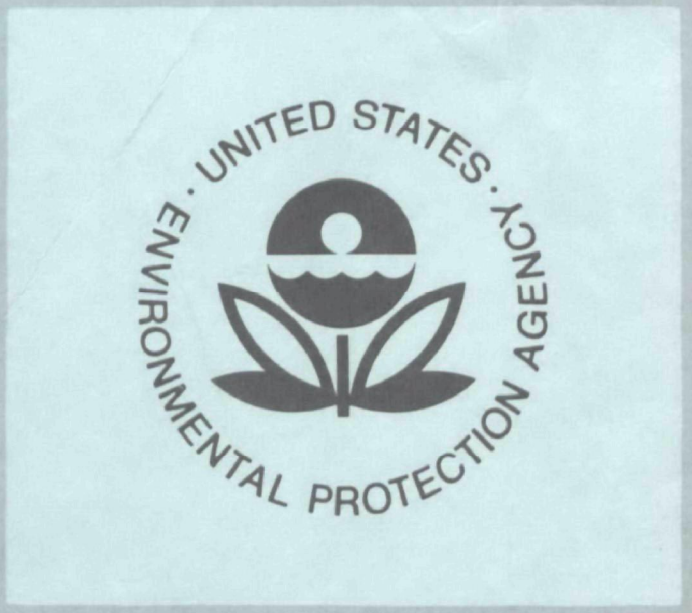
EPA-600/2-77-111
June 1977

Environmental Protection Technology Series

OIL SPILL AND OIL POLLUTION REPORTS
February 1977 - April 1977



Industrial Environmental Research Laboratory
Office of Research and Development
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Cincinnati, Ohio 45268

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:

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This report has been assigned to the ENVIRONMENTAL PROTECTION TECHNOLOGY series. This series describes research performed to develop and demonstrate instrumentation, equipment, and methodology to repair or prevent environmental degradation from point and non-point sources of pollution. This work provides the new or improved technology required for the control and treatment of pollution sources to meet environmental quality standards.

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EPA-600/2-77-111
June 1977

OIL SPILL AND OIL POLLUTION REPORTS

February 1977 - April 1977

by

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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 material 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

A B S T R A C T

OIL SPILL AND OIL POLLUTION REPORTS is a quarterly bulletin designed to review current scientific and technical publications and research projects in the field of oil pollution. Subject coverage includes all aspects of aquatic and terrestrial oil pollution. This issue contains summaries of research projects and published information selected from the scientific and technical literature during the period February, 1977 through April, 1977.

The following sections are included in the report:

I. Reports, Publications, and Patents

II. Current Research Projects

III. Current Oil-Related Conferences

This report is submitted in partial fulfillment of EPA Grant No. R805052-01 by the Marine Science Institute, University of California, Santa Barbara, California, under the sponsorship of the Environmental Protection Agency.

CONTENTS

Page

Abstract iv

Acknowledgments viii

Introduction ix

Abbreviations - Acronyms x

Sections

I. Reports, Publications, and Patents

A. Oil Pollution Detection and Evaluation

1. Reporting 1

Oil Discharges in U.S. Waters - 1975 12

2. Monitoring 18

3. Remote Sensing. 29

4. Sampling. 33

5. Analysis. 36

6. Source Identification 49

B. Oil Pollution Prevention and Control

1. Containment 51

2. Cleanup and Recovery. 54

3. Restoration 73

4. Oil Transfer and Transport. 75

5. Waste Treatment and Disposal Methods. 82

6. Reclamation and Reuse 100

7. Personnel Training and Education. 102

8. Contingency Planning 104

9. Prevention and Control Measures 108

C. Effects of Oil Pollution Page

1. Biological Effects 118

2. Economic Effects 144

3. General Effects 145

D. Effects of Oil Exploration and Production

1. Biological Effects 150

2. Physical Effects 152

3. Social Effects 153

4. Economic Effects 154

5. General Effects. 155

E. Fate of Oil in the Environment

1. Biodegradation 179

2. Physical Changes 198

3. Chemical Changes 200

4. General Fate of Oil. 201

F. Oil Pollution Regulations

1. U.S. Legislation 213

2. Standards and Guidelines 216

3. Agreements and Conventions 218

G. Bibliographies 219

II. Current Research Projects

A. Oil Pollution Detection and Evaluation

1. Monitoring 221

2. Remote Sensing 223

3. Analysis 225

B. Oil Pollution Prevention and Control Page

1. Containment 226

2. Cleanup and Recovery. 226

3. Oil Transfer and Transport. 227

4. Waste Treatment and Disposal Methods. 228

C. Effects of Oil Pollution

1. Biological Effects. 230

2. Chemical Effects. 235

3. General Effects 235

D. Effects of Oil Exploration and Production

1. General Effects 239

E. Fate of Oil in the Marine Environment

1. Biodegradation 241

2. General Fate of Oil 245

III. Current Conferences 248

Master List of Keywords 256

Subject Index 261

Author Index . . . . . .

Appendix. . . . . .

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The authors appreciate the assistance of Ms. Kathy Courtney and Ms. Patti Thurston in typing the camera-ready copy of Oil Spill and Oil Pollution Reports. We also wish to thank the personnel of the Science-Engineering Library, University of California, Santa Barbara, for their assistance during the research stages of the project.

INTRODUCTION

OIL SPILL AND OIL POLLUTION REPORTS is a quarterly bulletin which reviews pertinent scientific and technical publications and research projects to provide its readers with current developments in the field of oil pollution. This issue contains summaries of articles, reports, patents, documents, and other materials relating to oil pollution published during the period 1974 to 1977 (Section I); summaries and status of current research projects (Section II); and current oil-related conferences (Section III).

Subjects covered include all aspects of aquatic and terrestrial oil pollution. Items in Section I are categorized by seven major subdivisions which are divided into thirty-one specific subject categories. These are presented in the Table of Contents. Patents and patent applications are announced under appropriate subject categories. Subject and author indexes for entries in Section I are provided at the end of the report. A list of the periodicals reviewed in preparing this series appears in the Appendix.

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 were obtained from the Smithsonian Science Information Exchange (SSIE); American Society for Microbiology, Aquatic Microbiology Newsletter; and Canada, Department of the Environment, Spill Technology Newsletter. Entries are arranged according to the same subject categories as in Section I and are ordered by serial number within each subject division. Some of the current projects listed in previous Oil Pollution Reports have been recently renewed. These projects have been relisted and headed by the same serial number as originally reported, followed by the word (renewal). Renewal entries are listed at the beginning of each subject category.

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

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.

ABBREVIATIONS

atm	atmosphere
bbl	barrel
°C	degrees Centigrade
cm	centimeter
dwt	dead weight ton
°F	degrees Fahrenheit
ft	foot
g	gram
gal	gallon
GLC	gas-liquid chromatography
gpd	gallons per day
gph	gallons per hour
gpm	gallons per minute
ha	hectare
hr	hour
i.e.	(id est), that is
in	inch
IR	infrared
kg	kilogram
km	kilometers
kn	knot
l	liter
lb	pound
LNG	liquefied natural gas
LOT	load on top
LPG	liquefied petroleum gas
m	meter
mg	milligram
mi	mile
min	minute
ml	milliliter
mm	millimeter
OCS	outer continental shelf
oz	ounce
PAH	polycyclic aromatic hydrocarbon
pH	the negative log of the H ion concentration
ppb	part per billion
ppm	part per million
sp.	species
TLC	thin-layer chromatography
U.S.	United States
USSR	Union of Soviet Socialist Republics
UV	ultraviolet
VLCC	very large crude carrier
wt	weight
yr	year
μ	micron
%	percent
/	per

ACRONYMS

API	American Petroleum Institute
BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
EPA	Environmental Protection Agency
ERDA	Energy Research and Development Administration
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	National Technical Information Service
UN	United Nations
USCG	United States Coast Guard (DOT)
USGS	United States Geological Survey
USDI	United States Department of Interior
USDA	United States Department of Agriculture
USN	United States Navy

SECTION I. REPORTS, PUBLICATIONS, AND PATENTS

A. OIL POLLUTION DETECTION AND EVALUATION

1. REPORTING

C-0449-77
COUNTING THE BIRDS (news brief)
Anon. 1976.
Marine Pollution Bulletin 7(12):221.

Contamination, Birds, Coasts, UK, *Mortality

The Beached Bird Survey in the United Kingdom is described in which volunteers walk coastlines five times during each winter to check for stricken birds. From their records of birds found, species, sex, and extent of oil pollution, the Royal Society of the Protection of Birds has been able to develop a picture of the oil pollution problem as it affects birds in the UK, and its variations both regional and seasonal.

C-0450-77
AN EPIDEMIC OF OIL SPILLS (news brief)
Anon. 1977.
Environmental Action (8)17:15.

Oil spills, Tankers, Regulations, Tar, Argo Merchant spill, *Liberian tankers

Eight Liberian tankers were involved in oil spill incidents over a three week period; the largest spill was caused by the grounding and breaking up of the "Argo Merchant". Liberian tanker regulations are discussed and API's investigation into tar balls is reported.

C-0451-77
EXPLOSION RISK ON SUPERTANKERS (news brief)
Anon. 1976.
Marine Pollution Bulletin 7(12):219.

Tankers, Oil tanks, Cleanup, *Explosions, *Safety systems

A report at a London shipping seminar stated that hundreds of oil-carrying supertankers could explode during tank cleaning at

sea if a malfunction occurs in a built-in safety system specifically designed to reduce the risk of a vessel blowing up during the operation. The explosion of the Norwegian tanker, "Berge Istra", is briefly discussed as an example of a disaster caused by such a malfunction.

C-0452-77
L.A. TANKER BLAST BAD NEWS FOR OIL (news brief)
Anon. 1976.
Oil and Gas Journal 74(52):90.

Tankers, Oil industry, Development, Southern California, *Sansinena explosion

The oil tanker "Sansinena" explosion is discussed and the possible effects of this event on oil development and the oil industry in Southern California are presented. Alaskan oil and liquefied natural gas are mentioned specifically.

C-0453-77
NATO AND OIL (news brief)
Anon. 1976.
Marine Pollution Bulletin 7(12):220.

Offshore development, North Sea, Oil spills, Leakage, Contingency planning, *NATO

The director-general of the Norwegian Ministry of the Environment stated at a NATO meeting that the danger of a serious leak from North Sea oil fields was becoming more acute as offshore oil activities increased in the North Sea. He recommended that NATO countries concerned should prepare for such a disaster by organizing joint exercises on emergency procedures.

C-0454-77
NORTH SEA OIL SPILL AVERTED (news brief)
Anon. 1977.
Marine Pollution Bulletin 8(1):4.

Oil spills, Offshore production, Platforms, North Sea, *Oxygen corrosion

The shutdown of a British Petroleum offshore platform to stop the spillage of oil from a pipe fracture is described; the effects of oxygen corrosion on steel pipes are discussed.

C-0455-77
OIL SPILLS IN GULF OF MEXICO DOCUMENTED (news brief)
Anon. 1976.
Sea Technology 17(12):31.

Oil spills, Environmental effects, Gulf of Mexico, OCS, *USGS report

A 47 page report, "Oil Spills, 1971-1975, Gulf of Mexico Outer Continental Shelf", published as U.S.G.S. Circular 741, is available free from the U.S. Geological Survey's Branch of Distribution, 1200 South Eads St., Arlington, VA 22202. Accounts of oil spills, their causes and environmental effects are reported.

C-0456-77
OIL TROUBLES WATERS (news brief)
Anon. 1977.
Chemical Week 120(1):15.

Oil spills, Tankers, Cleanup, Argo Merchant spill, *Olympic Games spill, *Sansinena spill

The recent oil tanker disasters of the "Argo Merchant", "Olympic Games", and "Sansinena" are briefly reviewed and cleanup measures are discussed.

C-0457-77
POURING TROUBLED OIL ON ATLANTIC WATERS (news brief)
Anon. 1977.
Science News 111(1):6.

Oil spills, Atlantic coast, Tankers, Environmental effects, Argo Merchant spill

The grounding of the oil tanker, "Argo Merchant", is reviewed and the possible environmental effects of the spilled oil are discussed.

C-0458-77
RESOURCE DEVELOPMENT - PROCESSES AND PROBLEMS: THE 27TH ALASKA SCIENCE CONFERENCE, SPONSORED BY THE ALASKA DIVISION OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE AND HELD AT THE UNIVERSITY OF ALASKA, FAIRBANKS, ALASKA, 4-6 AUGUST 1976.
Anon. 1976.
Environmental Conservation 3(4):310.

Pipelines, Offshore development, OCS, Environmental effects, Economics, Alaska, *Trans-Alaska pipeline

Over 125 papers and several panel discussions were presented at this conference on the current status of resource development in

the North, with special reference to Alaska. Topics discussed included environmental impacts of the trans-Alaska pipeline, environmental problems associated with the exploration of the proposed outer continental shelf oil reserves, and biological, social, and economic concerns related to current development in the North.

C-0459-77
A TANKER GOES AGROUND
Anon. 1976.
Safety at Sea International 85:16-17.

Oil spills, Tankers, Environmental effects, Cleanup, Alaska, *Cold Bay

An account is given of the grounding of the tanker, "Hillyer Brown", and the subsequent oil spill. The environmental effects of the spill on the Cold Bay, Alaska ecosystem are discussed and the U.S. Coast Guard's attempt to clean up the spilled oil is described.

C-0460-77
URQUIOLA SPILL (news brief)
Anon. 1977.
Marine Pollution Bulletin 8(1):3.

Oil spills, Contamination, Coasts, Spain, *Shellfish, *Urquiola spill

The damage to the Spanish shellfish industry due to the oil contamination of 320 km (200 mi)of coastline is discussed and the cause of the Urquiola disaster is reviewed.

C-0461-77
THE CRUDE OIL POLLUTION OF SAND BEACH BY THE ACCIDENT OF A TANKER "THE JULIANA" OFF NIIGATA COAST IN 1971
Aoki, S., K. Chihara, I. Kobayashi, and K. Taguchi. 1975.
Science Report of Niigata University Series E, No. 3. p. 51-62.

Oil spills, Crude oil, Tankers, Spreading, Movement, Cleanup, Dispersants, Beaches, Japan

The grounding of a tanker near the port of Niigata, Japan, in late November 1971, and the resultant crude oil spill are chronologically reviewed. The spreading and movement of the spill onto beaches and efforts to chemically disperse the spilled oil on water and land are described in detail.

C-0462-77
ESTIMATING THE POTENTIAL FOR FUTURE OIL SPILLS FROM TANKERS, OFFSHORE DEVELOPMENT, AND ONSHORE PIPELINES
Beyer, A. H., and L. J. Painter. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 21-30. (American Petroleum Institute No. 4284.)

Oil spills, Statistics, Tankers, Offshore development, Pipelines, *Spill predictions

Historical spill statistics are summarized and techniques and equations are described to predict possible future oil spillage from marine tankers, offshore petroleum development facilities, and cross-country pipelines. Information compiled indicates that word-wide tanker spills can be expected to occur within 80 km (50 miles) of land an average of one in every 1,000 vessel port-calls, with an average size of 7,100 bbl and average spill rate of about 87 bpmb (bbl per million bbl). Average spill rates from offshore oil facilities and cross-country pipelines are estimated to be about 72 bpmb and 3.6 bpmb, respectively.

C-0463-77
OIL AND GAS SEEPS IN ALASKA. NORTH-CENTRAL GULF OF ALASKA
Blasko, D. P. 1976.
U.S. Bureau of Mines, Report of Investigation, RI8136. 123p.

Natural seepage, Hydrocarbons, Chemical analysis, Gulf of Alaska

Results presented of a study of oil and gas seeps in the Katalla River - Bering River and Cape Yakataga - Yakutat Bay regions of Alaska. The activity and characteristics of previously reported hydrocarbon seeps were investigated, and the bitumen content of drainages associated with seeps was determined.

[from Chemical Abstracts 86(4):#19197s. 1977]

C-0464-77
THE STATISTICAL PICTURE REGARDING DISCHARGES OF PETROLEUM HYDROCARBONS IN AND AROUND UNITED STATES WATERS
Boyd, B. D., C. C. Bates, and J. R. Harrald. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 38-53. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Statistics, Oil discharges, U.S., Information systems

Statistics regarding the discharge of petroleum hydrocarbons in and around U.S. waters in 1974 are tabulated and discussed. The

information is taken from the 1975 National Academy of Sciences study "Petroleum in the Marine Environment", and data from the USCG Pollution Incident Reporting System (PIRS). The nature and objectives of these two data bases are briefly compared.

C-0465-77
OIL AND SALT WATER SPILLS IN THE PROVINCE OF ALBERTA
Brushett, E. R. 1975.
Conference on the Environmental Effects of Oil and Salt Water Spills on Land, Banff, Alberta, 1975. Alberta Environment, and University of Calgary, 1975. p. 12-20.

Oil spills, *Salt water spills, Statistics, Pipelines, Canada, *Alberta

With an annual output of over 500 million barrels of oil per year and nearly 190 million barrels of salt water accompanying the oil, some salt water and oil spills in Alberta are certain to occur. Spill statistics for Alberta are reviewed and analyzed for the years 1972 to 1975. It is concluded that pipeline breakage and corrosion represent the greatest inland source of salt water and oil spills.

C-0466-77
ENVIRONMENTAL EFFECTS OF SCHUYLKILL OIL SPILL II, JUNE 1972
Environmental Protection Agency. 1975.
EPA/430/9-75/019. 205p.

Oil spills, Waste oil, Rivers, Environmental effects, Vegetation, Pennsylvania, *Schuylkill spill

About 23 to 30 million liters (six to eight million gal) of waste crankcase oil rerefined sludge were spilled into the Schuylkill River, Pennsylvania, during a flood. No direct permanent effects were noted; however, higher concentrations of lead and zinc were observed downstream. Concentrations of lead and petroleum hydrocarbons in sediments were higher at downstream stations. Concentrations of lead in downstream benthic macrofauna were also higher.

[from Government Reports Announcements 76(25):#PB-258 412/6GA. 1976]

C-0467-77
OIL SPILLS AND SPILLS OF HAZARDOUS SUBSTANCES
Environmental Protection Agency, Oil and Special Materials Control Division. 1977.
Environmental Protection Agency. 40p.

Oil spills, Biological effects, Pollution prevention, Cleanup, Surveillance, International agreements

This document describes some of the more significant spill incidents and the mechanisms, both managerial and technological, to deal with them. Included in the contents are: effects of spills; prevention of spills; responding to spills; spill surveillance, spill incidents; spills of hazardous substances; international cooperation; and EPA regional offices.

C-0468-77
AN ESTIMATE OF THE AMOUNT OF OIL ENTERING THE OCEANS
Grossling, B. F. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 6-37. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Statistical analysis, *Oil input, Sources, Oceans, Crude oil, Waste oil, Oil discharges, Tankers, Natural seepage

The annual world ocean inputs of crude oil and petroleum products from natural and manmade sources were estimated for the year 1972. Spent lubricants contributed about 2.6 million m tons (17.1 million bbl); oil industry accidents, about 960,000 m tons (6.4 million bbl); tanker cleaning discharges, about 360,000 m tons (2.6 million bbl); and offshore and onshore natural seeps together contributed roughly 1-30 million m tons (7.5-220 million bbl). Total world crude oil production was assessed to be about 8 billion m tons (20.5 billion bbl).

C-0469-77
INPUT OF HYDROCARBONS FROM SEEPS AND RECENT BIOGENIC SOURCES
Koons, C. B., and P. H. Monaghan. 1976.
Sources, Effects, & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 84-107. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Sources, Hydrocarbons, Oceans, Natural seepage, *Biogenic hydrocarbons, *Input estimates

The amounts of hydrocarbons in the world's oceans contributed by various natural sources and processes are estimated. Input from submarine seepage is estimated to be 0.6 million m tons/year, and

input from biochemical processes in the oceans, 6 million m tons/ year. The amounts of hydrocarbons transported to the oceans from natural sources on land are as yet unknown. Biochemical synthesis of hydrocarbons is briefly described, and contrasting characteristics of seepage and biogenic hydrocarbons are reviewed.

C-0470-77
OIL SPILL CONTAINMENT AND REMOVAL IN ARCTIC ECOSYSTEMS
McLeod, W. R., and D. L. McLeod. 1974.
Energy Resources and Management. Rolla, Missouri, Missouri University, 1974. p. 135-144.

Oil spills, Cleanup, Recovery, Disposal, Ecosystems, Arctic

Sixteen arctic and sub-arctic oil spills, their locations, amount of oil spilled, combatant schemes used in cleanup operations, and causes for the spills are reported. Analysis of the effectiveness of available chemical, mechanical, and destructive means of oil recovery or disposal under arctic and sub-arctic conditions is discussed and recommendations for further research on these problems are given.

[from Petroleum Abstracts 16(44):#226, 378. 1976]

C-0471-77
TO DRILL OR NOT TO DRILL
Mitchell, J. G. 1977.
Audubon 79(1):78-85.

Oil industry, Exploration, Drilling, *Michigan, *Baker Sanctuary

The history of the acquisition of Baker Sanctuary in Michigan is reviewed and the debate over oil exploration and development at the sanctuary is discussed.

C-0472-77
SOURCES AND DISTRIBUTION OF HYDROCARBONS IN THE ENVIRONMENT
Myers, L. H. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 66-83. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Hydrocarbons, Sources, Distribution, Industries, Refineries, *Municipal discharges, *Runoff

The various sources and distributions of biogenic and petroleum hydrocarbons are reviewed and tabulated. Industrial sources of hydrocarbon wastes are petroleum production and refining, the petrochemical industry, steel and iron manufacture, food and kindred products, and textile mills. Agriculture and municipal discharges and runoff are other major sources for petroleum-related hydrocarbons.

C-0473-77
KACHEMAK BAY; OIL SPILLS LEAD ALASKA TO REVERSE DRILLING OK
Panitch, M. 1976.
Science 193(4248):131.

Oil spills, Offshore drilling, Environmental effects, Alaska, *Kachemak Bay

The history of the George Ferris oil spill in Kachemak Bay, lower Cook Inlet, Alaska is reviewed. The political, economic, and environmental effects of the spill are discussed and Alaskan plans to buy back the lease that was sold three years ago to oil interests are described.

C-0474-77
JUST ANOTHER OIL SPILL
Reiger, G. 1977.
Audubon 79(1):144-148.

Oil spills, Cleanup, Pollution prevention, Birds, Wildlife, Chesapeake Bay, USCG

An account of an oil spill involving the tug, "Falcon", in Chesapeake Bay in 1976 is given. The actions of the U.S. Coast Guard in preventing and cleaning up the spilled oil are described and the deaths of birds and wildlife are discussed.

C-0475-77
THE CHESAPEAKE BAY OIL SPILL - FEBRUARY 2, 1976: A CASE HISTORY
Roland, J. V., G. E. Moore, and M. A. Bellanca. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 523-527. (American Petroleum Institute No. 4284).

Oil spills, Environmental effects, Beaches, Marshes, Marine organisms, Chesapeake Bay

A case history analysis is presented of the Chesapeake Bay oil spill in which about 946,000 liters (250,000 gallons) of No. 6 oil were discharged into the bay after a barge, the STC-101, sank in a storm near the Potomac River. The oil contaminated extensive beach and marsh areas on both sides of the bay. Approximately 632,000 liters (167,000 gallons) of oil were recovered by cleanup crews. An overall assessment of the environmental damages caused by the spill is almost complete.

C-0476-77
A PERSPECTIVE ON THE REGIONAL WATER QUALITY IMPACTS OF PETROLEUM FACILITIES
Schimke, G. R., C. B. Cooper, and E. H. Dohnert. 1975.
American Institute of Chemical Engineers Symposium Series 7(151): 25-33.

Oil spills, Ports, Pipelines, Refineries, Oil discharges, Water quality, *Petroleum facilities

Discussed are spills associated with ocean terminals and pipelines, and major water quality problems of petroleum refineries. Volumetrically, the oceanic oil pollution contributed by terminals and refineries is relatively small. Refinery discharges into small streams cause significant adverse water quality impacts regardless of the treatment technology.

[from Chemical Abstracts 76(4):#21498j. 1977]

C-0477-77
POLLUTER DISCRIMINANT ANALYSIS
Tock, D. G. 1976.
Water Resources Research 12(4):613-616.

Oil spills, U.S., Statistical analysis, Models, Great Lakes, Coasts, *Discriminant analysis

Statistics in a water pollution data base for U.S. coastal waterways and Great Lakes are used to develop a model, using multiple discriminant techniques, to determine which pollution incident report variables will discriminate the polluter who reports a spill from one who does not report a spill. As few as 9 variables out of a possible 60 provide sufficient discriminatory power .

[from Pollution Abstracts 8(1):#77-00312. 1977]

C-0478-77
A REVIEW OF WORLD OIL SPILLAGES, 1960-1975
van-Gelder-Ottway, S., and M. Knight. 1975.
International Petroleum/Field Studies Council Meeting on Marine Ecology and Oil Pollution, Scotland, 1975. p. 483-520.

Oil spills, Biological effects, Monitoring

Basic details of major oil spillages in recent years are listed and subsequent biological effects that have been monitored are included. The emphasis on reporting oil pollution incidents since 1967 is more a product of the increasing awareness of potential biological damage from these spills than of increases in the number of incidents.

[from Energy Information Abstracts 1(5):#76-23740. 1976]

C-0479-77
PROJECTION OF PETROLEUM CONTENT OF URBAN RUNOFF
Whipple, W., Jr., J. V. Hunter, and S. L. Yu. 1975.
Petroleum Industry in the Delaware Estuary. Staff report,
NSF-RANN Project G42282.

Industries, Refineries, Delaware, *Urban runoff, *Oil content,
*Delaware Estuary

Summary not available.

[from Urbanization and Water Quality Control. W. Whipple, Jr.
(ed.) Minneapolis, Minnesota, American Water Resources Association,
1975. p. 168]

C-0480-77
THE ARGO MERCHANT AND BEYOND
Worthington, V. 1977.
Conservation News 42(3):8-10.

Oil spills, Environmental effects, Tankers, Cleanup, Argo Merchant
spill

The environmental consequences of the Argo Merchant oil spill are
reviewed and possible legislation concerning oil disasters and
tankers is presented. Other recent Liberian tanker disasters
are described and the U.S. Coast Guard's efforts to contain and
cleanup the spilled oil are discussed.

C-0481-77

The following tables include data relating to oil discharges in the United States and contiguous waters during the calendar year 1975. The information was obtained from the U.S. Coast Guard publication, "Pollution Incidents in and Around U.S. Waters," and is based on incidents reported to or discovered by Coast Guard personnel.

GENERAL AREAS

	Number of incidents	% of Total	Volume in gallons	% of Total
Atlantic Coast	2,695	26.6	1,465,689	10.2
Gulf Coast (West of Long. 83°15')	3,315	32.8	5,430,212	37.6
Pacific Coast	1,768	17.4	440,923	3.0
Great Lakes	454	4.4	307,772	2.1
Inland U.S.	1,909	18.8	6,795,001	47.1
TOTAL	10,141	100.0	14,439,597	100.0

TYPE OF LOCATION

	Number of incidents	% of Total	Volume in gallons	% of Total
Inland Waters				
1. Roadsteads	120	1.0	37,164	.3
2. Ports	472	4.8	1,106,611	7.7
3. Beaches	96	.9	88,537	.6
4. River areas	836	8.2	3,816,371	26.4
5. Non-navigable areas	112	1.1	303,752	2.1
TOTAL	1,636	16.0	5,352,435	37.1
Coastal Waters (including Great Lakes)				
1. Bays, estuaries and sounds	1,117	11.0	3,227,563	22.3
2. Ports	3,937	38.9	2,173,847	15.1
3. Beaches	159	1.6	108,588	.8
4. River areas	1,272	12.5	2,008,819	13.9
5. Non-navigable areas	192	1.9	214,447	1.5
6. Open waters (Great Lakes or territorial sea)	955	9.4	453,683	3.1
TOTAL	7,632	75.3	8,186,947	56.7
Contiguous zone	188	1.9	5,725	.0
High seas	692	6.8	894,490	6.2
TOTAL	10,141	100.0	14,439,597	100.0

TYPE OF MATERIAL DISCHARGE

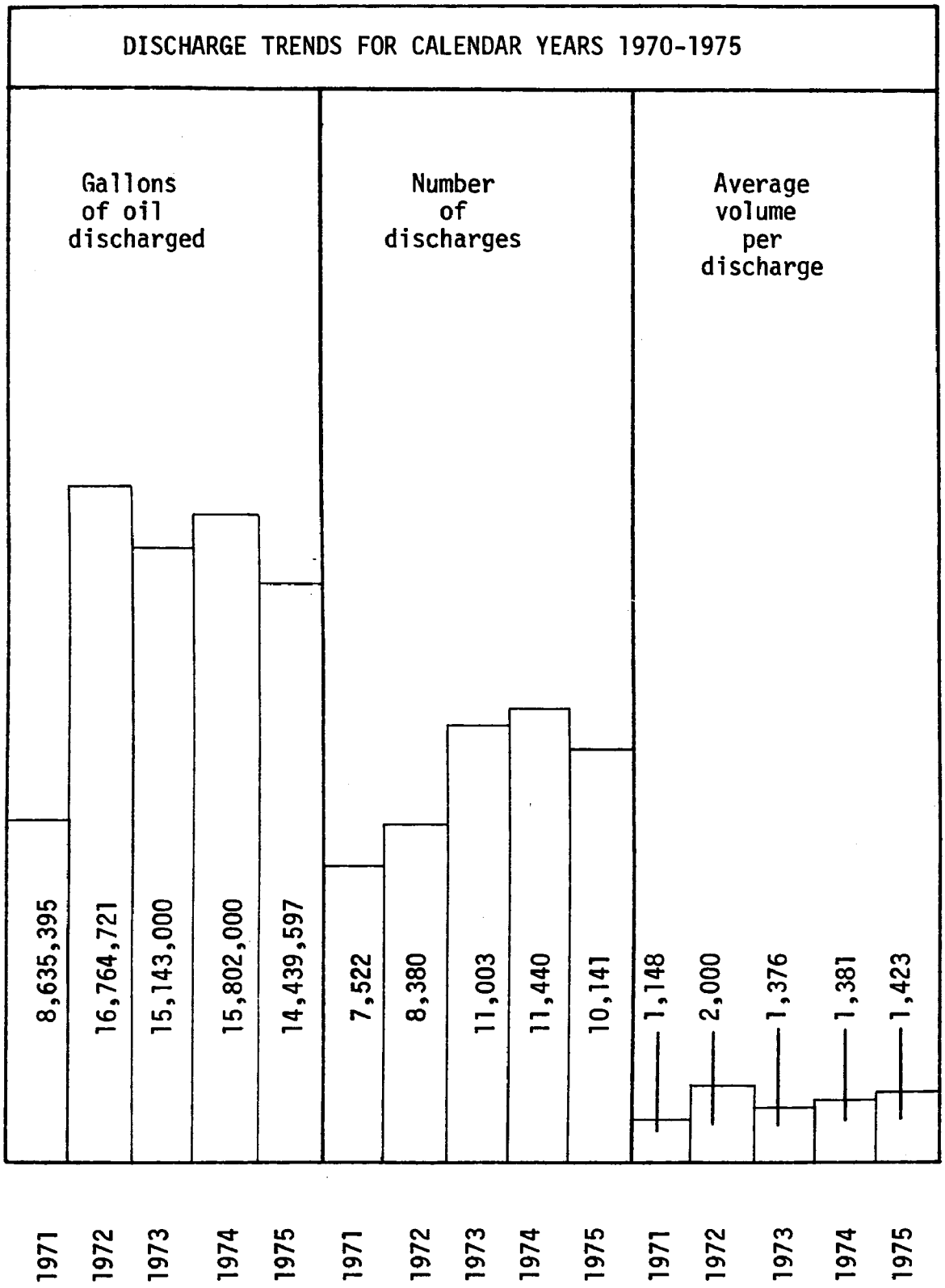
	Number of incidents	% of Total	Volume of gallons	% of Total
Crude oil	2,678	26.4	7,664,834	53.0
Gasoline	540	5.3	1,393,367	9.6
Other distillate fuel oil	273	2.7	952,725	6.7
Solvent	50	0.5	8,683	0.0
Diesel oil	1,736	17.1	843,406	5.9
Asphalt or residual fuel oil	1,010	10.0	739,066	5.1
Animal or vegetable oil	72	0.7	54,162	0.4
Waste oil	1,094	10.8	197,706	1.4
Other oil	2,688	26.5	2,585,648	17.9
TOTAL	10,141	100.0	14,439,597	100.0

SOURCES

	Number of incidents	% of Total	Volume in gallons	% of Total
VESSELS				
1. Dry cargo ships	277	2.7	21,843	0.2
2. Dry cargo barges	31	0.3	5,215	0.0
3. Tank ships	643	6.3	1,766,729	12.2
4. Tank barges	757	7.5	3,467,203	24.0
5. Combatant vessels	202	2.0	16,913	0.1
6. Other vessels	1,143	11.3	1,353,947	9.4
TOTAL	3,053	30.1	6,631,850	45.9
LAND VEHICLES				
1. Rail vehicles	27	0.4	576,507	4.0
2. Highway vehicles	263	2.6	356,601	2.4
3. Other/unknown vehicles	20	0.1	2,617	0.0
TOTAL	310	3.1	935,725	6.4
NON-TRANSPORTATION-RELATED FACILITIES				
1. Onshore refinery	176	1.7	145,722	1.0
2. Onshore bulk/storage	305	3.0	476,768	3.3
3. Onshore production	233	2.3	2,626,992	18.2
4. Offshore production facilities	1,243	12.3	78,217	0.5
5. Other facilities	762	7.5	567,924	4.0
TOTAL	2,719	26.8	3,895,623	27.0
PIPELINES	564	5.6	2,490,237	17.3
MARINE FACILITIES				
1. Onshore/offshore bulk cargo transfer	250	2.5	81,203	0.6
2. Onshore/offshore fueling	74	0.7	9,388	0.0
3. Onshore/offshore nonbulk cargo transfer	19	0.2	1,326	0.0
4. Other transportation-related marine facilities	80	0.8	7,239	0.0
TOTAL	423	4.2	99,156	0.6
LAND FACILITIES	167	1.6	200,962	1.5
MISC/UNKNOWN	2,905	28.6	186,044	1.3
TOTAL	10,141	100.00	14,439,597	100.00

CAUSES

	Number of incidents	% of Total	Volume in gallons	% of Total
Hull/tank rupture/leak	757	7.5	6,359,433	44.0
Transportation pipeline rupture leak	235	2.3	1,200,004	8.3
Other structural failure	200	2.0	2,744,656	19.0
Pipe rupture/leak	954	9.5	1,322,385	9.2
Hose rupture/leak	220	2.1	120,203	0.8
Valve failure	256	2.5	251,608	1.7
Pump failure	110	1.0	39,499	0.3
Other rupture/leak	29	.2	94,683	0.7
Other equipment failure	1,069	10.5	221,956	1.5
Tank overflow	464	4.5	473,454	3.3
Improper handling operation	679	6.5	276,226	4.3
Other personnel error	511	5.1	504,976	3.5
Bilge pumping	195	1.9	14,821	0.1
Ballast pumping	21	.2	754	0.0
Other intentional discharge	269	2.6	196,089	1.4
Natural or chronic phenomenon	352	3.5	144,115	1.0
Unknown/Miscellaneous	3,820	38.1	474,735	0.9
TOTAL	10,141	100.00	14,439,597	100.00


DISCHARGE TRENDS FOR CALENDAR YEARS 1970-1975
Gallons of oil discharged
Number of discharges
Average volume per discharge
8,635,395
16,764,721
15,143,000
15,802,000
14,439,597
7,522
8,380
11,003
11,440
10,141
1,148
2,000
1,376
1,381
1,423
1971
1972
1973
1974
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1975

C-0482-77
NASA MONITORING HELPS NOAA IN TRACKING OIL SPILL IN ATLANTIC
Anon. 1977.
Aviation Weekly & Space Technology 106(2):21.

Oil spills, Remote sensing, Spreading, Movement, Atlantic Ocean, Argo Merchant spill, Monitoring

NASA spacecraft and remote sensing aircraft have been involved in tracking the oil spilled by the Liberian tanker, "Argo Merchant", off Nantucket, Massachusetts. NASA overflights were initiated in late December, 1976, and have continued into early January, 1977, in an attempt to monitor and track the spreading and movement of the oil slick.

C-0483-77
DEVELOPMENT AND TEST OF A SHIPBOARD, CONTINUOUS, ON-LINE OIL-IN-WATER CONTENT MONITOR USING FORWARD (LASER) LIGHT SCATTERING TECHNIQUES
Batutis, E. P., and R. L. Skewes. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 157-160. (American Petroleum Institute No. 4284)

Detection, Ships, Monitoring, Design and engineering, USCG, *Oil-in-water

Procedures and results of a U.S. Coast Guard program to evaluate a shipboard oil-in-water content monitoring approach developed by General Electric Company are reviewed. The concept used allows for the detection of 0-100 ppm of a wide variety of oils and has low sensitivity to salinty, temperature, pH, and the presence of detergents. The instrument package is compact, lightweight, and designed for continuous monitoring capability.

C-0484-77
PROCESS FOR MEASURING THE OIL CONTENT OF WATER
Bolzmann, H. 1976.
German Patent 2,408,772

Oil slicks, Patent, Monitoring, *Oil content, *Echo sounding

The oil content of water is measured as a function of the thickness of the oil layer at the surface of the water by using echo sounding.

[from Petroleum Abstracts 16(42):#226,002. 1976]

C-0485-77
SHIPBOARD OIL-IN-WATER MONITOR
Bordeaux, J. 1976.
Final report, FR-2677-101; Contract N00024-74-C-5445. 57p.

Monitoring, Oilslicks, Ships, Solvents, Spectroscopy, Absorption, *Laser beam

An oil-in-water monitor is described which uses solvent extraction of oil and measures the infrared energy absorbed by the C-H bond. A cellulose acetate non-woven tape is saturated with perchlorethylene and the oily water is impinged onto the tape. The oil is extracted and the IR absorption measured using a dual beam laser system.

[from Government Reports Announcements 72(22):#AD-A028 785/4GA. 1976]

C-0486-77
MONITORING PROCEDURES FOR CHEMICAL CARCINOGENS IN COASTAL WATERS
Dunn, B. P., and H. F. Stich. 1976.
Journal of the Fisheries Research Board of Canada 33(9):2040-2046.

PAH, Coasts, Chemical analysis, Chromatography, Fluorimetry, Monitoring, Sampling, Carcinogens, *Coastal waters

Sampling and analytical procedures developed to assess the contamination of coastal waters by carcinogenic polycyclic aromatic hydrocarbons (PAH) are discussed. The procedures involved extraction and purification of hydrocarbon fractions from marine sediments and organisms, and detection of compounds by thin-layer chromatography, fluorimetry, or gas chromatography.

[from Chemical Abstracts 86(4):#21482z. 1977]

C-0487-77
BASELINE LEVELS OF BENZO(A)PYRENE IN SOUTHERN CALIFORNIA MUSSELS
Dunn, B. P., and D. R. Young. 1976.
Marine Pollution Bulletin 7(12):231-234.

PAH, Mollusks, Southern California, Carcinogens, Monitoring,*Mussels *Benzo(a)pyrene

A survey was made of the levels of benzo(a)pyrene in mussels from 19 mainland and 6 island stations in the California Bight. The study indicates that carcinogen levels in mussels are at or near zero, except in areas of human activity. These findings contradict previous suggestions that benzo(a)pyrene is widely distributed in marine organisms.

C-0488-77
LIGHT SCATTERING TECHNIQUES FOR DISCRIMINATING BETWEEN OIL AND PARTICULATES IN CONTAMINATED WATER
Friedman, B. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 153-156. (American Petroleum Institute No. 4284)

Detection, Wastewaters, Analytical techniques, Monitoring, *Particulates, *Oil-in-water, *Light scattering

Particulate matter interferes with the application of light scattering techniques used in several existing and proposed types of oil-in-water monitors. A mathematical analysis was made of the possibility of discriminating between oil and particulates by using measurements of the angular intensity distribution of scattered light. It was found that, even with the determination of the state of polarization of the scattered light, a distinction of oil and particulates is difficult.

C-0489-77
EXPERIENCE IN MONITORING THE OIL CONTENT OF BALLAST WATER BEING DISCHARGED BY TANKERS
Fleming, K., and J. P. P. Dick. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 165-168. (American Petroleum Institute No. 4284)

Oil discharges, Ballast, Tankers, Design and engineering, Monitoring

The major requirements of a practical shipboard monitoring system are outlined. The Societe d'Etude et de Realisation d'Equipementes Speciaux (SERES) Directe Response Ultra-Rapide (DRUR) Type 1 oil content monitor and its onboard installation are described. Typical experience in monitoring tanker effluents is discussed and common problems, especially with the sampling system, are reviewed. Practical experience in regard to compliance with the 1973 International Convention for the Prevention of Pollution from Ships is also discussed.

C-0490-77
STRATEGIES FOR MARINE POLLUTION MONITORING
Goldberg, E. D. 1976.
New York, John Wiley & Sons, 1976. 310p.

Contaminants, Oceans, Hydrocarbons, Tar, Analytical techniques, Sampling, Marine organisms, Monitoring

Methods are described for the analysis of organic marine environmental pollutants including petroleum hydrocarbons, PCB and DDT compounds, low molecular weight hydrocarbons, phthalates, chlorinated hydrocarbons, plastics, pelagic tars and

other litter. Discussions of sampling sites, organisms selected for monitoring, and transport paths are included.

[from Pollution Abstracts 8(1):#77-00344. 1977]

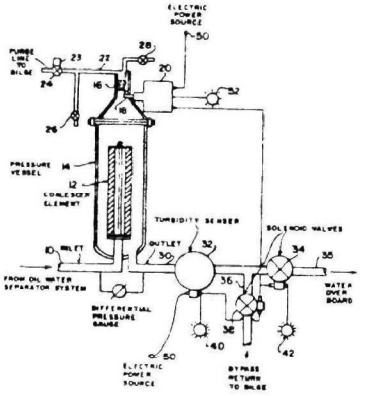
C-0491-77
OIL-IN-WATER MONITOR
Grant, M. G. 1976.
U.S. Patent 3,966, 603

Monitoring, Wastewaters, Oil-water separation, Patent

An oil-in-water monitor is described which is equipped with sensors that measure the amount of oil, turbidity, and flow rates of effluents from an oil-water separator. If predetermined limits are exceeded, the sensors activate alarms and/or automatically recirculate the effluent.

[from Chemical Abstracts 85(22):#166219h. 1976]

3,966,603
OIL-IN-WATER MONITOR
Michael G. Grant, Rte. 5 Box 1894, Fredericksburg, Va. 22401
Filed Nov. 25, 1975, Ser. No. 635,492
Int. Cl.² B01D *35/00*
U.S. Cl. 210—86
12 Claims



C-0492-77
DETERMINATION OF OIL CONTENT IN WASTEWATER [in Japanese]
Hagiwara, K. 1976.
Kagaku Kojo 20(7):35-39.

Monitoring, Wastewaters, Detection, Chemical analysis

"A review with 14 references of problems in JIS method of analysis of wastewater containing a low concentration of oils."

[from Chemical Abstracts 86(4):21327c. 1977]

C-0493-77
DEVELOPMENT OF AN OIL-IN-WATER CONTENT MONITOR
Hornig, A. W., J. T. Brownrigg, B. R. Chisholm, L. P. Giering, and R. L. Skewes. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 147-152. (American Petroleum Institute No. 4284)

Monitoring, Hydrocarbons, *Oil-in-water, Design and engineering, *Fluorescence

An oil-in-water content monitor, which utilizes the fluorescence characteristics of aromatic components of petroleum, has been developed by Baird-Atomic, Inc. High senstivity, real time output, fast response time, insensitivity to interferences, and low sensitivity to particulates are advantages of the technique; unequal luminescence response of various oil components presents the main problem. Two main approaches utilizing this technique are detailed: a synchronous scan monitoring device and a more generally applicable total luminescence monitor (TLS).

C-0494-77
ULTRASONIC POLLUTION MONITOR
Houlihan, T. M., and F. K. McGrath. 1976.
Proceedings of the Institute of Environmental Science No 22:487-490.

Monitoring, Contamination, Ships, Ballast, Bilges

An ultrasonic pollution monitor is described which is capable of accurately measuring oil contamination as low as 22 ppm oil in water. The monitoring system is intended for use on shipboard bilge and ballast waters.

[from Chemical Abstracts 85(22):#166154h. 1976]

C-0495-77
HIGH SEAS OIL POLLUTION: PARTICULATE PETROLEUM RESIDUES IN THE NORTH ATLANTIC
Levy, E. M., and A. Walton. 1976.
Journal of the Fisheries Research Board of Canada 33(12):2781-2791.

Monitoring, Tar, Sampling, Distribution, Atlantic Ocean

Water samples were taken from the North Atlantic over a three year period. Waters north of the Gulf Stream-North Atlantic Current system were virtually free from floating tar; while the waters of the Gulf Stream, Sargasso Sea, and Caribbean Sea were more heavily polluted. The distribution of tar is due to shipping and tanker traffic and surface circulation patterns.

C-0496-77
LEAK DETECTOR APPARATUS
Leybold Heraeus GmbH Company. 1976.
French Patent 2,283,431

Monitoring, Leakage, Detection, Oil tanks, Patent, Design and engineering

An apparatus which is more sensitive and has a faster response time than other leak detectors is described. The device is designed to detect leakage from tanks.

[from Petroleum Abstracts 17(4):#229,351. 1977]

C-0497-77
DISTRIBUTION OF LOW-MOLECULAR-WEIGHT HYDROCARBONS IN SOUTHERN BEAUFORT SEA
Macdonald, R. W. 1976.
Environmental Science and Technology 10(12):1241-1246.

Monitoring, Hydrocarbons, Distribution, Water quality, Beaufort Sea

C_1 and C_4 hydrocarbon concentrations were measured in the Southern Beaufort Sea continental shelf region. Saturated hydrocarbon concentrations were low in contrast to other shelf areas where shipping, ballast dumping, and drilling have occurred; thus, their concentrations could serve as indicators of deteriorating water quality.

C-0498-77
SURVEILLANCE OF THE MARINE ENVIRONMENT FOR HYDROCARBONS
McAuliffe, C. D. 1976.
Marine Science Communications 2(1):13-42.

Monitoring, Hydrocarbons, Oceans, Surveillance, Distribution

Low molecular weight hydrocarbons are found throughout the oceans, approximately in equilibrium with atmospheric CH_4. These gases and C_2H_6 and C_3H_8 found in the top 200 m of water are mostly biogenic. Higher molecular weight hydrocarbons are restricted to the top 10 m of water, principally as particles, with concentrations decreasing from the sea-air interface.

[from Chemical Abstracts 85(24):#182092s. 1976]

C-0499-77
A LIQUID CHROMATOGRAPHIC FLUORESCENCE TECHNIQUE FOR ESTIMATING CRUDE OIL IN WATER, SEDIMENT AND BIOLOGICAL MATERIAL
Miles, D. H., M. J. Coign, and L. R. Brown. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 179-182. (American Petroleum Institute No. 4284)

Monitoring, Crude oil, Detection, Chromatography, Sediments, *Oil-in-water, *Biological materials

A rapid method for detecting and estimating the amount of crude oil in the presence of large amounts of biological material is described. The method involves use of high pressure liquid chromatography with chloroform as the solvent, an excitation wavelength of 403 nm, and an emission wavelength of 418 nm. Results of experiments indicate that even the least responsive oils can be detected at concentrations less than 1 µg and that the method is selective, sensitive, and yields reproducible data.

C-0500-77
FRAMEWORK FOR BUREAU OF LAND MANAGEMENT PROGRAMS
Monastero, F. C. 1976.
Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings. M. F. Massoglia (compiler). Research Triangle Park, N.C., Research Triangle Institute, 1976. p. 15-24. Held at Atlanta, 1975.

Monitoring, OCS, Coasts, EIS, Oil-gas leasing, Regulations, BLM, *Environmental Studies Project

BLM's Environmental Studies Project encompasses a broad range of studies designed to gather data on the physical, chemical, biological and geological aspects of the OCS, nearshore and coastal environments. Information from these studies is essential in oil-gas leasing, lease modifications, EIS preparation, and formulation of regulations.

[from Selected Water Resources Abstracts 9(21):#W76-11476. 1976]

C-0501-77
HYDROCARBON POLLUTION MONITORING - A NATIONAL IMPERATIVE
Monastero, F. C. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 108-119. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Monitoring, Hydrocarbons, Oil spills, Pollution control, Surveillance, Government agencies, EPA, USGS, USCG, *UN

Four programs presently in effect which monitor petroleum hydrocarbons in the environment are briefly outlined. Programs are conducted by EPA, Office of Monitoring Systems; U.S. Coast Guard, Pollution Incident Reporting System (PIRS), Transportation Induced Pollution Surveillance System (TIPS), Airborne Remote Surveillance System (ARSS), and Airborne Oil Surveillance System (AOSS); the U.S. Geological Survey petroleum monitoring and compliance inspections program; and the U.N. Intergovernmental Oceanographic Commission (IOC), Integrated Global Ocean Station System (IGOSS).

C-0502-77
OIL DETECTOR ELEMENT
Ohtsu, T., Y. Nakamura, and A. Sugimoto. 1976.
French Patent 2,276,584

Monitoring, Leakage, Pipelines, Oil slicks, Wastewaters, Detection, Design and engineering, Patent

The oil detector consists of a housing with a water-repellant, oil-transmitting filter element mounted in a side opening. The back side of the filter is covered with conducting particles; the two faces of the layer of the particles are connected to electrodes. The device is suitable for a wide variety of applications.

[from Petroleum Abstracts 17(3):#229,120. 1977]

C-0503-77
HYDROCARBON FILM DETECTOR FOR CALM AND AGITATED WATERS
Ralet, C., and D. Ralet. 1976.
Belgian Patent 813,640

Monitoring, Hydrocarbons, Detection, Patent, Design and engineering

Hydrocarbons are detected by an electronic conductivity system mounted on a float.

[from Petroleum Abstracts 17(6):#230,168. 1977]

C-0504-77
FEASIBILITY OF CONTINUOUS MONITORING FOR OIL POLLUTION ACROSS CHANNELS AND RIVERS
Rambie, G. S., Jr., R. H. Morgan, and D. R. Jones. 1977. 1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 193-196. (American Petroleum Institute No. 4284)

Monitoring, Oil slicks, Rivers, Design and engineering, *Infrared scanning oil sensor

Several monitoring systems have been developed for detecting oil pollution in channels and rivers and are currently under evaluation. This report describes the characteristics, application,and evaluation of a bistatic active infrared scanning oil sensor under development by Rambie, Inc.

C-0505-77
PETROLEUM AND ANTHROPOGENIC INFLUENCE ON THE COMPOSITION OF SEDIMENTS FROM THE SOUTHERN CALIFORNIA BIGHT
Reed, W. E., I. R. Kaplan, M. Sandstrom, and P. Mankiewicz. 1977. 1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 183-188. (American Petroleum Institute No 4284)

Monitoring, Hydrocarbons, Sediments, Chemical analysis, Source identification, Southern California

Low to high concentrations of petroleum hydrocarbons and various anthropogenic organic chemicals have been detected in nearly all sandy intertidal and benthic sediments collected from the Southern California borderland and have been characterized by gas chromatography and mass spectrometry. Benthic samples showed considerable compositional variations from region to region. Intertidal sediment samples showed variations related to tidal position; samples from low tide levels had the highest hydrocarbon concentrations. Sources of hydrocarbons in the Southern California Bight include anthropogenic sources - municipal and industrial wastes, shipping and oil transport - and inputs from many natural seeps and the organic-rich Tertiary sediments.

C-0506-77
MONITORING OIL CONTENT IN SHIPBOARD WASTE WATER DISCHARGES BY USE OF A MULTI-PHASED DYE TRANSFER PROCESS
Ricci, R. J., and A. M. Kelley. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 161-164. (American Petroleum Institute No. 4284)

Monitoring, Oil discharges, Wastewater, Ships, Design and engineering, USN, *Oil content

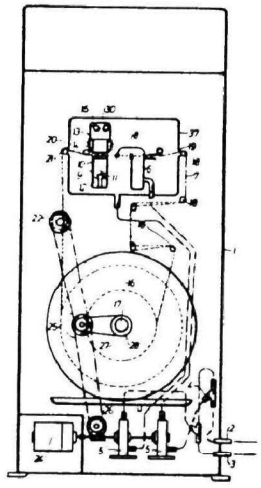
A new process for oil-in-water monitoring in the 1-200 ppm range has been developed by the U.S. Navy and engineered into a portable, compact and low-cost shipboard instrument package. The system reliably and accurately measures oil content irrespective of the type of oil or the presence of solids, detergents and other contaminants. Instrument prototype evaluation and continuing development of the system are described.

C-0507-77
METHOD AND DEVICE FOR ASCERTAINING SMALL AMOUNTS OF OIL IN WATER
Stenstrom, B. H. 1976.
U.S. Patent 3,964,295

Monitoring, Wastewaters, Bilges, Ships, Oil-water separation, Patent

A defined amount of water is removed so as to concentrate the oil and then the oil content is measured. The oil is concentrated by passing a predetermined amount of oily water per unit of time through a determined area of a filter material which absorbs or separates oil. Oil content is measured photo-electrically by determination of the color change of the oil-absorbing filter material.

[from Selected Water Resources Abstracts 9(24):#W76-13156. 1976]



3,964,295
METHOD AND DEVICE FOR ASCERTAINING SMALL AMOUNTS OF OIL IN WATER
Börje Harald Stenstrom, Enebyberg, Sweden, assignor to Salen & Wicander AB, Sundbyberg, Sweden
Continuation-in-part of Ser. No. 340,152, March 12, 1973, abandoned. This application Aug. 6, 1974, Ser. No. 495,179
Int. Cl.[2] G01N 21/06
U.S. Cl. 73—61.1 R
8 Claims

C-0508-77
DESIGNING WATER POLLUTION DETECTION SYSTEMS - ENVIRONMENTAL LAW ENFORCEMENT ON THE U.S. COASTAL WATERS AND THE GREAT LAKES
Wright, G. P., and D. G. Olson. 1975.
Chichester, England, John Wiley and Sons, Ltd., 1975. 225p.

Remote sensing, Oil spills, Ships, Surveillance, Design and engineering, Law enforcement, Environmental protection, USCG

This book is the result of a study on designing an effective airborne pollution detection and surveillance system for the U.S. Coast Guard. Chapter 1 explains the scope of the environmental protection and enforcement program. Chapter 2 evaluates pollution surveillance effectiveness and the allocation of resources. The third and fourth chapters present data on petroleum shipping in U.S. waters and pollution incident statistics from 1965 to 1972. An overview of oil and hazardous materials detection methods is given in Chapter 5, and computer applications to pollution surveillance are detailed in Chapter 6.

[from Water, Air and Soil Pollution 5(3):372. 1976]

C-0509-77
BIOGENIC HYDROCARBONS IN INTERTIDAL COMMUNITIES
Zsolnay, A., N. G. Maynard, and C. D. Gebelein. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 173-177. (American Petroleum Institute No. 4284)

Monitoring, Hydrocarbons, Marine organisms, Intertidal zone, Chemical analysis, Chromatography, Metabolism, *Biogenic hydrocarbons

Littoral marine flora and fauna from Bermuda were monitored for biogenic hydrocarbon content from late 1974 to early 1976; the hydrocarbons were characterized, differentiated from petroleum hydrocarbons, and quantified by gas-liquid chromatography. Experimental procedures used are reviewed. Macroalgae and algal mats had a mean of 35.5 µg/g of biogenic hydrocarbons and the invertebrates had a mean content of 10.5 µg/g (except for the barnacle, Chthamalus stellatus, with 108.0 µg/g). Present data do not clearly indicate whether the invertebrates are actively synthesizing the hydrocarbons, or simply incorporating them from their food sources.

3. REMOTE SENSING

C-0510-77
EEC REMOTE SENSING OF POLLUTION (news brief)
Anon. 1976.
Marine Pollution Bulletin 7(12):219.

Remote sensing, Contaminants, Oil slicks, Coasts, Europe, *Nimbus satellite

American and European scientists met in September, 1976, to discuss the EURASEP project (Europe Association of Scientists for Experiments with Pollution). The European Commission is interested in collaborating with the U.S. on the use of the Nimbus satellite for remote sensing of coastal water pollution. Among the applications of the satellite are detection of oil slicks at sea and industrial waste in estuaries.

C-0511-77
SATELLITE SENTINEL FOR OIL SPILLS IN 1978?
Hovis, W. A., and D. R. Jones. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 211-214. (American Petroleum Institute No. 4284)

Remote sensing, Oil slicks, Detection, Surveillance, Natural seepage, Santa Barbara Channel

The limited capabilities of existing satellite remote sensing systems for monitoring oil slicks are discussed. The much greater oil spill detection and surveillance capability of the proposed Coastal Zone Color Scanner (CZCS), designed to be onboard Nimbus G in 1978, is described. Preliminary tests of the CZCS in NASA U-Z high altitude flights have demonstrated a capacity for detecting natural seepage off Coal Oil Point near Santa Barbara. More testing of the CZCS is urged.

C-512-77
AERIAL PHOTOGRAPHIC APPLICATIONS IN SUPPORT OF OIL SPILL CLEANUP, CONTROL AND PREVENTION
Jones, D. R., R. Landers, and A. Pressman. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 221-222. (American Petroleum Institute No. 4284)

Remote sensing, Oil spills, Pollution control, Cleanup, Law enforcement, EPA

Environmental Protection Agency sponsored aerial reconnaisance and mapping of oil spills and oil contamination has been carried out over several years. This paper briefly outlines the scope and purpose of the ongoing pollution surveillance and compliance monitoring program.

C-0513-77
REMOTE SENSING OF OIL SLICKS WITH MICROWAVE RADIOMETER
Kaski, K., and A. Laeaeperi. 1976.
REPT-S-83. 18p.

Remote sensing, Oil slicks, Detection, Source identification, *Microwave radiometry

Oil slicks on the sea surface were detected, mapped, and identified through the use of microwave radiometry. The performance of this technique is assessed and experimental results are reported.

[from Scientific and Technical Aerospace Reports 14(22):#N76-31722. 1976]

C-0514-77
ESTUARINE DENSITY FRONTS AND THEIR EFFECTS ON OIL SLICKS
Klemas, V., D. Polis, and G. Davis. 1976.
NASA-CR-148518; Contract NAS5-20983. 3p.

Remote sensing, Estuaries, *Fronts, Delaware Bay, Oil slicks, Drift, Spreading, Models

Landsat imagery was used to determine the location and extent of estuarine frontal systems over all portions of the tidal cycle. These fronts represent regions of extremely high gradient or discontinuity in water velocity and density fields. Boats were used in Delaware Bay to study the behavior of front parameters and their effect on pollutants in order to provide a basis for improving an oil drift and spreading model.

[from Government Reports Announcements 76(22):#E76-10441. 1976]

C-0515-77
COMPARATIVE EVALUATION OF REAL AND SYNTHETIC APERTURE RADARS FOR THE DETECTION OF OIL POLLUTION IN THE SANTA BARBARA CHANNEL
Kraus, S. P., J. E. Estes, and R. R. Vollmers. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 203-208. (American Petroleum Institute No 4284)

Remote sensing, Detection, Oil slicks, Natural seepage, Platforms, Santa Barbara Channel, USCG, *Side-looking radar

A series of U.S. Coast Guard-sponsored tests were conducted in the Santa Barbara Channel during May,1976,to evaluate the oil detection and surface target sensing capabilities of two Motorola side-looking radar systems: a real aperture AN/APS-94D, and a synthetic aperture coherent-on-receive (COR). Among the test targets of coincident overflights were natural seeps, induced simulated oil slicks and offshore platforms. Based on 10 coincidentflights, COR provided better detection of natural and manmade slicks, while the APS-94D consistently exhibited better surface target resolution results.

C-0516-77
U.S. COAST GUARD AIRBORNE OIL SURVEILLANCE SYSTEM STATUS REPORT
Maurer, A. T., A. T. Edgerton, and D. C. Meeks. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 215-220. (American Petroleum Institute No. 4284)

Remote sensing, Oil spills, Detection, Surveillance, USCG, *Airborne coastal patrol

Evaluation of a U.S. Coast Guard prototype operational airborne coastal patrol system has been completed. This paper describes (1) results of prototype operational evaluation, (2) operational configuration of the C-130 aircraft in which the sensor equipment will be installed for deployment, and (3) future plans for the system.

C-0517-77
THE DETECTION AND MAPPING OF OIL ON A MARSHY AREA BY A REMOTE LUMINESCENT SENSOR
McFarlane, C., and R. Watson. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 197-202. (American Petroleum Institute No. 4284)

Remote sensing, Detection, Oil spills, Marshes, Contamination, *Remote luminescent sensor

An airborne luminescence detector with a Fraunhofer Line Discriminator was flown over a marshy area in Louisiana which had been heavily contaminated by an oil well blowout. Good correlation was observed between the remote sensing and ground truth data. The feasibility of using this instrument for delineating and assessing oil contamination levels and ecological damage is discussed.

C-0518-77
EVALUATION OF OPTICAL TECHNIQUES FOR REMOTE SENSING OF OIL SPILLS IN THE BEAUFORT SEA
McNeil, W. R. and P. A. Lapp. 1976.
Canadian Symposium on Remote Sensing, 3rd, Edmonton, Alberta, 1975. Ottawa, Ontario, Canadian Aeronautics and Space Institute, 1976. p. 297-308.

Remote sensing, Oil spills, Beaufort Sea, *Optical techniques

Meteorological and ice climatalogical conditions and remote sensing objectives need to be considered in selecting optical techniques. Three broadly defined electro-optical sensor classes, photometric, intensified photometric and thermal, are evaluated in terms of their "effective probability" for target registration.

[from The Engineering Index 14(12):#085715. 1976]

C-0519-77
CURRENT APPLICATIONS OF REMOTE OIL MONITORING EQUIPMENT
Wright, J. A. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 209-210. (American Petroleum Institute No. 4284)

Remote sensing, Refineries, Wastewaters, Monitoring, Oil slicks

Industrial experience shows that single-point monitoring of wastewater stream surfaces using an infrared reflectance instrument effectively detects oil films associated with oil concentrations in water as low as 1 ppm. Four case histories of installations in petroleum refineries and industrial plants illustrate the application of this monitoring system.

C-0520-77
NONVOLATILE HYDROCARBONS IN THE PACIFIC OCEAN
Brown, R. A., and T. D. Searl. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 239-255. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Sampling, Hydrocarbons, Chemical analysis, Pacific Ocean, *Tanker routes

To obtain baseline data on the Pacific Ocean, extractable organics and nonvolatile (C_{14+}) hydrocarbons were quantified and characterized from over 300 samples taken along 27,000 km (17,000 mi) of tanker routes. The hydrocarbons were complex mixtures which appeared to be of both biogenic and petroleum origin. A natural background of 1.5 ppb hydrocarbons occurs in ocean surface waters based on data from this and other studies.

C-0521-77
DISTRIBUTION OF VOLATILE HYDROCARBONS IN SOME PACIFIC OCEAN WATERS
Koons, C. B. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 589-592. (American Petroleum Institute No. 4284)

Sampling, Hydrocarbons, Distribution, Pacific Ocean, *Tanker routes

Distributions of volatile C_4 to C_8 hydrocarbons were sampled in 1974 along three major Pacific tanker routes: San Francisco - Cook Inlet, Alaska; San Francisco - Panama; and San Francisco - Singapore. Of the 138 surface and 10 m-deep samples taken, median concentrations were 0.33 ppb (by weight) and 0.10 ppb, respectively. Sampling and analytical procedures are briefly described, and pertinent data are presented. These data indicate that the highest concentrations occur along the San Francisco - Cook Inlet route.

C-0522-77
HYDROCARBONS IN THE NORTHEASTERN GULF OF MEXICO SEDIMENTS
Lytle, T. F., J. S. Lytle, P. J. Gearing, and J. N. Gearing. 1975.
Journal of the Mississippi Academy of Science 20(Supplement):8.

Sampling, Hydrocarbons, Sediments, Chemical analysis, Sources, Distribution, Gulf of Mexico

Sediments collected from 65 locations were analyzed for aliphatic and aromatic hydrocarbons. Only sediments from offshore Mississippi-Louisiana exhibited evidence of terrestrial input. Characteristic unresolved envelopes, distributions of aliphatic hydrocarbons, pristane/ phytane ratios, and other calculated parameters were used to designate possible petroleum pollution areas.

[from Bioresearch Index 12(12):#92074. 1976]

C-0523-77
EPIFAUNA AT JACKSON POINT IN PORT VALDEZ, ALASKA, DECEMBER 1970 THROUGH SEPTEMBER 1972
Nauman, J. W., and D. R. Kernodle. 1976.
Journal of the Research of the U.S. Geological Survey 4(3):299-304.

Sampling, Benthos, Estuaries, Water quality, Alaska, *Epifauna

A biological sampling program at Jackson Point (proposed oil terminal site) was begun in December, 1970. Results of the sampling operations for the two-year period are given. Diversity values were lower during 1972, except for the spring sample. Seasonal diversity varied from 0.36 in the summer of 1972 to 3.99 in the fall of 1971.

[from Selected Water Resources Abstracts 9(24):#W76-13070. 1976]

C-0524-77
MICRO-ORGANISMS AND HYDROCARBONS IN THE NORTH SEA DURING JULY-AUGUST, 1975
Oppenheimer, C. H., W. Gunkel, and G. Gassmann. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 593-610. (American Petroleum Institute No. 4284)

Sampling, Hydrocarbons, Distribution, Microorganisms, Bacteria, Tar, Sediments, Offshore development, North Sea

As a part of a cooperative program to determine the ecological effects of North Sea and offshore Louisiana oil development and exploitation, the title study was undertaken to determine the distribution of hydrocarbons and their interaction with micro-organisms of the North Sea oil field areas. This report presents preliminary analyses of cruise data relating to abundance of microorganisms at the water surface, at 10 m depth and in bottom sediments; ratios of oil degrading bacteria to heterotrophs; and distribution of hydrocarbons and tar balls in water and sediments.

C-0525-77
EXTRACTABLE ORGANICS AND NONVOLATILE HYDROCARBONS IN NEW YORK HARBOR WATERS
Searl, T. D., H. L. Huffman, Jr., and J. P. Thomas. 1977. 1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 583-588. (American Petroleum Institute No. 4284)

Sampling, Hydrocarbons, *Extractable organics, Harbors, New York, Contamination, Distribution

Selected stations in New York Harbor were sampled in November, 1974, and March-June, 1975, for carbon tetrachloride-extractable organics and nonvolatile hydrocarbons. Average contaminant concentrations were about one order of magnitude higher than those reported for open ocean. Diversity patterns and regional variations are reported and tabulated; some variations in the ratio of hydrocarbons to other organics are attributed to oxidation and/or adsorption and precipitation of hydrocarbons.

C-0526-77
HYDROCARBON UPTAKE BY DEEP SEA BENTHOS
Teal, J. M. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 358-372. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Sampling, Hydrocarbons, Sediments, Benthos, Uptake, Chemical analysis, Tar, *Abyssal depths

Hydrocarbons were analyzed from sediments and benthic animals collected at abyssal depths of 5500 m to 5800 m, and the preliminary results are presented. Petroleum hydrocarbons were found in some of the samples and found to be similar to those found in tar balls.

C-0527-77
EVALUATION OF CHEMICAL, SPECTROSCOPIC AND CHROMATOGRAPHIC METHODS USED TO IDENTIFY OFFSHORE OIL POLLUTANTS [English summary]
Albaiges, J., J. Rivera, J. M. Torradas, and M. R. Cuberes. 1976.
Revue de l'Institut Francais du Petrole 31(3):427-450.

Oil slicks, Chemical analysis, Chromatography, Spectroscopy, Detection

Various methods used to identify the leading petroleum pollutants of the sea by quantitative analysis of their passive markers and by determining other intrinsic properties are reviewed.

[from Petroleum Abstracts 16(48):#227,465. 1976]

C-0528-77
DETERMINATION OF THE CONTENT OF PETROLEUM PRODUCTS IN A FILM FLOATING ON THE SEA SURFACE [English summary]
Anufrieva, N. M., A. B. Gornitsky, M. P. Nesterova, and I. A. Nemirovskaya. 1976.
Okeanologiya 16(2):255-258.

Oil slicks, Petroleum products, Detection, Analytical techniques, Absorption

Oil from an oil slick was first absorbed by a piece of polyurethane foam, extracted by CCl_4, and the petroleum product content was then determined by infrared absorption at 2700-3200 cm^{-1}. Results of five samples are presented.

[from Chemical Abstracts 85(22):#166386k. 1976]

C-0529-77
CHARACTERIZATION OF PETROLEUM HYDROCARBONS IN THE MARINE ENVIRONMENT
Bean, R. M. 1975.
Pacific Northwest Laboratory Annual Report for 1974, BNWL-1950, Pt. 2. p. 113.

Hydrocarbons, Chemical analysis, Chromatography, Seawater

Biological studies have increased the demand for more rapid and detailed information concerning the nature and concentration of hydrocarbons in water. Results are given of gas chromatographic analyses conducted at the Marine Research Labs, Sequim, Washington, to determine the actual distribution of individual hydrocarbon compounds in seawater.

C-0530-77
CHEMICAL INVESTIGATIONS OF TWO EXPERIMENTAL OIL SPILLS IN AN ESTUARINE ECOSYSTEM
Bieri, R. H., V. C. Stamoudis, and M. K. Cueman. 1977. 1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 511-515. (American Petroleum Institute No. 4284)

Oil spills, Estuaries, Chemical analysis, Fishes, Fate, Hydrocarbons, Weathering, *Fundulus heteroclitus

The fate of fresh and artificially weathered South Louisiana crude oil was studied in large-scale experimental oil spills. The article focuses on hydrocarbon analyses in the fish, Fundulus heteroclitus, and water. Maximum concentrations of individual aromatic compounds found in fish were similar for both oils. The maximum occurred six hours after the spill for weathered crude, and 76 hours after the spill for fresh crude for all aromatics except naphthalene and the methylnaphthalenes.

C-0531-77
THE CHARACTERIZATION OF TRACE ORGANIC CONSTITUENTS IN PETROLEUM REFINERY WASTEWATER BY CAPILLARY GAS CHROMATOGRAPHY/REAL-TIME HIGH-RESOLUTION MASS SPECTROMETRY-A PRELIMINARY REPORT
Burlingame, A. L., B. J. Kimble, E. S. Scott, D. M. Wilson, M. J. Stasch, J. W. DeLeeuw, and L. H. Keith. 1976. Identification and Analysis of Organic Pollutants in Water. p. 587-624. L. H. Keith (ed.). Ann Arbor, Michigan, Ann Arbor Science Publishers, 1976. Chemical Congress of the North American Continent, 1st, 1975.

Wastewaters, Refineries, Analytical techniques, Chromatography, Spectrometry

Gas chromatography/high-resolution mass spectroscopy provides valuable information on organic constituents of refinery effluents, even when these occur as extremely complex mixtures.

[from Chemical Abstracts 85(22):#166166p. 1976]

C-0532-77
HYDROCARBONS FROM ZOOPLANKTON OF THE EASTERN GULF OF MEXICO
Calder, J. A. 1976. Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 159-183. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August, 1976.

Hydrocarbons, Zooplankton, Chemical analysis, Sources, Distribution, Gulf of Mexico, *Biogenic hydrocarbons

Four sets of seasonal zooplankton samples were collected in transits along the offshore Mississippi-Alabama-Florida (MAFLA) region of the

Gulf of Mexico; the contained hydrocarbons were analyzed and quantified. No fresh or weathered petroleum fractions were found in the zooplankton, and the hydrocarbons present appear to be of biogenic origin.

C-0533-77
EUROPEAN COMMUNITY STUDY ON THE DETERMINATION OF CYANIDES, PHENOLS, AND HYDROCARBONS IN SURFACE WATER. REPORT OF A WORKING GROUP OF EXPERTS
Commission of the European Communities. 1975.
Luxembourg, Directorate for Health Protection. NTIS No. EUR-5377e. 78p.

Chemical analysis, Hydrocarbons, *Phenols, *Surface waters

Thirty-four laboratories from eight European states conducted the preliminary collaborative study. An appraisal of the particular methods of analysis employed by each laboratory could not be done. It was found that the determination of hydrocarbons and cyanides in surface water may lead to considerably different results. In the given concentration range, phenol determinations showed the smallest variation of all parameters studied.

[from ERDA Energy Research Abstracts 1(7):#011476. 1976]

C-0534-77
GAS-CHROMATOGRAPHIC ANALYSIS IN WASTE CHEMISTRY
Dell'Acqua, R. 1975.
Chromatographic Analysis of the Environment. R. L. Grob (ed.). New York, Marcel Dekker, Inc., 1975. p. 581-609.

