our Environment."
 - FFI contact Institute of Environmental Sciences, 940 East Northwest Highway, Mt. Prospect, IL 60058.
- APR 30 *11th Annual Offshore Technology Conference, Houston, Texas,
 1979
 Sponsored by the American Institute of Chemical Engineers

(AIChE), and the Institute of Electrical and Electronics Engineers (IEEE)

FFI contact Offshore Technology Conference, 6200 North Central Expressway, Dallas, TX 75206.

MAY 21-24 *Sixth National Conference on Energy and the Environment, Pittsburg, Pennsylvania, 1979 Sponsored by the American Institute of Chemical Engineers (AIChE)

FFI contact Dr. Duane G. Nichols, Research Triangle Institute, PO Box 12194, Research Triangle Park, NC 27709.

READER'S GUIDE TO THE KEYWORD INDEX

The Master List of Keywords and Cross-Reference Guide is comprised of approximately 400 scientific, technical, geographic, and other descriptive terms relevant to the field of oil pollution. This list serves as a topical guide to the literature abstracts and research project summaries contained in Section I (C- -78) and in Section II (R- -78) of the REPORTS. Only terms included in the list are alphabetically permuted by computer to form the Keyword Index; additional free-language terms assigned to more thoroughly define the subject coverage of a specific entry are designated by an asterisk (*) in the Keyword Index, but do not appear as separate alphabetical entries. The Master List of Keywords and Cross-Reference Guide is continually updated to reflect trends in the current literature and research pertaining to oil pollution.

To effectively use the Keyword Index, the reader should use the following procedure: 1) scan the Master List of Keywords and Cross-Reference Guide to determine all possible terms and word variants applicable to the topic of interest; 2) look up all terms in the Keyword Index and scan other words in each entry to determine the relevancy of the entry; and 3) note the citation numbers of relevant entries and refer to them in the body of the REPORTS.

MASTER LIST OF KEYWORDS AND CROSS-REFERENCE GUIDE

S:

See

SA: See also Absorption Bering Sea Activated sludge ... SA: Sludge Bermuda Acute effects **Bibliographies** Adsorption Bilges Africa Bioassay Alabama Biodegradation ... SA: Bacteria, Micro-Alaska organisms Algae ... SA: Phytoplankton Biogenic hydrocarbons ... SA: Hydro-Amoco Cadiz spill carbons Amphipods Bioindicators Analytical techniques ... Biological effects ... SA: Acute SA: Chemical analysis, Chromaeffects, Chronic effects, Toxicity Biological treatment tography, Source identification Animals ... SA: Invertebrates, **Biomass** Marine mammals, Marine organ-Birds isms, Vertebrates Black Sea Annelids ... SA: Polychaetes Antarctica Blowout prevention **Blowouts** Arctic ... SA: Subarctic regions Book review Booms ... SA: Spill containment Arctic Ocean Argentina Bouchard 65 spill ... SA: Buzzards Bay Argo Merchant spill Brazil Aromatic hydrocarbons ... Buzzards Bay ... SA: Massachusetts California SA: Hydrocarbons, PAH Asia Canada Atlantic coast ... SA: Coasts Carcinogens ... SA: Health hazards, PAH Atlantic Ocean Caribbean Sea Australia Caspian Sea Bacteria ... SA: Microorganisms Chedabucto Bay Chemical analysis ... SA: Analytical Bahamas Ballast techniques, Chromatography, Source Baltic Sea identification, GC/MS Barent Sea Chemical effects Baseline studies ... SA: EIS Chesapeake Bay Bays ... SA: Estuaries, Chile Harbors China Beach cleanup Chromatography ... SA: Analytical tech-Beaches ... SA: Coasts, Shoreniques, Chemical analysis, GC/MS Chronic effects ... SA: Biological lines Beaufort Sea effects Behavior ... SA: Fate Coalescence ... SA: Flocculation Belgium Coastal zone management Benthos ... SA: Invertebrates, Coasts Compensation Marine organisms Connecticut

Conservation	Engineering S: Design-
Containment S: Booms,	engineering
Spill containment	England SA: UK
Contaminants	English Channel
Contamination	Environmental deterioration
Contingency planning	Environmental effects SA: EIS
Corals	Environmental Impact Statement
Coral reefs	S: EIS
Cost analysis SA: Economics	Environmental management SA: Coasta
Crankcase oil SA: Lubricating	zone management, Resource management
oil	Environmental protection
Crude oil	EPA
Crude oil washing	Equipment SA: Product information
Crustaceans	ERDA
Decomposition	Estuaries SA: Bays
Deepwater ports SA: Harbors,	Europe
Oil terminals, Ports	Evaporation
Delaware	Exploration SA: Offshore explora-
Delaware Bay	tion, Production
Denmark	Extraction
Design-engineering	Fate SA: Behavior
Detection SA: Monitoring,	FEA
Chemical analysis	Filtration SA: Flocculation,
Development SA: Offshore	Ultrafiltration
development	Finland
Dispersants SA: Emulsifiers,	Fish
Surfactants	Fisheries
Dispersion SA: Drift, Move-	Flocculation SA: Coalescence,
ment, Spreading	Filtration
Dispersions S: Emulsions	Florida
Disposal SA: Waste oil	
disposal, Wastewater disposal	<u>Florida</u> spill Flotation
Distillation	Food chain S: Food web
Distribution	Food web
DOE	
Drift SA: Movement, Spreading	Foreign governments SA: Government
Drilling SA: Offshore dril-	agencies
ling, Oil wells, Platforms	Fossil fuels
Echinoderms	France
Economic effects	Freshwater
Economics SA: Cost analysis	Fuel oil
Ecosystems	Fuels
Ecuador	Fungi SA: Microorganisms
Effluent treatment S: Waste-	Gas-liquid chromatography S:
water treatment	Chromatography
EIS SA: Baseline studies	Gasoline
	GC/MS SA: Chemical analysis, Chro-
Ekofisk blowout	matography, Spectrometry
Emulsification	Georges Bank
Emulsifiers SA: Dispersants,	Georgia
Surfactants	Germany, East
Emulsions	Germany, West

Government agencies SA: BLM, DOE, EPA, ERDA, FEA, NOAA, USCG, USGS,	Legislation SA: International conventions, Regulations
USN; Foreign governments, State	Liability
governments, US Government	Louisiana
Gravity separation SA: Oil-water	
	Lubricating oil
separation	Maine
Great Lakes	Manuals SA: Guidelines
Greenland	Marine mammals SA: Animals,
Groundwater	Vertebrates
Growth	Marine organisms
Guidelines SA: Manuals	Marshes
Gulf of Alaska	Maryland
Gulf of Mexico	Massachusetts SA: Buzzards Bay
Habitats	Mass spectroscopy S: Spectros-
Harbors SA: Bays, Deepwater	copy, GC/MS
ports, Oil terminals, Ports	Mediterranean Sea
Health hazards SA: Carcinogens	Metabolism SA: Growth, Release,
Hydrocarbons SA: Aromatic	Uptake
hydrocarbons, Biogenic hydro-	Metula spil SA: Strait of Magellan
carbons, Crude oil, PAH, WSF	Mexico
Ice	Michigan
Illinois	Microorganisms SA: Algae,
IMCO	Bacteria, Biodegradation,
Incineration	Fungi, Yeasts
India	Middle East
Indian Ocean	Mississippi
Indonesia	Mississippi River
Industries SA: Oil industry	Models
Information systems	Mollusks SA: Invertebrates
Infrared spectroscopy	Monitoring SA: Detection,
S: Spectroscopy	Remote sensing, Sampling
Inland SA: Onshore impacts	Mortality
Insurance	Movement SA: Spreading, Drift
International agreements SA:	Narragansett Bay
Foreign governments	Natural seepage
International conventions SA:	Neuston
Foreign governments, Legisla-	New Hampshire
tion, Regulations	New Jersey
Intertidal zone	New Mexico
Invertebrates SA: Marine	New York
organisms	Niches
Iran	NOAA
Iraq	North Carolina
Ireland	North Sea
Israel	Norway
Italy	Oceans SA: Sea surface, Seawater
Japan	OCS SA: Oil-gas leasing
Kuwait	Offsore development
	· · · · · · · · · · · · · · · · · · ·
Labrador Sea	Offshore drilling
Lakes SA: Great Lakes	Offshore exploration
Law enforcement	Offshore production
Leakage	Oil S: Crankcase oil, Crude oil,

Fuel oil, Lubricating oil,	Precipitation
Petroleum products, Waste oil	Product information
Oil discharges	SA: Equipment
Oil fields SA: Production	Production SA: Offshore pro-
Oil-gas leasing SA: OCS	duction, Drilling, Offshore
Oil industry	drilling
Oil shale	Prudhoe Bay
Oil slicks	Puerto Rico
Oil spills	Puget Sound
Oil tanks	Reclamation SA: Recycling, Reuse
Oil terminals SA: Deepwater	Recovery SA: Restoration
ports, Harbors, Ports	Recycling SA: Reclamation, Reuse
Oil transfer	Red Sea
Oil transport SA: Tankers	Refineries
Oil-water separation SA:	Refining
Gravity separation, Waste-	Regulations SA: Legislation,
water treatment	International conventions
Oil wells SA: Drilling, Pro-	Release SA: Growth, Metabolism,
duction, Offshore drilling,	Uptake
Offshore production	Remote sensing SA: Detection,
Olympic Games spill	Monitoring
Onshore impacts SA: Inland	Reproduction
Oregon	Residual oils
Oxidation SA: Biodegradation,	Resource management SA: Coastal
Weathering	zone management, Environmental
Pacific Ocean	management
PAH SA: Hydrocarbons	Restoration SA: Recovery
Patent	Reuse SA: Reclamation, Recycling
Pennsylvania	Rhine River
Personnel training	Rhode Island
Petrochemicals	Rivers SA: Streams
Petroleum S: Crude oil	Safety SA: Health hazards
Petroleum industry S: 0il	Sampling SA: Detection, Monitoring
industry	Source identification
Petroleum products	San Francisco Bay
pH control	Santa Barbara Channel
Philippines	Sargasso Sea
Physical effects	Saudi Arabia
Phytoplankton	Scotland
Pipelines Plankton SA. Phytoplankton	Sea surface SA: Oceans
Plankton SA: Phytoplankton,	Seawater
Zooplankton	Sedimentation
Plants SA: Vegetation	Sediments
Platforms SA: Offshore drilling Pollution control	Segregated ballast
	Ships SA: Tankers
Pollution prevention SA:	Shorelines SA: Beaches, Coasts
Environmental protection,	Sinking agents
Contingency planning Polychaotos SA: Appolids	Skimmers SA: Spill cleanup
Polychaetes SA: Annelids	Sludge SA: Activated sludge
Ports SA: Deepwater ports, Harbors, Oil terminals	Social effects
Portugal	Socioeconomic effects
I VI BUNUI	11.1.2.1

Solid wastes SA: Sludge Solubility	<u>Urquiola</u> spill US
Solution	USCG
Solvents	US Government SA: State
Sorbents SA: Absorption, Adsorp-	
tion	governments, Government
Source identification	agencies USGS
Sources	USN
South Carolina	USSR
Spain	Vegetation SA: Plants
Spectrometry	Venezuela
Spectroscopy	Vertebrates SA: Animals, Marine
Spill cleanup	mamma1s
Spill containment	Vietnam
Spill disposal	Virgin Islands
Spill removal	Virginia
Spreading SA: Drift, Movement	Washington
St. Lawrence River	Waste oil
State governments SA: US	Waste oil treatment
Government, Government	Wastewaters
agencies	Wastewater treatment SA: 0il-
Statistical analysis	water separation
Statistics	Waterfowl S: Birds
Storage	Water quality
Strait of Gibraltar	Water soluble fraction S: WSF
Strait of Magellan	Weathering
Streams SA: Rivers	West Indies
Subarctic regions SA: Arctic	Wildlife
Sublethal effects	WSF
	Yeasts SA: Microorganisms
Superports S: Deepwater ports,	
Oil terminals, Ports	Yugoslavia Zooplankton SA: Plankton
Supertankers S: Tankers	Zooptankton SA. Frankton
Surfactants SA: Dispersants,	
Emulsifiers	
Surveillance	
Sweden	
Syria	
Tankers, SA: Ships	
Tar	
Tar sands	
Texas	
Torrey Canyon spill	
Toxicity SA: Biological	
effects	
Tropical regions	
Turkey	
UK SA: England	
Ultrafiltration SA: Filtra-	
tion	
UN	
Uptake SA: Growth, Metabolism,	
Release	

```
ABSORPTION, SPILL CLEANUP, PATENT, *MAGNETIC SORBENT POWDER, POLLUTION CONTROL
1276
              WASTEWATER TREATMENT, SORBENTS, PATENT,
OIL-WATER SEPARATION, SORBENTS, PATENT, *PLANT FIBER MATS
OIL-WATER SEPARATION, SORBENTS, PATENT, *PLANT FIBER MATS
OIL-WATER SEPARATION, SORBENTS, PATENT, *URETHANE FOAM
OIL-WATER SEPARATION, SORBENTS, PATENT, *SORBENT MATS
1284
1320
1322
1325
1326
        " HYDROCARBONS, SPILL CLEANUP, *STARCH PCLYMERS
ACUTE EPFECTS, BIRDS, MORTALITY, SUBLETHAL EFFECTS, CONTAMINATION, HABITATS, *WATERPOWL
" CRUDE OIL, DISPERSANTS, FISH, *SALMC GAIRDNERI, *SERUM GLUCOSE AND SODIUM, *GILL
R 159
1356
              MORPHOLOGY
        " BIODEGRADATION, MICROORGANISMS, OCS, OIL SPILLS, CHRONIC EFFECTS, SAMPLING
" TO XICITY, BIOASSAY, REPINERIES, WASTEWATERS, FISH
ADSORPTION, WASTEWATER TREATMENT, OIL-WATER SEPARATION, SORBENTS, PATENT, *SORBENT
1415
R 172
1297
              FIBERS
              WASTEWATER TREATMENT, OIL-WATER SEPARATION, SORBENTS, PATENT, *SORBENT FIBERS WASTEWATER TREATMENT, SORBENTS, FATENT
1298
1299
1300
              WASTEWATER TREATMENT, PATENT, SORBENTS
              WASTEWATER TREATMENT, OIL-WATER SEPARATION, SORBENTS, PATENT, *SORBENT FIBERS OIL-WATER SEPARATION, SORBENTS, PATENT, *KAPOK FIBERS
1.40.3
1311
              OIL-WATER SEPARATION, HYDROCARBONS, SEAWATER, SEDIMENTATION OIL-WATER SEPARATION, EMULSIONS, PATENT, *SORBENT POWDER
1315
1314
              SKA , CONTINGENCY PLANNING, US, REGULATIONS, POLLUTION PREVENTION, POLLUTION CONTROL, OIL WELLS, INLAND
1336
         ALASKA
              EIS, OIL-GAS LEASING, OCS, OFFSHCRE DEVELOPMENT, BLM, *LOWER COOK INLET EIS, CIL-GAS LEASING, OCS, OFFSHORE DEVELOPMENT, BLM, *LOWER COOK INLET FIS, OIL-GAS LEASING, CCS, OFFSHORE DEVELOPMENT, BLM, *LOWER COOK INLET
1391
1392
              PIS, OIL-GAS LEASING, CCS, OFFSHORE DEVELOPMENT, BLM, *LOWER COOK INLET BASELINE STUDIES, SHORELINES, SEDIMENTATION, OIL SPILLS, FATE, ECOSYSTEMS,
1393
1404
               *VULNERABILITY INDEX, *LOWER COCK INLET
              BASELINE STUDIES, SHORELINES, SEDIMENTATION, OIL SPILLS, PATE, ECOSYSTEMS,
1435
               *VULNERABILITY INDEX, *LOWER COOK INLET
              BASELINE STUDIES, GUIDELINES, BICDEGRADATION, MICROORGANISMS, OCS, OFFSHORE
1406
               DEVELOPMENT, ANALYTICAL TECHNIQUES, NOAA
1409
              BASELINE STUDIES, HYDROCARBONS
                                                             , TANKERS, BALLAST , BIOLOGICAL EFFECTS,
               *TRANS-ALASKA PIPELINE, *PORT VALDEZ
              BIBLIOGRAPHIES, OFFSHORE DEVELOPMENT, OCS, ONSHORE IMPACTS, INDUSTRIES,
1443
              SOCIOECONOMIC EFFECTS, LEGISLATION WSF, CRUDE OIL, MARINE ORGANISMS, TOXICITY, BIOASSAY, CHEMICAL ANALYSIS
R170
              OIL FIELDS, DEVELOPMENT, ENVIRONMENTAL EFFECTS, ANIMALS, *FOXES, BASELINE STUDIES HYDROCAREONS, SOURCES, PATE, SEDIMENTATION, OCS, *NORTON SCUND
ā 194
3195
               SEDIMENTATION, BENTHOS, SOURCE IDENTIFICATION, *ORGANIC DETRITUS, *PETROLEUM
R 197
               POLLUTANTS, BASELINE STUDIES, OCS
R 199
              MODELS, *SPILL TRAJECTORY, DISTRIBUTION, OCS
         ALGAE, ECCNOMIC EFFECTS, PISH, INVERTEBRATES, OIL SPILLS, CHILE, *NORTHERN BREEZE SPILL AMOCO CADIZ SPILL, LIABILITY, *INQUEST
1369
1138
         ANALYTICAL TECHNIQUES, MONITORING, TANKERS, BALLAST, OIL DISCHARGES, EQUIPMENT,
1235
               PATENT. DETECTION
1211
              MONITORING, BIOINDICATORS, BASELINE STUDIES, HYDROCARBONS, BACTERIA, FISH,
               OCEANS, FRESHWATER
1217
              MONITORING, EQUIPMENT, WASTEWATERS, REFINERIES, PRODUCT INFORMATION, *PHOTOMETRIC
               ANALYZER
              REMOTE SENSING, SOURCE IDENTIFICATION, OIL SLICKS, EPA, MONITORING, POLLUTION CONTROL, *LASER FLUORESCENCE SAMPLING, MICROORGANISMS, BIODEGRADATION, *ENUMERATION, *MOST PROBABLE NUMBER
1221
1222
               METHOD
              CHROMATOGRAPHY, SPECTROSCOPY, *CASE HISTORIES
GC/MS, CRUDE OIL, OIL SPILLS, SOURCE IDENTIFICATION
INDUSTRIES, POLLUTION PREVENTION, WATER QUALITY
SAMPLING, HYDROCABBONS, *ZXXON, *NES, *INTERLABORATORY COMPARISON
TO THE O
1224
1225
1230
1231
              DETECTION, SPECTROSCOPY, HYDROCARBONS, WASTEWATERS, PATENT SAMPLING, CHROMATOGRAPHY, SPECTROSCOPY, STATISTICS
1232
1234
              CHROMATOGRAPHY, HYDROCARBONS, PATENT SPECTROMETRY, CHROMATOGRAPHY, *IR ANALYSIS
1236
1238
1241
              CONTAMINANTS, SEAWATER, SURFACTANTS, SOURCE INDENTIFICATION, MEDITERRANEAN SEA,
               *ELECTRCANALYSIS
               SOURCE IDENTIFICATION, CHROMATOGRAPHY, SPECTROSCOPY, *FLUORESCENCE, *IR ANALYSIS
1242
1260
              DISPERSANTS, OIL SLICKS, TOXICITY, ENVIRONMENTAL EFFECTS, *LICENSING, SPILL
               CLEANUP, EEACH CLEANUP, UK
              WASTEWATERS, REPINERIES, CONTAMINANTS, EPA, API, SAMPLING ALASKA, BASELINE STUDIES, GUIDELINES, BIODEGRADATION, MICROORGANISMS, OCS,
1283
              OFFSHORE DEVELOPMENT, NOAA
              BIBLICGRAPHIES, MONITORING, DETECTION, SAMPLING, CHEMICAL ANALYSIS, OIL SPILLS,
               *INDUSTRIAL WASTES
1445
              BIBLICGRAPHIES, SAMPLING, DETECTION, CHEMICAL ANALYSIS, REMOTE SENSING, OIL
               SPILLS, *INDUSTRIAL WASTES
```

DETECTION, BESIDUAL OILS, SEAWATER, USN

R155

- R 156 ANALYTICAL TECHNIQUES, CONTAMINANTS, POSSIL FUELS, SOLUBILITY, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, *ORGANIC COMPGUNDS
- CONTAMINANTS, SEDIMENTS, ECOSYSTEMS, SEAWATER, FRESHWATER, *IN SITU ANALYSIS R157
- HYDROCARBONS, BIOASSAY, BIGINDICATORS, CHRONIC EFFECTS, FATE, ECOSISTEMS, INTERTIDAL ZONE R179
- 3184 ANIMALS, ALASKA , OIL PIELDS, DEVELOPMENT , ENVIRONMENTAL EFFECTS, *FOXES, BASELINE STUDIES
- API, ANALYTICAL TECHNIQUES, WASTEWATERS, REFINERIES, CONTAMINANTS, EPA, SAMPLING ARCTIC, SPILL CLEANUP, SOCIAL EFFECTS, ECONOMICS, ENVIRONMENTAL EFFECTS, *REMOTE 1283 1368
- REGIONS FATE, BEHAVIOR, INCINERATION, DISPERSANTS, SPILL CLEANUP, ICE, ESTUARIES, 1427 *EXPERIMENTAL OIL SPILLS
- ARGO MERCHANT SPILL, CHEMICAL ANALYSIS, SAMPLING, CHRONIC EFFECTS, ENVIRONMENTAL R181 EFFEC IS
- AROMATIC HYDROCARBONS, MONITORING, PRODUCT INFORMATION, EQUIPMENT, CHROMATOGRAPHY, 1239 *BENZENE
- HYDROCAREONS 1229 , SOLUBILITY, CHEMICAL ANALYSIS, SURFACTANTS
- WSF, BIOLOGICAL EFFECTS, CHRONIC EFFECTS, FISH, UPTAKE, CRUDE OIL, *BENZENE, 1349 *T CLU ENE
- TOXICITY, BIOLOGICAL EFFECTS, FISH, UPTAKE, *NAPHTHALENE, *FUNDULUS HETEROCLITUS FISH, UPTAKE, BIOLOGICAL EFFECTS, FOOD WEB, *CLUPPA HARENGUS PALLASI, *BENZENB,
- 1355 *BIOMAGNIFICATION
- 1361
- BIOASSAY, TOXICITY, POLYCHAETES, SOLUBILITY, *PNA, *NEANTHES ARENACEODENTATA PISH, WSF, CRUDE OIL, ACCUMULATION, *ONCORHYNCHUS KISUTCH, *PLATICHTYS STELLATA BIOLOGICAL EFFECTS, HYDROCAEBGNS, CHUSTACEANS, BIOASSAY, TOXICITY, AETABOLISM, 1365 *ESTUARINE SHRIMP
- 1451
- R151
- " SEDIMENTS, PAH, SOURCES, POSSIL PUELS, EUZZARDS BAY, MASSACHUSETTS, *COMBUSTION
 " MONITORING, HYDROCARBONS, SEAWATER, SEDIMENTS, MOLLUSKS, SAMPLING
 ATLANTIC COAST, HYDROCARBONS, EICGENIC HYDROCARBONS, OFFSHORE DRILLING, SEDIMENTS,
 SOURCES, CONTAMINATION, *NOVA SCOTIA

 " EIS, CCS, ENVIRONMENTAL EFFECTS, OIL-GAS LEASING, SOCIOECONOMIC EFFECTS
 " EIS, OCS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, OIL-GAS LEASING, ON SHORE 1228
- 1389
- 1390 IMPACTS
- HYDROCARBONS, UPTAKE, FATE, SEDIMENTATION, BENTHOS, BIOLOGICAL EFFECTS, RHODE ISLAND, MOLLUSKS 1421
- R 185 ECOSISTEMS, COASTS, *PACIFIC NORTHWEST, LOUISIANA, MAINE, FISH, WILDLIFE, OFFSHORE DEVELOPMENT
- R 19.3 BASELINE STUDIES, OCS, HYDROCARBONS, SEDIMENTS, GULF OF MEXICO, *GEOCHEMISTRY
- R193
- " CONTAMINANTS, FATE, DISPERSION, *CURRENTS ATLANTIC OCEAN, BIOLOGICAL EFFECTS, FLANKTON, OFFSHORE DEVELOPMENT, HYDROCARBONS, FATE 1363
- BACTERIA, ANALYTICAL TECHNIQUES, MONITORING, BIGINDICATORS, BASELINE STUDIES, HYDROCAREONS, FISH, OCEANS, FRESHWATER 1211
- SOURCE IDENTIFICATION, HYDROCARBONS, BIOGENIC HYDROCARBONS, SEAWATER, PRESHWATER, PHYTOFLANKTON, *REVIEW
- PHYTOFLANKTON, *REVIEW

 "HYDROCARBONS, SPILL CLEANUP, BALLAST, BICDEGRADATION, PRODUCT INFORMATION, OIL DISCHARGES, SEAWATER, FRESHWATER
 "TOXICITY, WSF, CRUDE OIL, *REFINED OILS, *WEATHERED OILS
 "BIODEGRADATION, HYDROCARBONS, MICROGGANISMS, YEASTS, FUNGI, OXIDATION, * REVIEW

 BICDEGRADATION, OXIDATION, HYDBOCAREONS, *DESULFOVIBRIO DESULFURICANS, *WADDEN SEA

 BIODEGRADATION, MICROGRANISMS, DISTRIBUTION, CSSR, *VARNA BAY

 BALLAST, ANALYTICAL TECHNIQUES, MCNITCBING, TANKERS, OIL DISCHARGES, EQUIPMENT,

 PATENT, FRECTION 1271
- 1352
- 1413
- 1416
- 1417
- 1205 PATENT, CETECTION
- BACTERIA, HYDROCARBONS, SPILL CLEANUP, BICDEGRADATION, PRODUCT INFORMATION, OIL 1271 DISCHARGES, SPAWATER, PRESHWATER
- 1277 TANKERS, CRODE OIL WASHING, OIL DISCHARGES, OIL TERMINALS, OIL TRANSFER, POLLUTION PREVENTION
- 1316
- 1409
- OIL-WATER SEPARATION, DESIGN-ENGINEERING, COALESCENCE, EQUIPMENT, USN ALASKA, BASELINE STUDIES, HYDROCARBONS, TANKERS, BIOLOGICAL EFFECTS, *TRANS-ALASKA PIPELINE, *FORT VALUEZ
 BIGLICGRAPHIES, OIL-WATER SEPARATION, EQUIPMENT, SPILL REMOVAL, BILGES, POLLUTION CONTROL.
- BASELINE STUDIES, BACTERIA, ANALYTICAL TECHNIQUES, MONITORING, BIOINDICATORS, HYDROCAREONS, FISH, OCEANS, FRESHWATER
 "HYDROCARBONS, CHEMICAL ANALYSIS, SEDIMENTS, *INTERLABORATORY COMPARISON 1211
- 1227
- ALASKA , SHORELINES, SEDIMENTATION, OIL SPILLS, FATE, ECOSYSTEMS, *VULNERABILITY INDEX, *LOWER COOK INLET 1434
- ALASKA , SHORELINES, SECUMENTATION, OIL SPILLS, FATE, ECOSYSTEMS, *VULNERABILITY INDEX, *LOWER COOK INLET 1405
- ANALYTICAL TECHNIQUES, ALASKA, GUIDELINES, BIODEGRADATION, MICROORGANISMS, OCS, OFFSHORE DEVELOPMENT, NOAA 1406
- BENTHOS, HABITATS, MARINE OBGANISHS, ENVIRONMENTAL EFFECTS, OIL TRANSPORT, OIL 1437
- TRANSFER, PUGET SCUND 1408 SHORELINES, SEDIMENTATION, OIL STILLS, ECOSYSTEMS, GULF OF ALASKA, *VULNERABILITY INDEX

- BALLAST , ALASKA , HYDROCARBONS , TANKERS, BIOLOGICAL EFFECTS, *TRANS-ALASKA PIPELINE, *PORT VALDE Z 1409
- BASELINE STUDIES, ANIMALS, ALASKA, OIL FIELDS, DEVELOPMENT, ENVIRONMENTAL EPPECTS, R184 *FOXES
- MOLLUSKS, ECOSYSTEMS, REPINERIES, OIL TRANSFER, OIL TERMINALS, BIOLOGICAL EFFECTS. R 186 CHRONIC EFFECTS, *PACIFIC NORTHWEST
- R138
- OFFSHORE EXPLORATION, OCS, ENVIRONMENTAL EFFECTS, GEORGES BANK, *RISK ANALYSIS *GEOLOGIC HAZARDS, NATURAL SEEPAGE, OCS, CALIFORNIA, SANTA BARBARA CHANNEL, R 189 SEDIMENTS, DEVELOPMENT
- ATLANTIC COAST, OCS, HYDROCARBONS, SEDIMENTS, GULF OF MEXICO, *GEOCHEMISTRY ALASKA, SEDIMENTATION, BENTHCS, SCURCE IDENTIFICATION, *ORGANIC DETRITUS, R 197
- *PETROLEUM POLLUTANTS, OCS
- BAYS, SPILL CLEANUP, PORTS, INTERTIDAL ZONE, FLORIDA, USCG, ENVIRONMENTAL EFFECTS, 1191 *PORT SUTTON SPILL
- BEACH CLEANUP, OIL SLICKS, SHOBELINES, DISPERSANTS, SPILL CLEANUP, UK, *AMLWCH SPILL " TAR, COASTS, CHESAPERKE BAY, SOURCE IDENTIFICATION, USCG 1176 1202
- ANALYTICAL TECHNIQUES, DISPERSANTS, OIL SLICKS, TOXICITY, ENVIRONMENTAL EPPECTS, 1260
- *LICENSING, SPILL CLEANUP, UK
 *SURFACE TREATMENT AGENTS, SUBFACTANTS, DISPERSANTS, ENVIRONMENTAL PROTECTION, R 160 *FIELD TESTS
- 1190
- BEACHES, OIL SLICKS, SOURCES, MOVEMENT, *TRINIDAD

 " SPILL CONTAINMENT, BOOMS, EQUIPMENT, HYDROCARBONS , PATENT 1247
- INVERTEBRATES, SHORELINES, OIL SEILLS, EIOLOGICAL EFFECTS, CHILE, *NORTHERN BREEZE 1353 SPILL
- F 2JJ BEAUFORT SEA, OIL SPILLS, DRIFT, MOVEMENT, ICE, MODELS
- BEHAVIOR, BOUCHARD 65 SPILL, SPILL CLEANUP, ICE, FATZ, FUEL OIL, BUZZARDS BAY "SPREADING, EVAPORATION, *CII FILM 1274
- 1366
- BICDEGRADATION, MICROORGANISMS, OIL SPILLS, OIL DISCHARGES, SOURCES, EMULSIPICATION, SPILL CLEANUP, *REVIEW 1411
- 1419 FATE, PETROLEUM PRODUCTS, EVAFORATION, SOLUBILITY, WSP, *LIGHT REFINED OILS
- METULA SPILL, CONTEMINATION, ECOSYSTEMS, PATE, MOVEBENT, DISTRIBUTION, *COASTAL 1420 ENVIRONMENTS
- 1425
- MODELS, CIL SPILLS, FATE ARCTIC, FATE, INCINERATION, DISFEBSANTS, SPILL CLEANUP, ICE, ESTUARIES, *EXPERIMENTAL OIL SPILLS 1427
- 1428
- 2165
- R 169
- 8194
- "CIL SLICKS, SPEADING, DISTRIBUTION, PATE, MODELS, *PREDICTION
 "FUEL CIL, MARINE ORGANISMS, *HEAT, SUBLETHAL EFFECTS, *CHEMORECEPTION, MODELS
 "FISH, MARINE ORGANISMS, BIOLOGICAL EFFECTS, *CHEMORECEPTION, PACIFIC OCEAN
 "MODELS, STATISTICAL ANALYSIS, EMULSIONS, *OIL-SURFACTANT-WATER SYSTEMS
 BYNTHOS, BASELINE STUDIES, HABITATS, MARINE ORGANISMS, ENVIRONMENTAL EFFECTS, OIL 1407 TRANSFORT, OIL TRANSFER, PUGET SOUND
- ATLANTIC COAST, HIDRCCARBONS, UPTAKE, FATE, SEDIMENTATION, BIOLOGICAL EFFECTS, RHCDE ISLAND, MOLLUSKS 1421
- £ 174
- FOOD WEB, ECOSYSTEMS, COASTS, PISHEBIES, MARSHES
 BASFLINE STUDIES, ALASKA, SEDIMENTATION, SOURCE IDENTIFICATION, *ORGANIC
 DETRITUS, *PETROLEUM POLLUTANTS, CCS 2197
- 2194
- 1213
- BERMUDA, SEDIMENTATION, HYDROCARBONS, FATE, CHROMATOGRAPHY, SPECTROMETRY
 BIBLIOGRAPHIES, MONITORING, DETECTION, BIOINDICATORS, MICROORGANISMS, MARINE ORGANISMS
 "DISPOSAL, DECOMPOSITION, BICDEGRADATION, SOILS, ENVIRONMENTAL EFFECTS, *CASE DISPOSAL , DECOMPOSITION, I STUDIES, *OIL SPILL DEERIS 1332
- 1139 LEGISLATION, OCEANS, OFFSHORE DRILLING, POLLUTION CONTROL
- 1440 WASTEWATER TREATMENT, REFINERIES, PETROCHEMICALS, INDUSTRIES, ECONOMICS, POLLUTION CCNTRCL
- 1441 OFFSHORE DRILLING, OII RELLS, ENVIRONMENTAL EFFECTS, LEGISLATION, EQUIPMENT
- 1442 OFFSHORE DEVELOPMENT, DESIGN-ENGINEERING, ENVIRONMENTAL EFFECTS
- 1443 ALASKA, OFF SHORE DEVELOPMENT, OCS, CNSHORE IMPACTS, INDUSTRIES, SOCIOECONOMIC EFFECTS, LEGISLATION
- MONITORING, DETECTION, SAMPLING, CHEMICAL ANALYSIS, OIL 1444 ANALYTICAL TECHNIQUES, SPILLS, *INDUSTRIAL WASTES
- 1445 ANALYTICAL TECHNIQUES, SAMPLING, DETECTION, CHEMICAL ANALYSIS, REACTE SENSING, OIL SPILLS, *INDUSTRIAL WASTES
- 1446
- 1447
- 1291
- "BALLAST, OIL-WATER SEPARATION, EQUIPMENT, SPILL REMOVAL, BILGES, POLIUTION CONTROL

 "OCEANS, LEGISLATION, ECONOMICS, UN, *IAW OF THE SEA CONFERENCE

 BILGES, OIL-WATER SEPARATION, USN, WASTEWATER TREATMENT, EMULSIONS, *DEMULSIFICATION

 "BIBLIOGRAPHIES, BALLAST, OIL-WATER SEPARATION, EQUIPMENT, SPILL REMOVAL, 1446 POLLUTION CONTROL
- 1317 EIOASSAY, OIL-WATER SEPARATION, HYDROCARBONS, PILTRATION, WASTEWATERS, *EIOASSAY EFFLUENT, *SOBBENT FIBERS
- AROBATIC HYDBOCARBONS, TOXICITY, POLYCHAETES, SOLUBILITY, *PNA, *NEANTHES 136) AR ENACEODENTATA
- AROMATIC HYDROCARBONS, BICLCGICAL EFFECTS, HYDROCARBONS, CRUSTACEANS, TOXICITY, METABOLISM, *ESTUABINE SHRIMP WASTE HATER TREATMENT, BEFINERIES, MARINE CBGANISMS 1365
- 3 16 1
- HYDROCABEONS, PETROLEUM FRODUCTS, MCLLUSKS, TOXICITY, DELAWARE BAY, ESTUARIES, R 168 *OYSTER INDUSTRY

- BIOASSAY, ALASKA, WSF, CRUDE OIL, MARINE OFGANISMS, TOXICITY, CHEMICAL ANALYSIS R 170
- 8172
- ACUTE EFFECTS, TOXICITY, REPINERIES, WASTEWATERS, FISH ANALYTICAL TECHNIQUES, HYDROCARBONS, BIOINDICATORS, CHRONIC EFFECTS, PATE, R179 ECOSYSTEMS, INTERTIDAL ZONE
- BIODEGRADATION, ANALYTICAL TECHNIQUES, SAMPLING, MICROORGANISMS, *ENUMERATION, *MOST 1222 PROBABLE NUMBER METHOD
- 1270
- SPILL CLEANUP, DISPERSANTS, MICROORGANISMS, PATENT BALLAST, BACTERIA, HYDROCARBONS, SPILL CLEANUP, PRODUCT INFORMATION, OIL 1271
- 1272
- 1288
- 1302
- BALLAST, BACTERIA, HIDRUCARBUNG, SPILL CLEARUP, PRODUCT INFORMATION, OIL DISCHARGES, SEAWATER, FRESHWATER
 FRESHWATER, SEAWATER, SPILL REMOVAL, PATENT, *P & N COMPOSITIONS
 WASTE OIL TREATMENT, PATENT, *CATALYST
 BIBLIOGRAPHIES, DISPOSAL, DECCMECSITION, SCILS, ENVIRONMENTAL EPPECTS, *CASE
 STUDIES, *CIL SPILL DEBRIS
 HYDROCARBONS, DETECTION, SOURCES, BIOLOGICAL EPPECTS, OCEANS, FRESHWATER, 1377 INDUSTRIES, POLIUTION CONTROL, WASTEWATERS
- 1406 BASELINE STUDIES, ANALYTICAL TECHNIQUES, ALASKA, GUIDELINES, MICROORGANISMS, OCS. OFFSHORE DEVELOPMENT, NOAA
- MICROORGANISMS, HYDROCARBONS, SPILL CLEANUP BEHAVIOR, MICROORGANISMS, OIL SPILLS, CIL DISCHARGES, SOURCES, EMULSIFICATION, 1411 SPILL CLEANUP, *REVIEW
- HYDROCARBONS, OIL SPILLS, CIL SLICKS, DISPERSION, EVAPORATION, BOOK REVIEW 1412 1413
- 1414 1415
- PACTERIA, HYDROCARBONS, MICROSGANISMS, YEASTS, FUNGI, OXIDATION, * REVIEW MICROCRGANISMS, SPILL CLEANUP, *FERTILIZER, *NITROGEN, *FHOSPHORUS ACUTE EFFECTS, MICROCRGANISMS, OCS, CIL SPILLS, CHRONIC EFFECTS, SAMPLING FACTERIA, OXIDATION, HYDROCARBONS, *DESULFOVIBRIO DESULPURICANS, *WADDEN SEA BACTERIA, MICROCRGANISMS, DISTRIBUTION, USSR, *VARNA BAY 1416
- 1417
- 1418
- HYDROCARBONS , TAR, NATURAL SEEPAGE, CHROMATOGRAPHY, *HYPERSALINE ENVIRONMENTS HYDROCARECNS , SURFACTANTS, WASTEWATER TREATMENT, SPILL CLEANUP, *SOLUBILIZATION R158
- R 19 1
- MICROORGANISMS, HYDROCABBONS, *INTEACELLULAR KINETICS
 HYDROCABBONS, MICROORGANISMS, *PLASMID INTERACTION, *EVOLUTION R192
- BIOGENIC HYDROCARBONS, ATLANTIC COAST, HYDROCARBONS, OFFSHORE DRILLING, SEDIMENTS, SOURCES, CONTAMINATION, *NOVA SCOTIA 1228
- 1239 CHROMATOGRAPHY, HYDROCARBONS, MOLLUSKS, *CHITON
- BACTERIA, SOURCE IDENTIFICATION, HYDROCAREONS, SEAWATER, PRESENATER, 1246 PHYTOGLANKTON, *REVIEW
- FATE, DISTRIBUTION, PETROCHEMICALS, SEDIMENTATION, OCEANS, GC/MS R 196
- SIOLOGICAL EFFECTS, OIL SLICKS, OIL TERMINALS, DISPERSANTS, BIRDS, ESTUARIES, COASTS, 1177 UK. * AMINCH SPILL
- 1348
- TOXICITY, PISH, REPRODUCTION, CRUDE CIL, *BAINEOW TROUT AROMATIC HYDROCARBONS, WSF, CHRONIC EFFECTS, FISH, UPTAKE, CRUDE CIL, *BENZENE, 1349 *TOLUENE
- 1350
- 1353
- BIRDS, FUEL OIL, CRUDE OIL, TOXICITY, *HATCHABILITY, *INCUBATION STAGES BEACHES, INVERTEBRATES, SHORELINES, OIL SPILLS, CHILE, *NORTHERN BREEZE SPILL AROMATIC HYDROCARBONS, TOXICITY, FISH, UPTAKE, *NAPHTHALENE, *FUNDULUS HETEROCLITUS 1354
- AROMATIC HYDROCARBONS, PISH, UPTAKE, POOD WEB, *CLUPEA HARENGUS PALLASI, *BENZENE, 1355 *BIOMAGNIFICATION
- 1358
- ENVIRONMENTAL EFFECTS, OIL SPILLS, BIRDS, FISH HABITATS, INTERTIDAL ZONE, MAGINE ORGANISMS, OIL SPILLS, CHILE, *NORTHERN BREEZE 1362
- 1363
- ATLANTIC OCEAN, PLANKTON, OFFSHORE DEVELOPMENT, HYDROCARBONS, FATE BIOASSAY, AROMATIC HYDROCARBONS, HYDROCARBONS, CRUSTACEANS, TOXICITY, METABOLISM, 1365 *ESTUARINE SHRIMP
- ENVIRONMENTAL PROTECTION, POLLUTION PREVENTION, SHIPS, MONITORING, UN, *CONFERENCE, *GESAMP 1372
- ENVIRONMENTAL EFFECTS, OIL SPILLS, OFFSHORE EXPLORATION, OFFSHORE DEVELOPMENT, 1374
- WASTEWATERS, UN, *GESAMP BIODEGRADATION, HYDROCARBONS, DETECTION, SQURCES, OCEANS, FRESHWATER, INDUSTRIES, 1377
- POLLUTION CONTROL, WASTEWATERS 1378
- HYDROCARBONS, PAH, SEDIMENTS, MABINE OBGANISMS, TAR, SOUBCES, TANKERS, MEDITERBANEAN SEA
- SOURCES, TOXICITY, OCEANS, PETROLEUM PRODUCTS, CRUDE OIL, FOOD WEB, PHYTOPLANKTON, 1379 * NEKTON
- OFFSHORE DEVELOPMENT, DRILLING, OCEANS, ENVIRONMENTAL MANAGEMENT, SOURCES, 1384 REGULATIONS, MONITORING
- BASELINE STUDIES, BAILAST , ALASKA , HYDROCARBONS , TANKERS, *TBANS-ALASKA 1409
- PIFELINE, *PCRT VALCEZ BENTHOS, ATLANTIC COAST, HIDBCCABBONS, UPTAKE, PATE, SEDIMENTATION, BHODE ISLAND, 1421 MOLLUSKS
- 1449 *ENCYCLOPEDIA ENVIRONMENTAL EFFECTS, DEVELOPMENT .
- £ 167
- FUEL OIL, MOLLUSKS, *TUMOBS, *MYA ABENATIA, MAINE BEHAVIOR, PISH, MARINE ORGANISMS, *CHEMORECEPTION, PACIFIC OCEAN CHEMICAL EPPECTS, CHRONIC EPPECTS, CONTAMINATION R169
- 2173
- R176 BICINDICATORS, CONTAMINANTS, *AQUATIC ORGANISMS, RESOURCE MANAGEMENT
- CHODE OIL, HYDROCARBONS, TOXICITY, PIRCS, REPRODUCTION, SUBLETHAL EFFECTS, **R 177** UPTAKE, *EGGS

- R178 BIOLOGICAL EFFECTS, WSF, HYDROCARBONS, SUBLETHAL EFFECTS, MOLLUSKS, CRUSTACEANS, PISH, TOXICITY, *DEFENSE MECHANISMS
- BASELINE STUDIES, MOLLUSKS, ECOSYSTEMS, REFINERIES, OIL THANSFER, OIL TERMINALS, CHRONIC EFFECTS, *PACIFIC NORTHWEST R186
- 2187
- 1295
- " GEORGES BANK, OFFSHORE DEVELOFMENT, PISHERIES, ECONOMIC EFFECTS, EIS BIOLOGICAL TREATHENT, WASTEWATERS, PETROCHEMICALS, MODELS, COST ANALYSIS, EUROPE BIRDS, BIOLOGICAL EFFECTS, OIL SLICKS, CIL TERMINALS, DISPERSANTS, ESTUARIES, COASTS, 1177 OK, *AMLWCH SPILL
- OIL SPILLS, UK, TANKERS, CII TRANSFER, ENVIRONMENTAL EFFECTS, *CHRISTOS BITAS SPILL, *SALVAGE OPERATIONS TAR, COASTS, ENVIRONMENTAL EFFECTS, SWEDEN 1180
- 1201
- BIOLOGICAL EFFECTS, FUEL CIL, CHUDE CIL, TOXICITY, *HATCHABILITY, *INCUBATION 1350 STAGES
- ACUTE EFFECTS, MORTALITY, SUBLETHAL EFFECTS, CONTAMINATION, HABITATS, *WATERPOWL BIOLOGICAL EFFECTS, ENVIRONMENTAL EFFECTS, OIL SPILLS, FISH 1356
- 1358
- CONTAMINATION, HYDROCARBONS, MORTALITY, TOXICITY, SURFACTANTS, SOURCES, FATE, 1359 * P PV T FW
- 1364
- R171
- MORTALITY, *OILED BIRDS , *SUCCESSFUL REARING, *CAPTIVITY
 HYDROCARBONS , TOXICITY, FISH, HEALTH HAZARDS, *AITERED MEMBBANE
 BIOLOGICAL EFFECTS, CRUDZ OIL, HYDROCARBONS , TOXICITY, REPRODUCTION, SUBLETHAL R 177
- 1391
- 1392
- EFFECTS, UPTAKE, *EGGS
 BLM, ALASKA, EIS, CIL-GAS LEASING, CCS, OFFSHORE DEVELOPMENT, *LOWER COOK INLET
 " ALASKA, EIS, OIL-GAS LEASING, CCS, OFFSHORE DEVELOPMENT, *LOWER COOK INLET
 " ALASKA, EIS, OIL-GAS LEASING, CCS, OFFSHORE DEVELOPMENT, *LOWER COOK INLET
 " ALASKA, EIS, OIL-GAS LEASING, OCS, OFFSHORE DEVELOPMENT, *LOWER COOK INLET 1393
- BLOWOUT PREVENTION, DRILLING, INLAND, BEGULATIONS, GOVERNMENT AGENCIES, POLLUTION PREVENTION, CONTINGENCY PLANNING, CANADA 1344
- BLOWOUTS, SPILL CONTAINMENT, SPILL CLEANUP, OIL WELLS, LAKES, LOUISIANA, USCG, DOE, 1203 *STRATEGIC PETROLEUM RESERVE
- 1204 SPILL CLEANUP, OIL WELLS, LAKES , LQUISIANA, USCG, DOE, *STRATEGIC PETROLEUM RESERVE
- 1342
- POLLUTION CONTROL, PATENT, EQUIPMENT, DESIGN-ENGINEERING HYDROCARFONS, SEDIMENTS, ENVIRONMENTAL EFFECTS, CHEMICAL ANALYSIS, TEXAS, GULF OF 1381 MEXICO
- 1371 BOOK REVIZW, FATE, RECOVERY, RESTORATION, MARINE ORGANISMS, INTERTIDAL ZONE, CHRONIC PPPECTS, *PROCEEDINGS
 BICDEGRADATION, HYDROCARBONS, OIL SPILLS, OIL SLICKS, DISPERSION, EVAPORATION
- 1412
- 1448
- " SEDIMENTS, CHEMICAL ANALYSIS, CONTAMINANTS BOOMS, BEACHES, SPILL CONTAINMENT, EQUIPMENT, HYDROCARBONS, PATENT 1247
- 1248
- SPILL CONTAINMENT, PLATFORMS, PATENT, EQUIPMENT SPILL CONTAINMENT, PCLICTICN CONTROL, PATENT, EQUIPMENT 1249
- 1250 SPILL CONTAINMENT, POLLUTION CONTROL, EQUIPMENT, PRODUCT INFORMATION, US, CANADA, *FIELD TRIALS
- 1268 SPILL CLEANUP, SKIMMERS, DISPERSANTS, CONTINGENCY PLANNING, GOVERNMENT AGENCIES, TANKERS, COASTS, IRELAND
- 1301 PRODUCT INFORMATION, EQUIPMENT
- 1332 PERSCNNEL TRAINING, DISPERSANTS, INCO, MANUALS, SKIMMERS, SINKING AGENTS, SORBENTS, SPILL CLEANUP
- 1424 MODELS, *DISPERSIVE OIL LOSSES, OIL SLICKS, *THEORETICAL RESEARCH
- 1274
- 1274
- BOUCHARD 65 SPILL, BEHAVIOR, SPILL CLEANUP, ICE, FATE, FUEL OIL, BUZZARDS BAY BUZZARDS EAY, BOUCHARD 65 SPILL, BEHAVIOR, SPILL CLEANUP, ICE, FATE, FUEL OIL "AROMATIC HYDROCARBONS, SEDIMENTS, PAH, SOURCES, FOSSIL FUELS, MASSACHUSETTS, 1451 *CCMBUSTION
- CALIFORNIA, WASTEWATERS, CONTAMINANTS, HYDRCCAREONS, FOOD WEB, MARINE ORGANISMS, R 180 *PCLLUTART FLOW
- R 139 BASELINE STUDIES. *GEOLOGIC HAZARDS, NATURAL SPEPAGE, OCS, SANTA BARBARA CHANNEL,
- SEDIMENTS, DEVELOPMENT
 CANADA, BOOMS, SPILL CONTAINMENT, POLLUTION CONTROL, EQUIPMENT, PRODUCT INFORMATION, 1250 * FIELD TRIALS US.
- PORTS , PIPELINES, 1280 PCLLUTION PREVENTION, WASHINGTON, *PACIFIC COAST, *RISK
- ANALYSIS, *TRANS-ALASKA PIPELINE PERSONNEL TRAINING, CONTINGENCY FLANNING, POLLUTION CONTROL, OIL INDUSTRY, *PIELD 1333 EXERCISE
- 1344 BLOWOUT PREVENTION, DRILLING INLAND, REGULATIONS, GOVERNMENT AGENCIES, POLLUTION PREVENTION, CONTINGENCY PLANNING
- R152 CARCINOGENS, CHEMICAL ANALYSIS, WASTEWATERS, RECYCLING, CHROMATGRAPHY
- 1223 CHEMICAL ANALYSIS, CHRCMATGGRAPHY, *TBACE ANALYSIS
- 1226 PAH, PHYTOPLANKTON, SPECTROMETRY, *FLUORIMETRIC DETERMINATION
- BASELINE STUDIES, HYDROCARBONS, SECTIMENTS, *INTERLABORATORY COMPARISON 1227
- 1229
- AKCHATIC HYDROCAREONS, HYDROCARBONS, SOLUBILITY, SURFACTANTS
 CONTAININATION, CHRCHATOGRAPHY, FUEL OIL, FOOD WEB, *DIBENZCTHIOPHENES, *SEAFOOD 1233 TAINTING
- 1235 HYDROCARECNS CHRCHATOGRAPHY, SPECTROMETRY, *IR ANALYSIS
- 1237
- PETROLEUM PRODUCTS, *SUBFACE WATERS
 SOURCE ICENTIFICATION, CHROMATOGRAPHY, TAR, CRUDE OIL, FUEL OIL, *HIGH SPEED GEL 1244 PERMEATION METHOD

- 1381 CHEMICAL ANALYSIS, BLCHOUTS, HYDRCCAREONS, SEDIMENTS, ENVIRONMENTAL EFFECTS, TEXAS, GULF CF MEXICO
- ANALYTICAL TECHNIQUES, MONITORING, DETECTION, SAMPLING, OIL 1444 BIBLIOGRAPHIES, SPILLS, *INDUSTRIAL WASTES
- BIBLIOGRAPHIES, ANALYTICAL TECHNIQUES, SAMPLING, DETECTION, REMOTE SENSING, OIL 1445 SPILLS, *INDUSTRIAL WASTES
- 1448
- R 152
- R153 н
- BOCK SEVIEW, SEDIMENTS, CONTAMINANTS
 CARCINOGENS, WASTEWATERS, RECYCLING, CHECHATOGRAPHY
 HYDROCAREONS, PLANKTON, NEUTON, SEDIMENTS, SAMPLING, PUGET SOUND, WASHINGTON
 LAKES, GC/MS, *AIMOSPHERIC PETBCLEUM RESIDUES, PAH R 154
- ANALYTICAL TECHNIQUES, CONTAMINANTS, POSSIL FUELS, SOLUBILITY, SOUBCE R156 IDENTIFICATION, *ORGANIC COMPOUNDS
- BIOASSAY, ALASKA 2170
- BIOASSAY, ALASKA, WSF, CRUDE CIL, MABINE GEGANISMS, TOXICITY ARGC MERCHANT SPILL, SAMPLING, CHRONIC EFFECTS, ENVIRONMENTAL EFFECTS R181
- " ENVIRONMENTAL EFFECTS, GASOLINE, *BARGE 250 SPILL, BHODE ISLAND, SAMPLING CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, CHRONIC EFFECTS, CONTAMINATION R182
- R173
- 1202
- CHESAPEAKE BAY, BEACH CLEANUP, TAE, CCASTS, SOURCE IDENTIFICATION, USCG CHILE, BIOLOGICAL EFFECTS, EEACHES, INVERTEERATES, SHORELINES, OIL SPILLS, *HOSTHERN 1353 BREEZE SPILL
- BICLOGICAL EFFECTS. 1362 HABITATS, INTERTIDAL ZONE, MARINE ORGANISMS, OIL SPILLS.
- *NORTHERN BREEZE SPILL ALGAE, ECONOMIC EFFECTS, FISH, INVERTEBRATES, OIL SPILLS, *NORTHERN BREEZE SPILL 1369
- 1209 CHROMATOGRAPHY, AROMATIC HIDROCARBONS, MONITORING, PRODUCT INFORMATION, EQUIPMENT, *BENZENE
- CHEMICAL ANALYSIS, *TRACE ANALYSIS 1223
- 1224 11 ANALYTICAL TECHNIQUES, SPECTROSCOPY, *CASE HISTORIES
- CHEMICAL ANALYSIS, CONTAMINATION, FUEL OIL, FOOD WEB, *DIBENZOTHIOPHENES, *SEAFOOD 1233 TAINTING
- ANALYTICAL TECHNIQUES, SAMPLING, SPECTROSCOPY, STATISTICS 1234
- 1235
- 1236
- 1238
- 1239
- CHEMICAL ANALYSIS, HYDROCARBONS, SPECTFOMETRY, *IR ANALYSIS
 ANALYTICAL TECHNIQUES, HYDROCARBONS, PATENT
 ANALYTICAL TECHNIQUES, SPECTROMETRY, *IR ANALYSIS
 BIOGENIC HYDROCARBONS, HYDROCARBONS, MOLLUSKS, *CHITON
 HYDROCARBONS, ECHINODERMS, BIGGENIC HYDROCARBONS, *SEA URCHIN GONADS 1240
- ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, SPECTROSCOPY, *FLUORESCENCE, *IR 1242 ANALYSIS
- 1244 CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, TAR, CRUDE OIL, FUEL CIL, *HIGH SPEED GEL PERMEATION METHOD
- 1413 BIODEGRADATION, HYDROCARBONS, TAR, NATURAL SEEPAGE, *HYPERSALINE ENVIRONMENTS
- R152
- R194
- " CHEMICAL ANALYSIS, CARCINGGENS, WASTEWATERS, RECYCLING
 " BERMUDA, SEDIMENTATION, HYDROCARBONS, FATE, SPECTROMETRY
 CHRONIC EFFECTS, BIOLOGICAL EFFECTS, ARCMATIC HYDROCARBONS, WSF, PISH, UPTAKE, CRUDE 1349
- CIL, *BENZENE, *TOLUENE BOOK REVIEW, FATE, RECOVERY, RESTCRATION, MABINE CRGANISMS, INTERTIDAL ZONE, 1371 *PRCCEEDINGS
- ACUTE EFFECTS, MICROORGANISMS, OCS, OIL SPILLS, SAMPLING 1415 BICDEGRADATION.
- CHEMICAL EFFECTS, BICIOGICAL EFFECTS, CONTAMINATION R 173
- BIOASSAY, ANALYTICAL TECHNIQUES, HYDROCARBONS, BIOINDICATORS, PATE, ECOSYSTEMS, 2179 INTERTIDAL ZONE
- CHEMICAL ANALYSIS, ARGO MERCHANT SPILL, SAMPLING, ENVIRONMENTAL EFFECTS 3181
- BIOLOGICAL EFFECTS, BASELINE STUDIES, MCLLUSKS, ECOSYSTEMS, REFINERIES, OIL R 186 TRANSFER, OIL TERMINALS, *PACIFIC NORTHWEST
- COALESCENCE, CIL-WATER SEPARATION, EMULSIONS, PATENT, *SILICONE-COATED PIBERS 1310
- 1316 R 163
- " BAILAST, CIL-WATER SEPARATION, DESIGN-ENGINEERING, EQUIPMENT, USN
 " OIL-WATER SEPARATION, MODELS, *EVALUATIONS
 COASTS, BIRDS, BIOLOGICAL EFFECTS, CIL SLICKS, CIL TERMINALS, DISPERSANTS, ESTUARIES, 1177 UK, *AMIWCH SPILL
- OIL SPILLS, SPILL CLEANUP, GOVERNMENT AGENCIES, ENGLAND, *ELENI V BIEDS, TAR, ENVIRONMENTAL EFFECTS, SWEDEN CHES APEAKE BAY, EFACH CLEANUP, TAR, SOUBCE IDENTIFICATION, USCG 1183
- 1201
- 1232
- BOOMS, SPILL CLEANUP, SKIMMEBS, DISPERSANTS, CONTINGENCY PLANNING, GOVERNMENT 1268 AGENCIES, TANKERS, IRELAND
- R 174
- BENTHOS, POOD WEB, ECOSYSTEMS, PISHERIES, MARSHES ATLANTIC COAST, ECOSYSTEMS, *PACIFIC NORTHWEST, LOUISIANA, MAINE, PISH, WILDLIFE, R185 OFFSHORE DEVELOPMENT
- 1337 COMPENSATION, LIABILITY, SAFETY, INSURANCE, OFFSHORE DEVELOPMENT
- DEEPWATER PORTS, *LOCP, *SEADCCK, STILL CLEANUP, FOLLUTION PREVENTION, GULF OF 1387 MEXICC
- POLLUTION CONTROL, INTERNATIONAL CONVENTIONS, EUROPE, INFORMATION SYSTEMS, *EUROPEAN ECCNOMIC COMMUNITY 1436
- 1215
- CONTAMINANTS, MONITORING, OCEANS, SOBBENTS, DETECTION
 " HONITORING, INFORMATION SYSTEMS, SOURCE IDENTIFICATION, *NATIONAL WATER DATA 1218 EXCHANGE
- ANALYTICAL TECHNIQUES, SEAWATER, SUBFACTANTS, SCURCE INDENTIFICATION, 1241 MEDITERRANEAN SEA, *ELECTROANALYSIS

- 1293 CONTAMINANTS, API, ANALYTICAL TECHNIQUES, WASTEWATERS, REFINERIES, EPA, SAMPLING
- 1426
- DISPERSION, MODELS, ESTUABLES CHEMICAL ANALYSIS, BOOK REVIEW, SEDIMENTS 1448
- CHEMICAL ANALYSIS, ANALYTICAL TECHNIQUES, FOSSIL FUELS, SOLUBILITY, SOURCE **R 156** IDENTIFICATION, *OBGANIC COMPOUNDS
- ANALYTICAL TECHNIQUES, SEDIMENTS, ECOSYSTEMS, SEAWAIER, PRESHWATER, *IN SITU ₹157 ANALYSIS
- HYDROCAREONS, FISH, SUELETHAL EFFECTS, METABOLISM, *BICCHEMICAL EFFECTS BIOLOGICAL EFFECTS, BICINDICATORS, *AQUATIC ORGANISMS, BESOURCE MANAGEMENT 3175
- R 176
- CALIFORNIA, WASTEWATERS, HYDROCARBONS, FOOD WEB, MARINE ORGANISMS, *POLLUTANT FLOR R180
- 3 19 3
- " ATLANTIC COAST, PATE, DISPERSION, *CURRENTS
 CONTAMINATION, SPILL CLEANUP, CIL DISCHARGES, LEAKAGE, SHIPS, IRELAND, ENVIRONMENTAL 1184 FFFECTS
- BIOGENIC HYDROCARBONS, ATLANTIC COAST, SIDROCARBONS, OFFSHORE DAILLING, 1228
- SEDIMENTS, SOURCES, *NOVA SCOTIA
 CHROMATOGRAPHY, CHEMICAL ANALYSIS, FUEL OIL, FOCO WEB, *DIBENZOTHIOPHENES, 1233 *SEAFCOC TAINTING
- BIRDS, ACUTE EFFECTS, MORTALITY, SUBLETHAL EFFECTS, HABITATS, *WATERFOWL 1356
- 1359
- BIRDS, HYDROCARBONS, MORTALITY, TOXICITY, SURFACTANTS, SOURCES, FATE, *REVIEW MEDITERBANEAN SEA, SHORELINES, SOURCES, TAR, POLLUTION CONTROL, ENVIRONMENTAL 1373 DETERIORATION
- OIL SHALE, GROUNDWATER, *LEACHING 1380
- BEHAVIOR, METULA SPILL, ECOSYSTEMS, FATE, MCVEMENT, DISTRIBUTION, *COASTAL 1420 ENVIRONMENTS
- LEGISLATION, OCEANS, ENVIRONMENTAL EFFECTS, MONITORING, NCAA, US, *RESEARCH 1429
- CHRONIC EFFECTS, CHEMICAL EFFECTS, PICLOGICAL EFFECTS a 173
- CONTINGENCY PLANNING, COASTS, BOOMS, SPILL CLEANUP, SKIMMERS, DISPERSANTS, GOVEANMENT 1268
- AGENCIES, TANKERS, IRELAND
 CANADA, PERSONNEL TRAINING, POLLUTION CONTROL, OIL INDUSTRY, *FIELD EXERCISE 1333
- 1334 POLLUTION PREVENTION, SPILL CLEANUE, GOVEENMENT AGENCIES, ENGLAND
- 1335 POILUTION CONTROL, MONITORING, *PERSIAN GULF, *ACTION PLAN
- ALASKA, US, REGULATIONS, POLIUTION PREVENTION, POLLUTION CONTROL, OIL WELLS, 1336 INLAND
- CANADA, BLOWOUT PREVENTION, DBILLING , INLAND, REGULATIONS, GOVERNMENT AGENCIES, POLLUTION PREVENTION 1344
- LEGISLATION, HEALTH HAZARDS, FOLIUTION CONTROL, ENVIRONMENTAL PROTECTION, OCEANS, FRESHWATER, US 1433
- 1432 POLLUTION PREVENTION, GUIDELINES, REGULATIONS, SHIPS, SPILL CLEANUP, UK
- R164 OIL SFILLS, US, *RESEARCH FUNDS
- 1295
- 1225
- COST ANALYSIS, BIOLOGICAL TREATMENT, WASTEWATERS, FETROCHEMICALS, MODELS, EUROPE CRUDE CIL, ANALYTICAL TECHNIQUES, GC/MS, OIL SPILLS, SOURCE IDENTIFICATION

 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, TAR, FUEL OIL, *HIGH 1244 SPEED GEL PERMEATION METHOD
- SPILL REMOVAL, DISPERSANTS, PETROLEUM PRODUCTS, PATENT 1253
- STORAGE, OIL TRANSPER, FIPELINES, LOUISIANA, FEA, *STRATEGIC PETROLEUM RESERVE CIL-WATER SEPARATION, EMULSIONS, PATENT, *DEMULSIFIERS BIOLOGICAL EFFECTS, TOXICITY, FISH, REFRODUCTION, *RAINBOW TROUT 1279
- 1321
- 1348
- CHRONIC EFFECTS, BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, WSF, FISH, UPTAKE, 1349 *BENZENE. *TOLUENE
- 1350
- BIRDS, BIOLOGICAL EFFECTS, FUEL OIL, TOXICITY, *HATCHABILITY, *INCUBATION STAGES EMULSIONS, DISPERSANTS, METABOLISM, PISH, SUBLETHAL EFFECTS, TOXICITY, WEATHERING BACTERIA, TOXICITY, WSF, *REFINED CILS, *WEATHERED OILS 1351
- 1352
- 1357 ACUTE EFFECTS, DISPERSANTS, FISH, *SALMO GARBONZRI, *SERUM GLUCOSE AND SODIUM, *GILL MORPHOLOGY
- AROMATIC HYDROCARBONS, FISH, WSF, ACCUMULATION, *CNCORMINCHUS KISUTCH, *PLATICHTYS 1361 STELLATA
- 1379 BIOLOGICAL EFFECTS, SCURCES, TOXICITY, CCEANS, PETROLEUM PRODUCTS, FOOD WEB, PHYTCFLAAKTOR, *NEKTCN
 EIS, STORAGE, ENVIRONMENTAL EFFECTS, *STRATEGIC PETBOLEUM RESERVE
 EIS, STORAGE, ENVIRONMENTAL EFFECTS, LOUISIANA, *STRATEGIC PETROLEUM RESERVE
- 1394
- 1395
- 1396 1397
- R166
- R 17 3
- MSF, PETROLEUM PRODUCTS, TOXICITY, MARINE ORGANISMS
 CHEMICAL ANALYSIS, BIOASSAY, ALASKA, MSF, MARINE ORGANISMS, TOXICITY
 BIRDS, BIOLOGICAL EFFECTS, HYDROCARBONS, TOXICITY, REPRODUCTION, SUBLETHAL
 EFFECTS, OPTAKE, *EGGS R177
- CRUDE OIL WASHING, BALLAST , TANKERS, OIL DISCHARGES, OIL PERMINALS, CIL TRANSFER, 1277 POLLUTICA PREVENTION
- 1431 SAFETY, TANKERS, IMCC, FOLIUTION PREVENTION, SEGREGATED BALLAST, *INERT GAS
- SYSTEMS, GUIDELINES, SURVEILLANCE CRUSTACEANS, BIOLOGICAL EFFECTS, ELOASSAY, ARCMATIC HYDROCARBONS, BYDROCARBONS, 1365 TOXICITY, METABOLISM, *ESTUARINE SHRIMP
- BIOLOGICAL EFFECTS, ASF, HYDRCCABECNS, SUPLETHAL EFFECTS, AOLLUSKS, FISH, TOXICITY, *DEFENSE MECHANISMS R 178

```
1302 DECOMPOSITION, ELODEGRADATION, BIELLOGBAPHIES, DISPOSAL, SOILS, ENVIRONMENTAL
        EFFECTS, *CASE STUDIES, *OIL SPILL DEBRIS
DEEPWATER PORTS, SKIMMERS, EQUIPMENT, DESIGN-ENGINEERING, PRODUCT INFORMATION,
1252
                IRELAND, *BAY SKIMMER
        "COMPENSATION, *LOCP, *SEADCCK, SFILL CLEANUP, FOLLUTION PREVENTION, GULP OF MEXICO
"PORTS, CIL DISCHARGES, SAFETY, DEVELOPMENT, NEW YORK
DELAWABE EAY, BICASSAY, HYDROCARBONS, PETROLEUM PRODUCTS, MOLLUSKS, TOXICITY,
ESTUARIES, *OYSTER INDUSTRY
1387
1450
R168
        DESIGN-ENGINEERING, MONITORING, WASTEWATERS, SLUDGE, *LASERS, *OIL FILM, PATENT
" EQUIPMENT, PRODUCT INFORMATION, SKIMMERS, SPILL REMOVAL, *SSACV OIL SKIMMER, PATENT
" DEEPWATER PORTS, SKIMMERS, EQUIPMENT, PRODUCT INFORMATION, IRELAND, *BAY SKIMMER
1219
1251
1252
               SKIMMERS, EQUIPMENT, PRODUCT INFORMATION, SPILL CLEANUP, IBELAND, *BANTRY BAY SPILL REMOVAL, EQUIPMENT, SKIMMERS, PRODUCT INFORMATION
1253
1254
                EQUIPMENT, POLLUTION PREVENTION, SPILL CONTAINMENT, SPILL REMOVAL, PRODUCT
1255
                INFORMATION
               SKIMMERS, EQUIPMENT, SPILL REMOVAL, PRODUCT INFORMATION, *DYNAMIC OIL SKIMMER SPILL CLEANUP, PRODUCT INFORMATION, EQUIPMENT, SKIMMERS, EROFISK BLOWOUT
1256
1257
1258
                SPILL REMOVAL, EQUIPMENT, PATENT
                SPILL REMOVAL, SKIMMERS, EQUIPMENT, CIL-WATER SEPARATION, PATENT, *VACUUMING SPILL REMOVAL, SKIMMERS, CIL-WATER SEPARATION, EQUIPMENT, PATENT
1261
1262
               SPILL REBOVAL, SALMERS, CIL-WATER SEPARATION, EQUIPMENT, PATENT
HYDROCARBONS, SPILL CLEANUP, EQUIPMENT, SKIMMERS, PATENT
DISPERSION, SUFFACTANTS, OIL SPILLS, PATENT, EQUIPMENT
SPILL REMOVAL, EQUIPMENT, *CIL MCP, PATENT
WASTE OIL, DISPCSAL, ENVIRONMENTAL EPPECTS, VEGETATION, SOIL, *LAND APPLICATION
OIL-WATER SEPARATION, FILTRATION, PATENT, EQUIPMENT
OIL-WATER SEPARATION, WASTEWATER TREATMENT, PATENT, EQUIPMENT
COMESCENCE, BALLAST, OIL-WATER SEPARATION, POULDMENT, USB
1263
1265
1273
1296
1338
1313
                COALESCENCE, BALLAST, OIL-WATER SEPARATION, EQUIPMENT, USN BLOWOUTS, POILUTION CONTROL, FATENT, EQUIPMENT
1316
1342
                PIPELINES, LEAKAGE, DETECTION, EQUIPMENT, PATENT PLATFORMS, OPPSHORE DEVELOPMENT, SAFETY, POLIUTION CONTROL, REGULATIONS
1345
1386
                BIBLICGBAPHIES, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS
1442
1189
         DETECTION, LEAKAGE, SPILL CLEANUP, USCG, NEW YORK
1205
                BALLAST , ANALYTICAL TECHNIQUES, MONITORING, TANKERS, OIL DISCHARGES, EQUIPMENT,
                PATENT
                MONITCRING, WASTEWATERS, OIL DISCHARGES, PRODUCT INFORMATIOB, EQUIPMENT MONITORING, EQUIPMENT, HYDROCARBONS, FFODUCT INFORMATION, *FLUOROMETRY,
1206
1207
                 *PETRO-TRACT SYSTEM
                BIBLIOGRAPHIES, MCNITCRING, BICINDICATOFS, MICROOBGANISMS, MARINE ORGANISMS MONITCRING, LEAKAGE, EQUIPMENT, PATENT, HYDROCARBONS
1213
1213
                MONITORING, PIPELINES, OIL TRANSPER, LEAKAGE, PATENT
CONTAMINANTS, MONITORING, OCEANS, SCHEENTS
ANALYTICAL TECHNIQUES, SPECTROSCOPY, HYDROCARBONS, WASTEWATERS, PATENT
SOURCE IDENTIFICATION, FUEL GIL, PETROLFUM PROLUCTS, SPECTROMETRY, MODELS,
1214
1215
1232
1245
                STATISTICAL ANALYSIS
1278
                PIPELINES, LEAKAGE, PATENT
1343
                EQUIPMENT, POLLUTION CONTROL, FRANCE, OIL-WATER SEPARATION, SKIMMERS, SORBENTS,
                SINKING AGENTS, OIL DISCHAEGES, ERCOUT INFORMATION
DESIGN-ENGINEERING, PIPELINES, LEAKAGE, EQUIPMENT, PATENT
BIOLOGICAL EPPECTS, BICDEGRADATION, HYDROCARBONS, SOURCES, OCEANS, PRESHWATER,
1345
1377
                INDUSTRIES, POLLUTION CONTROL, WASTEWATERS
                CHEMICAL ANALYSIS, BIBLICGRAPHIES, ANALYTICAL TECHNIQUES, MONITORING, SAMPLING, CIL SFILLS, *INCUSTRIAL WASTES
1444
                CHEMICAL ANALYSIS, BIBLICGBAPHIES, ANALYTICAL TECHNIQUES, SAMPLING, REMOTE SENSING, OIL SPILLS, *INDUSTRIAL WASTES
1445
                ANALYTICAL TECHNIQUES, RESIDUAL OILS, SEAWATER, USN
R155
         DEVELOPMENT, ECONOMIC EFFECTS, INSUBANCE, OIL INDUSTRY, TANKERS, OIL SPILLS, *CLAIMS
138.2
              BIOLOGICAL EFFECTS, ENVIRONMENTAL EFFECTS, *ENCYCLOPEDIA
1444
                DEEPWATER PORTS, PORTS, CIL DISCHABGES, SAPETY, NEW YORK
BASELINE STUDIES, ANIMALS, ALASKA, OIL PIELDS, ENVIRONMENTAL EFFECTS, *POXES
CALIFORNIA, BASELINE STUDIES, *GEOLOGIC HAZARDS, NATURAL SEEPAGE, OCS, SANTA
1450
R184
k 189
                BARBARA CHANNEL, SEDIMENTS
         DISPERSANTS, BEACH CLEANUP, OIL SLICKS, SHOFELINES, SPILL CLEANUP, UK, *AMLNCH SPILL "COASTS, BIOLOGICAL EFFECTS, OIL SLICKS, OIL TERMINALS, ESTUARIES, UK,
1176
1177
                *AMLWCH SPILL
                CIL SPILLS, UK, TANKERS, OIL TRANSPER, *CHRISTOS BITAS SPILL SPILL CLEANUP, TANKERS, HARBOBS, *SCUTH APRICA, *STAWANDA SPILL CRUDE OIL, SPILL BEMOVAL, PETROLEUM PRODUCTS, PATENT
```