Chemical analysis, Chromatography, Contaminants, Wastewaters, Petroleum products, Petrochemicals, *Gas chromatography

The optimal analytical methods for quantifying organic contaminants present in wastewater by gas chromatography are reviewed. Gasoline, kerosine, fuel oils, lubricating oils, and certain refinery and petrochemical byproducts are among the pollutants considered.

C-0535-77
IDENTIFICATION OF GASOLINE CONTAMINATION OF GROUNDWATER BY GAS CHROMATOGRAPHY
Dell'Aqua, R., B. Bush, and J. Egan. 1976.
Journal of Chromatography 128(2):271-280.

Gasoline, Chemical analysis, Chromatography, Groundwater, Contamination

A method of extraction and identification of gasoline is described which may be used to identify a source causing contamination at a level as low as 0.5 µl/l. The method employs gas chromatography using packed columns and a flame ionization detector.

C-0536-77
THE SOLUBILITY OF MEDIUM MOLECULAR WEIGHT AROMATIC HYDROCARBONS AND THE EFFECTS OF HYDROCARBON CO-SOLUTES AND SALINITY
Eganhouse, R. P., and J. A. Calder. 1976.
Geochimica et Cosmochimica Acta 40(5):555-561.

Aromatic hydrocarbons, Chemical analysis, Solubility

The solubilities of several medium molecular weight hydrocarbons were determined at 25°C in aqueous binary, ternary, and quaternary hydrocarbon systems. Solubility limits of the hydrocarbons depend on the composition of the petroleum from which they are derived.

C-0537-77
INTERCALIBRATION OF GAS CHROMATOGRAPHIC ANALYSES FOR HYDROCARBONS IN TISSUES AND EXTRACTS OF MARINE ORGANISMS
Farrington, J. W., J. M. Teal, G. C. Medeiros, K. A. Burns, E. A. Robinson, Jr., J. G. Quinn, and T. L. Wade. 1976.
Analytical Chemistry 48(12):1711-1716.

Hydrocarbons, Marine organisms, Chemical analysis, Chromatography, Fish

Analyses of petroleum hydrocarbons separated from tuna meal samples and cod liver lipid extracts were performed using gas chromatography. Measured values of hydrocarbons spiked to samples of cod liver oil are presented. Limitations to current methods of analysis used in this and other current studies are discussed.

C-0538-77
PETROLEUM HYDROCARBONS
Farrington, J. W., J. M. Teal, and P. L. Parker. 1976.
Strategies for Marine Pollution Monitoring. E. D. Goldberg (ed.). New York, John Wiley & Sons, Inc., 1976. p. 3-34.

Hydrocarbons, Oceans, Chemical analysis, Sampling

In this chapter, the authors set forth principles for the analysis of marine samples for petroleum hydrocarbons with a boiling range above n-tetradecane. Continuing research needs in the measurement of petroleum hydrocarbons are noted. One point underlined is that sampling, analysis, and interpretation of data are best accomplished by a team of scientists or a scientist having experience in analytical chemistry, marine geochemistry, marine biochemistry, and marine ecology.

C-0539-77
HYDROCARBONS IN 60 NORTHEAST GULF OF MEXICO SHELF SEDIMENTS: A PRELIMINARY SURVEY
Gearing, P., J. N. Gearing, T. F. Lytle, and J. S. Lytle. 1976. Geochimica et Cosmochimica Acta 40(9):1005-1017.

Hydrocarbons, Sediments, Algae, Chromatography, Gulf of Mexico, Mississippi River, Sampling

Gas chromatography was used to analyze 60 sediment and 10 benthic algae samples in the northeast Gulf of Mexico. Results show two distinct shelf environments: one, a western zone dominated by hydrocarbon inputs from the Mississippi River and two, a zone extending from northwest Florida to Tampa dominated by hydrocarbons similar to those produced by marine organisms.

C-0540-77
DISTRIBUTION OF N-PARRAFINS [sic] IN SELECTED MARINE BENTHIC ORGANISMS
Giam, C. -S., H. S. Chan, and G. S. Neff. 1976.
Bulletin of Environmental Contamination and Toxicology 16(1):37-44.

Hydrocarbons, Marine organisms, Chemical analysis, Chromatography, Fish, *Shrimp, *Squid, *n-Paraffins

Shrimp, fish and squid from the Texas OCS area of the Gulf of Mexico were analyzed by gas chromatography for the presence of n-paraffins. Squid and fish contained relatively high concentrations of C_{15} and C_{17} n-paraffins. Shrimp and fish samples exhibited the least intraspecies and seasonal variations in their distribution of n-paraffins and are considered very useful for the detection of petroleum-based hydrocarbon pollution.

C-0541-77
CHARACTERIZATION OF INDUSTRIAL ORGANIC COMPOUNDS IN WATER
Goodley, P. C., and M. Gordon. 1976.
Transactions, Kentucky Academy of Science 37(1-2):11-15.

Chemical analysis, Hydrocarbons, *Industrial organic compounds, *Tennessee River

Waters from the Lower Tennessee River analyzed by gas chromatography, mass spectrometry, and infrared and NMR spectroscopy were found to contain aromatic and aliphatic hydrocarbons, phenols and other substances.

[from Chemical Abstracts 86(4): #21623w. 1977]

C-0542-77
CHROMATOGRAPHIC ANALYSIS OF THE ENVIRONMENT
Grob, R. L. (ed.). 1975.
New York, Marcel Dekker, Inc., 1975. xi + 734p.

Chemical analysis, Chromatography, Hydrocarbons, Petroleum products, Petrochemicals, Fuels, Wastewaters

This book provides a comprehensive review of various chromatographic techniques for determining contaminants in the air, water, waste effluents, and soil. The sections on water pollution (Part IV) and waste chemistry (Part V) include discussions of specific chromatographic techniques useful in the identification and characterization of petroleum hydrocarbons, petroleum-based fuels and lubricants, and petrochemical and petroleum industry wastes.

C-0543-77
A REVIEW OF SOME COMMONLY USED PARAMETERS FOR THE DETERMINATION OF OIL POLLUTION
Gruenfeld, M., and U. Frank. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 487-491. (American Petroleum Institute No. 4284)

Hydrocarbons, Detection, Analytical techniques

Parameters of petroleum used in the detection of oil in water, sediments and biological tissues are outlined, and a brief state-of-the-art review is presented of techniques used in the analysis and characterization of pollutant petroleum hydrocarbons.

C-0544-77
HIGH-PRESSURE LIQUID CHROMATOGRAPHY OF BENZO(A)PYRENE AND BENZO (GHI)PERYLENE IN OIL-CONTAMINATED SHELLFISH
Guerrero, H., E. R. Biehl, and C. T. Kenner. 1976.
Journal of the Association of Official Analytical Chemists 59(5): 989-992.

Chemical analysis, Chromatography, PAH, Marine organisms, *Shellfish

In the title analysis, the polynuclear aromatics are extracted with acetonitrile and partitioned into petroleum ether, the petroleum ether is removed, and the residue is saponified. The compounds are purified and isolated by passing the residue through a silica gel column and a high-pressure liquid chromatographic column, and detected by their ultraviolet absorption. Recoveries of standards through the analysis averaged 104%.

C-0545-77
LIQUID CHROMATOGRAPHIC ANALYSES IN WASTE CHEMISTRY
Hamilton, C. E. 1975.
Chromatographic Analysis of the Environment. R. L. Grob (ed.). New York, Marcel Dekker, Inc., 1975. p. 581-609.

Chemical analysis, Chromatography, Contaminants, Hydrocarbons, Wastewaters, *Liquid chromatography

The usefulness of conventional liquid chromatography (LC) is assessed for the analysis of organic contaminants, including certin petroleum hydrocarbons. The technique is presently limited in its applications because of poor reproducibility of results and low accuracy, speed and selectivity.

C-0546-77
ANALYSIS OF MICROGRAM/KG (PPB) LEVEL HYDROCARBONS IN INTERTIDAL ZONE SEDIMENTS AND WATER BY GAS CHROMATOGRAPHY-MASS SPECTROMETRY
Hertz, H. S., W. E. May, S. N. Chesler, and B. H. Gump. 1975. Annual Conference on Mass Spectrometry and Allied Topics, 23rd, Houston, 1975. p. 663-665.

Hydrocarbons, Chemical analysis, Chromatography, Spectrometry, Sediments, Intertidal zone, *Water analysis

Techniques involving dynamic headspace sampling and subsequent GC/GC-MS analysis have been developed in this laboratory. Sample components are separated from the matrix in a closed system and concentrated on a porous polymer pre-column, free from large amounts of solvent and ready for GC-MS analysis. Applications of this method to the identification of microgram/kg level hydrocarbons are discussed.

[from Government Reports Announcements 76(25):#PB-257 922/5GA. 1976]

C-0547-77
DIRECT ANALYSIS OF ORGANIC COMPOUNDS IN AQUEOUS BYPRODUCTS FROM FOSSIL FUEL CONVERSION PROCESSES: OIL SHALE RETORTING, SYNTHANE COAL GASIFICATION AND COED COAL LIQUEFACTION
Ho, C. H., B. R. Clark, and M. R. Guerin. 1976.
Journal of Environmental Science and Health A11(7):481-489.

Oil shale, Extraction, Analytical techniques, Chromatography, Contaminants, *By-product waters

An analytical technique is described for the rapid determination of contaminants occurring in the by-product water from oil shale retorting, coal gasification and coal liquefaction processes. Results of the technique, which utilizes gas chromatography, are presented.

C-0548-77
MEASUREMENT OF URBAN RUNOFF PETROLEUM
Hunter, J. V., S. L. Yu, and W. Whipple, Jr. 1975.
Urbanization and Water Quality Control. W. Whipple, Jr. (ed.). Minneapolis Minnesota, American Water Resources Association, 1975. p. 162-168.

Wastewaters, Refineries, Hydrocarbons, Delaware, *Oil content, *Urban runoff, *Delaware Estuary

Samples of urban storm runoff into the Delaware Estuary were analyzed to determine petroleum contents of urban runoff and to assess the relative importance of urban runoff and refinery effluent inputs. Average concentrations of hydrocarbons ranged from about 2-4 mg/l in runoff; hydrocarbons were predominantly aliphatic and associated with particulate matter. Refinery effluent hydrocarbon concentrations averaged about 1.5 mg/l, or 60 percent of the average concentrations of urban runoff; these were also predominantly aliphatic and associated with particulates.

C-0549-77
EFFECTS OF WATER POLLUTED BY OIL ON AQUATIC ANIMALS: III PRETREATMENT IN DETECTION OF N-PARAFFINS IN MARINE SEDIMENTS BY GAS CHROMATOGRAPHY
Motohiro, T., and Z. Iseya. 1976.
Hokkaido Daigaku, Sapporo, Japan. Suisangakubu, Hakodate. Hokkaido Daigaku Suisangakubu Kenkyo Iho 26(4):372-380.

Detection, Hydrocarbons, Sediments, Chemical analysis, Chromatography, Solvents, *n-Paraffins

Preliminary treatments by column and thin-layer chromatography (TLC) were conducted using solvents with different polarities. Petroleum ether + benzene = 90:10 (v/v) for column chromatography and n-hexane + benzene = 95:5 (v/v) for TLC were more efficient than other tested solvents in separating n-paraffins from contaminants. With pretreatment, n-paraffins below C_{13} tend to disappear due to evaporation losses.

[from Pollution Abstracts 8(1):#77-00276. 1977]

C-0550-77
ORGANIC SULFUR COMPOUNDS IN THE FLESH OF EELS REARED IN CRUDE OIL SUSPENSIONS [in Japanese]
Ogata, M. Y. Miyake, K. Matsunaga, M. Imanaka, M. Ikeda, and T. Ishada. 1976.
Igaku to Seibutsugaku 92(4):297-299.

Chemical analysis, Chromatography, Hydrocarbons, Crude oil, *Eels, *Organic sulfides

"Paraffin hydrocarbons together with organic sulfides were detected in eels after a 17-day exposure to water containing crude oil as detected by gas-liquid chromatography."

[from Chemical Abstracts 86(7):#38257c. 1977]

C-0551-77
ANALYZER OF PETROLEUM PRODUCT CONTENT IN WASTE WATERS AND ITS METEOROLOGICAL ATTESTATION [in Russian]
Osipov, V. M., A. V. Chel'tsov, Y. M. Lindenbaum, V. V. Luchinskii, and V. D. Grigor'ev. 1976.
Zhurnal Prikl. Spektrosk. 25(2):301-305.

Chemical analysis, Petroleum products, Wastewaters, Monitoring

Petroleum products (1-1000 mg/l) in wastewater were extracted with CCl_4 and analyzed. Results of infrared monitoring are presented.

[from Chemical Abstracts 86(4):21442m. 1977]

C-0552-77
PETROLEUM POLLUTION: CHEMICAL CHARACTERISTICS AND BIOLOGICAL EFFECTS
Parker, P. L., K. Winters, C. VanBaalen, J. C. Batterton, and R. C. Scalan. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 256-269. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Biological effects, Contamination, Chemical analyis, Crude oil, Hydrocarbons, *Water-soluble fractions

In this study the problems of the biological effects of petroleum pollution have been approached in two ways: (1) the study of the chemical composition of water-soluble fractions (WSFs) of crude oil and their physical and biological transport in the water column, and (2) identification and quantification of the types and levels of heavy hydrocarbons in the sea.

C-0553-77
ANALYSIS OF OIL, OIL DISPERSANTS AND METABOLITES DURING BIODEGRADATION IN SEAWATER
Penrose, W. R., L. L. Dawe, and M. J. Sandeman. [1976.]
Trace Analysis of Environmental Materials. p. 13. Program and abstracts.

Dispersants, Chemical analysis, Biodegradation, Seawater

Described are procedures which have been developed to identify a series of commercial oil dispersants and to establish the mechanism of biodegradation of the dispersants in seawater.

[from Pollution Abstracts 8(1):#77-00373. 1977]

C-0554-77
OIL AND GREASE ANALYSIS OF DRILLING MUDS. AN INVESTIGATION OF THE RELIABILITY AND CONFIDENCE INTERVALS OF STANDARD WATER QUALITY ANALYSIS METHODS AS THEY APPLY TO THE DRILLING MUDS
Strosher, M., and J. Bogner. 1975.
Report to the Water Pollution Control Section, Canada, Environmental Protection Service. 16p.

Drilling, Analytical techniques, Water quality, *Drilling muds

Summary not available.

[from Kananaskis, University of Calgary, Alberta, Canada. IB No. 9. Publication No. 75-14. March 31, 1976]

C-0555-77
LIQUID CHROMATOGRAPHIC ANALYSIS IN WATER POLLUTION
Suffett, I. H., and E. J. Sowinski. 1975.
Chromatographic Analysis of the Environment. R. L. Grob (ed.). New York, Marcel Dekker, Inc., 1975. p. 429-488.

Chemical analysis, Chromatography, Petroleum products, PAH, Refineries, Wastewaters, *Liquid chromatography

The application of various liquid chromatography (LC) techniques for identifying and quantifying trace amounts of organic pollutants in water is outlined. Included is a tabulation of LC techniques for characterizing petroleum products, polycyclic hydrocarbons, refinery effluents, and oily wastewaters.

C-0556-77
SOLUBILITY OF ALKYLBENZENES IN DISTILLED WATER AND SEAWATER AT 25.0°C
Sutton, C., and J. A. Calder. 1975.
Journal of Chemical & Engineering Data 20(3):320-322.

Chemical analysis, Aromatic hydrocarbons, Solubility, *Alkylbenzenes

Results indicated that for monosubstituted alkylbenzenes, the size of the alkyl substituent is important in determining the solubility; whereas for polysubstituted alkylbenzenes, the positions of the substituents on the benzene ring are also important.

C-0557-77
AUTOMATIC ANALYZER FOR TRACES OF DISPERSED OILS IN WASTE WATER USING SOLVENT EXTRACTION AND INFRARED SPECTROPHOTOMETRY [English summary]
Suzuki, R., N. Yamaguchi, and R. Matsumoto. 1976.
Bunseki Kagaku 25(5):308-313.

Wastewaters, Chemical analysis, Contaminants, *Solvent extraction, *IR spectrophotometry

An automatic analyzer is described which detects $\geq$ 0.5 ppm mineral oil, fatty oils and fatty acids in wastewater.

[from Chemical Abstracts 85(22):#166062b. 1976]

C-0558-77
THIN-LAYER CHROMATOGRAPHIC ANALYSIS IN SOIL CHEMISTRY
Thornburg, W. 1975.
Chromatographic Analysis of the Environment. R. L. Grob (ed.). New York, Marcel Dekker, Inc., 1975. p. 581-609.

Chemical analysis, Chromatography, Hydrocarbons, PAH, Soil, *Thin-layer chromatography

Techniques and applications of thin layer chromatography (TLC) in soil analysis are reviewed. TLC is considered a promising technique for the separation and semiquantitative analysis of organic compounds, including petroleum products and polycyclic aromatic hydrocarbons, and inorganic substances.

C-0559-77
INFRARED ANALYSIS OF MICRO AMOUNTS OF OIL IN WATER [in Chinese]
Tsai, M.-H. 1976.
T'ai-wan Huan Ching Wei Sheng 8(1):22-29.

Chemical analysis, *Infrared analysis, Detection, *Oil-in-water

Various types of oils and fatty acids were detected in water by infrared analysis at concentrations as low as 0.5 ppm or less. The technique involved mixing the oil-containing sample with NaCl, extracting with CCl_4, and analyzing the CCl_4 extracts.

[from Chemical Abstracts 86(2):#8377z. 1977]

C-0560-77
ALIPHATIC HYDROCARBONS IN SEDIMENTS OF LAKE WASHINGTON
Wakeham, S. G., and R. Carpenter. 1976.
Limnology and Oceanography 21(5):711-723.

Chemical analysis, Chromatography, Sources, Hydrocarbons, Sediments, Detection, Lakes, Washington

Aliphatic hydrocarbons of Lake Washington sediments were detected and characterized by gas chromatography and radiocarbon and stable C isotope analyses. Detailed analyses of cores show increases in petroleum hydrocarbon levels after 1880, which correspond to the start of a period of growth for the adjacent metropolitan area.

[from Chemical Abstracts 86(4):#21654g. 1977]

C-0561-77
HYDROCARBON IN SEWAGE AND URBAN RUNOFF-DELAWARE ESTUARY
Whipple, W., Jr., J. V. Hunter, and S. H. Yu. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 54-65. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Chemical analysis, Source identification, Hydrocarbons, Wastewaters, Refineries, *Sewage, *Urban runoff, Regulations, Delaware

Analyses conducted to identify and measure the sources of petroleum pollutants in the Delaware Estuary indicate that industrial wastes, particularly refinery process effluents, constitute the greatest input, followed by sewage plant effluents and urban runoff. Stringent new regulations are drastically reducing the refinery outputs of hydrocarbons, but such standards are not yet required for controlling municipal treatment plant and urban and industrial runoff inputs.

C-0562-77
HYDROCARBONS IN WATERS. IDENTIFICATION AND MEASUREMENT OF HYDROCARBONS AND THEIR DERIVATIVES IN WATERS
Whitby, F. J. 1976.
Proceedings of the Analytical Division of the Chemical Society 13(8):247-249.

Hydrocarbons, Chemical analysis

"A review with no references."

[from Chemical Abstracts 86(6):#34039k. 1977]

C-0563-77
WATER SOLUBLE COMPONENTS OF CRUDE OILS, FUEL OILS, AND USED CRANKCASE OILS
Winters, K., and P. L. Parker. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 579-582. (American Petroleum Institute No. 4284)

Chemical analysis, Chromatography, Spectrometry, Crude oil, Petroleum products, Hydrocarbons, Evaporation, *Water soluble fractions

Combined gas chromatography-mass spectrometry was used to identify and monitor evaporative changes in water soluble fractions present in representative crude oils, Bunker C fuel oil, and used crankcase oils. Identified hydrocarbons included alkyl phenols, amilines, indoles, quinolines, benzothiophenes, aromatic aldehydes and ketones. Alkyl benzenes, indans, and naphthalenes were found to evaporate most rapidly and completely from freshly prepared water soluble fractions, resulting in relative enrichment of alkyl phenols, anilines and indoles.

C-0564-77
QUANTIFICATION OF NAVY OILS IN DETERGENT LADEN WATERS
Yu, T. S. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 169-172. (American Petroleum Institute No. 4284)

Analytical techniques, Spectrometry, Extraction. Solvents, *Detergents, *Oil-in-water

The presence of detergents interferes with the solvent extraction and infrared spectrometry measurement technique for quantifying oil in water. This paper describes a study of an analytical method which utilizes silica gel to remove interfering detergent(s) in the extract, so that infrared spectrometry can be used to quantify the oil in water. Silica gel can remove up to 96.5% of the interference, thus enabling the determination of oil in water in which the ratio of the concentration of detergent to oil is less than 10 to one.

6. SOURCE IDENTIFICATION

C-0565-77
THE COAST GUARD'S FORENSIC OIL IDENTIFICATION SYSTEM
Clow, J. C. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 189-192. (American Petroleum Institute No. 4284)

Source identification, Oil spills, Analytical techniques, Chromatography, Spectroscopy, Sampling, USCG

The U.S. Coast Guard Research and Development Center has established the capability to identify and classify oil spill samples with sufficient accuracy and speed so that the results can withstand judicial review, and corrective or administrative action can be directed at the suspected polluter. Five promising techniques were evaluated; of these infrared and fluorescence spectroscopy, and gas and thin-layer chromatography have been selected for development as laboratory and field identification systems.

C-0566-77
SOURCES OF POLYCYCLIC AROMATIC HYDROCARBONS IN THE AQUATIC ENVIRONMENT
Hites, R. A. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 325-332. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Source identification, PAH, Oil spills, Incineration, Chemical analysis

The major sources of polycyclic aromatic hydrocarbons (PCAH) in nature are biosynthesis, petroleum spillage, and combustion from mobile and stationary sources including industrial activity, forest fires and refuse burning. Very complex PCAH mixtures have been identified in recent field and laboratory studies. The present study rules out biosynthesis as a major source and indicates that anthropogenic sources followed by in situ modification of the PCAH distribution is a valid hypothesis.

C-0567-77
OIL "FINGERPRINTS" FOR IDENTIFYING POLLUTERS, SYSTEMS FOR CONTROLLING SPILLS
Roberts, W. F. 1976.
Marine Engineering/Log 81(6):30-33.

Source identification, Oil spills, Analytical techniques, Oil transport, Pollution prevention, USCG

USCG is currently testing double-beam fluorescence spectrophotometry as a method of identifying and proving an oil spill's source. Results of tests of this method and others are compared, and pollution prevention techniques during marine oil transport and handling are discussed.

[from Environment Abstracts 6(11):#76-07339. 1976]

C-0568-77
SOURCE AND DISTRIBUTION OF HYDROCARBONS IN SURFACE WATERS OF THE SARGASSO SEA
Wade, T. L., J. G. Quinn, W. T. Lee, and C. W. Brown. 1976.
Sources Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 270-286. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Source identification, Hydrocarbons, Chemical analysis, Chromatography, Spectrometry, Distribution, Sargasso Sea

The hydrocarbon contents of pelagic tar and surface water samples from the Sargasso Sea were determined by gas liquid chromatography and infrared spectrometry. Small particles (0.3 μm to 1.0 mm diameter) of weathered tar appear to be the major source of cycloparaffins and other hydrocarbons present. The study indicates that previous estimates of pelagic tar may be very low because they did not include the smaller size range of these particles.

B. OIL POLLUTION PREVENTION AND CONTROL

1. CONTAINMENT

C-0569-77
A RIGID, PERFORATED PLATE OIL BOOM FOR HIGH CURRENTS
Ayers, R. R. 1976.
EPA-600/2-76-263, 68-03-0331. 131p.

Containment, Oil spills, Booms, Design and engineering, *High currents

"A radically different rigid, modular boom has been designed and verified by test for permanent installation in high currents. The design is based upon placing a baffle immediately upstream of a barrier to slow down the surface flow and, as a consequence, contain oil between at higher currents than conventional booms."

C-0570-77
AN OIL AND SORBENT MIXTURE CONTAINMENT BOOM
Der, J. J. 1976.
U.S. Patent Application AD-D003 051/0

Containment, Booms, Oil slicks, Design and engineering, Patent

A containment boom for containing a mixture of oil and sorbent floating on water is described.

[from Government Reports Announcements 77(1):#PAT-APPL-767 746/GA. 1977]

C-0571-77
OIL BARRIER WHICH CAN BE ROLLED UP
Dubois, B. J. 1976.
German Patent 2,253,884

Containment, Oil spills, Booms, Design and engineering, Patent

An oil barrier consists of a vertical, inflatable, floating, flexible skirt which is equipped with damping and stabilizing means and defines spaces which are closed on top and open on bottom so that they contain an air cushion. The cushion is subdivided into chambers by vertical walls extending downward to or below the water line. These walls have an elasticity which pushes them away from the other walls, thus automatically opening the air cushions.

[from Petroleum Abstracts 17(3):#229,165. 1977]

C-0572-77
USE OF FLOATING DEFLECTORS FOR OIL SPILL CONTROL IN FAST FLOWING WATERS
Eryuzlu, N. E., and R. Hausser. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 335-340. (American Petroleum Institute No. 4284)

Containment, Oil spills, Rivers, Design and engineering, *Hydrofoil deflectors

A system to control an oil spill in fast moving waters is described. A series of deflectors and hydrofoils deflect the oil from where the spill takes place into a portion of the river where slower currents allow the oil to be collected by conventional means.

C-0573-77
HYDRODYNAMICS OF A DIVERSIONARY BOOM
McCracken, W. E., and F. J. Freestone. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 329-334. (American Petroleum Institute No. 4284)

Containment, Oil spills, Booms, Design and engineering, EPA, *OHMSETT

A U.S. Environmental Protection Agency sponsored test program at their OHMSETT center to study the near-field hydrodynamics of a diversionary boom is reported. Three dimensional flow fields were examined using dye and oil droplets with an underwater video system. Turbulence intensity was measured with a single axis, hot-film anemometry probe.

C-0574-77
SOME OBSERVATIONS OF OIL SLICK CONTAINMENT BY SIMULATED ICE RIDGE KEELS
Moir, J. R., and Y. L. Lau. 1975.
Canada Centre for Inland Waters, unpublished report. 14p.

Containment, Oil slicks, Booms, Beaufort Sea, *Ice ridge keel

Brief, exploratory tests were conducted to compare the capability of an ice ridge keel for retaining oil and that of a boom in open water flow conditions. The two oil containment situations are found to be similar; however, slicks contained behind the sloping ridges are prone to long-term leakage. The presence of an ice-sheet upstream of the barrier does not significantly alter the slick profile or the maximum volume of oil containable in comparison to the open water case.

C-0575-77
EVALUATION OF OIL SPILL BARRIERS AND DEPLOYMENT TECHNIQUES FOR THE ST. CLAIR-DETROIT RIVER SYSTEM
Vanderkooy, N., A. Robertson, and C. J. Beckett. 1976.
Environment Canada, Environmental Protection Service. Technology Development Report EPS-4-EC-76-4. 97p. + viii.

Containment, Oil spills, Booms, Rivers, Contingency planning, Canada, U.S., *Detroit-St. Clair river system

Discussed is the Joint Canada-United States Marine Pollution Contingency Plan, "Operation Preparedness", established to develop operational procedures for dealing with spill incidents in the Detroit-St. Clair river system and to formulate an Action Plan. The performance of 12 oil spill barriers is evaluated and effective deployment procedures are developed.

C-0576-77
CONTAINMENT AND RIDDANCE OF OIL SPILLS
Zall, D. M. 1976.
U.S. Patent 3,977,969

Containment, Oil spills, Coagulation, Patent, *Polymers

The surface of the oil spill is chemically treated with a polymer of high molecular weight and with jelling properties, causing the oil to coagulate. The oil then is raked off the surface of the water. Polyethylene oxide (Polyox) and polyacrylamide are examples of effective polymers.

[from Petroleum Abstracts 17(2):#228,863. 1977]

C-0577-77
58' SKIMMER SAVES LOST OIL FOR MORE USEFUL PURPOSES
Anon. 1976.
National Fisherman 57(7):17-B, 29-B.

Oil spills, Skimmers, Recovery, Design and engineering, *MARCO Clean Sounder, Puget Sound

A new oil skimmer vessel called "Clean Sounder" has recently been built by MARCO of Seattle, Washington, and is presently in service in the coastal and inland waters of Puget Sound. The unit uses oil attraction belts to pick up the oil from water; the recovered oil is then squeezed from the belts and stored aboard the skimmer. The vessel has a recovery capacity of 2270 l (600 gal) per minute and handles any type of crude oil, refined oil and floating debris.

C-0578-77
CLEAN SWEEP OIL RECOVERY SYSTEM: PONTOON MODEL R2003 SPECIFICATION NO. 5518374 (product information)
Anon. n.d.
Lockheed Missiles and Space Co., Sunnyvale, California. 11p.

Oil spills, Recovery, Harbors, Design and engineering, *Clean Sweep

An oil recovery system designed for calm seas and harbors is described. The unit is mounted on four pontoon hulls, one of which contains a built in sump and storage tank. Maximum oil discharge rate is 1100 l/min (300 gal/min) with a full power endurance of 8 hours.

[from Oceanic Abstracts 13(6):#76-05577. 1976]

C-0579-77
CLEAN SWEEP OIL RECOVERY SYSTEM: HARBOR RAFT MODEL R2003 SPECIFICATION NO. 5518361 (product information)
Anon. n.d.
Lockheed Missiles and Space Co., Sunnyvale, California. 10p.

Oil spills, Recovery, Harbors, Estuaries, Design and engineering, *Clean Sweep

A pontoon mounted oil recovery system designed for harbors, bays, and estuaries is described. Maximum oil discharge rate is 1300 l/min; each pontoon hull contains a storage tank for recovered oil.

[from Oceanic Abstracts 13(6):#76-05578. 1976]

C-0580-77
CLEANUP SYSTEMS INADEQUATE FOR OPEN OCEAN OIL SPILL (news brief)
Anon. 1977.
Sea Technology 18(1):45-46.

Cleanup, Oil spills, Skimmers, USCG, Argo Merchant spill

The "Argo Merchant" oil spill is briefly discussed and U.S. Coast Guard action to prevent oil spillage is reviewed. The U.S. Coast Guard's Clean Sweep oil skimmer is also described.

C-0581-77
ITALIAN OIL SKIMMER AND FIRE FIGHTING CRAFT
Anon. 1976.
Northern Offshore 5(10):43,46.

Skimmers, Oil spills, Monitoring, Cleanup, Mediterranean Sea

The oil skimming vessel "Gaima", which is also useful as fire-fighting craft, personnel carrier and pollution monitoring craft, is described. The vessel has recently been put into service in the Mediterranean Sea.

[from Petroleum Abstracts 17(1):#228,669. 1977]

C-0582-77
OIL SLICK REMOVAL SYSTEM, SKIMJET (product information)
Anon. 1976.
Mechanical Engineering 98(9):62.

Oil slicks, Recovery, Skimmers, Oil-water separation

This water jet system is able to remove 98% of an oil slick measuring 500 m^2 with a thickness of 2 cm each hour from sea or inland water. Various models of the Skimjet, developed and manufactured by Skimovex B.V. of The Hague, are available for work in ports and inland streams as well as in cooling and rinsing water tanks, oil-water separators, refineries, and chemical and meat processing plants.

C-0583-77
SPILL FUND BASED ON PREMIUM PAYMENTS (news brief)
Anon. 1977.
Offshore 37(3):174.

Oil spills, Cleanup, Economics, Tankers, Pipelines, Alaska, *Oil spill fund

The Alaskan Department of Environmental Conservation's efforts to establish a $30 million fund for the cleanup of oil spills in state waters are discussed and contrasted with the federal Trans-Alaska Pipeline Liability Fund. The state fund will be derived from owners of tankers and oil terminals who will pay a premium based on the state's analysis of their risk.

C-0584-77
SOCK - AN OIL SKIMMING KIT FOR VESSELS OF CONVENIENCE
Ayers, R. R., and A. V. Barnett. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 361-366. (American Petroleum Institute No. 4284)

Oil spills, Cleanup, Skimmers, Containment, Design and engineering, Cost analysis, Gulf of Alaska

The design and specifications of the Spilled Oil Containment Kit (SOCK), an oil spill sweep skimmer for use in the Gulf of Alaska, are described. A cost analysis based on using vessels of convenience rather than a specific skimmer vessel is presented.

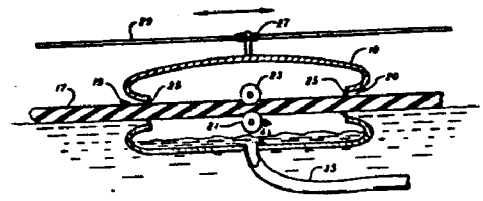
C-0585-77
OIL SPILL APPARATUS
Bagot, H. E., and S. P. Funkhouser. 1976.
U.S. Patent 3,986,959

Cleanup, Recovery, Oil spills, Patent, Design and engineering, *Oleophilic sponge

An endless belt apparatus which utilizes oleophilic and hydrophobic sponge or mop has been designed for the removal of floating oil. The apparatus contains the means to squeeze out recovered oil and to draw or pump the oil into a storage tank.

[from Petroleum Abstracts 17(1):#229,368. 1977]

3,986,959
OIL SPILL APPARATUS
Harold E. Bagot, 221 Bennett Ave., Yonkers, N.Y. 10701, and Selmes Paul Funkhouser, 79th St. Boat Basin, New York, N.Y. 10024
Filed May 21, 1975, Ser. No. 579,681
Int. Cl.² E02B 15/04
U.S. Cl. 210—242 AS 5 Claims



C-0586-77
ROLE OF THE MUSSEL IN PURIFYING SEA WATER OF PETROLEUM PRODUCTS (IN EXPERIMENT) [in Russian]
Bioko, E. V., and Yu. M. Petrov. 1975.
Gidrobiologicheskii Zhurnal 11(2):28-33.

Oil spills, Cleanup, Seawater, Mollusks, Oxidation, *Water purification, *Mussels, *Mytilus edulis

In aquaria with M. edulis, water is purified twice as fast as in the control (without animals). About 7% of the initial amount of petroleum product remains three weeks after mussels are introduced into aquaria; 1.4% of these products is settled by hydrobionts onto the bottom of the vessels; 5.6% remains in the surface film; and about 0.2% is dissolved in the water. Chemical oxidation of oil is assumed to begin three weeks after its introduction.

[from Selected Water Resources Abstracts 10(1):#W77-00418. 1977]

C-0587-77
NEW CONCEPT OF OIL DISPERSION IN VIEW OF CLEANUP BY DEGRADATION
Bocard, C., B. Durif-Varambon, C. Gatellier, Ph. Renault, P. Laboureur, and L. Person. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 407-410. (American Petroleum Institute No. 4284)

Oil spills, Dispersants, Cleanup, Toxicity, Biodegradation

Results of this study suggest that a complete degradation of crude oil can be assured by use of a new generation of dispersants which could be called "degrading detergents". Treatment using the degrading detergents would maintain the polluting hydrocarbons near the surface of the ocean and in the most reactive part of the water column, containing the planktonic and microbial biomass active in organic carbon decay.

C-0588-77
AN OFFSHORE MECHANIZED SORBENT OIL RECOVERY SYSTEM USING VESSELS OF OPPORTUNITY
Brunner, D. E., J. J. Der, and D. Hall. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 251-254. (American Petroleum Institute No. 4284)

Oil spills, Recovery, Absorption, Design and engineering

The development of an experimental prototype offshore oil recovery system designed for use on vessels of opportunity by the Civil Engineering Laboratory is described and the results of tests at sea are reported.

C-0589-77
SOME RECENT OBSERVATIONS REGARDING THE UNIQUE CHARACTERISTICS AND EFFECTIVENESS OF SELF-MIX CHEMICAL DISPERSANTS
Canevari, G. P. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 387-390. (American Petroleum Institute No. 4284)

Dispersants, Chemical analysis, Oil spills, *Dilution rate

The use and effectiveness of self-mix chemical dispersants in minimizing damage from oil spills are discussed, and laboratory results of bioassays performed with one micron diameter oil droplets are reported. Data to support the theory that droplet size influences the dilution rate of spilled oil are presented.

C-0590-77
DEVICE FOR RECOVERING OILY POLLUTING LIQUID FROM A WATER SURFACE
Degobert, P., F. Kermarrec, and Y. Nadaud. 1976.
British Patent 1,439,670

Oil slicks, Recovery, Design and engineering, Patent *Oleophilic container

An apparatus for removing oil slicks consists of a floating container having a porous oleophilic membrane and an impermeable collection sump which holds oil that has trickled through the oleophilic membrane. The device can be heated to reduce the viscosity of thick oils, thus aiding their penetration into the interior.

[from Chemical Abstracts 86(4):#21701v. 1977]

C-0591-77
EFFECTIVELY RECOVERING OIL SPILLS TO GROUNDWATER
Dennis, D. M. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 255-258. (American Petroleum Institute No. 4284)

Oil spills, Recovery, Hydrocarbons, Groundwater, Contingency planning, Cost analysis

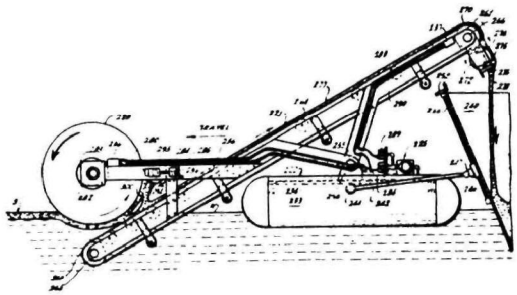
Oil spills on land pose a threat to potable water supplies through hydrocarbon contamination of groundwater. Three oil recovery methods are outlined: the recovery trench method is used when groundwater is less than three meters (10 feet) from the surface; the recovery well method employs a draw-down pump to concentrate the spilled oil; the recovery crock method is used as a barrier in areas of little groundwater movement. A cost analysis and a contingency plan outline are given for these methods.

C-0592-77
APPARATUS FOR COLLECTING OIL SLICKS FROM A BODY OF WATER
DeVoss, E. A. 1976.
U.S. Patent 3,968,041

Oil slicks, Recovery, Skimmers, Design and engineering, Patent

A system for removing oil slicks from water surfaces is described and various features of the device are treated in detail.

[from Petroleum Abstracts 16(42):#226,004. 1976]



3,968,041
APPARATUS FOR COLLECTING OIL SLICK FROM A BODY OF WATER
Edwin A. De Voss, 1363 Clarence Drive, Vista, Calif. 92083
Continuation-in-part of Ser. No. 128,766, March 29, 1971, abandoned. This application Sept. 12, 1973, Ser. No. 396,348
Int. Cl.² E02B *15/04*
U.S. Cl. 210—242 S 19 Claims

C-0593-77
NOVEL DISPERSING NITROGEN COMPOUNDS USABLE IN CLEANING HYDROCARBON IMPURITIES BY BIODEGRADATION
Durif-Varambon, B., C. Bocard, C. Gatellier, and B. Sillion. 1976.
French Patent 2,295,786

Dispersants, Hydrocarbons, Oil slicks, Cleanup, Biodegradation, Patent, *Nitrogen compounds

The chemical and biological degradation of hydrocarbons on and in water is effected by use of biodegradable nitrogen-based dispersants obtained by the cyanoethylation of oxyalkylated alcohols followed by reduction.

[from Petroleum Abstracts 16(50):#227,852. 1976]

C-0594-77
NOVEL DISPERSING BIODEGRADABLE NITROGEN COMPOUNDS USED IN CLEANING UP HYDROCARBON IMPURITIES
Durif-Varambon, B., C. Gatellier, C. Bocard, and B. Sillion. 1976.
French Patent 2,295,787

Dispersants, Hydrocarbons, Oil slicks, Cleanup, Biodegradation, Patent, *Nitrogen compounds

Hydrocarbons on and in water can be dispersed with biodegradable nitrogen compounds obtained by acylation of aliphatic amines with hydroxylated acids or their lactones. This process assures catalytic oxyalkylation so that a suitable hydrophilic-lipophilic equilibrium results.

[from Petroleum Abstracts 16(50):#227,853. 1976]

C-0595-77
NOVEL DISPERSING NITROGEN COMPOUNDS FOR THE BIODEGRADATION OF HYDROCARBON IMPURITIES
Durif-Varambon, B., C. Bocard, C. Gatellier, and B. Sillion. 1976.
French Patent 2,295,788

Dispersants, Hydrocarbons, Oil slicks, Cleanup, Biodegradation, Patent, *Nitrogen compounds

Hydrocarbon pollutants on and in water can be dispersed with nitrogen compounds obtained by combining glutamic acid with a hydroxylated compound and an alkylene oxide.

[from Petroleum Abstracts 16(50):#227,854. 1976]

C-0596-77
SKIMMING SAUCER
Falxa, H. 1976.
Canadian Patent 998,625

Skimmers, Oil slicks, Recovery, Design and engineering, Patent

A saucer-shaped oil skimming apparatus is described in which an open oil collection container is designed to float with its rim just below the oil-water interface. The device is most suitable for still water surfaces such as refinery effluent ponds.

[from Petroleum Abstracts 17(1):#228,670. 1977]

C-0597-77
UTILIZATION OF DISPERSANTS IN OFFSHORE AREAS
Fitzgerald, D. E. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 395-398. (American Petroleum Institute No. 4284)

Dispersants, Oil spills, Cleanup, Environmental effects, Contingency planning, API

The use of low toxicity oil dispersants that threaten sensitive environmental or commercial areas is discussed and the role of the On-Scene Coordinator (OSC) in dispensing dispersants is presented. Revisions to the National Contingency Plan are offered by the American Petroleum Institute Task Force.

C-0598-77
DEVELOPMENT OF A HIGH CURRENT STREAMLINED OIL BOOM/SKIMMER FOR INLAND WATERWAYS
Folsom, B. A., and C. Johnson. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 323-327. (American Petroleum Institute No. 4284)

Oil spills, Recovery, Booms, Skimmers, Oil-water separation, Design and engineering, *OHMSETT

A streamlined oil boom/skimmer is described which uses a slightly submerged slotted hydrofoil to skim a thin layer of oil and water into an attached sump where the oil and water are separated and the oil retained. Sump design, stable control/flotation system, and tests at OHMSETT are reported.

C-0599-77
THE STORY OF A SUCCESSFUL OIL SPILL COOPERATIVE: THE CORPUS CHRISTI AREA OIL SPILL CONTROL ASSOCIATION
Franklin, H. L. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 65-68. (American Petroleum Institute No. 4284)

Oil spills, Cleanup, Pollution control, Economics, Texas, *Corpus Christi

The history of the Corpus Christi Area Oil Spill Control Association, a nonprofit Texas corporation, is reviewed and two reasons for its success are given. The first is the equal share taken by industry, federal, state, and local governments to finance the budget and the second is the low average cleanup cost per gallon.

C-0600-77
PERFORMANCE TESTS OF THREE FAST CURRENT OIL RECOVERY DEVICES
Getman, J. H. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 341-346. (American Petroleum Institute No. 4284)

Oil spills, Recovery, Skimmers, Design and engineering, USCG

THE U.S. Coast Guard development program to evaluate seven different small-scale, fast-current recovery devices is reviewed. The results of tests on two full scale models at the OHMSETT center are reported.

C-0601-77
DISPERSANT FIELD TRIALS IN CANADIAN WATERS
Gill, S. D. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 391-394. (American Petroleum Institute No. 4284)

Oil spills, Cleanup, Dispersants, Canada, *Canadian Coast Guard

Field trials conducted by the Canadian Coast Guard Marine Emergency Organization on a number of commercial oil dispersants using the Warren Springs type of testing apparatus are reported and the effectiveness of dispersants in both warm and cold waters is discussed.

C-0602-77
FRENCH OIL SPILL POLICY: THE RECOVERY PHASE
Guerin, P., and J. Pichon. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 355-360. (American Petroleum Institute No. 4284)

Oil spills, Recovery, Skimmers, Booms, Storage, France

France emphasizes recovery of oil rather than chemical dispersion. Containment, recovery, and storage equipment are reviewed and details concerning booms, skimmers, and storage containers used in France are given.

C-0603-77
A MODEL FOR THE COSTING OF OIL SPILL CLEARANCE OPERATIONS AT SEA
Holmes, P. D. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 39-44. (American Petroleum Institute No. 4284)

Oil spills, Models, Cleanup, Recovery, Cost analysis

The model used in this study has been useful in identifying the main component costs for different techniques of cleaning up oil spills in a variety of situations. This model takes into account the spill size, makes allowance for transport time, and allows for the practical effects of natural dispersion, evaporation, etc. Dispersant application is probably the most cost-effective method of oil spill treatment for oil spills below about 2,000 tons. For spills larger than this size, calculations show an economic advantage for the use of mechanical recovery methods.

C-0604-77
A DISCUSSION OF THE RESTORATION OF AN OIL SPILL AT MAYTON
Loader, J. G. 1975.
Conference on the Environmental Effects of Oil and Salt Water Spills on Land, Banff, Alberta, 1975. Alberta Environment, and University of Calgary, 1975. p. 240-249.

Restoration, Oil spills, Cleanup, Canada, *Mayton oil spill

The cleanup techniques employed by Hudson's Bay Oil and Gas Co. Ltd. at the Mayton oil spill are discussed and restoration methods used on the oiled farm land are presented.

C-0605-77
PROCESS FOR TREATING FRESH WATERS AND SEA WATERS POLLUTED BY HYDROCARBONS
Marconi, W., N. Oddo, and L. Degen. 1976.
Belgian Patent 813,612

Hydrocarbons, Cleanup, Oil spills, Biodegradation, Bacteria, Patent

Lipophilic compounds of nitrogen and phosphorus salts are treated with paraffin to aid in flotation. These salts are usable by bacteria which metabolize the hydrocarbons on the sea surface.

[from Petroleum Abstracts 17(6):#230,143. 1977]

C-0606-77
CONSIDERATIONS FOR FIELD USE OF DISPERSANTS
McCarthy, L. T., Jr. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 399-401. (American Petroleum Institute No. 4284)

Dispersants, Oil spills, Cleanup, Toxicity, EPA

A rationale is presented for the correlation of laboratory generated dispersant data to the spill situation in the field; dispersant toxicity and effectiveness in the water column are discussed. Current Environmental Protection Agency research projects on oil spill dispersants are summarized.

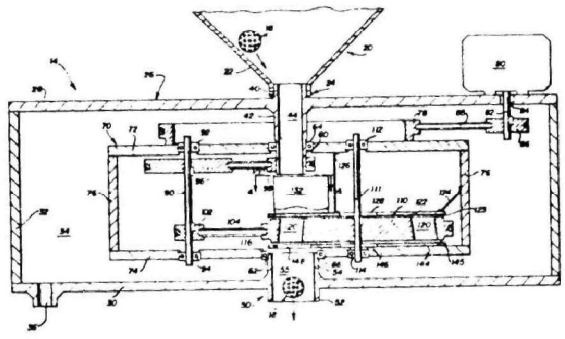
C-0607-77
METHOD AND APPARATUS FOR REMOVING CONTAMINANTS FROM THE SURFACE OF A BODY OF WATER
McCray, A. W. 1976.
U.S. Patent 3,976,570

Oil slicks, Cleanup, Petroleum products, Absorption, Design and engineering, Patent

Oil and petroleum products are removed by a procedure and apparatus which distributes oil absorbent, porous spheres on the water surface. The spheres absorb the oil and are removed; the absorbed oil is then recovered by a centrifuge apparatus, and the oleophilic spheres are returned to the water for further recovery.

[from Petroleum Abstracts 16(50):#227,858. 1976.]

3,976,570
METHOD AND APPARATUS FOR REMOVING CONTAMINANTS FROM THE SURFACE OF A BODY OF WATER
Arthur W. McCray, 1110 Grove Lane, Norman, Okla. 73069
Continuation of Ser. No. 404,111, Oct. 5, 1973, abandoned.
This application Apr. 18, 1975, Ser. No. 569,261
Int. Cl.[2] C02B 1/14
U.S. Cl. 210—30 A 16 Claims



C-0608-77
COMBINED SKIMMER-BARRIER HIGH SEAS OIL RECOVERY SYSTEM
Milgram, J. H., and R. A. Griffiths. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 375-379. (American Petroleum Institute No. 4284)

Oil spills, Recovery, Skimmers, Booms, Containment, Design and engineering, USCG

The development and design of an oil recovery system to be used in conjunction with the U.S. Coast Guard's high seas oil containment barriers are described. Tests conducted at the Environmental Protection Agency's OHMSETT facility and at sea are reported.

C-0609-77
DEBRIS HANDLING SYSTEM FOR NAVY HARBOR OIL SPILL CLEANUP OPERATIONS
Nadeau, P. F. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 271-275. (American Petroleum Institute No. 4284)

Oil spills, Cleanup, Skimmers, Harbors, USN, *Debris handling system

The development of a debris handling system for installation on Navy harbor oil skimmers is traced and specific problems, such as handling oily debris, system operation, and harbor debris, are discussed. The advantages of this system are: the flexibility of the skimmer is enhanced, manpower requirements and labor costs are reduced, the long term cost effectiveness of oil spill cleanup operations is greatly increased, and morale is enhanced by the elimination of manual debris handling operations.

C-0610-77
METHOD AND AN APPARATUS FOR COLLECTING SUBSTANCES AND OBJECTS ON A LIQUID SURFACE
Netzell, E. S. 1976.
U.S. Patent 3,980,559

Oil slicks, Skimmers, Recovery, Patent, Design and engineering

Oil and oily substances floating on water are collected by an apparatus which skims off the contaminant layer and floating objects, distributes these over a comparatively large collecting area, has means for collecting and separating the contaminant material, and drains off the cleaned liquid.

[from Petroleum Abstracts 16(50):#227,859. 1976]

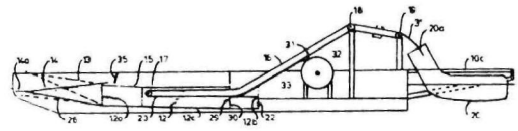
3,980,559

METHOD AND AN APPARATUS FOR COLLECTING SUBSTANCES AND OBJECTS ON A LIQUID SURFACE

Ernst Sune Netzell, Selmedalsvagen 222, 126 58 Hagersten, Sweden

Filed Sept. 9, 1974, Ser. No. 504,221

Claims priority, application Sweden, Sept. 10, 1973, 7312288



C-0611-77

WHAT CONSTITUTES GOOD TELECOMMUNICATIONS SYSTEMS FOR AN OIL SPILL CLEANUP

Pearce, R. B. 1977.

1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 69-75. (American Petroleum Institute No. 4284)

Oil spills, Cleanup, Pollution control, California, *Oakland estuary, *Telecommunications systems

The foundation of a good telecommunications system for oil spill cleanup consists of two networks: one, an operations system to keep the cleanup team synchronized and two, a logistics system to maintain a flow of support materials and equipment. Appropriate telecommunications equipment are listed and the Oakland estuary is cited as a case example.

C-0612-77

OIL COLLECTION BARGE

Petchul, S. L., and R. K. Petchul. 1976.

U.S. Patent 3,966,615

Oil spills, Recovery, Containment, Design and engineering, Patent, *Collection barge

A barge which collects and then contains and concentrates oil spilled on the surface of water is described; the operation of the vessel over large areas and in adverse sea states is discussed.

[from Petroleum Abstracts 16(42):#226,003. 1976]

3,966,615

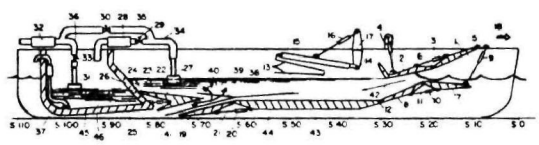
OIL COLLECTION BARGE

Sigvald L. Petchul, and Richard K. Petchul, both of 1380 SW. 57th Ave., Plantation, Fla. 33314

Filed June 25, 1974, Ser. No. 483,018

Int. Cl.² E02B 15/04

U.S. Cl. 210—242 R 8 Claims



C-0613-77
OIL COLLECTOR
Saeki, M., Y. Hosono, K. Mizumaki, and T. Honda. 1976.
Japanese Kokai (unexamined patent application) 76 81,796

Waste oil, Cleanup, Absorption, Patent

The oil-absorbent material consists of 40-97 parts powdered wood or grass with less than 30% water, and 3-60 parts material containing humic acid.

[from Chemical Abstracts 86(4):#21698z. 1977]

C-0614-77
DEVELOPMENT OF AN OIL SPILL RECOVERY SYSTEM FOR ARCTIC OPERATIONS
Scharfenstein, C. F., and M. G. Hoard. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 301-302. (American Petroleum Institute No. 4284)

Oil spills, Recovery, Ice, Design and engineering, Arctic, Canada, *Clean Sweep

The results of Canadian and Lockheed tests of the Clean Sweep oil recovery system in ice-clogged arctic waters are presented. The design of the arctic vessel, the ice processor, and plans for use of the system in arctic oil spill control operations are discussed.

C-0615-77
THE APPLICATION OF EXISTING OIL SPILL ABATEMENT EQUIPMENT TO COLD REGIONS
Schultz, L. A., and P. C. Deslauriers. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 309-312. (American Petroleum Institute No. 4284)

Oil spills, Arctic, Recovery, Containment, Remote sensing, Storage, Disposal

A recently completed survey study included a review and cursory evalution of oil spill response techniques and equipment currently used in warmer climates for application in the more severe environmental conditions of the arctic. The survey revealed that while a very limited degree of oil spill response capability presently exists for use in cold regions, a great deal of development work must be undertaken before a total cold regions oil response capability will be available.

C-0616-77
CLEANING THE CARGO TANKS ON PETROLEUM TANKERS USING THE PREPARATION IMF-1 [in Russian]
Semanov, G. N. 1975.
Trudy Tsentral'nyi Naucho-Issledovatel'skii Institut Morskogo Flota No. 203:76-80.

Tankers, Oil tanks, Cleanup, Surfactants

Various preparations for cleaning petroleum tanks were compared. The nontoxic and biodegradable cleaning agent IMF-1 removed the greatest amount of petroleum in the shortest amount of time, was the least corrosive agent, and had a greater multiplicity of other uses.

[from Chemical Abstracts 86(2):#6935f. 1977]

C-0617-77
USE OF DISPERSING AGENTS IN ELIMINATION OF THE CONSEQUENCES OF ACCIDENTAL PETROLEUM SPILLS [in Russian]
Semanov, G. N. 1975.
Trudy Tsentral'nyi Naucho-Issledovatel'skii Institut Morskogo Flota No. 203:67-72.

Oil spills, Cleanup, Dispersants

"A review with 5 references."

[from Chemical Abstracts 85(22):#166294d. 1976]

C-0618-77
A DISTRIBUTED REUSABLE-SORBENT OIL RECOVERY SYSTEM
Shaw, S. H., and J. S. Dorrler. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 247-250. (American Petroleum Institute No. 4284)

Oil spills, Recovery, Absorption, Rivers, Estuaries, Harbors, Design and engineering, EPA, *OHMSETT

The design, fabrication and test of a prototype system for the recovery of spilled oil from the surface of river, estuarine, and harbor waters are described. The tests were conducted at the Environmental Protection Agency's OHMSETT tank using diesel fuel and lubricating oil with efficiencies ranging from 45% to 100%.

C-0619-77
TECHNIQUES FOR MIXING DISPERSANT-TREATED OIL SLICKS INTO THE WATER
Smith, G. F., and W. E. McCracken. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 403-406. (American Petroleum Institute No. 4284)

Oil slicks, Cleanup, Dispersants, Design and engineering, EPA, *OHMSETT

Test results are given of an Environmental Protection Agency sponsored project conducted at their OHMSETT facility to measure the relative effectiveness of four devices for adding mixing energy to an oil slick after dispersant application. The modified five-bar gate proved to be the most effective for breaking up a one mm thick oil slick into droplets with the greatest depth of penetration.

C-0620-77
A FIELD EVALUATION OF OIL SPILL RECOVERY DEVICES
Solsberg, L. B. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 303-307. (American Petroleum Institute No. 4284)

Oil spills, Recovery, Crude oil, Fuel oil, Skimmers, Oil-water separation, Canada

Test conditions and results of 10 classes of commercially available oil skimmers used to clean up bunker, crude, and diesel oils in Canadian coastal harbors are reported and oil-water separation equipment is discussed.

C-0621-77
FIELD EVALUATION OF SEVEN OIL SPILL RECOVERY DEVICES
Solsberg, L. B., C. W. Ross, W. J. Logan, and M. F. Fingas. 1976.
Environment Canada, Environmental Protection Service. Technology Development Report EPS-4-EC-76-3. 81p. + xii.

Oil spills, Recovery, Skimmers, Emulsification, Canada

An evaluation of seven oil spill recovery devices was undertaken by the Centre of Spill Technology of the Environmental Emergency Branch. Evaluation was based on four parameters: oil recovery rate, oil recovery factor, oil content factor, and emulsification factor. The design of each skimmer is discussed and suggestions for improvements are made.

C-0622-77
DISCOVERY, CONTAINMENT AND RECOVERY OF A JET FUEL STORAGE TANK LEAK: A CASE HISTORY
Talts, A., J. Bauer, C. Martin, and D. Reeves. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 259-263. (American Petroleum Institute No. 4284)

Leakage, Gasoline, Oil tank, Recovery, Containment, Groundwater

The containment and recovery of approximately 314,000 l (83,000 gal) of JP-4 fuel lost from an aboveground storage tank at a U.S. government terminal are described. Fuel was found at the water table and about 25% of the lost fuel was recovered. Recommendations for terminal areas with porous soil are given.

C-0623-77
DEVELOPMENT OF OIL SPILL RECOVERY SHIP
Uchida, S., H. Takeshita, and Y. Seike. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 367-374. (American Petroleum Institute No. 4284)

Oil spills, Recovery, Skimmers, Oil-water separation, Design and engineering

An oil recovery system made up of a special oil suction float, a hydraulic fluid conveying unit, and an oil-water separating unit was developed and installed in a small, self-propelled, twin-hull craft. The experimental oil recovery ship completed in this manner successfully cleaned up a slick of heavy oil, 7m x 30m and 0.7-2.0mm in thickness in less than three minutes at 0.5-1.0 kt. Oil content of the water at the oil-water separation unit was less than one ppm.

C-0624-77
HARBOR OIL SPILL REMOVAL/RECOVERY SYSTEMS: PHASE 2
U.S. Navy. 1976.
Report No. Y41-21-001-01-001. 14p.

Oil spills, Recovery, Containment, Skimmers, Booms, EPA, *OHMSETT

Test procedures for oil containment booms and oil skimmers were developed and validated according to the EPA Oil and Hazardous Materials Simulated Environmental Test Tank (OHMSETT) requirements. The results of these tests are summarized and recommendations are presented.

[from Petroleum Abstracts 17(5):#229,888. 1977]

C-0625-77
OIL COLLECTING DEVICE
West, G. L. 1976.
Canadian Patent 995,593

Oil spills, Recovery, Skimmers, Design and engineering, Patent

A device for recovering oil from the water surface is described and consists of an intake member, a sump, and a storage tank.

[from Petroleum Abstracts 16(44):#226,377. 1976].

C-0626-77
BIOLOGICAL CRITERIA FOR THE SELECTION OF CLEANUP TECHNIQUES IN SALT MARSHES
Westree, B. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 231-235. (American Petroleum Institute No. 4284)

Oil spills, Cleanup, Marshes, Biological effects, Manuals

A training manual for the selection and application of cleanup procedures in marshland situations has been developed by URS Research Company. The manual incorporates biological criteria for selection and application of cleanup techniques. It is designed for use by cleanup personnel in the field.

C-0627-77
SURFACE ENHANCEMENT - BRINGING IT ALL TOGETHER
Wilson, J. E. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 347-354. (American Petroleum Institute No. 4284)

Oil spills, Cleanup, Skimmers, Booms, Surfactants, Absorption, Design and engineering, USN

Two oil spill cleanup methods used by the U.S. Navy are described and test results of each method are reported. The confined area spill, with the skimmer in a stationary mode, employs surface active agents, chip sorbents, and a skimmer/boom system. The open area spill, with a moving skimmer, employs two utility boats, granular sorbents, and oil concentration sweeps.

C-0628-77
OIL-ADSORBING POLYURETHANE FOAM
Yokota, K. 1976.
Japanese Kokai (unexamined patent application) 76 68,699

Adsorption, Contaminants, Patent, *Polyurethane foam

Polyurethane foams made from a mixture of 100 parts polyether and 5-50 parts oleophilic material containing $C_{>8}$ alkyl chain will adsorb up to 10 times as much oil as foams made from polyether alone.

[from Chemical Abstracts 85(22):#166220b. 1976]

C-0629-77
A FLOATING MATTER REMOVING APPARATUS
Inventor unknown. 1976.
British Patent 1,454,967

Skimmers, Oil slicks, Recovery, Design and engineering, Patent

An oil skimming apparatus is described which consists of a floating oil collection chamber equipped with adjustably floating means for controlling the oil inlet under various water surface conditions.

[from Petroleum Abstracts 17(1):#228,671. 1977]

C-0630-77
CLEANING AGENTS FOR OILED WILDLIFE
Berkner, A. B., D. C. Smith, and A. S. Williams. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 411-415. (American Petroleum Institute No. 4284)

Restoration, Wildlife, Oil spills, Solvents, Toxicity, *Detergents

The advantages and limitations of detergents and solvents are discussed with respect to the types of wildlife affected, the types of oil involved, and the available equipment and facilities. Several commercial detergents are ranked in order of their effectiveness and optimal concentrations. Toxicity data are included.

C-0631-77
THE RECLAMATION OF LAND AFFECTED BY OIL FIELD BRINES-TWO CASE HISTORIES
Clark, G. J., and H. F. Thimm. 1975.
Conference on the Environmental Effects of Oil and Salt Water Spills on Land, Banff, Alberta, 1975. Alberta Environment, and University of Calgary, 1975. p. 26-37.

Restoration, Inland, Contamination, Soil, Oil fields, *Brines

Two programs for the reclamation of lands contaminated by oil field brines are reported. Problems dealt with include: salt concentration, calcium to sodium ratio, soil tilth, water movement, and soil fertility.

C-0632-77
RESTORATION OF OIL SPILLS ON FOREST SOILS
Nyborg, M., and W. McGill. 1975.
Conference on the Environmental Effects of Oil and Salt Water Spills on Land, Banff, Alberta, 1975. Alberta Environment, and University of Calgary, 1975. p. 277-290.

Restoration, Oil spills, Soil, Vegetation, *Forests,

Oil spills in low lying "muskegs" kill off the vegetation; re-vegetation is inhibited by waterlogging and crusting of the soil due to containment dikes. Good restoration resulted from nutrient addition for three years and application of several tons of lime per acre.

C-0633-77
RESTORATION OF OIL SPILLS ON AGRICULTURAL SOILS
Rowell, M. J. 1975.
Conference on the Environmental Effects of Oil and Salt Water Spills on Land, Banff, Alberta, 1975. Alberta Environment, and University of Calgary, 1975. p. 250-276.

Restoration, Oil spills, Soil, Biodegradation, Plants, Fertilizers

Oil damaged mineral soils were best reclaimed by soil application of fertilizers containing N, P, K, and S. Biodegradation of the oil inhibited plant growth, but growth improved as the rate of oil decomposition declined.

C-0634-77
RECLAMATION OF SALT AND OIL DAMAGED SOILS
White, R. A., and E. deJong. 1975.
Saskatoon, Saskatchewan, Saskatchewan Institute of Pedology, University of Saskatchewan, Publication No. M27.

Restoration, Soil, Oil spills, Canada

Summary not available.

[from Conference on Environmental Effects of Oil and Salt Water Spills on Land, Banff, Alberta, 1975. Proceedings. p. 37.]

C-0635-77
OILED BIRD CLEANUP - A FORMIDABLE TASK
Worthington, V. 1977.
Conservation News 42(4):2-4.

Restoration, Birds, Oil spills, Cleanup, Solvents, Delaware, *Olympic Games spill

The attempt to save 270 oiled birds rescued after the Olympic Games oil spill in the Delaware River is presented. Methods for cleaning the waterfowl are outlined and several organic cleaning solvents are discussed.

4. OIL TRANSFER AND TRANSPORT

C-0636-77
REPORT OF THE SYMPOSIUM ON PREVENTION OF MARINE POLLUTION FROM SHIPS
Anon. 1976.
London, Inter-Governmental Maritime Consultative Organization, 1976. 90p.

Oil transport, Ships, Tankers, Pollution prevention, Oil-water separation, Oil spills

Subjects covered include a review of the 1973 convention; national and regional arrangements; construction, equipment, and operation of chemical tankers; segregated ballast tankers; oily water separators and oil monitoring and control equipment; operation of oil tankers; reception facilities in ports; sewage and garbage from ships; contingency planning; measures for control, detection, and data collection; and methods for dealing with spills.

[from Pollution Abstracts 8(1):#77-00345. 1977]

C-0637-77
TRAGEDY OF TANKER GROUNDING EMPHASIZED
Anon. 1976.
National Fisherman 57(8):17-A.

Oil spills, Tankers, Metula oil spill, Environmental protection, Offshore drilling, Pollution control

The long-lasting adverse effects of the 1974 Metula oil spill, the need for careful environmental planning in offshore drilling, and incidents leading to the evolution of the present oil spill control technology were topics recently discussed at the Second Annual Marine Technology Assessment Conference held at the Texas A & M University.

C-0638-77
CHALLENGE OF DEEPWATER TERMINALS
Bragaw, L. K., H. S. Marcus, G. C. Raffaele, and J. R. Townley. 1975.
Lexington, Mass., D. C. Heath and Co., 1975. 185p.

Offshore development, Ports, Tankers, Socio-economic effects, Environmental effects, *Deepwater terminals

The development of deep-water terminals presents potential hazards that must be considered and dealt with. To aid in formulating policies on offshore ports, this study examines the economic, social, technological, and environmental impacts - both offshore and onshore - of such development.

[from Petroleum Abstracts 16(50):#227,830. 1976]

C-0639-77
OIL IMPORTS AND DEEPWATER PORTS
Brown, D. 1976.
Environmental Data Service Jan:10-13.

Ports, Environmental effects, Socio-economic effects, Oil spills, Coasts, *Deepwater ports

The environmental and socio-economic effects of deepwater ports are dealt with in the Deepwater Port Act of 1974. The delegation of responsibilities to the Deepwater Ports Project Office are reviewed and procedures to evaluate the risk of oil spill damage along coastal waters are presented.

[from Oceanic Abstracts 13(6):#76-05612. 1976]

C-0640-77
WASHINGTON DETERMINED TO CONTROL TANKER MOVEMENT IN PUGET SOUND
Browning, R. J. 1976.
National Fisherman 57(8):16-A.

Tankers, Regulations, Law enforcement, Oil transport, Washington, Puget Sound

Fishermen, environmentalists, and most citizens of the state of Washington approved tough new tanker rules which prohibit the use of oil tankers of more than 125,000 dwt in Puget Sound and also require the use of tugboat escorts. These new regulations have met with considerable resistance from the tanker and oil refinery industry; recent incidents concerning these regulations are detailed.

C-0641-77
POLLUTANT TRANSFER TO THE MARINE ENVIRONMENT
Duce, R. A., P. L. Parker, and C. S. Giam. 1974.
Deliberations and Recommendations of the NSF/IDOE Pollutant Transfer Workshop, Port Aransas, Texas, January 11-12, 1974. 55p.

Hydrocarbons, Oil transfer, Oceans, Distribution, Marine organisms, Food web, *Transfer processes

This report summarizes the research accomplishments during the first two years of the Pollutant Transfer Program of the National Science Foundation, International Decade of Ocean Exploration. Discussion is separated into two chapters: trace metals, and chlorinated and petroleum hydrocarbons. Described are intercalibration and standardization programs planned and underway, research on transfer processes to the marine environment, and transfer processes within the marine environment (physical, chemical, biological) for the three classes of pollutants.

C-0642-77
DEEPWATER PORTS: POLICY ISSUES IN FLORIDA
Dzurik, A. 1975.
Florida Coastal Policy Study: The Impact of Offshore Oil Development. A. L. Pearman and J. W. Stafford (eds.). Florida State University, and University of South Florida, 1975 (reprinted 1976). Chapter VIII. p. 193-222. Final report.

Ports, Oil transfer, Florida, Gulf of Mexico, Environmental effects, Socio-economic effects, Legislation, *Deepwater ports

An overview is presented of the characteristics and policy issues associated with potential construction and operation of deepwater ports in or near Florida waters. Included is an assessment of the environmental, economic, and social impacts of deepwater port development. Pertinent federal legislation and federal and state agencies involved in deepwater port development are identified.

C-0643-77
STRATEGIC PETROLEUM RESERVE. BAYOU CHOCTAW SALT DOME
Federal Energy Administration. 1976.
Draft environmental impact statement, FEA/S-76/346, DES-76-5. 409p.

Crude oil, Storage, Environmental effects, EIS, Louisiana, *Bayou Choctaw Salt Domes

The Bayou Choctaw site, a salt dome with existing cavities located in Iberville Parish, Louisiana, has been selected as a candidate site for the proposed storage of crude oil because it offers the advantage of large storage capacity, easy access to the distribution network, and a short preparation period. This site-specific EIS assesses the environmental impacts caused by site preparation and operation.

[from Government Reports Announcements 76(25):#PB-257 506/6GA. 1976]

C-0644-77
STRATEGIC PETROLEUM RESERVE, COTE BLANCHE MINE
Federal Energy Administration. 1976.
Draft environmental impact statement, FEA/S-76/348, DES-76-7. 691p.

Crude oil, Storage, Environmental effects, EIS, Louisiana, *Cote Blanche Mine

This site specific environmental impact statement assesses the Cole Blanche salt mine located in St. Mary Parish, Louisiana, for the proposed storage of crude oil. The Strategic Petroleum Reserve program was established by Congress to provide the U.S. with sufficient petroleum reserves so as to minimize the effects of any future oil supply interruption.

[from Government Reports Announcements 76(25):#PB-257388/9GA. 1976]

C-0645-77
STRATEGIC PETROLEUM RESERVE, WEEKS ISLAND MINE
Federal Energy Administration. 1976.
Draft environmental impact statement, FEA/S-76/349, DES-76-8. 694p.

Crude oil, Storage, Environmental effects, EIS, Louisiana, *Weeks Island Mine

This site specific environmental impact statement assesses the Weeks Island salt mine located in Iberia Parish, Louisiana, for the proposed storage of crude oil. The Strategic Petroleum Reserve program was established by Congress to provide the U.S. with sufficient petroleum reserves so as to minimize the effects of any future oil supply interruption.

[from Government Reports Announcements 76(25):#PB-257 389/7GA. 1976]

C-0646-77
THE OIL WILL SOON FLOW, BUT WHERE WILL IT GO?
Fradkin, P. L. 1977.
Audubon 79(1):86-111.

Oil transport, Environmental effects, Pipelines, Economic effects, Alaska, California

Transporting Alaskan oil to California and other coastal states is reviewed with particular reference to environmental impacts and citizen opposition. Three pipeline routes, the Sohio, the Northern tier, and the Trans-provincial pipeline, are discussed and economic effects of the oil on west coast industries are presented.

C-0647-77
STUDY ON TREATMENT OF TANKER-DISCHARGED OILY WATER WITH IMPROVED TYPE SLOP TANK
Fukuda, S., Y. Seike, M. Nakajima, and H. Taniguchi. 1976.
Mitsubishi Heavy Industries Technical Review 13(3):487-495.

Oil discharges, Tankers, Wastewater treatment, *Slop tank

An improved slop tank for oil tanker load-on-top systems is described. The slop tank consists of a sludge recovery compartment and a settling compartment. Tests indicate that the improved load-on-top system satisfies discharge regulations for crude oil established at the 1973 IMCO Convention.

[from Selected Water Resources Abstracts 10(2):#W77-00750. 1977]

C-0648-77
PREVENTION OF POLLUTION DURING OIL TRANSFER OPERATIONS: AN EVALUATION OF USCG PREVENTIVE ACTIONS
Harrald, J. R., C. M. Stone, and K. R. Karwan. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 223-227. (American Petroleum Institute No. 4284)

Oil transfer, Pollution prevention, Oil discharges, Statistical analysis, Regulations, USCG

The origins, implementation, and effectiveness of a U.S. Coast Guard program to prevent discharges of oil during vessel oil-transfer operations are reviewed. An analysis of statistical data indicates that the preventive program and resultant regulations which have been implemented have achieved a measurable reduction of transfer-related pollution incidents.

C-0649-77
ENVIRONMENTAL IMPACTS AND MONITORING OF OIL AND GAS PIPELINES: A TECHNICAL NOTE
Limoges, L. 1975.
Florida Coastal Policy Study: The Impact of Offshore Oil Development. A. L. Pearman and J. W . Stafford (eds.). Florida State University, and University of South Florida, 1975 (reprinted 1976). Chapter VIII. p. 163-191. Final report.

Oil transport, Pipelines, Environmental effects, Estuaries, Plants, Animals, Monitoring, Florida

The potential environmental effects of the construction and operation of oil and gas pipeline corridors in Florida's estuarine and marshland environments are summarized. The tolerance of various plant and animal communities and species to the effects of pipeline dredging, such as sedimentation and water turbidity, are evaluated. Recommendations for monitoring the pipelines are made.

C-0650-77
SUPERTANKERS AND THE LAW OF THE SEA
Mostert, N. 1976.
Sierra Club Bulletin 61(6):13-16.

Tankers, Oil transport, Economics, Oil spills, Pollution control, Regulations, *Standards

The economic plight of the oil tanker owner and its direct effect on increased pollution of the sea by oil spills are discussed. Strong controls are desperately needed for the tanker industry; the best method is for the state from which the tankers sail to impose strong local laws for the tankers using their ports.

[from Energy Review No. 17:10. 1976]

C-0651-77
MINI-COMPUTERS USED IN METERING AND LEAK DETECTION SYSTEMS FOR LIQUID PETROLEUM PRODUCTS PIPELINES
Phillips, R. D., and C. Crider. 1975.
IEEE Petroleum and Chemical Industry Conference, 22nd, Milwaukee, 1975. p. 129-135.

Leakage, Pipelines, Detection, *Mini-computers

The use of mini-computers is discussed on the basis of their advantages, practical limitations and disadvantages; their use by Colonial Pipeline Company in metering and leak detection systems is described and evaluated.

[from The Engineering Index Monthly 14(12):#083245. 1976]

C-0652-77
OIL ON TROUBLED WATERS (editorial)
Plant, A. F. 1977.
Chemical & Engineering News 55(3):4.

Oil spills, Tankers, U.S., Regulations, International agreements

The recent series of tanker accidents off U.S. coasts since December, 1976, is briefly reviewed and the need to establish international and/or national controls on shipping vessels is discussed.

C-0653-77
THE TANKER/PIPELINE CONTROVERSY
Stewart R. J. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 95-99. (American Petroleum Institute No. 4284)

Oil transport, Pipelines, Tankers, Statistical analysis, Oil spills

The paper examines the spill data that have become available in recent years and the analytical techniques applied to the data to see if there is a reasonable basis for the preference given pipelines over tankers. The difficulty encountered in making the pipeline/tanker comparison is illustrated with statistics.

C-0654-77
RECOMMENDED PROCEDURE FOR DEVELOPING DEEP-WATER PORTS DESIGN CRITERIA
U.S. Coast Guard. 1975.
U.S. Department of Transportation, Washington, D.C. 11p.

Development, Ports, Environmental protection, Regulations, Design and engineering

Methods are established for defining the environmental conditions which will affect operations at the port site and which must be considered in establishing design criteria for all fixed marine and floating components of a deep-water port. A list of applicable laws concerning protection of the environment is also included.

[from Petroleum Abstracts 16(48):#227,447. 1976]

C-0655-77
SUPERPORT FOR PALAU DEBATED: ECOPOLITICS IN THE FAR PACIFIC
Walsh, J. 1976.
Science 194(4268):919-921.

Ports, Oil transport, Storage, Social effects, Environmental effects, Oil spills, Pacific Ocean, *Palau, *Superport development

Adverse environmental and social effects which would accompany the development of a superport and oil storage complex in the Palauan Islands are pointed out. Situated near major tanker routes at the western end of the Caroline Islands, the fragile ecology of Palau would be vulnerable to superport construction, dredging, and oil spills, or discharges from tankers and onshore storage facilties.

C-0656-77
NEW THREAT FOR LOUISIANA WETLANDS
Worthington, V. 1977.
Conservation News 42(3):2-5.

Crude oil, Storage, Environmental effects, Oil spills, Groundwater, Vegetation, Louisana, Texas, *Salt domes

The Federal Energy Administration's plan to store imported oil inside five or six salt domes located in southern Louisiana and Texas according to the Energy Policy and Conservation Act of 1974 is detailed. The risks involved in transporting oil and the environmental effects of oil spills and brine spills are discussed with emphasis on groundwater pollution and the destruction of vegetation.

C-0657-77
COMPACT INCINERATOR FOR SOLID AND LIQUID WASTES
Anon. 1976.
Processing 22(5):33.

Waste oil disposal, Incineration, Solid wastes, *Liquid wastes

A small self-contained incinerator, the "Furnapak", is available for applications involving the burning of sewage screening, oily wastes, and sewage sludges. A rotating rabble shaft and air injection are employed in a manner similar to multiple hearth furnaces. Both solid and liquid wastes can be incinerated simultaneously or independently. Operation procedures and capabilities are discussed.

[from Selected Water Resources Abstracts 9(23):#W76-12612. 1976]

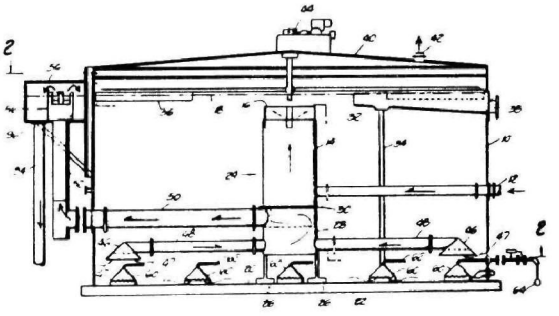
C-0658-77
CLARIFICATION TANK
Bascope, A. H., and E. H. Grizzard. 1976.
U.S. Patent 3,951, 816

Oil-water separation, Design and engineering, Patent

A clarification apparatus and oil-water separation tank designed for the separation of petroleum from flood water are described.

[from Chemical Abstracts 86(4):#18834k. 1977]

3,951,816
CLARIFICATION TANK
Alberto H. Bascope, and Eugene H. Grizzard, both of Huntington Beach, Calif., assignors to Burmah Oil and Gas Company, Houston, Tex.
Filed June 28, 1971, Ser. No. 157,343
Int. Cl.[2] B01D *21/24*
U.S. Cl. 210—519 1 Claim



C-0659-77
APPARATUS FOR SEPARATING FROM WATER LIQUIDS LIGHTER THAN WATER, ESPECIALLY OIL
Biswanger, K., P. Jakubek, and C. Cuillery. 1976.
Belgian Patent 814,992

Oil-water separation, Design and engineering, Patent

"A valve opening to the air is provided between the pump which moves the liquids and the separation chamber. An overflow is provided in the line between the sedimentation chamber and the filter."

[from Petroleum Abstracts 17(8):#230,638. 1977]

C-0660-77
CONTROLLING SURFACE WATER CONTAMINATION AT THE ESSO REFINERY AT ANTWERP [in Dutch]
Bossuyt, L. 1976.
Het Ingenieursblad 45(2):41-49.

Wastewater treatment, Refineries, Oil-water separation, Belgium

The complex wastewater treatment system at the Esso Petroleum Refinery at Antwerp, Belgium, is described. After various oil-water separation processes, the oil content of the wastewaters is reduced from 30-50 g/m^3 to below 1 g/m^3.

[from Selected Water Resources Abstracts 9(23):#W76-12416. 1976]

C-0661-77
FIGHT AGAINST POLLUTION OF SURFACE WATERS AT THE ESSO REFINERY AT ANTWERP [in French]
Bossuyt, L. 1976.
Technique de l'Eau et de l'Assainissement No. 352:23-34.

Wastewater treatment, Refineries, Pollution prevention, *Surface waters, Belgium

"The prevention of water pollution in oil refineries, waste water treatment installations, and treatment of refinery residues are described."

[from Chemical Abstracts 86(2):#8345n. 1977]

C-0662-77
A SYSTEMS APPROACH TO THE ECONOMICS OF WASTE HANDLING
Bridgwater, A. V., S. A. Gregory, C. J. Mumford, and E. L. Smith. 1975.
Resource Recovery and Conservation 1(1):3-23.

Economics, Oil industry, Wastewaters, Waste oil, Solid wastes, Disposal, Recycling

A systems approach to the economics of treatment, transport, disposal, and recycling of wastes in the oil industry is presented. Costs and benefits of each stage of waste processing and alternative ways of treating, disposing, or recycling specific wastes are considered. The economic effects of new legislation and changes in production and usage patterns are assessed, and alternatives to waste disposal are suggested.

[from Selected Water Resources Abstracts 10(2):#W77-00745. 1977]

C-0663-77
APPARATUS AND METHOD FOR SEPARATING OIL FROM OIL-CONTAMINATED WATER
Broadribb, M. P., R. C. Pitkethly, and M. W. Tideswell. 1976.
German Offenlegungsschriften (unexamined patent application) 2,551,416

Wastewater treatment, Contaminants, Oil-water separation, Coalescence, Design and engineering, Patent

"A column spaced with several layers of solid particles, e.g. anthracite was used for coalescing and separating oil droplets from oil-contaminated waters."

[from Chemical Abstracts 86(2):#8445v. 1977]

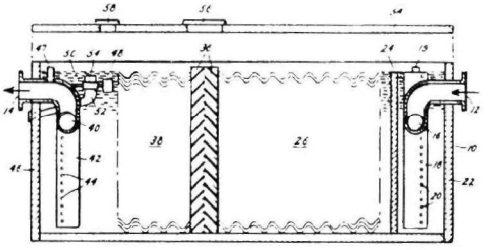
C-0664-77
PLATE SEPARATOR FOR FLUID MIXTURES
Castelli, J. L. 1976.
U.S. Patent 3,957,656

Dispersions, Oil-water separation, Coalescence, Design and engineering, Patent

An oil-water separator is described which is provided with corrugated baffle plates arranged parallel to each other and positioned to provide alternating constriction and expansion during fluid passage. Differential acceleration and deceleration of the dispersed oil droplets enhances collision and coalescence of the droplets.

[from Chemical Abstracts 86(4):#18838q. 1977]

3,957,656
PLATE SEPARATOR FOR FLUID MIXTURES
Joseph L. Castelli, 611 Forest Road, Wayne, Pa. 19087
Continuation of Ser. No. 248,421, April 28, 1972, abandoned.
This application Mar. 4, 1974, Ser. No. 447,795
Int. Cl.[2] B01D 21/00
U.S. Cl. 210—521 2 Claims



C-0665-77
OIL REMOVAL
Chambers, D. B. 1976.
South African Patent 75 06,346

Emulsions, Oil-water separation, Coalescence, Patent

A method is described for removing oil from an oil-in-water emulsion by contacting the emulsion with a fibrous structure of inorganic fibers and removing the coalesced oil droplets from the fibers.

[from Petroleum Abstracts 17(5):#229,882. 1977]

C-0666-77
SLICK SOLUTIONS TO OILY WATER SEPARATION
Cooke, B. 1976.
Process Engineering October:73-74.

Oil-water separation, Emulsions, Flocculation, Precipitation, Design and engineering

Oil-water separation equipment commonly used to meet various environmental, chemical, and physical requirements is reviewed; emulsions, flocculation, precipitation, oil droplet size, and oil load are discussed.

[from Petroleum Abstracts 17(5):#229,889. 1977]

C-0667-77
NEW TECHNOLOGY IN WATER-HYDROCARBON SEPARATIONS[in French]
Cuillery, C. 1976.
Filtration et Techniques Separatives 7:20-22.

Oil-water separation, Wastewater treatment, Filtration, Flotation

The "Hydropur" process, which utilizes the density differences between water and hydrocarbons to effect oil-water separation, is discussed. The polluted liquid is first filtered to remove suspended particles, then treated by diffusion which allows hydrocarbon particles to float for easy removal.

[from Chemical Abstracts 86(4):#21456u. 1977]

C-0668-77
REDUCTION IN THE VOLUME OF EFFLUENT FROM A REFINERY
Farber, A. L. 1975.
American Institute of Chemical Engineering Symposium Series 71 (151):9-13.

Refineries, Wastewater treatment, Disposal, Conservation

"The different effluent systems, e.g. desalter water, stripped sour water, cooling water blowdown, demineralizer rinse and spent regenerant wastes, and treatment that might by employed in a typical refinery to aid water conservation and reduce the volume are discussed."

[from Chemical Abstracts 86(4):#21497h. 1977]

C-0669-77
PRACTICAL RECOMMENDATIONS FOR OIL SPILL DEBRIS DISPOSAL
Farlow, J. S., D. E. Ross, and R. Landreth. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 265-269. (American Petroleum Institute No. 4284)

Oil spills, Disposal, Hydrocarbons, Biodegradation, Manuals, *Debris disposal

A manual and film for oil spill debris disposal prepared by SCS Engineers, Inc., for the Environmental Protection Agency is presented. Because aerobic conditions result in relatively rapid microbial degradation of the hydrocarbons, a landspreading process is recommended wherever debris size and access to suitable land permits.

C-0670-77
BINDER FOR CORROSIVE LIQUIDS ESPECIALLY ACIDS AND OIL
Fuelling, W. 1976.
German Offenlegungsschriften (unexamined patent application) 2,455,316

Oil spills, Cleanup, Waste oil, Absorption, Patent, *Metallurgical pumice

Spilled acids and oil are absorbed by metallurgical pumice granules that are sintered at 675°C, cooled, and mixed with 5 wt% slaked lime. The mixture sinks into and absorbs crude oil, and the slaked lime improves the oil-pumice bond.

[from Chemical Abstracts 86(4):#21587n. 1977]

C-0671-77
USE OF WATER-SOLUBLE POLYELECTROLYTES FOR PURIFYING PETROLEUM-CONTAINING WASTE WATERS [in Russian]
Gandurina, L. V., L. B. Zubakova, I. N. Myasnikov. L. N. Butseva, A. B. Zhovnirovskaya, and V. V. Ledeneva. 1976.
Plasticheskie Massy No. 5:59-61.

Wastewaster treatment, Contaminants, Flocculation, *Flocculant - polyelectrolytes

"Waste waters were purified by cation exchange flocculants, alone or with $Al_2(SO_4)_3$. Flocculant-polyelectrolytes of VPS series, based on vinylpyridine, were used. Combined use of $Al_2(SO_4)_3$ and VPS-47 was the most effective at optimum doses 50g $Al_2(SO_4)_3$ and 2g flocculant/l."

[from Chemical Abstracts 85(24):#181861e. 1976]

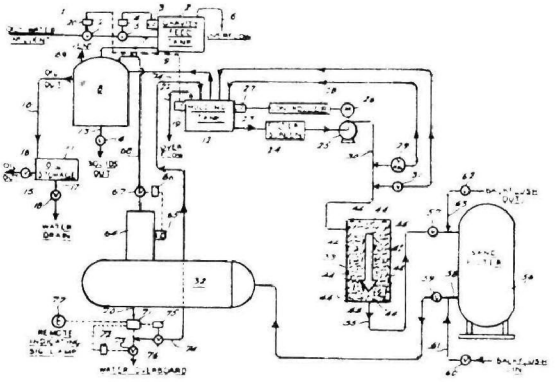
C-0672-77
REMOVAL OF CONTAMINANTS FROM WATER
Garber, D. C. 1976.
U.S. Patent 3,965,004

Wastewater treatment, Oil-water separation, Ballast, Coalescence, Patent

Oily ballast water from tankers is treated by passing it through a conventional oil-water separator. The effluent is then passed through a ceramic-pellet dewaxer unit which retains waxes, asphalts, gums and similar materials. Effluent from the dewaxer passes through a sand filter to remove particulates, and a final coalescing unit removes remaining oil droplets.

[from Selected Water Resources Abstracts 10(2):#W77-00687. 1977]

3,965,004
REMOVAL OF CONTAMINANTS FROM WATER
Daniel C. Garber, Overbrook Hills, Pa., assignor to Sun Shipbuilding & Drydock Company, Chester, Pa.
Continuation-in-part of Ser. No. 305,630, Nov. 10, 1972, abandoned. This application Jan. 30, 1975, Ser. No. 545,640
Int. Cl.² C10G 43/04
U.S. Cl. 210—73 W 9 Claims



C-0673-77
EFFLUENT REDUCTION THROUGH WATER CONSERVATION AND REUSE AS POLLUTION CONTROL MEASURES FOR PETROLEUM REFINERIES
Goldstein, P. 1976.
American Society of Mechanical Engineers, Petroleum Division, Joint Petroleum Mechanical Engineering and Pressure Vessels and Piping Conference, 1976. Paper 76-Pet-71. 8p.

Wastewater treatment, Refineries, Pollution control, Conservation, *Water reuse

Cooling system effluent reduction by water management, softening, reverse osmosis, and electrodialysis is discussed. Effluent reduction in utilities operations and the overall impact of effluent reduction practices are described and illustrated.

[from Pollution Abstracts 8(1):#77-00410. 1977]

C-0674-77
OPTIMIZE THE EFFLUENT SYSTEM. PART 1. ACTIVATED SLUDGE PROCESS
Grutsch, J. F., and R. C. Mallatt. 1976.
Hydrocarbon Processing 55(3):105-112.

Refineries, Wastewater treatment, Activated sludge, Guidelines

Refinery effluent water quality can be significantly improved and capital and operating costs can be lowered by carefully controlling and integrating the separate elements of a wastewater treatment system. This article, which discusses the activated sludge process, is the first of a series that outlines key objectives and recommends treatment sequences for optimizing refinery wastewater treatment systems.

C-0675-77
OPTIMIZE THE EFFLUENT SYSTEM. PART 2. INTERMEDIATE TREATMENT
Grutsch, J. F., and R. C. Mallatt. 1976.
Hydrocarbon Processing 55(4):213-218.

Wastewater treatment, Refineries, Contaminants, *Intermediate treatment

Intermediate treatment facilities should be optimized for contaminant reduction and equalization using hydraulic, chemical and physical design considerations. This can be achieved by: using a multiple compartmented basin for hydraulic equalization; monitoring for undesirable contaminants using the first compartment; using the second compartment to maximize oxygen transfer and rate of reaction of oxygen with contaminants by using the same highly mixed compartment for pH control; physically removing flocculated contaminants, destabilizing residual colloidal matter chemically and removing it by filtration; and minimizing retention time to conserve heat.

C-0676-77
OPTIMIZE THE EFFLUENT SYSTEM. PART 3. ELECTROCHEMISTRY OF DESTABILIZATION
Grutsch, J. F., and R. C. Mallatt. 1976.
Hydrocarbon Processing 55(5):221-230.

Wastewater treatment, Refineries, *Colloid destabilization

The properties of suspended solids in refinery effluents are described, and the objective of colloidal destabilization of suspended particles by chemical treatment is given. Colloid destabilization mechanisms include: colloid entrapment or removal via sweep floc mechanism, reduction in surface charge by double layer repression, bridging by polymers, and charge neutralization by adsorption. Destabilizing chemicals and a destabilization model are topics discussed.

C-0677-77
OPTIMIZE THE EFFLUENT SYSTEM. PART 4. APPROACH TO CHEMICAL TREATMENT
Grutsch, J. F., and R. C. Mallatt. 1976.
Hydrocarbon Processing 55(6):115-123.

Wastewater treatment, Refineries, *Chemical treatment, *Waterborne colloids

Chemical treatment methods for destabilizing and separating waterborne colloids from refinery wastewaters are detailed. The colloidal components consist of two basic types: the relatively inert substances such as clay, sand, and organics (including oil globules), and microorganisms or biocolloids. Examples and case histories of the treatment of these major colloidal systems are presented.

C-0678-77
OPTIMIZE THE EFFLUENT SYSTEM. PART 5. MULTI-MEDIA FILTERS
Grutsch, J. F., and R. C. Mallatt. 1976.
Hydrocarbon Processing 55(7):113-118.

Wastewater treatment, Refineries, Filtration, Oil-water separation

Theoretical and practical aspects of the filtration of petroleum refinery effluents are examined. Filtration mechanisms and chemical treatments that enhance filtration are briefly discussed. The application of filtration technology by the oil industry in the clarification of make-up waters, API separator effluents, aerated lagoon effluents, activated sludge unit effluents, and treatment of cooling and connate water is described.

C-0679-77
OPTIMIZE THE EFFLUENT SYSTEM. PART 6. BIOCHEMISTRY OF ACTIVATED SLUDGE PROCESS
Grutsch, J. F., and R. C. Mallatt. 1976.
Hydrocarbon Processing 55(8):137-142.

Wastewater treatment, Refineries, Contaminants, Activated sludge, *Biochemistry

The fundamental biochemical principles involved in the biodegradation and removal of organic contaminants from (refinery) wastewaters are reviewed.

C-0680-77
OILY BILGE WATER TREATMENT WITH A TUBULAR ULTRAFILTRATION SYSTEM
Harris, L. R. 1976.
American Society of Chemical Engineers, Aerospace Division, Intersociety Conference on Environmental Systems, 1976. Paper 76-ENAs-20. 6p.

Wastewater treatment, Bilges, Oil-water separation, Filtration, *Tubular ultrafiltration system

A tubular ultrafiltration system using cellulosic and noncellulosic membranes was tested with bilges and other oily wastes, alone and combined with nonionic detergent. Detergent addition resulted in a steeper flux decline than any of the fluids evaluated alone. Both membrane types produced a permeate with an oil content <15 mg/l. The noncellulosic membranes exhibited higher flux rates than the cellulosic membranes; only the former could be restored to its initial water flux by a cleaning operation.

[from Pollution Abstracts 8(1):#77-00236. 1977]

C-0681-77
PROCESS FOR REMOVING DISPERSED MATTER FROM WATER
Irani, C. A., and D. J. McHugh. 1976.
U.S. Patent 3,965,001

Wastewater treatment, Oil-water separation, Adsorption, Precipitation, pH control, Patent

Dispersed matter and oil in water is removed by adding a flocculated salt selected from the group consisting of iron, aluminum and Group IIA of the Periodic Table of Elements, and additional oil. The contaminants are adsorbed by the flocs, and these are precipitated by pH adjustment.

[from Selected Water Resources Abstracts 10(2):#W77-00684. 1977]

C-0682-77
THE LATEST TRENDS IN OILY WASTE WATER TREATMENT [in Japanese]
Katsuta, K. 1976.
Junkatsu 21(4):211-218.

Wastewater treatment, Industries

"A review with 11 references."

[from Chemical Abstracts 85(26):#197553s. 1976]

C-0683-77
OIL ADSORBER
Kobayashi, Y., and T. Onitake. 1976.
Japanese Kokai (unexamined patent application) 76 79,691

Wastewater treatment, Oil-water separation, Adsorption, Patent, *Polyolefin

A polyolefin is mixed with 0.01 to 2.0% nonionic or amphoteric surfactant to yield an oil adsorbing agent.

[from Chemical Abstracts 85(26):#197785u. 1976]

C-0684-77
UPGRADING LOW-GRADE OILS
Kondo, M. 1976.
U.S. Patent 3,959,119

Waste oil, Reclamation, Refining, Patent

A process for refining waste oils and spent oils containing water and sludge is described. The process involves thermal cracking in a fluidized-sand bed at 400-500°C followed by fractionation into gas-liquid phases and condensation to form a refined oil and a combustible gas.

[from Chemical Abstracts 86(4):#19377a. 1977]

C-0685-77
WASTEWATER PURIFICATION IN A PETROCHEMICAL PLANT [in German]
Krause, G. 1975.
Erdoel und Kohle-Erdgas-Petrochemie 28(7):340.

Wastewater treatment, Petrochemicals, Economics, Legislation, West Germany

A brief review of pertinent legislation is presented. The important factors in tightening up the current purification procedures are the new Federal Immission Protection Act; Wastewater Discharge Act, and the 4th Supplementary Law on Water Economy. To comply with current legislation, an average of 8% of total investment costs are used for purification installations.

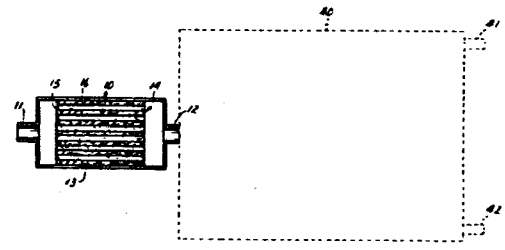
[from Environmental Health and Pollution Control 10(7):#1597. 1976]

C-0686-77
COALESCING UNIT FOR GRAVITY SEPARATOR
Krueger, D. L. 1976.
U.S. Patent 3,951,814

Wastewater treatment, Oil-water separation, Coalescence, Design and engineering, Patent

A coalescing apparatus and materials are described which remove a dispersed liquid such as petroleum by sorption onto fibers or porous materials.

[from Chemical Abstracts 86(4):#18834k. 1977]



3,951,814
COALESCING UNIT FOR GRAVITY SEPARATOR
Dennis L. Krueger, Hudson, Wis., assignor to Minnesota Mining and Manufacturing Company, St. Paul, Minn.
Continuation of Ser. No. 407,965, Nov. 12, 1974, Pat. No. 3,847,821. This application Nov. 7, 1974, Ser. No. 521,787
The portion of the term of this patent subsequent to Nov. 12, 1991, has been disclaimed.
Int. Cl.[2] B01D 25/16
U.S. Cl. 210—488 13 Claims

C-0687-77
INTERFACIAL PHENOMENA RELATED TO THE REMOVAL OF EMULSIFIED OIL FROM REFINERY WASTEWATERS
Luthy, R. G., R. E. Selleck, and T. R. Galloway. 1975.
SERL Report 75(3):1-94.

Oil-water separation, Wastewaters, Refineries, Emulsions, Flocculation

API refinery separator effluent levels were reduced to 10 mg/l oil with a 15 mg/l dose of 75% charged diallyldimethylammonium compound copolymer without aluminum or ferric coagulants. Efficient polymer bridging was necessary and good flocculation yielded good oil flotation.

[from Chemical Abstracts 85(26):#197737e. 1976]

C-0688-77
INVESTIGATION INTO THE TREATMENT OF PETROCHEMICAL WASTES
Lyons, B. J., and J. G. Parker. 1975.
Treatment, Recycle and Disposal of Wastes. Clayton, Australia, National Chemical Engineering Conference, 1975. Paper T39-T42. National Chemical Engineering Conference, 3rd, Victoria, Australia, 1975.

Wastewater treatment, Petrochemicals,

Discussed are the types of treatment processes available to handle petrochemical wastewaters with wide pH fluctuations, high temperatures, variable suspended solids and turbidity, oils and greases, detergents, nutrients, toxic metals, gases and organic matter.

[from The Engineering Index Monthly 14(12):#083249. 1976]

C-0689-77
APPARATUS FOR SEPARATING OIL AND WATER
Maatschappi, B. V. 1976.
Netherlands Application 7,413,907

Wastewater treatment, Oil-water separation, Coalescence, Flotation, Design and engineering, Patent

An oil-water separator is described which consists of a rectangular tank with specially arranged vertical and sloping baffle plates. Flow of oily wastewater through the baffle arrangement causes the oil to coalesce and float to the top of the tank from where it is collected. The oil-free water then exits through an outlet chamber.

[from Chemical Abstracts 86(2):#6648q. 1977]

C-0690-77
SURFACE PHENOMENA IN CHEMICAL ENGINEERING [in Japanese]
Matsumoto, T. 1976.
Hyomen 14(3):165-170.

Wastewater treatment, Oil-water separation, Adsorption, *Detergents

Temperature had a profound effect in experiments in which 1% heavy oil was mixed with seawater at 40-50°. Detergents can inhibit oil-water separation, especially at room temperature. Oil-containing waste water was treated using a settling tank, an oil-water separator, and adsorption on activated carbon.

[from Chemical Abstracts 85(24):#181853d. 1976]

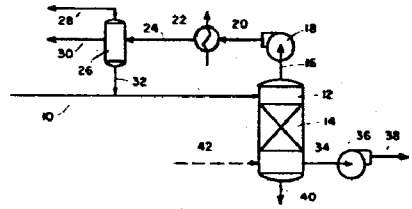
C-0691-77
VACUUM STRIPPING OF HYDROCARBON CONTAMINATED WATER STREAMS
McGill, J. C.
U.S. Patent 3,898,058

Wastewater treatment, Hydrocarbons, Contaminants, *Vacuum stripping

"Use of a high vapor pressure stripping gas on an aqueous stream at at least 40°F."

[from Environmental Technology & Economics No. 1:5. 1977]

3,898,058
VACUUM STRIPPING OF HYDROCARBON CONTAMINATED WATER STREAMS
James C. McGill, Tulsa, Okla., assignor to H-T Management Company, Tulsa, Okla.
Filed Apr. 12, 1973, Ser. No. 350,311
Int. Cl. B01d *19/00*
U.S. Cl. 55—50 12 Claims



C-0692-77
APPARATUS AND METHOD FOR COAGULATION, FOR USE IN SEPARATING OIL AND WATER
McGrew, J. L. 1976.
German Offenlegungsschriften (unexamined patent application) 2,613,870

Wastewater treatment, Oil-water separation, Emulsion, Coagulation, Patent

An oil-water emulsion is separated in an apparatus having a 3-dimensional network structure with a surface which sorbs oils. Oil droplets coagulate on the surface and can be squeezed or washed off the structure.

[from Chemical Abstracts 85(26):#197786v. 1976]

C-0693-77
LIGHT LIQUID AND/OR FAT SEPARATOR
Meier, K. 1976.
German Offenlegungsschriften (unexamined patent application) 2,441,401

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

Oils, fats, and other light liquids can be separated from water by a device which contains 2 chambers, connecting channels with slits, and a reflux cleaning device in the separating wall.

[from Chemical Abstracts 86(2):#6641g. 1977]

C-0694-77
PROSPECTS FOR USING MOLLUSK-FILTRATES OF SEA MUSSELS FOR THE PURIFICATION OF BALLAST WATERS OF TANKERS [in Russian]
Milovidova, N. Yu. 1975.
Biologicheskoe Samoochishchenie i Formirovanie Kachestva Vody, Materialy Vsesoyuznogo Simpoziuma po Sanitarnoi Gidrobiologii, 2nd, 1973. M. M. Telitchenko (ed.). Moscow, "Nauka", 1975. p. 141-143.

Wastewater treatment, Ballast, Tankers, Mollusks, *Mytilus galloprovincialis

When Black Sea mussel, Mytilus galloprovincialis was placed in a 200-500 ml vessel containing 0.1% emulsion of crude oil in seawater, the total crude oil content dropped 22-40% in one day in the form of mussel pseudofeces. After 5 days, total content of crude oil decreased by 52% as compared to 26% for the control. Medium size mollusks survived 2-15 days in this environment, while young perished in 8-20 days.

[from Chemical Abstracts 85(24):#181891q. 1976]

C-0695-77
METHOD AND COMPOSITION FOR PURIFYING WASTE WATER
Ochsenschlaeger, M., P. Pfeiffer, and R. Schwiete. 1976.
German Offenlegungsschriften (unexamined patent application)
2,507,733

Wastewater treatment, Waste oil, Emulsions, Patent

A mixture of kaolin and $Al_2(SO_4)_3$, and optionally bentonite and $Fe_2(SO_4)_3$, is used for treating waste water containing emulsified oils such as motor oils and lubricating oils.

[from Chemical Abstracts 86(2):#8452v. 1977]

C-0696-77
PROCESS FOR TREATING EFFLUENTS CONTAINING PETROLEUM PRODUCTS
Oldham, G. F. 1976.
French Patent 2,277,777

Wastewater treatment, Petroleum products, Patent

Wastewater is passed through a sand filter and then through a biological percolation filter. The treated water contains no petroleum products.

[from Petroleum Abstracts 17(6):#230,161. 1977]

C-0697-77
PROCESS AND APPARATUS FOR THE EXTRACTION OF LIGHTER LIQUIDS FROM WATER, ESPECIALLY FROM RESIDUAL WATER
Passavant Werke Miche Hutte. 1976.
French Patent 2,275,237

Wastewater treatment, Extraction, Contaminants, Design and engineering, Patent

This invention provides for the extraction of oil or gasoline from residual water which it pollutes. Feed liquid circulates downward along an inclined passage allowing the buoyancy force to drive the lighter polluting liquid into contact with the roof of the passage and lower side of the baffles. The pollutant is then withdrawn by aspiration or absorption through holes in the top surface of the flow channel.

[from Petroleum Abstracts 17(3):#229,170. 1977]

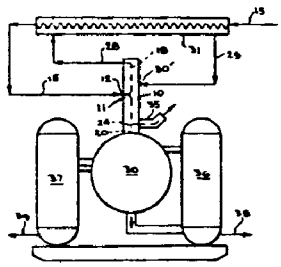
C-0698-77
PROCESS FOR SEPARATING WATER AND LIGHT HYDROCARBONS FROM A FLUID FLOW MEDIUM
Pilcher, D. W. 1976.
U.S. Patent 3,968,659

Oil wells, Oil-water separation, Design and engineering, Patent

A process for separating petroleum from water at the well head is described. The fluid mixture is conducted through a heat exchanger and a vortex generation chamber splits the fluid flow into a hot and a cold stream. One stream is conducted to the heat exchanger for heat transfer between the stream and the fluid flow, and the cold stream is conducted to a vessel to condense and separate entrained hydrocarbons which are then collected.

[from Chemical Abstracts 86(2):#7029a. 1977]

3,968,659
PROCESS FOR SEPARATING WATER AND LIQUID HYDROCARBONS FROM A FLUID FLOW MEDIUM
David W. Pilcher, 2544 Aspen, Pampa, Tex. 79605
Filed Sept. 9, 1974, Ser. No. 504,271
Int. Cl.² F25B 9/02
U.S. Cl. 62—5 10 Claims



C-0699-77
ENERGY FOR WASTEWATER TREATMENT
Prather, B. V., and E. P. Young. 1976.
Hydrocarbon Processing 55(5):88-92.

Wastewater treatment, Refineries, Water quality, Oil-water separation, *Energy requirements

Energy requirements for petroleum refinery wastewater treatment vary with type of treatment and effluent quality requirements. The major treatment processes are reviewed and energy requirements are given for the API separator, trickling filters, oxidation towers, and activated sludge.

C-0700-77
SEPARATION OF OILS, FATS, AND OTHER FINELY DISPERSED MATERIALS FROM WASTEWATER
Reti, I., T. Peter, G. Jurkovich, and B. Ujfalussy. 1976.
Hungarian Patent 12,027

Wastewater treatment, Oil-water separation, Flotation, Patent

A procedure is described in which wastewater is introduced at high speed into a cylindrical apparatus provided with deflection plates. Air is bubbled upwards along the walls to provide an upward helical motion to the effluent. The combined streaming motion and flotation efficiently separates oil and other substances which are then decanted from the top.

[from Chemical Abstracts 86(4):#21585k. 1977]

C-0701-77
NAVY DEVELOPMENT OF SUITABLE SHIPBOARD BILGE OIL/WATER SEPARATORS
Smookler, A. L., J. W. Harden, and P. D. Conroy. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 423-428. (American Petroleum Institute No. 4284)

Oil-water separation, Bilges, Ships, Design and engineering, USN

The development and evaluation of a Navy shipboard bilge oil-water separator are detailed and performance goals for effluent oil levels during in-port and at-sea periods are established. Test results on actual and deliberately contaminated bilge water are reported.

C-0702-77
OIL-ABSORBING COMPOSITE
Suzuki, T., T. Ito, and T. Onuma. 1976.
Japanese Kokai (unexamined patent application) 76 92,791

Wastewater treatment, Oil-water separation, Absorption, Patent

Micro-cellulosic fiber and micro-inorganic powder are mixed to give an oil-absorbing composite containing less than 20% water. Under experimental conditions, a composition of cellulose pulp and clay absorbed type A heavy oil.

[from Chemical Abstracts 85(24):#179312h. 1976]

C-0703-77
OIL ADSORBENT
Toyama, M., T. Ito, E. Kobayashi, and K. Hino. 1976.
Japanese Kokai (unexamined patent application) 76 100,981

Waste oil treatment, Adsorption, Patent

"Cellophane flakes treated with 1:1 masticated natural rubber-polyterpene resin (softening point 100°) were used as adsorbents for hydrocarbon oils."

[from Chemical Abstracts 86(4):#21586m. 1977]

C-0704-77
CONSOLIDATED HAZARDOUS ITEM LIST
U.S. Navy. Supply Systems Command. 1976.
NAVSUP Publication 4500.

Disposal, Waste oil, Petrochemicals, Storage, Manuals, USN

This U.S. Navy Manual covers the marking, storage, and disposal of some 8000 hazardous and toxic materials including oils and some petrochemicals. It is available from the Navy Fleet Material Support Office, Mechanicsburg, Pennsylvania 17055.

[from Industrial Wastes Information Bulletin 7(5):#HMS 7738. 1976]

C-0705-77
BLACK OIL DISPOSAL TECHNIQUES
Wise, N., and P. A. Brunk. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 277-279. (American Petroleum Institute No. 4284)

Oil spills, Disposal, Incineration, Chesapeake Bay, *Black oil

The burning of 472,000 l (125,000 gal) of contaminated black oil in the Chesapeake Bay is discussed and the use of the brush burner, a fan which forces a high volume of air to sustain a fire hot enough to burn contaminated black oil, is described.

6. RECLAMATION AND REUSE

C-0706-77
WASTE OIL STUDY. REPORT TO CONGRESS
Environmental Protection Agency. 1974. 414p.

Waste oil, Recycling, Reuse, Disposal, Biological effects

The collection of waste oils from industrial operations and automative services is the weakest link in the waste oil recycling/disposal scheme. Current disposal methods include re-refining, use as a fuel in industrial applications, use in road oils, asphalts, and as a dust palliative, disposal in sanitary landfills, and intentional dumping on land and in water. The U.S. re-refining industry is discussed and results of biological studies are presented.

[from Governments Reports Announcements 76(24):#PB-257 693/2GA. 1976]

C-0707-77
REGENERATION OF WASTE LUBRICANTS
Takaoka, S. 1976.
Japanese Kokai (unexamined patent application) 76 41,706

Waste oil, Lubricating oil, Reclamation, Patent

Treatment of waste lubricating oils with H_2SO_4 and Na_2CO_3 solution in alcohol, followed by settling, removes sludge. Further treatment with activated clay at 80°-100°C, and subsequent filtration results in fully regenerated lubricating oil.

[from Chemical Abstracts 85(22):#163134r. 1976]

C-0708-77
REGENERATION OF WASTE OILS. VI [in Japanese]
Kawase, Y. 1976.
Sekiyu to Sekiyu Kagaku 20(6):82-86.

Waste oil, Reclamation, Crude oil

"A review with 7 references is presented on the clay treatment of the lubricant fraction from crude oil and on synthetic lubricants."

[from Chemical Abstracts 86(4):#19184k. 1977]

C-0709-77
REGENERATION OF WASTE OILS. VII [in Japanese]
Kawase, Y. 1976.
Sekiyu to Sekiyu Kagaku 20(7):100-104.

Waste oil treatment, Reclamation

The occurrence, purification and properties of waste oils are reviewed.

[from Chemical Abstracts 86(4):#19183j. 1977]

7. PERSONNEL TRAINING AND EDUCATION

C-0710-77
THE SPILL TRAINING AND EDUCATION PROGRAM AT TEXAS A & I CORPUS CHRISTI
Gilchrist, R. E. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 135-136. (American Petroleum Institute No. 4284)

Oil spills, Personnel training, Pollution prevention, Cleanup, Contingency planning, Texas

The week-long Spill Training and Education Program at Texas A & I at Corpus Christi enables the student to accomplish the following: recognize the areal exposure to an oil spill, determine the equipment needed to clean up an oil spill, prepare a contingency plan, and recommend the vehicle to carry out the contingency plan. To accomplish these course objectives students are trained in the use of skimmers, booms, and other cleanup equipment and are given classroom instruction in the environmental, legal, and economic aspects of oil spills.

C-0711-77
HIATUSPORT - AN ON-SCENE COORDINATOR ROLE-PLAYING EXERCISE
Kangeter, E. B., III. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 141-143. (American Petroleum Institute No. 4284)

Oil spills, Personnel training, Pollution control, Contingency planning, USCG, *Hiatusport exercise

The "Hiatusport" technique, an exercise used by the U.S. Coast Guard for training on-scene coordinators, is presented and course objectives and management are reviewed.

C-0712-77
CANADIAN APPROACH TO OIL SPILL TRAINING
Kay, G. H. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 137-138. (American Petroleum Institute No 4284)

Oil spills, Personnel training, Pollution control, Cleanup, Contingency planning, Canada

Oil spill training aids produced by the Consortium on Spill Training (COST), a Canadian cooperation of industry and governments, are described and the objectives of COST are reviewed.

C-0713-77
OIL SPILL CONTROL TRAINING: TEXAS A&M UNIVERSITY'S APPROACH
Payne, J. L. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 129-134. (American Petroleum Institute No. 4284)

Personnel training, Oil spills, Texas, *Spill control course

The Oil Spill Control Course conducted at Galveston, Texas, by Texas A&M University's Engineering Extension Service is described. The program's growth and development is briefly documented. Topics of importance include: Educational Objectives, Instructive Modes, and Program Assessment. An outline of the Engineering Extension Services's proposals for updating and expanding its training program is discussed.

C-0714-77
THE PETROLEUM INDUSTRY TRAINING SERVICE - EDMONTON, ALBERTA
Wetmore, W. C. 1976.
Spill Technology Newsletter 1(6):36.

Personnel training, Oil industry, Pollution control, Oil spills, Cleanup, Recovery, Restoration

The Petroleum Industry Training Service (PITS) offers courses and educational services in most phases of the oil and gas industry. Present spill technology courses consist of (1) a three day Oil Spill Containment and Recovery program designed for field foremen and other personnel directly involved in oil spill control; and (2) a three day Oil and Salt Spill Site Rehabilitation Seminar designed for operations management personnel, environmental engineers, field superintendents, foremen and others directly involved in reclamation projects.

8. CONTINGENCY PLANNING

C-0715-77
OIL SPILL CONTROL IN ALBERTA
Bohme, V. E., and E. R. Brushett. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 91-94. (American Petroleum Institute No. 4284)

Contingency planning, Oil spills, Pollution control, Cleanup, Personnel training, Oil industry, Canada

The Energy Resources Conservation Board is responsible for the administration of the oil and gas industry in Alberta. While each oil company is held responsible for containment and cleanup of its own spills, the Board supports the oil spill cooperative concept in spill equipment maintenance, contingency plan preparation, and spill response training. The Board's efforts are aimed at careful containment and cleanup of spills followed by comprehensive evaluation of spill effects for effective rehabilitation programs.

C-0716-77
A DYNAMIC INTERNATIONAL CONTINGENCY PLAN
Corbett, C. R., and C. J. Beckett. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 79-80. (American Petroleum Institute No. 4284)

Contingency planning, U.S., Canada, Oil spills, St. Lawrence River

This paper tells of an international contingency plan, the Joint Canada/United States Marine Pollution Contingency Plan, and how its parties managed the problems confronting them when a major oil spill occurred in the St. Lawrence River on June 23, 1976.

C-0717-77
THE ST. LAWRENCE RIVER OIL SPILL OF JUNE 23, 1976 - ARE YOU EVER TRULY READY?
Foley, J. P., and S. J. Tresidder. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 81-85 (American Petroleum Institute No. 4284)

Contingency planning, Oil spills, Environmental effects, Cleanup, St. Lawrence River

A case study is presented of the title oil spill in which 1.1 million liters (300,000 gallons) of No. 6 oil were released into

St. Lawrence River waters. In a spill incident such as this, it is important that the pre-designated on-scene coordinator (OSC) implements an organizational scheme to make an effective and thorough recovery effort. An approach which was successful on the St. Lawrence River is pointed out.

C-0718-77
OIL SPILL CONTINGENCY PLANNING FOR THE BP FORTIES OILFIELD PRODUCTION, PIPELINE AND TERMINAL SYSTEMS
Fulleylove, R. J., and T. E. Lester. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 87-90. (American Petroleum Institute No. 4284)

Contingency planning, Oil spills, Cleanup, Personnel training, Oil fields, North Sea, *BP Forties oilfield

The plans and types of problems for BP in developing oil spill contingency plans to cover the entire Forties oil field in the UK sector of the North Sea are discussed. Efforts required include re-examining methods of oil spill cleanup at sea and on land and, taking into account ecological problems, redesigning equipment where necessary; coordinating with relevant authorities; and insuring personnel training.

C-0719-77
THE DEVELOPMENT AND USE OF RESOURCE SENSITIVITY MAPS FOR OIL SPILL COUNTERMEASURES
Hum, S. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 105-110. (American Petroleum Institute No. 4284)

Contingency planning, Oil spills, Canada, *Resource sensitivity maps, *British Columbia

This paper discusses the development and use of resource sensitivity maps to provide optimal protection and to set priorities for equipment and manpower deployment during an oil spill. The maps contain sufficient details of biological resources, current land and water uses, present access and land status, tide-current data and wind patterns to enhance initial decision-making until more detailed information systems are available and on-line. The maps illustrated in this paper cover coastal areas of British Columbia and were developed by the Environmental Protection Service of Environment Canada.

C-0720-77
OIL SPILL RESPONSE PLANNING FOR BIOLOGICALLY SENSITIVE AREAS
Linstedt-Siva, J. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 111-114. (American Petroleum Institute No. 4284)

Contingency planning, Oil spills, Fate, Environmental protection, Santa Barbara Channel, *Clean Seas, Inc.

Oil spill response plans should include the examination of physical processes of the environment in which they will be used so that the fate of spilled oil may be predicted, and biologically sensitive areas that are vulnerable to oil spill damage be identified. Clean Seas, Inc., an oil spill cooperative in Santa Barbara, is implementing such a spill response plan designed to protect these sensitive areas in the Santa Barbara Channel.

C-0721-77
TECHNICAL SUPPORT OF SPILL CONTROL OPERATIONS
Marum, J. P., W. R. Quanstrom, and R. G. Will. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 101-103. (American Petroleum Institute No. 4284)

Contingency planning, Oil spills, Gasoline, Cleanup, Oil industry, *Standard Oil Co. (Indiana)

Standard Oil Company (Indiana) has established a corporate technical support group to strengthen its response to oil spills and their effects. The group has been organized to advise and provide consultation to line management of the AMOCO companies in dealing with problems resulting from a spill. Two case histories are presented which illustrate the involvement of the support group in control of gasoline spills.

C-0722-77
OIL SPILL CLEAN-UP IN THE BEAUFORT SEA
O'Rourke, C. 1976.
Spill Technology Newsletter 1(6):12-35.

Contingency planning, Oil spills, Cleanup, Beaufort Sea, Ice

The main elements of Canadian Marine Drilling Ltd's (Canmar) Oil Spill Contingency Plan are presented, including the response organization, spill reconnaissance program, and the techniques for cleaning up oil in open arctic waters, ice-infested waters, on and under ice, and along the shoreline. The plan is designed to provide effective logistical and technical responses to a hypothetical well blowout in which oil is lost at the rate of

2,500 barrels per day for one year. Various techniques for cleaning up the spill site and removing spilled oil, primarily by burning, are described and illustrated. Canmar's present and future spill research and development projects are briefly outlined.

C-0723-77
CONTINGENCY PLANNING FOR THE IMPACT OF OIL SPILLS IN DIFFERENT COASTAL ENVIRONMENTS OF CANADA
Owens, E. H. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 115-122. (American Petroleum Institute No. 4284)

Contingency planning, Oil spills, Cleanup, Coasts, Canada

Planning for an oil spill cleanup operation of the coastal zone requires consideration of the physical characteristics of the coast, wave energy levels, and tidal range. Three examples from very different coastal environments in eastern Canada are used to illustrate the importance of understanding the variability of littoral processes and of geological parameters in planning cleanup programs.

C-0724-77
OIL AND SALT WATER SPILLS IN CANADA
Pettigrew, R. K. 1975.
Conference on the Environmental Effects of Oil and Salt Water Spills on Land, Banff, Alberta, 1975. Alberta Environment, and University of Calgary, 1975. p. 1-11.

Contingency planning, Oil spills, Inland, Canada, Personnel training

In this verbatim transcript of a presented paper, the possible responses to oil spills on Canadian lands and waters are outlined. Spill response preparedness, contingency plans and personnel training are briefly discussed, and several case histories of spills are reviewed.

C-0725-77
A WORKSHOP FOR DEFINING THE ROLE OF LOCAL GOVERNMENTS IN OIL SPILL RESPONSE
Putnam, W. H. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 125-127. (American Petroleum Institute No. 4284)

Contingency planning, Oil spills, Cleanup, Pollution control, Economics, *Local governments

The definition of how local governments are to participate under the National Oil and Hazardous Substance Pollution Contingency Plan is outlined with four major headings: protection of the bays, beach cleanup, crowd and traffic control, and funding.

C-0726-77
THE LAW AND PRACTICE RELATING TO POLLUTION CONTROL IN THE MEMBER STATES OF THE EUROPEAN COMMUNITIES
(Authors unknown). 1976.
London, Graham & Trotman Ltd., 1976. 13 volumes.

Pollution control, Legislation, Oil discharges, Europe, *Marine pollution

"A thirteen-volume series which describes the pollution control laws and practices of each country of the European Communities." Among the headings for each book is one dealing with pollution of the seas by oil.

[from brochure of publications, Graham & Trotman Ltd.]

C-0727-77
APPARATUS FOR TANKS INSTALLED ON THE SOIL, ESPECIALLY TANKS CONTAINING LIQUID OILY SUBSTANCES, WHICH IN CASE OF A LEAK AVOIDS THE POLLUTION OF THE GROUND-WATER BODY
Andersen, L. J. 1976.
French Patent 2,281,884

Oil tanks, Leakage, Soil, Pollution prevention, Storage, Design and engineering, Patent

The apparatus consists of a sealing barrier in the soil, surrounding one or more tanks, with its rim protruding a little above the ground level and having its lowest point below the lowest point of the groundwater table. It may include a cover, in the bottom of the tank, under which a well equipped with a suction pipe leads to a small tank with a suction pump located outside the enclosure.

[from Petroleum Abstracts 17(8):#230,633. 1977]

C-0728-77
APPARATUS FOR DETECTING LEAKS IN DOUBLE-WALLED TANKS, WORKING ON THE PRINCIPLE OF OVERPRESSURE
Budde, H., and J. Bahnsch. 1976.
German Patent 2,412,373

Oil tanks, Leakage, Detection, Design and engineering, Patent

A leak detector for storage tanks containing liquids consists of a pump which maintains an overpressure in the control space between the double walls. The pump is equipped with a pressure switch which switches it on and off when the pressure drops and reaches predetermined levels; an additional pressure switch triggers an alarm indicator when the pressure drops below a critical level because of a leak.

[from Petroleum Abstracts 17(8):#230,594. 1977]

C-0729-77
ENVIRONMENTAL PROBLEM DEFINITION FOR PETROLEUM REFINERIES, SYNTHETIC NATURAL GAS PLANTS, AND LIQUEFIED NATURAL GAS PLANTS
Cavanaugh, E. C., J. D. Colley, P. S. Dzierlenga, V. M. Felix, and D. C. Jones. 1975.
NTIS Report PB-252245. 476p.

Pollution control, Refineries, *Natural gas plants, Monitoring, Wastewaters, Solid waste

"Ambient air emissions, liquid effluents, solid wastes, monitoring methods and control techniques are given."

[from Chemical Abstracts 86(2):#8372u. 1977]

C-0730-77
SPCC PLANNING: GOOD MANAGEMENT PRACTICE
Clark, D. A. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 55-56. (American Petroleum Institute No. 4284)

Pollution prevention, Oil spills, Storage, Petroleum products, Contingency planning, *Oil storage plan

Spill Prevention Control and Countermeasure (SPCC) plans are required by the Oil Spill Prevention Program, EPA, for facilities with oil storage capacity above certain minimum amounts. The paper discusses the additional beneficial effects of a good SPCC plan other than the reduction in spill hazard.

C-0731-77
ASPECTS OF WATER POLLUTION IN THE OIL REFINING INDUSTRY [English summary]
Colin, J. 1976.
Industries Alimentaires et Agricoles 93(2):177-183.

Pollution prevention, Refining, Oil industry, Sources

Discussed are the sources of pollution in the production of refined and unrefined oils, and techniques of preventing pollution from cooling water, gas washers, and the decomposition of soapstocks.

[from Chemical Abstracts 85(24):#181847e. 1976]

C-0732-77
A GLOBAL ENVIRONMENT: THE OCEANS
Council on Environmental Quality. 1975.
CEQ Annual Report, 6th, 1975. p. 595-607.

Pollution prevention, Oceans, Storage, Oil spills, Environmental effects

The article discusses exploitation of marine resources, both living and mineral, ocean dumping of harmful wastes, and oil spills. Means for preventing adverse environmental effects from ocean mining and offshore oil storage are described.

[from Environment Abstracts 6(11):#76-07362. 1976]

C-0733-77
OIL SPILL CONTROL. PART 2: COUNTER MEASURES
D'Alessandro, P. L., and C. B. Cobb. 1975.
Hydrocarbon Processing 55(3):145-148.

Oil spills, Pollution control, Detection, Containment, Recovery, Disposal

Methods of detection, containment, recovery, and disposal are reviewed.

[from Chemical Abstracts 85(24):#182002n. 1976]

C-0734-77
CONTROLLING POLLUTION OF THE MARINE ENVIRONMENT: AN ECONOMIC ANALYSIS
Epple, D., and M. Visscher. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 31-34. (American Petroleum Institute No. 4284)

Pollution control, Oil spills, *Costs, Economic effects, Models, *Polluter response

"Using data from the U.S. Coast Guard's Pollution Incident Reporting System (PIRS) and the Port Safety and Security/Marine Environmental Protection Quarterly Activities Report, this paper examines a model describing the behavior of polluters in response to pollution control costs and, in so doing, stresses the potential economic impact. Implications for public policy also are presented."

C-0735-77
EVALUATION OF SELECTED SURFACE TREATMENT AGENTS FOR THE PROTECTION OF SHORELINES FROM OIL SPILLS
Foget, C. R. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 237-241. (American Petroleum Institute No. 4284)

Oil spills, Pollution prevention, Environmental protection, Shorelines, Marshes

The objectives of current research on chemical and natural agents used to protect shoreline or marsh areas from oil contamination are evaluated in the laboratory and in the field. Evaluation includes the environmental effects of the agents, the effects of climate on agent use, longevity of the agents, and ease of agent application.

C-0736-77
PROTECTION OF THE MARINE ENVIRONMENT FROM POLLUTION
Frank, R. A. 1976.
Georgia Journal of International and Comparative Law 6:73-91.

Environmental protection, Ships, Tankers, Inland, Offshore production, Monitoring

Six issues are discussed regarding protection of the marine environment from pollution in the context of the Third UN Conference on the Law of the Sea. Vessel source pollution, land based pollutant sources, pollution from offshore resource-related activities, and environmental monitoring and assessment are among the topics considered.

[from Selected Water Resources Abstracts 10(2):#W76-00973. 1977]

C-0737-77
SINKING OF TANKER ST. PETER OFF COLOMBIA
Hayes, T. M. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 289-291. (American Petroleum Institute No. 4284)

Oil spills, Tankers, Environmental protection, Colombia, IMCO

The tanker, "St. Peter", sank in 1,000 m of water off Cape Manglares, Colombia. The Intergovernmental Maritime Consultative Organization (IMCO) provided technical advice to the Colombian and Ecuadorian governments regarding countermeasures against pollution. The lack of available equipment to locate the sunken vessel, the logistics involved in operations to reduce environmental damage, and the need for a response organization are discussed.

C-0738-77
U.S. NAVY R & D EFFORTS IN SUPPORT OF OIL POLLUTION ABATEMENT STRATEGIES
Hura, M. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 61-63. (American Petroleum Institute No. 4284)

Pollution prevention, Oil discharges, Ships, Waste oil treatment, Cleanup, Monitoring, USN

The basic strategy of the Navy's Oil Pollution Abatement program has been to institute measures that will reduce the amount of oil discharged from ships into the environment wherever possible before implementing oily waste treatment techniques. Navy laboratories have been instrumental in developing techniques and hardware to combat oil pollution. Contributions include shipboard oil/water separators, real-time oil-in-water monitors, and effluent oil spill containment and cleanup equipment.

C-0739-77
REPORT OF THE SYMPOSIUM ON PREVENTION OF MARINE POLLUTION FROM SHIPS HELD IN ACAPULCO, MEXICO 22-31 MARCH 1976
Inter-Governmental Maritime Consultative Organization. 1976.
USCG-WEP-1-77, 1437p.

International conventions, Oil spills, Ships, Oil-water separation, Contingency planning, Pollution prevention, IMCO

Discussed at this symposium were: oil-water separators, oil monitoring equipment, contingency planning, and control and detection methods for dealing with oil spills.

[from Government Reports Announcements 77(1):#AD-A031 581/2GA. 1977]

C-0740-77
ELEMENT AND METHOD FOR DETECTING LEAKAGE OF PETROLEUM PRODUCTS
Kishikawa, H., T. Adachi, and T. Usami. 1976.
U.S. Patent 3,970,863

Leakage, Detection, Petroleum products, Patent

"Coating a laminate or film of petroleum product-swellable butadiene-styrene block copolymer with mixtures containing Ag or Al or coating polystyrene cords with mixtures containing styrene block copolymer and Ag gave materials useful for detection of petroleum leaks."

[from Chemical Abstracts 86(4):#17841y. 1977]

C-0741-77
THE EPA INDUSTRIAL POLLUTION R AND D PROGRAM. PETROLEUM REFINING AND ORGANIC CHEMICALS INDUSTRIES
Lacy, W. J., P. E. Des Rosiers, L. H. Myers, H. Leon, and T. E. Short. 1975.
Preprint, Division of Petroleum Chemistry, American Chemical Society 20(1):274-286.

Pollution control, Oil industry, Refineries, EPA

A review is presented of the Environmental Protection Agency pollution control research and development projects implemented by the petroleum industry.

[from Chemical Abstracts 86(4):#21334c. 1977]

C-0742-77
FAST SURFACE DELIVERY SYSTEM FOR POLLUTION RESPONSE EQUIPMENT
Larrabee, R. M., and R. Ward. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 417-421. (American Petroleum Institute No. 4284)

Oil spills, Pollution control, Cleanup, Design and engineering, USCG, *Equipment delivery system

Performance requirements and design specifications of the U.S. Coast Guard's Fast Service Delivery System are given. Test results show this system to be an efficient means to deliver pollution control equipment to the scene of a high seas oil spill.

C-0743-77
IMPROVEMENTS IN OR RELATING TO BLOWOUT PREVENTERS
Lerouax, R. K. 1976.
British Patent 1,457,562

Blowout prevention, Drilling, Design and engineering, Patent

A blowout preventer adapted to seal with the drill stem in a well bore or to close the bore in the absence of the drill stem consists of the following: 1) a resilient sealing member with an inner surface adapted to engage the drill stem, 2) a rigid retaining plate mounted with the sealing member, 3) means for urging the sealing member radially inward relative to the inner surface of the retaining-plate for sealing with the drill stem or with itself so as to close the bore, and 4) anti-extrusion means.

[from Petroleum Abstracts 17(3):#229,038. 1977]

C-0744-77
A BAD DAY AT BUNKER POINT
Marcus, E. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 139-140. (American Petroleum Institute No. 4284)

Oil spills, Personnel training, Pollution control, Contingency planning

The four-phase program by Gulf Trading and Transportation Company (GT&T) to improve existing oil spill policies and procedures is reviewed. The program includes terminal inspection, contingency planning, response teams, and mock spill exercises.

C-0745-77
HACKENSACK ESTUARY OIL SPILL: CUTTING OIL-SOAKED MARSH GRASS AS AN INNOVATIVE DAMAGE CONTROL TECHNIQUE
Mattson, C. P., N. C. Vallario, D. J. Smith, S. Anisfield, and G. Potera. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 243-246. (American Petroleum Institute No 4284)

Oil spills, Pollution control, Estuaries, Marshes, Movement, *Grass-cutting, *Hackensack estuary

Grass cutting technology for the control of oil pollution in the Hackensack estuary and marshland is analyzed and oil slick movement predictions are given.

C-0746-77
PREVENTING OIL SPILLS IN THE WEST COAST FOREST INDUSTRY
Melville, L., and P. Hamm. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 57-59. (American Petroleum Institute No. 4284)

Pollution prevention, Oil spills, Cleanup, Waste oil disposal, *Forest industry

The approach of MacMillan Bloedel, Canada's largest forest products company, to oil spill prevention and cleanup is discussed. The company's enlightened program of establishing control measures, training personnel, and contingency planning has resulted in a significant reduction in the number and magnitude of oil spills during operations.

C-0747-77
PROCESS FOR SEALING PIPE CONNECTIONS
Press (William) & Son Ltd. 1974.
Belgian Patent 815,458

Leakage, Pipelines, Pollution prevention, Patent *Sealing material

A thick annular ring of sealing material is made by introducing castable and hardening sealing agent in a mold which is mounted on the leaky pipe. The mold is dismantled, leaving the sealant completely surrounding the leaky junction.

[from Petroleum Abstracts 17(8):#230,615. 1977]

C-0748-77
LUBRICATING OIL CAUSING LESS POLLUTION PROBLEM
Shimuzu, I. H. Kurita, Y. Beppu, and M. Shibata. 1976.
Japanese Kokai (unexamined patent application) 76 83,606

Pollution control, Lubricating oil, Patent

"Lubricating oils are prepared by mixing base oils containing hydrocarbon oils and optionally olefin polymers with various additives such as anti-oxidants, oiliness improvers, demulsifying agents, corrosion inhibitors, defoaming agents, and viscosity index improvers."

[from Chemical Abstracts 85(22):#163148y. 1976]

C-0749-77
LUBRICATING OIL CAUSING LESS POLLUTION PROBLEM
Shimuzu, I., K. Okada, and M. Shibata. 1976.
Japanese Kokai (unexamined patent application) 76 83,607

Pollution prevention, Lubricating oil, Patent

"Lubricating oils are prepared by mixing base oils containing highly refined hydrocarbon oils with olefin polymers, and optionally 2,6-di-tert-butyl-4-methylphenol, fatty acids, and/or fatty acid esters."

[from Chemical Abstracts 85(22):#163147x. 1976]

C-0750-77
PROCESS FOR DETECTING LEAKS FROM A TANK AND APPARATUS FOR ITS APPLICATION
Siozade, J. E., and D. G. P. Bouvier. 1975.
French Patent 2,270,574

Leakage, Oil tanks, Detection, Design and engineering, Patent

"The tank is subjected to a first hydraulic pressure and the variation of liquid level in a sight glass is measured for a time interval, T; then the tank is subjected to a second hydraulic test pressure and time interval. The difference in liquid levels represents the rate of leakage."

[from Petroleum Abstracts 17(2):#228,832. 1977]

C-0751-77
ARCTIC OFFSHORE OIL SPILL COUNTERMEASURES WITH EMPHASIS ON AN OIL AND GAS BLOWOUT IN THE SOUTHERN BEAUFORT SEA
Thornton, D. E., S. L. Ross, W. J. Logan, and C. W. Ross. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 313-319. (American Petroleum Institute No. 4284)

Oil spills, Blowout prevention, Offshore drilling, Ice, Dispersants, Containment, Incineration

A summary is presented by Environment Canada of arctic offshore oil spill countermeasures projects to assess the potential impact of exploratory drilling for oil and to develop efficient methods of combusting oil on ice. Discussed are ways to evaluate the fate and effects of dispersants in cold sea water, develop dispersant deployment methods, and contain oil from underwater blowouts. For zones of moving ice, the best technique appears to be in-situ burning on the ice surface during the summer.

C-0752-77
THE CONTROL OF OIL POLLUTION ON THE SEA AND INLAND WATER
Wardley-Smith, J. (ed.). 1976.
London, Graham & Trotman Ltd., 1976. 240p.

Pollution control, Oil spills, Oceans, Inland, Environmental effects, Cleanup

This book explains the effect of oil spills on the marine environment and describes the best methods of cleaning up such pollution. The contents are divided into four main topics: (1) Oil and its Effects; (2) Treatment of Oil on Water, (3) Treatment of Oil on the Land,; (4) Organizational Aspects.

[from brochure, Graham & Trotman Ltd.]

C-0753-77
UNDERWATER BLOWOUT OIL COLLECTION
Westergaard, R. H. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 293-295. (American Petroleum Institute No. 4284)

Blowout prevention, Containment, Offshore drilling, Oil spills, North Sea

A feasibility study on underwater oil collection for control of underwater blowouts is presented and equipment operation is discussed. The possibility of a blowout in North Sea operations due to difficulties in containment is also reviewed.

C-0754-77
NEW TEST FACILITIES FOR THE PREVENTION OF OIL POLLUTION IN JAPAN
Yazaki, A. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 429-433. (American Petroleum Institute No. 4284)

Oil spills, Recovery, Pollution prevention, Japan, *Test facilities

Design specifications of new Japanese test facilities for conducting research on developing and evaluating oil-fences and oil-recovery equipment are given. These facilities include a circulating water channel, a rectangular tank, and an oil-water purifier system.

C. EFFECTS OF OIL POLLUTION

1. BIOLOGICAL EFFECTS

C-0755-77
OILS SPILLS ARE NOT FOR THE BIRDS
Anon. 1977.
Science News 111(10):153.

Fuel oil, Birds, Biological effects, Monitoring, *Reproduction

Recent research by C. R. Grau, T. Roudybush, J. Dobbs, and J. Wathen of the University of California, Davis, shows that even tiny amounts of fuel oils can hinder reproduction in a variety of birds. Petroleum oils in quantities too small to obviously harm adult birds were found to result in thinned eggshells, less yolk in eggs, and alterations of the yolk's chemical properties. These changes may be useful in monitoring oil pollution of wild birds.

C-0756-77
SUBLETHAL EFFECTS OF PETROLEUM FRACTIONS ON THE BEHAVIOR OF THE LOBSTER, HOMARUS AMERICANUS, AND THE MUD SNAIL, NASSARIUS OBSOLETUS
Atema, J. 1976.
Estuarine Research Federation Meeting, Houston, 1975. No. CONF-7510104-1. 23p.

Fuel oil, *Kerosene, Biological effects, Behavior, Crustaceans, Mollusks, *Sublethal effects, *Lobster, *Mud snail

The behavior observed varied from feeding attraction to repulsion and feeding inhibition when exposed to concentrations of No. 2 fuel oil and kerosene and its fractions. The author suggests that specific hydrocarbon fractions in specific amounts are responsible for distinct behavioral changes; the fractions are present in variable amounts in different oils; and the behavioral changes are general enough to similarly affect a large number of marine invertebrates.

[from ERDA Energy Research Abstracts 1(9):#017440. 1976]

C-0757-77
NONNUCLEAR EFFLUENTS: FATE AND EFFECTS OF OIL AND OIL COMPOUNDS ON MARINE COASTAL ECOSYSTEMS
Author unknown. 1976.
Battelle Pacific Northwest Laboratory annual report for 1975, No. BNWL-2000 (Pt. 2). p. 118-126.

Hydrocarbons, Fate, Chronic effects, Contamination, Marine organisms, Coasts, Analytical techniques

Based on information from short-term studies, three problem areas have been identified: (1) a need to stabilize experimental treatment to allow description of treatment and interpretation of observed biological response; (2) a need to develop existing analytical methods having high sensitivity for use as tools complementary to bioassay; and (3) a need to demonstrate the suitability of multi-species biological complexes as laboratory test units.

[from ERDA Energy Research Abstracts 1(9):#17375. 1976]

C-0758-77
ECOLOGICAL EFFECTS OF EXPERIMENTAL OIL SPILLS ON EASTERN COASTAL PLAIN ESTUARINE ECOSYSTEMS
Bender, M. E., E. A. Shearls, and R. P. Ayres. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 505-509. (American Petroleum Institute No. 4284)

Oil spills, Estuaries, Biological effects, Weathering, Plankton, Fishes, Benthos, Atlantic coast

The objective of this research is to determine the ecological effects of weathered and unweathered South Louisiana crude oil spilled into eastern coastal plain estuaries. This paper deals with biotic responses excluding bacteria. Overall, the artificially weathered oil was shown to have as great an ecological impact on the communities as the fresh crude. Phytoplankton and fish populations all showed greater declines following the spills in the weathered oil systems. Marsh grass production and benthic populations declined after both oil spills.

C-0759-77
EFFECTS OF SUNKEN OIL ON THE FEEDING OF PLAICE ON BROWN SHRIMPS AND OTHER BENTHOS
Blackman, R. A. A. 1974.
Copenhagen, International Council for the Exploration of the Sea, Fisheries Improvement Committee, 1974. 7p.

Behavior, Fish, Contamination, Benthos, *Sunken oil, *Oil-containing prey, *Feeding

The effects of oil-containing prey and oil from tank bottoms on predation behavior of demersal fish were studied. The fish caught shrimp that had ingested oil more easily because of the shrimp's reduced specific gravity. It was found that food-seeking fish in an oiled area will ingest oil as a potential food.

C-0760-77
EFFECTS OF NO. 2 FUEL OIL, NIGERIAN CRUDE OIL AND USED CRANKCASE OIL ON THE METABOLISM OF BENTHIC ALGAL COMMUNITIES
Bott, T. L. , K. Rogenmuser, and P. Thorne. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 373-393. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Toxicity, Fuel oil, Crude oil, Waste oil, Metabolism, Benthos, Algae

In this study, exposure of benthic algal communities to the three title oils was shown to depress the net community primary productivity; the degree of effect was dependent on the type and concentration of the oil used. No. 2 fuel oil had the most toxic effects on community function.

C-0761-77
SENSITIVITY OF LARVAL AND ADULT ALASKAN SHRIMP AND CRABS TO ACUTE EXPOSURES OF THE WATER-SOLUBLE FRACTION OF COOK INLET CRUDE OIL
Broderson, C. C., S. D. Rice, J. W. Short, T. A. Mecklenburg, and J. F. Karinen. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control Cleanup), New Orleans, March 8-10, 1977. p. 575-578. (American Petroleum Institute No. 4284)

Crude oil, Toxicity, Crustaceans, Alaska, *Water soluble fractions, *Larval stages, *Shrimp, *Crabs

Tests using 96-hour static bioassays at water temperatures normally encountered by the organisms were conducted in the title study. Larvae were found to be more sensitive to oil than adults, and

the sensitivity of the larvae was dependent on species and development stage. Greater vulnerability of larvae to oil exposure is probably due to greater susceptibility to oil toxicity and predation. Cold water species are particularly vulnerable because of the long time spent as developing larvae.

C-0762-77
MICROSOMAL MIXED FUNCTION OXIDASES IN AN ESTUARINE FISH, FUNDULUS HETEROCLITUS, AND THEIR INDUCTION AS A RESULT OF ENVIRONMENTAL CONTAMINATION
Burns, K. A. 1976.
Comparative Biochemistry and Physiology 53(4b):443-446.

Hydrocarbons, Contamination, Fish, Estuaries, *Microsomal mixed function oxidases, *Fundulus heteroclitus

In vitro aldrin epoxidation rates were measured in F. heteroclitus and compared to those seen in freshwater fish. "The oxidase(s) are microsomal, require NADPH and were poisoned by carbon monoxide (CO) indicating the involvement of a CO binding component." High levels of liver microsomal preparations containing the CO binding cytochrome P450 were induced both by a drug in the laboratory and by contamination of the aquatic environment by foreign hydrocarbons.

[from Environmental Health and Pollution Control 10(7):#1676. 1976]

C-0763-77
EFFECTS OF A SEAWATER-SOLUBLE FRACTION OF COOK INLET CRUDE OIL AND ITS MAJOR AROMATIC COMPONENTS ON LARVAL STAGES OF THE DUNGENESS CRAB, CANCER MAGISTER DANA
Caldwell, R. S., E. M. Caldarone, and M. H. Mallon. 1977.
Fate and Effects of Petroleum Hydrocarbons in Marine Ecosystems and Organisms, Seattle, November, 1976.

Crude oil, Toxicity, Crustaceans, *Water-soluble fractions, *Cancer magister Dana

Larval stages of C. magister Dana were exposed continuously to dilutions of Cook Inlet crude oil water-soluble fraction (WSF) or seawater solutions of naphthalene or benzene for periods up to 60 days. Effects on survival, duration of larval development, and size were used as indicators of toxicity. The lowest concentration of WSF at which toxic effects were seen was 4.0% of the full strength WSF (0.0049 mg/l as naphthalene or 0.22 mg/l as total dissolved aromatics). The lowest concentrations at which toxic effects were observed with naphthalene and with benzene were 0.13 mg/l and 1.1 mg/l, respectively. Concentrations of aromatic hydrocarbons in the WSF were inversely related to the degree of alkylation in the benzene and naphthalene families, but acute toxicity was directly related to the degree of alkyl substitution.