- 1179
- 1199
- 1259
- BEACH CLEANUP, ANALYTICAL TECHNIQUES, OIL SLICKS, TOXICITY, ENVIRONMENTAL EFFECTS, 1260
- *LICENSING, SPILL CLEANUP, UK SPILL CLEANUP, EMULSIFIERS, PATENT 1267
- CONTINGENCY PLANNING, COASTS, BCCMS, SPILL CLEANUP, SKIMMERS, GOVERNMENT AGENCIES, 1268 TANKERS. IRELAND
- 1270
- BIODEGRADATION, SPILL CLEANUP, MICROAGANISMS, PATENT BOOMS, PERSONNEL TRAINING, IMCO, MANUALS, SKIMMERS, SINKING AGENTS, SCRBENTS, 1332 SPILL CLEANCP

- DISPERSANTS, CRUDE CIL, EMULSIONS, METABOLISM, FISH, SUBLETHAL EFFECTS, TOXICITY, 1351
- WEATHERING CRUDE OIL, ACUTE EFFECTS, FISH, *SALMO GAIADNEFI, *SERUM GLUCOSE AND SODIUM, *GILL 1357 MCEPHCLCGY
- BEHAVIOR, ARCTIC, FATE, INCINERATION, SFILL CLEANUP, ICE, ESTUARIES, *EXPERIMENTAL 1427 OIL SFILLS
- BEACH CLEANUP, *SURFACE TREATMENT AGENTS, SURFACTANTS, ENVIRONMENTAL PROTECTION, R 160 *FIELC TESTS
- DISPERSION, MONITORING, EQUIPMENT, FEODUCT INFORMATION, *OIL-IN-WATER 1208
- DESIGN-ENGINEERING, SURFACTANTS, OIL SPILLS, PATENT, EQUIPMENT SLUDGE, PRECIPITATION, FILTRATION, PATENT 1265
- 1286
- BOOK REVIEW, BIODEGRADATION, HYDROCARBONS, OIL SPILLS, OIL SLICKS, EVAPORATION 1412
- 1426
- **R 193**
- " CONTAMINANTS, MODELS, ESTUARIES
 " CONTAMINANTS, ATLANTIC COAST, FATE, *CUERENTS
 DISPOSAL , WASTE CIL, *LANDFILLS, EMULSIONS, INDUSTRIES, *LEACHING, *PILOT STUDY 1294
- DESIGN-ENGINEERING, WASTE CIL, ENVIRONMENTAL EFFECTS, VEGETATION, SOII, *LAND 1296 APPLICATION
- DECOMFOSITION, EIODEGRADATION, BIBLIOGRAPHIES, SOILS, ENVIRONMENTAL EFFECTS, *CASE STUDIES, *OIL SPILL DEBBIS EXPLORATION, PRODUCTION, ECONOMIC EFFECTS, LEGISLATION, REGULATIONS, OIL SPILLS, 1332
- 1388 * OVER VIEW
- DISTILLATION, WASTE GIL, RECLAMATICN, REUSE, EVAPOBATION, EQUIPMENT, 1328
- 1331
- 1417
- " RECLAMATION, WASTE CIL, LUBRICATING OIL, SOLVENTS, PATENT, *VACUUM STEIPPING DISTRIBUTION, BIODEGRADATION, BACTERIA, MICEOGRGANISMS, USSR, *VARNA BAY " CONTAMINATION, BEHAVICR, METULA SPILL, ECOSYSTEMS, FATE, MOVEMENT, *COASTAL 1420 ENVIRONMENTS
- 1424
- R 196
- 2199
- " BEHAVICE, OIL SLICKS, SPREADING, FATE, MODELS, *PREDICTION
 " BIOGENIC HYDROCARBONS, FATE, FETROCHEMICALS, SECIMENTATION, OCEANS, GC/MS
 " ALASKA, MODELS, *SPILL TRAJECTORY, OCS
 DOE, BLOWOUTS, SPILL CCNTAINMENT, SPILL CLEANUP, OIL WELLS, LAKES, LOUISIANA, USCG, 1203 *STRATEGIC PETROLEUM RESERVE
- 1204 BLOWOUTS, SPILL CLEANUP, OIL WELLS, LAKES, LOUISIANA, USCG, *STRATEGIC PETROLEUM PESER VE
- 1367
- DRIFT, OIL SLICKS, SPREADING, FATE
 BEAUFORT SEA, OIL SPILLS, MCVEMENT, ICF, MCDELS R 2 3 3
- 1344 DRILLING, CONTINGENCY PLANNING, CANADA, BLOWOUT PREVENTION, INLAND, REGULATIONS,
- GOVERNMENT AGENCIES, ECILOTICN PREVENTION EICLOGICAL EFFECTS, CFFSHOBE DEVELOFMENT, OCEANS, ENVIRONMENTAL MANAGEMENT, SOURCES, REGULATIONS, MONITORING
- 1243 ECHINODERMS, CHRCMATOGRAPHY, HYDRCCARECNS, BIOGENIC HYDROCARONS, *SEA URCHIN GONADS
- ECCNOMIC EFFECTS, CHILE, ALGAE, FISH, INVERTEBRATES, OIL SPILLS, *NORTHERN BREEZE SPILL DEVELOPMENT, INSUBANCE, OIL INDUSTRY, TANKERS, OIL SPILLS, *CLAIMS 1369
- 1382
- DEVELOPMENT, INSURANCE, OIL INDUSTRY, TANKERS, OIL SPILLS, *CLAIMS OFFSHORE DEVELOPMENT, *RISK ANALYSIS, PLAIFORMS, SAPETY, OIL INDUSTRY, NOETH SEA 1333
- DISPOSAL , EXPLORATION , FECOUCTION , LEGISLATION, REGULATIONS, OIL SPILLS, *OVERVIEW 1388
- R 187 BIOLOGICAL EFFECTS, GEORGES BANK, CFFSHCBE DEVELOFMENT, FISHERIES, EIS
- ECCNOMICS, POILUTION CONTROL, ENVIRONMENTAL PROTECTION, MEDITERRANEAN SEA, *TREATY, 1333 *STANCABES
- 1363 ARCTIC, SPILL CLEANUP, SCCIAL EPPECTS, ENVIRONMENTAL EFFECTS, *REMOTE REGIONS
- 144) BIBLICGRAPHIES, WASTEWATER TREATMENT, REPINERIES, PETROCHEMICALS, INDUSTRIES, POLLUTION CONTROL
- 1447 BIBLICGRAPHIES, OCEANS, LEGISLATION, UN, *LAW CF THE SEA CONFERENCE
- 1370 ECOSYSTEMS, RECOVERY, ENVIRONMENTAL DETERIOFATION, RESOURCE MANAGEMENT, RESTORATION 1404 PASFLINE STUDIES, ALASKA, SHCRELINES, SEDIMENTATION, OIL SPILLS, PATE,
- *VULNEBABILITY INDEX, *LOWER COOK INLET 1435 BASELINE STUDIES, ALASKA, SHCRELINES, SEDIMENTATION, OIL SPILLS, FATE, *VULNERABILITY INDEX, *LOWER COOK INLET
- 1408 BASELINE STUDIES, SHORELINES, SEDIMENTATION, OIL SPILLS, GULF OF ALASKA, *VULNEBABILITY INCEX
- 1423 DISTRIBUTION, CONTAMINATION, BEHAVIOR, METULA SPILL, FATE, MOVEMENT, *COASTAL ENVIRONMENTS
- **R157** CONTAMINANTS, ANALYTICAL TECHNIQUES, SECIMENTS, SEAWATER, PRESHWATER, *IN SITH ANALYSIS
- 3174
- COASTS, EENTHOS, FOOL WEE, FISHERIES, MARSHES
 CABONIC EFFECTS, BICASSAY, ANALYTICAL TECHNIQUES, HYDROCARBONS, BIOINDICATORS,
 FATE, INTERTIDAL ZONE A 179
- R 185 CCASTS, ATLANTIC COAST, *PACIFIC NOFTHWEST, LOUISIANA, MAINE, FISH, WILDLIFE, OFFSHORE DEVELOPMENT
- R 186 CHRONIC EFFECTS, BIOLOGICAL EFFECTS, PASELINE STUDIES, MOLLUSKS, REFINERIES, OIL TRANSFER, OIL TERMINALS, *PACIFIC NORTHWEST
 ATLANTIC COAST, CCS, ENVIRONMENTAL EFFECTS, OIL-GAS LEASING, SOCIOECONONIC EFFECTS
- 1389 EIS,
- 1390 ATLANTIC COAST, CCS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, OIL-GAS LEASING, CNSHOPE IMPACTS
- 1391 BLM, ALASKA, OIL-GAS LEASING, CCS, OFFSHORE DEVELOPMENT, *LOWER COOK INLET BLM, ALASKA, OIL-GAS LEASING, OCS, OFFSHORE DEVELOPMENT, *ICWER COOK INLET
- 1392

```
EIS, BLM, ALASKA, OIL-GAS LEASING, CCS, CFFSHCRE DEVELOPMENT, *LOWER COOK INLET

"CRUDE OIL, STORAGE, ENVIRONMENTAL EFFECTS, *STRATEGIC PETROLEUM RESERVE

"CRUDE OIL, STORAGE, ENVIRONMENTAL EFFECTS, LOUISIANA, *STRATEGIC PETROLEUM RESERVE

"CRUDE OIL, STORAGE, ENVIRONMENTAL EFFECTS, LOUISIANA, *STRATEGIC PETROLEUM RESERVE

"CRUDE OIL, STORAGE, ENVIRONMENTAL EFFECTS, LOUISIANA, *STRATEGIC PETROLEUM RESERVE

"STORAGE, OIL TRANSFORT, CIL SELLIS, *STEATEGIC PETROLEUM RESERVE

"STORAGE, ENVIRONMENTAL EFFECTS, *STRATEGIC PETROLEUM RESERVE
                     STORAGE, OIL SPILLS, *BBINE SPILLS, *RISK ANALYSIS, *STRATEGIC PETROLEUM RESERVE STORAGE, ENVIRONMENTAL EFFECTS, *STBATEGIC PETROLEUM BESERVE
 1400
 140 1
                      STORAGE, OIL SPILLS, CIL TRANSPORT, OIL TERMINALS, *RISK ANALYSIS, *STRATEGIC
1402
                      PETROLEUM RESERVE
1403
                      STORAGE, ENVIRONMENTAL EFFECTS, OIL SPILLS, *RISK ANALYSIS, *STRATEGIC PETROLEUM
                      RESERVE
R187
                     ECCNOMIC EFFECTS, EIOLOGICAL EFFECTS, GEORGES BANK, OFFSHORE DEVELOPMENT, PISHERIES
            EKOPISK BLOGOUT, DESIGN-ENGINEEBING, SPILL CLEANUP, PRODUCT INFORMATION, EQUIPMENT,
 1257
                      SKIMMERS
             EMULSIPICATION, BIODEGRADATION, BEHAVIOR, MICROORGANISMS, OIL SPILLS, OIL DISCHARGES,
 1411
            SOURCES, SPILL CLEANUP, *REVIEW

EMULSIFIERS, DISPERSANTS, SPILL CLEANUP, FATENT

" WASTEWATER REATMENT, PLOTATION, *COAGULATION, OIL-WATER SEPARATION

" OIL-WATER SEPARATION, SOLVENTS, EQUIPMENT, FATENT
 1267
 1292
 1312
             EMULSIONS, WASTE OIL IBEATMENT, ULTRAFILTRATION, WASTEWATERS

" BILGES, CIL-WATER SEPARATION, USN, WASTEWATER TREATMENT, *DEMULSIFICATION

" DISPOSAL, WASTE CIL, *LANDFILLS, INDUSTRIES, *LEACHING, *PILOT STUDY
 1290
 1291
 1294
                      COALESCENCE, OIL-WATER SEPARATION, PATENT, *SILICONE-COATED FIBERS
 1310
                     ADSORPTION, OIL-WATER SEPARATION, PATENT, *SORBENT POWDER
CRUDE OIL, OIL-WATER SEPARATION, FATENT, *CEMULSIFIERS
CIL-WATER SEPARATION, EQUIPMENT, PATENT, EVAPORATION, *CONDENSATION
OIL-WATER SEPARATION, *BEVIEW
 1318
 1321
 1323
 1324
                      DISPERSANTS, CRUDE OIL, METABOLISM, FISH, SUBLETHAL EFFECTS, TOXICITY, WEATHERING
 1351
             " BEHAVIOR, MODELS, STATISTICAL ANALYSIS, *OIL-SURFACTANT-WATER SYSTEMS BNGLAND, COASTS, OIL SPILLS, SPILL CLEANUP, GOVERNMENT AGENCIES, *ELENI V 
" CONTINGENCY PLANNING, POLLUTION PREVENTION, SPILL CLEANUP, GOVERNMENT AGENCIES ENGLISH CHANNEL, TANKERS, SURVEILLANCE, SAFETY, *TBAFFIC CONTROL
R198
 1183
 1334
 1178
             ENVIRONMENTAL DETERIORATION, ECOSYSTEMS, RECOVERY, RESOURCE HANAGEMENT, RESTORATION
" CONTAMINATION, MEDITERRANEAN SEA, SHOBELINES, SCURCES, TAR, POLLUTION CONTROL
ENVIRONMENTAL EFFECTS, EIRDS, OIL SPILLS, UK, TANKERS, OIL TRANSFER, *CHRISTOS BITAS
 1370
 1373
 1180
                      SPILL, *SALVAGE OPERATIONS
                      CONTAMINATION, SPILL CLEANUP, OIL DISCHARGES, LEAKAGE, SHIPS, IRELAND BAYS, SPILL CLEANUP, PORTS , INTERTIDAL ZONE, FLORIDA, USCG, *PCRT SUTTON SPILL
 1184
 1191
                      COASTS, BIRDS, TAR, SWEDEN DISPERSANTS, EEACH CLEANUP, ANALYTICAL TECHNIQUES, OIL SLICKS, TOXICITY,
 1201
 1263
                       *LICENSING, SPILL CLEANUP, UK
                     REFINERIES, WASTEWATERS, *PROCESSING, *CATALOG
DISPOSAL , DESIGN-ENGINEERING, WASTE CIL, VEGETATION, SOIL, *LAND APPLICATION
DISPOSAL , DECOMPOSITION, EIOCEGRADATION, BIBLIOGRAPHIES, SOILS, *CASE STUDIES,
*OIL SPILL DEERIS
 1285
 1296
 1302
                     BIRDS, BIOLOGICAL EFFECTS, CII SFILIS, FISH ECONOMICS, ARCTIC, SPILL CLEANOP, SOCIAL EFFECTS, *REMOTE BEGIONS
 1358
 1363
                      BIOLOGICAL EFFECTS, CTI SPILLS, CFFSHCBF EXPLOBATION, OFFSHORE CEVELOPMENT,
 1374
                      WASTEWATERS, UN, *GESAMP
                      OIL SPILLS, OCEANS, *BOCK CHEMICAL ANALYSIS, BLOWOUTS, HYDROCARBONS, SEDIMENTS, TEXAS, GULF OF MEXICO
 1376
 1381
                      PRODUCTION , INDUSTRIES, GUIDELINES, *REVIEW, *WETLANDS
 1385
                     PRODUCTION , INDUSTRIES, GUIDELINES, *REVIEW, *WETLANDS
EIS, ATLANTIC COAST, CCS, CIL-GAS LEASING, SOCIOECONOMIC EFFECTS
EIS, ATLANTIC COAST, CCS, OFFSHORE DEVELOPMENT, OIL-GAS LEASING, CNSHORE IMPACTS
EIS, CRUDE OIL, STCBAGE, *STRATEGIC PETBOLEUM RESERVE
EIS, CRUDE OIL, STORAGE, LOUISIANA, *STRATEGIC PETROLEUM RESERVE
EIS, CRUDE OIL, STORAGE, LOUISIANA, *STRATEGIC PETROLEUM RESERVE
EIS, STORAGE, OIL SPILLS, **RISK ANALYSIS_ **STRATEGIC PETROLEUM RESERVE
 1389
 1390
 1394
 1395
 1396
 1397
 1399
 1431
                      EIS, STORAGE, OIL SPILLS, *RISK ANALYSIS, *STRATEGIC PETROLEUM BESERVE
BENTHOS, BASELINE STUDIES, HAPITATS, MARINE ORGANISMS, CIL TRANSPORT, OIL
 1403
                m
 1407
               **
                     THANDELH, PUGET SCUND

CONTAMINATION, LEGISLATION, OCEANS, MONITORING, NOAA, US, *RESEARCH
BIBLICGRAPHIES, OPPSHCRE DRILLING, CIL WELLS, LEGISLATION, EQUIPMENT
DESIGN-ENGINEERING, BIBLIOGRAPHIES, OFFSHORE DEVELOPMENT
DEVELOPMENT, BIOLOGICAL EFFECTS, *ENCYCLOPEDIA
FUELS, *REVIEW
FUELS, *REVIEW
CHRONIC PREFECTS
 1429
 1441
 1442
 1449
 1454
 1455
                     CHRONIC EFFECTS, CHEMICAL ANALYSIS, ARGO MERCHANT SFILL, SAMPLING CHEMICAL ANALYSIS, GASOLINE, *BARGE 250 SPILL, BHODE ISLAND, SAMPLING DEVELOPMENT, BASELINE STUDIES, ANIMALS, ALASKA, OIL FIELDS, *FOXES
R 181
2195
R 184
```

BAS FLINE STUDIES, OFFSHORE EXPLORATION, OCS, GEORGES BANK, *RISK ANALYSIS

£188

```
1341 ENVIRONMENTAL MANAGEMENT, POLLUTION CONTROL, LEGISLATION, MCNITCRING, MEDITERRANEAN
              SEA, ON, *UNEP
ESTUARIES, OIL INDUSTRY, FISHERIES, WATER QUALITY, *PROCEEDINGS
ESTUARIES, OIL INDUSTRY, FISHERIES, WATER QUALITY, *PROCEEDINGS
1375
              DRILLING , BIOLOGICAL EFFECTS, CPPSHOBE DEVELOPMENT, OCEANS, SCURCES, REGULATIONS,
1324
              MONITCRING
         " OL
XXNTR
1338 ENVIRONMENTAL PROTECTION, ECONOMICS, POLLUTION CONTROL, MEDITERRANEAN SEA, *TREATY,
              *STANDARDS
              BIOLOGICAL EFFECTS, POLLUTION PREVENTION, SHIPS, MONITORING, UN, *CONFERENCE,
              *GESAMP
              CONTINGENCY PLANNING, LEGISLATION, HEALTH HAZARDS, POLIUTION CONTROL, OCEANS,
1430
              PRESHWATER, OS
             OCS, OFFSHORE DEVELOPMENT, GOVERNMENT AGENCIES, REGULATIONS, SAFETY, USGS DISPERSANTS, BEACH CLEANUP, *SURFACE TREATMENT AGENTS, SURFACTANTS, *FIELD TESTS
1433
k 160
        EPA, SPILL CLEANUP, PIPELINES, OIL SPILLS, ILLINOIS, RIVERS
1182
              SPILL CLEANUP, PORTS , SOURCE IDENTIFICATION, USCG, PLORIDA, *PORT SUTTON SPILL,
1192
              *CLEANUF COSTS
             ANALYTICAL TECHNIQUES, BEMOTE SENSING, SOURCE IDENTIFICATION, OIL SLICKS, MONITORING, POILUTION CONTROL, *LASER FLUORESCENCE CONTAMINANTS, API, ANALYTICAL TECHNIQUES, WASTEWATERS, REPINERIES, SAMPLING IPHENT, DETECTION, EALLAST, ANALYTICAL TECHNIQUES, MONITORING, TANKERS, OIL
1221
1223
1205
        EQUIPMENT, DETECTION,
              DISCHARGES, PATENT
DETECTION, MONITORING, WASTEWATERS, OIL DISCHARGES, PRODUCT INFORMATION
DETECTION, MONITORING, HYDROCARBONS, PRODUCT INFORMATION, *FLUORCMETRY,
1206
1207
              *PETRO-TRACT SYSTEM
12.08
              DISPERSION, MONITCHING, PRODUCT INFORMATION, *OIL-IN-WATER
              CHROMATOGRAPHY, ARCMATIC HYDRICARBONS, MONITORING, PRODUCT INFORMATION, *BENZENE
1209
              MONITCRING, PRODUCT INFORMATION, HYDROCARBONS, *INFRARED SENSOR DETECTION, MONITORING, LEARAGE, FATENT, HYDROCABBONS
1212
1213
              MONITORING, *AUTOMATION, SAMPLING, *DATA PROCESSING ANALYTICAL TECHNIQUES, MONITORING, WASTEWATERS, REFINERIES, PRODUCT INFORMATION,
1216
1217
               *PHOTCHETRIC ANALYZER
              REMOTE SENSING, OIL SPILLS, SURVEILLANCE, PRANCE
BOOMS, BEACHES, SPILL CONTAINMENT, HYDECCABEONS, PATENT
BOOMS, SFILL CONTAINMENT, PLATFORMS, PATENT
BOOMS, SPILL CONTAINMENT, POLIUTION CONTROL, PATENT
CANADA, ECONS, SPILL CONTAINMENT, POLLUTION CONTROL, PRODUCT INFORMATION, US,
*FIELD TRIALS
1223
1247
1248
1249
1251
              DESIGN-ENGINEERING, PRODUCT INFORMATION, SKIMMERS, SPILL REMOVAL, *SSACV OIL
1251
              SKIMMER, PATENT
1252
              DESIGN-ENGINEERING, DEEPWATER PORTS, SKIMMERS, PRODUCT INFORMATION, IRELAND, *BAY
              SKIMMER
1253
              DESIGN-ENGINEERING, SKIMMERS, PRODUCT INFORMATION, SPILL CLEANUP, IRELAND, *BANTRY
              RAY
              DESIGN-ENGINEERING, SPILL REMOVAL, SKIMMERS, PRODUCT INFORMATION DESIGN-ENGINEERING, POLICICAL PREVENTION, SPILL CONTAINMENT, SPILL REMOVAL,
1254
1255
              PRODUCT INFORMATION
1256
              DESIGN-ENGINEERING, SKIMMERS, SPILL REMOVAL, PRODUCT INFORMATION, *DYNAMIC OIL
              SKIMMER
1257
              EKOFISK BLOWOUT, DESIGN-ENGINEERING, SPILL CLEANUP, PRODUCT INFORMATION, SKIMMERS
1258
              DESIGN-ENGINEERING, SPILL REMCVAL, PATENT
1261
              DESIGN-ENGINEERING, SPILL BEMCVAL, SKIMMERS, CIL-WATER SEPARATION, PATENT,
              *VACUUMING
              DESIGN-ENGINEERING, SPILL BEMCVAL, SKIMMERS, CIL-WATER SEPARATION, PATENT DESIGN-ENGINEERING, HYDROCARBONS, SPILL CLEANUP, SKIMMERS, PATENT SPILL BEMOVAL, CII-WATER SEPARATION, SKIMMERS, PATENT
1262
1263
1264
                              DESIGN-ENGINEERING, SURPACTANTS, OIL SPILLS, PATENT
1265
              DISPERSION.
              SPILL CLEANUP, *ULTRASONIC TRANSDUCER, FATENT
1206
              SPILL CLEARUP, FULINGUAL TRANSPORTER, EATTH SKIMMERS, SAFETY, PRODUCT INFORMATION
DESIGN-ENGINEERING, SPILL BEMCVAI, *CIL MCP, PATENT
WASTEWATER TREATMENT, REFINERIES, PLOTATION, PATENT, *AERATION TURBINE
1269
1273
1287
1301
              BOOMS, PRODUCT INFCEMATION
              OIL-#ATER SEPARATION, PATENT, *FACKED BEDS
CIL-WATER SEPARATION, *CISPERSIONS, PATENT
1326
1307
              DESIGN-ENGINEERING, CII-WATER SEFARATION, FILTRATION, PATENT
1308
              OIL-WATER SEPARATION, SPILL CLEANUP, FATENT
1309
1312
              EMULSIFIERS, CII-WATER SEPARATION, SOLVENTS, PATENT
1313
              DESIGN-ENGINEERING, CII-WATER SEFABATION, WASTEWATER TREATMENT, PATENT
1314
          16
              CIL-RATES SEPARATION, PRODUCT INFORMATION
```

DESIGN-ENGINZERING, COALESCENCE, BAILAST, CIL-WATER SEPARATION, USI EMULSIONS, OIL-WATER SEPARATION, PATENT, EVAPORATION, *CONDENSATION

DISTILLATION, WASTE CIL, BECLAMATION, REUSE, EVAPORATION, PATENT RECLAMATION, SPILL REMOVAL, SKIMMERS, PRODUCT INFORMATION

DESIGN-ENGINEERING, BLCWOUTS, FCILITION CONTROL, PATENT

1316 1323

1328

1329

1342

71

м

**

- " DETECTION, POLLUTION CONTEGL, PRANCE, CIL-WATER SEPARATION, SKIMMERS, SORBENTS, 1343 SINKING AGENTS, OIL DISCHARGES, PRODUCT INFORMATION
- 1345
- 1441
- EQUIPMENT, DETECTION, DESIGN-ENGINEERING, PIPELINES, LEAKAGE, PATENT
 " ENVIRONMENTAL FFFECTS, BIELIOGRAPHIES, OFFSHORE DRILLING, OIL WELLS, LEGISLATION
 BILGES, BIBLIOGRAPHIES, BALLAST, CIL-WATER SEPARATION, SPILL REMOVAL, POLLUTION 1446 CONTRCL.
- 1177 ESTUARIES, DISPERSANTS, COASTS, BIRDS, EIGLEGICAL EFFECTS, OIL SLICKS, OIL TERMINALS. UK, *AMIWCH SPILL
- 1347
- HYDROCARBONS, TO MICITY, CIL SPILLS, *PHOTC-OXICATION ENVIRONMENTAL MANAGEMENT, OIL INDUSTRY, FISHERIES, WATER QUALITY, *PROCEEDINGS DISPERSION, CONTAMINANTS, MCDEIS 1375
- 1426
- DISPERSANTS, BEHAVIOR, ARCTIC, PATE, INCINEBATION, SPILL CLEANUP, ICE, *EXPERIMENTAL CIL SPILLS 1427
- DELAWARE BAY, BIOASSAY, HYDROCARECNS, FETROLEUM PRODUCTS, MOLLUSKS, TOXICITY, R 168 *OYSTER INDUSTRY
- EUROPE, COST ANALYSIS, BICLOGICAL TREATMENT, WASTEWATERS, PETROCHEMICALS, MODELS 1295
- POLLUTICE CONTROL, MCNITORING, SURVEILLANCE, UK, PCREIGH GOVERNMENTS 1346
- COMPENSATION, POLIUTICN CONTROL, INTERNATIONAL CONVENTIONS, INFORMATION SYSTEMS, 1436 *EUROFEAN ECONOMIC COMMUNITY
- EVAPORATION, EQUIPMENT, EMULSICNS, OII-WATER SEPARATION, PATENT, *CONDENSATION " EQUIPMENT, DISTILLATION, WASTE OIL, RECLAMATION, REUSE, PATENT " BEHAVIOR, SPREADING, *CIL FILE 1323
- 1328
- 1366
- 1412
- 1419
- " DISPERSION, BOOK REVIEW, BIODEGRADATION, HYDROCARBONS, OIL SPILLS, OIL SLICKS

 " BEHAVIOR, FATE, PETROLEUM PRODUCTS, SOLUBILITY, WSF, *LIGHT REFINED OILS

 EXPLORATION, ECONOMIC EFFECTS, DISPOSAL, PRODUCTION, LEGISLATION, REGULATIONS, OIL

 SPILLS, *OVERVIEW 1388
- 1274
- PATE, BUZZARDS BAY, BOUCHARD 65 SPILL, BERAVIOB, SPILL CLEANUP, ICE, PUEL OIL
 " CONTAMINATION, EIRDS, HYDRCCABBOAS, MOETALITY, TOXICITY, SURPACTANTS, SOURCES, 1359 *REVIEW
- BIOLOGICAL EFFECTS, ATLANTIC CCEAN, FLANKTCN, OFFSHORE DEVELOPMENT, HYDROCARBONS 1363
- 1367 DRIFT, OIL SLICKS, SPREADING
- CHRONIC EFFECTS, BOOK REVIEW, BECCVEBY, RESTORATION, MARINE ORGANISMS, INTERTIDAL ZONE, *FROCEEDINGS
- *VULNERABILITY INDEX, *LOWER CCCK INLET ECOSYSTEMS, BASELINE STUDIES, ALASKA, S *VULNERABILITY INDEX, *LOWER CCCK INLET EVENT CCCK INLET *VULNERABILITY INDEX, *LOWER CCCK INLET 1404 SHCRELINES, SECIMENTATION, OIL SPILLS,
- SHORELINES, SEDIMENTATION, OIL SPILLS. 14.15
- 1419
- EVAPORATION, BEHAVIOR, PETROLEUM PRODUCTS, SOLUBILITY, WSP, *LIGHT REFINED OILS ECOSYSTEMS, DISTRIBUTION, CONTAMINATION, BEHAVIOR, METULA SPILL, MOVEBENT, 1420
- *COASTAL ENVIRONMENTS
- BIOLOGICAL EFFFCTS, BENTHOS, ATLANTIC COAST, HYDROCARBONS, UPTAKE, SEDIMENTATION, 1421 RHODE ISLAND, MOLIUSKS
- 1425 BEHAVIOR, MODELS, OIL SPILLS
- ESTUARIES, DISPERSANTS, BEHAVICE, ABCTIC, INCINEBATION, SPILL CLEANUP, ICE, 1427
- *EXPERIMENTAL CIL SPILLS 1428 DISTRIBUTION, BEHAVICH, OIL SLICKS, SPREADING, MODELS, *PREDICTION
- ECOSYSTEMS, CHRONIC EFFECTS, BIOASSAY, ANALYTICAL TECHNIQUES, HYDROCARBONS, R179 BIOINDICATORS, INTERTIDAL ZCNE
- 2193
- R 194
- R195
- R 196
- DISPESSION, CONTAMINANTS, ATLANTIC COAST, *CURRENTS
 CHROMATOGRAPHY, BERMUDA, SEDIMENTATION, HYDROCARBONS, SPECTROMETRY
 ALASKA, HYDROCAREONS, SOURCES, SEDIMENTATION, OCS, *NORTON SOUND
 DISTRIBUTION, BICGENIC HYDROCARBONS, FETROCHEMICALS, SEDIMENTATION, OCEANS, GC/MS, CRUDE OIL, STORAGE, OIL TRANSPER, PIPELINES, LOUISIANA, *STRATEGIC PETROLEUM 1279 PEA. RESER VE
- FISH, BASELINE STUDIES, EACTERIA, ANALYTICAL TECHNIQUES, MONITORING, BIGINDICATORS, HYDROCARBONS, CCEANS, FRESHWATER 1211
- CRUDE OIL, BIOLOGICAL EFFECTS, TOXICITY, REPRODUCTION, *RAINBOW TROUT 1348
- CRUDE OIL, CHRONIC EFFECTS, BICLCGICAL EFFECTS, ARONATIC BYCROCARBONS, WSF, 1349 UPTAKE, *EENZENE, *TCLUENE
- EMULSIONS, DISPERSANTS, CRUDE OIL, METABOLISM, SUBLETHAL EFFECTS, TOXICITY, 1351 WEATHERING
- BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, TOXICITY, UPTAKE, *NAPHTHALENE, *FUNDULUS HETEROCIITUS 1354
- BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, UPTAKE, POOD WEB, *CLUPEA HARENGUS PALLASI, *BENZENE, *EICMAGNIFICATION 1355
- DISPERSANTS, CRUDE OIL, ACUTE EFFECTS, *SALMO GAIRDNERI, *SERUM GLUCOSE AND 1357 SODIUM, *GILL MCRPHOLOGY
- 1358 ENVIRONMENTAL EFFECTS, BIRDS, BICICGICAL EFFECTS, OIL SPILLS
- CRUDE OIL, AROMATIC HYDROCARBONS, WSF, ACCUMULATION, *ONCORMYNCHUS KISUTCH, *PLATICHTYS STELLATA 1361
- ECONCHIC EFFECTS, CHILE, ALGAE, INVERTEERATES, OIL SPILLS, *NOETHERN EREEZE SPILL BIOLOGICAL EFFECTS, BEHAVICE, MARINE CRGANISMS, *CHEMORECEPTION, PACIFIC OCEAN BIRDS, HYDROCARBONS, TOXICITY, HEALTH HAZARDS, *ALTERED MEMERANE BIOASSAY, ACUTE EFFECTS, TOXICITY, BEFINERIES, WASTEWATERS 1369
- R 169
- R171
- R 172
- CONTAMINANTS, HYDROCARBONS, SUBLETHAL EFFECTS, METABOLISM, *BICCHEMICAL EFFECTS R175

- R178 FISH, CRUSTACEANS, BIOLOGICAL EFFECTS, WSF, HYDROCARBONS, SUBLETHAL EFFECTS,
- MOLLUSKS, TOXICITY, *DEFENSE MECHANISMS EUOSYSTEMS, COASTS, ATLANTIC COAST, *PACIFIC NORTHWEST, LCUISIANA, MAINE, R185 WILDLIFE, OFFSHCRE DEVELOPMENT
- FISHERIES, ESTUARIES, ENVIRONMENTAL MANAGEMENT, OIL INDUSTRY, WATER QUALITY. 1375 * PROCEEDINGS
- R 174
- R187
- ECOSYSTEMS, COASTS, BENTHOS, POOD WEP, MARSHES
 EIS, ECONOMIC EFFECTS, BIOLOGICAL EPFECTS, GEORGES BANK, OPPSHORE DEVELOPMENT
 RIDA, ENVIRONMENTAL EPPECTS, BAYS, SFILL CLEANUP, PORTS, INTERTIDAL ZONE, USCG, FLORIDA, 1191 *PCRT SUTTON SPILL
- EPA, SPILL CLEANUP, PORTS, SCURCE IDENTIFICATION, USCG, *PORT SUTTON SPILL, 1192 *CLEANUF COSTS
- SOURCE IDENTIFICATION, LAW ENFORCEMENT, USCG, LIABILITY, *PORT SUTTON SPILL, 1193 *CLEANUF COSTS
- SOURCE IDENTIFICATION, LAW ENFORCEMENT, USCG, SAMPLING, LIABILITY, TANKERS, *PORT 1194 SUTTON SPILL
- FLOTATION, OIL-WATER SEPARATION, WASTEWATER TREATMENT, PRODUCT INFORMATION, *ASPHALT 1282 PLANT, *CHIC RIVER
- 1287 EQUIPMENT, WASTEWATER TREATMENT, REPINERIES, PATENT, *AERATION TURBINE
- 1292 EMULSIFIERS, WASTIWATER TREATMENT, *COAGULATION, OLI-WATER SEPARATION
- FOOD WEB, CONTAMINATION, CHROMATOGRAPHY, CHEMICAL ANALYSIS, PUEL CII, *DIBENZOTHIOPHENES, *SEAFCCD TAINTING 1233
- FISH, BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, UPTAKE, *CLUPEA HARENGUS PALLASI, 1355 *BENZENE, *BIOMAGNIFICATION
- CRUDE OIL, BIOLOGICAL EFFECTS, SCURCES, TOXICITY, OCEANS, PETROLEUM PRODUCTS, 1379 PHYTOFLANKTON, *NEKTON
- R 174
- PISHERIES, ECOSYSTEMS, COASTS, BENTHOS, MARSHES
 CONTAMINANTS, CALIFORNIA, WASTEVATERS, HYDROCARBONS, MARINE ORGANISMS, *POLLUTANT R180 FLOW
- FOREIGN GOVERNMENTS, EUROPE, POLLUTION CONTROL, MONITORING, SURVEILLANCE, UK 1346
- INTERNATIONAL CONVENTIONS, RESCUECE MANAGEMENT, EUROPEAN ECONOMIC COMMUNITY, *LAW 1437 OF THE SEA, *JURISCICTION
- FOSSIL FUELS, BUZZARDS BAY, ARCMATIC HYDROCARBONS, SEDIMENTS, PAH, SOURCES, 1451
- MASSACHUSETTS, *COMECSTION CONTAMINANTS, CHEMICAL ANALYSIS, ANALYTICAL TECHNIQUES, SOLUBILITY, SCURCE R136 IDENTIFICATION, *GRGANIC CCEPCUNDS
- 1224
- FRANCE, EQUIPMENT, BEMOTE SENSING, OIL SPILLS, SURVEILLANCE
 " EQUIPMENT, DETECTION, POLIUTION CONTECL, GIL-WATER SEPARATION, SKIMMERS, SORBENTS, 1343 SINKING AGENTS, OIL DISCHARGES, PRODUCT INFORMATION
- 3 18 3 OIL SPILLS
- 1211 FRESHWATER, FISH, BASELINE STUDIES, EACTERIA, ANALYTICAL TECHNIQUES, MONITORING, BIOINDICATORS, HYDROCARECES, CCEANS
- 1246 ELOGENIC HYDROCAREONS, EACTERIA, SOURCE IDENTIFICATION, HYDROCARBONS, SEAWATER, PHYTOPLANKTON, *REVIEW
- 1271 BICDEGRADATION, BALLAST , BACTERIA, HYDROCARBONS , SPILL CLEANUP, PRODUCT INFORMATION, CIL DISCHARGES, SEAWATER
- 1272 BIODEGRADATION, SEAWATER, SPILL REMOVAL, PATENT, *P & N COMPOSITIONS
- 1377 DETECTION, EIOLOGICAL EFFECTS, BIODEGRADATION, HYDROCARBONS, SCURCES, OCEANS, INDUSTRIES, POLIUTION CONTROL, WASTEWATERS
- 1430 ENVIRONMENTAL PROTECTION, CONTINGENCY PLANNING, LEGISLATION, HEALTH HAZARDS, POLLUTION CONTROL, GCEANS, US
- R157 ECOSYSTEMS, CONTAMINANTS, ANALYTICAL TECHNIQUES, SEDIMENTS, SEAWATER, *IN SITU ANALYSIS
- 1233 FUEL OIL. FCOD WEB, CONTAMINATION, CHROMATOGRAPHY, CHEMICAL ANALYSIS,
- *DIBENZOTHIOPHENES, *SEAFCCD TAINTING 1244 CRUDE OIL, CHRCMATOGRAPHY, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, TAR, *HIGH SPEED GEL PERMEATION METHOD
- 1245 DETECTION, SOURCE IDENTIFICATION, PETBOLEUM PECDUCTS, SPECTROMETRY, MODELS, STATISTICAL ANALYSIS
- 1274
- PATE, BUZZARDS BAY, BOUCHARD 65 SPILL, EEHAVIOR, SPILL CLEANUP, ICE OIL-WATER SEPARATION, WASTEWATER TREATMENT, PATENT, *SORBENT FIBERS 1319
- CRUDE OIL, BIRDS, BICLOGICAL EFFECTS, TOXICITY, *HATCHABILITY, *INCUBATION STAGES BEHAVIOR, MABINE OBGANISMS, *HEAT, SUBLETHAL EFFECTS, *CHEMORECEPTION, MODELS 1350
- R165
- BIOLOGICAL EFFECTS, MOLLUSKS, *TUMOBS, *MYA ARENABIA, MAINE P 167
- 1454 FUELS , ENVIRONMENTAL EFFECTS, *REVIEW
- 1455 ENVIRONMENTAL EFFECTS, *REVIEW
- FUNGI, BICDEGRADATION, FACTERIA, HYDROCARBONS, MICROORGANISMS, YEASTS, CAIDATION, * 1413 REVIES
- GASOLINE, ENVIRONMENTAL EFFECTS, CHEMICAL ANALYSIS, *BARGE 250 SPILL, RHODE ISLAND, R182 SAMPLING
- 1225 GC/MS, CRUDE OIL, ANALYTICAL TECHNIQUES, OIL SPILLS, SOURCE IDENTIFICATION
- R 154
- CHEMICAL ANALYSIS, LAKES , *ATECSPHEBIC PETBOLEUM RESIDUES, PAH
 FATE, DISTRIBUTION, ELOGENIC HYDROCARBONS, PETROCHEMICALS, SEDIMENTATION, CCEANS R196
- R187 GEORGES BANK, FISHEBIES, EIS, ECCNODIC EFFECTS, BIOLOGICAL EFFECTS, OFFSHORE DEVELOPMENT

- R188 GEORGES BANK, ENVIRONMENTAL EFFECTS, EASELINE STUDIES, OFFSHORE EXPLORATION, OCS, *RISK ANALYSIS
- 1183
- GOVERNMENT AGENCIES, ENGLAND, CCASTS, CIL SPILLS, SPILL CLEANUP, *ELENI V
 "DISPERSANTS, CONTINGENCY PLANNING, COASTS, BOOMS, SPILL CLEANUP, SKIMMERS, 1268 TANKERS, IRELAND
- ENGLAND, CONTINGENCY PLANNING, POLLUTION PREVENTION, SPILL CLEANUP
- DRILLING, CONTINGENCY PLANNING, CANADA, ELGWOUT PREVENTION, INLAND, REGULATIONS, POLLUTION PREVENTION 1344
- 1433
- 1383
- 1385
- " ENVIRONMENTAL PROTECTION, OCS, OFFSHORE DEVELOPMENT, REGULATIONS, SAFETY, USGS GRCUNDWATER, CONTAMINATION, OIL SHALE, *LEACHING GUIDELINES, ENVIRONMENTAL EFFECTS, PRODUCTION, INDUSTRIES, *REVIEW, *WETLANDS BICDEGRALATION, EASELINE STUDIES, ANALYTICAL TECHNIQUES, ALASKA, MICROORGANISMS, 1406
- OCS, CFFSHORE DEVELOPMENT, NOAA
 CRUDE OIL WASHING, SAFETY, TABKEES, IMCC, FCLLUTION PREVENTION, SEGREGATED 1431 BALLAST, *INERT GAS SYSTEMS, SURVEILLANCE
- CONTINGENCY PLANNING, FCILITICN PREVENTION, REGULATIONS, SHIPS, SPILL CLEANUP, UK 1432 1408 GULF OF ALASKA, ECOSYSTEMS, BASELINE STUDIES, SHORELINES, SEDIMENTATION, OIL SPILLS. *VULNERABILITY INCEX
- GULF OF MEXICO, ENVIRONMENTAL EFFECTS, CHEMICAL ANALYSIS, BLOWOUTS, HYDROCARBONS, SEDIMENTS, TEXAS
- 1387
- R190 135n
- DEEPWATER PORTS, COMFENSATION, *LCCP, *SEATCCK, SPILL CLEANUP, POLLUTION PREVENTION BASELINE STUDIES, ATLANTIC COAST, OCS, HYDROCARBONS, SEDIMENTS, *GEOCHEMISTRY HABITATS, CONTABINATION, BIRDS, ACUTE EFFECTS, MORTALITY, SUBLETHAL EFFECTS, *WATERFOWL CHILE, BIOLOGICAL EFFECTS, INTESTIDAL ZCNE, MARINE ORGANISMS, OIL SPILLS, 1362 *NCFTHERN ERFEZE SPILL
- ENVIRONMENTAL EFFECTS, BENTHOS, BASELINE STUDIES, MARINE ORGANISMS, OIL TRANSPORT, 1437 CIL TRANSFER, PUGET SOUND
- 1199 HARBORS, DISPERSANTS, SPILL CLEANUF, TANKERS, *SOUTH AFRICA , *STAWANDA SPILL
- HEALTH HAZARES, FRESHWATER, ENVIRONMENTAL PROTECTION, CONTINGENCY FLANNING, 1433
- LEGISLATION, POILUTION CONTROL, CCEANS, US FISH, BIRDS, HYDROCARBONS, TOXICITY, *ALTERED MEMBRANE R171
- 1207 HYDROCARBONS, EQUIPMENT, DETECTION, MONITORING, FRODUCT INFORMATION, *FLUOROMETRY, *PETRO-TRACT SYSTEM
- FRESHWATER, FISH, BASELINE STUDIES, BACTERIA, ANALYTICAL TECHNIQUES, MONITORING, 1211 BICINCICATORS, OCEANS
- 1212
- 1213
- EQUIPMENT, MCHITORING, PRODUCT INFORMATION, *INPRARED SENSOB EQUIPMENT, DETECTION, MCNITCRING, LEAKIGE, FATENT CHEMICAL ANALYSIS, BASELINE STUDIES, SEDIMENTS, *INTERLABORATORY COMPARISON 1227
- CONTAMINATION, BIOGENIC HYDROCAHECNS, ATLABTIC COAST, OFFSHORE DRILLING, SEDIMENTS, SOUBCES, *NOVA SCOTIA 1228
- 1229
- CHEMICAL ANALYSIS, ARCHATIC HYDRICARBONS, SCLUEILITY, SURFACTANTS
 ANALYTICAL TECHNIQUES, SAMPLING, *EXXON, *NES, *INTERLABORATORY COMPARISON
 DETECTION, ANALYTICAL TECHNIQUES, SPECTROSCOPY, WASTEWATERS, PATENT
 CHROMATOGRAPHY, CHEMICAL ANALYSIS, SPECTROMETRY, *IR ANALYSIS 1231
- 1232
- 1235
- 1236
- CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, PATENT CHROMATOGRAPHY, BICGENIC HYDRICARBEINS, COLLUSKS, *CHITON ECHINODERUS, CHROMATCGRAPHY, EIGERNIC HYDROCARONS, *SEA URCHIN GONADS 1239
- 1243
- 1246 PRESHWATER, BIOGENIC HYDRICAREONS, EACTERIA, SOURCE IDENTIFICATION, SEAWATER, PHYTOPLASKTON, *REVIEW
- 1247
- EQUIPMENT, BOOMS, BEACHES, SPILL CONTAINMENT, FATENT EQUIPMENT, DESIGN-ENGINEERING, SFILL CLEANUP, SKIMMERS, PATENT 1263
- FRESHWATER, BIODEGRACATION, BALLAST, BACTERIA, SPILL CLEANUP, PRODUCT INFORMATION, OIL DISCHARGES, SEAWATER 1271
- 1305
- OIL-WATER SEPARATION, *PURIFICATION AGENT, PATENT ADSORPTION, OIL-WATER SEPARATION, SEAWATER, SECIMENTATION 1315
- BICASSAY, OIL-WATER SEPARATION, FILTRATION, WASTEWATERS, *BICASSAY EPPLUENT, 1317 *SCRBENT FIEERS
- 1347
- 1359
- 1363
- ESTUARIES, TOXICITY, OII SPILIS, *PHCTO-OXICATION
 PATE, CONTAMINATION, BIRDS, MORTALITY, TOXICITY, SURFACTANTS, SCURCES, *BEVIEW
 FATE, BIOLOGICAL EFFECTS, ATLANTIC CCFAN, PLANKTON, OFFSHORE DEVELOPMENT
 CRUSTACEANS, BIOLOGICAL EFFECTS, BICASSAY, ARCMATIC HYDBOCARBONS, TOXICITY,
 METABCLISM, *ESTUARINE SHRIMP
 PROPERTY OF PROPERTY O 1365
- PRESHWATER, DETECTION, BICLIGICAL EFFECTS, ELODEGRADATION, SOURCES, OCEANS, INDUSTRIES, POLLUTION CONTROL, WASTEWATERS 1377
- BIOLOGICAL EFFECTS, PAH, SEDIMENTS, MARINE CRGANISMS, TAR, SOURCES, TANKERS, 1378
- MEDITERRANEAN SEA
- GULF OF MEXICO, ENVIRONMENTAL EFFECTS, CHEMICAL ANALYSIS, BLOWOUTS, SEDIMENTS, 1381 TEXAS
- 1409 BIOLOGICAL EFFECTS, BASELINE STUDIES, BALLAST, ALASKA, TANKERS, *TRANS-ALASKA PIPELINE, *PCRT VAIDE2
- 1410 BICDEGRACATION, MICRCORGANISMS, SPILL CLEANUP
- 1412
- 1413
- 1416
- EVAPORATION, DISPERSION, BOCK REVIEW, BIODEGRADATION, OIL SPILLS, OIL SLICKS FUNGI, EIODEGRADATION, EACTERIA, MICROORGANISMS, YEASTS, OXIDATION, * REVIEW BIODEGRADATION, BACTERIA, CXIDATION, *DESULFOVIERIC DESULFURICANS, *WADDEN SEA CHROMATOGRAPHY, EIODEGRADATION, TAR, MATURAL SEEPAGE, *HYPERSALINE ENVIRONMENTS 1418

- 1421 HYDROCARBONS, FATE, EIOLOGICAL EFFECTS, BENTHOS, ATLANTIC COAST, UPTAKE, SEDIMENTATION, RHCDE ISLAND, ECLIUSES
- LAKES, SCUECES, BIVERS, SEDIMENTATION, WASHINGTON, *RUNOFF 1422 AROMATIC HYDROCARBONS, MONITORING, SEAW PTER, SEDIMENTS, MOLLUSKS, SAMPLING
- R 151 CHEMICAL ANALYSIS, PLANKTON, NEUSTON, SEDIMENTS, SAMPLING, PUGET SCUND, WASHINGTON BIODEGRADATION, SURFACTANTS, WASTEWATER TREATMENT, SPILL CLEANUP, *SOLUBILIZATION ABSOFTION, SPILL CLEANUP, *STARCH POLYMERS R153
- R 158
- R159
- ESTUARIES, DELAWARE BAY, BIOASSAY, PETROLEUM PRODUCTS, MOLLUSKS, TOXICITY, *OYSTER 2 168 INDUSTRY
- R 171
- R175
- HEALTH HAZARDS, FISH, BIRDS, TOXICITY, *ALTERPO MEMBRANE FISH, CONTAMINANTS, SUBLETHAL EFFECTS, METABOLISM, *BIOCHEMICAL EFFECTS CRUDE OIL, BIRDS, BICLOGICAL EFFECTS, TOXICITY, REPRODUCTION, SUBLETHAL EFFECTS, ₹177 UPTAKE, *EGGS
- FISH, CRUSTACEANS, BIOLOGICAL EFFECTS, WSP, SUELETHAL EFFECTS, MOLLUSKS, TOXICITY, R 178 *DEFENSE MECHANISMS
- FATE, ECOSYSTEMS, CHRONIC EFFECTS, EIOASS AY, ANALYTICAL TECHNIQUES, BIOINDICATORS, R 179 INTERTIDAL ZONE
- POOD WEB, CONTAMINANTS, CALIFCENIA, WASTEWATERS, MARINE ORGANISMS, *POLLUTANT PLOR GULP OF MEXICO, BASELINE STUDIES, ATLANTIC COAST, OCS, SEDIMENTS, *GECCHEMISTRY BIODEGRADATION, MICRCORGANISMS, *INTRACFLULIAB KINETICS
 BIODEGRADATION, MICRCORGANISMS, *PLASMID INTERACTION, *EVOLUTION FATE, CHRCMATOGRAPHY, EFRMUDA, SEDIMENTATION, SPECIFICMETRY R 180
- R190
- R 191
- R 192
- 3194
- R 195
- 1274
- " FATE, ALASKA, SOUBCES, SEDIMENTATION, CCS, *NORTON SOUND
 ICE, FUEL OIL, FATE, EUZZARDS BAY, BOUCHARD 65 SPILL, BEHAVIOR, SPILL CLEANUP
 " FATE, ESTUARIES, DISPERSANTS, BEHAVIOR, ARCTIC, INCINEBATION, SPILL CLEANUP,
 *EXPERIMENTAL CIL SPILLS 1427
- R 200
- " DRIFT, BEAUFORT SEA, OII SPILIS, MOVEMENT, MODELS ILLINOIS, EPA, SPILL CLEANUP, PIPELINES, OIL SPILLS, RIVERS 1182
- IMCO, DISPERSANTS, BOOMS, PERSONNEL TEAINING, MANUALS, SKIMMERS, SINKING AGENTS, 1332 SOFBENTS, SPILL CLEANUP
- 1431 GUIDELINES, CRUDE CIL WASHING, SAPETY, TANKERS, PCLLUTION PREVENTION, SEGREGATED BALLAST, *INERT GAS SYSTEMS, SURVEILLANCE
- INTERNATIONAL CONVENTIONS, POLIUTION PREVENTION, SHIPS, OIL DISCHARGES, *AMENDMENTS REGULATIONS, INTERNATIONAL CONVENTIONS, *MARINE POLLUTION CONVENTION 1434
- 1435
- 1438 INTERNATIONAL CONVENTIONS, POLLUTION CONTROL, SHIPS, UN
- INCINERATION, PIPELINES, OIL SPILLS, INLAND, SPILL CONTAINMENT, *UTAH 1196
- 1197 SPILL CLEANUP, PIPELINES, INLAND, *UTAH
- OIL SLICKS, SPILL CLEANUP, *CCMBUSTION, PATENT 1275
- SLUDGE, SHIPS, PRODUCT INFORMATION, POLLUTION PREVENTION, *EDCC/CITEX SYSTEM 1231
- ICE, FATE, ESTUARIES, DISPESSANTS, EEHAVIOR, ARCTIC, SPILL CLEANUP, *EXPERIMENTAL 1427 OIL SPILLS
- 1230 INDUSTRIES, ANALYTICAL TECHNIQUES, POLLUTION PREVENTION, WATER QUALITY
- 1294
- EMULSIONS, DISPOSAL, WASTE CIL, *LANGPILLS, *LEACHING, *PILOT STUDY
 HYDROCASEONS, FRESHWATER, DETECTION, BIOLOGICAL EFFECTS, BIODEGRADATION, SOURCES,
 OCEANS, POLIUTION CONTROL, WASTEWATERS
 GUIDELINES, ENVIRONMENTAL EFFECTS, FRODUCTION, *REVIEW, *WETLANDS
 SAFETY, *RISK ANALYSIS, OFFSHORE DEVELOPMENT, STATISTICS 1377
- 1395
- 1423
- ECONOMICS, BIBLIOGRAPHIES, WASTEWATER TERATMENT, REFINERIES, PETROCHEMICALS, POLLUTION CONTROL
- 1443 BIBLIOGRAPHIES, ALASKA, CFFSHCRE DEVELOPMENT, OCS, CNSHORE IMPACTS, SOCIOECONOMIC EFFECTS, LEGISLATION
- R 162 WASTEWATER TREATMENT, REPINING, *LAND APPLICATION
- INFORMATION SYSTEMS, TANKERS, SAPETY, STATISTICAL ANALYSIS, POLIUTION PREVENTION, *RISK ANALYSIS, *MARINE MANAGEMENT SYSTEMS, INC.

 CONTAMINANTS, MONITORING, SOURCE IDENTIFICATION, *NATIONAL WATER DATA EXCHANGE 1198
- 1218 *NATIONAL WATER DATA EXCHANGE
- EUROPE, CCMPENS ATION, POLLUTION CONTROL, INTERNATIONAL CONVENTIONS, *EUROPEAN ECONOMIC COMBUNITY 1436
- 1196
- 1197
- INLAND, INCINERATION, PIPELINES, OIL SPILLS, SPILL CONTAINMENT, *UTAH
 "INCINERATION, SPIIL CLEANUP, FIFELINES, *UTAH
 "CONTINGENCY PLANNING, ALASKA, US, REGULATIONS, POLLUTION PREVENTION, POLLUTION 1336 CONTROL, OIL WELLS
- 1344 GOVERNMENT AGENCIES, DRILLING, CONTINGENCY PLANNING, CANADA, BLOHOUT PREVENTION, REGULATIONS, POLLUTION FREVENTION
- 1337
- INSURANCE, CCEPENS ATION, LIABILITY, SAFETY, OFFSHORE DEVELOPMENT
 " ECONOMIC EFFECTS, DEVELOPMENT, CIL INDUSTRY, TANKERS, OIL SPILLS, *CLAIMS
 INTERNATIONAL AGREEMENTS, POLLUTION PREVENTION, INTERNATIONAL CONVENTIONS,
- REGULATIONS, TANKERS, SAFETY
 INTERNATIONAL CONVENTIONS, INTERNATIONAL AGREEMENTS, POLLUTION PREVENTION,
 REGULATIONS, TANKERS, SAFETY
 " 1400 DOLUMENT ON COMPUTATION CHIEF CIT FISCHARGES, **AMENOMENTS 134)
- 1434 IMCO, POLLUTION PREVENTION, SHIPS, CIL DISCHARGES, *AMENDMENTS IMCO, REGULATIONS, *MARINE POLLUTION CONVENIEN
- 1435
- 1436 INFORMATION SYSTEMS, EUROPE, COMFENSATION, POLIUTION CONTROL, *EUROPEAN ECONOMIC CCMMUNITY
- 1437 FOREIGN GOVERNMENTS, RESOURCE MANAGEMENT, EUROPEAN ECONOMIC COMMUNITY, *LAW OF THE SEA, *JURISDICTION

- 1438 INTERNATIONAL CONVENTIONS, IMCO, POLIUTION CONTROL, SHIPS, UN
- INTERTIDAL ZONE, FLORIDA, ENVIRONMENTAL EFFECTS, BAYS, SPILL CLEANUP, PORTS, USCG. 1191 *PORT SUTION SPILE
- 1362 HABITATS, CHILE, BIOLOGICAL EFFECTS, MARINE ORGANISMS, OIL SPILLS, *NORTHERN BREEZE SPILL
- FATE, CHRONIC EFFECTS, BOOK REVIEW, RECOVERY, RESTORATION, MARINE ORGANISMS, 1371 *PROCEEDINGS
- HYDROCAREONS, FATE, ECOSYSTEMS, CHRONIC EFFECTS, BIOASSAY, ANALYTICAL TECHNIQUES, 2179 BIOINDICATORS
- INVERTERS ATES, CHILE, PIOLOGICAL EFFECTS, BEACHES, SHORELINES, OIL SPILLS, *NOETHERM 1353 BREEZE SPILL
- 1369
- " FISH, ECCNOMIC EFFECTS, CHILE, ALGAR, OIL SPILLS, *NORTHERN BREEZE SPILL IRELAND, ENVIRONMENTAL EFFECTS, CCNTAMINATION, SPILL CLEANUP, OIL DISCHARGES, LEAKAGE, 1184 SHIPS
- EQUIPMENT, DESIGN-ENGINEERING, DEEPWATER PORTS, SKIMMERS, PRODUCT INFORMATION, 1252 *BAY SKIEMER
- EQUIPMENT, DESIGN-ENGINEZEING, SKIMMERS, PRODUCT INFORMATION, SPILL CLEANUP, 1253 * BANTRY EAY
- GOVERNMENT AGENCIES, DISPERSANTS, CONTINGENCY FLANNING, COASTS, BOOMS, SPILL 1268 CLEANUP, SKIMMERS, TANKERS
- 1195
- ISRAEL, OIL SPILLS, PCILOTICN CCHTBCL

 JAPAN, TANKERS, OIL SPILLS, LEAKAGE, SPILL CONTAINMENT, OIL TRANSPER, *RYUYO MARU SPILL

 " SAMPLING, MONITORING, FLAKKTON, *HYDBCLCGY, *SETO INLAND SEA 1135
- 1453
- LAKES , DCE, BLOWOUTS, SPILL CONTAINMENT, SPILL CLEANUP, OIL WELLS, LOUISIANA, USCG, 1203 *STRATEGIC PETROLEUM SESENVE
- 1204 DOE, BLOGOUTS, SPIIL CLEANUP, CII WELLS, LOUISIANA, USCG. *STRATEGIC PETROLEUM RESERVE
- 1243 SOURCE IDENTIFICATION, PAH, SEDIMENTS, GERMANY, *LAKE CONSTANCE
- HYDROCAREONS, SOURCES, RIVERS, SEDIMENTATION, WASHINGTON, *RUNOFF GC/MS, CHEMICAL ANALYSIS, *ATECSPHEBIC PETROLEUM RESIDUES, PAH 1422
- 8154
- 1193 LAW EMPORCEMENT, FLORIDA, SOURCE IDENTIFICATION, USCG, LIABILITY, *FORT SUTTON SPILL, *CLEANUP COSTS
- 1194 FLORIDA, SOURCE IDENTIFICATION, USCG, SAMPLING, LIABILITY, TANKERS, *PORT SUTTON SPILL
- LEAKAGE, IRELAND, ENVIRONMENTAL EFFECTS, CONTAMINATION, SPILL CLEANOP, OIL DISCHARGES, 1184 SHIPS
- 1145 JAPAN, TANKERS, OIL SPILLS, SPILL CONTAINMENT, OIL THANSFER, *RYUYO MARU SPILL
- 1186 PIPELINES, SPILL CONTAINMENT, LOUISIANA
- 1189
- DETECTION, SPILL CLEANUF, USCG, NEW YORK HYDROCABECNS, EQUIPMENT, DETECTION, MONITORING, PATENT 1213
- DETECTION, MONITORING, EIPELINES, CIL TEANSPEB, PATENT DETECTION, PIPELINES, PATENT 1214
- 1278
- 1339 STORAGE, POLLUTION PREVENTION, PATENT
- 1345
- " EQUIPMENT, DETECTION, CESIGN-ENGINEERING, PIPELINES, PATENT LEGISLATION, ENVIRONMENTAL MANAGEMENT, FOILUTION CONTROL, MONITORING, MEDITERRANEAN 1341
- SEA, UN, *UNEP EXPLORATION , ECONOMIC EPPECTS, DISFOSAL , PRODUCTION , REGULATIONS, CIL SPILLS, 1388
- ENVIRONMENTAL EFFECTS, CONTAMINATION, OCEANS, MONITORING, NCAA, US, *RESEARCH 1429
- HEALTH HAZARDS, FRESHWATER, ENVIRONMENTAL PROTECTION, CONTINGENCY PLANNING, 1430 POLLUTION CONTROL, OCEANS, US
- 1439
- BIBLIOGRAPHIES, OCZANS, OFFSHORE DRILLING, POLIUTION CONTROL EQUIPMENT, ENVIRONMENTAL EFFECTS, BIBLIOGRAPHIES, OFFSHORE DRILLING, CIL WELLS 1441
- INDUSTRIES, BIBLICGEAPHIZS, ALASKA, CFFSHORE DEVELOPMENT, OCS, ONSHORE IMPACTS, 1443 SOCICECCHOMIC EFFECTS
- 1447
- 1188
- " ECONOMICS, BIBLIOGRAPHIZS, CCEANS, UN, *LAW OF THE SEA CONFERENCE LIABILITY, AMOCG CADIZ SPILL, *INQUEST " LAW EMPORCEMENT, FLORIDA, SCURCE IDENTIFICATION, USCG, *PORT SUTTON SPILL, 1193 *CLEANUP COSTS
- 1194 LAW ENFORCEMENT, FLOBIDA, SOURCE IDENTIFICATION, USCG, SAMPLING, TANKERS, *PORT SULTON SPILL
- 1337 INSURANCE, COMPENSATION, SAFETY, OFFSHORE DEVELOPMENT
- 1186 LOUISTANA, LEAKAGE, PIEELINES, SPILL CONTAINMENT 1200 " OIL SPILLS, TANKERS, USCG, SPILL CLEANUP, MISSISSIPPI RIVER, *IRENE S. LEMCS SPILL
- LAKES , DOE, BLCGCUTS, SPIIL CCNTAINMENT, SPILL CLEANUP, OIL WELLS, USCG, 1203
- *STRATEGIC PETROLEUM BESERVE
- LAKES , DOE, BICHOUTS, SPILL CLEANUF, CIL WELLS, USCG, *STRATEGIC PETROLEUM RESERVE 1204
- FEA. CRUCE CIL, STORAGE, OIL TRANSPER, PIPELINES, *STRATEGIC PETROLEUM RESERVE ENVIRONMENTAL EFFECTS, EIS, CRUDE CIL, STORAGE, *STRATEGIC PETROLEUM RESERVE ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STORAGE, *STRATEGIC PETROLEUM RESERVE ENVIRONMENTAL EFFECTS, EIS, CRUDE CIL, STORAGE, *STRATEGIC PETROLEUM RESERVE 1279
- 1395
- 1396
- 1397 FISH, ECCSYSTEMS, COASTS, ATLANTIC COAST, *PACIFIC NORTHWEST, MAINE, WILDLIFE, R135 OFFSHORE DEVELOPMENT
- LUBRICATING OIL, WASTE OIL, AECLAMATION, PAIENT, *REGENERATION, *VACUUM STRIPPING DISTILLATION, RECLAMATION, WASTE CII, SCLVENTS, PATENT, *VACUUM STRIPPING 1335
- 1331

```
2167
```

- MAINE, FUEL CIL, BIOLCGICAL EFFECIS, MOLLUSKS, *TUMORS, *MYA ARENABIA
 " LOUISIANA, FISH, ECOSYSTEMS, COASTS, ATLANTIC COAST, *PACIFIC NORTHWEST, WILDLIFE, 2185 OFFSHORE DEVELOPMENT
- MANUALS, IMCC, DISPERSANTS, ECOMS, PERSONNEL TRAINING, SKIMMERS, SINKING AGENTS, 1332 SORBENTS, SPILL CLEANUP
- MARINE ORGANISMS, DETECTION, BIBLIOGRAPHIES, MONITORING, BIOINDICATORS, MICROOBGANISMS "INTERTIDAL ZONE, HABITATS, CHILE, BICICGICAL EFFECTS, OIL SPILLS, *NORTHERN BREEZE 1213 1362 SPILL
- INTESTIDAL ZONE, FATE, CHRONIC EFFECTS, BOOK REVIEW, RECOVERY, RESTORATION, 1371 *PROCEEDINGS
- EICLOGICAL EFFECTS, PAH, SEDIMENTS, TAR, SCURCES, TANKERS, 1378 HYDROCARECNS MEDITERRANEAN SEA
- HABITATS, ENVIRONMENTAL EFFECTS, BENTHOS, BASELINE STUDIES, CIL TRANSPORT, CIL TRANSPER, PUGET SCUND 1407
- BIOASSAY, WASTEWATER TREATMENT, REFINERIES R161
- R 165
- 8166
- R 169
- R173
- " FUEL OIL, BEHAVIOR, *REATMENT, REFINERIES
 " FUEL OIL, BEHAVIOR, *REAT, SUELETHAL PFFECTS, *CHEMORECEPTION, MODELS
 " CRUDE OIL, WSF, PETRCLEUM PRODUCTS, TOXICITY
 " FISH, BIOLOGICAL EFFECTS, BEHAVIOR, *CHEMORECEFTION, PACIFIC OCEAN
 " CRUDE OIL, CHEMICAL ANALYSIS, BIOASSAY, ALASKA, WSF, TGXICITY
 " HYDROCARBONS, FOCD WEB, CONTAMINANTS, CALIFORNIA, WASTEWATERS, *POLLUTANT PLOW MARSHES, FOCT WEE, FISHERIES, ECOSYSTEMS, COASTS, BENTHOS R 180
- 3174
- MASSACHUSETTS, POSSIL FUELS, BUZZARDS BAY, AROMATIC HYDROCARBONS, SEDIMENTS, PAH, SOURCES, *COMBUSTICN 1451
- MEDITERRANEAN SEA, CONTAMINANTS, ANALYTICAL TECHNIQUES, SEAWATER, SURFACTANTS, SOURCE INDENTIFICATION, *ELECTRCANALYSIS 1241
- ENVIRONMENTAL PROTECTION, ECONOMICS, POLLUTION CONTROL, *TREATY, *STANDARDS 1338
- LEGISLATION, ENVIRONMENTAL MANAGEMENT, POLLUTION CONTROL, MCNITCRING, UN, *UNEPENVIRONMENTAL DETERICRATION, CONTAMINATION, SECRELINES, SOURCES, TAR, POLLUTION 1373
- CONTROL
- 1378 MARINE ORGANISMS, HYDRCCARBONS, BICLCGICAL EFFECTS, PAH, SEDIMENTS, TAR, SOURCES, TANKERS
- METABOLISM, FISH, EMULSIONS, DISPEBSANTS, CRUDE OII, SUELETHAL EFFECTS, TOXICITY, 1351 WEATHERING
- 1365 HYDROCARECNS . CRUSTACEANS. BIOLOGICAL EFFECTS. BIOASSAY. AROMATIC HYDROCARBONS. TOXICITY, *ESTUARINE SHEIME
- HYDROCABEONS , FISH, CONTAMINANTS, SUBLETHAL EFFECTS, *BIOCHEMICAL EFFECTS R175
- 1420 METULA SPILL, PATE, ECCSYSTEMS, DISTRIBUTION, CONTAMINATION, BEHAVIOR, MOVEMENT, *COASTAL ENVIRONMENTS
- COORGANISMS, MARINE OBGANISMS, DETECTION, BIBLIOGRAPHIES, MCNITORING, HIGINDICATORS BIODEGRADATION, ANALYTICAL TECHNIQUES, SAMELING, *ENUMERATION, *MOST PROBABLE 1210 MICROORGANISMS, 1222
- NUMBER METHCE 1270
- DISPERSANTS, BIODEGRADATION, SFIIL CLEANUE, FATENT GUIDELINES, BIODEGRADATION, BASELINE STUDIES, ANALYTICAL TECHNIQUES, ALASKA, OCS, OFFSHORE DEVELOPMENT, NCAA 1406
- 1413
- HYDROCAREONS, EICDEGRADATION, SPILL CLEANUP
 EMULSIPICATION, BIODEGRADATION, BEHAVICE, O'LL SPILLS, O'LL DISCHARGES, SOURCES,
 SPILL CLEANUP, *REVIEW
 HYDROCARBONS, FUNGI, BICDEGRADATION, BACTEBIA, YEASTS, O'LLOTION, * BEVIEW 1411
- 1413
- 1414
- BICDEGRACATION, SPILL CLEANUP, *FESTILIZER, *NITRGEN, *FEOSPHOBUS
 CHRONIC EFFECTS, EIODEGRADATION, ACUTE EFFECTS, OCS, OIL SPILLS, SAMPLING
 DISTRIBUTION, BIODEGRADATION, FACTEBIA, USSR, *VARNA BAY
 HYDROCAREONS, FIODEGRADATION, *INTRACELLULAR KINETICS 1415
- 1417
- 3191
- R 192
- " HYDROCARBONS, BICDEGRADATION, *FLASMID INTERACTION, *EVOLUTION
 MISSISSIPPI FIVER, LOUISIANA, GIL SPILLS, TANKERS, USCG, SPILL CLEABUP, *IRENE S. 12.00 LEMOS SPILL
- 1245 MCDELS, FUEL OIL, DETECTION, SOURCE IDENTIFICATION, PETROLEUM PRODUCTS, SPECTROMETRY, STATISTICAL ANALYSIS
- EUROPE, COST ANALYSIS, EIOLOGICAL TREATMENT, WASTEWATERS, PETRICHEMICALS BOOMS, *DISPERSIVE OIL IGSSES, OIL SLICKS, *THEORETICAL RESEARCE 1295
- 1424
- 1425 BEHAVICE, OIL SPILLS FATE.
- 1426 ESTUARIES, DISPERSION, CONTAMINANTS
- FATE, DISTRIBUTION, EEHAVIOR, OIL SLICKS, SPREADING, *PREDICTION COALESCENCE, OIL-WATER SEFABATION, *EVALUATIONS 1428
- R 163
- MARINE CEGANISMS, FUEL OIL, BEHAVIOR, *HEAT, SUBLETHAL EPFECTS, *CHEMCRECEPTION EMULSIONS, BEHAVIOR, STATISTICAL ANALYSIS, *OIL-SURFACTANT-WATER SYSTEMS R165
- R 198
- R 199
- 3200
- 1239
- " DISTRIBUTION, ALASKA, *SEILL TRAJECTORY, CCS
 " ICE, DRIFT, EEAUFGET SEA, OIL SPILLS, MCVEMENT
 MOLLUSKS, HYDROCARBONS, CHROMATOGRAFHY, ELOGENIC HYDROCARBONS, *CHITON
 " HYDROCARBONS, FATE, BIOLOGICAL EFFECTS, BENTHOS, ATLANTIC COAST, UPTAKE,
 SEDIMENTATION, RHODE ISLAND
 " HYDROCARBONS AROMATIC HYDROCARBONS, MONITORING SEASATER, SEDIMENTS, SA 1+21
- 2151 HYDROCAREONS , AROMATIC HYDROCAREONS, MCNITORING, SZAWATER, SEDIMENTS, SAMPLING
- MAINE, FUEL CIL, BIGICGICAL EFFECTS, *TUMORS, *MYA ABENARIA **R 167**
- R168 HYDROCARECNS, ESTUARIES, DELAWARE BAY, BIOASSAY, PETROLEUM PRODUCTS, TOXICITY, *OYSTER INDUSTRY