C-0764-77
THEORY OF THE SOURCE AND ACCUMULATION OF 3,4-BENZOPYRENE IN THE FOOD CHAIN
Capone, W., M. Cottiglia, C. Mascia, and M. L. T. Masala. 1976. Inquinamento 18(7-8):35-40.

Aromatic hydrocarbons, Wastewaters, Refineries, Contamination, Mollusks, Food web, *Food chain accumulation, *3,4-benzopyrene

Mussels growing near the waste discharge pipes of a petroleum refinery were collected and examined for 3,4-benzopyrene levels. Those collected 150 m from the discharge pipes were exceptionally small and contained 7.5 µg/kg; those 1000 m distance were of normal size but contained 1342.5 µg/kg. Results of experiments in which contaminated mussels were fed to mullet, and in turn contaminated mullet and mussels were fed to rats and their offsprings are described.

[from Chemical Abstracts 86(5):#28546g. 1977]

C-0765-77
THE EFFECT OF CRUDE OIL EXPOSURE ON ENZYMES IN THE SHRIMP HEPATOPANCREAS
Chambers, J. E., J. D. Yarbrough, and J. R. Heitz. 1975. Association of Southeastern Biologists 22(2):45. Abstract.

Crude oil, Emulsions, Biological effects, Crustaceans, *Shrimp, *Enzyme activities

The effects of a one day in vivo exposure to 10 ppm emulsified crude oil on enzyme activity in the shrimp Penaeus sp. were investigated. An American and a Saudi Arabian crude oil were used for comparison, and the latter was found to significantly change enzyme levels in the shrimp, whereas the former caused little if any changes in activity.

C-0766-77
THE FIVE-YEAR RECRUITMENT OF MARINE LIFE AFTER THE 1971 SAN FRANCISCO OIL SPILL
Chan, G. L. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 543-545. (American Petroleum Institute No. 4284)

Oil spills, Biological effects, Restoration, Marine organisms, San Francisco Bay

Five-year observations of marine live recruitment following the spill indicate that population densities of some marine species have significantly increased in the San Francisco Bay area intertidal zones at Sausalito and Duxbury Reef. No evidence has been found of lasting detrimental effects of Bunker C oil on the marine populations within the transect sites.

C-0767-77
OIL POLLUTION AND TROPICAL LITTORAL COMMUNITIES: BIOLOGICAL EFFECTS OF THE 1975 FLORIDA KEYS OIL SPILL
Chan, E. I. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 539-542. (American Petroleum Institute No. 4284)

Oil spills, Biological effects, Tropical regions, Marine organisms, Intertidal zone, Marshes, Coral reefs, Florida coast

This study reports biological effects of the 1975 oil spill in the Florida keys for a one-year period. The effects are discussed by habitat, beginning with the rocky intertidal zone, in which the short-term effects were greatest, and followed by mangrove fringe, grass flats, sandy intertidal, mangrove swamp-Batis marsh, and the coral reef community.

C-0768-77
THE BIOLOGICAL CONSEQUENCES OF OIL POLLUTION
Clark, R. C., Jr. 1974.
Oil on Northern Puget Sound. W. H. Gray and J. Everitt (eds.). Pullman, Washington, Washington State University, 1974. Proceedings of a Seminar, Mount Vernon, Washington.

Contamination, Biological effects, Puget Sound

Summary not available.

[from Northwest Fisheries Center Monthly Report. February, 1975]

C-0769-77
THE EFFECTS OF PETROLEUM REFINERY LIQUID WASTES ON AQUATIC LIFE, WITH SPECIAL EMPHASIS ON THE CANADIAN ENVIRONMENT
Côté, R. P. 1976.
Ottawa, National Research Council of Canada, Associate Committee on Scientific Criteria for Environmental Quality, 1976. 77p.

Wastewaters, Refineries, Toxicity, Fish, *Aquatic life, Canada

In Canada, there are specific petroleum refineries whose effluents are highly toxic to fish; however, the majority of refinery effluents tend to be moderately or not acutely lethal. In many cases, petroleum refineries do not contribute large volumes of waste waters to the environment, and there is a continuing trend towards a reduction in effluent volume.

[from Marine Pollution Bulletin 7(12):240. 1976]

C-0770-77
THE EFFECTS OF PETROLEUM HYDROCARBONS ON AQUATIC BIRDS
Dieter, M. P. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 437-446. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Hydrocarbons, Birds, Chemical analysis, Biological effects, Metabolism, Food web, *Eggs

Confirmation and characterization of petroleum hydrocarbons present in eggs and avian tissues are being conducted by gas chromatography/mass spectrometry techniques. Ongoing and planned research projects are outlined which measure the biological effects and toxicity of petroleum hydrocarbons to incubating eggs and adult birds (mallard ducks). Food chain studies with invertebrates and mallards are also being conducted to assess possible effects of indirect petroleum pollution on aquatic birds.

C-0771-77
DISTRIBUTION OF NAPHTHALENES WITHIN EXPOSED FUNDULUS SIMILUS AND CORRELATIONS WITH STRESS BEHAVIOR
Dixit, D., and J. W. Anderson. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 633-636. (American Petroleum Institute No. 4284)

Fish, *Naphthalenes, Distribution, Uptake, Release, *Stress behavior, *Fundulus similus

The fish Fundulus similus was exposed to doses of naphthalenes and the distribution of these compounds within the organs and tissues was monitored with time. Uptake and release was relatively rapid; accumulation and retention of naphthalenes in the brain were higher than anticipated. Stress-produced behavioral abnormalities in this fish may correspond to the content of naphthalenes in the brain and other parts of the nervous system.

C-0772-77
TOMANO OIL SPILL IN CASCO BAY: ENVIRONMENTAL EFFECTS AND CLEANUP OPERATIONS
Environmental Protection Agency. 1975.
Washington, D.C., Environmental Protection Agency, 1975. Division of Oil and Special Materials Control, EPA/430/9-75/018. 284p.

Oil spills, Environmental effects, Contamination, Marine organisms, Sediments, Containment, Cleanup, Maine, *Tomano oil spill

The effects of No. 6 oil on marine communities of Casco Bay, Maine, were determined and the effectiveness of containment and cleanup

operations was assessed. Sediments and biota from intertidal areas were analyzed for No. 6 oil by gas chromatography; contamination to some degree was found at all stations.

[from Government Reports Announcements 76(26):#PB-257 950/6GA. 1976]

C-0773-77
THE SEDIMENT ENVIRONMENT OF PORT VALDEZ, ALASKA: THE EFFECT OF OIL ON THIS ECOSYSTEM
Feder, H. M., L. M. Cheek, P. Flanagan, S. C. Jewett, M. H. Johnston, A. S. Naidu, S. A. Norrell, A. J. Paul, A. Scarborough, and D. Shaw. 1976.
Final report, EPA/600/3-76-086; Contract R800944-02-0. 348p.

Crude oil, Biological effects, Sediments, Marine organisms, Ecosystems, Alaska

In the title investigation, physical, geological, geochemical, hydrocarbon, and biological features were examined. Bacterial populations were unaffected by single applications of up to 2000 ppm of Prudhoe Bay crude oil or chronic exposures. Three species of copepods exposed to oil in the field significantly increased in density in experimentally oiled plots. In studies of oil uptake and release in intertidal sediments and in the clam, Macoma balthica, petroleum was not detectable two months after application to sediments. A significant increase in mortality was noted for M. balthica exposed to oil. It is suggested that this widely distributed clam may be a valuable indicator for oil.

C-0774-77
UPTAKE AND RETENTION OF KUWAIT CRUDE OIL AND ITS EFFECTS ON OXYGEN UPTAKE BY THE SOFT-SHELL CLAM, MYA ARENARIA
Fong, W. C. 1976.
Journal of the Fisheries Research Board of Canada 33(12):2774-2780.

Crude oil, Metabolism, Mollusks, *Clams, *Mya arenaria

The gills of Mya arenaria are capable of removing finely dispersed oil globules from sea water and accumulating the oil in their tissues. This incorporation is directly related to the lipid content of the tissues. Respiration rates significantly increased in small clams after three weeks exposure to oily sea water.

C-0775-77
THE EFFECT OF CRUDE OIL ON LARVAE OF LOBSTER HOMARUS AMERICANUS
Forns, J. M. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 569-573. (American Petroleum Institute No. 4284)

Crude oil, Biological effects, Crustaceans, *Lobster, *Homarus americanus

Lobsters were exposed to South Louisiana crude oil in flow through systems at concentrations of 0.1 ppm and 1.0 ppm. The study demonstrates reduced survival of developing larval lobsters in the presence of 1.0 ppm unweathered crude oil in seawater. Another less direct effect of oil exposure is the increased vulnerability of affected larvae to predation due to resulting changes in coloration.

C-0776-77
PHYSICAL AND BIOLOGICAL EFFECTS OF EXPERIMENTAL CRUDE OIL SPILLS ON LOW ARCTIC TUNDRA IN THE VICINITY OF TUKTOYAKTUK, N.W.T., CANADA
Freedman, W., and T. C. Hutchinson. 1976.
Canadian Journal of Botany 54(19):2219-2230.

Crude oil, Vegetation, Biological effects, Oil spills, Arctic, Canada

Spills of fresh, unweathered crude oil resulted in rapid damage to, and subsequent death of all aboveground foliage coming in contact with the oil. Most species were defoliated; mosses and lichens were especially susceptible and killed. Within several weeks of the summer oil spills, a limited number of vascular plant species began to develop regrowth shoots. Summer spills were markedly more damaging than equivalent spills released in winter.

C-0777-77
CONSERVATION OF THE JACKASS PENGUIN (SPHENICUS DEMERSUS(L.))
Frost, P. G. H., W. R. Siegfried, and J. Cooper. 1976.
Biological Conservation 9:79-98.

Conservation, Birds, Restoration, South Africa, *Jackass penguin

The population of the jackass penguin, which is confined to the coastal waters of southern Africa, has declined in numbers of unknown magnitude since the early 1900's. This review relates current research and conservation efforts to several factors, including oil pollution, which are believed to affect the population status of the species.

C-0778-77
THE UPTAKE OF NAPHTHALENES BY THE CLAM RANGIA CUNEATA IN THE VICINITY OF AN OIL SEPARATOR PLATFORM IN TRINITY BAY, TEXAS
Fucik, K. W., H. W. Armstrong, and J. M. Neff. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 637-640. (American Petroleum Institute No. 4284)

Hydrocarbons, Mollusks, Uptake, Release, Platforms, Sediments, Texas, *Trinity Bay, *Naphthalenes, *Clam, *Rangia cuneata

In the title study, clams were sampled from under and near an oil separation platform. Clams under the platform showed the greatest uptake and accumulation of naphthalenes; those from 150 to 1000 m from the platform showed little to no signs of uptake. Under laboratory conditions, depuration of most of the accumulated naphthalenes was achieved by the majority of clams within 47 days. High levels of weathered hydrocarbons believed to come from suspended sediments in Trinity Bay were found to be accumulated by the clams.

C-0779-77
BEHAVIOR AND PATHOPHYSIOLOGY OF SEALS EXPOSED TO CRUDE OIL
Geraci, J. R., and T. G. Smith. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 447-462. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Crude oil, Marine mammals, Biological effects, Metabolism, *Seals

Ringed seals, Phoca hispida, and harp seals, Phoca groenlandica, were experimentally exposed to light crude oil and the biological effects were monitored. Healthy seals survived twenty-four hour exposures with reversible damage to the eyes; stressed seals died within two hours after exposure. Ingestion of quantities of oil considered reasonable during an oil spill did not cause irreversible damage. Evidence is presented which shows that the ultimate damage from a spill depends on the season, productivity of the area, and variable health status of a seal population.

C-0780-77
FIELD STUDIES ON THE PHYTOTOXICITY OF CRUDE OIL TO SUBARCTIC AQUATIC VEGETATION
Hanna, B. M., J. A. Hellebust, and T. C. Hutchinson. 1975. Verhandlungen, Internationale Vereinigung fuer Theoretische und Angewandte Limnologie 19(3):2165-2171.

Crude oil, Toxicity, Algae, Vegetation, Lakes, Subarctic regions

The effects of crude oil on a vegetative subarctic aquatic community were determined in field experiments. Algae showed a reduction in productivity greater than that of moss after introduction of crude oil. Surface contamination of oil resulted in significant reductions of chlorophyll a and b concentrations in sedge and horsetails.

[from Selected Water Resources Abstracts 9(21):#W76-11405. 1976]

C-0781-77
EFFECTS OF THE CHESAPEAKE BAY OIL SPILL ON SALT MARSHES OF THE LOWER BAY
Hershner, C., and K. Moore. 1977. 1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 529-533. (American Petroleum Institute No. 4284)

Oil spills, Biological effects, Marshes, Marine organisms, Mollusks, Chesapeake Bay, *Marsh grass

A study was conducted to determine the biological impacts of the February, 1976, Chesapeake Bay oil spill on the marshes of the eastern shore of the Bay. Populations of intertidal mussels, Modiolus demissus, and oysters, Crassostrea virginica, showed no significant short-term effects. The population of the snail, Littorina irrorata, was significantly reduced but appears to be recovering. The marsh grass, Spartina alterniflora, showed increased net productivity, increased density, decreased mean height, and increased flowering success.

C-0782-77
OIL SPILL EFFECTS ON VEGETATION AND SOIL MICROFAUNA AT NORMAN WELLS AND TUKTOYAKTUK, N.W.T.
Hutchinson, T. C., J. Hellebust, and M. Telford. 1974. Environmental Social Committee, Northern Pipelines, Task Force on Northern Oil Development, Report No. 74-14. 111p.

Oil spills, Biological effects, Vegetation, Microorganisms, Soil, Canada

Using experimental crude oil spills on the terrestrial vegetation, effects of spilled oil, different seasons and burned/unburned nature of the sites were examined. Reduction in species diversity, vegetation cover and frequency were monitored. Bryophytes suffered most, but most species were killed or defoliated. The spills severely depleted numbers of soil arthropods even at low concentrations. Little effect was observed on growth and composition of phytoplankton or zooplankton; however, periphyton algae and emergent vegetation were strongly inhibited.

[from Ecological Abstracts 1976(3):#76L/2067. 1976]

C-0783-77
A CONTINUOUS FLOW BIOASSAY SYSTEM FOR THE EXPOSURE OF MARINE ORGANISMS TO OIL
Hyland, J. L., P. F. Rogerson, and G. R. Gardner. 1977. 1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 547-550. (American Petroleum Institute No. 4284)

Marine organisms, Contamination, Acute effects, Chronic effects, Design and engineering, *Continuous flow bioassay system

This report describes the design and operation of a continuous flow-through bioassay system for exposing marine test organisms and their life stages to oil. Short-term lethal and chronic sublethal bioassays were conducted in the system and are summarized. Biological effects observed have ranged from lethal toxicity at oil concentrations of about 10 ppm to sublethal behavioral modifications at about 10 ppb.

C-0784-77
PETROLEUM HYDROCARBONS AND THEIR EFFECTS ON MARINE ORGANISMS, POPULATIONS, COMMUNITIES AND ECOSYSTEMS
Hyland, J. L., and E. D. Schneider. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 463-506. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Crude oil, Hydrocarbons, Toxicity, Petroleum products, Marine organisms, Ecosystems

A review of 114 bioassay and other studies conducted on a wide variety of marine organisms indicates lethal effects of soluble aromatic petroleum hydrocarbons in the 1 to 100 ppm range for adult stages, and typically 0.1 to 1 ppm for the more sensitive larval and juvenile stages. Certain ecologically or commercially important species are adversely impacted in the very low part per billion range. Large differences in sensitivity of various populations and communities of organisms to hydrocarbon contamination are pointed out, and areas in need of further study are identified. Strict controls are suggested for oil-related activities in certain shallow, highly productive continental shelf regions, wetlands and estuaries.

C-0785-77
INFILTRATION OF PETROLEUM PRODUCTS INTO WATER AND THEIR EFFECT ON THE HYDROCHEMICAL REGIME AND PHYTOPLANKTON COMMUNITY [in Russian]
Juknevicius, L., K. Jankevicius. 1975.
Osnovy Bioproduktivnosti Vnutrennikh Vodoemov Pribaltiki, Materialy Nauchnoi Konferentsii po Izucheniyu Vnutrennikh Vodoemon Pribaltiki, 18th, 1975. p. 454-457.

Fuels, Petroleum products, Toxicity, Phytoplankton

The effects of diesel fuel, oil, and gas on Cyanophyta, Chrysophyta, Chlorophyta, and Xanthophyta were determined. In the absence of other toxicants, the health of the phytoplankton community can be used to determine the concentration of hydrocarbons in water.

[from Chemical Abstracts 85(26):#197849t. 1976]

C-0786-77
MICROBIAL RESPONSES AFTER TWO EXPERIMENTAL OIL SPILLS IN AN EASTERN COASTAL PLAIN ESTUARINE ECOSYSTEM
Kator, H., and R. Herwig. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 517-522. (American Petroleum Institute No. 4284)

Oil spills, Estuaries, Distribution, Microorganisms, Bacteria

Large volumes of unweathered and weathered crude oil were introduced into a Spartina salt marsh enclosed by transite structures allowing tidal exchange in order to evaluate the effects of crude oil spillage on microbial populations. Within several days after the spill, the levels of petroleum-degrading bacteria rose by several orders of magnitude for a period of one year. Mean levels of chitinolytic, cellulytic, heterotrophic bacteria and fungi were not statistically different in the oil and control enclosures.

C-0787-77
STUDIES ON THE SUSCEPTIBILITY OF ANKISTRODESMUS SPECIES TO CRUDE OIL COMPONENTS
Kauss, P. B., and T. C. Hutchinson. 1975.
Verhandlungen, Internationale Vereinigung fuer Theoretische und Angewandte Limnologie 19(3):2155-2164.

Crude oil, Biological effects, Algae, *Ankistrodesmus

The response of Ankistrodesmus species to crude oil water soluble compounds was tested under laboratory conditions and the results of growth bioassays were reported.

[from Applied Ecology Abstracts 2(11):#2D9871. 1976]

C-0788-77
EFFECTS OF BENZENE ON GROWTH, FAT CONTENT, AND CALORIC CONTENT OF STRIPED BASS MORONE SAXATILIS
Korn, S., J. W. Struhsaker, and P. Benville, Jr. 1976.
Fishery Bulletin 74(3):694-698.

Biological effects, Aromatic hydrocarbons, Fishes, *Morone saxatilis, *Benzene

Exposure of juvenile bass to increasing amounts of benzene resulted in wet weight, dry weight and fat content losses. The inhibitory effect of benzene on growth and fat content may have resulted from impaired food localization. Dry weights of the fish appeared to increase after 4 weeks of exposure, suggesting some acclimatization.

[from Chemical Abstracts 85(23):#172 405g. 1976]

C-0789-77
PETROLEUM SULFUR CONTAINING COMPOUNDS AND AROMATIC HYDROCARBONS IN THE MARINE MOLLUSKS MODIOLUS DEMISSUS AND CRASSOSTREA VIRGINICA
Lake, J. L., and C. Hershner. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 627-632. (American Petroleum Institute No. 4284)

Aromatic hydrocarbons, Mollusks, Uptake, Release,*Modiolus demissus, *Crassostrea virginica, *Petro-sulfur compounds

The title organisms were oiled in situ with No. 2 fuel oil, and their retention and release of hydrocarbons and petro-sulfur compounds were observed for a recovery period of four months. Most petroleum compounds were released within 15 weeks. Both mollusks showed an initial enrichment of aromatics relative to saturated hydrocarbons, followed by a more rapid release of aromatics. Mussels selectively retained some aromatics, oysters nonselectively depurated the aromatics. The higher molecular weight petro-sulfur compounds were retained for the longest time periods, and depuration rates for these compounds were similar to those of the aromatic hydrocarbons.

C-0790-77
THE TOXICITY OF A SIMULATED REFINERY EFFLUENT TO SOME FRESH WATER ANIMALS
Lee, D. R., A. L. Buikema, Jr., and J. Cairns, Jr. 1975.
Association of Southeastern Biologists 22(2):63. Abstract .

Wastewaters, Refineries, Toxicity, Freshwater, Fish, Invertebrates, *Lethal concentration

The relative sensitivity of 3 species of fish and 15 species of invertebrates was tested using various concentrations of simulated refinery effluent. After 24 hours the lethal concentration for 50 percent of the exposed organisms ranged from 0.10 for Daphnia pulex to 9.2 for Physa sp. The usefulness of these animals in testing the toxicity of refinery effluents was assessed.

C-0791-77
CHRONIC EFFECT OF SMALL CONCENTRATIONS OF HYDROCARBONS ON SOME NONSPECIFIC INDEXES OF THE IMMUNOLOGICAL RESPONSE OF ANIMALS [in Russian]
Mamedov, A. M. 1975.
Materialy Nauchnoi Konferentsii Azgosmedinstituta, 1974 (pub. 1975). p. 176-178.

Hydrocarbons, Contamination, Animals, Chronic effects, *Immunological response

The effects of constant and intermittent exposure of rabbits and guinea pigs to about 1 µg/l of petroleum hydrocarbons were studied. The exposure resulted in changes which indicated a mobilization of compensatory reactions to hydrocarbon poisoning and inhibition of immunological response.

[from Chemical Abstracts 86(5):#26666x. 1977]

C-0792-77
THE EFFECT OF OIL ON SEEDLINGS OF THE PIONEER MANGROVE, AVICENNIA INTERMEDIA IN MALAYSIA
Mathias, J. A. [1976?]
International Symposium on the Ecology and Management of Some Tropical Shallow Water Communities, 1976? p. 13. Abstract.

Fuel oil, Biological effects, Plants, Tropical regions, Malaysia, *Pioneer mangrove, *Avicennia intermedia

Plants 15 cm in height and grown in plastic containers in a plant house were subjected to a simulated oil spill. Four concentrations of diesel oil in water were used in experiments continuing for 6 to 12 days. Differences between the 6-day and 12-day treatments were not substantial. Seedlings were killed at concentrations of $\geq$ 10,000 ppm. Normal growth was altered qualitatively or quantitatively below that concentration. The validity of field extrapolation is discussed.

[from Pollution Abstracts 8(1):#77-00435. 1977]

C-0793-77
THE EFFECTS OF PELAGIC HYDROCARBONS ON THE ROCKY INTERTIDAL FLORA AND FAUNA OF BERMUDA
Maynard, N. G., C. D. Gebelein, and A. Zsolnay. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 499-503. (American Petroleum Institute No. 4284)

Tar, Intertidal zone, Marine organisms, Biological effects, Hydrocarbons, Bermuda

Tar is deposited almost exclusively in the splash zone with the maximum amount accumulating on gently sloping or flat shores. Analyses show that the snails, Nodilittorina tuberculatus and Tectarius muricatus, which live in the splash zone, have the highest content of hydrocarbons of all animals examined. Animals sampled from adjacent tide pool areas contained no petrogenic hydrocarbons. The presence of tar on the rocks does not appear to adversely affect reproductive potential, size frequency or abundance of animals in the intertidal region below the splash zone.

C-0794-77
THE IMPACT OF OIL ON MARINE LIFE: A SUMMARY OF FIELD STUDIES
Mertens, E. W. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 507-514. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Offshore drilling, Offshore production, Chronic effects, Crude oil, Platforms, Marine organisms

The conclusions of sixteen field studies on the effects of chronic low-level exposure of marine life to oil-related activity are presented. The studies were conducted at Santa Barbara, Lake Maracaibo, Venezuela, Bermuda, and offshore Louisiana. "No measurable effects have been observed on such indicators of the health of the local marine communities as population levels of various organisms; species diversity; and size, growth rate, or reproducibility of various organisms. Moreover, there is no evidence of adverse effects such as abnormal growths and biomagnification of petroleum fractions in the food chain."

C-0795-77
EFFECTS OF WATER POLLUTED BY OIL ON AQUATIC ANIMALS: II. N-PARAFFINS, AROMATIC HYDROCARBONS AND CRUDE OIL CONCENTRATION ON TAINT IN SCALLOP (PECTEN YESSOENSIS)
Motohiro, T., and Z. Iseya. 1976.
Hokkaido Daigaku, Sapporo, Japan. Suisangakubu, Hakodate.
Hokkaido Daigaku, Suisangakubu Kenkyu Iho 26(4):267-371.

Biological effects, Hydrocarbons, Contamination, Mollusks, *Scallops, *Pecten yessoensis

"Taints in scallop adductor muscle were examined organoleptically to assess threshold concentrations of n-paraffins, aromatic hydrocarbons, and crude oil." Neither n-tetradecane nor n-hexadecane was found to cause the taint at 0.3 mg/g. Crude oil, xylene, toluene, and mixtures of hydrocarbons caused taints at 0.1-0.2 mg/g.

[from Pollution Abstracts 8(1):#77-00275. 1977]

C-0796-77
ON THE TOXIC EFFECT OF MINERAL OIL AND PETROLEUM ON THE SELF-PURIFICATION PROCESS IN WATERS [in German]
Müller, D., and H. Hellmann. 1976.
Gas Wasserfach, Wasser, Abwasser 117(8):369-373.

Toxicity, Petroleum products, Hydrocarbons

The disturbance of biological self-purification processes in water by oil products and their soluble fractions was studied. Effects vary according to chemical composition and time of contact. The effects on specific organisms were experimentally determined and compared with the literature.

[from Industrial Wastes Information Bulletin 7(5):#HMS 7778. 1976]

C-0797-77
EFFECTS OF THE MARCH 18, 1973 OIL SPILL NEAR CABO ROJO, PUERTO RICO ON TROPICAL MARINE COMMUNITIES
Nadeau, R. J., and E. T. Bergquist. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 535-538. (American Petroleum Institute No. 4284)

Oil spills, Biological effects, Contamination, Marine organisms, Tropical regions, Coasts, Puerto Rico, *Mangroves, *Turtle grass

The biological impact on coastal communities of the 1973 oil spill of the Greek tanker, "Zoe Colocotronic" into southern Puerto Rico waters is documented. Extensive contamination of the mangroves, beach shoreline, and sublittoral Thalassia beds was found. Analysis of sediments in this area indicates that significant levels of petroleum hydrocarbon residues were present as of January, 1976.

C-0798-77
EFFECTS OF PETROLEUM ON SURVIVAL, RESPIRATION AND GROWTH OF MARINE ANIMALS
Neff, J. M., J. W. Anderson , B. A. Cox, R. B. Laughlin, Jr., S. S. Rossi, and H. E. Tatem. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 516-539. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Toxicity, Petroleum products, Aromatic hydrocarbons, Marine organisms, *Sublethal effects, *Respiration, *Growth

Tremendous variations in the toxicity of petroleum products to marine organisms are noted; the generally greater toxicity of refined products correlates directly with their contents of aromatic hydrocarbons, especially phenanthrenes. Significant variations in the sensitivity of marine organisms are pointed out: oceanic species are usually more sensitive than estuarine and benthic species, and larvae and juveniles of a species are often more sensitive than adults. Variable sublethal effects of oil on respiration and growth of different organisms are compared; in most cases, adverse effects are reversible when the animal is returned to clean water.

C-0799-77
ACCUMULATION AND RELEASE OF PETROLEUM-DERIVED AROMATIC HYDROCARBONS BY FOUR SPECIES OF MARINE ANIMALS
Neff, J. M., B. A. Cox, D. Dixit, and J. W. Anderson. 1976.
Marine Biology 38(3):279-289.

Aromatic hydrocarbons, Seawater, Marine organisms, Uptake, Release

Marine animals exposed to oil-contaminated seawater accumulate and retain the aromatic hydrocarbons to a greater extent than the alkanes. Accumulation of aromatic hydrocarbons appears to be a passive process dependent on a partitioning of the hydrocarbons between the exposure water and the tissue lipids.

C-0800-77
EFFECT OF DIESEL OIL ON STREAM LIFE
Patterson, R. R. 1976.
Final report, Statewide Fisheries Investigations. Federal Aid Project F-22-R-17. Job No. B-2. 14p.

Oil spills, Fuel oil, Biological effects, Restoration, Streams, Invertebrates, Fish, New Mexico

Results of three years of sampling the Cimarron River after an oil spill decimated invertebrate and brown trout, Salmo trutta, populations in 19.3 km (12 miles) of river indicated that invertebrate populations had essentially recovered to prespill levels in one year. The brown trout population increased to about 54% of prespill number in three years.

C-0801-77
METABOLISM OF BENZO(A)PYRENE AND OTHER XENOBIOTICS BY MICROSOMAL MIXED FUNCTION OXIDASES IN MARINE SPECIES
Philpot, R. M., M. O. James, and J. R. Bend. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Insitute of Biological Sciences, 1976. p. 184-199. Proceedings of the Symposium, American University, Washington, D.C., 1976.

Hydrocarbons, PAH, Metabolism, Marine organisms, *Benzo(a)pyrene, *Microsomal mixed-function oxidases

Marine organisms are exposed to a wide variety of hydrocarbons introduced into the marine environment by natural and manmade sources. Many marine animals are able to metabolize petroleum hydrocarbons, especially polycyclic aromatic hydrocarbons, into excretable or activated products. This paper discusses the results of studies on the activity, inducibility, and tissue distribution of microsomal mixed-function oxidase activity of selected- marine species using benzo(a)pyrene and other substrates.

C-0802-77
INTERACTIONS BETWEEN THE DEPOSIT FEEDING POLYCHAETE ARENICOLA MARINA AND OILED SEDIMENT
Prouse, N. J., and D. C. Gordon, Jr. 1976.
Sources, Effects, & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 407-422. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Contamination, Sediments, Fuel oil, Biological effects, Polychaetes, Metabolism, *Feeding activity, *Arenicola marina

Concentrations of oil in water and sediment can force the worm Arenicola marina to surface or stop feeding activity. Lower

concentrations reduce the rate of cast production and apparently feeding. The bioturbation and ingestion of oil by the worm can be an important factor in the weathering of oil in sediments, especially those of the lower intertidal zone.

C-0803-77
TOXICITY OF COOK INLET CRUDE OIL AND NO. 2 FUEL OIL TO SEVERAL ALASKAN MARINE FISHES AND INVERTEBRATES
Rice S. D., J. W. Short, and J. F. Karinen. 1976.
Sources, Effects, & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 394-406. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Crude oil, Fuel oil, Toxicity, Marine organisms, Alaska, Fish, Invertebrates, Intertidal zone

Median tolerance levels of 27 different marine Alaskan invertebrate and vertebrate species to water soluble fractions of crude oil and No. 2 fuel oil were determined using a 96-hour static bioassay method. The two oils were equally toxic, fish were consistently among the most sensitive species, and intertidal invertebrates were consistently among the most resistant species. Alaskan marine species appear to be slightly more sensitive than those of temperate regions; this difference in sensitivity may be due to the greater persistence of toxic hydrocarbons at the lower temperatures.

C-0804-77
BIOAVAILABILITY OF PETROLEUM HYDROCARBONS FROM WATER, SEDIMENTS, AND DETRITUS TO THE MARINE ANNELID, NEANTHES ARENACEODENTATA
Rossi, S. S. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 621-626. (American Petroleum Institute No. 4284)

Hydrocarbons, Uptake, Metabolism, Release, Polychaetes, Sediments, Seawater, *Neanthes arenaceodentata

Seawater solutions and sediments artificially contaminated with radio-labeled naphthalenes and No. 2 fuel oil water-soluble fractions were used to examine the uptake, retention, metabolism and depuration of diaromatic hydrocarbons by polychaete worms. This paper summarizes the analytical procedures and discusses the results. The worms rapidly accumulated, metabolized, and slowly released hydrocarbons in solution. However, petroleum hydrocarbons adsorbed to sediment particles or particulate organic matter were found to be less available to the worms for accumulation.

C-0805-77
INTERACTIONS BETWEEN PETROLEUM HYDROCARBONS AND THE POLYCHAETOUS ANNELID, NEANTHES ARENACEODENTATA: EFFECTS ON GROWTH AND REPRODUCTION; FATE OF DIAROMATIC HYDROCARBONS ACCUMULATED FROM SOLUTION OR SEDIMENTS
Rossi, S. S. 1976.
Ph.D. dissertation, Texas A&M University. 106p.

Hydrocarbons, Fuel oil, Polychaetes, Biological effects, Uptake, Metabolism, *Neanthes arenaceodentata

The effects of water soluble fractions (WSFs) from No. 2 fuel oil on growth and reproduction of Neanthes arenaceodentata were studied. Uptake, retention, and metabolism of diaromatic hydrocarbons by this polychaete were examined.

[from Dissertation Abstracts International B 37(3):1142B-1143B. 1976]

C-0806-77
FLOW-THROUGH SYSTEM FOR CHRONIC EXPOSURE OF AQUATIC ORGANISMS TO SEAWATER-SOLUBLE HYDROCARBONS FROM CRUDE OIL: CONSTRUCTION AND APPLICATIONS
Roubal, W. T., D. H. Bovee, T. K. Collier, and S. I. Stranahan. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 551-555. (American Petroleum Institute No. 4284)

Marine organisms, Hydrocarbons, Crude oil, Chronic effects, Fish, Design and engineering, *Flow-through system

A flow-through system for use with crude oil has been devised which can be easily maintained and adjusted and can be used when large amounts of oil residues accumulate in the equipment. The system was tested by exposing young coho salmon (O. kisutch) to the water-soluble fraction of crude oil in seawater at 10°C for five weeks. Analyses of muscle tissue revealed that such hydrocarbons are readily sequestered in the fish tissue.

C-0807-77
A PRELIMINARY STUDY OF THE TOXIC EFFECTS OF IRRADIATED VS. NON-IRRADIATED WATER SOLUBLE FRACTIONS OF #2 FUEL OIL
Scheier, A., and D. Gominger. 1976.
Bulletin of Environmental Contamination and Toxicology 16(5): 595-603.

Toxicity, Fuel oil, Marine organisms, Estuaries, Delaware, *Ultraviolet radiation

The toxic effects of the water soluble fraction of #2 fuel oil on five aquatic species were measured in the Delaware Estuary and in a laboratory using ultraviolet light. Irradiated oil exhibited more toxic properties than non-irradiated oil.

C-0808-77
RESPONSES OF THE CLAM MACOMA BALTHICA TO PRUDHOE BAY CRUDE OIL
Shaw, D. G., A. J. Paul, and E. R. Smith. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 493-494. (American Petroleum Institute No. 4284)

Crude oil, Biological effects, Mollusks, Sediments, Behavior, Chemical analysis, *Clam, *Macoma balthica

The title study was conducted under laboratory conditions designed to simulate the stranding of oil on intertidal sediments in which M. balthica resides. The relationship of dry tissue weight to shell length was not significantly altered by exposure to oil at a level which did result in significant mortalities. Findings suggest that oil-induced death in M. balthica is caused by a metabolically specific mode of poisoning rather than by a general weakening of the animal. In an experiment where animals were subjected to two separated oil events, cumulative effects were not observed in mortalities or in gas chromatographic analysis of tissues for hydrocarbons.

C-0809-77
THE EFFECTS OF AQUEOUS EXTRACTS OF CRUDE OIL AND NAPHTHALENE ON THE PHYSIOLOGY AND MORPHOLOGY OF A FRESHWATER GREEN ALGA
Soto, C., J. A. Hellebust, and T. C. Hutchinson. 1975.
Verhandlungen, Internationale Vereinigung fuer Theoretische und Angewandte Limnologie 19(3);2145-2154.

Crude oil, *Naphthalene, Toxicity, Freshwater, Algae, Metabolism, *Chlamydomonas angulosa

The effects of aqueous crude oil extracts and naphthalene on the green alga, Chlamydomonas angulosa, were investigated. Growth inhibition, photosynthetic capacity, physiological responses, and morphological changes were monitored; results showed naphthalene to be more harmful than crude oil.

[from Applied Ecology Abstracts 2(10):#2D8824. 1976]

C-0810-77
ASPECTS OF THE METABOLISM OF PETROLEUM HYDROCARBONS ON INTERMEDIARY METABOLISM AND XENOBIOTIC METABOLISM IN MARINE FISH
Stegeman, J. J., and D. J. Sabo. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 423-436. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Contamination, Hydrocarbons, Metabolism, Fishes, Biological effects

In the title study, metabolic function in tissues of fish exposed to low levels of petroleum contamination is described. Petroleum hydrocarbons resulted in altered patterns of lipid metabolism characterized by a net decline in lipogenesis in the hepatic, gill, muscle, and brain tissues. Some evidence suggests that induction of mixed-function oxidases occurs in fish environmentally contaminated by petroleum.

C-0811-77
THE SUBLETHAL EFFECTS OF NATURAL CHRONIC EXPOSURE TO PETROLEUM ON MARINE INVERTEBRATES
Straughan, D. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 563-568. (American Petroleum Institute No. 4284)

Crude oil, Natural seepage, Chronic effects, Marine organisms, Mollusks, Santa Barbara Channel

The title study was conducted over a two-year period using Coal Oil Point as the area of natural chronic exposure of petroleum, and series of other sites in Southern California as control sites. Data obtained from studies of abalone and mussels in these areas indicate that marine invertebrates can live and breed in areas of chronic exposure to petroleum higher than that recorded in oil producing areas in the Santa Barbara Channel.

C-0812-77
TEMPERATURE EFFECTS OF CRUDE OIL IN THE UPPER INTERTIDAL ZONE
Straughan, D. 1976.
Final report, EPA/600/2-76/127. 64p.

Crude oil, Biological effects, Intertidal zone, Crustaceans, *Barnacles, *Chthamalus fissus

Laboratory and field tests were conducted to determine the effects of heavy black asphaltic Santa Barbara crude oil on the intertidal barnacle, Chthamalus fissus. This type of oil acts as a black body and has had a long term influence on C. fissus distribution after the oil has developed a hard surface crust.

[from Government Reports Announcements 76(22):#PB-255 956/5GA. 1976]

C-0813-77
WHAT HAVE WE FOUND AT THE SEVENTY-FIRST PARALLEL AND WHERE DO WE GO FROM THERE
Underwood, D., and A. Callahan. 1976.
Naval Research Reviews 29(5):18-34.

Oil spills, Arctic, Plants, Animals, USN

The impact of oil spills on arctic plant and animal life is being investigated by the U.S. Navy's NARL research program. The facilities at NARL field stations and the Animal Research Facility are described.

[from Oceanic Abstracts 13(6):#76-05459. 1976]

C-0814-77
EFFECTS OF PETROLEUM ON MARINE INTERTIDAL COMMUNITIES
Vanderhorst, J. R., C. I. Gibson, L. J. Moore, and P. Wilkinson. 1975.
Pacific Northwest Laboratory Annual Report for 1974, BNWL-1950, Pt. 2. p. 110.

Crude oil, Biological effects, Marine organisms, Intertidal zone

Petroleum effects on marine intertidal communities were studied by 1) treating artificial substrates with Prudhoe Bay crude oil and determining the influence of treatment to subsequent settling and growth of marine intertidal communities in situ, 2) determining the feasibility of delivering the soluble phase of crude petroleum to laboratory held communities; and 3) exposing coonstripe shrimp (Pandalus danae) in acute bioassays and determining mortality and oil in water concentrations as a function of mixing.

[from A Bibliography of Environmental Research: Ecosystems Department 1952-1975. Battelle-Northwest, No. BNWL-SA-4655. p. 130]

C-0815-77
EFFECTS OF A CONTINUOUS LOW-LEVEL NO. 2 FUEL DISPERSION ON LABORATORY-HELD INTERTIDAL COLONIES
Vanderhorst, J. R., R. M. Bean, L. J. Moore, P. Wilkinson, C. I. Gibson, and J. W. Blaylock. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 557-561. (American Petroleum Institute No. 4284)

Fuel oil, Dispersions, Marine organisms, Intertidal zone, Biological effects, Chemical analysis, *Species diversity

In the title study, initial colonies of approximately 83 species of marine intertidal plants and animals were continuously exposed for six months to 0.1 and 0.6 mg/l of No. 2 fuel oil dispersions. Hydrocarbon monitoring and analyses were performed by IR analysis of CCl_4 extracts, supplemented by standard gas chromatography and mass spectrometry methods. Species diversity and total number of species were significantly lower in treated colonies; relative abundance was not significantly affected. Hydrocarbon compositions remained similar to the parent oil and selective enrichment of aromatic hydrocarbons was not observed.

C-0816-77
OIL SPILLS: RISKS AND RELEVANCE (letter to the editor)
Williams, L. G. 1977.
Science 195(4279):636.

Oil spills, Tankers, Toxicity, Marine organisms, *Nannoplankters

This letter takes issue with a recent editorial article [Science 195(4274):137] entitled "Oil Spills" in which the editor concludes that catastrophe from oil spills has little basis in fact. The writer has studied the effects of World War II-related oil spills and recent offshore activity to nannoplankters and finds that not only the oil, but lipid-soluble metals released by weathering oil are toxic to such organisms.

C-0817-77
PHYSIOLOGICAL EFFECTS OF CRUDE OIL EXPOSURE IN THE STRIPED MULLET, MUGIL CEPHALUS
Yarbrough, J. D., J. R. Heitz, and J. E. Chambers. 1976.
Life Sciences 19(5):755-760.

Crude oil, Biological effects, Fish, Metabolism, Estuaries, *Mullet

Juvenile mullet were exposed to Empire Mix crude oil for a three week period in a simulated estuarine ecosystem. Compared to control mullet, the oil exposure increased the liver weight to body weight ratio, elevated the alkaline phosphatase activity in the gills and muscles, and elevated the B-glucuronidase and the malic dehydrogenase levels in muscles. The latter effect indicates changes in aerobic

metabolism in response to the stress of crude oil exposure on experimental mullet.

2. ECONOMIC EFFECTS

C-0818-77
SHELL SAYS "SOCIETY MUST PAY"
Anon. 1977.
Marine Pollution Bulletin 8(1):4-5.

Oil spills, Economic effects, Toxicity, Pollution control, *Shell Oil Co.

Shell's stand on pollution control costs is presented and current research on the toxicity, control, and dispersal of oil spills is discussed.

C-0819-77
CHEMICAL CARCINOGENS IN THE MARINE ENVIRONMENT. I. BENZO(a)PYRENE IN ECONOMICALLY-IMPORTANT BIVALVE MOLLUSCS FROM OREGON ESTUARIES
Mix, M. C., R. T. Riley, K. I. King, S. R. Trenholm, and R. L. Schaffer, 1977.
Symposium on Fate and Effects of Petroleum Hydrocarbons in Marine Ecosystems and Organisms, Seattle, 1976.

PAH, Carcinogens, Mollusks, Estuaries, Oregon, Economic effects, *Benzo(a)pyrene

Benzo(a)pyrene (BAP) levels were determined in economically-important indigenous shellfish populations from several sites in five Oregon bays. Detectable levels of BAP were present in bivalves from 43 of the 44 sampling sites. High levels (> 15 ng/g) were present in mussels collected from the Newport bayfront in Yaquima Bay and from a marina in Tillamook Bay. Significant levels (> 5 ng/g) were present in Mya arenaria collected along the shipping docks in Coos Bay.

C-0820-77
ESTIMATES OF SOCIO-ECONOMIC DAMAGES OF AN OIL SPILL
Rosenblum, I., and A. Jernelov. 1975.
IVL (Institutet for Vatten-och Luftvardsforskning)
Publication No. B 264. 23 p.

Oil spills, Social effects, Economic effects, Fisheries, Caribbean Sea, *Guatemala

The impact of an oil spill in the Caribbean Sea off the Guatemala coast in April, 1975, was evaluated as to the duration of its effects and the economic losses involved. The bulk of the damage consisted of financial losses to 43% of the population in the communities due to the interruption of fishing activities for an average of 15 days and reduced catch for 75 days after the spill occurrence.

[from Selected Water Resources Abstracts 9(24): #W76-12947. 1976]

C-0821-77
OIL SPILLS (editorial)
Abelson, P. H. 1977.
Science 195(4274):137.

Oil spills, Tankers, Toxicity, Fate, Hydrocarbons, Argo Merchant spill

The fate and effects of the Argo Merchant oil spill are shown not to be ecologically disastrous; physical and biological processes which break down and detoxify hydrocarbons are reviewed. Biosynthetic production of hydrocarbons is reported as being equivalent to hydrocarbons contributed by petroleum sources through transportation loss and river and urban runoff.

C-0822-77
MAJOR CONTAMINANTS IN THE MARINE ENVIRONMENT [English summary]
Bernhard, M., and A. Zattera. 1975.
Ingegneria Ambientale 4(3):186-287.

Contaminants, Oceans

"A review with about 400 references."

[from Chemical Abstracts 86(2):#8463z. 1977]

C-0823-77
"SLIKTRAK" - A COMPUTER SIMULATION OF OFFSHORE OIL SPILLS, CLEANUP, EFFECTS AND ASSOCIATED COSTS
Blaikley, D. R., G. F. L. Dietzel, A. W. Glass, and P. J. vanKleef. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 45-52. (American Petroleum Institute No. 4284)

Models, Oil spills, Fate, Movement, Cleanup, Cost analysis, Statistical analysis

"SLIKTRAK", developed by Shell, applies a slick description and combat concept, developed within the E&P Forum for well blowouts in the North Sea, but applicable to other areas as well. This concept includes costs for cleanup, damages and the effect of phenomena such as evaporation and natural dispersion."

C-0824-77
IMPACT OF OIL SPILLAGE FROM WORLD WAR II TANKER SINKINGS
Campbell, B., E. Kern, and D. Horn. 1977.
Massachusetts Institute of Technology, Report MITSG 77-4. 85p.

Oil spills, Tankers, Fate, Environmental effects, Models, Wildlife, Economic effects, *World War II spills

The overall effects of spilled oil were studied through an extensive literature and archives search of data on tankers sunk along the eastern U.S. coast during World War II. Cape Hatteras, North Carolina, and its surrounding area and the Ashbury Park area of New Jersey were selected as sites for the investigation. A computer model was developed to simulate the trajectory of oil released from each ship. Effects of spills, as reported by residents of both areas, were minimal; regional wildlife and the economy survived with minimal difficulty.

C-0825-77
SOME STUDIES OF AN OIL SPILLAGE DUE TO THE JACOB MAERSK ACCIDENT
Canelas, L. D., and J. D. Calejo Monteiro. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 281-288. (American Petroleum Institute No. 4284)

Oil spills, Environmental effects, Hydrocarbons, Cleanup, Dispersants, Shorelines, Portugal

A preliminary survey to study the long-term environmental effects of the Jacob Maersk spill in Leixoes harbor is presented; hydrocarbon levels along the shoreline adjacent to the spill are given. The use of dispersants and detergents in cleanup operations is discussed and recommendations for actions during future spill incidents are given. Non-polar hydrocarbon contamination at the harbor and on the beaches was not too intense, as the first analysis was carried out a week after the spill and a large part of the oil had been burned, blown to sea, and cleaned up.

C-0826-77
MOPPING UP THE MESS (book review)
Clark, R. B. 1977.
Marine Pollution Bulletin 8(1):23.

Oil spills, Environmental effects, Biodegradation, Sources, Cleanup, Recovery, *Book review

A review is given of the book, "The Control of Oil Pollution on the Sea and Inland Waters. The Effects of Oil Spills on the Marine Environment and Methods of Dealing with Them". Sections include: biodegradation, environmental effects of oil and chemical agents, sources of oil pollution, booms, skimmers, dispersants, and absorbents.

C-0827-77
AN OVERVIEW OF THE ISSUES RELATED TO THE IMPACT OF OIL ON NORTHERN PUGET SOUND
Clark, R. 1974.
Oil on Northern Puget Sound. W. H. Gray and J. Everitt (eds.). Pullman, Washington, Washington State University, 1974. Proceedings of a Seminar, Mount Vernon, Washington.

Contamination, Environmental effects, Puget Sound

Summary not available.

[from Northwest Fisheries Center Monthly Report. February, 1975]

C-0828-77
THE ARGO MERCHANT OIL SPILL (letter to editor)
Farrington, J. W., H. L. Sanders, J. M. Teal, and J. F. Grassle. 1977.
Science 195(4282):932.

Oil spills, Tankers, Argo Merchant spill, Hydrocarbons, Fate, Toxicity

This letter takes issue with a recent editorial article [Science 195(4274):137] entitled, "Oil Spills". The writers state that the editorial incorrectly compares annual biosynthesis of hydrocarbons with annual inputs into oceans from petroleum hydrocarbons and does not point out the important differences in composition and toxicity between these two categories. The rapidity of evaporation of low-molecular weight hydrocarbons after a spill is questioned, and the sinking of tar balls by various means as a method of removing oil from the ocean surface is criticized because it merely incorporates toxic hydrocarbons in the benthic ecosystem.

C-0829-77
APPLIED ECOLOGY: A NONTECHNICAL APPROACH
Hinckley, A. D. 1976.
New York, Macmillan Publishing Company, 1976. 342p.

Contamination, Environmental effects, Development, Coasts, Legislation, *Ecology

Among the topics covered in this book are history and scope of ecology, impact of man and his technology, aquatic ecosystems, coastal utilization, water conservation, several types of pollution including oil, environmental modeling, and environmental law.

[from Pollution Abstracts 8(1):#77-00964. 1977]

C-0830-77
THE HONG KONG SEA-SHORE - AN ENVIRONMENT IN CRISIS
Morton, B. S. 1976.
Environmental Conservation 3(4):243-254.

Contamination, Shorelines, Japan, Development, Environmental effects, Marine organisms

The reasons for the erosion and, in some cases, destruction of Hong Kong's littoral fauna are discussed in this paper. The various forms of pollution of the shorelines are described, including human and agricultural effluents, land reclamation, oil, heavy metals, mill wastes, freshwater runoff, and coastal development.

C-0831-77
POLYCYCLIC AROMATIC HYDROCARBONS IN THE MARINE ENVIRONMENT [in Norwegian]
Palmork, K. H. 1974.
Nordforsk, Havforskningsinst, Fiskeridir, Bergen, Norway
Miljoevardssidretariatet 4:99-125.

PAH, Oceans

Summary not available.

C-0832-77
MARINE AND ESTUARINE POLLUTION
Reish, D. J., T. J. Kauwling, and A. J. Mearns. 1976.
Journal Water Pollution Control Federation 48(6):1439-1459.

Oil spills, Contamination, Oceans, Estuaries, Biological effects, Fate, Environmental effects, Marine organisms, Bibliographies

This literature review includes a section on oil pollution in which forty-five recent articles (1974-1975) on oil pollution of marine and estuarine environments are incorporated. Included are papers on the fate of oil, biological, and environmental effects of oil spills and oil contamination, and the biodegradation and metabolism of oil, dispersants, and refinery effluents.

C-0833-77
OIL SPILLS: RISKS AND RELEVANCE (letter to the editor)
Sills, D. L. 1977.
Science 195(4279):636.

Oil spills, Tankers, Argo Merchant spill, Law enforcement, Regulations

The letter is in response to a recent editorial article [Science 195(4274):137] entitled, "Oil Spills", which focussed in part on the grounding of the oil tanker "Argo Merchant" in December, 1976. The inadequate enforcement of existing tanker regulations is emphasized, and the apparent inability of government institutions to make and enforce public policy on scientific-technical issues is pointed out.

C-0834-77
ENVIRONMENTAL POLLUTION AND CONTROL
Vesilind, P. A. 1975.
Ann Arbor, Michigan, Ann Arbor Science Publishers, 1975. 232p.

Environmental effects, Pollution control, Regulations, Legislation, U.S.

In this introduction to environmental pollution, all major pollutants except radiation are described. Pollutant effects, methods of control, and pollution standards, regulations and legislation with emphasis on the U.S. are discussed.

D. EFFECTS OF OIL EXPLORATION AND PRODUCTION

1. BIOLOGICAL EFFECTS

C-0835-77
BIOLOGICAL CONSIDERATIONS
Barber, R. T. 1976.
Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings. M. F. Massoglia (compiler). Research Triangle Park, North Carolina, Research Triangle Institute, 1976. p. 109-112. Held at Atlanta, Georgia, 1975.

Oil spills, Offshore development, Biological effects, Marine organisms, OCS, Atlantic Ocean

The South Atlantic OCS is dominated by horizontal along-shelf and cross-shelf circulation. A thorough understanding of this advective pattern is necessary in order to predict the effects of oil spills on the biota and susceptible parts of the marine environment.

[from Selected Water Resources Abstracts 9(21):#W76-11484. 1976]

C-0836-77
A BIOLOGICAL SURVEY OF OIL PLATFORMS IN THE SANTA BARBARA CHANNEL
Bascom, W., A. J. Mearns, and M. D. Moore. 1976.
Journal of Petroleum Technology. November:1280-1284.

Platforms, Biological effects, Offshore drilling, Marine organisms, Santa Barbara Channel

The findings are given of a study conducted in 1975 to assess the present status of the sea life on and near two offshore structures and to compare the quantity and quality of life there with that which lived at the towers several years ago and with that at nearby control sites. It was found that life on and around the platforms is healthy and shows no indication of the uptake of any toxicant. Species diversity and abundance are greater than at control sites.

C-0837-77
SCIENTISTS PRESENT FRESH WARNING ABOUT OIL DRILLING ON GEORGES BANK (news brief)
Day, G. 1977.
National Fisherman 57(10):16A.

Oil spills, Offshore drilling, Environmental effects, Fisheries, Marine organisms, *Georges Bank

The environmental effects of oil spills on Georges Bank are discussed and adverse effects to fisheries and bottom fauna, including shellfish, are presented.

C-0838-77
EFFECTS OF DRILL MUD ON SEDIMENT CLEARING RATES OF CERTAIN HERMATYPIC CORALS
Thompson, J. H., and T. J. Bright. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 495-498. (American Petroleum Institute No. 4284).

Drilling, Sediments, Corals, *Drill mud, *Cleaning rates

Three species of hermatypic corals were subjected to large uniform doses of four sediments: used whole drill mud, barite, aquagel, and calcium carbonate. Rates of sediment clearance by each species were measured. No corals were able to remove the used whole drill mud, but all could rid themselves effectively of the other three sediments.

C-0839-77
BIOLOGICAL SERVICES PROGRAM
U.S. Fish and Wildlife Service. 1976.
Washington, D. C., Office of Biological Services, 1976. 52 p. PB-251 738.

Development, Oil shale, Biological effects, Fish, Wildlife, *U.S. Fish and Wildlife Service

The Biological Services Program of the U.S. Fish and Wildlife Service was begun in 1974 to provide information to decision makers regarding fish and wildlife values in programs associated with energy research and development. Project areas include terrestrial habitats and fauna disturbed by oil shale, coal or geothermal development; freshwater inpingements associated with water allocation and stream channelization; and coastal and offshore management.

[from Energy Review No. 17:17. 1976]

C-0840-77
PHYSICAL OCEANOGRAPHY CONSIDERATIONS
Rinkel, M. 1976.
Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings. M. F. Massoglia (compiler). Research Triangle Park, North Carolina, Research Triangle Institute, 1976. p. 103-105. Held at Atlanta, Georgia, 1975.

Contaminants, Offshore exploration, Spreading, Dispersions, Platforms, Oil transport

Transport mechanisms which introduce, spread and disperse oil contaminants in the marine environment during exploration and development activities are discussed. Bottom transport of contaminants around platforms may be a more important factor than previously recognized.

[from Selected Water Resources Abstracts 9(21):#W76-11483. 1976]

C-0841-77
PROCEEDINGS OF THE CONFERENCE TO REVIEW THE DRAFT STUDY PLAN FOR SOCIAL AND ECONOMIC IMPACT ASSESSMENT OF ALASKA OUTER CONTINENTAL SHELF PETROLEUM DEVELOPMENT
Rosenberg, D. H. 1975.
Sea Grant-75-14, NOAA-76052801; Grant NOAA-04-5-158-35. 142 p.

Offshore development, Socio-economic effects, OCS, Alaska

The proceedings of the public conference held in Anchorage, Alaska, to discuss the Draft Study Plan for the Outer Continental Shelf (OCS) petroleum development in Alaska are presented.

[from Government Reports Announcements 76(22):#PB-256 813/76A. 1976]

C-0842-77
OIL INDUSTRY: BIG POLLUTION-CONTROL COSTS AHEAD? (news brief)
Anon. 1976.
Chemical Engineering 83(27):25.

Regulations, Pollution control, Economics, Oil industry, Refining, Exploration, Production

The American Petroleum Institute projects environmental regulations may cost the U.S. petroleum industry $10 billion yearly starting in 1985, with refining and exploration and production accounting for 90% of this cost.

C-0843-77
RESPONSES OF INDUSTRY WITHIN ABERDEEN TO OIL RELATED CHANGE: SOME IMPLICATIONS FOR URBAN PLANNERS
Hunt, D. 1976.
The International Journal of Environmental Studies 9(4):269-278.

Offshore development, Economic effects, Onshore impacts, Scotland

The growth of onshore supply centers due to development of offshore oil reserves is discussed. Aberdeen, Scotland is used as an example of a mature economy that was transformed by oil related industrial activity.

C-0844-77
REVIEW OF OFFSHORE EXPLORATION IN FLORIDA
Stafford, J. W. 1975.
Florida Coastal Policy Study: The Impact of Offshore Oil Development. A. L. Pearman and J. W. Stafford (eds.). Florida State University, and University of South Florida, 1975 (reprinted 1976). Chapter II. p. 31-53. Final report.

Offshore exploration, Oil-gas leasing, Economic effects, Florida, Onshore impacts

Recent offshore Florida oil-gas leasing and exploration activities are chronologically reviewed, and the characteristics of associated offshore and onshore facilities are examined. Past economic impacts of oil exploration on several Florida communities are assessed, and the potential positive and adverse economic effects of such development are considered.

C-0845-77
EFFECTS ON COMMERCIAL FISHING OF PETROLEUM DEVELOPMENT OFF THE NORTHEASTERN UNITED STATES
Allen, D. W., R. B. Allen, R. E. Black, J. M. Friedman, and L. G. Mallon. 1976.
WHOI-76-66, NOAA-76080904. Grant NOAA-04-6-158-44016. 78p.

Offshore development, Environmental effects, Fisheries, U.S., Regulations, Oil industry

The effects of petroleum development on the onshore and offshore interactions of fisheries are described. Environmental effects and legal and regulatory framework governing the oil industry are also discussed.

[from Government Reports Announcements 77(2):#PB-259 633/6GA. 1977]

C-0846-77
ERDA STUDIES WILL HELP ASSESS EFFECTS OF ENERGY GROWTH ON CONTINENTAL SHELF
Anon. 1976.
Information from ERDA July 16:5-6.

Offshore drilling, OCS, Atlantic coast, Environmental protection, Movement, Contaminants, *Southeastern U.S., ERDA

ERDA-sponsored research is gathering basic scientific information to protect the environment along the continental shelf of the U.S. southeastern coast by anticipating environmental problems that would result from offshore drilling and power plant construction. The movement of the Gulf Stream and the influence of it and winds on current patterns of the continental shelf will be studied in order to provide details about how nutrient and pollutants move aroung the shelf.

[from Energy Review No. 17:7. 1976]

C-0847-77
OFFSHORE OIL AND COASTAL RECREATION - COHABITATION OR CONFLICT
Anon. 1976.
OCS Update. Special June, 1976 issue. 8p.

Offshore development, Environmental effects, Oil industry, Oil spills, Environmental deterioration, Delaware, Government agencies, *Coastal recreation

This report summarizes divergent viewpoints expressed at a recent conference on the effects of offshore oil development on the environment, coastal recreation, and the related recreation industry. Opinions about the adverse effects of offshore development, the possibility of oil spillage and the resultant environmental degradation, and impacts on coastal recreation are expressed from the perspectives of the oil industry, recreation industry, and involved county, state and federal agencies.

C-0848-77
CIVIL LIABILITY FOR POLLUTION FROM OFFSHORE OPERATIONS
Archer, P., and C. A. Fleischer. 1976.
Environmental Policy & Law 2(1):2-5.

Offshore development, Liability, Europe, UK, France, Denmark, Norway, *Pollution damage

Disagreements arose between delegates from nine northwestern European countries regarding the extent of liability in the event of pollution damage caused by offshore operations. The U.K. and France favored a $25 million limit of liability for any one incident, and Norway and Denmark proposed a $60 million limit. The Norwegian view of strict and unlimited liability presently in force in Norway's sector of the North Sea is explained.

[from Environment Abstracts 6(9):#76-05816. 1976]

C-0849-77
OPERATIONS AND ENVIRONMENTAL CONSIDERATIONS, OCCIDENTAL PETROLEUM CORPORATION IN SITU OPERATIONS
Chew, R. T., III. 1976.
Science and Technology of Oil Shale. T. F. Yen (ed.). Ann Arbor, Michigan, Ann Arbor Science Publishers, Inc. 1976. p. 73-86.

Oil shale, Development, EIS, Colorado

Oil shale operations began at the Logan Wash Property near De Beque, Colorado, in June 1972. About half of the area, 1620 hectares (4000 acres) is underlain by oil shales. With respect to environmental considerations, the Logan Wash Project has two parallel thrusts: to acquire and prepare data for permit applications required for the operation, and to acquire baseline data needed to prepare a complete environmental impact statement for the project.

C-0850-77
ENVIRONMENTAL PROBLEMS ENCOUNTERED IN SHALE OIL PRODUCTION
Davidson, J. W. 1976.
Symposium on Alternate Fuels Resources, Santa Maria, California, 1976. North Hollywood, California, Western Periodicals Company; Vandenberg, California, American Institute of Aeronautics and Astronautics, Inc., 1976. p. 373-381.

Oil shale, Production, Extraction, Environmental effects, Solid waste, Wastewaters

Environmental control technologies applicable to shale oil production are reviewed, and the management of solid and liquid wastes from commercial extraction processes is discussed.

[from International Aerospace Abstracts 16(24):#A76-47313. 1976]

C-0851-77
ENVIRONMENTAL PROTECTION AGENCY'S ROLE, INTERESTS, AND RESPONSIBILITIES WITH RESPECT TO THE OUTER CONTINENTAL SHELF DEVELOPMENT
Davis, W. P. 1976.
Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings. M. F. Massoglia (compiler). Research Triangle Park, N. C., Research Triangle Institute, 1976. p. 55-58. Held at Atlanta, Georgia, 1975.

Offshore development, OCS, EPA, Environmental management, Oil spills, Water quality, Estuaries, Coasts

The EPA's role with respect to OCS development and environmentally sound management is outlined. The agency is concerned with ocean disposal and oil spillage, establishment of marine water quality standards, the effects of manmade organic compounds on the nearshore and estuarine environment, and maintenance of the U.S. coastal regions.

[from Selected Water Resources Abstracts 9(21):#W76-11479. 1976]

C-0852-77
THE VALUE OF OFFSHORE OIL
Dorfman, R. 1976.
The Question of Offshore Oil. E. J. Mitchell (ed.). Washington, D.C., American Enterprise Institute for Public Policy Research, 1976. p. 5-15.

Offshore development, Economics, Environmental effects

The author estimates that the oil and gas in the outer continental shelf was worth about $100 billion and concludes that these resources could make a significant contribution to the nation's fuel supply. The environmental costs of development would be great, but compared to coal and nuclear power, offshore resources would prove to be relatively clean environmentally.

C-0853-77
OFFSHORE OIL POTENTIAL AND LAND USE IMPACTS IN THE CENTRAL CALIFORNIA COASTAL ZONE
Doyle, W. T., (ed.). 1975.
University of California, Coastal Marine Studies, Special Publication No. 3. 85p.

Offshore drilling, Oil industry, Environmental effects, California coast, Onshore impacts

The oil potential of central and northern California, with particular interest in the Monterey Bay area, is considered and consequent possible land use conflicts are discussed. Offshore drilling impacts are also discussed.

[from Oceanic Abstracts 13(6):#76-05770. 1976]

C-0854-77
THE ENVIRONMENTAL AND SOCIO-ECONOMIC BASELINE ON THE GULF OF MEXICO COASTAL ZONE AND OUTER CONTINENTAL SHELF
Environmental Consultants Inc. 1975.
U.S. Bureau of Land Management. 3 volumes.

Offshore development, OCS, Coasts, Environmental effects, Socio-economic effects, Gulf of Mexico

Available from New Orleans OCS Office, Suite 3200, The Plaza Tower, 1001 Howard Ave., New Orleans, LA 70113.

[from Ocean Oil Weekly Report 10(18). 1975]

C-0855-77
ACCOMPLISHMENT PLAN, REGION VIII, COVERING EPA ACTIVITIES RELATING TO OIL SHALE (COLORADO, UTAH, WYOMING)
Environmental Protection Agency. 1974.
Report PB-255 125/7GA. 110p.

Oil shale, Development, EPA, *Rocky Mountain states

A description is given of the allocation of EPA resources to perform its responsibilities in light of major oil-shale development in these Rocky Mountain states.

[from Petroleum Abstracts 17(3):#229,167. 1977]

C-0856-77
SOUTHEAST COASTAL RESEARCH ACTIVITIES OF ERDA
Forster W. O. 1976.
Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings. M. F. Massoglia (compiler). Research Triangle Park, N.C., Research Triangle Institute, 1976. p. 29-37. Held at Atlanta, Georgia, 1975.

Offshore production, Atlantic coast, ERDA, Environmental effects, Oil discharges, Chronic effects

ERDA has developed a research program designed to complement that of the USBLM. The overall program is divided into the physical, geochemical, geological and biological programs, the purposes of which are discussed. The studies emphasize the potential environmental impacts of chronic petroleum discharges on the nearshore rather than the offshore areas.

[from Selected Water Resources Abstracts 9(21):#W76-11477. 1976]

C-0857-77
ENVIRONMENTAL OIL SHALE SYMPOSIUM, PROCEEDINGS, 1975.
Gary, J. H. (ed.). 1975.
Quarterly of the Colorado School of Mines 70(4). 244p.

Oil shale, Development, Environmental effects, Extraction

Nineteen papers in this proceedings deal with aspects of environmental quality problems associated with oil shale extraction and processing. The range of topics extends from environmental baseline data aquisition to legislative attitudes in the respective states involved in oil shale exploration and development.

[from The Engineering Index Monthly 14(12):#082896. 1976]

C-0858-77
DECISIONS FOR DELAWARE: SEA GRANT LOOKS AT OCS DEVELOPMENT
Goodman, J. M. 1975.
Report DEL SG-1-75(1). 43p.

Offshore development, OCS, Environmental effects, Economic effects, Delaware, Atlantic Coast

This report presents information on potential effects of OCS petroleum development in the Mid-Atlantic region. The study includes quantitative predictions of environmental, economic, and land-use impacts of oil-gas development, based in part on an analysis of similar development in the Gulf of Mexico and California coast.

[from Univeristy of Delaware Marine Publications Catalog. p. 6. Summer 1976]

C-0859-77
PRELIMINARY REPORT ON THE ENVIRONMENTAL GEOLOGY OF SELECTED AREAS OF THE SOUTHERN CALIFORNIA CONTINENTAL BORDERLAND
Green, H. G., S. H. Clark, Jr., M. E. Field, F. I. Linker, and H. C. Wagner. 1975.
U.S. Department of the Interior, Geological Survey. Open-file Report 75-596. 70p.

Offshore development, OCS, Southern California, Environmental effects, *Geologic hazards

Selected areas of the Southern California continental borderland have been studied to define the nature and extent of geologic hazards which could affect the environment as a result of the development of petroleum resources in this region. The areas designated for leasing in Federal Outer Continental Shelf lease sale 35 were studied in detail. The geologic phenomena investigated include faulting, seismicity, sediment instability, sediment erosion, and oil and gas seeps. Faulting and seismic activity are major hazards in all of the areas. Additional information is necessary for a complete evaluation of geologic hazards in the borderland region.

C-0860-77
OFFSHORE OPERATIONS, REGULATION, AND ENVIRONMENTAL PROTECTION: OPEN DISCUSSION
Hickman, R. R. 1975.
U.S. Bureau of Land Management Conference on Environmental Studies for the South Atlantic Continental Shelf Area, Atlanta, 1975. p. 63-76.

Offshore drilling, Offshore development, Environmental protection, Regulations, Alaska, Southern California, Gulf of Mexico

Environmental protection considerations and governmental regulation of offshore drilling and oil-gas development are discussed with reference to ongoing Exxon operations in the Gulf in Mexico, offshore Southern California, and Cook Inlet, Alaska.

[from Environment Abstracts 6(11):#76-07381. 1976]

C-0861-77
PROBLEMS ON ENVIRONMENTAL POLLUTION CAUSED BY THE PETROLEUM INDUSTRY
Hsieh, C.-H. 1976.
Neng Yuan Chi Kan 6(2):80-86.

Oil industry, Environmental effects, Contamination, Pollution control

"Environmental pollution caused by the petroleum industry and pollution control methods are reviewed."

[from Chemical Abstracts 86(4):#21111c. 1977]

C-0862-77
OFFSHORE OIL AND FISHERY RESOURCES
Jensen, A. C. 1976.
New York Fish and Game Journal 23(2):138-148.

Offshore drilling, Oil spills, Fisheries, Coasts, New York

Coastal fishery resources off the coast of New York are examined in view of offshore drilling and possible oil spills.

[from Biological Abstracts 62(12):#65749. 1976]

C-0863-77
ENVIRONMENTAL ASPECTS OF PRODUCED WATERS FROM OIL AND GAS EXTRACTION OPERATIONS IN OFFSHORE AND COASTAL WATERS
Koons, C. B., C. D. McAuliffe, and F. T. Weiss. 1976.
Offshore Technology Conference, 8th, Houston, Texas, 1976.
OTC Paper no. 2447. p. 247-257.

Environmental effects, Toxicity, Offshore production, Contamination, Marine organisms, *Produced waters

The constituents of produced waters and their marine environmental effects are examined. Laboratory and field studies show that toxic components occur in low concentrations in produced waters; natural processes such as dilution, evaporation, and chemical and biological reactions rapidly reduce contaminants to levels that are harmless to the marine environment and continuous low-level discharges of produced water have few or no detrimental effects on the marine environment or biota.

C-0864-77
SEA WATER POLLUTION AND ITS CONTROL DURING PETROLEUM EXPLORATION [in Chinese]
Liu, C.-F. 1975.
Shih You Tsuan T'sai Kung Ch'eng No. 15:192-200.

Exploration, Pollution control, Seawater

"A review with 10 references."

[from Chemical Abstracts 85(26):#197810y. 1976]

C-0865-77
BUREAU OF LAND MANAGEMENT'S ENVIRONMENTAL STUDIES PROGRAM FOR THE SOUTH ATLANTIC OUTER CONTINENTAL SHELF AREA, CONFERENCE/ WORKSHOP PROCEEDINGS
Massoglia, M.F. (compiler). 1976.
Research Triangle Park, North Carolina, Research Triangle Institute, 1976. 283p. Held at Atlanta Georgia, 1975.

Offshore drilling, Environmental effects, OCS, Monitoring, Guidelines, Atlantic Ocean, BLM

The report is a compilation of papers and discussions of the title conference/workshop. Objectives of this meeting were to summarize available information on the South Atlantic OCS area; to identify subject areas in need of additional environmental study; to provide predictions on environmental effects of drilling, based on present information; and to formulate guidelines for further baseline and environmental monitoring studies for the South Atlantic OCS area.

[from Selected Water Resources Abstracts 9(21):#W76-11474. 1976]

C-0866-77
ENVIRONMENTAL ASPECTS OF OCS PETROLEUM DEVELOPMENT
McAuliffe, C. D. 1976.
Los Angeles Council of Engineers and Scientists Proceedings Series No. 2. p.49-59. Energy LA: Tackling Crisis,Greater Los Angeles Area Energy Symposium, 1976.

Offshore development, Environmental effects, OCS

The environmental aspects of OCS petroleum development are reviewed.

[from Chemical Abstracts 85(22):166022p. 1976]

C-0867-77
THE ENVIRONMENTAL IMPACT OF OFFSHORE DRILLING
Menard, W. 1976.
The Question of Offshore Oil. E. J. Mitchell (ed.). Washington, D.C., American Enterprise Institute for Public Policy Research, 1976. p. 33-41.

Offshore drilling, Environmental effects, Oil spills

The author points out that constant changes in marine biology and ocean currents rapidly make environmental assessments of offshore areas out of date. Questions are raised concerning the immediate and long-term responses of the environment to oil spills. It is suggested that environmental impact be measured not in absolute terms but according to the actual exposure of people to environmental "insults".

C-0868-77
CONCLUSIONS AND RECOMMENDATIONS CONFERENCE/WORKSHOP
Menzel, D. 1976.
Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings. M. F. Massoglia (compiler). Research Triangle Park, N.C., Research Triangle Institute, 1976. p. 227-250. Held at Atlanta, Georgia, 1975.

Offshore development, OCS, Environmental effects, Hydrocarbons, Environmental deterioration, Health hazards, Atlantic Ocean

Study priorties for additional research into impacts of Southeastern Atlantic OCS development on man and the environment are summarized. Of major concern were 1) the possibility of accidents resulting from geologic hazards, 2) permanent destruction of unique environments; and 3) the effects of metals and hydrocarbons on organisms and man.