- HYDROCARECNS HYDROCARECNS, FISH, CRUSTACEANS, BIOLOGICAL EFFECTS, WSF, SUBJETHAL EFFECTS, TO XICITY, *DEFENSE MECHANISMS R178
- MCLLUSKS, ECOSYSTEMS, CHECNIC EFFECTS, BIOLOGICAL EFFECTS, BASELINE STUDIES, REFINERIES, OIL TRANSPER, CIL TERMINALS, *FACIFIC NORTHWEST R186
- MCNITORING, EQUIPMENT, DETECTION, BALLAST, ANALYTICAL TECHNIQUES, TANKERS, OIL 1205 DISCHARGES, PATENT
 EQUIPMENT, DETECTION, WASTEWATERS, OIL DISCHARGES, PRODUCT INFORMATION
 **FINOROMETRY
- 1206
- HYDROCARBONS, EQUIPMENT, DETECTION, PRODUCT INFORMATION, *FLUOROMETRY, *PETRC-TFACT SYSTEM 1207
- EQUIPMENT, DISPERSION, FRODUCT INFORMATION, *OIL-IN-WATER
- 1209
- 1210
- EQUIPMENT, CHROMATCGEAPHY, ARCMATIC HYDROCARBONS, PRODUCT INFORMATION, *BENZENE MICROORGANISMS, MAGINE CRGANISMS, DETECTION, BIBLIOGRAPHIES, BIOINDICATORS HYDROCARECNS, FRESHWATER, FISH, BASELINE STUDIES, BACTERIA, ANALYTICAL 1211 TECHNIQUES, BIOINDICATORS, CCEANS
 HYDROCAREONS, EQUIPMENT, PRODUCT INFORMATION, *INFRARED SENSOR
- 1212
- LEAKAGE, HYDROCARBONS, EQUIPMENT, DETECTION, PATENT LEAKAGE, DETECTION, PIPELINES, OIL TRANSPER, PATENT 1213 1214
- 1215
- DETECTION, CONTAMINANTS, CCEANS, SCHEETS EQUIPMENT, *AUTOMATICN, SAMPLING, *DATA PROCESSING 1216
- 1217 EQUIPMENT, ANALYTICAL TECHNIQUES, WASTEWATERS, REFINERIES, PRODUCT INFORMATION. *PHOTCMETRIC ANALYZER
- INFORMATION SYSTEMS, CONTAMINANTS, SOURCE IDENTIFICATION, *NATIONAL WATER DATA 1218 EXCHANGE
- 1219
- EPA, ANALYTICAL TECHNIQUES, REMOTE SENSING, SOURCE IDENTIFICATION, OIL SLICKS, POLLUTION CONTROL, *LASER FLUORESCENCE CONTINGENCY PLANNING POLLUTION CONTROL **CONTROL 1221
- 1335
- CONTINGENCY PLANNING, POLLUTION CONTROL, *PERSIAN GULF, *ACTION PLAN MEDITERRANDAN SEA, LEGISLATION, ENVIRONMENTAL MANAGEMENT, POLLUTION CONTROL, UN. 1341 *IINE P
- 1346
- FOREIGN GOVERNMENTS, EUROPE, FOLIUTION CONTEOL, SURVEILLANCE, UK ENVIRONMENTAL PROTECTION, BIOLOGICAL EFFECIS, POLLUTION PREVENTION, SHIPS, UN, 1372 *CONFERENCE, *GESAME
- ENVIRONMENT AL MANAGEMENT, DRILLING , BIOLOGICAL EFFECTS, OFFSHORE DEVELOPMENT, 1184 OCEANS, SOURCES, REGULATIONS
- 1429 LEGISLATION, ENVIRONMENTAL EFFECTS, CONTAMINATION, OCEANS, NOAA, US, *RESEARCH
- DETECTION, CHEMICAL ANALYSIS, BIELICGRAFHIES, ANALYTICAL TECHNIQUES, SAMPLING, OIL 1444 SPILLS, *INDUSTRIAL WASTES
- 1452 REMOTE SENSING, POILUTION PREVENTION
- 1453 JAPAN, SAMPLING, PLANKTON, *HYDROLOGY, *SETO INLAND SEA
- MOLLUSKS, HYDROCARBONS, ANCMATIC HYDBOCARECNS, SEAWATER, SEDIMENTS, SAMPLING R 151
- 1356 1359
- 1364
- 1190
- MCGTALITY, HAEITATS, CONTAMINATION, BIRDS, ACUTE EFFECTS, SUBLETHAL EFFECTS, *WATERFOWL

 "HYDRGCAREONS, FATE, CONTAMINATION, BIRDS, TOXICITY, SURFACTANTS, SQURGES, *REVIEW

 BIRDS, *CILED BIRDS, *SUCCESSFUI BEABLING, *CAPTIVITY

 MCVEMENT, BEACHES, CIL SLICKS, SCURCES, *TRINIDAD

 "METULA SPILL, FATE, ECOSYSTEMS, DISTRIBUTION, CONTAMINATION, BEHAVIOR, *CCASTAL 1420 ENVIRONMENTS
- R 2 3 3
- " MODELS, ICE, DRIFT, BEAUFORT SEA, CIL SEILLS
 NATURAL SEEPAGE, HYDROCABEONS, CHROMATOGRAPHY, BIODEGRADATION, TAR, *HYPERSALINE 1414 ENVIRONMENTS
- CALIFORNIA, BASTLINE STUDIES, *GEOLOGIC HAZARDS, CCS, SANTA BARBARA DEVELOPMENT , 3184 CHANNEL, SEDIMENTS
- NEUSTON, HYDBOCARBONS, CHEMICAL ANALYSIS, PLANKTON, SEDIMENTS, SAMPLING, PUGET SOUND, R153 WASHINGION
- 1187
- 1189
- NEW YORK, SPILL CLEANUP, SHIPS, RIVERS, USCG, *HYGBADE NO. 2 BARGE SPILL "LEAKAGE, DETECTION, SFILL CLEANUF, USCG "DEVELOPMENT, DEEPWATER PORTS, PORTS, GIL DISCHARGES, SAFETY 1450
- NOAA, MICROORGANISMS, GUIDELINES, BICDEGRADATION, EASELINE STUDIES, ANALYTICAL TECHNIQUES, ALASKA, CCS, OFFSHORE DEVELOPMENT
 "MONITORING, LEGISIATION, ENVIRONMENTAL EPPECTS, CONTAMINATION, OCEANS, US, 1406
- * RESEARCH
- NORTH SEA, ECONOMIC EFFECTS, OFFSHORE DEVELOPMENT, *RISK ANALYSIS, PLATFORMS, SAFETY, 1383 CIL INDUSTRY
- CCEANS, MONITORING, HYDROCARBONS, PRESHWATER, FISH, BASELINE STUDIES, BACTERIA, 1211 ANALYTICAL TECHNIQUES, EIGINDICATORS
- 1215 MONITORING, DETECTION, CONTAMINANTS, SOFBENTS
- 1376 ENVIRONMENTAL EFFECTS, OIL SPILLS, *BOOK
- 1377
- INDUSTRIES, HYDROCARBONS, FRESHWATER, LETECTION, BIOLOGICAL EFFECTS, BIODEGRADATION, SOURCES, POLLUTION CONTROL, WASTEWATERS FOOD WEB, CRUDE OIL, BIOLOGICAL EFFECTS, SOURCES, TOXICITY, PETROLEUM PRODUCTS, 1379 PHYTOPLANKTON, *NEKICA MCNITCRING, ENVIRCHMENT AL MANAGEMENT, DRILLING, BIOLOGICAL EFFECTS, OFFSHORE
- 1384 DEVELOPMENT, SOURCES, REGULATIONS
 NOAA, MCNITORING, LEGISLATION, ENVIRONMENTAL EFFECTS, CONTAMINATION, US, *RESEARCH LEGISLATION, HEALTH HAZARDS, FRESHWATER, ENVIRONMENTAL PROTECTION, CONTINGENCY PLANNING, PCILUTION CONTROL, US
- 1429
- 1430

- 1439
- 1447
- R196
- OCEANS, LEGISLATION, BIBLICGRAPHIES, CFFSHCFE TBILLING, POLIUTION CONTROL

 " LEGISLATION, ECONOMICS, BIPLICGRAPHIES, UN, *LAW OF THE SEA CONFERENCE

 " GC/MS, FATE, DISTRIBUTION, BIGGENIC HYDROCARBONS, PETROCHEMICALS, SEDIMENTATION

 OCS, ENVIRONMENTAL EFFECTS, EIS, ATLANTIC CCAST, OIL-GAS LEASING, SOCIOECONOMIC EPPECTS

 " ENVIRONMENTAL EFFECTS, EIS, ATLANTIC COAST, OFFSHORE DEVELOPMENT, OIL-GAS LEASING, 1389 1390
- 1391
- EIS, BLM, ALASKA, OIL-GAS LEASING, OFFSHORE DEVELOPMENT, *LOWER COOK INLET EIS, BLM, ALASKA, CII-GAS LEASING, CFFSHORE CEVELOPMENT, *LOWER COOK INLET EIS, ELM, ALASKA, OII-GAS LEASING, OFFSHORE DEVELOPMENT, *LCHER COOK INLET 1392
- 1393
- NOAA, MICROOBGANISMS, GUIDELINES, EIODEGRACATION, BASELINE STUDIES, ANALYTICAL TECHNIQUES, ALASKA, OFFSHORE DEVELOPMENT 1406
- MICROORGANISMS, CHRONIC EFFECTS, ELCDEGFADATION, ACUTE EFFECTS, OIL SPILLS, 1415 SAPPLING
- GOVERNMENT AGENCIES, ENVIRGNMENTAL PROTECTION, OFFSHORE DEVELOPMENT, REGULATIONS, 1433 SAFETY, USGS
- LEGISLATION, INDUSTRIES, BIBLICGEAPHIES, ALASKA, OFFSHORE DEVELOPMENT, ONSHORE 1443 IMPACTS, SOCIOECONCHIC EFFECTS
- GEORGES BANK, ENVIRONMENTAL EFFECTS, BASELINE STUDIES, OFFSHOBE EFPLORATION, *RISK R 188 ANALYSIS
- R 189 NATURAL SEEPAGE, DEVELOPMENT, CALIFORNIA, EASELINE STUDIES, *GEOLOGIC HAZARDS,
- SANTA BABEARA CHANNEL, SEDIMENTS
 HYDROCARBONS, GULF OF MEXICO, BASELINE STUDIES, ATLANTIC COAST, SEDIMENTS, 2 190 GECCHEMISTRY
- R 195 HYDROCARBONS, FATE, ALASKA, SCURCES, SEDIMENTATION, THORTON SOUND
- BENTHOS, PASELINE STUDIES, ALASKA, SEDIMENTATION, SOURCE IDENTIFICATION, *ORGANIC 2197 DETRITUS, *PETROLEUB SCILUTANTS
- R199

ONSHORE IMPACTS

- " MODELS, DISTRIBUTION, ALASKA, *SPILL TRAJECTORY
 OFFSHORE DEVELOPMENT, LIABILITY, INSURANCE, COMPENSATION, SAFETY 1337
- 1363
- HYDROCARBONS , FATE, BICLCGICAL EFFECTS, ATLANTIC OCEAN, PLANKTON ENVIRONMENTAL EFFECTS, BIOLOGICAL EFFECTS, OIL SPILLS, OFFSHORE EXPLORATION, 1374 WASTE WATERS, UN, *GESAME NORTH SEA, ECONOMIC EFFECTS, *RISK ANALYSIS, PLATFORMS, SAFETY, OIL INDUSTRY
- 1383 OCEANS, MONITORING, ENVIBONMENTAL MANAGEMENT, DRILLING, BIOLOGICAL EFFECTS, 1384 SOURCES, REGULATIONS
- 1386
- DESIGN-ENGINEERING, PLATFORMS, SAPETY, POLIDITION CONTROL, REGULATIONS
 OCS, ENVIRONMENTAL EFFECTS, EIS, ATLANTIC COAST, CIL-GAS LEASING, ONSHORE IMPACTS
 OCS, EIS, BLE, ALASKA, OIL-GAS LEASING, *LOWER COCK INLET
 OCS, EIS, BLM, ALASKA, CIL-GAS LEASING, *LOWER COCK INLET
 OCS, ZIS, BLM, ALASKA, OIL-GAS LEASING, *LOWER COCK INLET 1390
- 1391
- 1392
- 1393
- OCS, NORA, MICROORGANISMS, GUIDELINES, ELODEGRADATION, BASELINE STUDIES, 1406 ANALYTICAL TECHNIQUES, ALASKA
- 1423 INDUSTRIES, SAFETY, *RISK ANALYSIS, STATISTICS
- 1433 OCS, GOVERNMENT AGENCIES, ENVIRONMENTAL PROTECTION, REGULATIONS, SAFETY, USGS
- 1442 11 ENVIRONMENTAL EFFECTS, DESIGN-ENGINEERING, BRELIOGRAPHIES
- OCS, LEGISLATION, INDUSTRIES, BIELICGRAPHIES, ALASKA, ONSHORE IMPACTS, 1443 SCCICECCECHIC EFFECTS
- R 135 MAINE, LOUISIANA, PISH, ECCSYSTEMS, COASTS, MILANTIC COAST, SPACIFIC HORTHWEST. WILDLIPE
- R 187 GEORGES BANK, FISHERIES, EIS, ECCNOBIC EFFECTS, BIOLOGICAL EFFECTS
- 1223 CFFSHORE DRILLING, HYDROCAREONS, CONTAMINATION, BIOGENIC HYDROCARBONS, ATLANTIC COAST, SEDIMENTS, SCURCES, *NOVA SCOTIA
- 1439
- 1441
- " OCEANS, LEGISLATION, STELLOGRAPHIES, POLLUTION CONTROL
 " LEGISLATION, EQUIPMENT, ENVIRONMENTAL EFFECTS, BIELLOGRAPHIES, OIL WELLS
 CFFSHORE EXFLORATION, OFFSBORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, BICLOGICAL EFFECTS, 1374 CIL SPILLS, WASTEWATERS, UN, *GESABE
- 881E OCS, GEORGES BANK, ENVIRONMENTAL EFFECTS, BASELINE STUDIES, *RISK ANALYSIS
- 1184 OIL DISCHARGES, LEARAGE, THELAND, ENVIRONMENTAL EPPECIS, CONCRETATION, SPILL CLEANUP, SHIPS
- MONITORING, EQUIPMENT, DETECTION, BALLAST, ANALYTICAL TECHNIQUES, TANKERS, PATENT MONITORING, EQUIPMENT, DETECTION, WASTELATIESS, PRODUCT INFORMATION 1235
- 1206
- 1271 HYDROCARECNS, PRESHWATER, EIGDEGRADATION, BALLAST, BACTERIA, SPILL CLEANUP, PRODUCT INPORMATION, SEAWATER
- CRUDE OIL WASHING, BALLAST, TANKERS, OIL TERMINAIS, OIL TRANSFER, POLLUTION 1277 PREVENTION
- 1343 FRANCE, EQUIPMENT, DETECTION, POLLUTION CONTROL, OIL-WATER SEPARATION, SKIMMERS, SORBENTS, SINKING AGENTS, FECCUCT INFORMATION
- MICROCRGANTS MS, EMULSIFICATION, EIGDEGRADATION, BEHAVIOR, OIL SPILLS, SOURCES, SPILL CLEANUP, *REVIEW 1411
- 1434
- 1450
- " INTERNATIONAL CONVENTIONS, IMCO, POLLUTION PREVENTION, SHIPS, *AMENDMENTS
 " NEW YORK, DEVELOPMENT, DEEPWATER PORTS, PORTS, SAFETA
 OIL FIELDS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, BASELINE STUDIES, ANIMALS, ALASKA, 2184 *FCXES
- 1339
- OIL-GAS LEASING, OCS, ENVIRONMENTAL EFFECTS, EIS, ATLANTIC COAST, SOCIOECCNOMIC EFFECTS OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, EIS, ATLANTIC COAST, ONSHORE 1390 IMPACTS

- 1391
- 1392
- 1393
- OIL-GAS LEASING, OFFSHORE DEVELOPMENT, CCS, EIS, ELM, MLASKA, *IOWER COOK INLET
 " OFFSHORE DEVELOPMENT, CCS, EIS, ELM, ALASKA, *LOWER COOK INLET
 " OFFSHORE DEVELOPMENT, OCS, EIS, BLM, ALASKA, *LOWER COCK INLET
 OIL INDUSTRY, CCNTINGENCY PIANNING, CANADA, PERSONNEL TRAINING, POILUTION CONTROL, 1333 *FIELC EXERCISE
- 1375
- 1332
- FISHERIES, ESTUARIES, ENVIRONMENTAL MANAGEMENT, WATER QUALITY, *PROCEEDINGS INSUEANCE, ECONOMIC EFFECTS, DEVELOPMENT, TANKERS, OIL SPILLS, *CLAIMS OFFSHORE DEVELOPMENT, NORTH SEA, ECONOMIC EFFECTS, *RISK ANALYSIS, PLATFORMS, 1383 SAFETY
- 1380
- CIL SHALE, GROUNDWATER, CONTAMINATION, *LEACHING
 OIL SLICKS, DISPERSANTS, BEACH CLEANUP, SHOFELINES, SPILL CLEANUP, UK, *ANLACH SPILL 1176
- ESTUARIES, DISPERSANTS, COASTS, EIRDS, BIOLOGICAL EFFECTS, OIL TERMINALS, UK, 1177 *AMLWCH SPILL
- OIL SPILLS, UK, 1181 TANKERS, SHCRELINES, *CHRISTOS EITAS SPILL
- 1190
- MOVEMENT, BEACHES, SCURCES, *TRINIDAD MONITORING, EPA, ANALYTICAL TECHNIQUES, REMCTE SENSING, SOURCE IDENTIFICATION, 1221 POLLUTION CONTROL, *LASER FLUORESCENCE
- ENVIRONMENTAL EFFECTS, DISPERSANTS, BEACH CLEANUP, ANALYTICAL TECHNIQUES, TOXICITY, *LICENSING, SFILL CLEANUP, UK
 INCINERATION, SPILL CLEANUP, *COMBUSTION, PATENT 1260
- 1275
- 1367
- FAIE, DRIFT, SPREADING HYDROCAREGNS, EVAPORA 1412
- 1424
- 1428
- 1179
- " HYDROCAREONS, EVAPORATION, DISPERSION, BOOK REVIEW, BIODEGRADATION, CIL SPILLS
 " MODELS, BOOMS, *DISPERSIVE CIL LOSSES, *THECRETICAL RESEABCE
 " MODELS, PATE, DISTRIBUTION, BEHAVIOR, SPREADING, *PREDICTION
 OIL SPILLS, DISPERSANTS, UK, TANKEBS, OIL TRANSFER, *CHRISTOS BITAS SPILL
 " ENVIRONMENTAL EFFECTS, BIEDS, UK, TANKEIS, CIL TRANSFER, *CHRISTOS BITAS SPILL, 1180 *SALVAGE OPERATIONS
- OIL SLICKS, UK, TANKERS, SHORELINES, *CHRISTOS BITAS SPILL ILLINCIS, EPA, SPILL CLEANUP, PIPELINES, RIVERS 1181
- 1182
- 1133 GOVERNMENT AGENCIES, ENGLAND, COASTS, SFILL CLEANUP, *ELENI V
- 1135 LEAKAGE, JAPAN, TANKERS, SPILL CONTAINMENT, OIL TRANSFER, *RYUYC MARU SPILL
- 1195
- 1196
- ISRAEL, POLLUTION CONTROL
 INLAND, INCINERATION, PIPELINES, SPILL CONTAINMENT, *UTAH
 MISSISSIPPI RIVER, LOUISIANA, TANKEBS, USCG, SPILL CLFANDP, *IRENE S. LEMOS SPILL
 FRANCE, EQUIPMENT, REMOTE SENSING, SURVEILLANCE 1200
- 1220
- GC/MS, CRUDE OIL, ANALYTICAL TECHNIQUES, SCURCE IDENTIFICATION 1225
- EQUIPMENT, DISPERSION, DESIGN-ENGINEERING, SURPACTANTS, PATENT 1265
- HYDROCARBONS, ESTUARIES, TOXICITY, *FHCTC-GXICATION 1347
- INVERTEER ATES, CHILE, BIOLOGICAL EFFECTS, BEACHES, SHORELINES, *NORTHERN BREEZE 1353 SPILL
- 1354
- FISH, ENVIRONMENTAL EFFECTS, BIRDS, BIOLOGICAL EFFECTS
 MARINE ORGANISMS, INTERTIDAL 2CNE, HABITATS, CBILE, BIOLOGICAL EFFECTS, *NORTHERN 1362 EREEZE SFILL
- 1369
- INVERTEBRATES, FISH, ECCNORIC EPFECTS, CHILF, ALGAE, *NORTHERN EREEZE SPILL OFFSHORE EXPLORATION, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, BIGLOGICAL EFFECTS, WASTEBATERS, UN, *GESAMI OCEANS, ENVIRONMENTAL EFFECTS, *BOOK 1374
- 1376
- 1382
- OIL IND GSTRY, INSURANCE, ECONOMIC EFFECTS, DEVELOPMENT, TANKERS, *CLAIMS LEGISLATION, EXPLORATION, ECONOMIC EFFECTS, DISPOSAL, PRODUCTION, REGULATIONS, 1388 *OVERVIEW
- 1398
- 1433
- EIS, STORAGE, OII TRANSPORT, *STEATEGIC PETROLEUM BESERVE EIS, STOEAGE, *ERINE SPILLS, *RISK ANALYSIS, *STRATEGIC PETROLEUM BESERVE EIS, STORAGE, CIL TRANSPORT, CIL TERMINALS, *RISK ANALYSIS, *STRATEGIC PETROLEUM 1402 RESERVE
- ENVIRONMENTAL EFFECTS, FIS, STORAGE, *RISK ANALYSIS, *STRATEGIC PETROLEUM RESERVE PATE, ECOSYSTEMS, BASELINE STUDIES, ALASKA, SEOBELINES, SEDIMENTATION, 1433
- 1404
- *VULNERABILITY INDEX, *LOWER CCCK INLET
- FATE, ECCSYSTEMS, EASELINE STUDIES, ALASKA, SHORELINES, SEDIMENTATION, 1405
- *VULNERABILITY INDEX, *ICHER CCCK INLET
- GULF OF ALASKA, ECCSYSTEMS, BASELINE STUDIES, SHORELINES, SEDIMENTATION, 1438 *VULNERABILITY INDEX
- OIL DISCHARGES, MICROORGANISMS, EMULSIFICATION, BICDEGRADATION, BEHAVIOR, SOURCES, SPILL CLEANUP, *REVIEW 1411
- OIL SLICKS, HYDROCARBONS , EVAPORATION, DISPERSION, BOOK REVIEW, BIODEGRADATION OCS, BIOECORGANISMS, CHRONIC FFFECTS, BIODEGRADATION, ACUTE EFFECTS, SAMPLING 1412
- 1415
- 1425 MODELS, PATE, BEHAVICE
- MONITORING, DETECTION, CHEMICAL ANALYSIS, ELBLIGGRAPHIES, ANALYTICAL TECHNIQUES, SAUFLING, *INDUSTRIAL WASTES 1444
- DETECTION, CHEMICAL ANALYSIS, BIELICGRAPHIES, ANALYTICAL TECHNIQUES, SAMPLING, 1445
- REMOTE SENSING, *INDUSTRIAL WASTES CONTINGENCY PLANNING, US, *RESEARCH PUNDS R164
- R 183 FRANCE
- MOVEMENT, MODELS, ICE, DRIFT, DEAUFORT SEA R200
- OIL TERMINALS, OIL TRANSFER, TANKERS, SPILL CLEANUP, UK, *AMLWCH SPILL

```
" OIL SLICKS, ESTUARIES, DISPESSANTS, COASTS, EIGDS, BIOLOGICAL EPPECTS, UK, *ANLICH
1177
         SPILL
```

- OIL TERMINALS, OIL DISCHARGES, CRODE CIL WASHING, EALLAST, TANKERS, OIL TRANSPER, POLLUTION PREVENTION 1277
- OIL SPILLS, ZIS, STOBAGE, OII TRANSFORT, *RISK ANALYSIS, *STRATEGIC PETROLEUM
- 3 196 MOLLUSKS, ECOSYSTEMS, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, BASELINE STUDIES,
- 1175
- 1179
- REFINEBLES, OIL TRANSFER, *PACIFIC NORTHWEST
 OIL TRANSFER, OIL TERMINALS, TANKERS, SFILL CLEANUP, UK, *AMLUCE SPILL
 OIL SPILLS, DISPERSANTS, UK, TANKERS, *CHRISTOS BITAS SPILL
 OIL SPILLS, ENVIRONMENTAL EFFECTS, BIRDS, UK, TANKERS, *CHRISTOS BITAS SPILL, 1130 *SALVAGE OPERATIONS
- 1135
- 1214
- OIL SPILLS, LEAKAGE, JAPAN, TANKERS, SPILL CONTAINMENT, *RYUYO MARU SPILL MONITORING, LEAKAGE, DETECTION, PIPELINES, PATENT OIL TERMINALS, CII DISCHARGES, CRUDE CIL WASHING, BALLAST, TANKERS, POLLUTION 1277 PREVENTION
- *STRATEGIC PETROLEUM RESERVE FEA, CRUDE CIL, STCRAGE, PIPELINES, 1279 LOUISIANA.
- MARINE ORGANISMS, HAEITATS, ENVIRONMENTAL EFFECTS, BENTHOS, BASELINE STUDIES, OIL TRANSPORT, POGET SCODD 1437
- R136 OIL TERMINALS, MOLLUSKS, ECOSYSTEMS, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, BASELINE STUDIES, REPINERIES, *FACIFIC NCFTHWEST
- 1398 OIL TRANSPORT, OIL SPILLS, EIS, STORAGE, *STRATEJIC PETROLEUM RESERVE
- 1402 OIL TERMINALS, CII SFILIS, EIS, STORAGE, *RISK ANALYSIS, *STRATEGIC PETRCLEUM RESERVE
- OIL TRANSFER, MARINE CEGANISMS, HABITATS, ENVIRONMENTAL EFFECTS, BENTHOS, BASELINE 1407 STUDIES, POGET SCOND
- CIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL, SKIMMERS, PATENT, 1261 * VAC DEMING
- EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL, SKIMMERS, PATENT EQUIPMENT, SPILL REMOVAL, SKIMMERS, PATENT 1262
- 1264
- EQUIPMENT, SPILL REGOVAL, SKINNERS, PATENT FLOTATION, WASTEWATER TREATMENT, FECCUCT INFORMATION, WASTEWATER TREATMENT, FECCUCT INFORMATION, *ASPHALT PLANT, *OHIO RIVER WASTEWATER TREATMENT, *DEMULSIFICATION FLOTATION, EMULSIFIERS, WASTEWATER TREATMENT, *COAGULATION ADSORPTION, WASTEWATER TREATMENT, SCREENTS, PATENT, *SORBENT FIBERS ADSORPTION, WASTEWATER TREATMENT, SORBENTS, PATENT, *SORBENT FIBERS ADSORPTION, WASTEWATER TREATMENT, SORBENTS, PATENT, *SORBENT FIBERS ADSORPTION, WASTEWATER TREATMENT, SORBENTS, PATENT, *SORBENT FIBERS 1282
- 1234
- 1291
- 129.2
- ** 1297
- 1298 ADSORPTION, WASTEWATER TREATMENT, SCREENTS, PATENT, *SOBBENT FIBERS WASTEWATER TREATMENT, *PURIFICATION 1303
- 1304
- HYDROCARBONS , *PURIFICATION AGENT, PATENT 1305
- 1306 EQUIPMENT, PATENT, *FACKED BEDS
- EQUIPMENT, *DISPERSIONS, PATENT 1307
- 1308 EQUIPMENT, DESIGN-ENGINEERING, FILTRATICN, PARENT
- 1339 EQUIPMENT, SPILL CLEANUP, PATENT 1310
- EMULSIONS, COALESCENCE, PATENT, *SILICONE-COATED FIBERS ADSORPTION, SOREENTS, PATENT, *KAPOK FIBERS 1311
- 1312 EQUIPMENT, EMULSIFIERS, SCIVENTS, FATENT
- 1313 EQUIPMENT, CESIGN-ENGINEEBING, WASTEWATER TREATMENT, PATENT EQUIPMENT, PRODUCT INFORMATION
- 1314
- 1315 HYDROCAREONS, ADSORPTION, SEAWATER, SECIMENTATION
- EQUIPMENT, DESIGN-ENGINEERING, CCALESCENCE, BAILAST, USN 1310
- HYDROCAFEONS, EIOASSAY, FILTRATION, WASTEWATERS, *BIOASSAY EFFIUENT, *SORBENT 1317 FIBERS
- 1318
- EMULSIONS, ADSORPTION, PATENT, *SORBENT POWDER FUEL OIL, WASTEWATER TREATMENT, FATENT, *SCREENT FIBERS ABSORPTION, SORBENTS, PATENT, *PLANT FIER MATS EMULSIONS, CRUDE CIL, FATENT, *DEMULSIFIERS ABSORPTION, SORBENTS, PATENT, *PLANT FIERR MATS 1319
- 132)
- 1321 10
- 1322
- EVAPORATION, EQUIPMENT, EMULSIONS, FATENT, *CONCENSATION FMULSIONS, *REVIEW 1323
- 1324
- ABSORPTION, SORBENTS, PATENT, *URETHANE POAM ABSORPTION, SORBENIS, PATENT, *SCHEENT MATS 1325
- 1326
- 1343 OIL DISCHARGES, FRANCE, EQUIPMENT, DETECTION, POLICTION CONTROL, SKIMMERS, SORBENTS, SINKING AGENTS, PRODUCT INFORMATION
- EQUIPMENT, BILGES, BIBLICGBAPHIES, BALLAST, SPILL REMOVAL, POLLUTION CONTROL 1446
- MODELS, CCALESCENCE, *EVALUATIONS R163
- 1233 OIL WELLS, LCCISIANA, LAKES, DCE, BICWCUTS, SPILL CONTAINMENT, SPILL CLEANUP, USCG, *STRATEGIC PETROLECM RESERVE
- 1234 LOUISIANA, LAKES , DOF, ELCHOUTS, SPILL CLEANCP, GSCG, *STRATEGIC PETROLEUM RESERVE 1336 11
- INLAND, CONTINGENCY PLANNING, ALASKA, US, BEGULATIONS, POLLUTION PREVENTION, POILUTICE CONTECL 1441
- " OFFSHORE DRILLING, LEGISLATICN, EQUIPMENT, ENVIRONMENTAL EFFECTS, BIBLIOGRAPHIES CNSHORE IMPACTS, OIL-GAS LEASING, OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, 1390 ATLANTIC CCAST FIS.
- OFFSHORE DEVELOPMENT, OCS, LEGISLATION, INDUSTRIES, BIBLICGBAPHIES, ALASKA, 1443 SOCIDECONOMIC EFFECTS

```
1413 CXIDATION, SICRCCRGANISMS, SYDROCARBONS, FUNGI, BICDEGRADATION, BACTERIA, YEASTS, *
                 HYDROCARBONS
                                          , BIGDEGRADATION, BACTERIA, *DESULFOVIBRIO DESULFURICANS. *WADDEN SEA
         FACIFIC OCEAN, MARINE CREANISMS, FISH, BIOLOGICAL EFFECIS, BEHAVIOE, *CHEMORECEPTION PAH, CHEMICAL ANALYSIS, PHYTOPIANKTON, SPECTROMETEY, *FLUORIMETRIC DETERMINATION "LAKES, SOURCE IDENTIFICATION, SEDIMENTS, GERMANY, *LAKE CONSTANCE
R169
1226
1243
                 MEDITERRANBAN SEA, MARINE CEGANISMS, HYTROCARECNS, BIOLOGICAL EFFECTS, SEDIMENTS,
1378
                 TAR, SOUFCES, TANKERS
                 MASSACHUSETTS, FOSSIL FUELS, BUZZARDS BAY, ARCMATIC HYDROCARBONS, SEDIMENTS,
1451
                 SCURCES, *CONFUSTION
                LAKES , GC/MS, CHEMICAL ANALYSIS, *ATMOSPHEBIC PETROLEUM BESIDUES
R154
          PATENT, OIL DISCHARGES, MCNITCRING, EQUIPMENT, DETECTION, BALLAST, ANALYTICAL
1205
                 TECHNIQUES, TANKERS
MONITORING, LEAKAGE, HYDROCARECNS, EQUIPMENT, DETECTION
1213
                 OIL TEAMSFER, MCNITORING, LEAKAGE, DETECTION, PIPELINES
MONITORING, DESIGN-ENGINEERING, WASTEWATERS, SLUDGE, *LASERS, *OIL FILM
1214
1219
                 HYDROCARECNS , DETECTION, ANALYTICAL TECHNIQUES, SPECTROSCOPY, WASTEWATERS
1232
1236
                 HYDROCARBONS, CHRCMATCGRAFHY, ANALYTICAL TECHNIQUES
1247
                 HYDROCARECNS, EQUIPMENT, EGOMS, BEACHES, SPILL CONTAINMENT
                 EQUIPMENT, BOOMS, SPILL CONTAINMENT, FLATFCEMS
EQUIPMENT, BOOMS, SPILL CONTAINMENT, POLLUTION CONTROL
1248
1249
                 EQUIPMENT, DESIGN-ENGINEERING, FECCUCT INFOSMATION, SKIMMERS, SPILL REMOVAL,
1251
                 *SSACV CIL SKIMMER
                 EQUIPMENT, DESIGN-ENGINEERING, SFILL REMOVAL
DISPERSANTS, CRUDE OIL, SPILL REMOVAL, PETROLEUM PRODUCTS
1258
1259
            "
                 OIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL, SKIMMERS,
1261
                  *V ACHUMING
                 OIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL, SKIMMERS
1262
1263
                 HYDROCAREONS, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS
                 OIL-WATER SEPARATION, EQUIPMENT, SPILL REMOVAL, SKIMMERS
1264
1265
                 OIL SPILLS, EQUIPMENT, DISPERSION, DESIGN-ENGINEERING, SURFACTANTS
                EQUIPMENT, SPILL CLEANUP, *ULTRASONIC TRANSDUCER EMULSIFIERS, DISPERSANTS, SPILL CLEANUP
1266
1267
                MICROGRANISMS, DISPERSANTS, BIODEGRADATION, SPILL CLEANUP
FRESHWATER, BIODEGRADATION, SEAWATER, SFILL REMOVAL, *P & N COMPOSITIONS
EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL, *OIL MOP
OIL SLICKS, INCINEBATION, SPILL CLEANUP, *CCMEUSTION
ABSORFTICN, SPILL CLEANUP, *MAGNETIC SORBENT POWDER, POLLUTION CONTROL
1273
            15
1272
1273
            64
1275
1276
1278
                 LEAKAGE, DETECTION, PIPELINES
12.84
                 ABSORPTION, WASTEWATER TREATMENT,
                                                                               SORBENTS
1286
                 DISPERSION, SLUDGE, PRECIPITATION, FILTRATION
                FLCTATION, EQUIPMENT, WASTEWATER TREATMENT, REFINERIES, *AERATION TURBINE BIODEGRADATION, WASTE CII TBEATMENT, *CATALYST
1287
1288
1289
                 OIL-WATER SEPARATION, WASTEWATER TREATMENT, *REVERSE OSMOSIS
                 WASTEWATER TREATMENT, *PIUIDIZED BEES
CIL-WATER SEPARATION, ADSORPTION, WASTEWATER TREATMENT, SCREENTS, *SORBENT PIBERS
1293
           11
1297
            11
                OIL-WATER SEPARATION, ADSCRITION, WASTEWATER TREATMENT, SCREENTS, *SORBENT FIBERS ADSORPTION, WASTEWATER TREATMENT, SCREENTS
ADSORPTION, WASTEWATER TREATMENT, SORBENTS
OIL-WATER SEPARATION, ADSCRITION, WASTEWATER TREATMENT, SORBENTS, *SORBENT FIBERS
1298
1299
            11
1300
1303
                CIL-WATER SEPARATION, HYDROCAREONS, *PURIFICATION AGENT OIL-WATER SEPARATION, EQUIPMENT, *PACKEL BEES OIL-WATER SEPARATION, EQUIPMENT, *DISPERSIONS OIL-WATER SEPARATION, EQUIPMENT, ESIGN-ENGINEERING, FILTRATION OIL-WATER SEPARATION, EQUIPMENT, SPILL CLEANUP OIL-WATER SEPARATION FULL SEPARATION OIL-WATER SEPARATION
1305
1306
1337
1308
1339
                OIL-WATER SEPARATION, EMUISIONS, CCALESCENCE, *SILICONE-COATED FIBERS OIL-WATER SEPARATION, ADSORPTION, SORBENTS, *KAPOK FIBERS
1310
           14
1311
                OIL-WATER SEPARATION, EQUIPMENT, EMULSIFIERS, SCLVENTS
CIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING, WASTEWATER TREATMENT
OIL-WATER SEPARATION, EMULSICAS, ADSORPTION, *SCREENT POWDER
           11
1312
            41
1313
                OIL-WATER SEPARATION, ENUISICES, ACSORPTION, *SCREENT POWCER
CIL-WATER SEPARATION, FUEL OIL, WASTEWATER TREATMENT, *SORBEST PIBERS
OIL-WATER SEPARATION, ABSCRPTION, SORBESTS, *PIANT FIEER MATS
CIL-WATER SEPARATION, EMULSIONS, CRUDE OIL, *DEMULSIPIERS
OIL-WATER SEPARATION, ABSCRPTION, SCREENTS, *PIANT FIEER MATS
CIL-WATER SEPARATION, EVAPORATION, EQUIPMENT, EMULSIONS, *CONDENSATION
CIL-WATER SEPARATION, ABSCRPTION, SCREENTS, *UBETHANE FOAM
CIL-WATER SEPARATION, AESCRPTION, SORBENTS, *SORBENT MATS
EVAPORATION, EQUIPMENT, DISTILLATION, WASTE OIL, BELLAMATION, REUSE
LUBRICATING OIL, WASTE OIL, RECLAMATION, *REGENERATION, *VACUUM STRIPPING
LUBRICATING OIL, DISTILLATION, RECLAMATION, WASTE OIL, SOLVENTS, *VACUUM STRIPPING
LUBRICATING OIL, DISTILLATION, RECLAMATION, WASTE OIL, SOLVENTS, *VACUUM STRIPPING
LUBRICATING OIL, DISTILLATION, PREVENTION
1318
1319
            18
1320
1321
1322
1323
1325
           *1
1326
1328
           **
1330
1331
                LEAKAGE, STOBAGE, POLLUTION PREVENTION
EQUIPMENT, DESIGN-ENGINERRING, BLOWOUTS, POLLUTION CONTROL
LEAKAGE, EQUIPMENT, DEJECTION, DESIGN-ENGINEERING, PIFFLINES
1339
1342
1345
         PERSONNEL TRAINING, MANUFLS, IMCO, DISPERSANTS, BOOMS, SKIMMERS, SINKING AGENTS, SORBENTS, SPILL CLEANOR
1332
```

- 1333 PERSONNEL TRAINING, OIL INDUSTRY, CONTINGENCY PLANNING, CANADA, POLLUTION CONTROL, *FIELD EXERCISE
- PETROCHEMICALS, MODELS, EUROPE, COST ANALYSIS, BIOLOGICAL TREATHENT, WASTEWATERS "WASTE OIL, WASTEWATERS, REFINERIES, RECLAMATION, REUSE 1295
- 1327
- INDUSTRIES, ECONOMICS, BIGLICGEAFHIES, WASTEWATER TREATMENT, REFINERIES, POLLUTION 1440 CCNTBCL
- R 196
- 1237
- " OCEANS, GC/MS, FATE, DISTRIBUTION, EIGGENIC HYDBOCARBONS, SEDIMENTATION PETROLEUM FRODUCTS, CHEMICAL ANALYSIS, *SURFACE WATERS
 " MODELS, PUEL OIL, DETECTION, SCUECE IDENTIFICATION, SPECTROMETRY, STATISTICAL 1245 ANALYSIS
- PATENT, DISPERSANTS, CRUDE CIL, SPILL BEMCVAL 1259
- " OCEANS, FOOD WEE, CRUCE OIL, BIOLOGICAL EFFECTS, SOURCES, TOXICITY, PHYTOPLANKTON, 1379 *NEKTON
- FATE, EVAPORATION, BEHAVIOR, SOLUBILITY, WSF, *LIGHT REPINED OILS MARINE ORGANISMS, CRUDE CIL, WSF, TCXICITY 1419
- **B** 166
- MOLLUSKS, HYDROCAREONS, ESTUARIES, DELAWARE BAY, BIOASSAY, TOXICITY, *OYSTER R168 INDUSTRY
- 1226
- PHYTOPLANKTON, PAH, CHEMICAL ANALYSIS, SPECTROMETRY, *FLUORIMETRIC DETERMINATION "HYDROCARBONS, PRESHWATER, ELGEBIC HYDROCARBONS, EACTERIA, SOURCE IDENTIFICATION, 1246 SEAWATES, *REVIEW
- PETROLEUM PRODUCTS, CCEANS, FCOD WEB, CHUDE OIL, EIOLOGICAL EFFECTS, SOURCES, 1379 TOXICITY, *NEKTON
- PIPELINES, OIL SPILLS, ILLINOIS, EPA, SPILL CLEANUP, RIVERS 1182
- 1186
- LOUISIANA, LEAKAGE, SPILL CONTAINMENT, *UTAH
 OIL SPILLS, INLAND, INCINERATION, SPILL CONTAINMENT, *UTAH
 INLAND, INCINERATION, SEILL CLEANUP, *UTAH 1196
- 1197
- PATENT, OIL TRANSFER, MCNITORING, LEAKAGE, DETECTION 1214
- 1278
- 1279
- PATENT, LEAKAGE, DETECTION
 OIL TRANSFER, LOUISIANA, FEA, CRUDE OIL, STORAGE, STRATEGIC PETROLEUM RESERVE
 CANADA, PORTS, POLICTION PREVENTION, WASHINGTON, *PACIFIC COAST, *RISK ANALYSIS, 1280 *TRANS-ALASKA PIPELINE
- 1345 PATENT, LEAKAGE, EQUIPMENT, DETECTION, CESIGN-ENGINEERING
- 1248 PLATFORMS, PATENT, EQUIPMENT, BCCMS, SPILL CONTAINMENT
- OIL INDUSTRY, OFFSHORE DEVELOPMENT, NORTH SEA, ECONOMIC EPPECTS, *RISK ANALYSIS, 1383 SAFETY
- 1336 OFFSHORE DEVELOPMENT, DESIGN-ENGINEERING, SAFETY, POLLUTION CONTROL, REGULATIONS
- 1195 POLLUTION CONTROL, GIL SPILLS, ISPAEL
- OIL SLICKS, MONITORING, EPA, ANALYTICAL TECHNIQUES, REMOTE SENSING, SOURCE 1221 IDENTIFICATION, *LASEB PLUCEESCENCE
- EQUIPMENT, ECOMS, SPILL CONTAINMENT 1243 PATENT.
- 1250 EQUIPMENT, CANADA, BOOMS, SPILL CONTAINMENT, PRODUCT INFORMATION, US, *FIELD TRIALS
- 1276
- PATENT, ABSORPTION, SFILL CLEANUE, *MAGNETIC SCREENT POWDER
 PERSCHNEL TRAINING, CIL INDUSTRY, CONTINGENCY PLANNING, CANADA, *FIELD EXERCISE
 MONITORING, CONTINGENCY FLANNING, *FERSIAN GULF, *ACTION PLAN
 OIL WELLS, INLAND, CONTINGENCY PLANNING, ALASKA, US, REGULATIONS, POLLUTION 1333
- 18 1335
- PREVENTION
- MEDITEBRANEAN SEA, ENVIRONMENTAL PROTECTION, ECONOMICS, *TREATY, *STANDARDS MONITORING, MEDITEBRANEAN SEA, LEGISLATION, ENVIRONMENTAL MANAGEMENT, UN, *UNEP 1338 1341
- 1342
- PATENT, EQUIPMENT, DESIGN-ENGINEERING, ELCHGUTS
 OIL-WATER SEPARATION, OIL DISCHARGES, PRANCE, EQUIPMENT, DETECTION, SKINHERS,
 SORBENTS, SINKING AGENTS, PRODUCT INFORMATION 1343
- 1346
- MCNITORING, POSEICN GOVERNMENTS, EUROPE, SURVEILLANCE, UK MEDITERRANEAN SEA, ENVIRONMENTAL DETERICRATION, CONTANINATION, SHORELINES, 1373
- SCURCES, TAR OCEANS, INDOSTRIES, HYDROCARBONS, FRESHWATER, CETECTION, BIOLOGICAL EFFECTS, 1377 BICDEGRADATION, SCURCES, WASTEWATERS
- 1386 PLATFORMS, OFFSHORE DEVELOPMENT, DESIGN-ENGINEERING, SAFETY, REGULATIONS
- 1430 OCEANS, LEGISLATION, HEALTH HAZARDS, FRESHWATER, ENVIRONMENTAL FRCTECTION, CONTINGENCY PLANNING, US
- 1436 INTERNATIONAL CONVENTIONS, INFORMATION SYSTEMS, EUROPE, COMPENSATION, *FUROPEAN ECONOMIC COMMUNITY
- 1438
- 1439
- INTERNATIONAL CONVENTIONS, IMCO, SHIPS, UN
 OFFSHORE DRILLING, CCEANS, LEGISLATION, BIBLICGRAPHIES
 PETROCHEMICALS, INDUSTRIES, ECONOMICS, BIBLIOGRAPHIES, WASTEWATER TREATMENT, 1443 REFINERIES
- CIL-WATER SEPARATION, EQUIPMENT, BILGES, BIBLIOGRAPHIES, BALLAST 1446 SPILL REMOVAL
- POLLUTION PREVENTION, INFORMATION SYSTEMS, TANKERS, SAFETY, STATISTICAL ANALYSIS, *RISK ANALYSIS, *MARINE MANAGEMENT SYSTEMS, INC. 1198
- INDUSTRIES, ANALYTICAL TECHNIQUES, WATTE QUALITY EQUIPMENT, DESIGN-ENGINEERING, SPILL CONTAINMENT, SPILL REMOVAL, PRODUCT 1255 INFORMATION
- 1277 OIL TRANSFER, OIL TERMINAIS, CII DISCHARGES, CRUDE CIL WASHING, BALLAST, TANKERS
- 1280 PIPELINES, CANADA, PORTS, WASHINGTON, *PACIFIC COAST, *BISK ANALYSIS, *TRANS-ALASKA PIPELINE
- 1281 " INCINERATION, SLUDGE, SHIPS, PRODUCT INFORMATION, *EDCO/CITEX SYSTEM

```
1334
     POLLUTION PREVENTION, GOVERNMENT AGENCIES, ENGLAND, CONTINGENCY PLANNING, SPILL CLEANUP
         POLLUTION CONTROL, CIL WELLS, INLAND, CONTINGENCY PLANNING, ALASKA, US,
1336
         REGULATIONS
```

- 1339 PATENT, LEAKAGE, SICRAGE
- INTERNATIONAL CONVENTIONS, INTERNATIONAL AGREEMENTS, REGULATIONS, TANKERS, SAPETY 1340
- INLAND, GOVERNMENT AGENCIES, CHILLING, CONTINGENCY PLANNING, CANADA, BLOWOUT 1344 PREVENTION, REGULATIONS
- MONITORING, ENVIRONMENTAL PROTECTION, BIOLOGICAL EFFECTS, SHIPS, UN, *CONFERENCE, 1372 *GESAMP
- GULF OF MEXICO, DEEPRATER PORTS, COMPENSATION, *LCCP, *SFADOCK, SPILL CLEANUP 1387
- IMCC, GUIDELINES, CRUCE OIL WASHING, SAFETY, TANKERS, SEGREGATED BALLAST, *INERT GAS SYSTEMS, SURVEILLANCE 1431
- GUIDZLINES, CONTINGENCY PLANNING, REGULATIONS, SHIPS, SPILL CLEANUP, UK 1432
- 1434 OIL DISCHARGES, INTERNATIONAL CONVENTIONS, IMCO, SHIPS, *AMENDMENTS
- MONITORING, REMOTE SENSING 1452
- POLYCHAETES, BIOASSAY, AROMATIC HYDROCARBONS, TOXICITY, SOLUBILITY, *PNA, *NEANTHES 1360 ARENACEODENTATA
- FORTS , INTERTIDAL ZONE, FLORIDA, ENVIRONMENTAL EFFECTS, BAYS, SPILL CLEANUP, USCG, 1191 *PORT SUTTON SPILE
- FLORIDA, EPA, SPILL CLEANUP, SOURCE IDENTIFICATION, USCG, *PORT SUTTON SPILL, *CLEANUP COSTS 1192
- POLLUTION PREVENTION, PIPELINES, CANADA, WASHINGTON, *PACIFIC CCAST, *RISK 1280 ANALYSIS, *TRANS-ALASKA PIFELINE
- 1450 CIL DISCHARGES, NEW YORK, DEVELOPMENT, DEEPWATER PORTS, SAFETY
- PRECIPITATION, PATENT, DISPERSION, SLUDGE, FILTRATION 1286
- PRODUCT INFORMATION, CII DISCHARJES, SCHITCHING, EQUIPMENT, DETECTION, WASTEWATERS 1206
- 1207 MONITORING, HY EROCARECNS, EQUIPMENT, DETECTION, *FLUORCHETRY, *PETRO-TRACT SYSTEM
- 1208
- MONITORING, EQUIPMENT, DISPESSION, *OIL-IN-WATER MONITORING, EQUIPMENT, CHROMATOGRAPHY, AROMATIC HYDROCARBONS, *EENZENE MONITORING, HYDROCARBONS, EQUIPMENT, *INFRAREC SENSOR 1209
- 1212
- 1217 MONITORING, EQUIPMENT, AMALYTICAL TECHNIQUES, WASTEWATERS, REFINERIES, *PHOTCMETRIC ANALYZER
- POLLUTION CONTROL, EQUIPMENT, CANADA, BOOMS, SPILL CONTAINMENT, US, *FIELD TRIALS PATENT, EQUIPMENT, DESIGN-ENGINEEBING, SKIMMERS, SPILL REMOVAL, *SSACV OIL SKIMMER 125) 1251
- 1252
- IRELAND, EQUIPMENT, LESIGN-ENGINEERING, DEEPWATER PORTS, SKIMMERS, *BAY SKIMMER IRELAND, EQUIPMENT, DESIGN-ENGINEERING, SKIMMERS, SPILL CLEANUP, *BANTRY BAY EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL, SKIMMERS 1253
- 1254
- 1255 POLLUTION PREVENTION, EQUIPMENT, DESIGN-ENGINEERING, SPILL CONTAINMENT, SPILL REMOVAL
- 1256 EQUIPMENT, DESIGN-ENGINEERING, SKIMBERS, SPILI BEMOVAL, *DYNAMIC OIL SKIMMER
- EQUIPMENT, EKOFISK BLOWCUT, DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS EQUIPMENT, SKIMMERS, SAFETY 1257
- 1269
- OIL DISCHARGES, HYDROCARBONS, FRESHWATER, BIODEGRADATION, BALLAST, BACTERIA, SPILL CLEANUP, SEAWATER 1271
- 1291
- POLLUTION PREVENTION, INCINERATION, SLUDGE, SHIPS, *EDCO/CITEX SYSTEM OIL-WATER SEPARATION, FLOTATION, WASTEWATER TREATMENT, *ASPHALT PLANT, *OHIO RIVER 1282
- 1331 EQUIPMENT, ECCMS
- 1314
- 1329
- EQUIPMENT, ECONS
 OIL-WATER SEPARATION, EQUIPMENT
 EQUIPMENT, RECLAMATION, SPILL REMOVAL, SKIMMERS
 POLLUTION CONTROL, CII-WATER SEPARATION, CIL EISCHARGES, FRANCE, EQUIPMENT,
 DETECTION, SKIMMERS, SOREENTS, SINKING AGENTS

 THE PROPERTY OF TH 1343
- 1385
- PRODUCTION , INDUSTRIES, GUIDELINES, ENVIRONMENTAL EFFECTS, *REVIEW, *WETLANDS
 " OIL SPILLS, LEGISLATION, EXPLORATION , ECONOMIC EFFECTS, DISPOSAL , REGULATIONS, 1398 *O VER VIEW
- PUGET SCUND, OIL TRANSPORT, OIL TRANSFER, MARINE CRGANISMS, HABITATS, ENVIRONMENTAL EFFECTS, BENTHOS, EASELINE STUDIES 1437
- NEUSTON, HYDROCARBONS, CHEMICAL ANALYSIS, ELANKTON, SEDIMENTS, SAMPLING, R153 WASHINGTON
- RECLAMATION, PETROCHEMICALS, WASTE OIL, WASTEWATERS, BEFINERIES, REUSE
 "PATENT, EVAPORATION, EQUIPMENT, DISTILLATION, WASTE OIL, REUSE 1327
- 1328
- 1329
- 1330
- 1331
- PRODUCT INFORMATION, EQUIFMENT, SPIIL BENCVAL, SKIMMERS
 PATENT, LUBRICATING CIL, WASTE OIL, *REGZYBRATION, *VACUUM STRIPPING
 PATENT, LUBRICATING OIL, DISTILLATION, WASTE OIL, SCLVENTS, *VACUUM STRIPPING
 RECOVERY, ENVIRONMENTAL DETERIORATION, ECOSYSTEMS, RESOURCE MANAGEMENT, RESTORATION 1370
- MARINE ORGANISMS, INTERTIDAL ZONE, FATE, CHRONIC EFFECTS, BCCK REVIEW, 1371
- RESTORATION, *PROCEEDINGS RECYCLING, CHRCMATOGRAPHY, CHEMICAL ANALYSIS, CARCINGGENS, WASTEWATERS 3152
- REPINEBLES, PRODUCT INFORMATION, MONITORING, EQUIPMENT, ANALYTICAL TECHNIQUES, WASTEWATERS, *PHOTOMETRIC ANALYZER 1217
- 1283
- 1285
- EPA, CONTAMINANTS, AFI, ANALYTICAL TECHNIQUES, WASTEWATERS, SAMPLING ENVIRONMENTAL EFFECTS, WASTEWATERS, *ERCCESSING, *CATALOG PATENT, FLOTATION, EQUIPMENT, #ASTEWATER TREATMENT, *AERATION TURBINE RECLAMATION, PETROCHEMICALS, WASTE CIL, WASTEWATERS, REUSE 1287
- 1327
- POLLUTION CONTROL, PETROCHEMICALS, INDUSTRIES, ECONOMICS, BIBLICG RAPHIES, 1440 WASTEWATER TREATMENT

- REFINERIES, MARINE CRGANISMS, EIGASSAY, WASTEWATER TREATMENT R161
- FISH, BICASSAY, ACUTE EFFECTS, TOXICITY, WASTEWATERS R172
- OIL TRANSFER, OIL TERMINALS, MOLIUSKS, ECOSYSTEMS, CHRONIC EFFECTS, BIOLOGICAL R186 EFFECTS, BASILINE STUDIES, *PACIFIC NORTHWEST
- REFINING, INDUSTRIES, WASTEWATER TREATMENT, *LAND APPLICATION 3 16 2
- REGULATIONS, POLLUTION PREVENTION, POLIUTION CONTBOL, OIL WELLS, INLAND, CONTINGENCY 1336
- PLANNING, ALASKA, US POLLUTION PREVENTION, INTERNATIONAL CONVENTIONS, INTERNATIONAL AGREEMENTS, 1340
- TANKERS, SAFETY POLLUTION PREVENTION, INLAND, GOVERNMENT AGENCIES, DRILLING, CONTINGENCY PLANNING, CANADA, ELCYCUT PREVENTION 1344
- OFFSHORE DEVELOPMENT, CCEANS, MONITCRING, ENVIRONMENTAL MANAGEMENT, DRILLING, 1384 BIOLOGICAL EFFECTS, SOURCES
- 1386
- POLLUTION CONTROL, PIATFORMS, CFFSHCRE DEVELOPMENT, DESIGN-ENGINEERING, SAFETY PRODUCTION, OIL SPILLS, LEGISLATION, EXPLORATION, ECONOMIC EFFECTS, DISPOSAL 1388
- POLLUTION PREVENTION, GUIDELINES, CONTINGENCY PLANNING, SHIPS, SPILL CLEANUP, UK 1432
- OFFSHORE DEVELOPMENT, CCS, GOVERNMENT AGENCIES, ENVIRONMENTAL PROTECTION, SAFETY, 1433 USGS
- 1435
- 1220
- " INTERNATIONAL CONVENTIONS, IMCG, *MARINE POLLUTION CONVENTION
 REMOTE SENSING, OIL SPILLS, FRANCE, EQUIPMENT, SURVEILLANCE
 " POLLUTION CONTROL, OIL SLICKS, MONITORING, EPA, ANALYTICAL TECHNIQUES, SOURCE 1221
- IDENTIFICATION, *LASER FLUORESCENCE
 OIL SPILLS, DETECTION, CHEMICAL ANALYSIS, BIBLICGRAPHIES, ANALYTICAL TECHNIQUES,
 SAMPLING, *INDUSTRIAL WASTES
 POLLUTION PERVENTION, MONITORING 1445
- 1452
- 1348
- REPRODUCTION, FISH, CRUDE CIL, BICICGICAL EFFECTS, TOXICITY, *RAINFOW TROUT
 "HYDROCARECNS, CRUDE OIL, BIRDS, BIOLOGICAL EFFECTS, TOXICITY, SUBLETHAL EFFECTS, ₹177 UPTAKE, *EGGS
- a155 RESIDUAL CILS, DETECTION, ANALYTICAL TECHNIQUES, SEAWATER, USN
- RESOURCE MANAGEMENT, RECOVERY, ENVIRONMENTAL DETERIORATION, ECOSYSTEMS, RESTORATION INTERNATIONAL CONVENTIONS, POFFIGN GOVERNMENTS, EUROPEAN ECONOMIC COMMUNITY, *LAW 137)
- 1437 OF THE SEA, *JURISCICTION
- CONTAMINANTS, BIOLOGICAL EFFECTS, BIGINCICATORS, *AQUATIC ORGANISMS
- 1370
- RESTORATION, RESOURCE MANAGEMENT, RECOVERY, ENVIRONMENTAL DETERIORATION, ECOSYSTEMS
 " RECOVERY, MARINE CAGANISMS, INTERTIDAL ZONE, PATE, CHRONIC EFFECTS, BOOK REVIEW, 1371 *PROCEEDINGS
- 1327
- 1328
- REUSE, REFINERIES, RECLAMATION, PETROCHEMICALS, WASTE OIL, WASTEWATERS
 " RECLAMATION, PATENT, EVAFCRATICN, EQUIPMENT, DISTILLATION, WASTE OIL
 RHODE ISLAND, MCLLUSKS, HYDROCARBONS, PATE, BIOLOGICAL EFFECTS, BENTHOS, ATLANTIC
 COAST, DPTAKE, SEDIMENTATICA 1421
- R182 GASOLINE, ENVIRONMENTAL EFFECTS, CHEMICAL ANALYSIS, *BARGE 250 SPILL, SAMPLING
- 1182
- 1197
- 1422
- 1178
- " GASOLINE, ENVIRONMENTAL EFFECTS, CHEMICAL ANALYSIS, *BARGE 200 SPILL, DARPLING RIVERS, PIPELINES, CII SPILLS, IIIINCIS, EPA, SPILL CLEANUP
 " NEW YORK, SPILL CLEANUP, SHIPS, USCG, *HYGRADE NO. 2 BARGE SPILL
 " LAKES, HYDROCARBONS, SOURCES, SEDIMENTATION, WASHINGTON, *RUNOFF
 SAFSTY, ENGLISH CHANNEL, TANKERS, SURVEILLANCE, '*TRAPPIC CONTROL
 " POLLUTION PREVENTION, INFORMATION SYSTEMS, TANKERS, STATISTICAL ANALYSIS, *RISK 1198 ANALYSIS, *MARINE MANAGEMENT SYSTEMS, INC.
- PRODUCT INFORMATION, EQUIPMENT, SKIMMERS 1269
- LIABILITY, INSUBANCE, CCEPENSATION 1337 OFFSHORE DEVELOPMENT.
- 134) REGULATIONS, POLLUTION PREVENTION, INTERNATIONAL CONVENTIONS, INTERNATIONAL AGREEMENTS, TANKERS
- 1383 PLATFORMS, OIL INDUSTRY, OFFSHORE DEVELOPMENT, NORTH SEA, ECONOMIC EFFECTS, *RISK ANALYSIS
- 1300 REGULATIONS, POILUTION CONTROL, PLATFORMS, OFFSHORE DEVELOPMENT, DESIGN-ENGINEERING
- OFFSHORE DEVELORMENT, INDUSTRIES, *FISK ANALYSIS, STATISTICS
 POLLUTION PREVENTION, IMCO, GUIDELINES, CRUDE CIL WASHING, TANKERS, SEGREGATED 1423
- 1431 BALLAST, *INERT GAS SYSTEMS, SUBVEILLANCE
- REGULATIONS, OPPSHORE DEVELORMENT, CCS, GOVERNMENT AGENCIES, ENVIRONMENTAL FROTECTION, USGS 1433
- " PORTS, OIL DISCHARGES, NEW YORK, DEVELOPMENT, DEEPWATER PORTS SAMPLING, LIABILITY, LAW ENFORCEMENT, FLORIDA, SOURCE IDENTIFICATION, USCG, TANKERS, 1194 *PORT SETTON SPILE
- 1216 MONITCRING, EQUIPMENT, *AUTOMATION, *DATA PROCESSING
- MICROORGANISMS, BICDEGRADATION, ANALYTICAL TECHNIQUES, *ENUMERATION, *MOST 1222 PROBABLE NUMBER METHOD
- 1231 HYDROCARECNS , ANALYTICAL TECHNIQUES, *EXXON, *NBS, *INTERLABORATORY COMPARISON
- 1234 CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, SPECTROSCOPY, STATISTICS
- 1233
- 1415
- REFINERIES, EPA, CONTAMINANTS, API, AWALYTICAL TECHNIQUES, WASTEWATERS
 OIL SPILLS, OCS, MICROORGANISES, CHEONIC EFFECTS, BIODEGRADATION, ACUTE EFFECTS
 OIL SPILLS, MONITORING, DETECTION, CHEMICAL ANALYSIS, BIBLICGEAPHIES, ANALYTICAL
 TECHNIQUES, *INDUSTRIAL WASTES 1444
- REMOTE SENSING, OIL SPILLS, DETECTION, CHEMICAL ANALYSIS, BIBLICGRAPHIES, 1445 ANALYTICAL TECHNIQUES, *INCUSTRIAL WASTES
- 1453 " MONITORING, JAPAN, PLANKTON, *HYDECLOGY, *SETC INLAND SEA

- SAMPLING, MCNITCRING, MOLLUSKS, HYDROCARBONS, ARCMATIC HYDROCARBONS, SEAWATER, R151 SEDIMENTS
- PUGET SOUND, NEUSTON, HYDECCAREONS, CHEMICAL ANALYSIS, PLANKTON, SEDIMENTS, R153 WASHINGTON
- R 181 ENVIRONMENTAL EFFECTS, CHEONIC EFFECTS, CHEMICAL ANALYSIS, ARGO MERCHANT SPILL
- " RHODE ISLAND, GASOLINE, ENVIRONMENTAL EFFECTS, CHEMICAL ANALYSIS, *BARGE 250 SPILL SANTA BARBARA CHANNEL, CCS, NATURAL SEFFAGE, DEVELOPMENT, CALIFORNIA, BASELINE STUDIES, *GEOLOGIC HAZARDS, SECIMENTS R182 R 189
- SEAWATER, MEDITEBRANEAN SEA, CONTAMINANTS, ANALYTICAL TECHNIQUES, SURPACTANTS, SOURCE INDENTIFICATION, *ELECTECANALYSIS 1241
- PHYTCPLANKTON, HYDROCAREONS, PRESHWATER, BIOGENIC HYDROCARBONS, BACTERIA, SOURCE 1246 IDENTIFICATION, *REVIEW
- PRODUCT INFORMATION, CII DISCHABGES, HICROCARECNS, FRESHWATER, BIODEGRADATION, BALLAST, EACTERIA, SPILL CLEANUP 1271
- 1272 PATENT, FRESHWATER, BICDEGRADATION, SPILL REMOVAL, *P & N COMPOSITIONS
- 1315
- R151
- R155
- OIL-WATER SEPARATION, HYDROCARBONS, ADSORPTION, SEDIMENTATION
 SAMPLING, MONITORING, MCLIUSKS, HYDROCARBONS, SEDIMENTS
 RESIDUAL OILS, DETECTION, ANALYTICAL TECHNIQUES, USN
 FRESHWATER, ECOSYSTEMS, CONTAMINANTS, ANALYTICAL TECHNIQUES, SEDIMENTS, *IN SITU ₹157 ANALYSIS
- 1315
- SEDIMENTATION, SEAWATER, CII-WATER SEPARATION, HYDROCARBONS, ADSORPTION OIL SPILLS, FATE, FCOSYSTEMS, BASELINE STUDIES, ALASKA, SHORELINES, *VULNERABILITY INDEX, *LCREE CCCK INLET 1434
- OIL SPILLS, FATE, ECOSYSTEMS, BASELINE STUDIES, ALASKA, SHORELINES, *VULNERABILITY INDEX, *ICWER COOK INLET 1435
- OIL SPILLS, GULF OF ALASKA, ECCSYSTEMS, BASELINE STUDIES, SHORELINES, *VULNEBAEILITY INCEX 1408
- 1421 RHODE ISLAND, MOLLUSKS, HYDROCARECNS, FATE, BIOLOGICAL EFFECTS, BENTHOS, ATLANTIC COAST, UFTAKE
- FIVERS, LAKES, HYDROCARBONS, SCUBCES, WASHINGTON, *RUNOFF HYDROCAREONS, PATE, CHROMATOGRAPHY, BERMUDA, SPECTROMETRY 1422
- R194
- a 195
- CCS, HYDROCARBONS, FATE, ALASKA, SOUFCES, *NORTON SOUND PETROCHEMICALS, OCEANS, GC/MS, FATE, DISTRIBUTION, BIOGENIC HYDROCARBONS **R196**
- CCS, BENTHOS, BASELINE STUDIES, ALASKA, SCURCE IDENTIFICATION, *ORGANIC DETRITUS. R 197 *PETRCLEUM PCLLUTANTS
- 1227 SEDIMENTS, HYDROCARBONS, CHEMICAI ANALYSIS, BASELINE STUDIES, *INTERLABORATORY CCEPABISCN
- 1228 CFFSHORZ DRILLING, HYDRCCARBOAS, CONTAMINATION, ELOGENIC HYDROCARBONS, ATLANTIC COAST, SCURCES, *NOVA SCOTIA
- PAH, LAKES , SOURCE IDENTIFICATION, GERBANY, *LAKE CONSTANCE 1243
- PAH, MEDITERRANEAN SEA, MARINE ORGANISMS, HYDROCAREONS, BIOLOGICAL EFFECTS, TAR, 1378 SOURCES, TANKERS
- HYDROCARBONS, GULF CF MEXICO, ENVIRONMENTAL EFFECTS, CHEMICAL ANALYSIS, BLOWOUTS, 1381 TEXAS
- 1448 CONTAMINANTS, CHEMICAL ANALYSIS, ECCK BEVIEW
- PAH, MASSACHUSETTS, FOSSIL FUELS, BUZZARDS BAY, ARCHATIC HYDROCARBONS, SOURCES, 1451 *COMB USTION
- ARCMATIC HYDROCARBONS R151
- SEAWATER, SAMPLING, MCNITORING, MOLLUSKS, HYDROCARBONS, ARCMATIC HYDROCARB SAMPLING, PUGET SCUND, NEUSTCA, HYDECCAEBONS, CHEMICAL ANALYSIS, PLANKTON, R 153
- WASHINGTON SEAWATER, FRESHWATER, ECOSYSTEMS, CONTAMINANTS, ANALYTICAL TECHNIQUES, *IN SITU R157
- ANALYSIS SANTA BARBARA CHANNEL, CCS, NATURAL SEFFAGE, DEVELOPMENT, CALIFORNIA, BASELINE R 189
- R 190
- SAMIA DARDARA CHARNEL, CC3, NATURAL SECTAGE, REVELOPMENT, CALIFORNIA, BASELINE STUDIES, *GEOLOGIC HAZARES

 " OCS, HYDROCARBONS, GULF OF MEXICO, BASELINE STUDIES, ATLANTIC COAST, *GEOCHEMISTRY SEGREGATED EALLAST, SAFETY, POLLUTION PREVENTION, IMCC, GUIDELINES, CRUDE OIL WASHING, TANKERS, *INERT GAS SYSTEMS, SUBVEILIANCE
 SHIPS, OIL DISCHARGES, LEAKAGE, IRELAND, ENVIRONMENTAL EFFECTS, CONTAMINATION, SPILL 1431
- 1184 C LEA NUP
- 1187
- RIVERS, NEW YORK, SPILL CLEANUF, USCG, *HYGRADE NO. 2 BARGE SPILL PRODUCT INFOFMATION, POLLUTION PREVENTION, INCINERATION, SLUDGE, *EDCO/CITEX 1281 SYSTEM
- POLLUTION PREVENTION, MONITORING, ENVIRONMENTAL PROTECTION, BIGLOGICAL EFFECTS, 1372 UN, *CONFERENCE, *GESAME
- REGULATIONS, POLLUTION PREVENTION, GUIDELINES, CONTINGENCY PLANNING, SPILL 1432
- CLEANUP, UK POLLUTION PREVENTION, CIL DISCHAFGES, INTERNATIONAL CONVENTIONS, IMCO, *AMENDMENTS POLLUTION CONTROL, INTERNATIONAL CONVENTIONS, IMCO, JN 1434
- 1438
- SHORELINES, CIL SLICKS, DISPERSANTS, EFACH CLEANUF, SPILL CLEANUP, DK, *AMLWCH SPILL "OIL SPILLS, CIL SLICKS, UK, TANKERS, *CHRISTOS BITAS SPILL 117 á
- 1181
- OIL SPILLS, INVERTEBRATES, CHILE, BICLCGICAL EFFECTS, BEACHES, *NORTHERN BREEZE 1353 SPILL
- POLLUTION CONTROL, MEDITERRANEAN SEA, ENVIRONMENTAL DETERIORATION, CONTAMINATION, 137.3 SCURCES, TAR