[from Selected Water Resources Abstracts 9(21):#W76-11485. 1976]

C-0869-77
OVERVIEW OF CONFERENCE PROGRAMS
Menzel, D. 1976.
Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings. M. F. Massoglia (compiler). Research Triangle Park, N. C., Research Triangle Institute, 1976. p. 93-96. Held at Atlanta, Georgia, 1975.

Offshore drilling, Environmental effects, Platforms, OCS, Atlantic Ocean, BLM

The objectives of the conference are reviewed; these include summarizing available information and understanding the southeast U.S. continental shelf environment, and predicting the environmental effects of oil drilling. The USBLM is specifically concerned with the environmental impacts of activities on and around drilling platforms.

[from Selected Water Resources Abstracts 9(21):#W76-11481. 1976]

C-0870-77
THE QUESTION OF OFFSHORE OIL
Mitchell, E. J. (ed.). 1976.
Washington, D. C., American Enterprise Institute for Public Policy Research, 1976. 161p.

Offshore development, Economics, Environmental effects, Offshore drilling

This conference held March 20-21, 1975, and sponsored by the American Enterprise Institute (AEI) National Energy Project, dealt with the subject of offshore oil - economic value and environmental risk. Four major papers were given: The Value of Offshore Oil (R. Dorfman); The Environmental Impact of Offshore Oil (W. Menard); The Social Benefit/Cost Analysis of Offshore Drilling (W. Mead); and The Appropriate Pace of Offshore Drilling (I. White). Each paper was followed by comments from discussants. The conference concluded with a Round Table Discussion on Offshore Oil: Costs and Benefits.

C-0871-77
THE OFFSHORE ECOLOGY INVESTIGATION: AN EVALUATION OF OIL INDUSTRY IMPACT ON CENTRAL COASTAL LOUISIANA
Morgan, J. P. 1975.
Gulf Association of Geological Societies, Transactions Vol. 25. p. 182. Abstract.

Offshore production, Oil industry, Environmental effects, Hydrocarbons, *Marine organisms, Sediments, Louisiana

A study conducted by the Gulf Universities Research Consortium on the environmental effects of offshore exploration, drilling, and production off the Louisiana coast is presented. No significant ecological changes were noted; hydrocarbon levels in organisms, the water column, and sediments were low and present no known biological hazards. The reef effect of platform structures tends to increase biological activity.

C-0872-77
ENVIRONMENTAL IMPROVEMENTS BY OIL SHALE LEACHING
Moussavi, M., and T. F. Yen. 1976.
Science and Technology of Oil Shale. T. F. Yen (ed.). Ann Arbor, Michigan, Ann Arbor Science Publishers Inc., 1976. p. 205-220.

Oil shale, Development, Environmental effects, *Liquid wastes, Solid wastes, *Leaching

"The effect of minerals leaching prior to retorting of any other processes utilized for recovery of organics from oil shales is multifunctional. A considerable decrease in required retorting temperature may be obtained by leaching." ..."The volume of liquid and solid wastes left behind by shale oil industries is considerably high. If the leaching step is taken, it will become higher. However, since the nature of waste is environmentally more refractive, it is preferred."

C-0873-77
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF: VOLUME 1. MARINE MAMMALS
National Oceanic and Atmospheric Administration, Environmental Research Laboratories. 1976.
NOAA, Environmental Research Laboratories, Principal Investigators' Reports for the Year Ending March 1976. 434p.

Environmental effects, Offshore development, Alaska, OCS, Marine mammals, *Baseline studies

Baseline studies on the abundance, diversity, characteristics and distribution of marine mammals of the Alaskan Continental Shelf are presented as part of a 14-volume assessment of the environmental effects of OCS resources development and oil pollution.

[from Selected Water Resources Abstracts 10(2):#W77-00901. 1977]

C-0874-77
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 2. MARINE BIRDS
National Oceanic and Atmospheric Administration, Environmental Research Laboratories. 1976.
NOAA, Environmental Research Laboratories, Principal Investigators' Reports for the Year Ending March 1976. 601p.

Environmental effects, Offshore development, Alaska, OCS, Birds, *Baseline studies, *Marine birds

Studies on the coastal and seabirds of the Alaskan Continental Shelf are presented as part of a 14-volume assessment of the environmental effects of Alaskan OCS resources development and oil pollution. Included are reports on the abundance, diversity, behavioral characteristics, and distribution of seabirds, their habitats, migratory routes, breeding habits, and their interrelationships with the environment.

[from Selected Water Resources Abstracts 10(2):#W77-00902. 1977]

C-0875-77
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 3. MARINE BIRDS
National Oceanic and Atmospheric Administration, Environmental Research Laboratories. 1976.
NOAA, Environmental Research Laboratories, Principal Investigators' Reports for the Year Ending March 1976. 647p.

Environmental effects, Offshore development, Alaska, OCS, Birds, *Baseline studies, *Marine birds

Studies on the behavior, abundance, feeding ecology, and seasonal distribution of seabirds of the Alaskan Continental Shelf waters are presented as part of a 14-volume assessment of the environmental effects of Alaskan OCS resources development and oil pollution.

[from Selected Water Resources Abstracts 10(2):#W77-00903. 1977]

C-0876-77
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 4. MARINE BIRDS
National Oceanic and Atmospheric Administration, Environmental Research Laboratories. 1976.
NOAA, Environmental Research Laboratories, Principal Investigators' Reports for the Year Ending March 1976. 362p.

Environmental effects, Offshore development, Alaska, OCS, Birds, *Baseline studies, *Marine birds

Among the topics of this volume are: results of aerial surveys and photographic mapping of seabirds and seabird colonies; literature reviews; and analyses of published and unpublished data on seabird migratory patterns, population dynamics, and habitats. These reports are part of a 14-volume assessment of the environmental effects of OCS resources development and oil pollution.

[from Selected Water Resources Abstracts 10(2):#W77-00904. 1977]

C-0877-77
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 5. FISH, PLANKTON, BENTHOS, LITTORAL
National Oceanic and Atmospheric Administration, Environmental Research Laboratories. 1976.
NOAA, Environmental Research Laboratories, Principal Investigators' Reports for the Year Ending March 1976. 715p.

Environmental effects, Offshore development, Alaska, OCS, Benthos, Marine organisms, Beaufort Sea, Bering Sea, *Baseline studies

Included in this volume are studies on the abundance, distribution, diversity and productivity of benthic

organisms of the Bering and Beaufort Seas, and summaries of the published and unpublished literature on benthic organisms of the Beaufort Sea. The volume is part of a 14-volume assessment of the environmental effects of Alaskan OCS resources development and oil pollution.

[from Selected Water Resources Abstracts 10(2):#W77-00905. 1977]

C-0878-77
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 6. FISH, PLANKTON, BENTHOS, LITTORAL
National Oceanic and Atmospheric Administration, Environmental Research Laboratories. 1976.
NOAA, Environmental Research Laboratories, Principal Investigators' Reports for the Year Ending March 1976. 587p.

Environmental effects, Offshore development, Alaska, OCS, Fish, Mollusks, Habitat, *Baseline studies

Baseline studies and surveys of specific fishes and mollusks and their habitats, productivity, abundance, and spawning characteristics are presented as part of a 14-volume assessment of the environmental effects of Alaskan OCS resources development and oil pollution.

[from Selected Water Resources Abstracts 10(2):#W77-00906. 1977]

C-0879-77
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 7. FISH, PLANKTON, BENTHOS, LITTORAL
National Oceanic and Atmoshperic Administration, Environmental Research Laboratories. 1976.
NOAA, Environmental Research Laboratories, Principal Investigators' Reports for the Year Ending March 1976. 675p.

Environmental effects, Offshore development, Alaska, OCS, Plankton, Benthos, Fisheries, *Baseline studies

Among the baseline studies presented in this volume are reports on phytoplankton and zooplankton of the continental shelf areas surrounding Alaska; fisheries and other demersal resources; and literature reviews on distribution, abundance, diversity and productivity of benthic organisms of the Gulf of Alaska, Bering Sea and Beaufort Sea. This study is part of a 14-volume assessment of the environmental effects of Alaskan OCS resources development and oil pollution.

[from Selected Water Resources Abstracts 10(2):#W77-00907. 1977]

C-0880-77
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 8. EFFECTS OF CONTAMINANTS
National Oceanic and Atmospheric Administration, Environmental Research Laboratories. 1976.
NOAA, Environmental Research Laboratories, Principal Investigators' Reports for the Year Ending March 1976. 392p.

Offshore development, Environmental effects, Biological effects, Alaska, OCS, Hydrocarbons, Marine organisms, Biodegradation

Among the reports presented in this volume are studies on the acute and chronic effects of petroleum hydrocarbons on the marine biota and on specific fishes, marine mammals and crustaceans; uptake, depuration and sublethal effects of petroleum and petroleum hydrocarbons on organisms as reflected in morphological, physiological, chemical and behavioral changes; biodegradation and biotransformation of petroleum compounds; and literature reviews of biological effects of oil on the arctic and subarctic biota.

[from Selected Water Resources Abstracts 10(2):#W77-00908. 1977]

C-0881-77
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF VOLUME 9. CHEMISTRY AND MICROBIOLOGY
National Oceanic and Atmospheric Administration, Environmental Research Laboratories. 1976.
NOAA, Environmental Research Laboratories, Principal Investigators' Reports for the Year Ending March 1976. 555p.

Environmental effects, Offshore development, Alaska, OCS, Microorganisms, Hydrocarbons, Chemical analysis, Distribution, *Baseline studies

Included in this volume are studies on the analysis of trace hydrocarbons, their abundance and distribution; and the interaction of microorganisms and petroleum pollutants in the Beaufort Sea and Gulf of Alaska. The volume is part of a 14-volume assessment of the environmental effects of Alaskan OCS resources development and oil pollution.

[from Selected Water Resources Abstracts 10(2):#W77-00909. 1977]

C-0882-77
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 10. CHEMISTRY AND MICROBIOLOGY
National Oceanic and Atmoshperic Administration, Environmental Research Laboratories. 1976.
NOAA, Environmental Research Laboratories, Principal Investigators' Reports for the Year Ending March 1976. 436p.

Environmental effects, Offshore development, Alaska, OCS, Biodegradation, Hydrocarbons, Distribution, *Baseline studies

Among the reports presented in this volume are studies of crude oil degradation by psychrophilic bacteria; baseline assessment of microbial activity in the Beaufort Sea and Gulf of Alaska; natural hydrocarbon distribution and dynamics of the Alaskan OCS area; and the microbial release of soluble trace metals from oiled sediments. These reports are part of a 14-volume assessment of the environmental effects of Alaskan OCS resources development and oil pollution.

[from Selected Water Resources Abstracts 10(2):#W77-00910. 1977]

C-0883-77
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 11. PHYSICAL OCEANOGRAPHY AND METEOROLOGY
National Oceanic and Atmospheric Administration, Environmental Research Laboratories. 1976.
NOAA, Environmental Research Laboratories, Principal Investigators' Reports for the Year Ending March 1976. 996p.

Environmental effects, Offshore development, Alaska, OCS, *Baseline studies, *Physical oceanography, *Meteorology

This volume presents reports dealing mostly with the physical oceanography of the Gulf of Alaska, Beaufort Sea, and Bering Sea. Included are topics on oceanographic processes, coastal and ocean currents, transport of pollutants, regional marine climatology, development and application of current mapping, analytical models, and historical and statistical data analyses. These studies are part of a 14-volume assessment of the environmental effects of Alaskan OCS resources development and oil pollution.

[from Selected Water Resources Abstracts 10(2):#77-00911. 1977]

C-0884-77
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 12. GEOLOGY
National Oceanic and Atmospheric Administration, Environmental Research Laboratories. 1976.
NOAA, Environmental Research Laboratories, Principal Investigators' Reports for the Year Ending March 1976. 679p.

Environmental effects, Offshore development, Alaska, OCS, *Baseline studies, *Geologic hazards, *Marine geology

Geologic studies constitute this part of a 14-volume assessment of the environmental effects of Alaskan OCS resources development and oil pollution. Research reports on seismic and volcanic hazards, sedimentation, coastal morphology, regional environmental geology and geomorphology, offshore permafrost and marine geology problems are presented.

[from Selected Water Resources Abstracts 10(2):#W77-00912. 1977]

C-0885-77
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 13. GEOLOGY
National Oceanic and Atmospheric Administration, Environmental Research Laboratories. 1976.
NOAA, Environmental Research Laboratories, Principal Investigators' Reports for the Year Ending March 1976. 430p.

Environmental effects, Offshore development, Alaska, OCS, *Baseline studies, *Geologic hazards

Geologic processes and geologic hazards of the Alaskan Continental Shelf are discussed in this part of a 14-volume assessment of the environmental effects of Alaskan OCS resources development and oil pollution. Research reports on recent and active faulting, slope instabilities, slumping, submarine and coastal depositional and erosional processes, seismic and volcanic risks, and coastal and offshore permafrost are presented.

[from Selected Water Resources Abstracts 10(2):#W77-00913. 1977]

C-0886-77
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME 14. ICE
National Oceanic and Atmospheric Administration, Environmental Research Laboratories. 1976.
NOAA, Environmental Research Laboratories, Principal Investigators' Reports for the Year Ending March 1976. 459p.

Environmental effects, Offshore development, Alaska, OCS, Ice, Arctic Ocean, *Baseline studies

Among the topics covered in this volume are: the interactions of oil with sea ice in the Arctic Ocean; the morphology and dynamics of sea ice, the seasonal development, abundance and decay of sea ice; the study of sea ice conditions by aerial and satellite remote sensing; historical baseline ice studies; and development of equipment and methods for sea ice measurement and monitoring. These studies are part of a 14-volume assessment of the environmental effects of Alaskan OCS resources development and oil pollution.

[from Selected Water Resources Abstracts 10(2):#W77-00914. 1977]

C-0887-77
INTRODUCTION
Pearman, A. L. 1975.
Florida Coastal Policy Study: The Impact of Offshore Oil Development. A. L. Pearman and J. W. Stafford (eds.). Florida State Universtiy, and University of South Florida, 1975 (reprinted 1976). Chapter I. p. 1-30. Final report.

Offshore exploration, Offshore development, Socio-economic effects, Onshore impacts, Florida

The patterns of development and onshore impacts of OCS oil-gas exploration and development are discussed, using examples from other Gulf states and the British experience with North Sea production. The social and economic effects on coastal communities are considered, and the development of the inland Florida Jay oil field is briefly reviewed.

C-0888-77
FLORIDA COASTAL POLICY STUDY: THE IMPACT OF OFFSHORE OIL DEVELOPMENT
Pearman, A. L., and J. W. Stafford. 1975.
Florida State University, and University of South Florida, 1975 (reprinted 1976). ix + 273p. Final report.

Offshore development, Environmental effects, Onshore impacts, Socio-economic effects, Refineries, Ports, Coasts, Florida, Guidelines

In chapters I to IX, the environmental, economic, social and legal effects of offshore oil-gas development and related oil production and transfer facilities on coastal Florida are examined, based on an analysis of oil-gas development in other coastal areas. In the last chapter, policy options are identified and developed to serve as guidelines for minimizing the adverse offshore and onshore impacts of such activities.

C-0889-77
GEOLOGICAL OCEANOGRAPHY CONSIDERATIONS
Pilkey, O. H. 1976.
Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings. M. F. Massoglia (compiler). Research Triangle Park, N.C., Research Triangle Institute, 1976. p. 97-101. Held at Atlanta, Georgia, 1975.

OCS, Atlantic Ocean, EIS, *Geologic framework

A brief overview of the geologic framework of the southeastern U.S. Continental Shelf is presented, and problems to be investigated in conjunction with other baseline environmental studies are identified and listed.

[from Selected Water Resources Abstracts 9(21):#W76-11482. 1976]

C-0890-77
OIL UNDER THE ICE
Pimlott, D., D. Brown, and K. Sam. 1976.
Ottawa, Ontario, Canadian Arctic Resources Committee, 1976. 161p.

Offshore drilling, Arctic, Environmental effects, Beaufort Sea, Canada

The book is a thorough case-study of the environmental risks of drilling programs which have already been undertaken from areas of the Canadian Arctic and which have been proposed for deeper waters of the Beaufort Sea and Lancaster Sound. Evidence is presented of the need for a clearly stated policy of environmental assessment and public review of development plans in hazardous areas.

C-0891-77
NOAA RESEARCH ON MARINE ENVIRONMENTAL EFFECTS OF ENERGY-RELATED ACTIVITIES
Rucker, J. B. 1976.
EPA National Conference on Health, Environmental Effects, and Control Technology of Energy Use, Washington, D. C., 1976. 4p.

Offshore development, Environmental effects, Puget Sound, Gulf of Mexico, Fate, Hydrocarbons, Toxicity, Marine organisms, NOAA

The following NOAA energy-related R&D projects are described: an environmental assessment of the potential impact of petroleum activities in Northern Puget Sound and Strait of Juan de Fuca; an environmental assessment of an active oil field in the northwestern Gulf of Mexico; and a study of the fate and effects of toxic metals and petroleum hydrocarbons on selected ecosystems and organisms.

[from Environment Abstracts 6(9):#76-05861. 1976]

C-0892-77
SHETLAND'S OIL- AND SHETLAND'S ENVIRONMENT
Sage, B. 1976.
New Scientist 70(998):236-238.

Development, Pipelines, Storage, Oil industry, Scotland, *Sullom Voe terminal

Handling by Shetland authorities of the adverse impacts of oil development at the Sullom Voe pipeline terminal, oil storage, and transmission facilities is described.

[from Environment Abstracts 6(9):#76-05783. 1976]

C-0893-77
AN OIL SPILL RISK ANALYSIS FOR THE SOUTH ATLANTIC OUTER CONTINENTAL SHELF LEASE AREA
Slack, J. R., and R. A. Smith. 1976.
U.S. Geological Survey Open-file report, No. 76-653. 58p.

Oil spills, OCS, Oil-gas leasing, Fate, Environmental effects, Atlantic Ocean, *Risk analysis

The study was conducted to yield estimates of the overall oil spill risk associated with development of the Atlantic OCS lease area. Analyzed were probability of spill occurrence, likely path of pollutants from spills, and locations in space and time of recreational and biological resources likely to be vulnerable.

[from Petroleum Abstracts 17(8):#230,631. 1977]

C-0894-77
IMPACT ANALYSIS OIL PLATFORM CONSTRUCTION AT LOCH CARRON
Sphere Environmental Consultants Ltd. n.d.
Report. 197p.

Platforms, Development, EIS, Environmental effects, Scotland

The report was prepared for the Scottish Development Department in connection with environmental impacts of the proposed construction of concrete wellhead platforms at a site at Loch Carron.

[from Offshore Abstracts 3(5):#76-1985. 1976]

C-0895-77
ENVIRONMENTAL IMPACTS OF OCS OIL AND GAS ACTIVITY
Stafford, J. W. 1975.
Florida Coastal Policy Study: The Impact of Offshore Oil Development. A. L. Pearman and J. W. Stafford (eds.). Florida State University, and University of South Florida, 1975 (reprinted 1976). Chapter VI. p. 131-162. Final report.

Offshore development, Environmental effects, OCS, Oil spills, Pipelines, Florida

A general overview is presented of a range of environmental impacts associated with OCS oil and gas exploration, drilling, development, production, storage, transport, and processing. Whereas the pollution associated with geophysical exploration in Florida waters has usually been negligible, drilling rigs, production platforms, pipelines, and transfer and storage facilities present a more serious environmental threat in the form of potential blowouts, large oil spills, and small or chronic spills and discharges.

C-0896-77
OIL ON EAST COAST GROUNDS - HOW BAD IS BAD? (news brief)
Townes, B. 1977.
National Fisherman 57(9):7B.

Oil spills, Offshore development, Fisheries, Economic effects, Atlantic Coast

The chances of a major oil spill occurring off New England's coast due to offshore oil development are discussed; the effects on fisheries, the fishing industry, and the economy are assessed.

C-0897-77
DRILLING, TANKERS AND OIL SPILLS ON THE ATLANTIC OUTER CONTINENTAL SHELF
Travers, W. B., and P. R. Luney. 1976.
Science 194(4267):791-796.

Offshore drilling, Blowout prevention, OCS, Tankers, Oil transport, Oil spills, Atlantic coast, California coast, Gulf of Mexico

Recent technological advances which prevent offshore oil well blowouts under adverse geologic conditions are explained, and the relatively safe geologic conditions of the Atlantic OCS areas are compared with those of the Gulf of Mexico and California. Sources of oil spills into the oceans are analyzed and tabulated. It is concluded that oil tankers and the long-distance transport of oil represent a far greater threat to the marine environment than offshore drilling and production.

C-0898-77
SEDIMENTS, STRUCTURAL FRAMEWORK, PETROLEUM POTENTIAL, ENVIRONMENTAL CONDITIONS, AND OPERATIONAL CONSIDERATIONS OF THE UNITED STATES SOUTH ATLANTIC OUTER CONTINENTAL SHELF
U.S. Geological Survey.
Open-file report 75-411. 262p.

Offshore development, Atlantic Ocean, OCS, Environmental effects

Summary not available. FFI contact Library, U.S. Geological Survey, National Center, Reston, VA 22092.

[from Marine Newsletter 7(3):8. 1976]

C-0899-77
A SOCIO-ECONOMIC ENVIRONMENTAL BASELINE SUMMARY FOR THE SOUTH ATLANTIC REGION BETWEEN CAPE HATTERAS, NORTH CAROLINA AND CAPE CANAVERAL, FLORIDA
Virginia Institute of Marine Science. 1975.
U.S. Bureau of Land Management. 5 volumes.

Offshore development, Socio-economic effects, Environmental effects, Atlantic Ocean

Available from New Orleans OCS Office, Suite 3700, The Plaza Tower, 1001 Howard Ave., New Orleans, LA 70113.

[from Ocean Oil Weekly Report 10(18). 1975]

C-0900-77
OIL AND ICE IN THE BEAUFORT SEA
Wadhams, P. 1976.
Polar Record 18(114):237-250.

Blowout prevention, Pollution control, Offshore drilling, Arctic, Beaufort Sea

The results of experimental and field studies of the Beaufort Sea have been published in 39 technical and 6 overview reports which are tabulated in this article. The most likely source of oil pollution is a well blowout and no adequate cleanup technique is presently available, especially if the oil becomes incorporated into the ice. Emphasis is placed, therefore, on the observation of very stringent safety precautions to prevent blowouts.

[from Petroleum Abstracts 17(1):#228,673. 1977]

C-0901-77
ENVIRONMENTAL PROBLEMS ASSOCIATED WITH ARCTIC DEVELOPMENT ESPECIALLY IN ALASKA
West G. C. 1976.
Environmental Conservation 3(3):218-224.

Exploration, Production, Arctic, Environmental effects, Plants, Wildlife, Oil spills, Marine organisms

The potentially adverse impacts on the environment, wildlife, and human health and safety resulting from exploration and production of mineral and petroleum resources in arctic environments are outlined. A brief discussion of the effects of oil spillage, especially in the aquatic environment, is included.

C-0902-77
THE DEPARTMENT OF THE INTERIOR'S OUTER CONTINENTAL SHELF LEASING PROGRAM
Whelan, J. 1976.
Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings. M. F. Massoglia (compiler). Research Triangle Park, N.C., Research Triangle Institute, 1976. p. 11-14. Held at Atlanta, Georgia, 1975.

Oil-gas leasing, OCS, Offshore development, Economics, Environmental protection, USDI

USDI responsibilities in developing and managing OCS oil and mineral resources are outlined. They include the orderly development of such resources, receipt of fair market value for the leased mineral resources, and protection of the marine coastal environment.

[from Selected Water Resources Abstracts 9(21):#W76-11475. 1976]

C-0903-77
FEDERALLY SPONSORED OCS SCIENTIFIC STUDIES: PUBLIC RELATIONS OR ENVIRONMENTAL PROTECTION?: OPEN DISCUSSION
Winchester, E. 1975.
Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/ Workshop Proceedings. M. F. Massoglia (compiler). Research Triangle Park, N.C., Research Triangle Institute, 1976. p. 79-90. Held at Atlanta, Georgia, 1975.

Oil-gas leasing, EIS, Environmental protection, OCS, BLM

The presentation raises doubts over the real purposes and effectiveness of BLM and other federally sponsored environmental inpact studies of possible OCS lease areas, and questions the adequacy of oil-gas leasing decisions based on one-year environmental assessment studies.

[from Environment Abstracts 6(11):#76-07382. 1976]

C-0904-77
THE ALASKAN OUTER CONTINENTAL SHELF ENVIRONMENTAL ASSESSMENT PROGRAM
Wolfe, D. A. 1975.
Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/ Workshop Proceedings. M. F. Massoglia (compiler). Research Triangle Park, N.C., Research Triangle Institute, 1976. p. 39-53. Held at Atlanta, Georgia, 1975.

Offshore development, Environmental effects, OCS, Alaska, Biological effects, Contaminants, Monitoring, Information Systems

NOAA's research program to assess the environmental impacts of Alaskan OCS oil and gas development is described Research objectives include: characterization and quantification of petroleum-related contaminant and their effects on critical habitats, species, and biological processes; identification and quantification of irreversible effects; development of a pollution monitoring program; and the establishment of an environmental data storage and retrieval bank to provide an information base for all phases of OCS leasing and operation.

[from Environment Abstracts 6(11):#76-07380. 1976]

C-0905-77
FINAL ENVIRONMENTAL IMPACT REPORT FOR RESUMPTION OF DRILLING IN THE SANTA BARBARA CHANNEL FROM EXISTING STANDARD OIL COMPANY OF CALIFORNIA PLATFORMS
Woodward-Clyde Consultants. 1976.
Special report. 113 p.

Offshore drilling, Environmental effects, EIS, Santa Barbara Channel, *Air quality impacts

Presented are revisions to the Draft Environmental Impact Report of the title study. The most significant revisions deal with air quality baseline and potential impacts. Questions and comments from agencies and individuals during the public review of the Draft EIR and the public hearing held in Santa Barbara on May 8, 1976, are provided. Responses to questions and comments follow each statement.

[from Energy Information Abstracts 1(5): #76-23737. 1976]

E. FATE OF OIL IN THE ENVIRONMENT

1. BIODEGRADATION

C-0906-77
MICROBIAL DEGRADATION OF PETROLEUM IN THE ARCTIC
Atlas, R. M., and M. Busdosh. 1976.
Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 79-86. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Crude oil, Microorganisms, Arctic, Alaska

The effects of nutrient concentration, temperature, crude oil chemical composition, and concentration of oil-degrading microorganisms on the biodegradation of oil in Alaskan coastal waters were investigated. Addition of N and P or seeding with petroleum-degrading bacteria increased the rate of degradation in some situations.

[from Proceedings of the Third Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. July, 1976]

C-0907-77
MICROBIAL DEGRADATION OF PETROLEUM
Azarowicz, E. N. 1976.
South African Patent 75 05,088

Biodegradation, Oil spills, Waste oil, Microorganisms, Patent, South Africa

A process for the microbial degradation of oil spills and oily wastes is described.

[from Petroleum Abstracts 17(5): #229,881. 1977]

C-0908-77
BIODEGRADATION OF OIL SLICKS ON THE MARINE ENVIRONMENT
Bartha, R. 1976.
Final report, Contract N00014-67-A-0115-0005. 11 p.

Biodegradation, Oil slicks, Hydrocarbons, Bacteria, Clean-up, *Nutrient enrichment

Biodegradation of petroleum hydrocarbons by marine bacteria was studied with the aim of using bacteria in oil spill cleanup operations. By supplying nitrogen, phosphorus, and iron to an oil slick, the rate of biodegradation can be increased by an order of magnitude or more.

[from Government Reports Announcements 77(1): #AD-A031 739/6GA. 1977]

C-0909-77
AEROBIC DEGRADATION OF HYDROCARBONS IN SOIL. SIGNIFICANCE OF AN INITIAL RISE IN OXYGEN UPTAKE RATE FOLLOWING CONTAMINATION WITH OIL
Blakebrough, N., P. J. Garner, A. H. Knap, J. M. Raisbeck, and D. Heppell. 1976.
Journal of Applied Chemistry and Biotechnology 26(10):550-558.

Biodegradation, Hydrocarbons, Soil, Oxidation, Microorganisms, *Oxygen uptake rate

The increase in the rate of oxygen uptake by the soil due to hydrocarbon addition was investigated using an electrolytic respirometer. Oxidation was not the cause of the increased rate but was probably due to microbial lysis or the release of nutrients induced by addition of the oil.

[from Petroleum Abstracts 17(5): #229,892. 1977]

C-0910-77
MICROBIAL GENETIC ENGINEERING. AN EVALUATION OF BENEFITS AND BIOHAZARDS
Chakrabarty, A. M. 1977.
Genetic Engineering. Cleveland, CRC Press Inc., 1977. 23 p.

Biodegradation, Oil spills, Bacteria, Cleanup, *Microbial genetic engineering

Three areas of genetic engineering research are discussed by the author: oil spill cleanup, enhanced production of methane from cellulosic wastes, and functional expression of bacterial nitrogen fixation genes in plants. The reasons for the genetic development of a multi-plasmid pure culture for oil spill cleanup, the methods used, and an assessment of biohazard potentials in using these micro-organisms for this purpose are presented in Section I.

C-0911-77
HYDROCARBON-USING MICROORGANISMS IN THREE FRESH-WATER ECO-SYSTEMS
Cooney, J. J., and R. J. Summers. 1976.
Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 141-156. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Hydrocarbons, Microorganisms, Freshwater, Ecosystems

Both bacteria, and yeast and fungi are important in hydro-carbon polluted ecosystems. Only 0.1% of the total population grew with hydrocarbons as a sole carbon source. Representative colonies included 54% bacteria, 33% yeasts and 13% filamentous fungi; approximately 30% of each group was able to emulsify kerosene.

[from Proceedings of the Third International Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. July, 1976]

C-0912-77
ACTIVITY OF SOIL BACTERIA ON PETROLEUM WASTE ADJACENT TO AN ACTIVE OIL WELL
Cooper, R. E., and H. G. Hedrick. 1976.
Soil Science 122(6):331-338.

Biodegradation, Waste oil, Oil wells, Bacteria, Soil, *Petroleum waste

Of 10 primary isolates, four bacteria were found to be highly active on petroleum waste and were identified as species of Pseudomonas, Alcaligenes, and Achromobacter. Results of growth experiments showed that all four isolates utilized petroleum waste at high rates in a shake-culture system. Studies on gaseous evolution showed a constant rate of activity as measured by evolved CO_2. Manometric studies showed a slow to moderate rate of oxygen uptake on three selected hydrocarbons.

[from Petroleum Abstracts 17(8): #230,634. 1977]

C-0913-77
SUPERSTRAIN OF OIL-EATING MICROBES
Cottrell, K. 1977.
Sea Frontiers 23(1):28-31.

Biodegradation, Hydrocarbons, Oil slicks, Bacteria, *Supermicrobes

The article discusses the development of a new bacterial strain having the genetic capacity to breakdown simultaneously a variety of oil components. Dr. A. M. Chakrabarty, General Electric Research and Development Center, has combined the genetic makeup of four different strains of hydrocarbonoclastic bacteria that occur in nature into a single superstrain which is able to consume about two-thirds of the hydrocarbons in a crude oil slick.

C-0914-77
THE FATE OF PETROLEUM IN A SOIL ENVIRONMENT
Cresswell, L. W. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 479-482. (American Petroleum Institute No. 4284).

Biodegradation, Oil spills, Soil, Fate, Environmental effects

The fate of oil spilled on soil was studied by experimentally oiling test plots of land, tilling the oil into the top 15-20 cm of soil, and adding fertilizer for nutrients. Paraffinic crudes are found to biodegrade more rapidly than asphaltic crudes; at an oil concentration in soil of 5%, about 60 bbl/acre are degraded annually. No known adverse environmental effects have been observed after over 40 months; the oil appears to stay tightly bound in the top layer of soil, and apparently healthy crops of wheat have been grown in plots with 5-10% oil.

C-0915-77
MICROBIAL POPULATIONS IN COASTAL SURFACE SLICKS
Crow, S. A., W. L. Cook, D. G. Ahearn, and A. W. Bourquin. 1976. Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 93-98. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Hydrocarbons, Bacteria, Oil slicks, Coasts, Freshwater

Bacterial concentrations on the surface were 10 to 100 times greater than those 10 cm below. The surface film bacteria had weak hydrocarbonoclastic and lipolytic activities. A greater proportion of them are capable of growth on freshwater media.

[from Proceedings of the Third International Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. July, 1976]

C-0916-77
PSYCHROPHILIC HYDROCARBON-DEGRADING BACTERIA FROM NARRAGANSETT BAY, RHODE ISLAND, U.S.A.
Cundell, A. M., and R. W. Traxler. 1976.
Material und Organismen 11(1):1-17.

Biodegradation, Hydrocarbons, Bacteria, Sediments, Seawater, Narragansett Bay, Rhode Island

Growth rates and generation times were reported for hydrocarbon degrading bacteria isolated by enrichment culture from littoral sediments and seawater collected in Narragansett Bay.

[from Biological Abstracts 63(1): #169. 1977]

C-0917-77
THE MICROBIAL METABOLISM OF CYCLOHEXANE AND RELATED COMPOUNDS
Donoghue, N. A., M. Griffin, D. B. Norris, and P. W. Trudgill. 1976.
Proceedings of the Third International Biodegradation Symposiun. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 43-56. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Hydrocarbons, Metabolism, Bacteria, *Alicyclic Compounds

Three genera of bacteria have been isolated which are capable of growth with cyclohexanol and cyclopentanol. The steps in the breakdown of these alicyclic hydrocarbons are presented.

[from Proceedings of the Third International Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. 1976]

C-0918-77
RESEARCH ON THE FOULING BIOCENOSIS COMPOSITION IN RECYCLING WATER SYSTEMS OF PETROLEUM PLANTS AND MEASURES TO COMBAT IT
Dzhalilov, R. K., N. I. Karayeva, and N. R. Magerramova. 1976.
Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 113-118. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Wastewaters, Refineries, Recycling

Summary not available.

[from Proceedings of the Third International Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. July, 1976]

C-0919-77
OIL BIODEGRADATION IN THE OCEANS
Floodgate, G. D. 1976.
Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 87-92. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Crude oil, Oceans, Microorganisms, *Nutrient requirements

The nutrient requirements for biodegradation are clarified. The range of microorganisms involved in biodeterioration has been extended. However, many other factors influencing the rate of biodegradation still remain to be investigated.

[from Proceedings of the Third Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. July,1976]

C-0920-77
USE OF GENETICALLY-ENGINEERED MULTI-PLASMID MICROORGANISMS FOR RAPID DEGRADATION OF FUEL HYDROCARBONS
Friello, D. A., J. R. Myerore, and A. M. Chakrabarty. 1976. Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 205-214. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Hydrocarbons, Bacteria, *Multi-plasmid microorganisms

Transmissible plasmids in different strains of Pseudomonas putida carry the genes specifying enzymes involved in the biodegradation of a number of hydrocarbons. Transfer of these plasmids into one strain can create a multi-plasmid strain capable of growing faster with crude oil than any of the naturally-occurring mono-plasmid parents.

[from Proceedings of the Third International Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. July, 1976]

C-0921-77
METHODS AND INTERPRETATION IN MEASUREMENT OF OIL BIO-DEGRADATION RATE
Gibbs, C. F. 1976.
Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 127-140. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Hydrocarbons, Oxidation, *Oil biodegradation rate

Various methods of measuring the extent and rate of oil biodegradation are discussed. Relationships between oxidation rate and the supply of nutrient N were obtained. Oxygen uptake implied a lesser amount of destruction than did recovery of oil. Changes in the physical properties of the oil are noted.

[from Proceedings of the Third International Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. July, 1976]

C-0922-77
INITIAL REACTIONS IN THE BACTERIAL DEGRADATION OF AROMATIC HYDROCARBONS [English summary]
Gibson, D. T. 1976.
Zentralblatt fuer Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, Abteilung 1: Originale, Reiche B 162(1-2):157-168.

Biodegradation, Aromatic hydrocarbons, Bacteria, *Mammals

Mammals incorporate one atom of molecular oxygen into aromatic hydrocarbons to form arene oxides. Bacteria incorporate two atoms of molecular oxygen to form cis-dihydrodiols; arene oxides are hydrated and produce trans-dihydrodiols in mammals.

[from Chemical Abstracts 85(19): #139564k. 1976]

C-0923-77
MICROBIAL DEGRADATION OF CARCINOGENIC HYDROCARBONS AND RELATED COMPOUNDS
Gibson, D. T. 1976.
Sources, Effects and Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 224-238. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August, 1976.

Biodegradation, Aromatic hydrocarbons, PAH, Carcinogens, Microorganisms

Metabolic activation by organisms is believed to cause the carcinogenicity of several polycyclic aromatic hydrocarbons (PAH). This paper reviews the bacterial and mammalian oxidation processes for aromatic hydrocarbons and polycyclic aromatic hydrocarbons that are responsible for potentially carcinogenic compounds.

C-0924-77
MICROBIAL DEGRADATION OF POLYCYCLIC AROMATIC HYDROCARBONS
Gibson, D. T. 1976.
Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd. 1976. p. 57-65. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, PAH, Microorganisms, Bacteria , Carcinogens

Mammalian microsomes oxidize polycyclic aromatic hydrocarbons (PAH) to arene oxides, the suggested toxic or carcinogenic agents. Results of bacterial degradation studies indicate that bacteria oxidize PAH by a different mechanism.

[from Proceedings of the Third International Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. July, 1976]

C-0925-77
MICROBIOLOGICAL ASPECTS OF SUPERSONIC AIRCRAFT FUEL
Hill, E. C., and A. R. Thomas. 1976.
Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 157-176. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Fuels, Microorganisms, *Supersonic aircraft fuel

Summary not available.

[from Proceedings of the Third International Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. July, 1976]

C-0926-77
BIODEGRADATION OF HIGH-OCTANE GASOLINE
Jamison, V. W., R. L. Raymond, and J. O. Hudson. 1976.
Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 187-196. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Gasoline, Groundwater, *Nutrient addition

Groundwater contaminated with gasoline was treated with fertilizer to enhance biodegradation. Cultures isolated from the groundwater were evaluated for their ability to degrade gasoline. Several components did not appear to be utilized for growth, which raises the question of whether complete degradation of the gasoline is possible.

C-0927-77
BIODEGRADATION OF HIGH-OCTANE GASOLINE IN GROUNDWATER
Jamison, V. W., R. L. Raymond, and J. O. Hudson, Jr. 1975.
Developments in Industrial Microbiology 16:305-312.

Biodegradation, Gasoline, Groundwater, Pennsylvania, *Nutrient addition

Microbial degradation was studied as a possible means of removing the remaining gasoline in the contaminated water supply of Amber, Pennsylvania, after a gasoline pipeline leak. Laboratory studies showed there was a small microbial population that could utilize high-octane gasoline as the sole carbon source, but nitrogen, phosphate and oxygen were limiting factors for maximum utilization. Results of analyses of the water after the addition of fertilizer and air to several wells are discussed.

C-0928-77
THE VARIETY OF PETROLEUMS AND THEIR DEGRADATIONS
Kallio, R. E. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 214-223. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August, 1976.

Biodegradation, Crude oil, Hydrocarbons, Analytical techniques, *Petroleum varieties

"Petroleums are all different from each other. The reasons, the processes, the alterations by which these changes are arrived at are noted. The implications of these are directed toward environmental studies of oil spills and their effects on the biosphere."

C-0929-77
THE TWO FACES OF BIODETERIORATION
Lamanna, C. 1976.
Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 21-28. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Hydrocarbons, Microorganisms

Summary not available.

[from Proceedings of the Third International Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. July, 1976]

C-0930-77
PETROLEUM-OXIDIZING MICROORGANISMS IN THE SOUTHERN AND CENTRAL PARTS OF THE ATLANTIC OCEAN [in Russian]
Lebed, A. A. 1975.
Biologicheskie Issledovaniya Trop. Okeana. V. N. Greze (ed.). Kiev, "Naukova Dumka," 1975. p. 10-16.

Biodegradation, Oxidation, Microorganisms, Bacteria, Pollution control, Atlantic Ocean

Forty-two of the 109 heterotrophic microorganisms isolated from the southern and central parts of the Atlantic Ocean showed growth on media containing petroleum or petroleum products. More than 50% of these bacteria were isolated from surface water samples or samples collected at 100m, where a significant difference in temperature exists. The oil-oxidizing bacteria belonged to the genera Pseudobacterium, Pseudomonas, Micrococcus, and Bacterium. The significance of these bacteria in eliminating marine oil pollution is discussed.

[from Chemical Abstracts 85(25): #188936s. 1976]

C-0931-77
METABOLISM OF PETROLEUM HYDROCARBONS IN MARINE SEDIMENTS
Lee, R. F. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 333-344. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August, 1976.

Biodegradation, Hydrocarbons, Metabolism, Sediments, Microorganisms, Marine organisms, Benthos

Thirty-nine recent studies on the metabolism and biodegradation of petroleum hydrocarbons by benthic microbes and other marine organisms are synthesized to trace the general pathways of hydrocarbon breakdown in marine sediments.

C-0932-77
BIODEGRADATION OF PETROLEUM HYDROCARBONS BY MARINE MICROBES
Lee, R. F., and C. Ryan. 1976.
Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 119-126. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Hydrocarbons, Microorganisms, Seawater

Radioactive hydrocarbons were added to water samples from three areas. In the first 24 hours, between 1% and 5% of the hydrocarbon was degraded and released as $^{14}CO_2$. The rates of degradation of alkylated aromatics, pure aromatics and paraffinics differed. No evidence existed for hydrocarbon degradation by isolated phytoplankton.

[from Proceedings of the Third International Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. July, 1976]

C-0933-77
HYDROCARBON DEGRADATION IN THE PRESENCE OF OTHER ORGANIC SUBSTANCES BY BACTERIA ISOLATED FROM SEAWATER
Le Petit, J., and S. Tagger. 1976.
Canadian Journal of Microbiology 22(11):1654-1657.

Biodegradation, Hydrocarbons, Bacteria, Seawater, *Hexadecane, *Organic substances

Effects were measured of the presence of two organic substances on three bacterial strains isolated from seawater and grown on hexadecane. Acetate was found to reduce growth of all strains and particularly the hexadecane degradation by Acinetobacter sp. Trypticase-phytone, on the other hand, promoted the degradation by the three strains.

[from Petroleum Abstracts 17(2): #228,862. 1977]

C-0934-77
BACTERIAL DEGRADATION OF BUNKER 6C FUEL OIL
Liu, D., and P. T. S. Wong. 1976.
Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 175-186. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Fuel oil, Bacteria, Soil

A bacterium isolated from the soil of a local refinery was able to degrade Bunker 6C fuel oil, with the n-alkane fractions being the primary target for degradation. The bacteria could oxidize the Bunker 6C fuel oil over a wide range of oil concentrations.

[from Proceedings of the Third International Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. July, 1976]

C-0935-77
A PRELIMINARY MODEL OF OIL DECOMPOSITION IN SOILS
McGill, W. 1975.
Conference on the Environmental Effects of Oil and Salt Water Spills on Land, Banff, Alberta, 1975. Alberta Environment, and University of Calgary, 1975. p. 291-312.

Biodegradation, Oil spills, Soil, Decomposition, Microorganisms, Models, *Nutrient demand

A model of oil decomposition in soil was tested to determine its sensitivity to nitrogen remineralization at high and low oil concentrations. The rate of oil decomposition and amount of oil were found to be more important in controlling nitrogen demand.

C-0936-77
SELF PURIFICATION OF THE SEAS OF NORTHERN EUROPE BY THE REMOVAL OF PETROLEUM PRODUCTS [in Russian]
Mironov, O. G., and A. A. Lebed. 1975.
Biologicheskoe Samoochishchenie i Formirovanie Kachestva Vody, Materialy Vsesoyuznogo Simpoziuma po Sanitarnoi Gidrobiologii, 2nd. p. 22-24.

Biodegradation, Petroleum products, Microorganisms, Barent Sea, Baltic Sea, Atlantic Ocean

The degree of petroleum product decomposition by microorganisms in the Baltic and Barent Seas and in the north-eastern Atlantic Ocean was investigated. The quantity of oxidizing microorganisms was directly proportional to the degree of water contamination.

[from Chemical Abstracts 86(6): #34052j. 1977]

C-0937-77
METABOLISM OF HYDROCARBONS BY MICROORGANISMS [English summary]
Neryng, A. 1976.
Postepy Mikrobiologii 15(1):57-69.

Biodegradation, Hydrocarbons, Metabolism, Microorganisms

"A review with 63 references of the assimilation of n-alkanes and other hydrocarbons, mechanisms of n-alkane oxidation by microorganisms, and the substrate specificity of microbial enzymes for the hydrocarbons."

[from Chemical Abstracts 85(21): #156154u. 1976]

C-0938-77
ROLE OF MICROORGANISMS IN THE WATER ENVIRONMENT [English summary]
Pawlaczyk-Szpilowa, M. 1976.
Postepy Mikrobiologii 15(2):17-27.

Biodegradation, Oil spills, Microorganisms

"A review with 39 references."

[from Chemical Abstracts 86(6): #34037h. 1977]

C-0939-77
THE MICROBIAL DEGRADATION OF DIESEL OIL IN MULTISTAGE CONTINUOUS CULTURE
Pritchard, P. H., R. M. Ventullo, and J. M. Suflita. 1976.
Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 67-78.
Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Fuel oil, Microorganisms, Freshwater, *Continuous culture

Oil layers approximately 1-2 mm thick were placed on samples of freshwater. Microbial growth appeared in 5-10 days; the oil layer was completely removed in 120 days. The degradation process was sensitive to environmental variables.

[from Proceedings of the Third Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. July, 1976]

C-0940-77
OXIDATION OF PETROLEUM AND PETROLEUM PRODUCTS BY MICRO-ORGANISMS ISOLATED FROM THE CASPIAN SEA [in Russian]
Salmanov, M. A., S. N. Aliev, and Z. N. Shakhmatova. 1975. Mikrobiol. Mebody Bor'by Zagryaz. Okruzhayushchei Sredy, Tezisy Dokl. Konf., 1975.
V. A. Lambina and V. N. Uarova (eds.). Pushchino USSR, Akad. Nauk SSSR, 1975. p. 105-106.

Biodegradation, Crude oil, Petroleum products, Bacteria, Caspian Sea, USSR

One hundred sixty-four strains of hydrocarbon-degrading bacteria from the Caspian Sea were cultured under laboratory conditions on petroleum and petroleum products. Maximal growth occurred with crude oil and kerosene. Biodegrading bacteria were more abundant in the water than in the bottom sediments.

[from Chemical Abstracts 86(7): #39962r. 1977]

C-0941-77
PETROLEUM MICROBIOLOGY
Schwartz, R. D., and W. W. Leathen. 1976.
Industrial Microbiology. B. M. Miller and W. Litsky (eds.). New York, McGraw-Hill, 1976. p. 384-411.

Biodegradation, Crude oil, Petroleum products, Environmental effects, Microorganisms, Oxidation

"A review with 40 references on environmental effects of microbes on petroleum and petroleum products, microbial oxidation of hydrocarbons, and beneficial aspects of petroleum microorganisms."

[from Chemical Abstracts 85(23): #173909e. 1976]

C-0942-77
SOME DATA ON THE MICROFLORA OF THE GROUNDWATERS FROM THE SOVETSKOE PETROLEUM DEPOSIT OF THE TOMSK DISTRICT [in Russian]
Shamolina, E. P., and A. D. Nazarov. 1975.
Izvestiya Tomskogo Politekhnincheskogo Instituta No. 237: 59-62.

Biodegradation, Microorganisms, Hydrocarbons, Petroleum products, Crude oil, Groundwater, USSR

"Microorganisms oxidizing hexane, phenol, benzene, and petroleum and CH_4-producing microorganisms were found in groundwaters from crude oil-containing geologic layers 6-2200 m deep."

[from Chemical Abstracts 85(21): #156417g. 1976]

C-0943-77
USE OF MICROORGANISMS UNDER SPECIAL MEDIUM CONDITIONS. I. USE OF PETROCHEMICAL PRODUCTS BY MICROORGANISMS [in Japanese]
Uyema, H., and H. Horikoshi. 1976.
Hakko To Kogyo 34(11):851-865.

Biodegradation, Petrochemicals, Microorganisms, Metabolism

This review with 93 references includes such topics as the conditions of growth for microorganisms, characteristics of petrochemical products as substrates, and microorganisms utilizing petrochemical products as C sources.

[from Chemical Abstracts 86(7): #39846f. 1977]

C-0944-77
MODELLING OF THE BREAKDOWN AND THE MOBILIZATION OF HYDROCARBONS IN UNSATURATED SOIL LAYERS
Verstraete, W., R. Vanloocke, R. De Borger, and A. Verlinde. 1976.
Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 99-112. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Hydrocarbons, Soils, Monitoring, Models

Three different zones occur in hydrocarbon polluted soils. In each layer, monitoring of the biodegradation process is by different technique. In the layer on a level with the aquifer, biodegradation is mainly anoxic. Models of the various processes are discussed.

[from Proceedings of the Third International Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. July, 1976]

C-0945-77
PETROLEUM: DEGRADATION BY ESTUARINE ORGANISMS
Walker, J. D., and R. R. Colwell. 1976.
Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 197-204. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Crude oil, Microorganisms, Estuaries, Chesapeake Bay

This paper reports on the seasonal variation in the numbers and activity of petroleum-degrading microorganisms from oil-contaminated and oil-free environments. Information on the susceptibility of petroleum to microbial degradation by indigenous microorganisms of Chesapeake Bay is presented.

[from Proceedings of the Third International Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. July, 1976]

C-0946-77
SAMPLING DEVICE FOR MONITORING BIODEGRADATION OF OIL AND OTHER POLLUTANTS IN AQUATIC ENVIRONMENTS
Walker, J. D., and R. R. Colwell. 1977.
Environmental Science and Technology 11(1):93-95.

Biodegradation, Crude oil, Bacteria, Monitoring, Sampling, Fate

The fate of crude oil in the aquatic environment was studied in a sampling chamber for four weeks; 97% of the oil was removed by biodegradation. An increase in the total aerobic, heterotrophic microbial population, including lipolytic bacteria, was noted and was accompanied by a decrease in the amylolytic bacteria population.

C-0947-77
ROLE OF AUTOCHTHONOUS BACTERIA IN THE REMOVAL OF SPILLED OIL FROM SEDIMENT
Walker, J. D., and R. R. Colwell. 1977.
Environmental Pollution 12(1):51-56.

Biodegradation, Oil Spills, Sediments, Bacteria, Chesapeake Bay, *Colgate Creek

The sediment of Colgate Creek in Baltimore Harbor of Chesapeake Bay showed a significant increase in oil concentration after an oil spill. Within a month after the spill, oil concentration diminished by 75%; this decrease is attributed to bacterial degradation.

C-0948-77
THE MICROBIAL UTILIZATION OF BUTADIENE
Watkinson, R. J., and H. J. Somerville. 1976.
Proceedings of the Third International Biodegradation Symposium. J. M. Sharpley and A. M. Kaplan (eds.). Barking, Essex, Applied Science Publishers, Ltd., 1976. p. 35-42. Symposium held in Kingston, Rhode Island, 17-23 August, 1975.

Biodegradation, Hydrocarbons, Metabolism, Microorganisms, *Butadiene

Summary not available.

[from Proceedings of the Third International Biodegradation Symposium. List of Contents. Applied Science Publishers, Ltd. July, 1976]

C-0949-77
SURFACE TENSION SPREADING OF CRUDE OIL ON ICE
Chen, E. C., and D. K. Charles. 1976.
Marine Science Communications 2(1):1-11.

Crude oil, Ice, Spreading, *Oil-on-ice

The spreading of crude oil on ice passes through three distinct stages: gravity-inertia, gravity-viscous, and surface tension viscous. Spreading experiments were carried out on artificial ice surfaces and the surface tension-viscous spreading of crude oil on ice was studied.

[from Underwater Information Bulletin 8(6): #7612/1350. 1976]

C-0950-77
CHARACTERIZATION OF THE EVAPORATION RATES OF COMPLEX HYDROCARBON MIXTURES UNDER ENVIRONMENTAL CONDITIONS
Goodwin, S. R., D. Mackay, and W. Y. Shiu. 1976.
Canadian Journal of Chemical Engineering 54(4):290-294.

Oil spills, Hydrocarbons, Evaporation, Solution

Physical parameters governing evaporation rates of spilled hydrocarbon mixtures such as petroleum are discussed, and the basis of a methodology for establishing evaporation rates under various environmental conditions is outlined. Evaporation and dissolution rates under spreading and non-isothermal conditions are briefly considered.

[from Chemical Abstracts 86(2):#6929g. 1977]

C-0951-77
OIL IN SEA ICE
Lewis, E. L. 1976.
Pacific Marine Science Report No. 76-12. 26 p.

Ice, Oil spills, Movement, Behavior, Offshore drilling, Environmental effects, Arctic, Canada, *Blowouts, *Oil in ice

The following topics are covered: formation and structure of sea ice, movement of spilled oil from the sea-bed to the sea surface, oil at the ice/water interface, migration of oil through ice, oil at the ice surface, and effects of blowouts.

[from Petroleum Abstracts 17(7): #230,423. 1977]

C-0952-77
THE PHYSICAL BEHAVIOR OF OIL SPILLS ON NORTHERN TERRAIN
Mackay, D. 1975.
Conference on the Environmental Effects of Oil and Salt Water Spills on Land, Banff, Alberta, 1975. Alberta Environment, and University of Calgary, 1975. p. 81-110.

Oil spills, Behavior, Statistical analysis, Weathering, Pipelines, Canada, Inland

This paper deals specifically with the terrain of the Mackenzie Valley which will probably be the location of an oil pipeline to be constructed in the 1980's. An analysis of the spill frequency data indicates that this pipeline may be subject to about two large spills per year, the average volume being about 1,600 m^3. In predicting the resultant physical behavior, the following factors must be defined: weather (or climate), the oil properties, the condition of the soil and the ground cover, and the topography.

C-0953-77
WATER SOLUBLE HYDROCARBONS AND THEIR DETECTION
Peake, E., M. T. Strosher, M. Strosher, and G. Hodgson. 1975.
Conference on the Environmental Effects of Oil and Salt Water Spills on Land, Banff, Alberta, 1975. Alberta Environment, and University of Calgary, 1975. p. 184-228.

Oil spills, Behavior, Hydrocarbons, Groundwater, *Surface waters, *Water-soluble fractions

A number of experimental observations dealing with the interaction between spilled oil and surface waters, shallow near-surface groundwaters, and subsurface waters are considered. In the event of an oil spill, the water-soluble hydrocarbons, which are mainly methyl benzene and methyl naphthalene compounds, are rapidly dissolved in surface waters. The water-naphthalene compounds are strongly fluorescent and provide a useful basis for detecting oil leaks. Some water-soluble compounds are persistent, continuing in the water for at least two and one-half years even with continuous exposure to the atmosphere.

C-0954-77
MODELING OF OIL EVAPORATION IN AN AQUEOUS ENVIRONMENT
Wang, H., W. E. Yang, and C. P. Huang. 1976.
Final report, CMS-RANN-3-76.

Models, Evaporation, Oil spills, Weathering

A numerical model developed to predict changes in oil through evaporation is summarized. Evaporation dominates in the early stages of the weathering of oil and petroleum products.

[from University of Delaware Marine Publications Catalog. p. 31. Summer, 1976]

3. CHEMICAL CHANGES OF OIL

C-0955-77
TOXIC HYDROPEROXIDES: PHOTOCHEMICAL FORMATION FROM PETROLEUM CONSTITUENTS
Larson, R. A., D. W. Blankenship, and L. H. Hunt. 1976. Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 298-308. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August, 1976.

Oxidation, Fuel oil, Toxicity, Yeasts, *Hydroperoxides

Short-term ultraviolet radiation adjusted to simulate sunlight was found to form hydroperoxides in No. 2 fuel oil. These substances were produced from the benzylic hydocarbons, were relatively water soluble and suppressed the growth of yeast cultures at low concentrations. Some of their breakdown products, including carbonyl compounds, phenols and acids, also inhibited growth.

4. GENERAL FATE OF OIL

C-0956-77
NOAA'S ACTIVITIES IN ENERGY RELATED MEASUREMENT AND MONITORING R&D
Bestul, A. B., and W. L. Pugh. 1976.
EPA National Conference on Health, Environmental Effects, and Control Technology of Energy Use, Washington, D.C., 1976. 5 p.

Oil spills, Fate, Movement, Sampling, Monitoring, Oceans, NOAA

Four oceanic projects will develop from NOAA's energy-related activities: oil spill concentrations and trajectory forecasting, a shipboard environmental data acquisition system, a water sampling program, and standardized marine monitoring techniques.

[from Environment Abstracts 6(9): #76-05862. 1976]

C-0957-77
THE FATE OF PETROLEUM IN THE OPEN OCEAN
Butler, J. N., B. F. Morris, and T. D. Sleeter. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 287-297. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August, 1976.

Oil spills, Crude oil, Fate, Evaporation, Dispersion, Biodegradation, Oxidation, Tar

Petroleum spilled at sea undergoes evaporation, dispersion and degradation, including photochemical oxidation and biodegradation. Although physicochemical dispersion processes which distribute hydrocarbons throughout the environment can be studied by quantitative models, the degradation processes that actually remove petroleum hydrocarbons from the environment are poorly understood as is the ultimate fate of petroleum at sea.

C-0958-77
OIL, WATER AND SQUIGGLY THINGS
Claggett, F. M. 1976.
Petroleum Today 17(3):20-21.

Fate, Oil Spills, Biological effects, Marine organisms, API

The American Petroleum Institute has invested about $2.75 million to date in fate-of-oil studies. A typical example of an oil industry-sponsored research project on the effects of an oil spill on marine plants and burrowing organisms is briefly reviewed.

C-0959-77
THE CONCENTRATIONS OF OIL IN SEAWATER RESULTING FROM NATURAL AND CHEMICALLY INDUCED DISPERSION OF OIL SLICKS
Cormack, D., and J. A. Nichols. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 381-385. (American Petroleum Institute No. 4284)

Oil spills, Crude oil, Cleanup, Dispersants, Spreading, Emulsification, Weathering

Factors relating to the dissipation of Ekofisk and Kuwait crude oil spills are discussed and chemical dispersants used to cleanup the spills are presented. Evaporation, emulsion formation, spreading, and natural dispersion of oil into the water column are also discussed. Test results indicate that spreading of the oil leads to extensive evaporative losses. No significant effects on marine life were reported as a result of dispersing oil slicks.

C-0960-77
INFLUENCE OF SAMPLING METHOD ON THE CHEMICAL COMPOSITION OF WATER SURFACE FILM
Daumas, R. A., P. L. Laborde, J. C. Marty, and A. Sailot. 1976.
Limnology and Oceanography 21(2):319-326.

Hydrocarbons, Refineries, Mediterranean Sea, Sampling, *Surface microlayer composition

Surface microlayer composition was compared at two sites, having different degrees of water pollution, near the northern Mediterranean coast. Eutrophication due to river runoff and hydrocarbon pollution from refinery effluents may contribute to an increase in the enrichment factor.

C-0961-77
SUBSURFACE BIOPHYSIOCHEMICAL TRANSFORMATIONS OF SPILLED CRUDE OIL
Duffy, J. J., E. Peake, and M. F. Mohtadi. 1975.
Conference on the Environmental Effects of Oil and Salt Water Spills on Land, Banff, Alberta, 1975. Alberta Environment, and University of Calgary, 1975. p. 136-183.

Oil spills, Inland, Fate, Crude oil, Models,Contamination Groundwater

The persistence of water soluble hydrocarbons from crude oil spills on land was investigated as a source of groundwater contamination by means of theoretical models, percolation experiments, and core sampling at spill sites. Based on the results obtained, it is concluded that the water soluble components of crude oil spilled on land are very persistent and represent long-term environmental threats to groundwater.

C-0962-77
SUBSURFACE PERSISTENCE OF CRUDE OIL SPILLED ON LAND AND ITS TRANSPORT IN GROUNDWATER
Duffy, J. J., E. Peake, and M. F. Mohtadi. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 475-478. (American Petroleum Institute No. 4284)

Fate, Oil spills, Inland, Crude oil, Contamination, Groundwater, *Persistence

The persistence of petroleum hydrocarbons in groundwater was studied using theoretical models, laboratory percolation experiments, and analysis of core samples from spill sites. Even with some biodegradation and evapotranspiration activity, the oil components constitute extremely persistent contaminants and require enormous quantities of water to reduce the spill leachate to acceptable drinking water levels.

C-0963-77
THE USE OF A DIAGNOSTIC CIRCULATION MODEL FOR OIL TRAJECTORY ANALYSIS
Galt, J. A., and C. H. Pease. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 447-454. (American Petroleum Institute No. 4284)

Models, Oil spills, Movement, Drift, OCS, Gulf of Alaska

A diagnostic ocean current circulation model has been developed for studying oil trajectories along continental shelf regions. In this report, the model formulation is outlined and test applications in predicting currents and pollutant trajectories for the Northeast Gulf of Alaska are presented and compared with observational data.

C-0964-77
A PROBABILISTIC MODEL FOR DISPERSIVE OIL LOSSES BENEATH OIL BOOMS
Fallah, M. H., and R. M. Stark. 1976.
Ocean Engineering 3(6):383-390.

Oil slicks, Dispersions, Containment, Booms, Models, *Dispersive oil losses

Wave action and current turbulence can cause substantial oil losses from spill containment booms. The process of "dispersive oil loss," in which vertically dispersed oil particles when carried by current escape beyond the boom perimeter, is studied using a random walk model. Probabilistic descriptions for the volume of oil loss are derived. The model's application using a hypothetical oil slick is illustrated.

C-0965-77
FATE OF OIL FROM THE SUPERTANKER METULA
Hann, R. W., Jr. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 465-468. (American Petroleum Institute No. 4284)

Metula oil spill, Fate, Tankers, Environmental effects, Beaches, Estuaries, Marine organisms, Strait of Magellan

The Metula grounding and oil spill disaster of August, 1974, in which nearly 54,000 tons of crude and fuel oil were spilled into the Strait of Magellan, is reviewed. The report summarizes the initial and long-term effects of the oil on the beaches, estuaries, waterfowl, and marine life of Tierra del Fuego. The oil is disappearing from the beaches at varying, but generally faster rates than from estuaries and protected areas. No attempt at cleanup was made and the ultimate fate of the oil is as yet uncertain.

C-0966-77
INVESTIGATION, PREDICTION, AND CONTROL OF THE CONTAMINATION OF GROUNDWATER BY OIL
Harper, T. R. 1976.
Petroleum Review 30(356):484-487.

Groundwater, Contamination, Hydrocarbons, Movement, Pollution Control

Refineries,tank farms, terminals, and pipelines are all capable of leaking hydrocarbons into groundwater. Methods of studying and controlling the subsurface migration of hydrocarbons are discussed, and the possibilities and consequences of subsurface contamination by hydrocarbons are assessed.

[from Petroleum Abstracts 16(50):#227,860. 1976]

C-0967-77
STORM RELATED OIL SPILL MOVEMENT ON THE BEAUFORT SEA SHELF
Hufford, G. L., I. M. Lissauer, and B. D. Thompson. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 455-460.
(American Petroleum Institute No. 4284)

Models, Oil spills, Drift, Shorelines, OCS, Beaufort Sea, *Storm modeling

A storm model which incorporates historical storm data has been developed for studying the wind drift trajectories of oil spills along the Beaufort Sea coast. The probability of an oil slick impacting the shoreline from five different sites and under different storm conditions is discussed.

C-0968-77
NEW YORK HARBOR OIL DRIFT PREDICTION MODEL
Kollmeyer, R. C., and M. E. Thompson. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 441-446.
(American Petroleum Institute No. 4284)

Models, Oil spills, Harbors, Spreading, Drift, New York

The spreading behavior and drift of oil spills in New York Harbor were studied using computer modeling techniques. The computer model equations are reviewed, and the parameters incorporated in the simulation, which include tidal currents, Hudson River flow, wind direction and velocity,are discussed.

C-0969-77
PRIORITIES IN FATE OF OIL SPILL RESEARCH
Kolpack, R. L. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 483-486. (American Petroleum Institute No. 4284)

Models, Oil spills, Fate, Hydrocarbons, Spreading, Solution, Emulsification, Adsorption, Decomposition

A computer simulation model was used to study the interaction of different petroleum hydrocarbons with varying marine environmental conditions. Processes active at the water surfaces are considered to be most important. Suggested high priority research topics include: spreading, mixing, dissolution, emulsification, photochemical degradation, bottom transport and degradation, sorption of oil on particulates, and coordinated studies of nearshore processes.

C-0970-77
ELEMENTS OF MASS BALANCE RELATIONSHIPS FOR OIL RELEASED IN THE MARINE ENVIRONMENT
Kolpack, R. L., and N. B. Plutchak. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 345-357. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August, 1976.

Models, Hydrocarbons, Oil spills, Oceans, Fate, Spreading, Evaporation, Biodegradation

A three-dimensional computer simulation model was designed to study the interaction and effects of variables which influence the composition, quantity and spatial distribution of hydrocarbons in the environment. For processes such as spreading, evaporation, mixing, dissolution and microbial degradation of oil, more than 40 different environmental variables were taken into account, including air and water temperature, wind velocity, water currents, solar radiation, dissolved oxygen and microbial populations.

C-0971-77
FATE AND EFFECTS OF OIL ON MARINE LIFE: PROGRESS REPORT ON RESEARCH SPONSORED BY THE AMERICAN PETROLEUM INSTITUTE
Lasday, A. H., and E. W. Mertens. 1976.
Offshore Technology Conference, 8th, Houston, Texas, 1976. OTC paper No. 2449. p. 275-283. (Also in Journal of Petroleum Technology November, 1976:1285-1288).

Fate, Toxicity, Oil spills, Contamination, Marine organisms, API

The results of API research into the acute and chronic effects of contaminants upon marine organisms are summarized. The research suggests that temporary exposure of a marine organism to oil does not result in permanent contamination. The composition of spilled oil changes rapidly with time, and toxicity is reduced by evaporation of the most toxic compounds. Thus, residues of oil after an offshore-platform mishap become relatively inert before they reach the most biologically sensitive shoreline area.

C-0972-77
FATE OF PETROLEUM COMPONENTS IN ESTUARINE WATERS OF THE SOUTHEASTERN UNITED STATES
Lee, R. F. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 611-616. (American Petroleum Institute No. 4284)

Hydrocarbons, Fate, Estuaries, Rivers, Atlantic coast, PAH, Adsorption, Biodegradation

Radiolabeled hydrocarbons and phenols were added to samples of estuarine river waters of the U.S. south Atlantic coast in order to observe the biodegradation and adsorption of hydrocarbons to particulates. The higher-weight polycyclic aromatic hydrocarbons in river waters were subject to low degradation rates and were found to preferentially adsorb onto detrital particles composed of a mixture of clay, organic matter, plankton remains, and living microbes.

C-0973-77
A COMPUTER SIMULATION TECHNIQUE FOR OIL SPILLS OFF THE NEW JERSEY - DELAWARE COASTLINE
Lissauer, I. M., J. C. Bacon, and M. C. Miller. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 437-440.
(American Petroleum Institute No. 4284)

Models, Oil spills, Movement, Coasts, Offshore drilling, Ports, New Jersey, Delaware

Oil slick trajectories and impact locations were predicted for spills from two potential deepwater ports and two drilling sites off the New Jersey-Delaware coastline using a computer generated model. This report shows spill movement generated by severe conditions caused by a typical low-pressure coastal winter storm and those resulting from a typical summer high pressure system situated off the U.S. east coast.

C-0974-77
FATE OF CRUDE OIL SPILLED IN A SIMULATED ARCTIC ENVIRONMENT
MacGregor, C., and A. Y. McLean. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 461-464.
(American Petroleum Institute No. 4284)

Oil spills, Fate, Arctic, Crude Oil, Evaporation, Weathering, Solution, Emulsification, Tar

The title study was conducted under laboratory conditions in order to understand changes in physical properties and chemical composition of crude oil spilled on cold water. Evaporation removed the largest quantity of the oil, whereas sinking and solution was minimal. The oil rapidly emulsified and in a matter of days coagulated into extremely persistent, non-weathering tarballs.

C-0975-77
WEATHERING OF OIL SPILLED ON COLD, OCEANIC WATER WITH PARTICULAR REFERENCE TO SULFUR CONTAINING COMPOUNDS
MacGregor, D. R. C. 1975.
Masters Thesis, Dalhousie University, Halifax, Nova Scotia.

Crude oil, Oil spills, Weathering, Tar, Evaporation, Solution, *Sulfur compounds

The simulated weathering of crude oil from the liquid to the tarball state was studied with emphasis on the detection of changes in the sulfur content of the oil. Evaporation removed most of the spilled oil; solution was minimal at first but increased with time. Tarball formation was rapid and resulted in a complete cessation of weathering effects. Elemental sulfur fractions in the oil decreased with weathering, whereas the relative amount of organic sulfur increased with time.

C-0976-77
SEDIMENTS - SOURCES OR SINKS FOR PETROLEUM HYDROCARBONS?
Meyers, P. A. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 309-324. Proceedings of the Symposium, American University, Washington, D. C. 9-11 August, 1976.

Hydrocarbons, Sediments, Fate, Crude oil, Behavior, Sources, Environmental effects

The adsorption and incorporation of petroleum hydrocarbons in sediments, and conversely the slow release of hydrocarbons by sediments into overlying waters were studied; results were compared with the behavior of biogenic hydrocarbons from Lake Huron sediments and other areas. It is concluded that burial in sediments can effectively prevent further interaction between trapped hydrocarbons and the environment. However, hydrocarbons in surface sediments can continue to interact with surrounding waters by physical reworking of the sediments, bioturbation, or solution.

C-0977-77
PHOTO-OXIDATION OF CRUDE OILS
Nagata, S., and G. Kondo. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 617-620. (American Petroleum Institute No. 4284)

Crude oil, Chemical analysis, Chromatography, Oxidation, Evaporation, Biodegradation, *Photooxidation

Gas-liquid chromatography was used to analyze changes with elapsed time for five different crude oils. Changes monitored included specific gravity, viscosity and amount of water in oil. Processes of evaporation, biodegradation and photodecomposition were studied. Evaporation affected mainly

the paraffins with low boiling points; biodegradation affected mainly the normal paraffins. Aromatic and heteroaromatic hydrocarbons which were not readily removed by biodegradation or evaporation were decomposed by photo-irradiation.

C-0978-77
THE ENVIRONMENTAL LOAD AND CYCLE OF POLYCYCLIC AROMATIC HYDROCARBONS
Suess, M. J. 1976.
The Science of the Total Environment 6(3):239-250.

PAH, Carcinogens, Fate, Decomposition, Environment effects

The formation, degradation and environmental effects of carcinogenic polycyclic aromatic hydrocarbons (PAH) are reviewed. Various natural and manmade PAH sources, such as open burning, heating, power generation, combustion of refuse, oil, and hydrocarbon fuels, are examined.

C-0979-77
1970 ARROW BUNKER C OIL IN 1975: RESIDENCE TIME AND MOBILITY OF STRANDED OIL - IMPLICATIONS
Vandermeulen, J. H. 1975.
Conference on the Environmental Effects of Oil and Salt Water Spills on Land, Banff, Alberta, 1975. Alberta Environment, and University of Calgary, 1975. p. 111-135.

Oil spill, Beaches, Fate, Movement, Sediments, Biological effects, Plankton, Benthos, Chedabucto Bay

The degree of contamination and pattern of residual oiling of a typical low-energy beach in a sheltered lagoon is described; observations on movement, residence time, and re-entry of Bunker C are presented. Large amounts of the fuel oil remain stranded along the shoreline of Chedabucto Bay five years after the grounding of the "Arrow". The stranded oil is slowly being released to the littoral and sub-littoral environments; main route of re-entry appears to be through the sediment. Zooplankton and phytoplankton in the area probably experience little or no direct hydrocarbon effects at the measured oil concentrations. However, epibenthic organisms and the meiobiota encounter much high concentrations, generally deleterious to growth, respiration, and chemo-reception.

C-0980-77
PERSISTENCE OF NON-ALKANE COMPONENTS OF BUNKER C OIL IN BEACH SEDIMENTS OF CHEDABUCTO BAY, AND LACK OF THEIR METABOLISM BY MOLLUSCS
Vandermeulen, J. H., P. D. Keizer, and W. R. Penrose. 1977. 1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 469-474. (American Petroleum Institute No. 4284)

Fuel oil, Sediments, Fate, Weathering, Hydrocarbons, Metabolism, Mollusks, Chedabucto Bay

Analysis of beach sediment cores from Chedabucto Bay shows that weathering of oil occurs in the top 15 cm of sediment, except for aromatic and cycloalkane components which are resistant and unaltered and become enriched in the sediments. Molluscs from oiled sediments and control organisms were assayed for their ability to metabolize and rid themselves of petroleum hydrocarbons. Both the oiled and non-oiled bivalves lacked the ability to induce hydroxylation activity (AHH) during petroleum exposure; depuration was incomplete and exceedingly slow.