- " SEDIMENTATION, OIL SFILLS, FATE, ECOSYSTEMS, BASELINE STUDIES, ALASKA, 14.)4
- * VULNERABILITY INDEX, * ICWEB CCCK INLET 1405 SHORELINES, SEDIMENTATION, OIL SPILLS, FATE, ECOSYSTEMS, BASELINE STUDIES, ALASKA, *VULNERABILITY INDEX, *LOWER COOK INLET
- SEDIMENTATION, OIL SPILIS, GUIF OF ALASKA, ECCSYSTEMS, BASELINE STUDIES, 1408 *VULNEBAEILITY INCEX
- 1332 SINKING AGENTS, PERSONNEL TRAINING, MANUALS, IMCO, DISPERSANTS, BOOMS, SKIMMERS, SORBENTS, SPILL CLEANUP
- PRODUCT INFORMATION, POLIUTION CONTECL, OIL-WATER SEPARATION, OIL DISCHARGES, FRANCE, EQUIPMENT, DETECTION, SKIMMERS, SORBENTS
- SKIMMERS, PRODUCT INFORMATION, FATENT, EQUIPMENT, LESIGN-ENGINZERING, SPILL REMOVAL, 1251 *SSACV CIL SKIMMER
- PRODUCT INFORMATION, IRELAND, EQUIPMENT, DESIGN-ENGINEERING, DEEPWATER PORTS, * EAY 1252 SKIMMER
- PRODUCT INFORMATION, IRELAND, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, 1253 *BANTRY BAY
- 1254
- PRODUCT INPORMATION, EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL PRODUCT INFORMATION, EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL, *DYNAMIC OIL 1250 SKIMMER
- PRODUCT INFORMATION, EQUIPMENT, EKOPISK BLOWOUT, DESIGN-ENGINEERING, SPILL CLEANUP 1257 1261 PATENT, OIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL,
- *VACUUMING PATENT, OIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL PATENT, HYDROCARBONS, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP PATENT, CIL-WATER SEPARATION, EQUIPMENT, SPILL REMOVAL 1262
- 1263
- 1264
- IRELAND, GOVERNMENT AGENCIES, DISPERSANTS, CONTINGENCY PLANNING, COASTS, BOOMS, 1258
- SPILL CLEANUP, TANKERS
 SAFETY, PRODUCT INFORMATION, EQUIPMENT 1269
- RECLAMATION, PRODUCT INFORMATION, EQUIPMENT, SPILL REMOVAL 1329
- SINKING AGENTS, PERSONNEL TRAINING, MANUALS, IMCO, DISPERSANTS, BOOMS, SORBENTS, 1332 SPILL CLEANUP
- 1343 SINKING AGENTS, PRODUCT INFORMATION, POLLUTION CONTROL, OIL-WATER SEPARATION, OIL DISCHARGES, FRANCE, EQUIPMENT, DETECTION, SCREENTS
- 1219 SLUDGE , PATENT, MONITORING, DESIGN-ENGINEERING, WASTEWATERS, *LASERS, *OIL FILM
- " SHIPS, PRODUCT INFORMATION, POLICITION PERVENTION, INCINERATION, *EDCO/CITEX SYSTEM 1481
- 1286
- " PRECIPITATION, PATENT, DISPERSION, FILTRATION
 SOCIAL EFFECTS, ENVIRONMENTAL EFFECTS, ECCNOMICS, ARCTIC, SPILL CLEANUP, *REMOTE 1368 REGIONS
- SUCIOECONOMIC EFFECTS, OIL-GAS LEASING, CCS, ENVIRONMENTAL EFFECTS, EIS, ATLANTIC COAST "GNSHORE IMPACTS, OFFSHORE DEVELOPMENT, OCS, LEGISLATION, INDUSTRIES, 1389 1443
- BIBLICGRAPHIES, ALASKA SOIL, ENVIRONMENTAL EFFECTS, DISPOSAL , DESIGN-ENGINEERING, WASTE CIL, VEGETATION, *LAND APPLICATION 1296
- 1229
- SOLUBILITY, HYDROCABBONS, CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, SURPACTANTS
 " POLYCHAETES, BIOASSAY, AROMATIC HYDROCARBONS, TOXICITY, *PNA, *NEANTHES 1360
- AR ENACEODENTATA
- 1419 PETROLEUM PRODUCTS, FATE, EVAPORATION, BEHAVIOR, WSF, *LIGHT REFINED CILS
- FOSSIL FUELS, CONTAMINANTS, CHEMICAL ANALYSIS, ANALYTICAL TECHNIQUES, SOURCE 3 156 IDENTIFICATION, *OBGANIC COMPOUNDS
- 1312 SOLVENTS, PATENT, CII-WATER SEPARATION, EQUIPMENT, EMULSIFIERS
- " RECLAMATION, PATENT, LUCRICATING CIL, DISTILLATION, WASTE OIL, *VACUUM STRIPPING SCRBENTS, OCEANS, MONITORING, DETECTION, CONTAMINANTS 1331
- 1215 1234
- PATENT, ABSORPTION, WASTEWATER TREATMENT 1297
- PATENT, CIL-WATER SEPARATION, ADSORPTION, WASTEWATER TREATMENT, *SORBENT FIBERS PATENT, OIL-WATER SEPARATION, ADSORPTION, WASTEWATER TREATMENT, *SORBENT FIBERS 1298
- PATENT, ADSCRPTION, WASTEWATER TREATMENT 1299 11
- 1300
- PATENT, ADSORPTION, WASTEWATER THEATMENT
 PATENT, CIL-WATER SEPARATION, ADSORPTION, WASTEWATER TREATMENT, *SORBENT PIBERS
 PATENT, CIL-WATER SEPARATION, ADSCRITTION, *KAPCK FIEERS
 PATENT, CIL-WATER SEPARATION, ABSORPTION, *PLANT FIBER MATS 1303
- 1311 11
- 1320
- 11 1322 PATENT, GIL-RATER SEPARATION, ABSCRETION, *FLANT FIEER MATS
- 1325
- PATENT, CIL-WATER SEPARATION, ABSCRITION, *URETHANE FOAM PATENT, CIL-WATER SEPARATION, ABSORPTION, *SORBENT MAIS 1326
- 1332 SKIMMERS, SINKING AGENTS, PERSONNEL THAINING, MANUALS, IMCO, DISPERSANTS, BOOMS, SPILL CLEANUE
- 1343 SKIMMERS, SINKING AGENTS, PRODUCT INFORMATION, POLLUTION CONTROL, OIL-WATER
- SEPARATION, GIL DISCHARGES, FRANCE, EQUIPMENT, DETECTION
 SCHACE IDENTIFICATION, PORTS, FLORIDA, EPA, SFILL CLEANUP, USCG, *PORT SUTTON SPILL, 1132 *CLEANUP COSTS
- 1193
- LIABILITY, LAW ENFORCEMENT, PICRIDA, USCG, *PORT SUTTON SPILL, *CLEANUP COSTS SAMPLING, LIABILITY, LAW ENFORCEMENT, PLORIDA, USCG, TANKERS, *FORT SUTTON SPILL 1194
- 1202
- 1213
- COASTS, CHESAPEAKE BAY, BEACH CLEANUP, TAB, USCG
 MONITORING, INFORMATION SYSTEMS, CONTAMINANTS, *NATIONAL WATER DATA EXCHANGE
 REMOTE SENSING, POLLUTION CONTROL, OIL SLICKS, MONITORING, EPA, ANALYTICAL ** 1221 TECHNIQUES. *LASER FLUCBESCENCE

```
1225 SOURCE IDENTIFICATION, OIL SPILIS, GC/MS, CRUDE GIL, ANALYTICAL TECHNIQUES
```

- 1242
- 1243
- CHROMATCGRAPHY, ANALYTICAL TECHNIQUES, SPECIROSCOPY, *FLUCRESCENCE, *IR ANALYSIS SEDIMENIS, PAH, LAKES, GEBRARY, *LAKE CONSTANCE FUEL CIL, CRUDE OIL, CHROMATGRAPHY, CHEMICAL ANALYSIS, TAR, *HIGH SPEED GEL 1244 PERMEATION METHOD
- PETROLEUM PRODUCTS, MODELS, FUEL OIL, DETECTION, SPECTROMETRY, STATISTICAL ANALYSIS SEAWATER, PHYTOPIANKTON, HYDROCAREONS, FRESHWATER, BIOGENIC HYDROCARBONS, 1245
- 1246
- EACT EBIA, *BEVIEW
 SOLUBILITY, FOSSII FUELS, CONTAMINANTS, CHEMICAL ANALYSIS, ANALYTICAL TECHNIQUES, R 156 *ORGANIC COMPOUNDS
- SEDIMENTATION, CCS, EENTHOS, BASELINE STUDIES, ALASKA, *ORGANIC DETRITUS, R197 *PETROLEUM POLLUTANTS
- SCURCES, CIL SLICKS, FOVEMENT, BEACHES, *TRINIDAD 1190
- SEDIMENTS, OFF SHORE DELILING, HYDROCARBONS, CONTAMINATION, BIOGENIC HYDROCARBONS, 1228 ATIANTIC COAST, *NCVA SCOTIA
- 1359 MORTALITY, HYDROCARBONS, FATE, CONTAMINATION, BIRDS, TOXICITY, SURFACTANTS, *REVIEW
- SHORELINES, POLLUTION CONTROL, MEDITERRANEAN SEA, ENVIRONMENTAL DETERIORATION, 1373
- CONTAMINATION, TAR
 POLLUTION CONTROL, OCEANS, INDUSTRIES, HYDROCARBONS, FRESHWATER, DETECTION, 1377
- 1378 SEDIMENTS, PAH, MEDITERBANEAN SEA, MARINE ORGANISMS, HYDROCARBONS, BIOLOGICAL EFFECTS, TAR, TANKERS
- PHYTOPLANRTON, PETROLEUM PRODUCTS, OCEANS, POOD WEB, CRUDE CIL, BIOLOGICAL 1379 EFFECIS, TOXICITY, * NEXTCK
- REGULATIONS, OFFSHORE DEVELOPMENT, OCEANS, MONITORING, ENVIRONMENTAL MANAGEMENT, DRILLING , BIOLOGICAL EFFECTS
- 1411 OIL SPILLS, OIL DISCHARGES, MICECCRGANISMS, EMULSIFICATION, BIODEGRADATION, BEHAVIOR, SPILL CLEANUP, *REVIEW
- 1422
- SEDIMENTATION, RIVERS, LAKES, HYDECCAREONS, WASHINGTON, *RUNOFF SEDIMENTS, PAH, MASSACHUSETTS, POSSIL FUELS, BUZZARDS BAY, AROMATIC HYDROCARBONS, 1451 *COMBUSTION
- OCS, HYDROCARBONS , R195 SEDIMENTATION, FATE, ALASKA , *NORTCN SCUND
- SPECTROMETRY, PHITOPLANKICH, FAH, CHEMICAL ANALYSIS, *FLUORIMETRIC DETERMINATION "HYDROCABECNS, CHECHATOGRAPHY, CHEMICAL ANALYSIS, *IR ANALYSIS 1226
- 1235
- CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, *IB ANALYSIS 1238
- SOURCE IDENTIFICATION, PETROLEUM PRODUCTS, MODELS, PUEL OIL, DETECTION, 1245 STATISTICAL ANALYSIS
- R194
- " SEDIMENTATION, SYDROCARBONS, PATE, CHRCMATOGRAPHY, BERMUDA SPECTROSCOPY, CHROMATCGBAPHY, ANALYTICAL TECHNIQUES, *CASE HISTORIES 1224
- 1232
- 1234
- PATENT, HYDROCAREONS, EETECTION, ANALYTICAL TECHNIQUES, WASTEWATERS SAMPLING, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, STATISTICS SOURCE IDENTIFICATION, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, *FLUORESCENCE, *IR 1242 ANALYSIS
- 1175
- SPILL CLEANUF, OIL TRANSFER, OIL TERMINALS, TANKERS, UK, *AMLWCH SPILL "SHORELINES, OIL SLICKS, DISFEBSANTS, EFACH CLEANUP, UK, *AMLWCH SPILL BIVERS, FIPELINES, OIL SPILLS, ILLINOIS, EPA 1176
- 1102
- 1183
- OIL SPILLS, GOVERNMENT AGENCIES, ENGLAND, CCASTS, *ELENI V SHIPS, OIL DISCHARGES, LEAKAGE, IRELAND, ENVIRONMENTAL EPPECIS, CONTABINATION SHIPS, RIVERS, NEW YORK, USCG, *HYGEADE NC. 2 EARGE SPILL NEW YORK, LEAKAGE, DETECTION, USCG 1184
- 1187
- 1189
- PORTS , INTERTIDAL 2CNE, FLORIDA, ENVIRONMENTAL EFFECTS, BAYS, USCG, *PORT SUTTON 1191 ** SPILL
- SOURCE IDENTIFICATION, FORTS , FICRIDA, EPA, USCG, *PORT SUTTON SPILL, *CLEANUP 1192 COSTS
- 1197 PIPELINES, INLAND, INCINEBATION, *UTAH
- 1199
- 1200
- HARBORS, DISPERSANTS, TANKERS, *SOUTH APRICA, *STAWANDA SPILL
 OIL SPILLS, BISSISSIFFI BIVER, ICUISIANA, TANKERS, USCG, *IRENE S. LEMOS SPILL
 CIL WELLS, LOUISIANA, LAKES, DOE, BLOWCUTS, SPILL CONTAINMENT, USCG, *STRATEGIC 1203 PETROLEUM RESERVE
- OIL WELLS, LOUISIANA, LAKES, DCP, BLCWCUTS, USCG, *STRATEGIC PETROLEUM RESERVE 1204
- SKIMMERS, PRODUCT INFORMATION, IRELAND, EQUIPMENT, DESIGN-ENGINEERING, *EANTRY BAY SKIMMERS, PRODUCT INFORMATION, EQUIFMENT, EKOFISK BLOWOUT, CESIGN-ENGINEERING 1253
- 1257
- OIL SLICKS, ENVIRONMENTAL EFFECTS, DISPERSANTS, BEACH CLEANUP, ANALYTICAL 1260
- TECHNIQUES, TOXICITY, *LICENSING, UK
 SKIMMERS, PATENT, HYDROCAREONS, EQUIPMENT, DESIGN-ENGINEERING
 PATENT, EQUIPMENT, *CLIBASCNIC TEANSDUCER
 PATENT, ENULSIFIESS, CISPERSANTS 1263
- 1266
- 1267
- SKIMMERS, IRELAND, GOVERNMENT AGENCIES, DISPERSANTS, CONTINGENCY PLANNING, COASTS, 1268 ECCMS, TANKERS
- 1270 PATENT, MICROORGANISMS, DISFEBSANTS, BICDEGRACATION
- SEAWATER, PRODUCT INFORMATION, OIL DISCHARGES, HYDROCARBONS, FRESHWATER, 1271
- BIODEGRADATION, BALLAST , EACTERIA ICE, FURL OIL, FATE, RUZZARDS BAY, BOUCHARD 65 SPILL, BEHAVICR PATENT, OIL SLICKS, INCINEFATION, *COMEUSTION 1274
- 1275

```
1276 SPILL CLEANUP, POLIUTION CONTROL, FATFAT, AESCRPTION, *MAGNETIC SORBENT POWDER
          PATENT, CIL-WATER SEPARATION, EQUIPMENT
1309
           SORBENTS, SKIMMERS, SINKING AGENTS, PERSONNEL TRAINING, MANUALS, IMCO,
1332
            DISPERSANTS, BOCAS
           POLLUTION PREVENTION, GOVERNMENT AGENCIES, ENGLAND, CONTINGENCY PLANNING
1334
           SOCIAL EFFECTS, ENVIRONMENTAL EFFECTS, ECONOMICS, ARCTIC, *REMOTE REGIONS POLLUTION PREVENTION, GUIF OF MEXICO, DEEPWATEB PORTS, COMPENSATION, *LOOP,
1368
1387
            *SPADCCK
           MICROORGANISMS, HIDRCCARBONS, BIODEGBATATION SOURCES, CIL SPILLS, CIL DISCHARGES, MICROORGANISMS, EMOLSIFICATION,
14.10
1411
            BIODEGRADATION, BEHAVICE, *REVIEW
            MICROORGANISMS, BIODEGRADATION, *FERTILIZER, *NITROGEN, *FHOSPHORUS
1414
           INCINEBATION, ICE, PATE, ESTUABLES, DISPERSANTS, BEHAVIOR, ARCTIC, *EXPERIMENTAL
1427
            OIL SPILLS
            SHIPS, REGULATIONS, POLLUTION PREVENTION, GUIDELINES, CONTINGENCY PLANNING, UK HYDROCARBONS, BICDEGRADATION, SURPACTANTS, WASTEWATER TREATMENT, *SOLUBILIZATION
1432
R158
       " HYDROCAREGNS , ABSORPTION, *STARCH POLYMERS
SPILL CONTAINMENT, OIL TRANSFEB, CIL SPILLS, LEAKAGE, JAPAN, TANKERS, *RYUYO MARU SPILL
R159
1185
          PIPELINES, LOUISIANA, LEAKAGE
1186
           PIPELINES, OIL SPILLS.
                                       INLAND, INCINERATION, *UTAH
1196
           SPILL CLEANUP, OIL WELLS, LCUISIANA, LARES, COE, BLOWOUTS, USCG, *STRATEGIC
1203
            PETROLEUM RESERVE
1247
           PATENT, HYDROCARBONS, EQUIPMENT, ECOMS, EFACHES
            PLATFORMS, PATENT, EQUIPMENT, BOCKS
1248
           POLLUTION CONTROL, FATENT, EQUIPMENT, BCGBS
1249
           PRODUCT INFORMATION, POLLUTION CONTROL, EQUIPMENT, CANADA, BOOMS, US, *FIELD TRIALS
1250
           PRODUCT INFORMATION, POILUTION PREVENTION, EQUIPMENT, DESIGN-ENGINEERING, SPILL
1255
            REMOVAL
       SPILL REMOVAL, SKIMMERS, PRODUCT INFORMATION, PATENT, EQUIPMENT, DESIGN-ENGINEERING,
1251
            *SSACV CIL SKIMMER
           SKIMMERS, PRODUCT INPORMATION, EQUIPMENT, DESIGN-ENGINEERING
1254
           SPILL CONTAINMENT, PRODUCT INFORMATICM, POLLUTION PREVENTION, EQUIPMENT,
1255
            DESIGN-ENGINEERING
           SKIMMERS, PRODUCT INFORMATION, EQUIPMENT, DESIGN-ENGINEERING, *DYNAMIC OIL SKIMMER PATENT, EQUIPMENT, DESIGN-ENGINEERING
1256
1258
           PETROLEUM PRODUCTS, PATENT, DISPEBSANTS, CRUDE OIL SKIMMERS, PATENT, CIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING, *VACUUMING
1259
1261
            SKIMMERS, PATENT, CII-WATER SEFABATION, EQUIPMENT, CESIGN-ENGINEERING SKIMMERS, PATENT, CII-WATER SEPARATION, EQUIPMENT
1262
1264
1272
            SEAWATER, PAIENT, PRESHWATER, PICDEGRADATION, *P & N COMPOSITIONS
1273
        **
           PATENT, EQUIPMENT, DESIGN-ENGINEERING, *OIL MOP
            SKIMMERS, RECLARATION, FRODUCT INFORMATION, EQUIPMENT
1329
1446
           POLLUTION CONTROL, OIL-WATER SEPARATION, EQUIPMENT, BILGES, BIBLIOGRAPHIES,
           BALLAST
       SPREADING, EVAPORATION, PEHAVIOR, *OIL FILM
        " OIL SLICKS, PATE, DRIFT
" OIL SLICKS, MODELS, PATE, DISTRIBUTION, BEHAVIOR, *PREDICTION
1367
1428
       STATISTICAL ANALYSIS, SAPETY, POLIUTION PREVENTION, INFORMATION SYSTEMS, TANKERS,
1198
            *RISK ANALYSIS, *MARINE MANAGEMENT SYSTEMS, INC.
1245
            SPECTROMETRY, SOURCE IDENTIFICATION, FETRCLEUM PRODUCTS, MODELS, FUEL OIL,
            DETECTION
        " MODELS, EMULSIONS, BEHAVIOR, *OIL-SUBFACTANT-WATER SYSTEMS
R198
       STATISTICS, SPECTROSCOPY, SAMPLING, CHRCMATCGRAFHY, ANALYTICAL TECHNIQUES
SAFETY, OFFSHORE DEVELOPMENT, INDUSTRIES, *RISK ANALYSIS
1234
1279
       STORAGE, PIPELINES, OIL TRANSPER, LCUISIANA, PEA, CRUDE OIL, *STRATEGIC PETROLEUM
            RESERVE
           POLLUTION PREVENTION, PATENT, LEAKAGE
ENVIRONMENTAL EFFECTS, EIS, CBUDE OIL, *STRATEGIC PETROLEUM RESERVE
LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE CIL, *STRATEGIC PETROLEUM RESERVE
LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE CIL, *STRATEGIC PETROLEUM RESERVE
1339
1394
1395
1396
1397
           LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, *STRATEGIC PETROLEUM RESERVE
1398
            OIL TRANSPORT, OII SEILIS, EIS, *STEATEGIC PETROLEUM BESERVE
1399
```

- ENVIRONMENTAL EFFECTS, EIS, *STRATEGIC PETROLEUM RESERVE
- 1490 11 OIL SPILLS, ZIS, *BRINE SFILLS, *BISK ABALYSIS, *STRATEGIC PETROLEUM RESERVE
- 1401 ENVIRONMENTAL EFFECTS, EIS, *STRATEGIC FETBOLEUM BESERVE
- 11 OIL TRANSPORT, CIL TERMINALS, OIL SPILLS, EIS, *RISK ANALYSIS, *STRATEGIC 1432 PETROLEUM RESERVE
- 1403 OIL SPILLS, ENVIRONMENTAL EFFECTS, BIS, *RISK ANALYSIS, *STRATEGIC PETROLEUM RESERVE
- 1351 SUBLETHAL EFFECTS, METABOLISM, FISH, EMULSIONS, DISPERSANTS, CRUDE CIL, TOXICITY, WEATHERING
- 1356
- MOBTALITY, HABITATS, CONTAMINATION, BIRDS, ACUTE EFFECTS, *WATERFOWL MODELS, MARINE ORGANISMS, FUEL CIL, BEHAVICE, *HEAT, *CHEMORECEPTION R 165
- " METABOLISM, HYDBOCARECNS, FISH, CONTAMINANTS, *BIOCHEMICAL EFFECTS 2175

```
R177
         REPRODUCTION, HYDROCARBONS, CRUDE OIL, BIRDS, BIOLOGICAL EFFECTS, TOXICITY,
         UPTAKE, *EGGS
```

- SUBLETHAL EFFECTS, MOILUSKS, HYDRCCARECKS, PISH, CRUSTACEANS, BIOLOGICAL EPFECTS, ASP, TOXICITY, *DEFENSE MECEANISMS R 178
- 1229 SURFACTANTS, SOLUBILITY, HYDRCCARECNS, CHERICAL ANALYSIS, AROMATIC HYDROCARBONS
- SEAWATER, MEDITERRANEAN SEA, CONTAMINANTS, ANALYTICAL TECHNIQUES, SOURCE INDENTIFICATION, *ELECTROANALYSIS 1241
- 1265
- PATENT, OIL SPILLS, EQUIPMENT, DISPERSION, CESIGN-ENGINEEBING SOURCES, MORTALITY, HICROCARBONS, PATE, CONTAMINATION, BIRDS, TOXICITY, *REVIEW SPILL CLEANUP, HYDROCARBONS, EICDEGRADATION, WASTEWATER TREATMENT, *SOLUBILIZATION 1359 R158
- ENVIRONMENTAL PROTECTION, DISPERSANTS, BEACH CLEANUP, *SURFACE TREATMENT AGENTS, R160 *FIELD TESTS
- RVEILLANCE, SAFETY, ENGLISH CHANNEL, TANKERS, *
 REMOTE SENSING, OIL SPILLS, FRANCE, EQUIPMENT SURVEILLANCE, SAFETY, *TRAFFIC CONTROL
- 1220
- 1346
- POLLUTION CONTROL, MCNITCRING, PCREIGN GOVERNMENTS, EUROPE, UK SEGREGATED EALLAST, SAFETY, POLLUTION PREVENTION, IMCO, GUIDELINES, CRUDE OIL 1431 WASHING, TANKERS, *INERT GAS SYSTEMS
 SWEDEN, ENVIRONMENTAL EFFECTS, COASTS, BIRDS,
- 1201
- SPILL CLEANUP, CIL TRANSFER, CIL TERMINALS, UK, *AMLWCH SPILL 1175 TANKERS.
- SURVEILLANCE, SAFETY, ENGLISH CHANNEL, *TRAFFIC 1178 CONTROL
- 1179
- OIL TRANSPER, JIL SPILLS, DISFEBSANTS, UK, *CHRISTOS BITAS SPILL OIL TRANSFER, OIL SPILLS, ENVIRONMENTAL EFFECTS, BIRDS, UK, *CHRISTOS BITAS SPILL, 1183 *SALVAGE OPERATIONS
- 1181
- 1185
- SHORELINES, GIL SPILLS, OIL SLICKS, UK, *CHRISTOS BITAS SPILL
 SPILL CONTAINMENT, OIL TRANSFER, OIL SPILLS, LEAKAGE, JAPAN, *RYUYO MARU SPILL
 SOURCE IDENTIFICATION, SAMPLING, IIABILITY, LAW EMPORCEMENT, PLORIDA, USCG, *PORT 1194 SUTTON SFILL
- STATISTICAL ANALYSIS, SAPETY, FOLIUTION PREVENTION, INFORMATION SYSTEMS, *RISK ANALYSIS, *MARINE MANAGEMENT SYSTEMS, INC.

 SPILL CLEANUP, HARBORS, DISPERSANTS, *SCUTH APRICA, *STANANDA SPILL

 SPILL CLEANUP, OIL SPILLS, MISSISSIFPI BIVER, LOUISIANA, USCG, *IRENE S. LEMOS
- 1199
- 1200 SPILL
- 1205 PATENT, OIL DISCHARGES, MCNITCRING, EQUIPMENT, DETECTION, BALLAST, ANALYTICAL TECHNIQUES
- 1268 SPILL CLEANUP, SKIMMERS, IRELAND, GOVERNMENT AGENCIES, DISPERSANTS, CONTINGENCY
- PLANNING, COASTS, EOCMS
 POLLUTION PREVENTION, CII TRANSFER, OIL TERMINALS, CIL DISCHARGES, CRUDE OIL 1277 WASHING, EALLAST
- 1340 SAPETY, REGULATIONS, PCILUTION PREVENTION, INTERNATIONAL CONVENTIONS,
- INTERNATIONAL AGREEMENTS
- SOURCES, SEDIMENTS, PAH, MEDITERRANEAN SEA, MARINE ORGANISMS, BYDROCARBONS, BICLOGICAL EFFECTS, TAR 1378
- OIL SPILLS, OIL INDUSTRY, INSURANCE, ECCNOMIC EFFECTS, DEVELOPMENT, *C HYDROCAREONS, BICLOGICAL EFFECTS, BASELINE STUDIES, BALLAST, ALASKA, 1382
- 1409 *TRANS-ALASKA PIPEIINE, *FCST VALCEZ
- SUBVEILLANCE, SEGREGATED BALLAST, SAFETY, POLIUTION PREVENTION, IMCO, GUIDELINES, 1431 CRUDE OIL WASHING, *INEST GAS SYSTEMS

 TAR, SWEDEN, ENVIRONMENTAL EFFECTS, CGASTS, BIBDS

 "SOURCE IDENTIFICATION, COASTS, CHESAPEAKE BAY, BEACH CLEANUP, USCG

 "SOURCE IDENTIFICATION, PUEL CII, CHUCE CIL, CHECHATOGRAPHY, CHEMICAL ANALYSIS,
- 1231
- 1232
- 1244 *HIGH SPEED GEL PERMEATION METHOD
- SOURCES, SHORELINES, POILUTION CONTEOL, MEDITEBRANEAN SEA, ENVIRONMENTAL 1373 DETERIORATION, CONTAMINATION
- TANKERS, SOURCES, SEDIMENTS, FAH, MECITERBANEAN SEA, MARINE ORGANISMS, 1378 HYDEOCARECUS , BICLOGICAL FFFECTS
- NATURAL SEEPAGE, HYDRCCARBONS , CHRCMATCGRAPHY, BIODEGRADATION, *HYPERSALINE 1418
- ENVIRONMENTS TEXAS, SEDIMENTS, HID AGCARBONS, GULF OF MEXICO, ENVIRONMENTAL EFFECTS, CHEMICAL ANALYSIS, ELOWOUTS 1381
- TOXICITY, SPILL CLEANUP, CIL SLICKS, ENVIRONMENTAL EFFECTS, DISPERSANTS, BEACH CLEANUP, ANALYTICAL TECHNIQUES, *LICENSING, UK 1260
- 1347
- 1348
- 1350
- 1351
- 1352
- CLEANUP, ANALYTICAL TECHNIQUES, *LICENSING, UK
 OIL SPILLS, HIDROCARPENS, ESTUABLES, *ENCTO-OXIDATION
 REPRODUCTION, PISH, CRUDE OIL, BIOLOGICAL EFFECTS, *RAINBOW TROUT
 FUEL OIL, CRUDE OIL, BIFDS, BICLOGICAL EFFECTS, *HATCHABILITY, *INCUBATION STAGES
 SUFLETHAL EFFECTS, METABOLISM, FISH, EMULSIONS, DISPERSANTS, CRUDE OIL, WEATHERING
 CRUDE OIL, BACTERIA, WSF, *REFINED CILS, *WEATHERED OILS
 FISH, BICLOGICAL EFFECTS, AROMATIC HYDROCARBONS, UPTAKE, *NAPHTHALENE, *PUNDULUS 1354 HETERCCLITUS
- , FATE, CONTAMINATION, BIRDS, *REVIEW SURPACTANTS, SOURCES, MCBTALITY, HYCBOCARBONS, FATE, CONTAMINATION, BIRD SOLUBILITY, POLYCEAETES, BICASSAY, ARCMATIC HYDROCARBONS, *FNA, *NEANTHES 1359
- 1360
- AR ENACECDENTATA
- METABOLISM, HYDROCARBONS, CRUSTACEANS, BIOLOGICAL EFFECTS, BIOASSAY, AROMATIC HYDROCARBONS, *ESTCARINE SHALEP SOURCES, PHYTOPLANKTON, PETROLEUM PRODUCTS, OCEANS, FOOD WEB, CRUDE OIL, 1365
- 1379 BIOLOGICAL EFFECTS, *NEKTON

- R 166 TOXICITY, PETROLEUM PRODUCTS, MARINE CRGANISMS, CRUEE CIL, WSF
- PETROLEUM PRODUCTS, MOLLUSKS, HYDROCARBONS, ESTUARIES, DELAWARE BAY, BIGASSAY, R168 *OYSTER INDUSTRY
- CRUDE OIL, CHEMICAL ANALYSIS, BLOASSAY, ALASKA, WSF R17) MARINE ORGANISMS.
- 9 17 1
- R172
- HIDNOCARBONS, HEALTH HAZARDS, FISH, BIBDS, *AITEBED MEMBRANE REFINERIES, FISH, BIOASSAY, ACUTE EFFECTS, WASTEWATERS SUBLETHAL EFFECTS, REPRODUCTION, HYDROCARBONS, CRUDE OIL, BIRDS, BIOLOGICAL R 177 EFFECTS, UPTAKE, *FGGS
- SUBLETHAL EFFECTS, MCLIUSKS, HYDECCAREGAS, FISH, CRUSTACEANS, BIOLOGICAL EFFECTS, R 178 18 WSF, *DEFENSE MECHANISMS
- 1175
- 1176
- UK, TANKERS, SPILL CLEANUP, OIL TRANSPER, OIL TERMINALS, *AMLWCH SPILL
 "SPILL CLEANUP, SHORELINES, CII SIICKS, EISPEESANTS, EFACH CLEANUP, *AMLWCH SPILL
 "CIL TERMINALS, OIL SLICKS, ESTUARIES, DISPERSANTS, COASTS, BIRDS, BIOLOGICAL 1177 EFFECTS, *ANLWCH SPILL
- 1179
- TANKERS, OIL TRANSFER, OIL SPILLS, DISPERSANTS, *CHRISTCS BITAS SPILL TANKERS, OIL TRANSFER, OIL SPILLS, ENVIRONMENTAL EFFECTS, BIRDS, *CHRISTOS BITAS SPILL, *SALVAGE OPERATIONS 1180
- 1181
- TANKERS, SHORELINES, OIL SPILLS, OIL SLICKS, *CHRISTOS BITAS SPILL TOXICITY, SPILL CLEANUP, CII SLICKS, ENVIRONMENTAL EFFECTS, DISPERSANTS, BEACH 1260
- CLEANUP, AMALYTICAL TECHNIQUES, *LICENSING SURVEILLANCE, POLLUTION CONTROL, MCMITCEING, FCREIGN GOVERNMENTS, EUROPE 1346
- SPILL CLEANUP, SHIPS, REGULATIONS, POLLUTION PREVENTION, GUIDELINES, CONTINGENCY 1432 PLANNING
- 1290
- ULTRAFILTRATION, EMULSIONS, WASTE CIL THEATMENT, WASTEWATERS UN, POLIUTION CONTROL, MONITORING, MEDITERRANEAN SEA, LEGISLATION, ENVIRONMENTAL 1341 MANAGEMENT, * UNEP
- SHIPS, POLLUTION PREVENTION, MONITORING, ENVIRONMENTAL PROTECTION, BIOLOGICAL 1372
- EFFECTS, *CONFERENCE, *GESAMP OIL SPILLS, OFFSHORE EXPLORATION, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, 1374 BIOLOGICAL EFFECTS, WASTEWATERS, *GESAME
- 1138
- 1447
- " SHIPS, POILUTION CONTROL, INTERNATIONAL CONVENTIONS, IMCO
 " OCEANS, LEGISLATION, ECONOMICS, BIBLIOGRAPHIES, *LAW OF THE SEA CONPEGENCE
 UPTAKE, FISH, CRUDE CII, CHEONIC EFFECTS, BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, 1349 WSF, *BENZENE, *TCLUENE
- TO XICITY, FISH, DIGLEGICAL EFFECTS, AROMATIC HYDROCARBONS, *NAPHTHALENE, *FUNDULUS HETERCCLITUS 1354
- 1355 FOOD WEB, FISH, BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, *CLUPEA HARENGUS PALLASI, *BENZENE, *EICHAGNIFICATICB
- SEDIMENTATION, RHCCE ISLAND, MOLLUSKS, HYDROCARBONS, FATE, BIOLOGICAL EFFECTS, 1421 BENTHCS, ATLANTIC COAST
- R 177 TO XICITY, SUBLETHAL EFFECTS, REFREDUCTION, HYDROCARBONS, CRUDE OIL, BIRDS,
- BIOLOGICAL EFFECTS, *EGGS
 US, SPILL CONTAINMENT, FRODUCT INFGREATION, POLLUTION CONTROL, EQUIPMENT, CANADA, 1250 SOCMS, *FIELD TRIALS
- REGULATIONS, POLLUTION PREVENTION, POLLUTION CONTROL, OIL REILS, INLAND, CONTINGENCY PLANNING, ALASKA 1336
- 1429 OCEANS, NOAA, MCNITORING, LEGISLATION, ENVIRONMENTAL EFFECTS, CONTAMINATION, *RESEARCH
- 143) POILUTION CONTROL, OCEANS, LEGISLATION, HEALTH HAZARDS, FRESHWATER, ENVIRONMENTAL PROTECTION, CONTINGENCY FLANNING
- R164 CIL SFILLS, CONTINGENCY PLANNING, *RESEARCH FUNDS
- 1187 USCG, SPILL CLEANUP, SHIPS, BIVERS, NEW YORK, *HYGEADE NO. 2 PARGE SPILL
- 1189 SPILL CLEANUP, NEW YORK, LEAKAGE, DETECTION
- SPILL CLEANUP, 1191 POSTS , INTERTIDAL ZONE, FLORIDA, ENVIRONMENTAL EFFECTS, BAYS, *PORT SCITON SPILL
- 1192 SPILL CLEANUP, SOURCE IDENTIFICATION, PORTS , FLORIDA, EPA, *PCET SUTTON SPILL. *CLEANUP COSTS
- 1193 SOURCE IDENTIFICATION, LIABILITY, LAW ENFORCEMENT, FLORIDA, *PORT SUTTON SPILL, *CLEANUP COSTS
- 1194 TANKERS, SOURCE IDENTIFICATION, SAMPLING, LIABILITY, LAW EMPORCEMENT, PLORIDA. *PORT SUTTON SPILE
- 1200 TANKERS, SPILL CLEANCP, OIL SPILLS, MISSISSIPPI RIVER, LOUISIANA, *IRENE S. LEMCS SPILL
- 1202 TAR, SOURCE IDENTIFICATION, COASTS, CHESAPEAKE BAY, BEACH CLEANUP
- SPILL CONTAINMENT, SPILL CLEADUF, CIL WELLS, LCUISIANA, LAKES, DOE, BLOWOUTS, 1233 *STRATEGIC PETRCLEUM BESERVE
- 1204 SPILL CLEANUP, OIL WELLS, ICUISIANA, LAKES , DCF, BLOWOUTS, *STRATEGIC PETROLEUM RESERVE
- 1433 USGS, SAFETY, REGULATIONS, OFFSHORE DEVELOPMENT, CCS, GOVERNMENT AGENCIES. ENVIRONMENTAL PROTECTION
- 1291 JSM, CIL-WATER SEPARATION, EMULSIONS, BILGES, WASTEWATER TREATMENT, *DEMULSIFICATION
- OIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING, COALESCENCE, BALLAST 1316
- " SEAWATER, RESIDUAL CILS, DETECTION, ANALYTICAL TECHNIQUES 8 155
- 1417 USSR, MICHOCRGANISMS, DISTRIBUTION, ELODEGRADATION, BACTERIA, *VARNA BAY

```
1296 VEGETATION, SOIL, ENVIRONMENTAL EFFECTS, DISPOSAL, DESIGN-ENGINEERING, WASTE CIL,
         *LAND APPLICATION
```

- WASHINGTON, POHTS , POLLUTION PREVENTION, PIPELINES, CANADA, *PACIFIC COAST, *BISK 1280 ANALYSIS, *TRANS-ALASKA FIFELINE
- SOURCES, SEDIMENTATION, BIVERS, LAKES, HYDROCARBONS, *RUNOFF 1422
- SEDIMENTS, SAMPLING, PUGET SOUND, NEUSTON, HYDROCARBONS, CHEMICAL ANALYSIS, R153 PLANKION
- WASTE CIL, INDUSTRIES, EMULSIONS, DISPOSAL, *LANDFILLS, *LEACHING, *PILOT STUDY *VEGETATION, SOIL, ENVIRONMENTAL EFFECTS, DISPOSAL, DESIGN-ENGINEERING, *LAND 1294 1296 APPLICATION
- REUSE, REPINERIES, BECLAMATION, PETECCHEMICALS, WASTEWATERS 1327
- 1328
- 1330
- REUSE, RECLAMATION, PATENT, EVAPORATION, EQUIPMENT, DISTILLATION RECLAMATICM, PATENT, LUBRICATING CII, *FEGENERATICM, *VACUUM STRIPPING SOLVENTS, RECLAMATION, PATENT, LUBRICATING OIL, DISTILLATION, *VACUUM STRIPPING 1331
- 1288 WASTE OIL TREATMENT, PATENT, BICDEGRACATION, *CATALYST
- 1290
- " ULTRAFILTRATION, EMULSIONS, WASTEWATERS
 WASTEWATERS, PRODUCT INFORMATION, OIL DISCHARGES, MONITORING, EQUIPMENT, DETECTION 1206
- REFINERIES, PRODUCT INFORMATICE, ECUITOBING, EQUIPMENT, ANALYTICAL TECHNIQUES, 1217 *PHOTCMETRIC ANALYZER
- SLUDGE , PATENT, MCNITCHING, DESIGN-ENGINEERING, *LASERS, *OIL FILM 1219
- 1232
- SPECTROSCOPY, PATENT, HYDROCAREONS, DETECTION, ANALYTICAL TECHNIQUES SAMPLING, REPINZRIES, EFA, CONTACINANTS, AFI, ANALYTICAL TECHNIQUES REFINERIES, ENVIRONMENTAL EFFECTS, *PROCESSING, *CATALCG 1283
- 1235
- WASTE OIL TREATMENT, ULTRAFILTBATION, EMULSIONS 1290
- 1295
- PETROCHEMICALS, MCCELS, EUROPE, COST ANALYSIS, BIOLOGICAL TREATMENT OIL-WATER SEPARATION, HYDROCARBONS, BICASSAY, FILTRATION, *FIOASSAY EFPLUENT, 1117 *SCREENT PIETRS
- WASTE OIL, REUSE, REFINERIES, RECLAMATION, PETROCHEMICALS 1327
- 10 1374 UN, OIL SPILLS, OFFSBORE EXPLORATION, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, BIOLOGICAL EFFECTS, *GESARF
- 1377 SOURCES, POLLUTION CONTROL, OCEANS, INDUSTRIES, HYDROCARBONS, PRESHWATER,
- R152
- R172
- DZIECIJON, BIOLOGICAL EFFECTS, BIODEGRALATION
 RECYCLING, CHRCHATOGRAPHY, CHEMICAL ANALYSIS, CARCINGENS
 TOXICITY, REFINERIES, FISH, BIOASSAY, ACUTE EFFECTS
 MARINE ORGANISMS, HYDROCARBONS, PCCD WEB, CONTAMINANTS, CALIFORNIA, *POLLUTANT R180 FLCW
- 1282 WASTEWATER TREATMENT, PRODUCT INFORMATION, CIL-WATER SEPARATION, PLOTATION, *ASPHALT PLANT, *CHIO RIVER
- 1284
- 1287
- 1289
- SORBENTS, PATENT, ABSCRETION
 REFINERIES, PATENT, FLOTATION, EQUIPMENT, *ABRATION TURBINE
 PATENT, CIL-WATER SEPARATION, *BEVERSE CSMCSIS
 USN, CIL-WATER SEPARATION, EMULSIONS, BILGES, *DEMULSIFICATION
 OIL-WATER SEPARATION, FICTATION, EMULSIFIERS, *COAGULATION 1291
- 1292
- PATENT, *PLUIDIZEC BECS 1293

REVIEW

- SORBENTS, PATENT, CII-WATER SEPARATION, ACSORPTION, *SORBENT PIEERS SORBENTS, PATENT, CII-WATER SEPARATION, ACSORPTION, *SORBENT FIBERS SORBENTS, PATENT, ACSORPTION 1297
- 1298
- 1299
- 1300
- SORBENTS, PATENT, ADSCRPTION SORBENTS, PATENT, CIL-WATER SEPARATION, ADSCRPTION, *SORBENT FIBERS OIL-WATER SEPARATION, *FUBIFICATION 1303
- 1304
- 1313 11
- 1319
- PATENT, CIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING PATENT, CIL-WATER SEPARATION, FUEL CIL, *SCREENT FIBERS REFINERIES, POILUTION CONTROL, PETROCHEMICALS, INDUSTRIES, ECONOMICS, BIBLIOGRAPHIES 1440
- SURFACTANTS, SPILL CLEANUP, HYDROCARBONS, BIODEGRADATION, *SCIUBILIZATION REFINERIES, MARINE CRGANISMS, FICASSAY R158
- 2161
- R162
- 1230
- 1375
- " REFINING, INDUSTRIES, *LAND APPLICATION
 WATER QUALITY, POLLUTION PREVENTION, INDUSTRIES, ANALYTICAL TECHNIQUES
 " OIL INDUSTRY, FISHERIES, ESTUARIES, ENVIRONMENTAL MANAGEMENT, *PROCEEDINGS
 WEATHERING, TOXICITY, SUELETHAL EFFECTS, METABOLISM, FISH, EMULSIONS, DISPERSANTS, 1351 CRUDE OIL
- WILDLIFE, OFFSHORE DEVELOPMENT, MAINE, LOUISIANA, FISH, ECOSYSTEMS, CCASTS, ATIANTIC COAST, *PACIFIC NCFIHREST
- UPTAKE, FISH, CRUDE CIL, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, *BENZENE, *TOLUENE 1349 WSF,
- 1352
- TO XICITY, CRUDE OIL, EACTERIA, * SEFINED OILS, *WEATHERED OILS FISH, CRUDE CIL, ARGMATIC HYDROCARBONS, ACCUMULATION, *CNCCRHYNCHUS KISUTCH, 1361
- *PLATICHTYS STELLATA 1419
- SOLUBILITY, PETROLEUM PRODUCTS, FATE, EVAPORATION, 32HAVICA, *IIGHT REFINED CILS TOXICITY, PETROLEUM ERCOUCTS, MAGINE CEGANISMS, COUDE OIL TOXICITY, MARINE CEGANISMS, CRUDE OIL, CHEMICAL ANALYSIS, BICASSAY, ALASKA R 166 9170
- R 178
- TO XICITY, SUBLETHAL EFFECTS, MCLIUSKS, EYDECCAREONS, FISE, CRUSTACEANS, EIOLOGICAL EFFECTS, *DEFENSE MECHANISMS YEASTS, OXIDATION, MICRCCAGANISMS, HYDROCARBONS, FUNGI, BIODEGRADATION, EACTERIA, * 1413

AUTHOR INDEX

(AGENCE NAT VALOR RECH) (BAILEY METERS&CONTRACT LTD) (BAIRD-ATCMIC) (BIOSPHERICS) (GCW-MAC INSTRUMENT) (IMPERIAL CHEM IND LTD) (IMPERIAL CHEM IND LTD) (IMPERIAL CHEM IND LTD) (INTERGOV CCEANOGR COMM) (LANKRO CHEMICALS GROUP LTD) (MATINE CONSTRUCT & DESIGN) (MCTIGHE IND) (MATURAL HC ELIMINATION CO) (CBRAS MARITIMAS CIVIL CA) (POLLUTION CONTROL ENG) (RAMBIE, INC) (SAFARE CROUZET SA) (SERLACHIUS (G A) O/Y) (SLICKBAR) (TELEDYNE ANALYTICAL INSTR) AARON, J.M. ABDEL-REHEIM, H. ALBANC, R.R. ALBERS, P.H. AMY, G. ANDERSEN, L.J. ANDERSEN, L.J. ANDERSEN, L.J. ANDERSEN, L.J. ANTONOVA, N.M. API AFLAS, R.M. ATLAS, R.M. ATLAS, R.M. ALJAS, R.M. BARTA, J. BARATHA, T. BABA, N. BARRETT, S.M. BARRETT, S.M. BARRETT, S.M. BARRETT, S.M. BARRETT, T. BARTLETT, T			
		BRCOKS, J.M. BPCWN, P.J. BRCWN, P.J. BROWN, P.J. BROWN, R.J. BRUNER, F. BUGLER, J. BURBANK, N.C. BURKS, S.L. BURKS, S.L. BURKS, S.L. BURROW, M. BUTLER, J.N. BUTLER, R.G. CAIRNS, J., JR. CALDER, J.A.	1381
(AGENCE NAT VALCE RECH)	1305	BROWN. P.J.	1274
(BAILEY METERS&CONTRACT LTD)	1205	BROWN, P.J.	1404
(BAIDD-ATCMIC)	1206	BROWN P.J.	1405
(BTCSDHERICS)	1208	BROWN, R.J.	1439
(COW_MAC INSTRUMENT)	1209	BRIINER F.	1223
(INDEDIAL CUEM IND ITE)	1265	BUGLER - J	1341
(IMPERIAL CHEM IND LED)	1210	DUDDANK N. C	R152
(IMPERIAL CHEM IND LID)	1310	BURDANK, N.C.	R161
(INTERGOV CCEANOGR COMM)	1402	DURKS, S.L.	
(LANKRO CHEMICALS GROUP LID)	1267	DURNS, S.L.	R172
(MARINE CONSTRUCT & DESIGN)	1259	BURROW, M.	1342
(MCTIGHE IND)	1314	BUTLER, J.N.	R194
(NATURAL HC ELIMINATION CO)	1271	BUTLER, R.G.	R171
(CBRAS MARITIMAS CIVIL CA)	1258	CAIRNS, J., JR.	1370
(PCLLUTION CONTROL ENG)	1329	CALDER, J.A.	1352
(RAMBIE, INC)	1212	CALDWELL, R.S.	R166
(SAFARE CROUZET SA)	1213	CANCINO, J.	1362
(SERLACHIUS (G A) O/Y)	1275	CALDER, J.A. CALDWELL, R.S. CANCINO, J. CARPENTER, R. CASTILLA, J.C. CASTILLA, J.C. CAVAGNARC, D.M. CHAKRABARTY, A.M.	R153 1353 1369 1440 R192
(SLICKBAR)	1301	CASTILLA, J.C.	1353
(TELEDYNE ANALYTICAL INSTR)	1217	CASTILLA, J.C.	1369
AARON, J.M.	R183	CAVAGNARC, D.M.	1440
ABDEL-REHEIM, H.	1381	CHAKRABARTY, A.M.	R192
ALBANC, R.R.	1258	CHASTAN-BAGNIS, L.	1261
ALBERS, P.H.	1350	CHESLER, S.N.	1227
AMY, G.	1380	CHESLER, S.N.	1231
ANBAR, M.	1245	CICCIOLI, P.	1223
ANDERSEN, L.J.	1339	CLARK, R.B.	1371
ANDERSON, J.W.	1365	CLEMENT, P.	1231 1223 1371 1235 R195
ANTONOVA, N.M.	1259	CLINE, J.	R195
API	1283	COCJIN, D.L.	1262
AREF'EVA, R.P.	1229	COLLEY, J.D.	1285
ARITA, H.	1284	COLWELL, R.R.	1222
ATEMA, J.	R165	CONNER, W.H.	1385
ATLAS, R.M.	1410	CORNER, E.D.S.	1412
ATLAS, R.M.	1411	COSOVIC, B.	1241
AZUMA, T.	1320	CHAKRABARTY, A.M. CHASTAN-BAGNIS, L. CHESLER, S.N. CHESLER, S.N. CICCIOLI, P. CLARK, R.B. CLEMENT, P. CLINE, J. COCJIN, D.L. COLLEY, J.D. COLWELL, R.R. CONNER, W.H. CORNER, E.D.S. COSOVIC, B. COTTON, F.C. COTTON, F.C. COX, B.A. DALE, J. DAVIES, G.A. DAVIS, H.T. DAY, J.W., JR. DE CASTRO, G. DEGAN, L. DEGEN, L. DELAMARE, G.R. DICKERMAN, J.C. DICKERMAN, J.C. DICKSON, K.L. DIMICHELLE, L. DOANE, W.M. DOW, R.L. EBERHARDT, L. ECHEVERRIA, T. EISENREICH, S.J. EL-DEFRAWY, M.K.	1330
BABA, N.	1453	COTTON, F.C.	1331
BAHR, L.M.	1385	COX, B.A.	1365
BAKER, B.A.	1409	DALE, J.	1228
BALLAST-NEDAM GROEP N. V.	1306	DAVIES, G.A.	1307
BARNETT, J.	1351	DAVIS, H.T.	R198
BARNETT; S.M.	R158	DAY, J.W., JR.	1385
BARRETT, B.R.	1430	DE CASTRO, G.	1220
BARTHA, R.	1411	DE CASTRO, G.	1343
BARTLETT, T.	1340	DEGAN. L.	1414
BARTLETT, T.	1435	DEGEN, L.	1272
BASARABESCU, T.D.	1321	DELAMARE, G.R.	1249
BAYLEY, D.P.	1307	DELAMARE, G.R.	1263
BENDER, E.	1207	DICKERMAN. J.C.	1285
BENNET, V.R.	1385	DICKSON, K.I.	1370
BENTZ, A.P.	1242	DIMICHELLE, L.	1354
BERNARD, B.B.	1381	DOANE, W.M.	R159
BERTONI, G.	1223	DOW . R. L.	R167
BLACKMAN, R.A.A.	1260	EBERHARDT, L.	R184
BLANCH, I'.W.	R191	FCHEVERDIA T	1355
BLANTON, J.C.	R193	EISENREICH, S.J.	R154
BLM	1389	EL-DEFRAWY, M.K.	1744
BLM	1390	ELDRIDGE, M.B.	
BLM	1391	ERI, J.	1355
B LM	1392	EWING, G.W.	1423 1224
BLM	139?		
BLOUNT, A.E.	1420	FALLAH, M.H. FANTA, G.F.	1424
BCEHM, P.D.	1421		R159
BCHNKE, H.	1243	FARRINGTON, J.W. FEA	1451
BCNDARYUK, T.P.	1292	FEA FEA	1279
BORGESE, E.M.	1384		1394
BRANDES, B.	1278	FEA	1795
BRANTCA, M.	1241	FEA	1396
BREUIL, C.	1241	FEA	1397
BROCK, T.D.	1413	FEA FEA	1793
		LEA	6 فرد 1

FEA	1400	KEIZER, P.D.	1228
FEA	1401	KIJIMA, J.	1239
FEA	1402	KINTER, W.B.	P]7]
FEA	1403	KLAUSEWITZ, W.	1449
FECHTER, H.R.	1345	KLEINHOLZ, C.W.	R172
FISCHER, I.A.	1274	KLINKOWSKI, P.R.	1290
FLETCHER, G.M.	1264	KOBA, T.	
FLETCHER, W.W.	1376		1323
FLORY, D.A.	1225	KOBAYASHI, Y.	1311
FOGET, C.R.	R160	KOBLANSKI, J.N.	1266
FRANKLIN, F.L.		KOONS, C.B.	1225
FRUMAN, D.H.	1260	KORENMAN, I.M.	1229
FUKANIYA, N.	1308	KORN, S.	1355
	1239	KOTANI, F.	1299
FUKANIYA, N.	1240	KOTANI, F.	1300
GALLOWAY, W.	1317	KOUTSANDREAS, J.D.	1221
GALT, J.	R199	KOZARAC, Z.	1241
GEL'FER, T.M.	1259	KURODA, K.	1453
GIBSON, R.R.	1309	LAFLAMME, R.E.	1451
GILFILLAN, E.	R167	LARRANCE, J.	R173
GLCYNA, E.F	R163	LARRANCE, J.D.	R197
GGETZINGER, J.W.	1330	LARRSON, R.	1312
GOETZINGER, J.W.	1331	LASKIN, A.I.	1270
GCNZALEZ, E.	1362	LATHAM, W.T.	1386
GORDON, D.C., JR.	1228	LEE, J.J.	R174
GREEN, R.E.	R152	LENIHAN, J.	1376
GREENE, H.G.	R189	LICHTENSTEIN, H.A.	1225
GRIFFIN, L.F.	1352	LINDUSKA, J.P.	1356
GRIGALUNAS, T.	R187	LISSAUER, I.M.	R200
GRIMMER, G.	1243	LITTLE, R.C.	
GRZIMEK, B.	1449		1291 1387
GUMP, B.H.	1231	LOUGHRY, T.	
		MACKAY, D.	1368
HABERCOM, G.E., JR.	1441	MACKAY, D.	1425
HADERCOM, G.E., JR.	1442	MACLEOD, W.	R151
HAGIWARA, K.	1244	MALINS, D.C.	R175
HAMMON, A.	1450	MALINS, D.C.	1361
HANSCN, S.	R167	MANSFIELD, B.H.	1333
HANSON, W.C.	R184	MARCH, G.L.	1357
HARRISCN, E.A.	1210	MARGARA, A.	1377
HASKIN, H.H.	R168	MARKOVETZ, A.J.	1413
HAYES, M.C.	1404	MARUYAMA, I.	1303
HAYES, M.O.	1405	MARUYAMA, I.	1326
HELLMANN, H.	1226	MASONGSCNG, A.M.	1262
HERRICKS, E.E.	1370	MATSUO, R.	1311
HERTZ, H.S.	1227	MATTHEWS, P.J.	1230
HERTZ, H.S.	1231	MAY, W.E.	1227
HIEFTJE, G.M.	R155	MAY, W.E.	1231
EIGASHI, K.	1244	MAYER, F.L.	R176
ATLPERT, L.R.	1227	MCCARTHY, P.M.	1713
HIRANC, F.	1366	MCGEE, R.	1268
HITES, R.A.	1451	MCKEOWN, B.A.	1357
HCDGINS, H.	R169	MCTIGHE, G.T.	1313
HCRIUCHI, K.	1286	MCTIGHE, R.T.	1313
HOULT, D.P.	1367	METZIAN, B.D.	1317
HOUSTON, C.W.	R153	MELFI, S.H.	1221
HUFFORD, G.L.	R200	MEN, S.K.	1292
	R167	MENA, C.	1353
HURST, J.W.		MEYERS, P.A.	1315
HYLAND, J.L.	1317		1404
IIJIMA, T.	1327	MICHEL, J.	
ILLIES, J.	1449	MICHEL, J.	1405
INCUE, I.	1428	MILLER, D.S.	R171
ITANI, F.	1297	MILLER, R.E.	R190
ITANI, F.	1293	MILLS, A.L.	1222
ITO, M.	1286	MITTLEMAN, J.	1316
IVANENKOV, V.N.	1215	MIZUCH, K.G.	1259
IWAMOTO, T.	1328	MOCHALOVA, O.S.	1259
JENKINS, S.H.	1436	MCHAN, R.R.	1270
JCBSKT, H.	1287	MCHRI, M.	1293
JODEHL, A.P.	1283	MCNTALVA, S.	1362
JONES, N.V.	1375	MCORE, W.S.	1512
KALMUTCHI, G.	1232	MORAN, J.	1221
KANDA, T.	1293	MORI, M.	1318
KAPLAN, I.B.	R196	MORIMURA, T.	1219
KAFINEN, J.	R170	MORRISON, R.	1302
KASHIMCTO, T.	1233	MORESCU, N.	12,5
	1319	MUSHA, M.	1319
KATO, C.	()17	FOOTH, N.	17.2

```
NAGAI, T.

NAKANUBA, A.

1123 SAMP, T.

1139 SCHERMORN, M.

1120 SCHERMORN, M.

1121 SCHERMORN, M.

1121 SCHERMORN, M.

1121 SCHERMORN, M.

1122 SCHERMORN, M.

1123 SAMP, T.

1131 SCHERMORN, M.

1124 SCHERMORN, M.

1125 SCHERMORN, M.

1126 SCHERMORN, M.

1126 SCHERMORN, M.

1127 SCHERMORN, M.

1126 SCHERMORN, M.

1127 SCHERMORN, M.

1127 SCHERMORN, M.

1128 SCHERMORN, M.

1129 SCHERMORN, M.

1129 SCHERMORN, M.

1120 SCHERMORN, M.

1121 SCHERMORN, M.

1121 SCHERMORN, M.

1122 SCHERMORN, M.

1124 SCHERMORN, M.

1125 SCHERMORN, M.

1126 SCHERMORN, M.

1127 SCHERMORN, M.

1128 SCHERMORN, M.

1128 SCHERMORN, M.

1129 SCHERMORN, M.

1120 SCHERM
```

WEIDEL, D.	1324
WELSH, J.P.	R200
WESTERMAN, P.W.	R162
WHISMAN, M.L.	1330
WHISMAN, M.L.	1331
WILL, E.	1324
WILLITS, K.L.	1336
WILSON, K.W.	1260
WISE, S.A.	1227
WCGMAN, N.A.	R157
WU, C.J.	R163
YAMAGATA, N.	1366
YAMAMOTO, O.	1286
YAMANOUCHI, H.	1419
YASUDA, S.	1239
YASUDA, S.	1240
YASUI, J.	1319
YOSHIDA, C.	1325
YCSHIMURA, S.	1325
YOUNG, D.R.	R180
YUZHANINOV, A.G.	1304
ZENNO, A.	1303
ZENNO, A.	1326
ZUTIC, V.	1241
ZVCNARIC, T.	1241

PATENT INDEX

PATENT	CITATION NO.	PATENT	CITATION NO.
Australian Patent		Japanese Kokai	
484,456	C-1310	77,101,860	C-1299
485,370	C-1205	77,105,653	C-1297
100,070	0 .200	77,105,654	C-1298
Belgian Patent		77,111,471	C-1319
	0 1006	77,116,646	C-1303
848,519	C-1306	77,119,293	C-1219
Duitich Detent		77,133,881	C-1318
British Patent		77,138,081	C-1311
1,445,692	C-1307	77,139,674	C-1328
1,447,037	C-1309	77,142,666	C-1323
1,456,891	C-1275	77,148,493	C-1320
1,456,985	C-1305	77,149,290	C-1322
1,481,850	C-1278	78 42,191	C-1325
1,484,512	C-1270		
1,485,716	C-1339	<u>Japanese Patent</u>	
Canadian Patent		77 43,629	C-1289
1,011,658	C-1273	Netherlands Application	
French Patent		76 14,136	C-1265
	0 1040	Daniel Date 1	
2,324,504	C-1249	Romanian Patent	
2,324,807 2,324,808	C-1263 C-1266	60,217	C-1232
2,327,534	C-1213	62,129	C-1321
2,328,801	C-1213 C-1258		
2,329,808	C-1247	Swedish Patent	
2,330,653	C-1267	393,996	C-1312
2,000,000	0 1207	395,471	C-1288
German Offenlegungsschrif	ften		0 .1200
2,652,329	C-1287	<u>US Patent</u>	
2,739,428	C-1272	3,929,644	C-1264
2,740,768	C-1293	4,008,156	C-1261
,		4,020,674	C-1345
German Patent		4,022,694	C-1308
1 772 510	C 1006	4,026,354	C-1342
1,773,510 1,775,046	C-1236	4,033,876	C-1262
1,775,040	C-1214	4,042,512	C-1313
Japanese Kokai		4,043,131	C-1248
		4,073,719	C-1330
77 49,749	C-1286	4,073,720	C-1331
77 69,884	C-1326		
77 72,387	C-1276	USSR Patent	
77 99,647	C-1284	596,547	C-1259
77,101,859	C-1300	84	0-1633
	•	0 1	

APPENDIX A

Periodicals Reviewed

Abstracts on Health Effects of Environmental Pollutants Alternatives: Perspectives on Society and Environment Ambio American Fisheries Society Transactions Analytical Chemistry Applied Ecology Abstracts Applied Energy Applied Microbiology Applied Science & Technology Index Aquatic Sciences & Fisheries Abstracts Audubon Australian Science Index Berichte der Deutschen Wissenschaftlichen Komission fuer Meeresforschung Bibliography and Index of Geology Biological Abstracts Bioresearch Index Bioscience British Birds British Library. Lending Division. Index of Conference Proceeding Received Bulletin of Environmental Contamination and Toxicology Bulletin of Marine Science Catalyst for Environmental Quality Chemical Abstracts Chemical and Engineering News Chemical Engineering Chemical Engineering Progress Chemical Week Chemistry in Canada Chemosphere Coastal Engineering Coastal Zone Management Journal Conservation News Current Contents: Life Sciences Current Contents: Physical and Chemical Sciences Deep-Sea Research/Oceanographic Bibliography Ecolibrium | Ecological Abstracts Ecological Modelling The Ecologist Ecology Law Quarterly Effluents & Water Treatment Journal Energy Information Abstracts Energy Review The Engineering Index Monthly Environment

Environment Abstracts

Environmental Action Environment Reporter Environmental Conservation Environmental Geology Environmental Health and Pollution Control Environmental Periodicals Bibliography Environmental Pollution Environmental Research Environmental Science & Technology Environmental Technology and Economics EPA Reports Bibliography Quarterly ERDA Energy Research Abstracts Estuarine and Coastal Marine Science Forthcoming International Scientific and Technical Conferences Fuel Abstracts and Current Titles Government Reports Announcements Groundwater Hydrocarbon Processing India Journal of Environmental Health Industrial Wastes Information Bulletin INTERDOK Directory of Published Proceedings International Aerospace Abstracts International Journal of Ecology and Environmental Science International Journal of Environmental Analytical Chemistry International Journal of Environmental Studies International Petroleum Abstracts Iranian Journal of Science and Technology The Journal of Applied Ecology Journal of Canadian Petroleum Technology Journal of Chromatography Journal of Environmental Science and Health, Part A Journal of Environmental Sciences Journal of the Institute of Water Pollution Control Journal of Petroleum Technology Journal of the Fisheries Research Board of Canada Journal of Toxicology and Environmental Health Limnology and Oceanography Marine Biological Association of the United Kingdom, Journal Marine Biology Marine Chemistry Marine Geology Marine Geotechnology Marine Policy Marine Pollution Bulletin Marine Science Contents Tables Marine Technology Marine Technology Society, Journal Maritime Research Information Service Abstracts Microbial Ecology National Fisherman National Research Council, News Report

National Wildlife

Nature

New Technical Books

Nippon Susan Gakkai Shi. Bulletin of the Japanese Society of

Scientific Fisheries

Ocean Engineering

Ocean Industry

Ocean Management

Oceanic Abstracts

Oceanus

Offshore

Oil and Gas Journal

Outdoor California

Pacific Oil World

Petroleum Abstracts

Petroleum Engineer International

Petroleum Today

Pollution Abstracts

Pollution Engineering

Proceedings in Print

Progress in Water Technology

Rapports et Proces Verbaux

Resources

Resource Recovery and Conservation

Royal Society of London, Proceedings, Series B, Biological Sciences

Science

The Sciences

Science News

Science of the Total Environment

Scientific and Technical Aerospace Reports

Scientific Meetings

Sea Frontiers

Sea Secrets

Sea Technology

Selected Water Resources Abstracts

Shore and Beach

Summaries of Foreign Government Environmental Reports

Technical Book Review

Technology Review

Toxicity Bibliography

Toxicology

UDS Water Quality Control Digest

Underwater Information Bulletin

Underwater Naturalist

Waste Materials Biodegradation Research Titles

Water, Air and Soil Pollution

Water & Pollution Control

Water & Wastes Engineering

Water Pollution Control Federation, Journal

Water Research

Western Fisheries

World Meetings: Outside United States and Canada

World Meetings: United States and Canada

DEDONT DEDIOD	DUDI TOATTON DATE	EDA ACCECCION NUMBER	NITTO ACCEPCTON NUMBER	DDICE DED CODY.
REPORT PERIOD	PUBLICATION DATE	EPA ACCESSION NUMBER	NTIS ACCESSION NUMBER	PRICE PER COPY*
Jul 74-Oct 74	Mar 1975	EPA 670/2-75-003	PB 240-719	9.25
Nov 74-Feb 75 Feb 75-Apr 75 May 75-Jul 75 Aug 75-Oct 75	May 1975 Jun 1975 Jul 1976 Jul 1976	EPA 670/2-75-044 EPA 670/2-75-059 EPA 600/2-76-129 EPA 600/2-76-113	PB 242-542 PB 243-724 PB 258-852 PB 258-745	10.75 9.50 12.00 11.75
Nov 75-Jan 76 Feb 76-Apr 76 May 76-Jul 76 Aug 76-Oct 76	Jul 1976 Aug 1976 Oct 1976 Feb 1977	EPA 600/2-76-185 EPA 600-2-76-215 EPA 600/2-76-266 EPA 600/2-77-037	PB 257-886 PB 259-932 PB 264-870 PB 267-266	12.50 11.75 12.50 11.75
Nov 76-Jan 77 Feb 77-Apr 77 May 77-Jul 77 Aug 77-Oct 77	Apr 1977 Jun 1977 Nov 1977 Jan 1978	EPA 600/2-77-075 EPA 600/2-77-111 EPA 600/2-77-243 EPA 600/2-78-005	PB 268-248 PB 272-689 PB 276-691 PB 281-114	11.75 12.50 13.00 11.00
Vol 5 No. 1 (Nov 77-Jan 78)	Apr 1978	EPA 600/2-78-071	PB 281-671	9.25
Vol. 5 No. 2 (Feb 78-May 78)	Aug 1978	EPA 600/7-78-160	PB 287-071	10.75
Vol. 5 No. 3 (Jun-Sep 78)		Submitted 10/78	PB**	**
Vol. 5 No. 4 (Oct-Dec 78)		Submitted 1/79	PB**	**

These documents are available to the public through the National Technical Information Service (NTIS), Springfield, Virginia 22161, USA. NTIS requests prepayment for each order and will add a \$5.00 service charge for each order not accompanied by payment. Telephone orders to NTIS are accepted at (703) 557-4650.

^{*}Price listed include postage and handling fees.

^{**}Information is or will be available from NTIS.

TECHNICAL REPORT DATA (Please read Instructions on the reverse before completing)			
REPORT NO. 2. EPA-600/7-79-040	3. RECIPIENT'S ACCESSION NO.		
OIL POLLUTION REPORTS	5.REPORT DATE February 1979 issuing date		
Vol. 5 No. 4 (October 1978 - December 1978)	6. PERFORMING ORGANIZATION CODE		
AUTHOR(S) Helmut Ehrenspeck, Elizabeth Sorenson, Barbara Searles, Katherine Osteryoung, and Ivana Roland	8. PERFORMING ORGANIZATION REPORT NO.		
PERFORMING ORGANIZATION NAME AND ADDRESS MARINE SCIENCE INSTITUTE	10. PROGRAM ELEMENT NO.		
University of California	11, CONTRACT/GRANT NO.		
Santa Barbara, California 93106	R-805803-01-0		
2. SPONSORING AGENCY NAME AND ADDRESS	13. TYPE OF REPORT AND PERIOD COVERED		
Industrial Environmental Research Lab Cinn, OH	Quarterly, Oct.78-Dec. 78		
Office of Research and Development	14. SPONSORING AGENCY CODE		
U.S. Environmental Protection Agency Cincinnati, Ohio 45268	EPA/600/12		

6. ABSTRACT

5. SUPPLEMENTARY NOTES

OIL POLLUTION REPORTS (formerly OIL SPILL AND OIL POLLUTION REPORTS) is a quarterly compilation of abstracts of current oil pollution related literature, research projects, and conferences. Comprehensive coverage of terrestrial and aquatic oil pollution and its prevention and control is provided, with emphasis on the marine environment. The report contains (a) citations and summaries of 1976 to 1978 scientific and technical publications, and patents; (b) status and summaries of current research programs; and (c) information on current meetings. This report is submitted in partial fulfillment of EPA Grant No. R-805803-01-0 by the Marine Science Institute, University of California, Santa Barbara, under the sponsorship of the U.S. Environmental Protection Agency.

7. KEY WORDS AND DOCUMENT ANALYSIS			
DESCRIPTORS	c. COSATI Field/Group		
Abstracts Bibliographies Research Patents Subject indexing	Oil pollution Oil spill events Oil spill research Oil pollution control Oil pollution patents	13B	
DISTRIBUTION STATEMENT	19. SECURITY CLASS (This Report) UNCLASSIFIED	21. NO. OF PAGES 203	
RELEASE TO PUBLIC	20. SECURITY CLASS (This page) UNCLASSIFIED	22. PRICE	

101-049

SUMMARY: This 1979 EPA document is a compilation of

abstracts of oil pollution-related literature, research projects, and meetings. Comprehensive coverage of terrestrial and aquatic oil pollution and its prevention and control is provided, with an emphasis on the marine environment. Pollution prevention topics include, but are not limited to, reclamation and reuse, oil-water separation, and

oil transfer and transport.

KEYWORDS: Reuse, oil recovery, oily waste, reclamation

SIC CODE: 9511

101-049

SUMMARY:

This 1979 EPA document is a compilation of abstracts of oil pollution-related literature, research projects, and meetings. Comprehensive coverage of terrestrial and aquatic oil pollution and its prevention and control is provided, with an emphasis on the marine environment. Pollution prevention topics include, but are not limited to, reclamation and reuse, oil-water separation, and oil transfer and transport.

KEY WORDS:

oil pollution prevention, oil reclamation and reuse,

oil récovery, vily wask, phase spandien

SIC CODE 9511