C-0981-77
A COMPARATIVE SURVEY OF PETROLEUM HYDROCARBONS IN LAKE SEDIMENTS
Wakeham, S. G. 1976.
Marine Pollution Bulletin 7(11):206-211.

Hydrocarbons, Distribution, Sediments, Lakes

The distribution of petroleum hydrocarbons in lake sediments is related to the level of human activity in the respective drainage basins. Surface sediments in a lake surrounded by a major city were found to be contaminated with hydrocarbons, whereas no detectable contamination was found in a comparable lake located in a national park.

C-0982-77
COMPUTER MODELING OF OIL DRIFT AND SPREADING IN DELAWARE BAY
Wang, H., J. R. Campbell, and J. D. Ditmars. 1976.
Final report, CMS-RANN-1-76. 58 p.

Oil spills, Fate, Models, Drift, Spreading, Delaware Bay

The report provides information on computer modeling of oil transfer operations and prediction of oil spill dispersion. Two modes are considered: drifting and spreading. Physical processes involved in spreading are discussed with examples of field comparisons.

[from University of Delaware Marine Publications Catalog. p. 31. Summer, 1976]

C-0983-77
OIL SLICK SPREADING BENEATH A UNIFORM ICE COVER IN THE PRESENCE OF A CURRENT
Weiskopf, F. B., and M. S. Uzuner. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 293-300. (American Petroleum Institute No. 4284)

Oil slicks, Spreading, Ice, *Current

Previous studies of oil spill extent and spreading rates conducted in still water beneath solid ice indicated that a spreading oil slick passes through three distinct phases: a gravity inertia phase, viscous-gravity phase, and viscous-surface tension phase. This study, which incorporated into the system a steady current of water beneath the ice cover and used crude oil and No. 2 fuel oil in tests, indicates that a fourth phase of spreading motion occurs in the presence of a current. This phase was identified as a turbulent drag-viscous drag phase. Based on test data, a first approximation predictor equation was developed for predicting the spreading of oil beneath uniform ice cover in the presence of a current.

F. OIL POLLUTION REGULATIONS

1. U.S. LEGISLATION

C-0984-77
OCZM RELEASES PROPOSED REGULATIONS FOR THE COASTAL ENERGY IMPACT PROGRAM
Anon. 1976.
OCS Update 1(6):1.

Regulations, Offshore development, Environmental protection, Economic effects, Delaware

Economic implications for Delaware of proposed Coastal Energy Impact Program (CEIP) regulations developed by the Office of Coastal Zone Management are briefly summarized. Included in the CEIP will be funding for grants which may be applied toward planning, or devising protective measures for environmental and recreational resources affected by offshore development.

C-0985-77
OIL IMPACT LEGISLATION SIGNED INTO LAW JULY 26
Anon. 1976.
OCS Update 1(5):4.

Legislation, U.S., OCS, Offshore development, Environmental effects, Pollution control, Economics, Delaware

Amendments to the Federal Coastal Zone Management Act (PL94-370), which were signed into law in July, 1976, will in part provide for funds to be used to compensate for direct adverse impacts caused by OCS activity. These funds could be applied to help prevent losses to valuable ecological resources or to pay for oil spill containment and cleanup equipment. Possible economic and other benefits of this legislation to Delaware are briefly discussed.

C-0986-77
LEGAL CONSIDERATIONS FOR THE CONSTRUCTION AND OPERATION OF A DEEPWATER OIL TERMINAL IN THE DELAWARE BAY
Center for the Study of Marine Policy. 1975.
Report CMS-7-75. 27p.

Ports, Oil transfer, Legislation, Delaware Bay

"A study of appropriate legislation and other actions necessary to plan, construct, and operate a deepwater oil terminal, addressing the legal issues likely to be raised in the course of creating such a terminal."

[from University of Delaware Marine Publications Catalog. p. 19. Summer, 1976]

C-0987-77
MANDATORY OIL IMPORT PROGRAM
Federal Energy Administration. 1975.
Report No. FEA/D-75/303; PB-255608/2GA. 337p.

Regulations, Crude oil, Petroleum products, Environmental effects, Economic effects, FEA, *Mandatory Oil Import Program

"This report considers the environmental impact of, and alternatives to, regulations implementing Presidential Proclamation No. 3279, as recently amended by Proclamation Nos. 4210, 4341, and 4355, including amendments to FEA's Mandatory Oil Import Regulations, 10 C.F.R., Parts 206 and 213, and the Mandatory Petroleum Allocation and Price Program, 10 C.F.R., Parts 211 and 212. These regulations establish and distribute the burden of increased fees on imports of crude oil and petroleum products."

[from Petroleum Abstracts 17(3):#229,164. 1977]

C-0988-77
ENVIRONMENTAL CONTROLS: THE IMPACT ON INDUSTRY
Leone, R. A. (ed.). 1976.
Lexington, Massachusetts, D. C. Heath and Company, 1976. 129p.

Legislation, U.S., Pollution control, Refineries, Oil industry, Economic effects

Research findings are summarized from a 16-month study of the impact on various manufacturing industries of the 1972 amendments to the Federal Water Pollution Control Act. The petroleum refining industry is among the industries studied.

[from Pollution Abstracts 8(1):#77-00978. 1977]

C-0989-77
RECOVERING FOR MARINE LIFE DAMAGE: LEGAL ASPECTS OF ALLOCATING SOCIAL COSTS AND PROTECTING PUBLIC INTERESTS
Lutz, R. E., II, and J. P. Meck. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 11-14. (American Petroleum Institute No. 4284)

Environmental deterioration, Oil spills, Compensation, Wildlife, Marine organisms, Economics, *Legal aspects

Means for compensating and settling wildlife damage claims can be accomplished by direct cash payment, trust funds, specific replacement and restoration programs, maintenance of sanctuaries and reserves, and financing of wildlife refuges and habitats. Wildlife damage compensation is moving from the unquantifiable approach of civil penalties to an approach which allows for a quantification of damages. This article discusses many issues relating to such an expanded approach.

C-0990-77
PROBLEMS AND PERSPECTIVES IN RECOVERY OF OIL POLLUTION REMOVAL COSTS
Norris, W. H., and H. N. Johnston. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 35-37. (American Petroleum Institute No. 4284)

Legislation, Pollution control, Cleanup, Liability, Cost analysis, *Federal Water Pollution Control Act

The paper examines Sections 311(f) and (i) of the Federal Water Pollution Control Act (FWPCA) and discusses the statutory scheme for the recovery of clean-up costs by both government and private persons. The effectiveness of the scheme is assessed by reviewing statistics developed from the Coast Guard's Pollution Incident Reporting System data and records used in administering the revolving fund. Some of the problems that have been experienced are discussed and some proposed changes are considered.

C-0991-77
OIL SPILL LIABILITY AND COMPENSATION ("SUPERFUND")
Reynolds, J. L. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 15-18. (American Petroleum Institute No. 4284)

Legislation, U.S., Oil Spills, Liability, Compensation, *Superfund

The oil spills liability and compensation system in existence today ranges from little or no coverage in some instances to duplicative coverage in other instances. A national fund is proposed that would eliminate the need for all the other existing funds, would compensate for spills in any U.S. waters and would provide coverage at much less cost to the consumer. This paper reviews the existing system, the problems involved, the proposed Comprehensive Oil Pollution Liability and Compensation system (or "Superfund"), and the present status of the legislation.

C-0992-77
U.S. COAST GUARD AND OIL POLLUTION REGULATIONS (news brief)
Anon. 1975.
Oregon Commercial Fisheries Newsletter 6(3):4-5.

Regulations, U.S., Ships, Oil transfer, Bilges, Oil discharges, USCG

A brief review of the U.S. Coast Guard regulations on oil pollution from uninspected vessels is given. These regulations have been in effect since 1974 and include oil transfer procedures, bilge draining, and discharge procedures and deck lighting requirements.

C-0993-77
PUBLISHED REGULATORY GUIDELINES OF ENVIRONMENTAL CONCERN TO THE OIL INDUSTRY IN WESTERN EUROPE
CONCAWE Secretariat. 1976.
Stichting CONCAWE, Report 6/76. 49p.

Oil industry, Regulations, Pipelines, Wastewaters, Guidelines, Europe

The following guidelines are presented which apply to all or selected European countries: regulations relevant to the S content of fuels and gasoline composition; gasoline engine vehicle emission regulations; present legislation, technical requirements, and codes for pipelines; environmental noise control regulations; and liquid effluent discharge limits.

[from Pollution Abstracts 8(1):#77-00992. 1977]

C-0994-77
ONSHORE SEGMENT OF THE OIL AND GAS EXTRACTION POINT SOURCE CATEGORY
Environmental Protection Agency. 1976.
Federal Register 41(199):44949-44952.

Guidelines, Production, Exploration, Drilling, Wastewaters, EPA, *Onshore point source category

The proposed guidelines preclude the discharge of wastewater pollutants into navigable waters from any source associated with production, field exploration, drilling, well completion, or well treatment. They limit release of oil and grease to 45 mg/l for the beneficial use subcategory and to 100 mg/l for the other categories.

[from Pollution Abstracts 8(1):#77-00340. 1977]

C-0995-77
ONSHORE SEGMENT OF THE OIL AND GAS EXTRACTION POINT SOURCE CATEGORY: INTERIM FINAL RULE MAKING AND PROPOSED RULE MAKING
Environmental Protection Agency. 1976.
Federal Register 41(199):44941-44948.

Guidelines, Production, Extraction, Oil industry, Wastewaters, EPA, *Onshore point source category

The EPA has issued effluent guidelines and standards which are applicable to existing sources for the onshore subcategory, the coastal subcategory, the beneficial use subcategory, and the stripper subcategory. The specified limitations are to be accomplished by the best practicable control technology available.

[from Pollution Abstracts 8(1):#77-00339. 1977]

C-0996-77
TEXACO EFFLUENT GUIDELINES FOR PETROLEUM MARKETING STORAGE AND DISTRIBUTION FACILITIES
Texaco. 1975.
Texaco Draft report to the Environmental Protection Agency, January 1975. 100p.

Guidelines, Oil industry, Wastewater treatment, Production, Storage, Distribution, Oil-water separation, Pollution control

In order to expedite resolution of the complex issues involved for petroleum marketing terminals, Texaco surveyed nine exemplary terminals having gravity separation to determine the oil and grease concentrations achievable by application of what the industry deems to be the 'best practicable control technology currently available'.

[from Urbanization and Water Quality Control, W. Whipple, Jr. (ed.). Minneapolis, Minnesota, American Water Resources Association, 1975. p. 216, 218.]

C-0997-77
THE PETROLEUM INDUSTRY AND COST-EFFECTIVE WATER QUALITY PLANNING
Wiley, M. A. 1975.
Urbanization and Water Quality Control. W. Whipple, Jr. (ed.). Minneapolis, Minnesota, American Water Resources Association, 1975. p. 211-218.

Guidelines, Wastewater treatment, Oil industry, Refineries, Legislation, Water quality, Economics

Legal and economic aspects of oil industry compliance with effluent guidelines and water pollution control regulations are examined. Improved legislation is called for to ensure equitable and cost-effective water quality planning by industries, municipalities, commerce and small business.

C-0998-77
INTERNATIONAL REGULATION OF THE TANKER INDUSTRY
Gray, W. O., C. J. Carven, and G. L. Becker. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 7-10. (American Petroleum Institute No. 4284)

International conventions, IMCO, Regulations, Tankers, Pollution prevention

This paper reports on progress during the past two years toward adoption of the International Convention for the Prevention of Pollution from Ships (1973 MARPOL) and broadens the subject to give a perspective on the "family" of IMCO conventions as they relate to tankers. The paper is divided into the following sections: technical progress towards IMCO 1973 MARPOL; ratification problems for IMCO 1973 MARPOL; the "family" of IMCO conventions; conclusions.

C-0999-77
IMCO AND THE EVOLVING INTERNATIONAL SCHEME FOR CONTROLLING MARINE POLLUTION
Schubert, F. P. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 3-6. (American Petroleum Institute No. 4284)

International conventions, IMCO, Pollution prevention, USCG

The origin, composition and functions of the Intergovernmental Maritime Consultative Organization (IMCO) and its expanding role in protection of the marine environment are described. The interrelationship between U.S. regulatory processes and IMCO activities is discussed. As the primary U.S. maritime regulatory and enforcement agency, the Coast Guard plays a leading role in IMCO affairs, particularly those concerned with marine polltuion prevention.

C-1000-77
OIL SPILL IDENTIFICATION BIBLIOGRAPHY
Bentz, A. P. 1976.
CGR/DC-3/76; USCG-D-41-76. 9p.

Bibliographies, Oil spills, Source identification, Analytical techniques, Spectroscopy, Spectrometry, Chromatography

The latest state-of-the-art techniques in oil spill identification are reviewed. Included are low temperature luminescence, field ionization mass spectrometry, double-beam fluorescence, and dual detection gas chromatography. Current research in the field of oil identification is also covered.

[from Government Reports Announcements 76(22):#AD-A029 126/0GA. 1976]

C-1001-77
OCEAN LAW (a bibliography with abstracts)
Brown, R. J.
Report for 1964-October 1976. 236p.

Bibliographies, Legislation, U.S., International agreements, Oceans, Ships, Offshore drilling, Pollution prevention, Oil spills

This updated bibliography contains 231 abstracts (68 of which are new entries to the previous edition) covering national and international laws on fishing, underseas mining, shipping, dredging, territorial waters, navigation regulations, seafloor minerals, offshore drilling, and water pollution.

[from Government Reports Announcements 76(25):#NTIS/PS-76/0834/2GA. 1976]

C-1002-77
CARCINOGENICITY OF RESIDUAL FUEL OILS BY NONBIOLOGICAL LABORATORY METHODS: ANNOTATED BIBLIOGRAPHY. PART I. LABORATORY METHODS OF ANALYSIS. PART II. ANALYSIS RESULTS
Cichorz, R. S. 1976.
Contract E (29-2)-3533. NTIS No. RFP-2436. 16p.

Bibliographies, Fuel oils, Carcinogens, PAH, Analytical techniques, Petroleum products

The literature search is presented as an annotated bibliography, current as of January 1, 1975. Part I deals with laboratory chemical and physical methods of determining carcinogenicity and/or polynuclear aromatic hydrocarbons in residual fuel oils and contains

10 entries. Part II includes the results of testing specific fuel oils for carcinogenic components and contains 11 entries. Author index and subject categories are included.

[from ERDA Energy Research Abstracts 1(9):#17763. 1976]

C-1003-77
POLYCYCLIC AROMATIC HYDROCARBONS: OCCURRENCE AND ANALYSIS - A PARTIAL BIBLIOGRAPHY
Martin. A., and M. Blumer. 1975.
Technical report, Woods Hole Oceanographic Institute, WHOI-75-22.

Bibliographies, PAH, Sources, Fate, Analytical techniques, Chromatography, Spectroscopy, Carcinogens, Crude oil

This bibliography contains 1,055 references on the occurrence of polycyclic aromatic hydrocarbons in nature, their origin, composition, fate and analysis. The majority of citations refer to work reported between 1970 and mid-1973. Main topics include air and air particulates, automotive, benzo[a]pyrene, carcinogenesis, chromatography, crude oil and petroleum, extraction, fluorescence, infrared, mass spectra, water and others.

C-1004-77
OIL WATER SEPARATORS (a bibliography with abstracts)
Smith, M. F. 1976.
NTIS/PS-76/0863/1GA. 126p.

Bibliographies, Oil-water separation, Pollution control, Oil spills, Recovery, Ballast, Bilges

This NTIS research covers federally sponsored studies on oil water separators used primarily for pollution control. Included are centrifuge separators, coalescers, filters, oil spill recovery, and ballast and bilge water treatment.

[from Government Reports Announcements 76(26):#NTIS/PS-76/0863/1GA. 1976]

SECTION II: CURRENT RESEARCH PROJECTS

Title, contract information and a summary of project objectives are provided in each entry. Project notices have been obtained from the Smithsonian Science Information Exchange (SSIE), and from the National Oceanographic and Atmospheric Administration, National Sea Grant Program. 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 by serial number within each subject division. The serial number designates the original issue of OIL SPILL AND OIL POLLUTION REPORTS in which the research project is listed:

R-001-74 to R-165-74	EPA-670/2-75-003 July 74 to October 74
R-166-74 to R-244-74	EPA-670/2-75-044 November 74 to February 75
R-269-75 to R-304-75	EPA-600/2-76-113 August 75 to October 75
R-001-76 to R-035-76	EPA-600/2-76-185 November 75 to January 76
R-124-76 to R-175-76	August 76 to October 76
R-001-77 to R-022-77	November 76 to January 77
R-023-77 to R- -77	February 77 to April 77

A. OIL POLLUTION DETECTION AND EVALUATON

1. MONITORING

R-124-76 (renewal)
LIGHT HYDROCARBONS - OCS
Principal Investigator: Cline, J. D.
Performing Organization: U.S. Department of Commerce, Environmental Research Labs, Boulder, CO 80302

Supporting Agency: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Research Laboratories. No. R7120841
Period: 6/76 to 9/76
Funds: $37,200

The project objective is to determine the temporal and spatial distributions of the low molecular weight hydrocarbons, C_1-C_4, on the outer continental shelf of Alaska.

[SSIE No. GUK-65-1]

R-126-76 (renewal)
PHYTOPLANKTON - OCS
Principal Investigator: Larrance, J. D.
Performing Organization: U.S. Department of Commerce, Environmental Research Labs, Boulder, CO 80302
Supporting Agency: U.S. Department of the Interior, Bureau of Land Management. No. R7120844
Period: 7/76 to 9/76
Funds: $53,900

The project objective is to provide a phytoplankton baseline in northern Gulf of Alaska for the outer continental shelf studies. Sampling and analysis of phytoplankton are in progress.

[SSIE No. GUK-70-1]

R-023-77
FISH EGGS AND LARVAE STUDIES
Principal Investigators: Kendall, A. W., F. W. Barvenik, and D. Judkins
Performing Organization: Brookhaven National Laboratory, Upton, NY 11973
Supporting Agency: U.S. Energy Research and Development Administration, Biomedical and Environmental Research Division. Contract E(30-1)-16
Period: 7/75 to 6/76

A number of energy-related developments, i.e. nuclear plants, oil fields, and supertanker facilities, are planned or contemplated for the continental shelf and coastal regions of the U.S. Since fish eggs and larvae are particularly susceptible to damage by oil pollution, entrainment in power plant heat exchangers, and by limitation of food supply, a study of the seasonal and spatial distribution, abundance, and condition of ichthyoplankton stocks in the New York Bight is planned.

[SSIE No. ZPE-11112-1]

R-024-77
DISTRIBUTION OF HYDROCARBONS IN NARRAGANSETT BAY SEDIMENTS
Principal Investigator: Quinn, J. G.
Performing Organization: University of Rhode Island, School of Oceanography, Kingston, RI 02881
Supporting Agency: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Sea Grant Office. Grant No. 04-6-158-44085
Period: 7/76 to 6/78

The qualitative and quantitative distribution of hydrocarbons in Narragansett Bay sediment cores is being investigated. Information obtained will help provide a firm basis to evaluate current petroleum-related activities in the Bay, and will serve as a baseline on which decisions concerning future uses can be made.

[Sea Grant Project Summary, National Sea Grant Program]

2. REMOTE SENSING

R-005-77
MAINTENANCE FOR THE AIRBORNE OIL SURVEILLANCE SYSTEM (AOSS)
Principal Investigator: Unknown
Performing Organization: Aerojet General Corporation, 9236 E. Hall Rd., Downey, CA 90241
Supporting Agency: U.S. Department of Transportation, Coast Guard
Period: 7/75 to 6/76

The contract provides for (1) advice and assistance in the operation and maintenance of the AOSS; (2) system and subsystem performance evaluation; (3) adjustment, alignment, test and checkout of the system; (4) troubleshooting and field repair.

[SSIE No. GZ-58334-1]

Status: Evaluation of a U.S. Coast Guard prototype operational airborne coastal patrol system has been completed. The system has proven effective for detection, monitoring, and assessment of offshore oil discharges; search and rescue operations; ice reconnaisance; and monitoring of foreign fishing activities in coastal waters. The Coast Guard contracted with Aerojet ElectroSystems Company to modify the sensor equipment for installation into a C-130 aircraft for operational deployment. Active operations using the modified system were scheduled to begin in January, 1977.

Reports and Publications

DEVELOPMENT OF U.S. COAST GUARD PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM
Ketchel, R. J. and A. T. Edgerton. 1973.
Prevention and Control of Oil Spills. Proceedings of Joint Conference on Prevention and Control of Oil Spills, Washington, D. C., 1973. p. 127-137.

Multispectral sensors, operating from the UV to the microwave region of the electromagnetic spectrum, will form the system for day/night all-weather airborne monitoring of oil spills at sea. Aerojet Electrosystems Company is the designer.

FLIGHT EVALUATION OF U.S. COAST GUARD AIRBORNE OIL SURVEILLANCE SYSTEM
Maurer, A., and A. T. Edgerton. 1975.
Conference on Prevention and Control of Oil Pollution, San Francisco, 1975. p. 129-141.

The multi-sensor airborne system has the capabilities of detecting, mapping and documenting oil spills at sea in all kinds of weather and at all times of day. The surveillance data gathered during the test were from natural seeps, controlled oil spills and routine shipping. Testing revealed each sensor to be "blind" under certain environmental conditions, reaffirming the necessity of a multisensor system.

U.S. COAST GUARD AIRBORNE OIL SURVEILLANCE SYSTEM STATUS REPORT
Maurer, A. T., A. T. Edgerton, and D. C. Meeks. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, March 8-10, 1977. p. 215-220. (American Petroleum Institute No. 4284)

This paper describes (1) results of prototype operational evaluation, (2) operational configuration of the C-130 aircraft, in which the sensor equipment will be installed for deployment, and (3) future plans for the system.

Information Source: A. T. Edgerton, Aerojet Electrosystems Company, 1100 W. Hollyvale St., Azusa, CA 91702

R-025-77
PHYSICO-CHEMICAL REACTIONS OF METALS IN PETROLEUM WITH BEACH SEDIMENT

Principal Investigator: Rule, J. H.
Performing Organization: University of Tennessee, School of Liberal Arts, W. Cumberland Ave., S.W. Knoxville, TN 37916
Supporting Agency: U.S. National Science Foundation, Division of Advanced Environmental Research and Technology. No. ENV76-18817.
Period: 6/76 to 8/77
Funds: $56,300

Certain physical-chemical relations between crude oil and beach sediment are being studied. Emphasis is on partitioning of heavy metals between oil and sediment. This study will be based on analysis of natural materials collected from beaches along the Straits of Magellan, Chile - the site of the 1974 grounding of the Tanker "Metula" which spilled nearly 68 million liters (18 million gallons) of crude oil.

B. OIL POLLUTION PREVENTION AND CONTROL

1. CONTAINMENT

R-026-77
OIL SLICK CONTROL IN OFFSHORE ENVIRONMENTS
Principal Investigator: Milgram, J. H.
Performing Organization: Massachusetts Institute of Technology, School of Engineering, 77 Massachusetts Ave., Cambridge, MA 02139
Supporting Agency: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Sea Grant Office. No. R/PO-1.
Period: 7/75 to 6/77
Funds: $20,700

Project objectives are (1) to explore by means of laboratory experiments the relative importance of turbulence on formation of polluting oil droplets by tearing them from the bottom of a contained oil slick, and (2) to devise logistical plans for oil slick control and cleanup in currents and waves typical of offshore environments.

[SSIE No. GBP-2379]

Status: A precision flume for studying oil pollution hydrodynamics, the first facility of this kind known to exist, has been made operational. The mass transport of oil by ocean waves has been determined, both theoretically and experimentally, and has been found to be different from the values in the past for predicting oil slick movements.

2. CLEANUP AND RECOVERY

R-027-77
OIL SPILL EQUIPMENT AND OIL BEHAVIOR IN COLD REGIONS
Principal Investigators: Deslauriers, P. C., and L. A. Schultz
Performing Organization: Arctec, Incorporated, 9104 Red Branch Rd., Columbia, MD 21045
Supporting Agency: U.S. Environmental Protection Agency
Period: Unknown (completed)

Reports and Publications

A COLD REGION OIL POLLUTION BIBLIOGRAPHY
Arctec, Incorporated. 1976.

The bibliography covers the following areas of aquatic and terrestrial oil pollution: containment, recovery, transfer, storage, disposal, and oil pollution sensing for cold regions; burning slicks in cold regions; biodegradation of oil; and interaction of oil pollutants with snow and ice environment.

OIL SPILL EQUIPMENT AND OIL BEHAVIOR IN COLD REGIONS
Deslauriers, P. C., and L. A. Schultz. 1977.
Final report, available from NTIS.

Summary not available.

THE APPLICATION OF EXISTING OIL SPILL ABATEMENT EQUIPMENT TO COLD REGIONS
Schultz, L. A., and P. C. Deslauriers. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), March 8-10, 1977. p. 309-312. (American Petroleum Institute No. 4284)

A recently completed survey study included a review and cursory evaluation of oil spill response techniques and equipment currently used in warmer climates for application in the more severe environmental conditions of the Arctic. The survey revealed that while a very limited degree of oil spill response capability exists for use in cold regions, a great deal of development work must be undertaken before a total cold regions oil response capability will be available.

Information Source: P. C. Deslauriers, Arctec, Inc., 9104 Red Branch Rd., Columbia, MD 21045

3. OIL TRANSFER AND TRANSPORT

R-028-77
PETROLEUM - TRANSPORTATION - ENVIRONMENTAL
Principal Investigator: Lifson, W. E.
Performing Organization: Exxon Research and Engineering Co., P.O. Box 101, Florham Park, NJ 07932
Supporting Agency: Exxon Corporation
Period: 7/75 to 6/76

The contract provides for research and development of processes, equipment, and techniques to monitor, prevent, and alleviate potential environmental degradation resulting from oil transportation.

[SSIE No. CA-702-1]

R-211-74 (renewal)
BILGE AND BALLAST WATER OIL POLLUTION CONTROL TECHNOLOGY FOR NAVAL SHIPS
Principal Investigator: Yu, T. S.
Performing Organization: U.S. Navy, Ship Research and Development Center, Annapolis, MD 21402
Supporting Agency: U.S. Department of Defense, Navy. No. DN710112
Period: 10/76 to 9/77

The following approaches for the near-term phases of the project will be applied: development of materials and technology (using both physical and chemical means) to enhance oil-detergent-water-separation, improvement of oil-water monitoring and measuring techniques, and search for a new cleaning agent formulation which will not produce stabilized emulsion.

[SSIE No. ZQN-710112-6]

R-281-75 (renewal)
SEPARATION OF EMULSIFIED OIL FROM WATER THROUGH IMPROVED MECHANICAL DEVICE
Principal Investigators: Gloyna, E. F., and C. Wu
Performing Organization: University of Texas, School of Engineering, 200 W. 21 St., Austin, TX 78712
Supporting Agency: University of Texas
Period: 7/75 to 6/76

The objective of the research is to design, construct, and evaluate devices for removing emulsified oil from oily wastewater. This work is aimed at evaluating the operational characteristics of these mechanical devices.

[SSIE No. NTX-774]

Status: A new report entitled, "Separation of Free Oil from Water Following Coalescence", will be released shortly.

Reports and Publications

COALESCENCE OF EMULSIFIED WASTES BY FIBROUS BED
Chieu, J. N., R. S. Schechter, M. J. Humenick, and E. F. Gloyna. 1975.
Texas University at Austin, Center for Research in Water Resources; Technical report CRWR-126. 183p.

The feasibility of using a fibrous bed coalescer to separate emulsified oil from industrial waste streams

and to evaluate system parameters was determined. Several types of coalescing media were used and four types of oily wastes were tested to determine the effect of fluid properties. Contact angle, interfacial tension and oil viscosity were measured for each system and the results were compared with the coalescer efficiency.

HIGH RATE FILTRATION OF SOLIDS-STABILIZED OIL-IN-WATER EMULSIONS
Humenick, M. J., E. F. Gloyna, and B. J. Davis. 1973. Texas University at Austin, Center for Research in Water Resources; Technical report CRWR-105. 166p.

The performance of a high rate filtration process in removing suspended solids and oil in solids-stabilized oil-in-water emulsions was evaluated. Literature pertaining to the filtration theory and operation is reviewed.

Information Source: N. Haynes, University of Texas at Austin, Center for Research in Water Resources, Route 4, Box 189, Austin, TX 78757

R-029-77
LAND APPLICATION OF INDUSTRIAL WASTES

Principal Investigators:	Overcash, M. R., and P. W. Westerman
Performing Organization:	University of North Carolina, School of Agriculture and Life Sciences, Raleigh, VA 27607
Supporting Agency:	U.S. Department of the Interior, Office of Water Research and Technology. No. B-100-NC
Period:	7/76 to 6/77
Funds:	$33,468

The proposal objectives are: (1) to coordinate 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."

C. EFFECTS OF OIL POLLUTION

1. BIOLOGICAL EFFECTS

R-103-74
EFFECT OF DIESEL OIL ON STREAM LIFE
Principal Investigator: Patterson, R. R.
Performing Organization: State Department of Game & Fish, Santa Fe, NM 87501
Supporting Agency: U.S. Department of the Interior, Bureau of Sport Fish & Wildlife, Federal Aid Division. No. F-22-R-15-B-2
Period: 4/73 to 3/74

The project will determine repopulation rates of invertebrates and brown trout in a region of the Cimarron River heavily affected by diesel oil spillage.

[SSIE No.: GUN-11137]

Reports and Publications

EFFECT OF DIESEL OIL ON STREAM LIFE
Patterson, R. R. 1976.
Final report, Statewide Fisheries Investigations. Federal Aid Project F-22-R-17, Job No. B-2. 14 p.

Results of three years of sampling the Cimarron River after an oil spill decimated invertebrate and brown trout, Salmo trutta, populations in 19 km (12 mi) of river indicated that invertebrate populations had essentially recovered to prespill levels in one year. The brown trout population increased to about 54% of prespill numbers in three years.

Information Source: R. R. Patterson, State of New Mexico, Department of Game and Fish, Santa Fe, NM 87503

R-46-76 (renewal)
EVALUATION OF THE ACUTE TOXICITY OF SECONDARILY TREATED OIL REFINERY EFFLUENTS TO FISH
Principal Investigators: Burks, S. L., and T. C. Dorris

Performing Organization: Oklahoma State University, Reservoir Research Center, Life Sciences W., Stillwater, OK 74074
Supporting Agency: Oklahoma Oil Ref. Waste Cont.
Period: 7/75 to 6/76

On-site toxicity evaluations of oil refinery effluents were made with the use of a mobile bioassay laboratory trailer equipped for performance of static and continuous-flow bioassays.

[SSIE No. CH-122]

R-030-77
FUNDAMENTAL ANALYSIS TO ENABLE DETERMINATION OF EFFECTS OF OIL POLLUTION
Principal Investigators: Glynn, P. W., C. Birkeland, A. A. Reimer, and J. R. Young
Performing Organization: U.S. Environmental Protection Agency, 401 M St., S.W., Washington, D.C. 20460
Supporting Agency: Smithsonian Institution Tropical Research Institute (STRI). Contract No. 14-12-874
Period: 7/75 to 6/76

The STRI proposes to engage in a program which will lay the basework for evaluating the biological costs of future oil spills on tropical and related ecosystems. The roles of several natural agents of oil pollution abatement will be examined.

[SSIE No. GTA-64-4]

Reports and Publications

SURVEY OF MARINE COMMUNITIES IN PANAMA AND EXPERIMENTS WITH OIL
Birkeland, C., A. A. Reimer, and J. R. Young. 1976. Report EPA-600/3-76-028, Contract No. 14-12-874. 176 p.

Effects of oil pollution on tropical intertidal marine communities were tested by controlled experiments using tarry Bunker C and volatile marine diesel oils. Bunker C had a greater detrimental effect than did marine diesel on coral growth. Marine diesel had a greater detrimental effect on fouling communities of settling

plates. Susceptibility to oil pollution varied significantly between individuals.

Information Source: P. W. Glynn, P. O. Box 2072, Balboa, Canal Zone

R-031-77
EFFECTS OF MIXED PETROLEUM HYDROCARBONS IN MARINE FISHES

Principal Investigators:	Stegeman, J. J., and D. J. Sabo
Performing Organization:	Woods Hole Oceanographic Institution, Main St., Woods Hole, MA 02543
Supporting Agency:	U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Sea Grant Office No. R/B 5
Period:	7/75 to 6/77
Funds:	$85,000

The following areas of research will be determined: the nature and effects of low levels of petroleum hydrocarbons on enzymatic processes related to drug or hydrocarbon, hormone, protein, carbohydrate and lipid metabolism; the significance of related cellular and ultrastructural changes; how time-dosage relationships and routes of hydrocarbon introduction alter the above effects, and whether these can be reversed by transferring contaminated fish to uncontaminated water; the characteristics of the hydrocarbon metabolizing system in marine fish.

[SSIE No. GBP-2481]

Status: The project is ongoing. Several manuscripts are in preparation.

Reports and Publications

ELECTRON PARAMAGNETIC RESONANCE STUDIES OF HEPATIC MICROSOMAL CYTOCHROME P-450 FROM A MARINE TELEOST FISH
Chevion, M., J. J. Stegeman, J. Peisach, and W. E. Blumberg. 1977.
Life Sciences Vol. 20 (in press).

ASPECTS OF THE METABOLISM OF PETROLEUM HYDROCARBONS ON INTERMEDIARY METABOLISM AND XENOBIOTIC METABOLISM IN MARINE FISH
Stegeman, J. J., and D. J. Sabo. 1976.
Sources, Effects & Sinks of Hydrocarbons in the

Aquatic Environment. American Institute of Biological Sciences, 1976. p. 423-436. Proceedings of the Symposium, Washington, D. C., 1976.

In the title study, metabolic function in tissues of fish exposed to low levels of petroleum contamination is described. Petroleum hydrocarbons resulted in altered patterns of lipid metabolism characterized by a net decline in lipogenesis in the hepatic, gill, muscle, and brain tissues. Some evidence suggests that induction of mixed-function oxidases occurs in fish environmentally contaminated by petroleum.

SEX DIFFERENCES IN HEPATIC MICROSOMAL CYTOCHROME P-450 IN SPAWNING TROUT
Stegeman, J. J. 1977.
Federation Proceedings (in press)

Information source: J. J. Stegeman, Woods Hole Oceanographic Institution, Woods Hole, MA 02543

R-032-77
XENOBIOTIC (HYDROCARBON) METABOLISM BY MIXED FUNCTION OXIDASES IN ESTUARINE, COASTAL AND OPEN OCEAN FISH SPECIES

Principal Investigator:	Stegeman, J. J.
Performing Organization:	Woods Hole Oceanographic Institution, Woods Hole, MA 02543
Supporting Agency:	National Science Foundation
Period:	3/77 to 2/78

Some factors potentially contributing to the variability noticed in hepatic mixed-function oxidase activity in estuarine and coastal fish species will be investigated. Factors will include sex, size, season, nutritional deprivation, and chemical environment, and will be examined in experimental and environmental samples. A variety of coastal water and open ocean pelagic and mesopelagic species from an area with the lowest levels of hydrocarbon contamination will be surveyed for relative ability to metabolize hydrocarbons. Results will expand what is known of the association between environmental contamination and the response of hepatic mixed-function oxidases in fish to such contamination, and provide information needed to assess the validity of using levels of these enzymes as indicators of biological effects.

[J. Stegeman, Woods Hole Oceanographic Institution, Woods Hole, MA 02543]

R-033-77
HYDROCARBON CONCENTRATION IN FOOD CHAINS
Principal Investigator: Whelan, T.
Performing Organization: Louisiana State University, Center for Wetland Resources, University Station, Baton Rouge, LA 70803
Supporting Agency: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Sea Grant Office, No. R/HSE-1
Period: 7/75 to 3/76

Hydrocarbon concentrations were determined in tissues of several resident marine organisms at different trophic levels in a chronically contaminated oil field environment. The geographic limits of petroleum contamination to resident marine organisms were established, based upon levels of petroleum in surrounding sediments and waters.

[SSIE No. GBP-2529]

Status: Seasonal and climatic concentrations of hydrocarbon-related compounds in water bodies of natural and oil-contaminated areas have been determined. Oil field waters contain 30% to 50% more dissolved organic carbon than control sites. The alkane and aromatic fractions of surface sediments from the oil field stations indicate substantial petroleum derived compounds. Other extractable sedimentary constituents show no quantitative or qualitative differences between oil field and natural sediments.

Reports and Publications

THE DEPARTMENT OF THE INTERIOR'S OUTER CONTINENTAL SHELF LEASING PROGRAM
Whelan, J. 1976.
Bureau of Land Management's Environmental Studies Program for the South Atlantic Outer Continental Shelf Area, Conference/Workshop Proceedings. M. F. Massoglia (compiler). Research Triangle Park, N. C., Research Triangle Institute, 1976. p. 11-14. Held at Atlanta, Georgia, 1975.

USDI responsibilities in developing and managing OCS oil and mineral resources are outlined. They include the orderly development of such resources, receipt of fair market value for the leased mineral resources, and protection of the marine coastal environment.

Information Source: T. Whelan, Louisiana State University, Center for Wetland Resources, Baton Rouge, LA 70803

2. CHEMICAL EFFECTS

R-034-77
MESA-CHEMICAL
Principal Investigator: Berberian, G. A.
Performing Organization: U.S. Department of Commerce, Environmental Research Labs, Boulder, CO 80302
Supporting Agency: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Research Labs. No. 87121402
Period: 7/76 to 9/76
Funds: $59,300

Distributions and fluxes of chemical contaminants within the New York Bight ecosystem are being investigated and the degree to which anthropogenic wastes may affect the water column, suspended sediment, and bottom sediment chemistry is being assessed. Water quality in the apex is influenced by the Hudson River discharge, photoplankton assemblages, and anthropogenic wastes. Bottom sediments appear to be primarily affected by sewage discharge, oil pollution, and acid-iron waste dumping.

[SSIE No. ZBP-777-2]

3. GENERAL EFFECTS

R-296-75 (renewal)
ENVIRONMENTAL SUPPORT TECHNOLOGY: INTERFACE CHEMISTRY IN THE MARINE ENVIRONMENT AND ITS EFFECT ON NAVAL OPERATIONS
Principal Investigators: Garrett, W. D., and W. R. Barger
Performing Organization: U.S. Navy Research Laboratory, Washington, D. C. 20390
Supporting Agency: U.S. Department of Defense, Navy No. DNO 20190
Period: 10/76 to 9/77

Objectives of the project are: to enhance naval operations by chemical modification of the air-sea interface, to evaluate the role of natural, artificial and pollutant surface films on air-sea interactions, and to determine the influence of organic films on atmospheric processes. Based on laboratory, test tank, and field experiments, surface-active chemicals have been selected for use as sea markers to control oil pollution at naval ship installations.

[SSIE No. ZQN-20190-3]

R-035-77
FACTORS INFLUENCING DISTRIBUTION OF HEAVY METALS IN WATER, SEDIMENTS, AND BIOTA IN A STREAM RECEIVING DOMESTIC AND OIL REFINERY EFFLUENTS

Principal Investigator:	Wilhm, J.
Performing Organization:	Oklahoma State University, School of Arts and Sciences, Agriculture Hall, Stillwater, OK 74075
Supporting Agency:	Oklahoma State Government
Period:	7/75 to 6/76

The contract provides for observation of the effect of environment disturbances on the distribution and concentration of heavy metals in sediments and biota.

[SSIE No. YOK-96]

Reports and Publications

EFFECTS OF HIGH DISCHARGE AND AN OIL REFINERY CLEANUP OPERATION ON HEAVY METALS IN WATER AND SEDIMENTS IN SKELETON CREEK
Namminga, H. E., and J. Wilhm. 1976.
Proceedings of the Oklahoma Academy of Sciences 56:133-138.

Heavy metal concentrations in water generally decreased exponentially with time following high stream discharge while no significant trends existed in the distribution of heavy metals in sediments. Copper concentration in water generally decreased with time while chromium, lead, and zinc exhibited peak concentrations four to eight days after the date effluents from an oil refinery cleanup were expected to enter Skeleton Creek. No significant changes in metal concentrations occurred in the sediments.

HEAVY METALS IN WATER, SEDIMENTS, AND CHIRONOMIDS IN A STREAM RECEIVING DOMESTIC AND OIL REFINERY EFFLUENTS
Namminga, H. E., and J. Wilhm.
To be published in Journal Water Pollution Control Federation

The distribution of copper, chromium, lead, and zinc in water, sediments, and chironomids in Skeleton Creek, Oklahoma were measured; and the concentrations in cool and warm seasons were compared. Copper, chromium, and zinc levels in water were higher in winter than in summer, and highest concentrations generally occurred just below the outfall. Metals in sediments were generally higher in summer than in winter and highest concentrations occurred farther downstream. Concentrations of heavy metals in chironomid larvae were two or three orders of magnitude greater than in the water, but were comparable to levels in sediments.

Information Source: J. Wilhm, Oklahoma State University, School of Biological Sciences, Stillwater, OK 74074

R-036-77
OIL SPILLAGE IMPACT STUDY ON WORLD WAR II TANKER SINKINGS

Principal Investigator:	Kern, E. C., and D. A. Horn
Performing Organization:	Massachusetts Institute of Technology, School of Engineering, 77 Massachusetts Ave., Cambridge MA 02139
Supporting Agency:	U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Sea Grant Office. No. R/PO-2
Period:	7/75 to 6/78
Funds:	$33,500

Research is being conducted of available data on World War II tanker sinkings off the U.S. East Coast to 1) determine the identifiable impact, both short- and long-range, on the marine and coastal environment; and 2) to identify areas where more detailed and definitive environmental impact studies may be warranted. The work will ascertain whether useful data exists to improve the ability to forecast oil spill impacts.

[SSIE No. GBP-2307]

Status: The project was completed December, 1976.

Reports and Publications

IMPACT OF OIL SPILLAGE FROM WORLD WAR II TANKER SINKINGS
Campbell, B., E. Kern, and D. Horn. 1977. Massachusetts Institute of Technology, Report MITSG 77-4. 85 p.

The overall effects of spilled oil are studied through an extensive literature and archives search of data on tankers sunk along the eastern U.S. coast during World War II. Cape Hatteras, North Carolina and its surrounding area and the Ashbury Park area of New Jersey were selected as sites for the investigation. Results indicated that effects of the oil spills, as observed by residents of the areas under examination, were negligible. In both cases, regional wildlife and economy survived with minimal difficulty.

Information Source: S. B. Hurd, M.I.T. Sea Grant Program, 77 Massachusetts Ave., Cambridge, MA 02139

D. EFFECTS OF OIL EXPLORATION AND PRODUCTION

1. GENERAL EFFECTS

R-037-77
POTENTIAL INTERACTIONS BETWEEN MARINE RELATED INDUSTRY, RECREATION, AND FISHING IN THE NEW HAMPSHIRE COASTAL ZONE

Principal Investigators:	Henry, W. F., and O. Durgin
Performing Organization:	University of New Hampshire, Resources Development Center, Durham, NH 03824
Supporting Agency:	U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Sea Grant Office. No. R/ME-1
Period:	7/75 to 6/76
Funds:	$29,600

Among the objectives of this program are: determine the probable onshore impacts of OCS petroleum exploration and recovery based on the Coastal Zone Input-Output Matrix, and assess the public intervention measures that can be taken to improve the relationships between costs and benefits of OCS petroleum operations and recreation industry developments. The study results will be valuable in coastal zone management work.

[SSIE No. GBP-2244]

R-038-77
IMPACT ON TEXAS WATER QUALITY OF ENERGY STRATEGIES - 1974-2000

Principal Investigator:	Rohlich, G. A.
Performing Organization:	State Water Quality Board, Austin, TX 78711
Supporting Agency:	Texas State Government
Period:	7/74 to 12/74

The project was designed to assess the impact of meeting the future energy needs of Texas on water quality and water resources. Summaries on the water use and degradation due to several energy operations, including oil and gas production, on and off shore have been prepared based on best current practices available to minimize water pollution.

[SSIE No. YTZ-531]

R-039-77
HYDROCARBON EFFECTS ON ESTUARINE CARBON FLUX
Principal Investigator: Turner, R. E.
Performing Organization: Louisiana State University, Center for Wetland Resources, University Station, Baton Rouge, LA 70803
Supporting Agency: U.S. Department of Commerce, National Oceanographic and Atmospheric Administration, Sea Grant Office, No. R/HSE-4.
Period: 7/75 to 8/77

The project aim is to estimate the environmental impact of oil recovery operations on in situ aquatic estuarine primary production and salt marsh macrophyte productivity in Louisiana. A firm statistical design for seasonal sampling and a variety of approaches to integrating short-term and long-term effects are planned.

[SSIE No. GBP-2506]

Status: The project is on-going; work is currently involved in the field research phase. No publications have been completed at present. Funding for a third year beginning September, 1977, is anticipated.

Information Source: R. E. Turner, Center for Wetland Resources, Louisiana State University, Baton Rouge, LA 70803

E. FATE OF OIL IN THE ENVIRONMENT

1. BIODEGRADATION

R-059-74 (renewal)
NAVY ENVIRONMENT: BIODEGRADATION OF OIL POLLUTANTS BY YEAST AND YEAST LIKE FUNGI

Principal Investigators:	Ahearn, D. G., and W. L. Cook
Performing Organization:	Georgia State University, School of Arts and Sciences, 33 Gilmer St., S.E., Atlanta, GA 30303
Supporting Agency:	U.S. Department of Defense, Navy. No. DN123203, Contract N00014-71-C-0145
Period:	10/76 to 9/77
Funds:	$18,000

To provide a better understanding of how biological degradation takes place in the marine environment and its enhancement, the effects of oil soluble toxicants on growth and oil emulsification by yeasts are being studied. The factors necessary for optimum nutrient enrichment and oxygenation for oil degradation by yeasts are being determined. The assessment of possible toxicity of selected fungi to marine and estuarine organisms is being continued.

[SSIE No. GQN-123203-6]

Reports and Publications

MICROBIOLOGICAL CYCLING OF OIL IN ESTUARINE MARSHLANDS
Ahearn, D. G., S. A. Crow, and N. H. Berner. 1976. Estuarine Processes, Uses, Stresses, and Adaptation to the Estuary. New York, Academic Press, 1976. Vol. 1. p. 483-492.

This report examines the effects of Louisiana crude oil and a mixed culture of yeasts on the indigenous microbial flora. The hydrocarbon-utilizing bacteria and yeasts increased at sites accidentally or experimentally inundated with crude oil. Marsh sediments contained low populations of hydrocarbonoclastic fungi with few strains showing significant oil-emulsifying properties. In culture, a mixed culture of Candida maltosa and C. lipolytica gave significant emulsification of crude oil and utilized up to 90% of selected hydrocarbons.

Information Source: D. G. Ahearn, Georgia State University, School of Arts and Sciences, 33 Gilmer St., S.E., Atlanta, GA 30303

R-068-74 (renewal)
NAVY ENVIRONMENT-BIODEGRADATION OF OIL SLICKS IN THE MARINE ENVIRONMENT

Principal Investigator:	Bartha, R.
Performing Organization:	Rutgers The State University, School of Arts and Sciences, Old Queens Building, New Brunswick, NJ 08903
Supporting Agency:	U.S. Department of Defense, Navy. No. DN023175, Contract N00014-67-A-0115-0005
Period:	7/75 to 8/76
Funds:	$17,981

Isolates of microorganisms from oil-soaked beaches and soil samples are being examined to obtain species that are able to grow in the oil phase of an oil-water system. The metabolic activity of the microorganisms in oil is being determined and the effect of oleophilic fertilizers on the rate of growth measured. Mutants of bacteria that utilize both normal and branched alkanes are being tested for their ability to increase petroleum degradation in seawater. Additional work concerns the effects of stimulated biodegradation on marine ecosystems.

[SSIE No. GQN-23175-7]

Status: The project terminated in August, 1976.

Reports and Publications

EFFECT OF IRON ON THE BIODEGRADATION OF PETROLEUM IN SEAWATER
Dibble, J. T., and R. Bartha. 1976.
Applied and Environmental Microbiology 31(4):544-550.

Studies on South Louisiana crude oil show ferric octoate, in combination with paraffinized urea and octylphosphate, to be suitable for treatment of oil slicks. Nitrogen and phosphorus were also shown to greatly increase biodegradation in polluted seawater.

Information Source: R. Bartha, Rutgers The State University, School of Arts and Sciences, Old Queens Bldg., New Brunswick, NJ 08903

R-116-74 (renewal)
NAVY ENVIRONMENT: MICROBIAL METABOLISM OF HYDROCARBONS UNDER LOW TEMPERATURE MARINE CONDITIONS
Principal Investigators: Traxler, R. W., and A. M. Cundell
Performing Organization: University of Rhode Island, Agricultural Experiment Station, Administration Building, Wakefield, RI 02881
Supporting Agency: U.S. Department of Defense, Navy. No. DN475025, Contract N00014-76-C-0318
Period: 10/76 to 9/77
Funds: $15,000

This study employs isolates from environments with a temperature range from -2.5 to 20°C; liquid-liquid and vapor-liquid phase culture systems are being used to measure cyclic hydrocarbon metabolism. Component analyses of the fine structure are being made to define the nature of the intracellular deposit found in hydrocarbon grown cells. Laboratory data is being compared to data from a fuel oil spill study in Narragansett Bay.
[SSIE No. GQN-475025-3]

R-216-74(renewal)
NAVY ENVIRONMENT: MICROBIAL DEGRADATION OF AROMATIC PETROLEUM PRODUCTS
Principal Investigators: Gibson, D. T., and H. J. Rohlich
Performing Organization: University of Texas, School of Natural Sciences, 200 W. 21 St., Austin, TX 78712
Supporting Agency: U.S. Department of Defense, Navy. No. DN323091, Contract N00014-76-C-0102
Period: 10/76 to 9/77
Funds: $20,000

This work on microorganisms that preferentially attack aromatic hydrocarbons found in crude oil provides for the successful treatment of oil spills. Emphasis is placed on the pathways of degradation of these compounds by organisms that can use them for growth.

[SSIE No. GQN-323091-3]

R-299-75 (renewal)
GENETICALLY ENGINEERED MICROORGANISMS FOR ENHANCED PRODUCTION OF PROTEIN FROM PETROLEUM
Principal Investigator: Chakrabarty, A. M.
Performing Organization: General Electric Company, 1 River Rd., Schenectady, NY 12305

Supporting Agency: U.S. National Science Foundation, Division of Biological and Medical Sciences. No. BMS75-10978.
Period: 5/76 to 5/77
Funds: $30,000

A large number of aromatic and polynuclear aromatic hydrocarbon metabolizing pathways will be screened and analyzed genetically in several Pseudomonas species to characterize the transmissable plasmid nature of the genes specifying these pathways. Multi-plasmid single strains will be constructed to be used for enhanced production of protein from petroleum or for rapid cleanup of oil spills on rivers and lakes.

[SSIE No. GSB-16385-1]

Reports and Publications

MICROBIAL GENETIC ENGINEERING. AN EVALUATION OF BENEFITS AND BIOHAZARDS
Chakrabarty, A. M. 1977
Genetic Engineering. Cleveland, CRC Press Inc., 1977. 23 p.

Three areas of genetic engineering research are discussed by the author: oil spill cleanup, enhanced production of methane from cellulosic wastes, and functional expression of bacterial nitrogen fixation genes in plants. The reasons for the genetic development of a multi-plasmid pure culture for oil spill cleanup, the methods used, and an assessment of biohazard potentials in using these microorganisms for this purpose are presented in Section I.

Information Source: A. M. Chakrabarty, General Electric Company, 1 River Rd., Schenectady, NY 12305

R-027-76 (renewal)
NAVY ENVIRONMENT: MICROBIAL METABOLISM OF HYDROCARBONS UNDER CONDITIONS OF EXTREME COLD
Principal Investigator: Atlas, R. M.
Performing Organization: University of Louisville, School of Arts and Sciences, 129 E. Broadway, Louisville, KY 40208
Supporting Agency: U.S. Department of Defense, Navy. No. DN475257, Contract N00014-76-C-0400
Period: 10/76 to 9/77
Funds: $15,531

Summer field work concerned with monitoring changes in microbial populations of Alaskan coastal waters exposed to petroleum hydrocarbons is being conducted along with the Naval Arctic Research Laboratory. The effects of oil on essential microbial processes (nitrogen fixation and photosynthesis) are being studied. Experiments are being done to determine if oil is degradable when the sea is frozen.

[SSIE No. GQN-475257-3]

2. GENERAL FATE OF OIL

R-155-76 (renewal)
DISTRIBUTION OF SPILLED OIL IN RELATION TO BEACH MORPHOLOGY

Principal Investigator:	Hayes, M. O.
Performing Organization:	University of South Carolina, School of Arts and Sciences, Administration Building, Rm. 115, Columbia, SC 29208
Supporting Agency:	U.S. National Science Foundation, Division of Advanced Environmental Research and Technology. No. ENV76-06898-A01
Period:	12/76 to 2/77
Funds:	$9,000

Research was begun on the oil-contaminated beaches of the Straits of Magellan after the 1974 Metula grounding to develop a land-form classification of these beaches and to measure the distribution of oil. Under the present grant, the beaches have been classified by types, profiles drawn, oil distribution defined, and permanent survey markers installed. This research is designed to measure the rate of erosion-deposition of sediments occurring on the beaches by revisiting the study areas six months after the original trip and re-measuring the beach profiles using the permanent survey points as reference markers.

[SSIE No. GSQ-1455-1]

R-169-76
FATE OF PETROLEUM HYDROCARBONS IN THE MARINE FOOD WEB

Principal Investigator:	Lee, R. F.
Performing Organization:	Skidaway Institute of Oceanography, Savannah, GA 31406

Supporting Agency:	U.S. National Science Foundation, Division of Ocean Sciences, No. OCE74-05283 A01
Period:	3/76 to 2/77
Funds:	$57,000

The objective of the proposed research is to further the understanding of the uptake, metabolism, storage, and discharge of petroleum hydrocarbons in marine phytoplankton and zooplankton. The distribution of a hydrocarbon within tissues, induction of hydrocarbon-degrading enzymes after oil exposure, and identification of hydrocarbons by both radiolabeled and non-labeled types in petrogenic metabolites will be studied in four phyla of benthic invertebrates. Microbial degradation work will involve the addition of C-hydrocarbon to inshore and offshore water samples followed by a collection of $^{14}CO_2$ and water soluble products.

[SSIE No. GSN-1508-2]

Reports and Publications

METABOLISM OF PETROLEUM HYDROCARBONS IN MARINE SEDIMENTS
Lee, R. F. 1976.
Sources, Effects & Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, 1976. p. 333-344. Proceedings of the Symposium, American University, Washington, D.C., 9-11 August 1976.

Thirty-nine recent studies on the metabolism and biodegradation of petroleum hydrocarbons by benthic microbes and other marine organisms are synthesized to trace the general pathways of hydrocarbon breakdown in marine sediments.

MONITORING OF PETROLEUM HYDROCARBONS
Lee, R. F. 1976.
Manual of Methods in Aquatic Environmental Research. Part 2 - Guidelines for the Use of Biological Accumulators in Marine Pollution Monitoring. J. E. Portmann (ed.). Rome, Food and Agricultural Organization of the United Nations, 1976. p. 38-47. (FAO Fisheries Technical Paper No. 150)

Analytical studies of the uptake, bioaccumulation, and metabolism of petroleum hydrocarbons in marine animals are reviewed. The relation of these studies to the selection of marine organisms for monitoring these hydrocarbons is examined. Based on present evidence, bivalves, specifically clams, oysters and mussels, appear to be a group of animals which are suitable for monitoring purposes.

FATE OF PETROLEUM HYDROCARBONS TAKEN UP FROM FOOD AND WATER BY THE BLUE CRAB CALLINECTES SAPIDUS
Lee, R. F., C. Ryan, and M. L. Neuhauser. 1976. Marine Biology 37(4):363-370.

Radiolabeled aromatic and paraffinic hydrocarbons were taken up from food and water by the blue crab Callinectes sapidus; about 10 percent of the hydrocarbons were assimilated. More than 50 percent of the radioactivity assimilated was in the hepatopancreas. Twenty-five days after exposure, radioactivity was found only in the hepatopancreas, suggesting that this organ was the site of hydrocarbon metabolism. No evidence was found of hydrocarbon storage by any of the crab tissues.

Information Source: R. F. Lee, Skidaway Institute of Oceanography, Savannah, GA 31406

*Additional information not available at time of publication.

Jan. 17 - Feb. 27 FAO/SIDA Workshop on Aquatic Pollution in Relation to Protection of Living Resources, 5th, Manila, Philippines, 1977.
Sponsored by the Food and Agriculture Organization of the United Nations and the Swedish International Development Authority.

The theme of the workshop is entitled "Scientific and Administrative Basis for Management Measures"

Oil Pollution Related Papers

POLLUTION BY OIL
Wisaksono, W.

Various aspects of marine oil pollution in Southeast Asia are reviewed and pertinent statistics are tabulated. Included are the sources of oil from shipping and tanker accidents or discharges; the characteristics of oil and methods of identifying oil pollutants; the general fate of oil in the ocean; areas likely to be affected by spills; biological/environmental effects of oil spills and chronic oil discharges; and immediate and long-term effects of oil pollution.

OIL POLLUTION ABATEMENT
Wisaksono, W.

Presently available methods and materials for curtailing, containing, and cleaning up oil spills in the marine environment are outlined. The advantages or environmental disadvantages of each method are briefly pointed out based on experience gained in Southeast Asia and elsewhere.

FFI contact Dr. H. Naeve, Fishery Resources Officer, Fishery Resources and Environment Division, FAO Department of Fisheries, Via delle Terme di Caracalla, 00100 Rome, Italy.

Feb. 27-
Mar. 4

Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 28th, Cleveland, 1977.

Oil Pollution Related Papers

Session: Environmental Analysis I - Toxic substances

HYDROCARBON CONTENT OF WATER IN SIMULATED OIL SPILLS
Shaw, D. G. , L. Clement, and B. J. Snarski

Oil Identification Symposium I

QUANTITATIVE EFFECTS OF WEATHERING ON GAS CHROMATOGRAMS OF OILS
Flanigan, G. A., and A. P. Bentz

QUANTITATIVE EFFECTS OF WEATHERING ON INFRARED SPECTRA OF OILS
Gronlund, W. R., C. P. Chamberlain, and A. P. Bentz

DESCRIPTIVE MEASUREMENTS OF DIFFERENCES IN FLUORESCENCE SPECTRA
Chien, Y. T., T. J. Killeen, and J. R. Jadamec

USE OF NITROGEN-SENSITIVE DETECTOR FOR OIL IDENTIFICATION
Flanigan, G. A.

CHARACTERIZATION OF SYNTHETIC FUELS BY LIQUID CHROMATOGRAPHY AND MATRIX ISOLATION SPECTROSCOPY
Wehry, E. L., G. Mamantor, E. R. Hinton, R. R. Kemmerer, R. C. Stroupe, and G. Goldstein

CHEMICAL COMPOUND TYPES IN PETROLEUM RESIDUES
McKay, J. F., P. J. Amend, T. E. Cogswell, P. M. Harnsberger, R. B. Erickson, and P. R. Latham

ANALYSIS OF PETROLEUM FROM MARINE ENVIRONMENT
Brown, C. W. , M. Ahmadjian, P. F. Lynch, and F. E. Franklin

Oil Identification Symposium II

PRELIMINARY INVESTIGATIONS ON CONTINUOUS FLUORESCENCE EMISSION IDENTIFICATION OF HPLC ELUATES
Jadamec, J. R., W. A. Saner, E. Kallet, and S. Cravitt

FLUORESCENCE AND LOW-TEMPERATURE LUMINESCENCE STUDIES ON WEATHERED OILS
Eastwood, D., M. S. Hendrick, and S. H. Fortier

IMPROVED IDENTIFICATION OF OILS BY LOW-TEMPERATURE TOTAL LUMINESCENCE SPECTROSCOPY
Brownrigg, J. T., A. W. Hornig, and H. Coleman

FURTHER DEVELOPMENTS IN OIL IDENTIFICATION BY TOTAL LUMINESCENCE SPECTROSCOPY
Giering, L. P., and A. W. Hornig

COMPARISON OF FLUOROMETRIC INSTRUMENTAL TECHNIQUES APPLIED TO OIL SPILL IDENTIFICATION
Helman, D. L., and J. Macemon

FINGERPRINTING CRUDE OILS WITH LOW-TEMPERATURE DERIVATIVE FLUOROMETRY
Kolb, D. A., W. V. Miller, and K. K. Shearin

COMPUTER IDENTIFICATION OF OIL TYPES (OR SPILLS)
Pyne, C. C., and J. D. Johnson

ANALYSIS OF OILS BY FLUORESCENCE SPECTROSCOPY AND NMR
Frank, U., and M. Gruenfeld

FFI contact John Graham, Program Chairman, Koppers Company, Inc., 440 College Park Drive, Monroeville, PA 15146.

Mar. 20-25 ACS National Meeting, 173rd, New Orleans, 1977.

Oil Pollution Related Papers

Symposium on Developments in Molecular Fluorescence and Phosphorescence Analysis

Paper 27
PROGRESS IN FLUORESCENCE AND LOW TEMPERATURE LUMINESCENCE TECHNIQUES FOR OIL IDENTIFICATION
Eastwood, D., S. H. Fortier, and M. S. Hendrick

Paper 28
APPLICATION OF LUMINESCENCE FOR IDENTIFICATION OF AROMATIC MIXTURES
Hornig, A. W., J. T. Brownrigg, and L. P. Giering

General Session - Gas Chromatography

Paper 56
GAS-CHROMATOGRAPHIC MASS-SPECTROMETRIC ANALYSIS OF WATER-SOLUBLE ORGANICS IN BILGE AND BALLAST WATERS
Lysyj, I., and E. C. Russell

FFI contact A. T. Winstead, American Chemical Society, 1155 16th St. N.W., Washington, D. C. 20036.

*Mar. 26-28 Changing Seabird Populations of the North Atlantic, Aberdeen, Scotland, 1977.
Sponsored by the British Ornithologists Union; British Trust for Ornithology; Royal Society for the Protection of Birds, Seabird Group; Scottish Ornithologists Club; Wildfowl Trust

Conference topics will include the effects of human activity, oil development, and chemical pollution on seabirds.

FFI contract Chris Mead, British Trust for Ornithology, Beech Grove, Tring, Herts HP23 5NR, UK.

Mar. 27-29 National Petroleum Refiners Association Annual Meeting, 75th, San Francisco, 1977.

Oil Pollution Related Papers

Environmental Control Session

THE BP EFFLUENT TREATMENT PROCESS
Oldham, G. F.

REFINERY USE OF ROTATING BIOLOGICAL SURFACES IN WASTE WATER TREATING
Knowlton, H. E.

MEMBRANE PROCESSES FOR REFINERY EFFLUENT TREATMENT
Kremen, S. S.

Refinery Process Session

CONVERSION OF RESIDUAL OILS INTO HIGH VALUE PRODUCTS
Gould, G. D.

FFI contact National Petroleum Refiners Association, 1725 De Sales St. N.W., Washington, D.C. 20036.

Apr. 12-14 International School of Hydrocarbon Measurement, 52nd, Norman, Oklahoma, 1977.
Sponsored by the University of Oklahoma Center for Continuing Education

The purpose of the intensive 3-day seminar, which includes over 100 lectures by instructors from universities and the petroleum industry, is to provide expert instruction in the measurement and handling of hydrocarbons.

Oil Pollution Related Papers

Paper L-37
THE ROLES OF EPA & INDUSTRY IN PROTECTING OUR ENVIRONMENT
Karkalik, E. J.

Paper L-41
LEAK DETECTION ON PETROLEUM PIPELINES
Hackman, R. L.

FFI regarding published proceedings, contact Dr. Laurance S. Reid, P. O. Box 1188, Norman, OK 73070

Apr. 18-21 Annual WWEMA Industrial Pollution Conference, 5th, Atlanta, 1977.

Oil Pollution Related Papers

Session 8: Petroleum and Petrochemical Industry Case Histories

MEETING COST-EFFECTIVE DISCHARGE REQUIREMENTS WITH ORBAL SYSTEM FOR REFINERY WASTEWATER TREATMENT
Takach, H. J., and W. M. Throop

TREATMENT OF OIL REFINERY WASTEWATERS WITH GRANULAR AND POWDERED ACTIVATED CARBON
DeJohn, P., and J. P. Black

FFI contact Water & Wastewater Equipment Manufacturers Association, 7900 Westpark Dr., Suite 304, McLean, VA 22101.

Apr. 22-23 Oil spills and the Law, ALI-ABA-Course, Philadelphia, 1977. Sponsored by the American Law Institute and American Bar Association.

The course deals with legal aspects of oil spills resulting from production and transfer and transportation of oil. Discussed are regulatory schemes designed to prevent spills and their effects, as well as damage liability systems and oil spill litigation. The course refers to state and federal laws, international agreements, and possible changes in the law.

Course Program

LAWS AND REGULATIONS TO PREVENT SPILLS FROM OFFSHORE EXPLORATION AND PRODUCTION OPERATIONS AND PIPELINE TRANSPORT
Radlinski, W. A., C. C. Smith, Jr., and J. J. Zedrosser

LAWS AND CONVENTIONS TO PREVENT TANKER SPILLS
Greenberg, E. V. C. , C. R. Hallberg, and C. C. Smith, Jr.

LAWS AND REGULATIONS WITH RESPECT TO CONTAINING AND CLEANING UP OIL SPILLS
Hallberg, C. R., W. A. Radlinski, C. C. Smith, Jr., and J. J. Zedrosser

LAWS AND PRIVATE AGREEMENTS WITH RESPECT TO LIABILITY FOR OIL SPILLS
Greenberg, E. V. C., C. R. Hallberg, T. H. Kurtz, C. C. Smith, Jr., and J. T. Ward

OIL SPILLS LITIGATION: THE SANTA BARBARA EXPERIENCE
McNichols, R.

OIL SPILLS LITIGATION: PRACTICAL ASPECTS OF LITIGATING VESSEL SPILLS
Kurtz, T. H., and J. T. Ward

FFI contact Donald M. Maclay, Director, Courses of Study, ALI-ABA, 4025 Chestnut St., Philadelphia, PA 19104.

Apr. 24-27 Environmental Technology '77, Annual Technical Meeting and Equipment Exposition, 23rd, Los Angeles, 1977.
Sponsored by the Institute of Environmental Sciences.

Oil Pollution Related Papers

Session A3: Management Aspects of Environmental Studies

REGULATORY THINKING AND OFFSHORE EXPLORATION
Mahmood, A., and H. M. Meadow

FFI contact Institute of Environmental Sciences, 940 East Northwest Highway, Mt. Prospect, IL 60056.

Apr. 25-27 Annual Symposium on the Analytical Chemistry of Pollutants, 7th, Lake Lanier Island, Georgia, 1977.
Sponsored by EPA, University of Georgia, and Division of Analytical Chemistry and Division of Environmental Chemistry of the American Chemical Society.

Oil Pollution Related Papers

Paper 2
POLYCYCLIC AROMATIC HYDROCARBONS IN THE ENVIRONMENT: CHARACTERIZATION BY CAPILLARY GC-MS AND LOW VOLTAGE MASS SPECTROMETRY
Giger, W.

A procedure for isolating trace quantities (ppm) of polycyclic aromatic hydrocarbons (PAH) from various environmental samples is detailed. The technique utilizes a sequence of gel filtration and adsorption chromatography followed by glass capillary gas chromatography to quantitatively determine individual PAH's. Directly-coupled mass spectrometry, mass chromatography, probe distillation, and low voltage mass spectrometry are then applied to identify and describe the different PAH's.

Paper 4
ORGANIC MARKER COMPOUNDS
Hertz, H. W.

Marker compounds are useful both as indicators of the presence of a larger group of compounds, and as internal and/or external standards for the quantitation of trace level constituents in a natural sample. The applicability of this concept is illustrated by a quantitative determination of weight percent of petroleum hydrocarbons in an environmental sample.

Paper 15
THE U.S. ENVIRONMENTAL PROTECTION AGENCY PROGRAM OF ENVIRONMENTAL REMOTE SENSING FROM AIRCRAFT
Melfi, S. H.

The EPA program for environmental remote sensing is outlined and the advantages of remote sensing are pointed out. Remote sensing systems that have proven useful in this program include passive imaging techniques such as photography, thermal and multispectral scanners, and active laser systems for remote measurement of atmospheric and subaqueous contaminants. Applications of remote sensing include locating, mapping and documenting major oil spills, and guiding spill containment and cleanup efforts.

FFI contact Ms. E. McGarity, Environmental Research Laboratory, College Station Rd., Athens, GA 30601.

Apr. 25-29 International Symposium on Remote Sensing of Environment, 11th, Ann Arbor, Michigan, 1977.

Oil Pollution Related Papers

Poster Sesstion E

Paper P106
PROTOTYPE ACTIVE SCANNER FOR NIGHTTIME OIL SPILL MAPPING AND CLASSIFICATION
Sandness, G. A., and S. B. Ailes

Poster Session F

Paper P128
U.S. COAST GUARD AIRBORNE OIL SURVEILLANCE SYSTEM: STATUS REPORT
Maurer, A. T., A. T. Edgerton, and D. C. Meeks

FFI contact Dr. Jerald J. Cook, Environmental Research Institute of Michigan, P.O. Box 618, Ann Arbor, MI 48107.

*May 2-5 Annual Offshore Technology Conference, 9th, Houston, 1977.
Sponsored by American Institute of Mining, Metallurgical and Petroleum Engineers; American Association of Petroleum Geologists; American Institute of Chemical Engineers; American Society of Civil Engineers; American Society of Mechanical Engineers; Marine Technology Society; Institute of Electrical and Electronics Engineers; Society of Exploration Geophysicists; and Society of Naval Architects and Marine Engineers.

FFI contact Program Manager, Offshore Technology Conference, 6200 North Central Expressway, Dallas, TX 75206.

*May 9-12 API Refining Department Midyear Meeting, 42nd, Chicago, 1977.

FFI contact American Petroleum Institute Publications and Distribution Section, 2101 L. St. N.W., Washington, D.C. 20037.

*May 10-13 Annual Conference on Great Lakes Research, 20th, Ann Arbor, Michigan, 1977.

FFI contact Dr. Andrew Robertson, 2300 Washtenaw Ave., Ann Arbor, MI 48104

*May 16-18 Canadian Symposium on Remote Sensing, 4th, Quebec City, Quebec, 1977.

FFI contact Dr. J. Kruus, Technical Program Chairman, 4th Canadian Symposium on Remote Sensing, Canada Centre for Remote Sensing, 2464 Sheffield Rd., Ottawa, Canada.

*May 17-20 Oil Sands Symposium '77, Edmonton, Alberta, 1977.
Sponsored by the Petroleum Society of the Canadian Institute of Mining and Metallurgy.

Topics include environmental aspects of oil sands extraction and production.

FFI contact D. A. Redford, Oil Sands Symposium '77, c/o Alberta Research Council, 11315 87th Ave., Edmonton, Alberta, Canada.

*May 29-June 3 Joint Conference of the American Chemical Society and the Chemical Institute of Canada, Montreal, Quebec, 1977.

FFI contact M. W. Kirkwood, Du Pont of Canada, Ltd., P.O. Box 660, Montreal, Quebec H3C 2V1, Canada.

S: See
SA: See also

Absorption
Activated sludge
Acute effects
Adriatic Sea
Adsorption
Aegean Sea
Africa
Alaska
Alaska coast
Alaska, Gulf of
Algae ... SA: Phytoplankton
Analytical techniques ...
SA: Chemical analysis; Source identification
Animals
Annelids ... SA: Polychaetes
Antarctica
API
Arabian Sea
Arctic
Arctic Ocean
Argentina
Argo Merchant Spill
Aromatic hydrocarbons ...
SA: Hydrocarbons; PAH
Asia
Atlantic coast
Atlantic Ocean
Australia
Bacteria
Bahamas
Ballast
Baltic Sea
Bantry Bay
Barent Sea
Beaches
Beaufort Sea
Behavior
Belgium
Bengal, Bay of
Benthos
Bering Sea
Bermuda coast
Bibliographies
Bilges
Biodegradation
Biological effects ... SA:
Toxicity; Acute effects;
Chronic effects
Biomass
Birds
Biscay, Bay of
Black Sea
BLM
Blowout prevention
Booms
Brazil
California
California coast
California, Southern
Canada
Carcinogens ... SA: Health hazards; PAH
Caribbean Sea
Caspian Sea
Chedabucto Bay
Chemical analysis ... SA: Analytical techniques; Source identification
Chemical effects
Chesapeake Bay
Chile
China
Chromatography
Chronic effects
Cleanup ... SA: Recovery; Containment
Coagulation
Coalescence
Coasts
Colorado
Compensation
Connecticut
Conservation
Containment
Contaminants
Contamination
Contingency planning
Coral reefs
Cost analysis
Crankcase oil
Crude oil
Crustaceans
Decomposition
Delaware

Delaware Bay
Denmark
Design and engineering
Detection ... SA: Monitoring; Chemical analysis
Development ... SA: Offshore development
Dispersants
Dispersions
Disposal ... SA: Waste oil disposal; Wastewater disposal
Distillation
Distribution
Drift ... SA: Movement; Spreading
Drilling ... SA: Offshore drilling; Oil wells
East China Sea
Echinoderms
Economic effects
Economics
Ecosystems
Ecuador
Effluent treatment ... S: Wastewater treatment
EIS
Emulsification
Emulsifiers
Emulsions
Engineering ... S: Design and engineering
England
English Channel
Environmental deterioration
Environmental effects
Environmental Impact Statement ... S: EIS
Environmental management
Environmental protection
EPA
ERDA
Europe
Evaporation
Exploration ... SA: Offshore exploration; Production
Extraction
Fate
FEA
Filtration ... SA: Flocculation
Finland
Fish
Fisheries
Flocculation ... SA: Filtration
Florida
Florida coast
Flotation
Food web
Foreign governments
Fossil fuels
France
Freshwater
Fuel oil
Fuels
Fungi
Gas, liquid chromatography ... S: Chromatography
Gasoline
Georgia
Germany, East
Germany, West
Gibralter, Strait of
Government agencies ... SA: U.S. Government, State governments
Great Lakes
Groundwater
Guidelines ... SA: Manuals
Habitat
Harbors
Health hazards ... SA: Carcinogens
Hydrocarbons ... SA: Aromatic hydrocarbons; Crude oil, PAH
IMCO
Incineration
India
Indian Ocean
Indonesia
Industries ... SA: Oil industry
Information systems
Infrared spectroscopy ... S: Spectroscopy
Inland
Insurance
International agreements
International conventions ... SA: Regulations; Legislation
Intertidal zone
Invertebrates
Iran
Iraq
Ireland
Israel
Italy
Japan

Japan, Sea of
Korea
Kuwait
Labrador Sea
Lakes ... SA: Great Lakes
Latin America
Law enforcement
Leakage
Legislation ... SA: Regulations; International conventions
Liability
Louisiana
Lubricating oil
Magellan, Strait of
Maine
Malaysia
Manuals ... SA: Guidelines
Marine mammals
Marine organisms
Marshes
Maryland
Massachusetts
Mass spectroscopy ... S: Spectroscopy
Mediterranean Sea
Metabolism
Metula spill
Mexico
Mexico, Gulf of
Microorganisms ... SA: Algae; Bacteria; Fungi; Yeasts
Middle East
Mississippi River
Models
Mollusks
Monitoring ... SA: Detection; Remote sensing; Sampling
Movement ... SA: Spreading; Drift
Narraganset Bay
Natural seepage
Netherlands
Neuston
New Hampshire
New Jersey
New Mexico
New York
Niche
North Carolina
North Sea
North Vietnam
Norway
Norwegian Sea
Oceans
OCS
Offshore development
Offshore drilling
Offshore exploration
Offshore pipelines
Offshore production
Ohio
Oil ... S: Crude oil; Fuel oil; Lubricating oil, Crankcase oil; Waste oil
Oil discharges
Oil fields ... SA: Production
Oil-gas leasing
Oil industry
Oil shale
Oil slicks
Oil spills
Oil tanks
Oil transfer
Oil transport
Oil-water separation ... SA: Wastewater treatment
Oil wells ... SA: Drilling; Production; Offshore drilling, Offshore production
Okhotsk, Sea of
Onshore impacts
Oregon
Oxidation ... SA: Biodegradation; Weathering
Pacific Ocean
PAH
Patent
Pennsylvania
Personnel training
Petroleum ... S: Crude oil
Petroleum products
Petrochemicals
Petroleum industry ... S: Oil industry
pH control
Philippines
Physical effects
Phytoplankton
Pipelines ... SA: Offshore pipelines
Plankton ... SA: Phytoplankton; Zooplankton
Plants
Platforms
Pollution control

Pollution prevention ... SA: Environmental protection; Contingency planning
Polychaetes
Ports
Portugal
Precipitation
Production ... SA: Offshore production; Drilling; Offshore drilling
Prudhoe Bay
Puerto Rico
Puget Sound
Reclamation ... SA: Recyling; Reuse
Recovery ... SA: Cleanup
Recycling ... SA: Reclamation; Reuse
Red Sea
Refineries
Refining
Regulations ... SA: Legislation; International conventions
Release
Remote Sensing ... SA: Monitoring; Detection
Resource management
Restoration
Reuse ... SA: Reclamation; Recycling
Rhine River
Rhode Island
Rivers
Ross Sea
Safety
Sampling ... SA: Monitoring; Detection
San Francisco Bay
Santa Barbara Channel
Sargasso Sea
Saudi Arabia
Scotland
Seawater
Sedimentation
Sediments
Segregated ballast
Ships ... SA: Tankers
Shorelines
Sinking agents
Skimmers
Sludge
Social effects
Socio-economic effects
Soil
Solid wastes
Solubility
Solution
Solvents
Source identification
South Africa
South Carolina
South China Sea
Spain
Spectrometry
Spectroscopy
Spreading ... SA: Movement; Drift
St. Lawrence River
Standing Crop
State Governments ... SA: U.S. Government; Government agencies
Statistical analysis
Statistics
Storage
Streams
Superports ... S: Ports
Supertankers ... S: Tankers
Surfactants
Surveillance
Sweden
Syria
Tankers ... SA: Ships
Tar
Tar sands
Texas
Torrey Canyon
Toxicity ... SA: Biological effects
Tropical regions
Turkey
UK
Uptake
U.S.
USCG
U.S. Government ... SA: State governments; Government agencies
USGS
USSR
Vegetation
Venezuela
Vietnam
Virginia
Virgin Islands
Wales
Washington
Waste oil

Waste oil disposal ... SA: Disposal
Waste oil treatment
Wastewaters
Wastewater disposal ... SA: Disposal
Wastewater treatment
Water quality

THE SUBJECT INDEX IS A PERMUTED INDEX THAT LISTS ALPHABETICALLY THE KEYWORDS AND CORRESPONDING CITATION NUMBER ASSIGNED TO EACH ABSTRACT IN SECTION I (EACH INDEX NUMBER APPEARS IN THE FORM C-____-77). THESE KEYWORDS ARE SELECTED FROM THE MASTER LIST, P. 256. FREE LANGUAGE TERMS WHICH ARE INCLUDED TO GIVE MORE SPECIFIC INFORMATION ABOUT AN ENTRY ARE PRECEDED BY A * SIGN IN THE SUBJECT INDEX.

0485 ABSORPTION, MONITORING, OIL SLICKS, SHIPS, SOLVENTS, SPECTROSCOPY, *LASER BEAM,
0528 ABSORPTION, OIL SLICKS, PETROLEUM PRODUCTS, DETECTION, ANALYTICAL TECHNIQUES,
0588 ABSORPTION, OIL SPILLS, RECOVERY, DESIGN-ENGINEERING,
0607 ABSORPTION, OIL SLICKS, CLEANUP, PETROLEUM PRODUCTS, DESIGN-ENGINEERING, PATENT,
0613 ABSORPTION, WASTE OIL, CLEANUP, PATENT,
0618 ABSORPTION, OIL SPILLS, RECOVERY, RIVERS, ESTUARIES, HARBORS, DESIGN-ENGINEERING, EPA, *OHMSETT,
0627 ABSORPTION, OIL SPILLS, CLEANUP, SKIMMERS, BOOMS, SURFACTANTS, DESIGN-ENGINEERING, USN,
0670 ABSORPTION, OIL SPILLS, CLEANUP, WASTE OIL, PATENT, *METALLURGICAL PUMICE,
0702 ABSORPTION, WASTEWATER TREATMENT, OIL-WATER SEPARATION, PATENT,
0764 ACCUMULATION, AROMATIC HYDROCARBONS , WASTEWATERS, REFINERIES, CONTAMINATION, MOLLUSKS, FOOD WEB, *FOOD CHAIN, *3,4-BENZOPYRENE,
0674 ACTIVATED SLUDGE, REFINERIES, WASTEWATER TREATMENT, GUIDELINES,
0679 ACTIVATED SLUDGE, WASTEWATER TREATMENT, REFINERIES, CONTAMINANTS, *BIOCHEMISTRY,
0783 ACUTE EFFECTS, MARINE ORGANISMS, CONTAMINATION, CHRONIC EFFECTS, DESIGN-ENGINEERING, *CONTINUOUS FLOW BIOASSAY SYSTEM,
0628 ADSORPTION, CONTAMINANTS, PATENT, *POLYURETHANE FOAM,
0681 ADSORPTION, WASTEWATER TREATMENT, OIL-WATER SEPARATION, PRECIPITATION, PH CONTROL, PATENT,
0683 ADSORPTION, WASTEWATER TREATMENT, OIL-WATER SEPARATION, PATENT, *POLYOLEFIN,
0690 ADSORPTION, WASTEWATER TREATMENT, OIL-WATER SEPARATION, *DETERGENTS,
0703 ADSORPTION, WASTE OIL TREATMENT, PATENT,
0969 ADSORPTION, MODELS, OIL SPILLS, FATE, HYDROCARBONS, SPREADING, SOLUTION, EMULSIFICATION, DECOMPOSITION,
0972 ADSORPTION, HYDROCARBONS, FATE, ESTUARIES, RIVERS, ATLANTIC COAST, PAH, BIODEGRADATION,
0777 AFRICA/SOUTH, CONSERVATION, BIRDS, RESTORATION, *JACKASS PENGUIN,
0907 AFRICA/SOUTH, BIODEGRADATION, OIL SPILLS, WASTE OIL, MICROORGANISMS, PATENT,
0458 ALASKA, PIPELINES, OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ECONOMICS, *TRANS-ALASKA PIPELINE,
0459 ALASKA, OIL SPILLS, TANKERS, ENVIRONMENTAL EFFECTS, CLEANUP, *COLD BAY,
0473 ALASKA, OIL SPILLS, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, *KACHEMAK BAY,
0523 ALASKA, SAMPLING, BENTHOS, ESTUARIES, WATER QUALITY, *EPIFAUNA,
0583 ALASKA, OIL SPILLS, CLEANUP, ECONOMICS, TANKERS, PIPELINES, *OIL SPILL FUND,
0646 ALASKA, OIL TRANSPORT, ENVIRONMENTAL EFFECTS, PIPELINES, ECONOMIC EFFECTS, CALIFORNIA,
0761 ALASKA, CRUDE OIL, TOXICITY, CRUSTACEANS, *WATER SOLUBLE FRACTIONS, *LARVAL STAGES, *SHRIMP, *CRABS,
0773 ALASKA, CRUDE OIL, BIOLOGICAL EFFECTS, SEDIMENTS, MARINE ORGANISMS, ECOSYSTEMS,
0803 ALASKA, CRUDE OIL, FUEL OIL, TOXICITY, MARINE ORGANISMS, FISH, INVERTEBRATES, INTERTIDAL ZONE,
0841 ALASKA, OFFSHORE DEVELOPMENT, SOCIO-ECONOMIC EFFECTS, OCS,
0860 ALASKA, OFFSHORE DRILLING, OFFSHORE DEVELOPMENT, ENVIRONMENTAL PROTECTION, REGULATIONS, CALIFORNIA/SOUTHERN, MEXICO/GULF OF,
0873 ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, MARINE MAMMALS, *BASELINE STUDIES,
0874 ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, BIRDS, *BASELINE STUDIES,
0875 ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, BIRDS, *BASELINE STUDIES,
0876 ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, BIRDS, *BASELINE STUDIES,
0877 ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, BENTHOS, MARINE ORGANISMS, BEAUFORT SEA, BERING SEA, *BASELINE STUDIES,
0878 ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, FISH, MOLLUSKS, HABITAT, *BASELINE STUDIES,
0879 ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, PLANKTON , BENTHOS, FISHERIES, *BASELINE STUDIES,
0880 ALASKA, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, BIOLOGICAL EFFECTS, OCS, HYDROCARBONS, MARINE ORGANISMS, BIODEGRADATION,

0881 ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, MICROORGANISMS, HYDROCARBONS, CHEMICAL ANALYSIS, DISTRIBUTION, *BASELINE STUDIES,
0882 ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, BIODEGRADATION, HYDROCARBONS, DISTRIBUTION, *BASELINE STUDIES,
0883 ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES, *PHYSICAL OCEANOGRAPHY, *METEOROLOGY,
0884 ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES, *GEOLOGIC HAZARDS, *MARINE GEOLOGY,
0885 ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES, *GEOLOGIC HAZARDS,
0886 ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, ICE, ARCTIC OCEAN, *BASELINE STUDIES,
0904 ALASKA, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, OCS, BIOLOGICAL EFFECTS, CONTAMINANTS, MONITORING, INFORMATION SYSTEMS,
0906 ALASKA, BIODEGRADATION, CRUDE OIL, MICROORGANISMS, ARCTIC,
0463 ALASKA/GULF OF, NATURAL SEEPAGE, HYDROCARBONS, CHEMICAL ANALYSIS,
0584 ALASKA/GULF OF, OIL SPILLS, CLEANUP, SKIMMERS, CONTAINMENT, DESIGN-ENGINEERING, COST ANALYSIS,
0963 ALASKA/GULF OF, MODELS, OIL SPILLS, MOVEMENT, DRIFT, OCS,
0539 ALGAE, HYDROCARBONS, SEDIMENTS, CHROMATOGRAPHY, MEXICO/GULF OF, MISSISSIPPI RIVER, SAMPLING,
0760 ALGAE, TOXICITY, FUEL OIL, CRUDE OIL, WASTE OIL, METABOLISM, BENTHOS,
0780 ALGAE, CRUDE OIL, TOXICITY, VEGETATION, LAKES, SUBARCTIC REGIONS,
0787 ALGAE, CRUDE OIL, BIOLOGICAL EFFECTS, *ANKISTRODESMUS,
0809 ALGAE, CRUDE OIL, *NAPHTHALENE, TOXICITY, FRESHWATER, METABOLISM, *CHLAMYDOMONAS ANGULOSA,
0488 ANALYTICAL TECHNIQUES, MONITORING, DETECTION, WASTEWATERS, *LIGHT SCATTERING, *PARTICULATES, *OIL-IN-WATER,
0490 ANALYTICAL TECHNIQUES, MONITORING, CONTAMINANTS, OCEANS, HYDROCARBONS, TAR, SAMPLING, MARINE ORGANISMS,
0528 ANALYTICAL TECHNIQUES, ABSORPTION, OIL SLICKS, PETROLEUM PRODUCTS, DETECTION,
0531 ANALYTICAL TECHNIQUES, WASTEWATERS, REFINERIES, CHROMATOGRAPHY, SPECTROMETRY,
0543 ANALYTICAL TECHNIQUES, HYDROCARBONS, DETECTION,
0547 ANALYTICAL TECHNIQUES, OIL SHALE, EXTRACTION, CHROMATOGRAPHY, CONTAMINANTS, *BY-PRODUCT WATERS,
0554 ANALYTICAL TECHNIQUES, DRILLING , WATER QUALITY, *DRILLING MUDS,
0564 ANALYTICAL TECHNIQUES, SPECTROMETRY, EXTRACTION, SOLVENTS, *DETERGENTS, *OIL-IN-WATER,
0565 ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, OIL SPILLS, CHROMATOGRAPHY, SPECTROSCOPY, SAMPLING, USCG,
0567 ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, OIL SPILLS, OIL TRANSPORT, POLLUTION PREVENTION, USCG,
0757 ANALYTICAL TECHNIQUES, HYDROCARBONS, FATE, CHRONIC EFFECTS, CONTAMINATION, MARINE ORGANISMS, COASTS,
0928 ANALYTICAL TECHNIQUES, BIODEGRADATION, CRUDE OIL, HYDROCARBONS, *PETROLEUM VARIETIES,
1000 ANALYTICAL TECHNIQUES, BIBLIOGRAPHIES, OIL SPILLS, SOURCE IDENTIFICATION, SPECTROSCOPY, SPECTROMETRY, CHROMATOGRAPHY,
1002 ANALYTICAL TECHNIQUES, BIBLIOGRAPHIES, FUEL OIL, CARCINOGENS, PAH, PETROLEUM PRODUCTS,
1003 ANALYTICAL TECHNIQUES, BIBLIOGRAPHIES, PAH, SOURCES, FATE, CHROMATOGRAPHY, SPECTROSCOPY, CARCINOGENS, CRUDE OIL,
0649 ANIMALS, OIL TRANSPORT, PIPELINES, ENVIRONMENTAL EFFECTS, ESTUARIES, PLANTS, MONITORING, FLORIDA,
0791 ANIMALS, HYDROCARBONS, CONTAMINATION, CHRONIC EFFECTS, *IMMUNOLOGICAL RESPONSE,
0813 ANIMALS, OIL SPILLS, ARCTIC, PLANTS, USN,
0597 API, DISPERSANTS, OIL SPILLS, CLEANUP, ENVIRONMENTAL EFFECTS, CONTINGENCY PLANNING,
0958 API, FATE, OIL SPILLS, BIOLOGICAL EFFECTS, MARINE ORGANISMS,
0971 API, FATE, TOXICITY, OIL SPILLS, CONTAMINATION, MARINE ORGANISMS,
0470 ARCTIC, OIL SPILLS, CLEANUP, RECOVERY, DISPOSAL , ECOSYSTEMS,
0614 ARCTIC, OIL SPILLS, RECOVERY, ICE, DESIGN-ENGINEERING, CANADA, *CLEAN SWEEP,
0615 ARCTIC, OIL SPILLS, RECOVERY, CONTAINMENT, REMOTE SENSING, STORAGE, DISPOSAL ,
0776 ARCTIC, CRUDE OIL, VEGETATION, BIOLOGICAL EFFECTS, OIL SPILLS, CANADA,
0813 ARCTIC, ANIMALS, OIL SPILLS, PLANTS, USN,
0890 ARCTIC, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, BEAUFORT SEA, CANADA,
0900 ARCTIC, BLOWOUT PREVENTION, POLLUTION CONTROL, OFFSHORE DRILLING, BEAUFORT SEA,
0901 ARCTIC, EXPLORATION , PRODUCTION , ENVIRONMENTAL EFFECTS, PLANTS, WILDLIFE, OIL SPILLS, MARINE ORGANISMS,
0906 ARCTIC, ALASKA, BIODEGRADATION, CRUDE OIL, MICROORGANISMS,
0951 ARCTIC, ICE, OIL SPILLS, MOVEMENT, BEHAVIOR, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, CANADA, *BLOWOUTS, *OIL-IN-ICE,
0974 ARCTIC, OIL SPILLS, FATE, CRUDE OIL, EVAPORATION, WEATHERING, SOLUTION, EMULSIFICATION, TAR,
0886 ARCTIC OCEAN, ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, ICE, *BASELINE STUDIES,
0450 ARGO MERCHANT SPILL, OIL SPILLS, TANKERS, REGULATIONS, TAR, *LIBERIAN TANKERS,
0457 ARGO MERCHANT SPILL, OIL SPILLS, ATLANTIC COAST, TANKERS, ENVIRONMENTAL EFFECTS,
0456 ARGO MERCHANT SPILL, OIL SPILLS, TANKERS, CLEANUP, *OLYMPIC GAMES SPILL, *SANSINENA SPILL,
0457 ARGO MERCHANT SPILL, OIL SPILLS, ATLANTIC COAST, TANKERS, ENVIRONMENTAL EFFECTS,
0480 ARGO MERCHANT SPILL, OIL SPILLS, ENVIRONMENTAL EFFECTS, TANKERS, CLEANUP,
0482 ARGO MERCHANT SPILL, MONITORING, OIL SPILLS, REMOTE SENSING, SPREADING, MOVEMENT, ATLANTIC OCEAN,
0580 ARGO MERCHANT SPILL, CLEANUP, OIL SPILLS, SKIMMERS, USCG,

0821 ARGO MERCHANT SPILL, OIL SPILLS, TANKERS, TOXICITY, FATE, HYDROCARBONS,
0828 ARGO MERCHANT SPILL, OIL SPILLS, TANKERS, HYDROCARBONS, FATE, TOXICITY,
0833 ARGO MERCHANT SPILL, OIL SPILLS, TANKERS, LAW ENFORCEMENT, REGULATIONS,
0536 AROMATIC HYDROCARBONS, CHEMICAL ANALYSIS, SOLUBILITY,
0556 AROMATIC HYDROCARBONS, CHEMICAL ANALYSIS, SOLUBILITY, *ALKYLBENZENES,
0764 AROMATIC HYDROCARBONS, ACCUMULATION, WASTEWATERS, REFINERIES, CONTAMINATION, MOLLUSKS, FOOD WEB, *FOOD CHAIN, *3,4-BENZOPYRENE,
0788 AROMATIC HYDROCARBONS, BIOLOGICAL EFFECTS, FISH, *MORONE SAXATILIS, *BENZENE,
0789 AROMATIC HYDROCARBONS, MOLLUSKS, UPTAKE, RELEASE, *MODIOLUS DEMISSUS, *CRASSOSTREA VIRGINICA, *PETRO-SULFUR COMPOUNDS,
0798 AROMATIC HYDROCARBONS, TOXICITY, PETROLEUM PRODUCTS, MARINE ORGANISMS, *SUBLETHAL EFFECTS, *RESPIRATION, *GROWTH,
0799 AROMATIC HYDROCARBONS, SEAWATER, MARINE ORGANISMS, UPTAKE, RELEASE,
0922 AROMATIC HYDROCARBONS, BIODEGRADATION, BACTERIA, *MAMMALS,
0923 AROMATIC HYDROCARBONS, BIODEGRADATION, PAH, CARCINOGENS, MICROORGANISMS,
0457 ATLANTIC COAST, ARGO MERCHANT SPILL, OIL SPILLS, TANKERS, ENVIRONMENTAL EFFECTS,
0457 ATLANTIC COAST, ARGO MERCHANT SPILL, OIL SPILLS, TANKERS, ENVIRONMENTAL EFFECTS,
0758 ATLANTIC COAST, OIL SPILLS, ESTUARIES, BIOLOGICAL EFFECTS, WEATHERING, PLANKTON , FISH, BENTHOS,
0846 ATLANTIC COAST, OFFSHORE DRILLING, OCS, ENVIRONMENTAL PROTECTION, MOVEMENT, CONTAMINANTS, *SOUTHEASTERN U.S., ERDA,
0856 ATLANTIC COAST, OFFSHORE PRODUCTION, ERDA, ENVIRONMENTAL EFFECTS, OIL DISCHARGES, CHRONIC EFFECTS,
0858 ATLANTIC COAST, OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, DELAWARE,
0896 ATLANTIC COAST, OIL SPILLS, OFFSHORE DEVELOPMENT, FISHERIES, ECONOMIC EFFECTS,
0897 ATLANTIC COAST, OFFSHORE DRILLING, BLOWOUT PREVENTION, OCS, TANKERS, OIL TRANSPORT, OIL SPILLS, CALIFORNIA COAST, MEXICO/GULF OF,
0972 ATLANTIC COAST, ADSORPTION, HYDROCARBONS, FATE, ESTUARIES, RIVERS, PAH, BIODEGRADATION,
0482 ATLANTIC OCEAN, ARGO MERCHANT SPILL, MONITORING, OIL SPILLS, REMOTE SENSING, SPREADING, MOVEMENT,
0495 ATLANTIC OCEAN, MONITORING, TAR, SAMPLING, DISTRIBUTION,
0835 ATLANTIC OCEAN, OIL SPILLS, OFFSHORE DEVELOPMENT, BIOLOGICAL EFFECTS, MARINE ORGANISMS, OCS,
0865 ATLANTIC OCEAN, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, OCS, MONITORING, GUIDELINES, BLM,
0868 ATLANTIC OCEAN, OFFSHORE DEVELOPMENT, OCS, HYDROCARBONS, ENVIRONMENTAL DETERIORATION, HEALTH HAZARDS,
0869 ATLANTIC OCEAN, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, PLATFORMS, OCS, BLM,
0889 ATLANTIC OCEAN, OCS, EIS, *GEOLOGIC FRAMEWORK,
0893 ATLANTIC OCEAN, OIL SPILLS, OCS, OIL-GAS LEASING, FATE, ENVIRONMENTAL EFFECTS, *RISK ANALYSIS,
0898 ATLANTIC OCEAN, OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS,
0899 ATLANTIC OCEAN, OFFSHORE DEVELOPMENT, SOCIO-ECONOMIC EFFECTS, ENVIRONMENTAL EFFECTS,
0930 ATLANTIC OCEAN, BIODEGRADATION, OXIDATION, MICROORGANISMS, BACTERIA, POLLUTION CONTROL,
0936 ATLANTIC OCEAN, BIODEGRADATION, PETROLEUM PRODUCTS, MICROORGANISMS, BARENT SEA, BALTIC SEA,
0524 BACTERIA, SAMPLING, HYDROCARBONS, DISTRIBUTION, MICROORGANISMS, TAR, SEDIMENTS, OFFSHORE DEVELOPMENT, NORTH SEA,
0605 BACTERIA, HYDROCARBONS, CLEANUP, OIL SPILLS, BIODEGRADATION, PATENT,
0786 BACTERIA, OIL SPILLS, ESTUARIES, DISTRIBUTION, MICROORGANISMS,
0908 BACTERIA, BIODEGRADATION, OIL SLICKS, HYDROCARBONS, CLEANUP, *NUTRIENT ENRICHMENT,
0910 BACTERIA, BIODEGRADATION, OIL SPILLS, CLEANUP, *MICROBIAL GENETIC ENGINEERING,
0912 BACTERIA, BIODEGRADATION, WASTE OIL, OIL WELLS, SOIL, *PETROLEUM WASTE,
0913 BACTERIA, BIODEGRADATION, HYDROCARBONS, OIL SLICKS, *SUPERMICROBES,
0915 BACTERIA, BIODEGRADATION, HYDROCARBONS, OIL SLICKS, COASTS, FRESHWATER,
0916 BACTERIA, BIODEGRADATION, HYDROCARBONS, SEDIMENTS, SEAWATER, NARRAGANSETT BAY, RHODE ISLAND,
0917 BACTERIA, BIODEGRADATION, HYDROCARBONS, METABOLISM, *ALICYCLIC COMPOUNDS,
0920 BACTERIA, BIODEGRADATION, HYDROCARBONS, *MULTI-PLASMID MICROORGANISMS,
0922 BACTERIA, AROMATIC HYDROCARBONS, BIODEGRADATION, *MAMMALS,
0924 BACTERIA, BIODEGRADATION, PAH, MICROORGANISMS, CARCINOGENS,
0930 BACTERIA, ATLANTIC OCEAN, BIODEGRADATION, OXIDATION, MICROORGANISMS, POLLUTION CONTROL,
0933 BACTERIA, BIODEGRADATION, HYDROCARBONS, SEAWATER, *HEXADECANE, *ORGANIC SUBSTANCES,
0934 BACTERIA, BIODEGRADATION, FUEL OIL, SOIL,
0940 BACTERIA, BIODEGRADATION, CRUDE OIL, PETROLEUM PRODUCTS, CASPIAN SEA, USSR,
0946 BACTERIA, BIODEGRADATION, CRUDE OIL, MONITORING, SAMPLING, FATE,
0947 BACTERIA, BIODEGRADATION, OIL SPILLS, SEDIMENTS, CHESAPEAKE BAY, *COLGATE CREEK,
0489 BALLAST, MONITORING, OIL DISCHARGES, TANKERS, DESIGN-ENGINEERING,
0494 BALLAST, MONITORING, CONTAMINATION, SHIPS, BILGES,
0672 BALLAST, WASTEWATER TREATMENT, OIL-WATER SEPARATION, COALESCENCE, PATENT,
0694 BALLAST, WASTEWATER TREATMENT, TANKERS, MOLLUSKS, *MYTILUS GALLOPROVINCIALIS,
1004 BALLAST, BIBLIOGRAPHIES, OIL-WATER SEPARATION, POLLUTION CONTROL, OIL SPILLS, RECOVERY, BILGES,
0936 BALTIC SEA, ATLANTIC OCEAN, BIODEGRADATION, PETROLEUM PRODUCTS, MICROORGANISMS, BARENT SEA

0936 BARENT SEA, BALTIC SEA, ATLANTIC OCEAN, BIODEGRADATION, PETROLEUM PRODUCTS, MICROORGANISMS,
0461 BEACHES, OIL SPILLS, CRUDE OIL, TANKERS, SPREADING, MOVEMENT, CLEANUP, DISPERSANTS, JAPAN,
0475 BEACHES, OIL SPILLS, ENVIRONMENTAL EFFECTS, MARSHES, MARINE ORGANISMS, CHESAPEAKE BAY,
0965 BEACHES, METULA SPILL, FATE, TANKERS, ENVIRONMENTAL EFFECTS, ESTUARIES, MARINE ORGANISMS, MAGELLAN/STRAIT OF,
0979 BEACHES, OIL SPILLS, FATE, MOVEMENT, SEDIMENTS, BIOLOGICAL EFFECTS, PLANKTON , BENTHOS, CHEDABUCTO BAY,
0497 BEAUFORT SEA, MONITORING, HYDROCARBONS, DISTRIBUTION, WATER QUALITY,
0518 BEAUFORT SEA, REMOTE SENSING, OIL SPILLS, *OPTICAL TECHNIQUES,
0574 BEAUFORT SEA, CONTAINMENT, OIL SLICKS, BOOMS, *ICE RIDGE KEEL,
0722 BEAUFORT SEA, CONTINGENCY PLANNING, OIL SPILLS, CLEANUP, ICE,
0877 BEAUFORT SEA, ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, BENTHOS, MARINE ORGANISMS, BERING SEA, *BASELINE STUDIES,
0890 BEAUFORT SEA, ARCTIC, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, CANADA,
0900 BEAUFORT SEA, ARCTIC, BLOWOUT PREVENTION, POLLUTION CONTROL, OFFSHORE DRILLING,
0967 BEAUFORT SEA, MODELS, OIL SPILLS, DRIFT, SHORELINES, OCS, *STORM MODELING,
0756 BEHAVIOR, FUEL OIL, *KEROSENE, BIOLOGICAL EFFECTS, CRUSTACEANS, MOLLUSKS, *SUBLETHAL EFFECTS, *LOBSTER, *MUD SNAIL,
0759 BEHAVIOR, FISH, CONTAMINATION, BENTHOS, *SUNKEN OIL, *OIL-CONTAINING PREY, *FEEDING,
0771 BEHAVIOR, FISH, *NAPHTHALENES, DISTRIBUTION, UPTAKE, RELEASE, *STRESS, *FUNDULUS SIMILUS,
0808 BEHAVIOR, CRUDE OIL, BIOLOGICAL EFFECTS, MOLLUSKS, SEDIMENTS, CHEMICAL ANALYSIS, *CLAM, *MACOMA BALTHICA,
0951 BEHAVIOR, ARCTIC, ICE, OIL SPILLS, MOVEMENT, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, CANADA, *BLOWOUTS, *OIL-IN-ICE,
0952 BEHAVIOR, OIL SPILLS, STATISTICAL ANALYSIS, WEATHERING, PIPELINES, CANADA, INLAND,
0953 BEHAVIOR, OIL SPILLS, HYDROCARBONS, GROUNDWATER, *SURFACE WATERS, *WATER-SOLUBLE FRACTIONS,
0976 BEHAVIOR, HYDROCARBONS, SEDIMENTS, FATE, CRUDE OIL, SOURCES, ENVIRONMENTAL EFFECTS,
0660 BELGIUM, WASTEWATER TREATMENT, REFINERIES, OIL-WATER SEPARATION,
0661 BELGIUM, WASTEWATER TREATMENT, REFINERIES, POLLUTION PREVENTION, *SURFACE WATERS,
0523 BENTHOS, ALASKA, SAMPLING, ESTUARIES, WATER QUALITY, *EPIFAUNA,
0526 BENTHOS, SAMPLING, HYDROCARBONS, SEDIMENTS, UPTAKE, CHEMICAL ANALYSIS, TAR, *ABYSSAL DEPTHS,
0758 BENTHOS, ATLANTIC COAST, OIL SPILLS, ESTUARIES, BIOLOGICAL EFFECTS, WEATHERING, PLANKTON , FISH,
0759 BENTHOS, BEHAVIOR, FISH, CONTAMINATION, *SUNKEN OIL, *OIL-CONTAINING PREY, *FEEDING,
0760 BENTHOS, ALGAE, TOXICITY, FUEL OIL, CRUDE OIL, WASTE OIL, METABOLISM,
0877 BENTHOS, BEAUFORT SEA, ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, MARINE ORGANISMS, BERING SEA, *BASELINE STUDIES,.
0879 BENTHOS, ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, PLANKTON , FISHERIES, *BASELINE STUDIES,
0931 BENTHOS, BIODEGRADATION, HYDROCARBONS, METABOLISM, SEDIMENTS, MICROORGANISMS, MARINE ORGANISMS,
0979 BENTHOS, BEACHES, OIL SPILLS, FATE, MOVEMENT, SEDIMENTS, BIOLOGICAL EFFECTS, PLANKTON, CHEDABUCTO BAY,
0877 BERING SEA, BENTHOS, BEAUFORT SEA, ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, MARINE ORGANISMS, *BASELINE STUDIES,
0793 BERMUDA, TAR, INTERTIDAL ZONE, MARINE ORGANISMS, BIOLOGICAL EFFECTS, HYDROCARBONS,
0832 BIBLIOGRAPHIES, OIL SPILLS, CONTAMINATION, OCEANS, ESTUARIES, BIOLOGICAL EFFECTS, FATE, ENVIRONMENTAL EFFECTS, MARINE ORGANISMS,
1000 BIBLIOGRAPHIES, ANALYTICAL TECHNIQUES, OIL SPILLS, SOURCE IDENTIFICATION, SPECTROSCOPY, SPECTROMETRY, CHROMATOGRAPHY,
1001 BIBLIOGRAPHIES, LEGISLATION, US, INTERNATIONAL AGREEMENTS, OCEANS, SHIPS, OFFSHORE DRILLING, POLLUTION PREVENTION, OIL SPILLS,
1002 BIBLIOGRAPHIES, ANALYTICAL TECHNIQUES, FUEL OIL, CARCINOGENS, PAH, PETROLEUM PRODUCTS,
1003 BIBLIOGRAPHIES, ANALYTICAL TECHNIQUES, PAH, SOURCES, FATE, CHROMATOGRAPHY, SPECTROSCOPY, CARCINOGENS, CRUDE OIL,
1004 BIBLIOGRAPHIES, BALLAST, OIL-WATER SEPARATION, POLLUTION CONTROL, OIL SPILLS, RECOVERY, BILGES,
0494 BILGES, BALLAST, MONITORING, CONTAMINATION, SHIPS,
0507 BILGES, MONITORING, WASTEWATERS, SHIPS, OIL-WATER SEPARATION, PATENT,
0680 BILGES, WASTEWATER TREATMENT, OIL-WATER SEPARATION, FILTRATION, *TUBULAR ULTRAFILTRATION SYSTEM,
0701 BILGES, OIL-WATER SEPARATION, SHIPS, DESIGN-ENGINEERING, USN,
0992 BILGES, REGULATIONS, US, SHIPS, OIL TRANSFER, OIL DISCHARGES, USCG,
1004 BILGES, BIBLIOGRAPHIES, BALLAST, OIL-WATER SEPARATION, POLLUTION CONTROL, OIL SPILLS, RECOVERY,
0553 BIODEGRADATION, DISPERSANTS, CHEMICAL ANALYSIS, SEAWATER,
0587 BIODEGRADATION, OIL SPILLS, DISPERSANTS, CLEANUP, TOXICITY,
0593 BIODEGRADATION, DISPERSANTS, HYDROCARBONS, OIL SLICKS, CLEANUP, PATENT, *NITROGEN COMPOUNDS,

0594 BIODEGRADATION, DISPERSANTS, HYDROCARBONS, OIL SLICKS, CLEANUP, PATENT, *NITROGEN COMPOUNDS,
0595 BIODEGRADATION, DISPERSANTS, HYDROCARBONS, OIL SLICKS, CLEANUP, PATENT, *NITROGEN COMPOUNDS,
0605 BIODEGRADATION, BACTERIA, HYDROCARBONS, CLEANUP, OIL SPILLS, PATENT,
0633 BIODEGRADATION, RESTORATION, OIL SPILLS, SOIL, PLANTS, *FERTILIZERS,
0669 BIODEGRADATION, OIL SPILLS, DISPOSAL, HYDROCARBONS, MANUALS, *DEBRIS,
0826 BIODEGRADATION, OIL SPILLS, ENVIRONMENTAL EFFECTS, SOURCES, CLEANUP, RECOVERY, *BOOK REVIEW,
0880 BIODEGRADATION, ALASKA, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, BIOLOGICAL EFFECTS, OCS, HYDROCARBONS, MARINE ORGANISMS,
0882 BIODEGRADATION, ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, HYDROCARBONS, DISTRIBUTION, *BASELINE STUDIES,
0906 BIODEGRADATION, ARCTIC, ALASKA, CRUDE OIL, MICROORGANISMS,
0907 BIODEGRADATION, AFRICA/SOUTH, OIL SPILLS, WASTE OIL, MICROORGANISMS, PATENT,
0908 BIODEGRADATION, BACTERIA, OIL SLICKS, HYDROCARBONS, CLEANUP, *NUTRIENT ENRICHMENT,
0909 BIODEGRADATION, HYDROCARBONS, SOIL, OXIDATION, MICROORGANISMS, *OXYGEN UPTAKE RATE,
0910 BIODEGRADATION, BACTERIA, OIL SPILLS, CLEANUP, *MICROBIAL GENETIC ENGINEERING,
0911 BIODEGRADATION, HYDROCARBONS, MICROORGANISMS, FRESHWATER, ECOSYSTEMS,
0912 BIODEGRADATION, BACTERIA, WASTE OIL, OIL WELLS, SOIL, *PETROLEUM WASTE,
0913 BIODEGRADATION, BACTERIA, HYDROCARBONS, OIL SLICKS, *SUPERMICROBES,
0914 BIODEGRADATION, OIL SPILLS, SOIL, FATE, ENVIRONMENTAL EFFECTS,
0915 BIODEGRADATION, BACTERIA, HYDROCARBONS, OIL SLICKS, COASTS, FRESHWATER,
0916 BIODEGRADATION, BACTERIA, HYDROCARBONS, SEDIMENTS, SEAWATER, NARRAGANSETT BAY, RHODE ISLAND,
0917 BIODEGRADATION, BACTERIA, HYDROCARBONS, METABOLISM, *ALICYCLIC COMPOUNDS,
0918 BIODEGRADATION, WASTEWATERS, REFINERIES, RECYCLING,
0919 BIODEGRADATION, CRUDE OIL, OCEANS, MICROORGANISMS, *NUTRIENT REQUIREMENTS,
0920 BIODEGRADATION, BACTERIA, HYDROCARBONS, *MULTI-PLASMID MICROORGANISMS,
0921 BIODEGRADATION, HYDROCARBONS, OXIDATION, *OIL BIODEGRADATION RATE,
0922 BIODEGRADATION, BACTERIA, AROMATIC HYDROCARBONS, *MAMMALS,
0923 BIODEGRADATION, AROMATIC HYDROCARBONS, PAH, CARCINOGENS, MICROORGANISMS,
0924 BIODEGRADATION, BACTERIA, PAH, MICROORGANISMS, CARCINOGENS,
0925 BIODEGRADATION, FUELS, MICROORGANISMS, *SUPERSONIC AIRCRAFT FUEL,
0926 BIODEGRADATION, GASOLINE, GROUNDWATER, *NUTRIENT ADDITION,
0927 BIODEGRADATION, GASOLINE, GROUNDWATER, PENNSYLVANIA, *NUTRIENT ADDITION,
0928 BIODEGRADATION, ANALYTICAL TECHNIQUES, CRUDE OIL, HYDROCARBONS, *PETROLEUM VARIETIES,
0929 BIODEGRADATION, HYDROCARBONS, MICROORGANISMS,
0930 BIODEGRADATION, BACTERIA, ATLANTIC OCEAN, OXIDATION, MICROORGANISMS, POLLUTION CONTROL,
0931 BIODEGRADATION, BENTHOS, HYDROCARBONS, METABOLISM, SEDIMENTS, MICROORGANISMS, MARINE ORGANISMS,
0932 BIODEGRADATION, HYDROCARBONS, MICROORGANISMS, SEAWATER,
0933 BIODEGRADATION, BACTERIA, HYDROCARBONS, SEAWATER, *HEXADECANE, *ORGANIC SUBSTANCES,
0934 BIODEGRADATION, BACTERIA, FUEL OIL, SOIL,
0935 BIODEGRADATION, OIL SPILLS, SOIL, DECOMPOSITION, MICROORGANISMS, MODELS, *NUTRIENT DEMAND,
0936 BIODEGRADATION, BARENT SEA, BALTIC SEA, ATLANTIC OCEAN, PETROLEUM PRODUCTS, MICROORGANISMS,
0937 BIODEGRADATION, HYDROCARBONS, METABOLISM, MICROORGANISMS,
0938 BIODEGRADATION, OIL SPILLS, MICROORGANISMS,
0939 BIODEGRADATION, FUEL OIL, MICROORGANISMS, FRESHWATER, *CONTINUOUS CULTURE,
0940 BIODEGRADATION, BACTERIA, CRUDE OIL, PETROLEUM PRODUCTS, CASPIAN SEA, USSR,
0941 BIODEGRADATION, CRUDE OIL, PETROLEUM PRODUCTS, ENVIRONMENTAL EFFECTS, MICROORGANISMS, OXIDATION,
0942 BIODEGRADATION, MICROORGANISMS, HYDROCARBONS, PETROLEUM PRODUCTS, CRUDE OIL, GROUNDWATER, USSR,
0943 BIODEGRADATION, PETROCHEMICALS, MICROORGANISMS, METABOLISM,
0944 BIODEGRADATION, HYDROCARBONS, SOIL, MONITORING, MODELS,
0945 BIODEGRADATION, CRUDE OIL, MICROORGANISMS, ESTUARIES, CHESAPEAKE BAY,
0946 BIODEGRADATION, BACTERIA, CRUDE OIL, MONITORING, SAMPLING, FATE,
0947 BIODEGRADATION, BACTERIA, OIL SPILLS, SEDIMENTS, CHESAPEAKE BAY, *COLGATE CREEK,
0948 BIODEGRADATION, HYDROCARBONS, METABOLISM, MICROORGANISMS, *BUTADIENE,
0957 BIODEGRADATION, OIL SPILLS, CRUDE OIL, FATE, EVAPORATION, DISPERSIONS, OXIDATION, TAR,
0970 BIODEGRADATION, MODELS, HYDROCARBONS, OIL SPILLS, OCEANS, FATE, SPREADING, EVAPORATION,
0972 BIODEGRADATION, ATLANTIC COAST, ADSORPTION, HYDROCARBONS, FATE, ESTUARIES, RIVERS, PAH,
0977 BIODEGRADATION, CRUDE OIL, CHEMICAL ANALYSIS, CHROMATOGRAPHY, OXIDATION, EVAPORATION, *PHOTOOXIDATION,
0467 BIOLOGICAL EFFECTS, OIL SPILLS; POLLUTION PREVENTION, CLEANUP, SURVEILLANCE, INTERNATIONAL AGREEMENTS,
0478 BIOLOGICAL EFFECTS, OIL SPILLS, MONITORING,
0552 BIOLOGICAL EFFECTS, CONTAMINATION, CHEMICAL ANALYSIS, CRUDE OIL, HYDROCARBONS, *WATER-SOLUBLE FRACTION,
0626 BIOLOGICAL EFFECTS, OIL SPILLS, CLEANUP, MARSHES, MANUALS,
0706 BIOLOGICAL EFFECTS, WASTE OIL, RECYCLING, REUSE, DISPOSAL,
0755 BIOLOGICAL EFFECTS, FUEL OIL, BIRDS, MONITORING, *REPRODUCTION,

0756 BIOLOGICAL EFFECTS, BEHAVIOR, FUEL OIL, *KEROSENE, CRUSTACEANS, MOLLUSKS, *SUBLETHAL EFFECTS, *LOBSTER, *MUD SNAIL,
0758 BIOLOGICAL EFFECTS, BENTHOS, ATLANTIC COAST, OIL SPILLS, ESTUARIES, WEATHERING, PLANKTON , FISH,
0765 BIOLOGICAL EFFECTS, CRUDE OIL, EMULSIONS, CRUSTACEANS, *SHRIMP, *ENZYME ACTIVITIES,
0766 BIOLOGICAL EFFECTS, OIL SPILLS, RESTORATION, MARINE ORGANISMS, SAN FRANCISCO BAY,
0767 BIOLOGICAL EFFECTS, OIL SPILLS, TROPICAL REGIONS, MARINE ORGANISMS, INTERTIDAL ZONE, MARSHES, CORAL REEFS, FLORIDA COAST,
0768 BIOLOGICAL EFFECTS, CONTAMINATION, PUGET SOUND,
0770 BIOLOGICAL EFFECTS, HYDROCARBONS, BIRDS, CHEMICAL ANALYSIS, METABOLISM, FOOD WEB, *EGGS,
0773 BIOLOGICAL EFFECTS, ALASKA, CRUDE OIL, SEDIMENTS, MARINE ORGANISMS, ECOSYSTEMS,
0775 BIOLOGICAL EFFECTS, CRUDE OIL, CRUSTACEANS, *LOBSTER, *HOMARUS AMERICANUS,
0776 BIOLOGICAL EFFECTS, ARCTIC, CRUDE OIL, VEGETATION, OIL SPILLS, CANADA,
0779 BIOLOGICAL EFFECTS, CRUDE OIL, MARINE MAMMALS, METABOLISM, *SEALS,
0781 BIOLOGICAL EFFECTS, OIL SPILLS, MARSHES, MARINE ORGANISMS, MOLLUSKS, CHESAPEAKE BAY, *MARSH GRASS,
0782 BIOLOGICAL EFFECTS, OIL SPILLS, VEGETATION, MICROORGANISMS, SOIL, CANADA,
0787 BIOLOGICAL EFFECTS, ALGAE, CRUDE OIL, *ANKISTRODESMUS,
0788 BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, FISH, *MORONE SAXATILIS, *BENZENE,
0792 BIOLOGICAL EFFECTS, FUEL OIL, PLANTS, TROPICAL REGIONS, MALAYSIA, *PIONEER MANGROVE, *AVICENNIA INTERMEDIA,
0793 BIOLOGICAL EFFECTS, BERMUDA, TAR, INTERTIDAL ZONE, MARINE ORGANISMS, HYDROCARBONS,
0795 BIOLOGICAL EFFECTS, HYDROCARBONS, CONTAMINATION, MOLLUSKS, *SCALLOPS, *PECTEN YESSOENSIS,
0797 BIOLOGICAL EFFECTS, OIL SPILLS, CONTAMINATION, MARINE ORGANISMS, TROPICAL REGIONS, COASTS, PUERTO RICO, *MANGROVES, *TURTLE GRASS,
0800 BIOLOGICAL EFFECTS, OIL SPILLS, FUEL OIL, RESTORATION, STREAMS, INVERTEBRATES, FISH, NEW MEXICO ,
0802 BIOLOGICAL EFFECTS, CONTAMINATION, SEDIMENTS, FUEL OIL, POLYCHAETES, METABOLISM, *FEEDING ACTIVITY, *ARENICOLA MARINA,
0805 BIOLOGICAL EFFECTS, HYDROCARBONS, FUEL OIL, POLYCHAETES, UPTAKE, METABOLISM, *NEANTHES ARENACEODENTATA,
0808 BIOLOGICAL EFFECTS, BEHAVIOR, CRUDE OIL, MOLLUSKS, SEDIMENTS, CHEMICAL ANALYSIS, *CLAM, *MACOMA BALTHICA,
0810 BIOLOGICAL EFFECTS, CONTAMINATION, HYDROCARBONS, METABOLISM, FISH,
0812 BIOLOGICAL EFFECTS, CRUDE OIL, INTERTIDAL ZONE, CRUSTACEANS, *BARNACLES, *CHTHAMALUS FISSUS,
0814 BIOLOGICAL EFFECTS, CRUDE OIL, MARINE ORGANISMS, INTERTIDAL ZONE,
0815 BIOLOGICAL EFFECTS, FUEL OIL, DISPERSONS, MARINE ORGANISMS, INTERTIDAL ZONE, CHEMICAL ANALYSIS, *SPECIES DIVERSITY,
0817 BIOLOGICAL EFFECTS, CRUDE OIL, FISH, METABOLISM, ESTUARIES, *MULLET,
0832 BIOLOGICAL EFFECTS, BIBLIOGRAPHIES, OIL SPILLS, CONTAMINATION, OCEANS, ESTUARIES, FATE, ENVIRONMENTAL EFFECTS, MARINE ORGANISMS,
0835 BIOLOGICAL EFFECTS, ATLANTIC OCEAN, OIL SPILLS, OFFSHORE DEVELOPMENT, MARINE ORGANISMS, OCS,
0836 BIOLOGICAL EFFECTS, PLATFORMS, OFFSHORE DRILLING, MARINE ORGANISMS, SANTA BARBARA CHANNEL,
0839 BIOLOGICAL EFFECTS, DEVELOPMENT, OIL SHALE, FISH, WILDLIFE, *US FISH & WILDLIFE SERVICE,
0880 BIOLOGICAL EFFECTS, BIODEGRADATION, ALASKA, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, OCS, HYDROCARBONS, MARINE ORGANISMS,
0904 BIOLOGICAL EFFECTS, ALASKA, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, OCS, CONTAMINANTS, MONITORING, INFORMATION SYSTEMS,
0958 BIOLOGICAL EFFECTS, API, FATE, OIL SPILLS, MARINE ORGANISMS,
0979 BIOLOGICAL EFFECTS, BENTHOS, BEACHES, OIL SPILLS, FATE, MOVEMENT, SEDIMENTS, PLANKTON, CHEDABUCTO BAY,
0449 BIRDS, CONTAMINATION, COASTS, UK, *MORTALITY,
0474 BIRDS, OIL SPILLS, CLEANUP, POLLUTION PREVENTION, WILDLIFE, CHESAPEAKE BAY, USCG,
0635 BIRDS, RESTORATION, OIL SPILLS, CLEANUP, SOLVENTS, DELAWARE, *OLYMPIC GAMES SPILL,
0755 BIRDS, BIOLOGICAL EFFECTS, FUEL OIL, MONITORING, *REPRODUCTION,
0770 BIRDS, BIOLOGICAL EFFECTS, HYDROCARBONS, CHEMICAL ANALYSIS, METABOLISM, FOOD WEB, *EGGS,
0777 BIRDS, AFRICA/SOUTH, CONSERVATION, RESTORATION, *JACKASS PENGUIN,
0874 BIRDS, ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES,
0875 BIRDS, ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES,
0876 BIRDS, ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES,
0500 BLM, MONITORING, OCS, COASTS, EIS, OIL-GAS LEASING, REGULATIONS, *ENVIRONMENTAL STUDIES PROJECT,
0865 BLM, ATLANTIC OCEAN, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, OCS, MONITORING, GUIDELINES,
0869 BLM, ATLANTIC OCEAN, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, PLATFORMS, OCS,
0903 BLM, OIL-GAS LEASING, EIS, ENVIRONMENTAL PROTECTION, OCS,
0743 BLOWOUT PREVENTION, DRILLING , DESIGN-ENGINEERING, PATENT,
0751 BLOWOUT PREVENTION, OIL SPILLS, OFFSHORE DRILLING, ICE, DISPERSANTS, CONTAINMENT, INCINERATION

0753 BLOWOUT PREVENTION, CONTAINMENT, OFFSHORE DRILLING, OIL SPILLS, NORTH SEA,
0897 BLOWOUT PREVENTION, ATLANTIC COAST, OFFSHORE DRILLING, OCS, TANKERS, OIL TRANSPORT, OIL SPILLS, CALIFORNIA COAST, MEXICO/GULF OF,
0900 BLOWOUT PREVENTION, BEAUFORT SEA, ARCTIC, POLLUTION CONTROL, OFFSHORE DRILLING,
0569 BOOMS, CONTAINMENT, OIL SPILLS, DESIGN-ENGINEERING, *HIGH CURRENTS,
0570 BOOMS, CONTAINMENT, OIL SLICKS, DESIGN-ENGINEERING, PATENT,
0571 BOOMS, CONTAINMENT, OIL SPILLS, DESIGN-ENGINEERING, PATENT,
0573 BOOMS, CONTAINMENT, OIL SPILLS, DESIGN-ENGINEERING, EPA, *OHMSETT,
0574 BOOMS, BEAUFORT SEA, CONTAINMENT, OIL SLICKS, *ICE RIDGE KEEL,
0575 BOOMS, CONTAINMENT, OIL SPILLS, RIVERS, CONTINGENCY PLANNING, CANADA, US, *DETROIT-ST. CLAIR RIVER SYSTEM,
0598 BOOMS, OIL SPILLS, RECOVERY, SKIMMERS, OIL-WATER SEPARATION, DESIGN-ENGINEERING, *OHMSETT,
0602 BOOMS, OIL SPILLS, RECOVERY, SKIMMERS, STORAGE, FRANCE,
0608 BOOMS, OIL SPILLS, RECOVERY, SKIMMERS, CONTAINMENT, DESIGN-ENGINEERING, USCG,
0624 BOOMS, OIL SPILLS, RECOVERY, CONTAINMENT, SKIMMERS, EPA, *OHMSETT,
0627 BOOMS, ABSORPTION, OIL SPILLS, CLEANUP, SKIMMERS, SURFACTANTS, DESIGN-ENGINEERING, USN,
0964 BOOMS, OIL SLICKS, DISPERSIONS, CONTAINMENT, MODELS, *DISPERSIVE OIL LOSSES,
0611 CALIFORNIA, OIL SPILLS, CLEANUP, POLLUTION CONTROL, *OAKLAND ESTUARY, *TELECOMMUNICATIONS SYSTEM,
0646 CALIFORNIA, ALASKA, OIL TRANSPORT, ENVIRONMENTAL EFFECTS, PIPELINES, ECONOMIC EFFECTS,
0853 CALIFORNIA COAST, OFFSHORE DRILLING, OIL INDUSTRY, ENVIRONMENTAL EFFECTS, ONSHORE IMPACTS,
0897 CALIFORNIA COAST, BLOWOUT PREVENTION, ATLANTIC COAST, OFFSHORE DRILLING, OCS, TANKERS, OIL TRANSPORT, OIL SPILLS, MEXICO/GULF OF,
0452 CALIFORNIA/SOUTHERN, TANKERS, OIL INDUSTRY, DEVELOPMENT, *SANSINENA EXPLOSION,
0487 CALIFORNIA/SOUTHERN, MONITORING, PAH, MOLLUSKS, CARCINOGENS, *MUSSELS, *BENZO(A)PYRENE,
0505 CALIFORNIA/SOUTHERN, MONITORING, HYDROCARBONS, SEDIMENTS, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION,
0859 CALIFORNIA/SOUTHERN, OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, *GEOLOGIC HAZARDS,
0860 CALIFORNIA/SOUTHERN, ALASKA, OFFSHORE DRILLING, OFFSHORE DEVELOPMENT, ENVIRONMENTAL PROTECTION, REGULATIONS, MEXICO/GULF OF,
0465 CANADA, OIL SPILLS, *SALT WATER SPILLS, STATISTICS, PIPELINES, *ALBERTA,
0575 CANADA, BOOMS, CONTAINMENT, OIL SPILLS, RIVERS, CONTINGENCY PLANNING, US, *DETROIT-ST. CLAIR RIVER SYSTEM,
0601 CANADA, OIL SPILLS, CLEANUP, DISPERSANTS, *CANADIAN COAST GUARD,
0604 CANADA, RESTORATION, OIL SPILLS, CLEANUP, *MAYTON OIL SPILL,
0614 CANADA, ARCTIC, OIL SPILLS, RECOVERY, ICE, DESIGN-ENGINEERING, *CLEAN SWEEP,
0620 CANADA, OIL SPILLS, RECOVERY, CRUDE OIL, FUEL OIL, SKIMMERS, OIL-WATER SEPARATION,
0621 CANADA, OIL SPILLS, RECOVERY, SKIMMERS, EMULSIFICATION,
0634 CANADA, RESTORATION, SOIL, OIL SPILLS,
0712 CANADA, OIL SPILLS, PERSONNEL TRAINING, POLLUTION CONTROL, CLEANUP, CONTINGENCY PLANNING,
0715 CANADA, CONTINGENCY PLANNING, OIL SPILLS, POLLUTION CONTROL, CLEANUP, PERSONNEL TRAINING, OIL INDUSTRY,
0716 CANADA, CONTINGENCY PLANNING, US, OIL SPILLS, ST. LAWRENCE RIVER,
0719 CANADA, CONTINGENCY PLANNING, OIL SPILLS, *RESOURCE SENSITIVITY MAPS, *BRITISH COLUMBIA,
0723 CANADA, CONTINGENCY PLANNING, OIL SPILLS, CLEANUP, COASTS,
0724 CANADA, CONTINGENCY PLANNING, OIL SPILLS, INLAND, PERSONNEL TRAINING,
0769 CANADA, WASTEWATERS, REFINERIES, TOXICITY, FISH, *AQUATIC LIFE,
0776 CANADA, BIOLOGICAL EFFECTS, ARCTIC, CRUDE OIL, VEGETATION, OIL SPILLS,
0782 CANADA, BIOLOGICAL EFFECTS, OIL SPILLS, VEGETATION, MICROORGANISMS, SOIL,
0890 CANADA, BEAUFORT SEA, ARCTIC, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS,
0951 CANADA, BEHAVIOR, ARCTIC, ICE, OIL SPILLS, MOVEMENT, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, *BLOWOUTS, *OIL-IN-ICE,
0952 CANADA, BEHAVIOR, OIL SPILLS, STATISTICAL ANALYSIS, WEATHERING, PIPELINES, INLAND,
0486 CARCINOGENS, MONITORING, PAH, COASTS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, SAMPLING, *FLUORIMETRY, *COASTAL WATERS,
0487 CARCINOGENS, CALIFORNIA/SOUTHERN, MONITORING, PAH, MOLLUSKS, *MUSSELS, *BENZO(A)PYRENE,
0819 CARCINOGENS, PAH, MOLLUSKS, ESTUARIES, OREGON, ECONOMIC EFFECTS, *BENZO(A)PYRENE,
0923 CARCINOGENS, BIODEGRADATION, AROMATIC HYDROCARBONS, PAH, MICROORGANISMS,
0924 CARCINOGENS, BIODEGRADATION, BACTERIA, PAH, MICROORGANISMS,
0978 CARCINOGENS, PAH, FATE, DECOMPOSITION, ENVIRONMENTAL EFFECTS,
1002 CARCINOGENS, BIBLIOGRAPHIES, ANALYTICAL TECHNIQUES, FUEL OIL, PAH, PETROLEUM PRODUCTS,
1003 CARCINOGENS, BIBLIOGRAPHIES, ANALYTICAL TECHNIQUES, PAH, SOURCES, FATE, CHROMATOGRAPHY, SPECTROSCOPY, CRUDE OIL,
0820 CARIBBEAN SEA, OIL SPILLS, SOCIAL EFFECTS, ECONOMIC EFFECTS, FISHERIES, *GUATEMALA,
0940 CASPIAN SEA, BIODEGRADATION, BACTERIA, CRUDE OIL, PETROLEUM PRODUCTS, USSR,
0979 CHEDABUCTO BAY, BIOLOGICAL EFFECTS, BENTHOS, BEACHES, OIL SPILLS, FATE, MOVEMENT, SEDIMENTS, PLANKTON

0980 CHEDABUCTO BAY, FUEL OIL, SEDIMENTS, FATE, WEATHERING, HYDROCARBONS, METABOLISM, MOLLUSKS,
0463 CHEMICAL ANALYSIS, ALASKA/GULF OF, NATURAL SEEPAGE, HYDROCARBONS,
0486 CHEMICAL ANALYSIS, CARCINOGENS, MONITORING, PAH, COASTS, CHROMATOGRAPHY, SAMPLING, *FLUORIMETRY, *COASTAL WATERS,
0492 CHEMICAL ANALYSIS, MONITORING, WASTEWATERS, DETECTION,
0505 CHEMICAL ANALYSIS, CALIFORNIA/SOUTHERN, MONITORING, HYDROCARBONS, SEDIMENTS, SOURCE IDENTIFICATION,
0509 CHEMICAL ANALYSIS, MONITORING, HYDROCARBONS, MARINE ORGANISMS, INTERTIDAL ZONE, CHROMATOGRAPHY, METABOLISM, *BIOGENIC HYDROCARBONS,
0520 CHEMICAL ANALYSIS, SAMPLING, HYDROCARBONS, PACIFIC OCEAN, *TANKER ROUTES,
0522 CHEMICAL ANALYSIS, SAMPLING, HYDROCARBONS, SEDIMENTS, SOURCES, DISTRIBUTION, MEXICO/GULF OF,
0526 CHEMICAL ANALYSIS, BENTHOS, SAMPLING, HYDROCARBONS, SEDIMENTS, UPTAKE, TAR, *ABYSSAL DEPTHS,
0527 CHEMICAL ANALYSIS, OIL SLICKS, CHROMATOGRAPHY, SPECTROSCOPY, DETECTION,
0529 CHEMICAL ANALYSIS, HYDROCARBONS, CHROMATOGRAPHY, SEAWATER,
0530 CHEMICAL ANALYSIS, OIL SPILLS, ESTUARIES, FISH, FATE, HYDROCARBONS, WEATHERING, *FUNDULUS HETEROCLITUS,
0532 CHEMICAL ANALYSIS, HYDROCARBONS, ZOOPLANKTON, SOURCES, DISTRIBUTION, MEXICO/GULF OF, *BIOGENIC HYDROCARBONS,
0533 CHEMICAL ANALYSIS, HYDROCARBONS, *PHENOLS, *SURFACE WATERS,
0534 CHEMICAL ANALYSIS, CHROMATOGRAPHY, CONTAMINANTS, WASTEWATERS, PETROLEUM PRODUCTS, PETROCHEMICALS, *GAS CHROMATOGRAPHY,
0535 CHEMICAL ANALYSIS, GASOLINE, CHROMATOGRAPHY, GROUNDWATER, CONTAMINATION,
0536 CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, SOLUBILITY,
0537 CHEMICAL ANALYSIS, HYDROCARBONS, MARINE ORGANISMS, CHROMATOGRAPHY, FISH,
0538 CHEMICAL ANALYSIS, HYDROCARBONS, OCEANS, SAMPLING,
0540 CHEMICAL ANALYSIS, HYDROCARBONS, MARINE ORGANISMS, CHROMATOGRAPHY, FISH, *SHRIMP, *SQUID, *N-PARAFFINS,
0541 CHEMICAL ANALYSIS, HYDROCARBONS, *INDUSTRIAL ORGANIC COMPOUNDS, *TENNESSEE RIVER,
0542 CHEMICAL ANALYSIS, CHROMATOGRAPHY, HYDROCARBONS, PETROLEUM PRODUCTS, PETROCHEMICALS, FUELS, WASTEWATERS,
0544 CHEMICAL ANALYSIS, CHROMATOGRAPHY, PAH, MARINE ORGANISMS, *SHELLFISH,
0545 CHEMICAL ANALYSIS, CHROMATOGRAPHY, CONTAMINANTS, HYDROCARBONS, WASTEWATERS, *LIQUID CHROMATOGRAPHY,
0546 CHEMICAL ANALYSIS, HYDROCARBONS, CHROMATOGRAPHY, SPECTROMETRY, SEDIMENTS, INTERTIDAL ZONE, *WATER ANALYSIS,
0549 CHEMICAL ANALYSIS, DETECTION, HYDROCARBONS, SEDIMENTS, CHROMATOGRAPHY, SOLVENTS, *N-PARAFFINS,
0550 CHEMICAL ANALYSIS, CHROMATOGRAPHY, HYDROCARBONS, CRUDE OIL, *EELS, *ORGANIC SULFIDES,
0551 CHEMICAL ANALYSIS, PETROLEUM PRODUCTS, WASTEWATERS, MONITORING,
0552 CHEMICAL ANALYSIS, BIOLOGICAL EFFECTS, CONTAMINATION, CRUDE OIL, HYDROCARBONS, *WATER-SOLUBLE FRACTION,
0553 CHEMICAL ANALYSIS, BIODEGRADATION, DISPERSANTS, SEAWATER,
0555 CHEMICAL ANALYSIS, CHROMATOGRAPHY, PETROLEUM PRODUCTS, PAH, REFINERIES, WASTEWATERS, *LIQUID CHROMATOGRAPHY,
0556 CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, SOLUBILITY, *ALKYLBENZENES,
0557 CHEMICAL ANALYSIS, WASTEWATERS, CONTAMINANTS, *SOLVENT EXTRACTION, *IR SPECTROPHOTOMETRY,
0558 CHEMICAL ANALYSIS, CHROMATOGRAPHY, HYDROCARBONS, PAH, SOIL, *THIN-LAYER CHROMATOGRAPHY,
0559 CHEMICAL ANALYSIS, *INFRARED ANALYSIS, DETECTION, *OIL-IN-WATER,
0560 CHEMICAL ANALYSIS, CHROMATOGRAPHY, SOURCES, HYDROCARBONS, SEDIMENTS, DETECTION, LAKES, WASHINGTON,
0561 CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, HYDROCARBONS, WASTEWATERS, REFINERIES, *SEWAGE, *URBAN RUNOFF, REGULATIONS, DELAWARE,
0562 CHEMICAL ANALYSIS, HYDROCARBONS,
0563 CHEMICAL ANALYSIS, CHROMATOGRAPHY, SPECTROMETRY, CRUDE OIL, PETROLEUM PRODUCTS, HYDROCARBONS, EVAPORATION, *WATER SOLUBLE FRACTIONS,
0566 CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, PAH, OIL SPILLS, INCINERATION,
0568 CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, HYDROCARBONS, CHROMATOGRAPHY, SPECTROMETRY, DISTRIBUTION, SARGASSO SEA,
0589 CHEMICAL ANALYSIS, DISPERSANTS, OIL SPILLS, *DILUTION RATE,
0770 CHEMICAL ANALYSIS, BIRDS, BIOLOGICAL EFFECTS, HYDROCARBONS, METABOLISM, FOOD WEB, *EGGS,
0808 CHEMICAL ANALYSIS, BIOLOGICAL EFFECTS, BEHAVIOR, CRUDE OIL, MOLLUSKS, SEDIMENTS, *CLAM, *MACOMA BALTHICA,
0815 CHEMICAL ANALYSIS, BIOLOGICAL EFFECTS, FUEL OIL, DISPERSONS, MARINE ORGANISMS, INTERTIDAL ZONE, *SPECIES DIVERSITY,
0881 CHEMICAL ANALYSIS, ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, MICROORGANISMS, HYDROCARBONS, DISTRIBUTION, *BASELINE STUDIES,
0977 CHEMICAL ANALYSIS, BIODEGRADATION, CRUDE OIL, CHROMATOGRAPHY, OXIDATION, EVAPORATION, *PHOTOOXIDATION,
0474 CHESAPEAKE BAY, BIRDS, OIL SPILLS, CLEANUP, POLLUTION PREVENTION, WILDLIFE, USCG,
0475 CHESAPEAKE BAY, BEACHES, OIL SPILLS, ENVIRONMENTAL EFFECTS, MARSHES, MARINE ORGANISMS,

0705 CHESAPEAKE BAY, OIL SPILLS, DISPOSAL, INCINERATION, *BLACK OIL,
0781 CHESAPEAKE BAY, BIOLOGICAL EFFECTS, OIL SPILLS, MARSHES, MARINE ORGANISMS, MOLLUSKS, *MARSH GRASS,
0945 CHESAPEAKE BAY, BIODEGRADATION, CRUDE OIL, MICROORGANISMS, ESTUARIES,
0947 CHESAPEAKE BAY, BIODEGRADATION, BACTERIA, OIL SPILLS, SEDIMENTS, *COLGATE CREEK,
0486 CHROMATOGRAPHY, CHEMICAL ANALYSIS, CARCINOGENS, MONITORING, PAH, COASTS, SAMPLING, *FLUORIMETRY, *COASTAL WATERS,
0499 CHROMATOGRAPHY, MONITORING, CRUDE OIL, DETECTION, SEDIMENTS, *OIL-IN-WATER, *BIOLOGICAL MATERIALS,
0509 CHROMATOGRAPHY, CHEMICAL ANALYSIS, MONITORING, HYDROCARBONS, MARINE ORGANISMS, INTERTIDAL ZONE, METABOLISM, *BIOGENIC HYDROCARBONS,
0527 CHROMATOGRAPHY, CHEMICAL ANALYSIS, OIL SLICKS, SPECTROSCOPY, DETECTION,
0529 CHROMATOGRAPHY, CHEMICAL ANALYSIS, HYDROCARBONS, SEAWATER,
0531 CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, WASTEWATERS, REFINERIES, SPECTROMETRY,
0534 CHROMATOGRAPHY, CHEMICAL ANALYSIS, CONTAMINANTS, WASTEWATERS, PETROLEUM PRODUCTS, PETROCHEMICALS, *GAS CHROMATOGRAPHY,
0535 CHROMATOGRAPHY, CHEMICAL ANALYSIS, GASOLINE, GROUNDWATER, CONTAMINATION,
0537 CHROMATOGRAPHY, CHEMICAL ANALYSIS, HYDROCARBONS, MARINE ORGANISMS, FISH,
0539 CHROMATOGRAPHY, ALGAE, HYDROCARBONS, SEDIMENTS, MEXICO/GULF OF, MISSISSIPPI RIVER, SAMPLING,
0540 CHROMATOGRAPHY, CHEMICAL ANALYSIS, HYDROCARBONS, MARINE ORGANISMS, FISH, *SHRIMP, *SQUID, *N-PARAFFINS,
0542 CHROMATOGRAPHY, CHEMICAL ANALYSIS, HYDROCARBONS, PETROLEUM PRODUCTS, PETROCHEMICALS, FUELS, WASTEWATERS,
0544 CHROMATOGRAPHY, CHEMICAL ANALYSIS, PAH, MARINE ORGANISMS, *SHELLFISH,
0545 CHROMATOGRAPHY, CHEMICAL ANALYSIS, CONTAMINANTS, HYDROCARBONS, WASTEWATERS, *LIQUID CHROMATOGRAPHY,
0546 CHROMATOGRAPHY, CHEMICAL ANALYSIS, HYDROCARBONS, SPECTROMETRY, SEDIMENTS, INTERTIDAL ZONE, *WATER ANALYSIS,
0547 CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, OIL SHALE, EXTRACTION, CONTAMINANTS, *BY-PRODUCT WATERS,
0549 CHROMATOGRAPHY, CHEMICAL ANALYSIS, DETECTION, HYDROCARBONS, SEDIMENTS, SOLVENTS, *N-PARAFFINS,
0550 CHROMATOGRAPHY, CHEMICAL ANALYSIS, HYDROCARBONS, CRUDE OIL, *EELS, *ORGANIC SULFIDES,
0555 CHROMATOGRAPHY, CHEMICAL ANALYSIS, PETROLEUM PRODUCTS, PAH, REFINERIES, WASTEWATERS, *LIQUID CHROMATOGRAPHY,
0558 CHROMATOGRAPHY, CHEMICAL ANALYSIS, HYDROCARBONS, PAH, SOIL, *THIN-LAYER CHROMATOGRAPHY,
0560 CHROMATOGRAPHY, CHEMICAL ANALYSIS, SOURCES, HYDROCARBONS, SEDIMENTS, DETECTION, LAKES, WASHINGTON,
0563 CHROMATOGRAPHY, CHEMICAL ANALYSIS, SPECTROMETRY, CRUDE OIL, PETROLEUM PRODUCTS, HYDROCARBONS, EVAPORATION, *WATER SOLUBLE FRACTIONS,
0565 CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, OIL SPILLS, SPECTROSCOPY, SAMPLING, USCG,
0568 CHROMATOGRAPHY, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, HYDROCARBONS, SPECTROMETRY, DISTRIBUTION, SARGASSO SEA,
0977 CHROMATOGRAPHY, CHEMICAL ANALYSIS, BIODEGRADATION, CRUDE OIL, OXIDATION, EVAPORATION, *PHOTOOXIDATION,
1000 CHROMATOGRAPHY, BIBLIOGRAPHIES, ANALYTICAL TECHNIQUES, OIL SPILLS, SOURCE IDENTIFICATION, SPECTROSCOPY, SPECTROMETRY,
1003 CHROMATOGRAPHY, CARCINOGENS, BIBLIOGRAPHIES, ANALYTICAL TECHNIQUES, PAH, SOURCES, FATE, SPECTROSCOPY, CRUDE OIL,
0757 CHRONIC EFFECTS, ANALYTICAL TECHNIQUES, HYDROCARBONS, FATE, CONTAMINATION, MARINE ORGANISMS, COASTS,
0783 CHRONIC EFFECTS, ACUTE EFFECTS, MARINE ORGANISMS, CONTAMINATION, DESIGN-ENGINEERING, *CONTINUOUS FLOW BIOASSAY SYSTEM,
0791 CHRONIC EFFECTS, ANIMALS, HYDROCARBONS, CONTAMINATION, *IMMUNOLOGICAL RESPONSE,
0794 CHRONIC EFFECTS, OFFSHORE DRILLING, OFFSHORE PRODUCTION, CRUDE OIL, PLATFORMS, MARINE ORGANISMS,
0806 CHRONIC EFFECTS, MARINE ORGANISMS, HYDROCARBONS, CRUDE OIL, FISH, DESIGN-ENGINEERING, *FLOW-THROUGH SYSTEM,
0811 CHRONIC EFFECTS, CRUDE OIL, NATURAL SEEPAGE, MARINE ORGANISMS, MOLLUSKS, SANTA BARBARA CHANNEL,
0856 CHRONIC EFFECTS, ATLANTIC COAST, OFFSHORE PRODUCTION, ERDA, ENVIRONMENTAL EFFECTS, OIL DISCHARGES,
0451 CLEANUP, TANKERS, OIL TANKS, *EXPLOSIONS, *SAFETY SYSTEMS,
0456 CLEANUP, ARGO MERCHANT SPILL, OIL SPILLS, TANKERS, *OLYMPIC GAMES SPILL, *SANSINENA SPILL,
0459 CLEANUP, ALASKA, OIL SPILLS, TANKERS, ENVIRONMENTAL EFFECTS, *COLD BAY,
0461 CLEANUP, BEACHES, OIL SPILLS, CRUDE OIL, TANKERS, SPREADING, MOVEMENT, DISPERSANTS, JAPAN,
0467 CLEANUP, BIOLOGICAL EFFECTS, OIL SPILLS, POLLUTION PREVENTION, SURVEILLANCE, INTERNATIONAL AGREEMENTS,
0470 CLEANUP, ARCTIC, OIL SPILLS, RECOVERY, DISPOSAL, ECOSYSTEMS,
0474 CLEANUP, CHESAPEAKE BAY, BIRDS, OIL SPILLS, POLLUTION PREVENTION, WILDLIFE, USCG,
0480 CLEANUP, ARGO MERCHANT SPILL, OIL SPILLS, ENVIRONMENTAL EFFECTS, TANKERS,

0512 CLEANUP, REMOTE SENSING, OIL SPILLS, POLLUTION CONTROL, LAW ENFORCEMENT, EPA,
0580 CLEANUP, ARGO MERCHANT SPILL, OIL SPILLS, SKIMMERS, USCG,
0581 CLEANUP, SKIMMERS, OIL SPILLS, MONITORING, MEDITERRANEAN SEA,
0583 CLEANUP, ALASKA, OIL SPILLS, ECONOMICS, TANKERS, PIPELINES, *OIL SPILL FUND,
0584 CLEANUP, ALASKA/GULF OF, OIL SPILLS, SKIMMERS, CONTAINMENT, DESIGN-ENGINEERING, COST ANALYSIS,
0585 CLEANUP, OIL SPILLS, RECOVERY, PATENT, DESIGN-ENGINEERING, *OLEOPHILIC SPONGE,
0586 CLEANUP, OIL SPILLS, SEAWATER, MOLLUSKS, OXIDATION, *WATER PURIFICATION, *MUSSELS, *MYTILUS EDULIS,
0587 CLEANUP, BIODEGRADATION, OIL SPILLS, DISPERSANTS, TOXICITY,
0593 CLEANUP, BIODEGRADATION, DISPERSANTS, HYDROCARBONS, OIL SLICKS, PATENT, *NITROGEN COMPOUNDS,
0594 CLEANUP, BIODEGRADATION, DISPERSANTS, HYDROCARBONS, OIL SLICKS, PATENT, *NITROGEN COMPOUNDS,
0595 CLEANUP, BIODEGRADATION, DISPERSANTS, HYDROCARBONS, OIL SLICKS, PATENT, *NITROGEN COMPOUNDS,
0597 CLEANUP, API, DISPERSANTS, OIL SPILLS, ENVIRONMENTAL EFFECTS, CONTINGENCY PLANNING,
0599 CLEANUP, OIL SPILLS, POLLUTION CONTROL, ECONOMICS, TEXAS, *CORPUS CHRISTI,
0601 CLEANUP, CANADA, OIL SPILLS, DISPERSANTS, *CANADIAN COAST GUARD,
0603 CLEANUP, OIL SPILLS, MODELS, RECOVERY, COST ANALYSIS,
0604 CLEANUP, CANADA, RESTORATION, OIL SPILLS, *MAYTON OIL SPILL,
0605 CLEANUP, BIODEGRADATION, BACTERIA, HYDROCARBONS, OIL SPILLS, PATENT,
0606 CLEANUP, DISPERSANTS, OIL SPILLS, TOXICITY, EPA,
0607 CLEANUP, ABSORPTION, OIL SLICKS, PETROLEUM PRODUCTS, DESIGN-ENGINEERING, PATENT,
0609 CLEANUP, OIL SPILLS, SKIMMERS, HARBORS, USN, *DEBRIS HANDLING SYSTEM,
0611 CLEANUP, CALIFORNIA, OIL SPILLS, POLLUTION CONTROL, *OAKLAND ESTUARY, *TELECOMMUNICATIONS SYSTEM,
0613 CLEANUP, ABSORPTION, WASTE OIL, PATENT,
0616 CLEANUP, TANKERS, OIL TANKS, SURFACTANTS,
0617 CLEANUP, OIL SPILLS, DISPERSANTS,
0619 CLEANUP, OIL SLICKS, DISPERSANTS, DESIGN-ENGINEERING, EPA, *OHMSETT,
0626 CLEANUP, BIOLOGICAL EFFECTS, OIL SPILLS, MARSHES, MANUALS,
0627 CLEANUP, BOOMS, ABSORPTION, OIL SPILLS, SKIMMERS, SURFACTANTS, DESIGN-ENGINEERING, USN,
0635 CLEANUP, BIRDS, RESTORATION, OIL SPILLS, SOLVENTS, DELAWARE, *OLYMPIC GAMES SPILL,
0670 CLEANUP, ABSORPTION, OIL SPILLS, WASTE OIL, PATENT, *METALLURGICAL PUMICE,
0710 CLEANUP, OIL SPILLS, PERSONNEL TRAINING, POLLUTION PREVENTION, CONTINGENCY PLANNING, TEXAS,
0712 CLEANUP, CANADA, OIL SPILLS, PERSONNEL TRAINING, POLLUTION CONTROL, CONTINGENCY PLANNING,
0714 CLEANUP, PERSONNEL TRAINING, OIL INDUSTRY, POLLUTION CONTROL, OIL SPILLS, RECOVERY, RESTORATION,
0715 CLEANUP, CANADA, CONTINGENCY PLANNING, OIL SPILLS, POLLUTION CONTROL, PERSONNEL TRAINING, OIL INDUSTRY,
0717 CLEANUP, CONTINGENCY PLANNING, OIL SPILLS, ENVIRONMENTAL EFFECTS, ST. LAWRENCE RIVER,
0718 CLEANUP, CONTINGENCY PLANNING, OIL SPILLS, PERSONNEL TRAINING, OIL FIELDS, NORTH SEA, *BP FORTIES OILFIELD,
0721 CLEANUP, CONTINGENCY PLANNING, OIL SPILLS, GASOLINE, OIL INDUSTRY, *STANDARD OIL CO. INDIANA,
0722 CLEANUP, BEAUFORT SEA, CONTINGENCY PLANNING, OIL SPILLS, ICE,
0723 CLEANUP, CANADA, CONTINGENCY PLANNING, OIL SPILLS, COASTS,
0725 CLEANUP, CONTINGENCY PLANNING, OIL SPILLS, POLLUTION CONTROL, ECONOMICS, *LOCAL GOVERNMENTS,
0738 CLEANUP, POLLUTION PREVENTION, OIL DISCHARGES, SHIPS, WASTE OIL TREATMENT, MONITORING, USN,
0742 CLEANUP, OIL SPILLS, POLLUTION CONTROL, DESIGN-ENGINEERING, USCG, *EQUIPMENT DELIVERY SYSTEM,
0746 CLEANUP, POLLUTION PREVENTION, OIL SPILLS, WASTE OIL DISPOSAL, *FOREST INDUSTRY,
0752 CLEANUP, POLLUTION CONTROL, OIL SPILLS, OCEANS, INLAND, ENVIRONMENTAL EFFECTS,
0772 CLEANUP, OIL SPILLS, ENVIRONMENTAL EFFECTS, CONTAMINATION, MARINE ORGANISMS, SEDIMENTS, CONTAINMENT, MAINE, *TOMANO SPILL,
0823 CLEANUP, MODELS, OIL SPILLS, FATE, MOVEMENT, COST ANALYSIS, STATISTICAL ANALYSIS,
0825 CLEANUP, OIL SPILLS, ENVIRONMENTAL EFFECTS, HYDROCARBONS, DISPERSANTS, SHORELINES, PORTUGAL,
0826 CLEANUP, BIODEGRADATION, OIL SPILLS, ENVIRONMENTAL EFFECTS, SOURCES, RECOVERY, *BOOK REVIEW,
0908 CLEANUP, BIODEGRADATION, BACTERIA, OIL SLICKS, HYDROCARBONS, *NUTRIENT ENRICHMENT,
0910 CLEANUP, BIODEGRADATION, BACTERIA, OIL SPILLS, *MICROBIAL GENETIC ENGINEERING,
0959 CLEANUP, OIL SPILLS, CRUDE OIL, DISPERSANTS, SPREADING, EMULSIFICATION, WEATHERING,
0990 CLEANUP, LEGISLATION, POLLUTION CONTROL, LIABILITY, COST ANALYSIS, *FEDERAL WATER POLLUTION CONTROL ACT,
0576 COAGULATION, CONTAINMENT, OIL SPILLS, PATENT, *POLYMERS,
0692 COAGULATION, WASTEWATER TREATMENT, OIL-WATER SEPARATION, EMULSIONS, PATENT,
0663 COALESCENCE, WASTEWATER TREATMENT, CONTAMINANTS, OIL-WATER SEPARATION, DESIGN-ENGINEERING, PATENT,
0664 COALESCENCE, DISPERSIONS, OIL-WATER SEPARATION, DESIGN-ENGINEERING, PATENT,

0665 COALESCENCE, EMULSIONS, OIL-WATER SEPARATION, PATENT,
0672 COALESCENCE, BALLAST, WASTEWATER TREATMENT, OIL-WATER SEPARATION, PATENT,
0686 COALESCENCE, WASTEWATER TREATMENT, OIL-WATER SEPARATION, DESIGN-ENGINEERING, PATENT,
0689 COALESCENCE, WASTEWATER TREATMENT, OIL-WATER SEPARATION, FLOTATION, DESIGN-ENGINEERING, PATENT,
0449 COASTS, BIRDS, CONTAMINATION, UK, *MORTALITY,
0460 COASTS, OIL SPILLS, CONTAMINATION, SPAIN, *SHELLFISH, *URQUIOLA SPILL,
0477 COASTS, OIL SPILLS, US, STATISTICAL ANALYSIS, MODELS, GREAT LAKES , *DISCRIMINANT ANALYSIS,
0486 COASTS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, CARCINOGENS, MONITORING, PAH, SAMPLING, *FLUORIMETRY, *COASTAL WATERS,
0500 COASTS, BLM, MONITORING, OCS, EIS, OIL-GAS LEASING, REGULATIONS, *ENVIRONMENTAL STUDIES PROJECT,
0510 COASTS, REMOTE SENSING, CONTAMINANTS, OIL SLICKS, EUROPE, *NIMBUS SATELLITE,
0639 COASTS, PORTS, ENVIRONMENTAL EFFECTS, SOCIO-ECONOMIC EFFECTS, OIL SPILLS, *DEEPWATER PORTS,
0723 COASTS, CLEANUP, CANADA, CONTINGENCY PLANNING, OIL SPILLS,
0757 COASTS, CHRONIC EFFECTS, ANALYTICAL TECHNIQUES, HYDROCARBONS, FATE, CONTAMINATION, MARINE ORGANISMS,
0797 COASTS, BIOLOGICAL EFFECTS, OIL SPILLS, CONTAMINATION, MARINE ORGANISMS, TROPICAL REGIONS, PUERTO RICO, *MANGROVES, *TURTLE GRASS,
0829 COASTS, CONTAMINATION, ENVIRONMENTAL EFFECTS, DEVELOPMENT, LEGISLATION, *ECOLOGY,
0851 COASTS, OFFSHORE DEVELOPMENT, OCS, EPA, ENVIRONMENTAL MANAGEMENT, OIL SPILLS, WATER QUALITY, ESTUARIES,
0854 COASTS, OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, SOCIO-ECONOMIC EFFECTS, MEXICO/GULF OF,
0862 COASTS, OFFSHORE DRILLING, OIL SPILLS, FISHERIES, NEW YORK,
0888 COASTS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, ONSHORE IMPACTS, SOCIO-ECONOMIC EFFECTS, REFINERIES, PORTS, FLORIDA, GUIDELINES,
0915 COASTS, BIODEGRADATION, BACTERIA, HYDROCARBONS, OIL SLICKS, FRESHWATER,
0973 COASTS, MODELS, OIL SPILLS, MOVEMENT, OFFSHORE DRILLING, PORTS, NEW JERSEY, DELAWARE,
0849 COLORADO, OIL SHALE, DEVELOPMENT, EIS,
0989 COMPENSATION, ENVIRONMENTAL DETERIORATION, OIL SPILLS, WILDLIFE, MARINE ORGANISMS, ECONOMICS, *LEGAL ASPECTS,
0991 COMPENSATION, LEGISLATION, US, OIL SPILLS, LIABILITY, *SUPER-FUND,
0668 CONSERVATION, REFINERIES, WASTEWATER TREATMENT, DISPOSAL,
0673 CONSERVATION, WASTEWATER TREATMENT, REFINERIES, POLLUTION CONTROL, *WATER REUSE,
0777 CONSERVATION, BIRDS, AFRICA/SOUTH, RESTORATION, *JACKASS PENGUIN,
0569 CONTAINMENT, BOOMS, OIL SPILLS, DESIGN-ENGINEERING, *HIGH CURRENTS,
0570 CONTAINMENT, BOOMS, OIL SLICKS, DESIGN-ENGINEERING, PATENT,
0571 CONTAINMENT, BOOMS, OIL SPILLS, DESIGN-ENGINEERING, PATENT,
0572 CONTAINMENT, OIL SPILLS, RIVERS, DESIGN-ENGINEERING, *HYDROFOIL DEFLECTORS,
0573 CONTAINMENT, BOOMS, OIL SPILLS, DESIGN-ENGINEERING, EPA, *OHMSETT,
0574 CONTAINMENT, BOOMS, BEAUFORT SEA, OIL SLICKS, *ICE RIDGE KEEL,
0575 CONTAINMENT, CANADA, BOOMS, OIL SPILLS, RIVERS, CONTINGENCY PLANNING, US, *DETROIT-ST. CLAIR RIVER SYSTEM,
0576 CONTAINMENT, COAGULATION, OIL SPILLS, PATENT, *POLYMERS,
0584 CONTAINMENT, CLEANUP, ALASKA/GULF OF, OIL SPILLS, SKIMMERS, DESIGN-ENGINEERING, COST ANALYSIS,
0608 CONTAINMENT, BOOMS, OIL SPILLS, RECOVERY, SKIMMERS, DESIGN-ENGINEERING, USCG,
0612 CONTAINMENT, OIL SPILLS, RECOVERY, DESIGN-ENGINEERING, PATENT, *COLLECTION BARGE,
0615 CONTAINMENT, ARCTIC, OIL SPILLS, RECOVERY, REMOTE SENSING, STORAGE, DISPOSAL,
0622 CONTAINMENT, LEAKAGE, GASOLINE, OIL TANKS, RECOVERY, GROUNDWATER,
0624 CONTAINMENT, BOOMS, OIL SPILLS, RECOVERY, SKIMMERS, EPA, *OHMSETT,
0733 CONTAINMENT, OIL SPILLS, POLLUTION CONTROL, DETECTION, RECOVERY, DISPOSAL,
0751 CONTAINMENT, BLOWOUT PREVENTION, OIL SPILLS, OFFSHORE DRILLING, ICE, DISPERSANTS, INCINERATION,
0753 CONTAINMENT, BLOWOUT PREVENTION, OFFSHORE DRILLING, OIL SPILLS, NORTH SEA,
0772 CONTAINMENT, CLEANUP, OIL SPILLS, ENVIRONMENTAL EFFECTS, CONTAMINATION, MARINE ORGANISMS, SEDIMENTS, MAINE, *TOMANO SPILL,
0964 CONTAINMENT, BOOMS, OIL SLICKS, DISPERSIONS, MODELS, *DISPERSIVE OIL LOSSES,
0490 CONTAMINANTS, ANALYTICAL TECHNIQUES, MONITORING, OCEANS, HYDROCARBONS, TAR, SAMPLING, MARINE ORGANISMS,
0510 CONTAMINANTS, COASTS, REMOTE SENSING, OIL SLICKS, EUROPE, *NIMBUS SATELLITE,
0534 CONTAMINANTS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, WASTEWATERS, PETROLEUM PRODUCTS, PETROCHEMICALS, *GAS CHROMATOGRAPHY,
0545 CONTAMINANTS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, HYDROCARBONS, WASTEWATERS, *LIQUID CHROMATOGRAPHY,
0547 CONTAMINANTS, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, OIL SHALE, EXTRACTION, *BY-PRODUCT WATERS,
0557 CONTAMINANTS, CHEMICAL ANALYSIS, WASTEWATERS, *SOLVENT EXTRACTION, *IR SPECTROPHOTOMETRY,
0628 CONTAMINANTS, ADSORPTION, PATENT, *POLYURETHANE FOAM,
0663 CONTAMINANTS, COALESCENCE, WASTEWATER TREATMENT, OIL-WATER SEPARATION, DESIGN-ENGINEERING, PATENT,

0671 CONTAMINANTS, WASTEWATER TREATMENT, FLOCCULATION, *FLOCCULANT-POLYELECTROLYTES,
0675 CONTAMINANTS, WASTEWATER TREATMENT, REFINERIES, *INTERMEDIATE TREATMENT,
0679 CONTAMINANTS, ACTIVATED SLUDGE , WASTEWATER TREATMENT, REFINERIES, *BIOCHEMISTRY,
0691 CONTAMINANTS, WASTEWATER TREATMENT, HYDROCARBONS, *VACUUM STRIPPING,
0697 CONTAMINANTS, WASTEWATER TREATMENT, EXTRACTION, DESIGN-ENGINEERING, PATENT,
0822 CONTAMINANTS, OCEAN,
0840 CONTAMINANTS, OFFSHORE EXPLORATION, SPREADING, DISPERSIONS, PLATFORMS, OIL TRANSPORT,
0846 CONTAMINANTS, ATLANTIC COAST, OFFSHORE DRILLING, OCS, ENVIRONMENTAL PROTECTION, MOVEMENT, *SOUTHEASTERN U.S., ERDA,
0904 CONTAMINANTS, BIOLOGICAL EFFECTS, ALASKA, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, OCS, MONITORING, INFORMATION SYSTEMS,
0449 CONTAMINATION, COASTS, BIRDS, UK, *MORTALITY,
0460 CONTAMINATION, COASTS, OIL SPILLS, SPAIN, *SHELLFISH, *URQUIOLA SPILL,
0494 CONTAMINATION, BILGES, BALLAST, MONITORING, SHIPS,
0517 CONTAMINATION, REMOTE SENSING, DETECTION, OIL SPILLS, MARSHES, *REMOTE LUMINESCENT SENSOR,
0525 CONTAMINATION, SAMPLING, HYDROCARBONS, *EXTRACTABLE ORGANICS, HARBORS, NEW YORK, DISTRIBUTION,
0535 CONTAMINATION, CHROMATOGRAPHY, CHEMICAL ANALYSIS, GASOLINE, GROUNDWATER,
0552 CONTAMINATION, CHEMICAL ANALYSIS, BIOLOGICAL EFFECTS, CRUDE OIL, HYDROCARBONS, *WATER-SOLUBLE FRACTION,
0631 CONTAMINATION, RESTORATION, INLAND, SOIL, OIL FIELDS, *BRINES,
0757 CONTAMINATION, COASTS, CHRONIC EFFECTS, ANALYTICAL TECHNIQUES, HYDROCARBONS, FATE, MARINE ORGANISMS,
0759 CONTAMINATION, BENTHOS, BEHAVIOR, FISH, *SUNKEN OIL, *OIL-CONTAINING PREY, *FEEDING,
0762 CONTAMINATION, HYDROCARBONS, FISH, ESTUARIES, *MICROSOMAL MIXED FUNCTION OXIDASES, *FUNDULUS HETEROCLITUS,
0764 CONTAMINATION, AROMATIC HYDROCARBONS, ACCUMULATION, WASTEWATERS, REFINERIES, MOLLUSKS, FOOD WEB, *FOOD CHAIN, *3,4-BENZOPYRENE,
0768 CONTAMINATION, BIOLOGICAL EFFECTS, PUGET SOUND,
0772 CONTAMINATION, CONTAINMENT, CLEANUP, OIL SPILLS, ENVIRONMENTAL EFFECTS, MARINE ORGANISMS, SEDIMENTS, MAINE, *TOMANO SPILL,
0783 CONTAMINATION, CHRONIC EFFECTS, ACUTE EFFECTS, MARINE ORGANISMS, DESIGN-ENGINEERING, *CONTINUOUS FLOW BIOASSAY SYSTEM,
0791 CONTAMINATION, CHRONIC EFFECTS, ANIMALS, HYDROCARBONS, *IMMUNOLOGICAL RESPONSE,
0795 CONTAMINATION, BIOLOGICAL EFFECTS, HYDROCARBONS, MOLLUSKS, *SCALLOPS, *PECTEN YESSOENSIS,
0797 CONTAMINATION, COASTS, BIOLOGICAL EFFECTS, OIL SPILLS, MARINE ORGANISMS, TROPICAL REGIONS, PUERTO RICO, *MANGROVES, *TURTLE GRASS,
0802 CONTAMINATION, BIOLOGICAL EFFECTS, SEDIMENTS, FUEL OIL, POLYCHAETES, METABOLISM, *FEEDING ACTIVITY, *ARENICOLA MARINA,
0810 CONTAMINATION, BIOLOGICAL EFFECTS, HYDROCARBONS, METABOLISM, FISH,
0827 CONTAMINATION, ENVIRONMENTAL EFFECTS, PUGET SOUND,
0829 CONTAMINATION, COASTS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, LEGISLATION, *ECOLOGY,
0830 CONTAMINATION, SHORELINES, JAPAN, DEVELOPMENT, ENVIRONMENTAL EFFECTS, MARINE ORGANISMS,
0832 CONTAMINATION, BIOLOGICAL EFFECTS, BIBLIOGRAPHIES, OIL SPILLS, OCEANS, ESTUARIES, FATE, ENVIRONMENTAL EFFECTS, MARINE ORGANISMS,
0861 CONTAMINATION, OIL INDUSTRY, ENVIRONMENTAL EFFECTS, POLLUTION CONTROL,
0863 CONTAMINATION, ENVIRONMENTAL EFFECTS, TOXICITY, OFFSHORE PRODUCTION, MARINE ORGANISMS, *PRODUCED WATERS,
0961 CONTAMINATION, OIL SPILLS, INLAND, FATE, CRUDE OIL, MODELS, GROUNDWATER,
0962 CONTAMINATION, FATE, OIL SPILLS, INLAND, CRUDE OIL, GROUNDWATER, *PERSISTENCE,
0966 CONTAMINATION, GROUNDWATER, HYDROCARBONS, MOVEMENT, POLLUTION CONTROL,
0971 CONTAMINATION, API, FATE, TOXICITY, OIL SPILLS, MARINE ORGANISMS,
0453 CONTINGENCY PLANNING, OFFSHORE DEVELOPMENT, NORTH SEA, OIL SPILLS, LEAKAGE, *NATO,
0575 CONTINGENCY PLANNING, CONTAINMENT, CANADA, BOOMS, OIL SPILLS, RIVERS, US, *DETROIT-ST. CLAIR RIVER SYSTEM,
0591 CONTINGENCY PLANNING, OIL SPILLS, RECOVERY, HYDROCARBONS, GROUNDWATER, COST ANALYSIS,
0597 CONTINGENCY PLANNING, CLEANUP, API, DISPERSANTS, OIL SPILLS, ENVIRONMENTAL EFFECTS,
0710 CONTINGENCY PLANNING, CLEANUP, OIL SPILLS, PERSONNEL TRAINING, POLLUTION PREVENTION, TEXAS,
0711 CONTINGENCY PLANNING, OIL SPILLS, PERSONNEL TRAINING, POLLUTION CONTROL, USCG, *HIATUSPORT EXERCISE,
0712 CONTINGENCY PLANNING, CLEANUP, CANADA, OIL SPILLS, PERSONNEL TRAINING, POLLUTION CONTROL,
0715 CONTINGENCY PLANNING, CLEANUP, CANADA, OIL SPILLS, POLLUTION CONTROL, PERSONNEL TRAINING, OIL INDUSTRY,
0716 CONTINGENCY PLANNING, CANADA, US, OIL SPILLS, ST. LAWRENCE RIVER,
0717 CONTINGENCY PLANNING, CLEANUP, OIL SPILLS, ENVIRONMENTAL EFFECTS, ST. LAWRENCE RIVER,
0718 CONTINGENCY PLANNING, CLEANUP, OIL SPILLS, PERSONNEL TRAINING, OIL FIELDS, NORTH SEA, *BP FORTIES OILFIELD,
0719 CONTINGENCY PLANNING, CANADA, OIL SPILLS, *RESOURCE SENSITIVITY MAPS, *BRITISH COLUMBIA,
0720 CONTINGENCY PLANNING, OIL SPILLS, FATE, ENVIRONMENTAL PROTECTION, SANTA BARBARA

CHANNEL, *CLEAN SEAS INC,
0721 CONTINGENCY PLANNING, CLEANUP, OIL SPILLS, GASOLINE, OIL INDUSTRY, *STANDARD OIL CO. INDIANA,
0722 CONTINGENCY PLANNING, CLEANUP, BEAUFORT SEA, OIL SPILLS, ICE,
0723 CONTINGENCY PLANNING, COASTS, CLEANUP, CANADA, OIL SPILLS,
0724 CONTINGENCY PLANNING, CANADA, OIL SPILLS, INLAND, PERSONNEL TRAINING,
0725 CONTINGENCY PLANNING, CLEANUP, OIL SPILLS, POLLUTION CONTROL, ECONOMICS, *LOCAL GOVERNMENTS,
0730 CONTINGENCY PLANNING, POLLUTION PREVENTION, OIL SPILLS, STORAGE, PETROLEUM PRODUCTS, *OIL STORAGE PLAN,
0739 CONTINGENCY PLANNING, INTERNATIONAL CONVENTIONS, OIL SPILLS, SHIPS, OIL-WATER SEPARATION, POLLUTION PREVENTION, IMCO,
0744 CONTINGENCY PLANNING, OIL SPILLS, PERSONNEL TRAINING, POLLUTION CONTROL,
0838 CORALS, DRILLING, SEDIMENTS, *DRILL MUD, *CLEARING RATES,
0767 CORAL REEFS, BIOLOGICAL EFFECTS, OIL SPILLS, TROPICAL REGIONS, MARINE ORGANISMS, INTERTIDAL ZONE, MARSHES, FLORIDA COAST,
0584 COST ANALYSIS, CONTAINMENT, CLEANUP, ALASKA/GULF OF, OIL SPILLS, SKIMMERS, DESIGN-ENGINEERING,
0591 COST ANALYSIS, CONTINGENCY PLANNING, OIL SPILLS, RECOVERY, HYDROCARBONS, GROUNDWATER,
0603 COST ANALYSIS, CLEANUP, OIL SPILLS, MODELS, RECOVERY,
0823 COST ANALYSIS, CLEANUP, MODELS, OIL SPILLS, FATE, MOVEMENT, STATISTICAL ANALYSIS,
0990 COST ANALYSIS, CLEANUP, LEGISLATION, POLLUTION CONTROL, LIABILITY, *FEDERAL WATER POLLUTION CONTROL ACT,
0461 CRUDE OIL, CLEANUP, BEACHES, OIL SPILLS, TANKERS, SPREADING, MOVEMENT, DISPERSANTS, JAPAN,
0468 CRUDE OIL, STATISTICAL ANALYSIS, *OIL INPUT, SOURCES, OCEANS, WASTE OIL, OIL DISCHARGES, TANKERS, NATURAL SEEPAGE,
0499 CRUDE OIL, CHROMATOGRAPHY, MONITORING, DETECTION, SEDIMENTS, *OIL-IN-WATER, *BIOLOGICAL MATERIALS,
0550 CRUDE OIL, CHROMATOGRAPHY, CHEMICAL ANALYSIS, HYDROCARBONS, *EELS, *ORGANIC SULFIDES,
0552 CRUDE OIL, CONTAMINATION, CHEMICAL ANALYSIS, BIOLOGICAL EFFECTS, HYDROCARBONS, *WATER-SOLUBLE FRACTION,
0563 CRUDE OIL, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SPECTROMETRY, PETROLEUM PRODUCTS, HYDROCARBONS, EVAPORATION, *WATER SOLUBLE FRACTIONS,
0620 CRUDE OIL, CANADA, OIL SPILLS, RECOVERY, FUEL OIL, SKIMMERS, OIL-WATER SEPARATION,
0643 CRUDE OIL, STORAGE, ENVIRONMENTAL EFFECTS, EIS, LOUISIANA, *BAYOU CHOCTAW SALT DOMES,
0644 CRUDE OIL, STORAGE, ENVIRONMENTAL EFFECTS, EIS, LOUISIANA, *COTE BLANCHE MINE,
0645 CRUDE OIL, STORAGE, ENVIRONMENTAL EFFECTS, EIS, LOUISIANA, *WEEKS ISLAND MINE,
0656 CRUDE OIL, STORAGE, ENVIRONMENTAL EFFECTS, OIL SPILLS, GROUNDWATER, VEGETATION, LOUISIANA, TEXAS, *SALT DOMES,
0708 CRUDE OIL, WASTE OIL, RECLAMATION,
0760 CRUDE OIL, BENTHOS, ALGAE, TOXICITY, FUEL OIL, WASTE OIL, METABOLISM,
0761 CRUDE OIL, ALASKA, TOXICITY, CRUSTACEANS, *WATER SOLUBLE FRACTIONS, *LARVAL STAGES, *SHRIMP, *CRABS,
0763 CRUDE OIL, TOXICITY, CRUSTACEANS, *WATER-SOLUBLE FRACTIONS, *CANCER MAGISTER DANA,
0765 CRUDE OIL, BIOLOGICAL EFFECTS, EMULSIONS, CRUSTACEANS, *SHRIMP, *ENZYME ACTIVITIES,
0773 CRUDE OIL, BIOLOGICAL EFFECTS, ALASKA, SEDIMENTS, MARINE ORGANISMS, ECOSYSTEMS,
0774 CRUDE OIL, METABOLISM, MOLLUSKS, *CLAMS, *MYA ARENARIA,
0775 CRUDE OIL, BIOLOGICAL EFFECTS, CRUSTACEANS, *LOBSTER, *HOMARUS AMERICANUS,
0776 CRUDE OIL, CANADA, BIOLOGICAL EFFECTS, ARCTIC, VEGETATION, OIL SPILLS,
0779 CRUDE OIL, BIOLOGICAL EFFECTS, MARINE MAMMALS, METABOLISM, *SEALS,
0780 CRUDE OIL, ALGAE, TOXICITY, VEGETATION, LAKES, SUBARCTIC REGIONS,
0784 CRUDE OIL, HYDROCARBONS, TOXICITY, PETROLEUM PRODUCTS, MARINE ORGANISMS, ECOSYSTEMS,
0787 CRUDE OIL, BIOLOGICAL EFFECTS, ALGAE, *ANKISTRODESMUS,
0794 CRUDE OIL, CHRONIC EFFECTS, OFFSHORE DRILLING, OFFSHORE PRODUCTION, PLATFORMS, MARINE ORGANISMS,
0803 CRUDE OIL, ALASKA, FUEL OIL, TOXICITY, MARINE ORGANISMS, FISH, INVERTEBRATES, INTERTIDAL ZONE,
0806 CRUDE OIL, CHRONIC EFFECTS, MARINE ORGANISMS, HYDROCARBONS, FISH, DESIGN-ENGINEERING, *FLOW-THROUGH SYSTEM,
0808 CRUDE OIL, CHEMICAL ANALYSIS, BIOLOGICAL EFFECTS, BEHAVIOR, MOLLUSKS, SEDIMENTS, *CLAM, *MACOMA BALTHICA,
0809 CRUDE OIL, ALGAE, *NAPHTHALENE, TOXICITY, FRESHWATER, METABOLISM, *CHLAMYDOMONAS ANGULOSA,
0811 CRUDE OIL, CHRONIC EFFECTS, NATURAL SEEPAGE, MARINE ORGANISMS, MOLLUSKS, SANTA BARBARA CHANNEL,
0812 CRUDE OIL, BIOLOGICAL EFFECTS, INTERTIDAL ZONE, CRUSTACEANS, *BARNACLES, *CHTHAMALUS FISSUS,
0814 CRUDE OIL, BIOLOGICAL EFFECTS, MARINE ORGANISMS, INTERTIDAL ZONE,
0817 CRUDE OIL, BIOLOGICAL EFFECTS, FISH, METABOLISM, ESTUARIES, *MULLET,
0906 CRUDE OIL, BIODEGRADATION, ARCTIC, ALASKA, MICROORGANISMS,
0919 CRUDE OIL, BIODEGRADATION, OCEANS, MICROORGANISMS, *NUTRIENT REQUIREMENTS,
0928 CRUDE OIL, BIODEGRADATION, ANALYTICAL TECHNIQUES, HYDROCARBONS, *PETROLEUM VARIETIES,
0940 CRUDE OIL, CASPIAN SEA, BIODEGRADATION, BACTERIA, PETROLEUM PRODUCTS, USSR,
0941 CRUDE OIL, BIODEGRADATION, PETROLEUM PRODUCTS, ENVIRONMENTAL EFFECTS, MICROORGANISMS, OXIDATION

0942 CRUDE OIL, BIODEGRADATION, MICROORGANISMS, HYDROCARBONS, PETROLEUM PRODUCTS, GROUNDWATER, USSR,
0945 CRUDE OIL, CHESAPEAKE BAY, BIODEGRADATION, MICROORGANISMS, ESTUARIES,
0946 CRUDE OIL, BIODEGRADATION, BACTERIA, MONITORING, SAMPLING, FATE,
0949 CRUDE OIL, ICE, SPREADING, *OIL-ON-ICE,
0957 CRUDE OIL, BIODEGRADATION, OIL SPILLS, FATE, EVAPORATION, DISPERSIONS, OXIDATION, TAR,
0959 CRUDE OIL, CLEANUP, OIL SPILLS, DISPERSANTS, SPREADING, EMULSIFICATION, WEATHERING,
0961 CRUDE OIL, CONTAMINATION, OIL SPILLS, INLAND, FATE, MODELS, GROUNDWATER,
0962 CRUDE OIL, CONTAMINATION, FATE, OIL SPILLS, INLAND, GROUNDWATER, *PERSISTENCE,
0974 CRUDE OIL, ARCTIC, OIL SPILLS, FATE, EVAPORATION, WEATHERING, SOLUTION, EMULSIFICATION, TAR,
0975 CRUDE OIL, OIL SPILLS, WEATHERING, TAR, EVAPORATION, SOLUTION, *SULFUR COMPOUNDS,
0976 CRUDE OIL, BEHAVIOR, HYDROCARBONS, SEDIMENTS, FATE, SOURCES, ENVIRONMENTAL EFFECTS,
0977 CRUDE OIL, CHROMATOGRAPHY, CHEMICAL ANALYSIS, BIODEGRADATION, OXIDATION, EVAPORATION, *PHOTOOXIDATION,
0987 CRUDE OIL, REGULATIONS, PETROLEUM PRODUCTS, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, FEA, *MANDATORY OIL IMPORT PROGRAM,
1003 CRUDE OIL, CHROMATOGRAPHY, CARCINOGENS, BIBLIOGRAPHIES, ANALYTICAL TECHNIQUES, PAH, SOURCES, FATE, SPECTROSCOPY,
0756 CRUSTACEANS, BIOLOGICAL EFFECTS, BEHAVIOR, FUEL OIL, *KEROSENE, MOLLUSKS, *SUBLETHAL EFFECTS, *LOBSTER, *MUD SNAIL,
0761 CRUSTACEANS, CRUDE OIL, ALASKA, TOXICITY, *WATER SOLUBLE FRACTIONS, *LARVAL STAGES, *SHRIMP, *CRABS,
0763 CRUSTACEANS, CRUDE OIL, TOXICITY, *WATER-SOLUBLE FRACTIONS, *CANCER MAGISTER DANA,
0765 CRUSTACEANS, CRUDE OIL, BIOLOGICAL EFFECTS, EMULSIONS, *SHRIMP, *ENZYME ACTIVITIES,
0775 CRUSTACEANS, CRUDE OIL, BIOLOGICAL EFFECTS, *LOBSTER, *HOMARUS AMERICANUS,
0812 CRUSTACEANS, CRUDE OIL, BIOLOGICAL EFFECTS, INTERTIDAL ZONE, *BARNACLES, *CHTHAMALUS FISSUS,
0935 DECOMPOSITION, BIODEGRADATION, OIL SPILLS, SOIL, MICROORGANISMS, MODELS, *NUTRIENT DEMAND,
0969 DECOMPOSITION, ADSORPTION, MODELS, OIL SPILLS, FATE, HYDROCARBONS, SPREADING, SOLUTION, EMULSIFICATION,
0978 DECOMPOSITION, CARCINOGENS, PAH, FATE, ENVIRONMENTAL EFFECTS,
0479 DELAWARE, INDUSTRIES, REFINERIES, *URBAN RUNOFF, *OIL CONTENT, *DELAWARE ESTUARY,
0548 DELAWARE, WASTEWATERS, REFINERIES, HYDROCARBONS, *OIL CONTENT, *URBAN RUNOFF, *DELAWARE ESTUARY,
0561 DELAWARE, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, HYDROCARBONS, WASTEWATERS, REFINERIES, *SEWAGE, *URBAN RUNOFF, REGULATIONS,
0635 DELAWARE, CLEANUP, BIRDS, RESTORATION, OIL SPILLS, SOLVENTS, *OLYMPIC GAMES SPILL,
0807 DELAWARE, TOXICITY, FUEL OIL, MARINE ORGANISMS, ESTUARIES, *ULTRA-VIOLET RADIATION,
0847 DELAWARE, OFFSHORE DEVELOPMENT, OIL INDUSTRY, OIL SPILLS, ENVIRONMENTAL DETERIORATION, GOVERNMENT AGENCIES, *COASTAL RECREATION,
0858 DELAWARE, ATLANTIC COAST, OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS,
0973 DELAWARE, COASTS, MODELS, OIL SPILLS, MOVEMENT, OFFSHORE DRILLING, PORTS, NEW JERSEY,
0984 DELAWARE, REGULATIONS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL PROTECTION, ECONOMIC EFFECTS,
0985 DELAWARE, LEGISLATION, US, OCS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, POLLUTION CONTROL, ECONOMICS,
0514 DELAWARE BAY, REMOTE SENSING, ESTUARIES, *FRONTS, OIL SLICKS, DRIFT, SPREADING, MODELS,
0982 DELAWARE BAY, OIL SPILLS, FATE, MODELS, DRIFT, SPREADING,
0986 DELAWARE BAY, PORTS, OIL TRANSFER, LEGISLATION,
0848 DENMARK, OFFSHORE DEVELOPMENT, LIABILITY, EUROPE, UK, FRANCE, NORWAY, *POLLUTION DAMAGE,
0483 DESIGN-ENGINEERING, MONITORING, DETECTION, SHIPS, USCG, *OIL-IN-WATER,
0489 DESIGN-ENGINEERING, BALLAST, MONITORING, OIL DISCHARGES, TANKERS,
0493 DESIGN-ENGINEERING, MONITORING, HYDROCARBONS, *OIL-IN-WATER, *FLUORESCENCE,
0496 DESIGN-ENGINEERING, MONITORING, LEAKAGE, DETECTION, OIL TANKS, PATENT,
0502 DESIGN-ENGINEERING, MONITORING, LEAKAGE, PIPELINES, OIL SLICKS, WASTEWATERS, DETECTION, PATENT,
0503 DESIGN-ENGINEERING, MONITORING, HYDROCARBONS, DETECTION, PATENT,
0504 DESIGN-ENGINEERING, MONITORING, OIL SLICKS, RIVERS, *INFRARED SCANNING OIL SENSOR,
0506 DESIGN-ENGINEERING, MONITORING, OIL DISCHARGES, WASTEWATERS, SHIPS, USN, *OIL CONTENT,
0508 DESIGN-ENGINEERING, REMOTE SENSING, OIL SPILLS, SHIPS, SURVEILLANCE, LAW ENFORCEMENT, ENVIRONMENTAL PROTECTION, USCG,
0569 DESIGN-ENGINEERING, CONTAINMENT, BOOMS, OIL SPILLS, *HIGH CURRENTS,
0570 DESIGN-ENGINEERING, CONTAINMENT, BOOMS, OIL SLICKS, PATENT,
0571 DESIGN-ENGINEERING, CONTAINMENT, BOOMS, OIL SPILLS, PATENT,
0572 DESIGN-ENGINEERING, CONTAINMENT, OIL SPILLS, RIVERS, *HYDROFOIL DEFLECTORS,
0573 DESIGN-ENGINEERING, CONTAINMENT, BOOMS, OIL SPILLS, EPA, *OHMSETT,
0577 DESIGN-ENGINEERING, OIL SPILLS, SKIMMERS, RECOVERY, PUGET SOUND,
0578 DESIGN-ENGINEERING, OIL SPILLS, RECOVERY, HARBORS, *CLEAN SWEEP,
0579 DESIGN-ENGINEERING, OIL SPILLS, RECOVERY, HARBORS, ESTUARIES, *CLEAN SWEEP,
0584 DESIGN-ENGINEERING, COST ANALYSIS, CONTAINMENT, CLEANUP, ALASKA/GULF OF, OIL SPILLS, SKIMMERS

0585 DESIGN-ENGINEERING, CLEANUP, OIL SPILLS, RECOVERY, PATENT, *OLEOPHILIC SPONGE,
0588 DESIGN-ENGINEERING, ABSORPTION, OIL SPILLS, RECOVERY,
0590 DESIGN-ENGINEERING, OIL SLICKS, RECOVERY, PATENT, *OLEOPHILIC CONTAINER,
0592 DESIGN-ENGINEERING, OIL SLICKS, RECOVERY, SKIMMERS, PATENT,
0596 DESIGN-ENGINEERING, SKIMMERS, OIL SLICKS, RECOVERY, PATENT,
0598 DESIGN-ENGINEERING, BOOMS, OIL SPILLS, RECOVERY, SKIMMERS, OIL-WATER SEPARATION, *OHMSETT,
0600 DESIGN-ENGINEERING, OIL SPILLS, RECOVERY, SKIMMERS, USCG,
0607 DESIGN-ENGINEERING, CLEANUP, ABSORPTION, OIL SLICKS, PETROLEUM PRODUCTS, PATENT,
0608 DESIGN-ENGINEERING, CONTAINMENT, BOOMS, OIL SPILLS, RECOVERY, SKIMMERS, USCG,
0610 DESIGN-ENGINEERING, OIL SLICKS, SKIMMERS, RECOVERY, PATENT,
0612 DESIGN-ENGINEERING, CONTAINMENT, OIL SPILLS, RECOVERY, PATENT, *COLLECTION BARGE,
0614 DESIGN-ENGINEERING, CANADA, ARCTIC, OIL SPILLS, RECOVERY, ICE, *CLEAN SWEEP,
0618 DESIGN-ENGINEERING, ABSORPTION, OIL SPILLS, RECOVERY, RIVERS, ESTUARIES, HARBORS, EPA, *OHMSETT,
0619 DESIGN-ENGINEERING, CLEANUP, OIL SLICKS, DISPERSANTS, EPA, *OHMSETT,
0623 DESIGN-ENGINEERING, OIL SPILLS, RECOVERY, SKIMMERS, OIL-WATER SEPARATION,
0625 DESIGN-ENGINEERING, OIL SPILLS, RECOVERY, SKIMMERS, PATENT,
0627 DESIGN-ENGINEERING, CLEANUP, BOOMS, ABSORPTION, OIL SPILLS, SKIMMERS, SURFACTANTS, USN,
0629 DESIGN-ENGINEERING, SKIMMERS, OIL SLICKS, RECOVERY, PATENT,
0654 DESIGN-ENGINEERING, DEVELOPMENT , PORTS, ENVIRONMENTAL PROTECTION, REGULATIONS,
0658 DESIGN-ENGINEERING, OIL-WATER SEPARATION, PATENT,
0659 DESIGN-ENGINEERING, OIL-WATER SEPARATION, PATENT,
0663 DESIGN-ENGINEERING, CONTAMINANTS, COALESCENCE, WASTEWATER TREATMENT, OIL-WATER SEPARATION, PATENT,
0664 DESIGN-ENGINEERING, COALESCENCE, DISPERSIONS, OIL-WATER SEPARATION, PATENT,
0666 DESIGN-ENGINEERING, OIL-WATER SEPARATION, EMULSIONS, FLOCCULATION, PRECIPITATION,
0686 DESIGN-ENGINEERING, COALESCENCE, WASTEWATER TREATMENT, OIL-WATER SEPARATION, PATENT,
0689 DESIGN-ENGINEERING, COALESCENCE, WASTEWATER TREATMENT, OIL-WATER SEPARATION, FLOTATION, PATENT,
0693 DESIGN-ENGINEERING, OIL-WATER SEPARATION, WASTEWATER TREATMENT, PATENT,
0697 DESIGN-ENGINEERING, CONTAMINANTS, WASTEWATER TREATMENT, EXTRACTION, PATENT,
0698 DESIGN-ENGINEERING, OIL WELLS, OIL-WATER SEPARATION, PATENT,
0701 DESIGN-ENGINEERING, BILGES, OIL-WATER SEPARATION, SHIPS, USN,
0727 DESIGN-ENGINEERING, OIL TANKS, LEAKAGE, SOIL, POLLUTION PREVENTION, STORAGE, PATENT,
0728 DESIGN-ENGINEERING, OIL TANKS, LEAKAGE, DETECTION, PATENT,
0742 DESIGN-ENGINEERING, CLEANUP, OIL SPILLS, POLLUTION CONTROL, USCG, *EQUIPMENT DELIVERY SYSTEM,
0743 DESIGN-ENGINEERING, BLOWOUT PREVENTION, DRILLING , PATENT,
0750 DESIGN-ENGINEERING, LEAKAGE, OIL TANKS, DETECTION, PATENT,
0783 DESIGN-ENGINEERING, CONTAMINATION, CHRONIC EFFECTS, ACUTE EFFECTS, MARINE ORGANISMS, *CONTINUOUS FLOW BIOASSAY SYSTEM,
0806 DESIGN-ENGINEERING, CRUDE OIL, CHRONIC EFFECTS, MARINE ORGANISMS, HYDROCARBONS, FISH, *FLOW-THROUGH SYSTEM,
0483 DETECTION, DESIGN-ENGINEERING, MONITORING, SHIPS, USCG, *OIL-IN-WATER,
0488 DETECTION, ANALYTICAL TECHNIQUES, MONITORING, WASTEWATERS, *LIGHT SCATTERING, *PARTICULATES, *OIL-IN-WATER,
0492 DETECTION, CHEMICAL ANALYSIS, MONITORING, WASTEWATERS,
0496 DETECTION, DESIGN-ENGINEERING, MONITORING, LEAKAGE, OIL TANKS, PATENT,
0499 DETECTION, CRUDE OIL, CHROMATOGRAPHY, MONITORING, SEDIMENTS, *OIL-IN-WATER, *BIOLOGICAL MATERIALS,
0502 DETECTION, DESIGN-ENGINEERING, MONITORING, LEAKAGE, PIPELINES, OIL SLICKS, WASTEWATERS, PATENT,
0503 DETECTION, DESIGN-ENGINEERING, MONITORING, HYDROCARBONS, PATENT,
0511 DETECTION, REMOTE SENSING, OIL SLICKS, SURVEILLANCE, NATURAL SEEPAGE, SANTA BARBARA CHANNEL,
0513 DETECTION, REMOTE SENSING, OIL SLICKS, SOURCE IDENTIFICATION, *MICROWAVE RADIOMETRY,
0515 DETECTION, REMOTE SENSING, OIL SLICKS, NATURAL SEEPAGE, PLATFORMS, SANTA BARBARA CHANNEL, USCG, *SIDE-LOOKING RADAR,
0516 DETECTION, REMOTE SENSING, OIL SPILLS, SURVEILLANCE, USCG, *AIRBORNE COASTAL PATROL,
0517 DETECTION, CONTAMINATION, REMOTE SENSING, OIL SPILLS, MARSHES, *REMOTE LUMINESCENT SENSOR,
0527 DETECTION, CHROMATOGRAPHY, CHEMICAL ANALYSIS, OIL SLICKS, SPECTROSCOPY,
0528 DETECTION, ANALYTICAL TECHNIQUES, ABSORPTION, OIL SLICKS, PETROLEUM PRODUCTS,
0543 DETECTION, ANALYTICAL TECHNIQUES, HYDROCARBONS,
0549 DETECTION, CHROMATOGRAPHY, CHEMICAL ANALYSIS, HYDROCARBONS, SEDIMENTS, SOLVENTS, *N-PARAFFINS,
0559 DETECTION, CHEMICAL ANALYSIS, *INFRARED ANALYSIS, *OIL-IN-WATER,
0560 DETECTION, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SOURCES, HYDROCARBONS, SEDIMENTS, LAKES, WASHINGTON,
0651 DETECTION, LEAKAGE, PIPELINES, *MINI-COMPUTERS,
0728 DETECTION, DESIGN-ENGINEERING, OIL TANKS, LEAKAGE, PATENT,
0733 DETECTION, CONTAINMENT, OIL SPILLS, POLLUTION CONTROL, RECOVERY, DISPOSAL ,
0740 DETECTION, LEAKAGE, PETROLEUM PRODUCTS, PATENT,

0750 DETECTION, DESIGN-ENGINEERING, LEAKAGE, OIL TANKS, PATENT,
0452 DEVELOPMENT, CALIFORNIA/SOUTHERN, TANKERS, OIL INDUSTRY, *SANSINENA EXPLOSION,
0654 DEVELOPMENT, DESIGN-ENGINEERING, PORTS, ENVIRONMENTAL PROTECTION, REGULATIONS,
0829 DEVELOPMENT, CONTAMINATION, COASTS, ENVIRONMENTAL EFFECTS, LEGISLATION, *ECOLOGY,
0830 DEVELOPMENT, CONTAMINATION, SHORELINES, JAPAN, ENVIRONMENTAL EFFECTS, MARINE ORGANISMS,
0839 DEVELOPMENT, BIOLOGICAL EFFECTS, OIL SHALE, FISH, WILDLIFE, *US FISH & WILDLIFE SERVICE,
0849 DEVELOPMENT, COLORADO, OIL SHALE, EIS,
0855 DEVELOPMENT, OIL SHALE, EPA, *ROCKY MOUNTAIN STATES,
0857 DEVELOPMENT, OIL SHALE, ENVIRONMENTAL EFFECTS, EXTRACTION,
0872 DEVELOPMENT, OIL SHALE, ENVIRONMENTAL EFFECTS, *LIQUID WASTES, SOLID WASTES, *LEACHING,
0892 DEVELOPMENT, PIPELINES, STORAGE, OIL INDUSTRY, SCOTLAND, *SULLOM VOE TERMINAL,
0894 DEVELOPMENT, PLATFORMS, EIS, ENVIRONMENTAL EFFECTS, SCOTLAND,
0461 DISPERSANTS, CRUDE OIL, CLEANUP, BEACHES, OIL SPILLS, TANKERS, SPREADING, MOVEMENT, JAPAN,
0553 DISPERSANTS, CHEMICAL ANALYSIS, BIODEGRADATION, SEAWATER,
0587 DISPERSANTS, CLEANUP, BIODEGRADATION, OIL SPILLS, TOXICITY,
0589 DISPERSANTS, CHEMICAL ANALYSIS, OIL SPILLS, *DILUTION RATE,
0593 DISPERSANTS, CLEANUP, BIODEGRADATION, HYDROCARBONS, OIL SLICKS, PATENT, *NITROGEN COMPOUNDS,
0594 DISPERSANTS, CLEANUP, BIODEGRADATION, HYDROCARBONS, OIL SLICKS, PATENT, *NITROGEN COMPOUNDS,
0595 DISPERSANTS, CLEANUP, BIODEGRADATION, HYDROCARBONS, OIL SLICKS, PATENT, *NITROGEN COMPOUNDS,
0597 DISPERSANTS, CONTINGENCY PLANNING, CLEANUP, API, OIL SPILLS, ENVIRONMENTAL EFFECTS,
0601 DISPERSANTS, CLEANUP, CANADA, OIL SPILLS, *CANADIAN COAST GUARD,
0606 DISPERSANTS, CLEANUP, OIL SPILLS, TOXICITY, EPA,
0617 DISPERSANTS, CLEANUP, OIL SPILLS,
0619 DISPERSANTS, DESIGN-ENGINEERING, CLEANUP, OIL SLICKS, EPA, *OHMSETT,
0751 DISPERSANTS, CONTAINMENT, BLOWOUT PREVENTION, OIL SPILLS, OFFSHORE DRILLING, ICE, INCINERATION,
0825 DISPERSANTS, CLEANUP, OIL SPILLS, ENVIRONMENTAL EFFECTS, HYDROCARBONS, SHORELINES, PORTUGAL,
0959 DISPERSANTS, CRUDE OIL, CLEANUP, OIL SPILLS, SPREADING, EMULSIFICATION, WEATHERING,
0664 DISPERSIONS, DESIGN-ENGINEERING, COALESCENCE, OIL-WATER SEPARATION, PATENT,
0840 DISPERSIONS, CONTAMINANTS, OFFSHORE EXPLORATION, SPREADING, PLATFORMS, OIL TRANSPORT,
0957 DISPERSIONS, CRUDE OIL, BIODEGRADATION, OIL SPILLS, FATE, EVAPORATION, OXIDATION, TAR,
0964 DISPERSIONS, CONTAINMENT, BOOMS, OIL SLICKS, MODELS, *DISPERSIVE OIL LOSSES,
0470 DISPOSAL, CLEANUP, ARCTIC, OIL SPILLS, RECOVERY, ECOSYSTEMS,
0615 DISPOSAL, CONTAINMENT, ARCTIC, OIL SPILLS, RECOVERY, REMOTE SENSING, STORAGE,
0662 DISPOSAL, ECONOMICS, OIL INDUSTRY, WASTEWATERS, WASTE OIL, SOLID WASTES, RECYCLING,
0668 DISPOSAL, CONSERVATION, REFINERIES, WASTEWATER TREATMENT,
0669 DISPOSAL, BIODEGRADATION, OIL SPILLS, HYDROCARBONS, MANUALS, *DEBRIS,
0704 DISPOSAL, WASTE OIL, PETROCHEMICALS, STORAGE, MANUALS, USN,
0705 DISPOSAL, CHESAPEAKE BAY, OIL SPILLS, INCINERATION, *BLACK OIL,
0706 DISPOSAL, BIOLOGICAL EFFECTS, WASTE OIL, RECYCLING, REUSE,
0733 DISPOSAL, DETECTION, CONTAINMENT, OIL SPILLS, POLLUTION CONTROL, RECOVERY,
0472 DISTRIBUTION, HYDROCARBONS, SOURCES, INDUSTRIES, REFINERIES, *MUNICIPAL DISCHARGES, *RUNOFF,
0495 DISTRIBUTION, ATLANTIC OCEAN, MONITORING, TAR, SAMPLING,
0497 DISTRIBUTION, BEAUFORT SEA, MONITORING, HYDROCARBONS, WATER QUALITY,
0498 DISTRIBUTION, MONITORING, HYDROCARBONS, OCEANS, SURVEILLANCE,
0521 DISTRIBUTION, SAMPLING, HYDROCARBONS, PACIFIC OCEAN, *TANKER ROUTES,
0522 DISTRIBUTION, CHEMICAL ANALYSIS, SAMPLING, HYDROCARBONS, SEDIMENTS, SOURCES, MEXICO/GULF OF,
0524 DISTRIBUTION, BACTERIA, SAMPLING, HYDROCARBONS, MICROORGANISMS, TAR, SEDIMENTS, OFFSHORE DEVELOPMENT, NORTH SEA,
0525 DISTRIBUTION, CONTAMINATION, SAMPLING, HYDROCARBONS, *EXTRACTABLE ORGANICS, HARBORS, NEW YORK,
0532 DISTRIBUTION, CHEMICAL ANALYSIS, HYDROCARBONS, ZOOPLANKTON, SOURCES, MEXICO/GULF OF, *BIOGENIC HYDROCARBONS,
0568 DISTRIBUTION, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, HYDROCARBONS, SPECTROMETRY, SARGASSO SEA,
0641 DISTRIBUTION, HYDROCARBONS, OIL TRANSFER, OCEANS, MARINE ORGANISMS, FOOD WEB, *TRANSFER PROCESSES,
0771 DISTRIBUTION, BEHAVIOR, FISH, *NAPHTHALENES, UPTAKE, RELEASE, *STRESS, *FUNDULUS SIMILUS,
0786 DISTRIBUTION, BACTERIA, OIL SPILLS, ESTUARIES, MICROORGANISMS,
0881 DISTRIBUTION, CHEMICAL ANALYSIS, ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, MICROORGANISMS, HYDROCARBONS, *BASELINE STUDIES,
0882 DISTRIBUTION, BIODEGRADATION, ALASKA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, HYDROCARBONS, *BASELINE STUDIES,
0981 DISTRIBUTION, HYDROCARBONS, SEDIMENTS, LAKES,

0996 DISTRIBUTION, GUIDELINES, WASTEWATER TREATMENT, PRODUCTION, STORAGE, OIL-WATER SEPARATION, POLLUTION CONTROL,
0514 DRIFT, DELAWARE BAY, REMOTE SENSING, ESTUARIES, *FRONTS, OIL SLICKS, SPREADING, MODELS,
0963 DRIFT, ALASKA/GULF OF, MODELS, OIL SPILLS, MOVEMENT, OCS,
0967 DRIFT, BEAUFORT SEA, MODELS, OIL SPILLS, SHORELINES, OCS, *STORM MODELING,
0968 DRIFT, MODELS, OIL SPILLS, HARBORS, SPREADING, NEW YORK,
0982 DRIFT, DELAWARE BAY, OIL SPILLS, FATE, MODELS, SPREADING,
0471 DRILLING, OIL INDUSTRY, EXPLORATION, *MICHIGAN, *BAKER SANCTUARY,
0554 DRILLING, ANALYTICAL TECHNIQUES, WATER QUALITY, *DRILLING MUDS,
0743 DRILLING, DESIGN-ENGINEERING, BLOWOUT PREVENTION, PATENT,
0838 DRILLING, CORALS, SEDIMENTS, *DRILL MUD, *CLEARING RATES,
0994 DRILLING, GUIDELINES, PRODUCTION, EXPLORATION, WASTEWATERS, EPA, *ONSHORE POINT SOURCE CATEGORY,
0646 ECONOMIC EFFECTS, CALIFORNIA, ALASKA, OIL TRANSPORT, ENVIRONMENTAL EFFECTS, PIPELINES,
0734 ECONOMIC EFFECTS, POLLUTION CONTROL, OIL SPILLS, *COSTS, MODELS, *POLLUTER RESPONSE,
0818 ECONOMIC EFFECTS, OIL SPILLS, TOXICITY, POLLUTION CONTROL, *SHELL OIL CO.,
0819 ECONOMIC EFFECTS, CARCINOGENS, PAH, MOLLUSKS, ESTUARIES, OREGON, *BENZO(A)PYRENE,
0820 ECONOMIC EFFECTS, CARIBBEAN SEA, OIL SPILLS, SOCIAL EFFECTS, FISHERIES, *GUATEMALA,
0824 ECONOMIC EFFECTS, OIL SPILLS, TANKERS, FATE, ENVIRONMENTAL EFFECTS, MODELS, WILDLIFE, *WORLD WAR II SPILLS,
0843 ECONOMIC EFFECTS, OFFSHORE DEVELOPMENT, ONSHORE IMPACTS, SCOTLAND,
0844 ECONOMIC EFFECTS, OFFSHORE EXPLORATION, OIL-GAS LEASING, FLORIDA, ONSHORE IMPACTS,
0858 ECONOMIC EFFECTS, DELAWARE, ATLANTIC COAST, OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS,
0896 ECONOMIC EFFECTS, ATLANTIC COAST, OIL SPILLS, OFFSHORE DEVELOPMENT, FISHERIES,
0984 ECONOMIC EFFECTS, DELAWARE, REGULATIONS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL PROTECTION,
0987 ECONOMIC EFFECTS, CRUDE OIL, REGULATIONS, PETROLEUM PRODUCTS, ENVIRONMENTAL EFFECTS, FEA, *MANDATORY OIL IMPORT PROGRAM,
0988 ECONOMIC EFFECTS, LEGISLATION, US, POLLUTION CONTROL, REFINERIES, OIL INDUSTRY,
0458 ECONOMICS, ALASKA, PIPELINES, OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, *TRANS-ALASKA PIPELINE,
0583 ECONOMICS, CLEANUP, ALASKA, OIL SPILLS, TANKERS, PIPELINES, *OIL SPILL FUND,
0599 ECONOMICS, CLEANUP, OIL SPILLS, POLLUTION CONTROL, TEXAS, *CORPUS CHRISTI,
0650 ECONOMICS, TANKERS, OIL TRANSPORT, OIL SPILLS, POLLUTION CONTROL, REGULATIONS, *STANDARDS,
0662 ECONOMICS, DISPOSAL, OIL INDUSTRY, WASTEWATERS, WASTE OIL, SOLID WASTES, RECYCLING,
0685 ECONOMICS, WASTEWATER TREATMENT, PETROCHEMICALS, LEGISLATION, GERMANY, WEST,
0725 ECONOMICS, CONTINGENCY PLANNING, CLEANUP, OIL SPILLS, POLLUTION CONTROL, *LOCAL GOVERNMENTS,
0842 ECONOMICS, REGULATIONS, POLLUTION CONTROL, OIL INDUSTRY, REFINING, EXPLORATION, PRODUCTION,
0852 ECONOMICS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS,
0870 ECONOMICS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, OFFSHORE DRILLING,
0902 ECONOMICS, OIL-GAS LEASING, OCS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL PROTECTION, *USDI,
0985 ECONOMICS, DELAWARE, LEGISLATION, US, OCS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, POLLUTION CONTROL,
0989 ECONOMICS, COMPENSATION, ENVIRONMENTAL DETERIORATION, OIL SPILLS, WILDLIFE, MARINE ORGANISMS, *LEGAL ASPECTS,
0997 ECONOMICS, GUIDELINES, WASTEWATER TREATMENT, OIL INDUSTRY, REFINERIES, LEGISLATION, WATER QUALITY,
0470 ECOSYSTEMS, DISPOSAL, CLEANUP, ARCTIC, OIL SPILLS, RECOVERY,
0773 ECOSYSTEMS, CRUDE OIL, BIOLOGICAL EFFECTS, ALASKA, SEDIMENTS, MARINE ORGANISMS,
0784 ECOSYSTEMS, CRUDE OIL, HYDROCARBONS, TOXICITY, PETROLEUM PRODUCTS, MARINE ORGANISMS,
0911 ECOSYSTEMS, BIODEGRADATION, HYDROCARBONS, MICROORGANISMS, FRESHWATER,
0500 EIS, COASTS, BLM, MONITORING, OCS, OIL-GAS LEASING, REGULATIONS, *ENVIRONMENTAL STUDIES PROJECT,
0643 EIS, CRUDE OIL, STORAGE, ENVIRONMENTAL EFFECTS, LOUISIANA, *BAYOU CHOCTAW SALT DOMES,
0644 EIS, CRUDE OIL, STORAGE, ENVIRONMENTAL EFFECTS, LOUISIANA, *COTE BLANCHE MINE,
0645 EIS, CRUDE OIL, STORAGE, ENVIRONMENTAL EFFECTS, LOUISIANA, *WEEKS ISLAND MINE,
0849 EIS, DEVELOPMENT, COLORADO, OIL SHALE,
0889 EIS, ATLANTIC OCEAN, OCS, *GEOLOGIC FRAMEWORK,
0894 EIS, DEVELOPMENT, PLATFORMS, ENVIRONMENTAL EFFECTS, SCOTLAND,
0903 EIS, BLM, OIL-GAS LEASING, ENVIRONMENTAL PROTECTION, OCS,
0905 EIS, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, SANTA BARBARA CHANNEL, *AIR QUALITY IMPACTS,
0621 EMULSIFICATION, CANADA, OIL SPILLS, RECOVERY, SKIMMERS,
0959 EMULSIFICATION, DISPERSANTS, CRUDE OIL, CLEANUP, OIL SPILLS, SPREADING, WEATHERING,
0969 EMULSIFICATION, DECOMPOSITION, ADSORPTION, MODELS, OIL SPILLS, FATE, HYDROCARBONS, SPREADING, SOLUTION,
0974 EMULSIFICATION, CRUDE OIL, ARCTIC, OIL SPILLS, FATE, EVAPORATION, WEATHERING, SOLUTION, TAR,
0665 EMULSIONS, COALESCENCE, OIL-WATER SEPARATION, PATENT,
0666 EMULSIONS, DESIGN-ENGINEERING, OIL-WATER SEPARATION, FLOCCULATION, PRECIPITATION,
0687 EMULSIONS, OIL-WATER SEPARATION, WASTEWATERS, REFINERIES, FLOCCULATION,

0692 EMULSIONS, COAGULATION, WASTEWATER TREATMENT, OIL-WATER SEPARATION, PATENT,
0695 EMULSIONS, WASTEWATER TREATMENT, WASTE OIL, PATENT,
0765 EMULSIONS, CRUSTACEANS, CRUDE OIL, BIOLOGICAL EFFECTS, *SHRIMP, *ENZYME ACTIVITIES,
0847 ENVIRONMENTAL DETERIORATION, DELAWARE, OFFSHORE DEVELOPMENT, OIL INDUSTRY, OIL SPILLS, GOVERNMENT AGENCIES, *COASTAL RECREATION,
0868 ENVIRONMENTAL DETERIORATION, ATLANTIC OCEAN, OFFSHORE DEVELOPMENT, OCS, HYDROCARBONS, HEALTH HAZARDS,
0989 ENVIRONMENTAL DETERIORATION, ECONOMICS, COMPENSATION, OIL SPILLS, WILDLIFE, MARINE ORGANISMS, *LEGAL ASPECTS,
0455 ENVIRONMENTAL EFFECTS, OIL SPILLS, MEXICO/GULF OF, OCS, *USGS REPORT,
0457 ENVIRONMENTAL EFFECTS, ATLANTIC COAST, ARGO MERCHANT SPILL, OIL SPILLS, TANKERS,
0458 ENVIRONMENTAL EFFECTS, ECONOMICS, ALASKA, PIPELINES, OFFSHORE DEVELOPMENT, OCS, *TRANS-ALASKA PIPELINE,
0459 ENVIRONMENTAL EFFECTS, CLEANUP, ALASKA, OIL SPILLS, TANKERS, *COLD BAY,
0466 ENVIRONMENTAL EFFECTS, OIL SPILLS, WASTE OIL, RIVERS, VEGETATION, PENNSYLVANIA, *SCHUYLKILL SPILL,
0473 ENVIRONMENTAL EFFECTS, ALASKA, OIL SPILLS, OFFSHORE DRILLING, *KACHEMAK BAY,
0475 ENVIRONMENTAL EFFECTS, CHESAPEAKE BAY, BEACHES, OIL SPILLS, MARSHES, MARINE ORGANISMS,
0480 ENVIRONMENTAL EFFECTS, CLEANUP, ARGO MERCHANT SPILL, OIL SPILLS, TANKERS,
0597 ENVIRONMENTAL EFFECTS, DISPERSANTS, CONTINGENCY PLANNING, CLEANUP, API, OIL SPILLS,
0638 ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, PORTS, TANKERS, SOCIO-ECONOMIC EFFECTS, *DEEPWATER TERMINALS,
0639 ENVIRONMENTAL EFFECTS, COASTS, PORTS, SOCIO-ECONOMIC EFFECTS, OIL SPILLS, *DEEPWATER PORTS,
0642 ENVIRONMENTAL EFFECTS, PORTS, OIL TRANSFER, FLORIDA, MEXICO/GULF OF, SOCIO-ECONOMIC EFFECTS, LEGISLATION, *DEEPWATER PORTS,
0643 ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STORAGE, LOUISIANA, *BAYOU CHOCTAW SALT DOMES,
0644 ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STORAGE, LOUISIANA, *COTE BLANCHE MINE,
0645 ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STORAGE, LOUISIANA, *WEEKS ISLAND MINE,
0646 ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, CALIFORNIA, ALASKA, OIL TRANSPORT, PIPELINES,
0649 ENVIRONMENTAL EFFECTS, ANIMALS, OIL TRANSPORT, PIPELINES, ESTUARIES, PLANTS, MONITORING, FLORIDA,
0655 ENVIRONMENTAL EFFECTS, PORTS, OIL TRANSPORT, STORAGE, SOCIAL EFFECTS, OIL SPILLS, PACIFIC OCEAN, *PALAU, *SUPERPORT,
0656 ENVIRONMENTAL EFFECTS, CRUDE OIL, STORAGE, OIL SPILLS, GROUNDWATER, VEGETATION, LOUISIANA, TEXAS, *SALT DOMES,
0717 ENVIRONMENTAL EFFECTS, CONTINGENCY PLANNING, CLEANUP, OIL SPILLS, ST. LAWRENCE RIVER,
0732 ENVIRONMENTAL EFFECTS, POLLUTION PREVENTION, OCEANS, STORAGE, OIL SPILLS,
0752 ENVIRONMENTAL EFFECTS, CLEANUP, POLLUTION CONTROL, OIL SPILLS, OCEANS, INLAND,
0772 ENVIRONMENTAL EFFECTS, CONTAMINATION, CONTAINMENT, CLEANUP, OIL SPILLS, MARINE ORGANISMS, SEDIMENTS, MAINE, *TOMANO SPILL,
0824 ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, OIL SPILLS, TANKERS, FATE, MODELS, WILDLIFE, *WORLD WAR II SPILLS,
0825 ENVIRONMENTAL EFFECTS, DISPERSANTS, CLEANUP, OIL SPILLS, HYDROCARBONS, SHORELINES, PORTUGAL,
0826 ENVIRONMENTAL EFFECTS, CLEANUP, BIODEGRADATION, OIL SPILLS, SOURCES, RECOVERY, *BOOK REVIEW,
0827 ENVIRONMENTAL EFFECTS, CONTAMINATION, PUGET SOUND,
0829 ENVIRONMENTAL EFFECTS, DEVELOPMENT, CONTAMINATION, COASTS, LEGISLATION, *ECOLOGY,
0830 ENVIRONMENTAL EFFECTS, DEVELOPMENT, CONTAMINATION, SHORELINES, JAPAN, MARINE ORGANISMS,
0832 ENVIRONMENTAL EFFECTS, CONTAMINATION, BIOLOGICAL EFFECTS, BIBLIOGRAPHIES, OIL SPILLS, OCEANS, ESTUARIES, FATE, MARINE ORGANISMS,
0834 ENVIRONMENTAL EFFECTS, POLLUTION CONTROL, REGULATIONS, LEGISLATION, US,
0837 ENVIRONMENTAL EFFECTS, OIL SPILLS, OFFSHORE DRILLING, FISHERIES, MARINE ORGANISMS, *GEORGES BANK,
0845 ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, FISHERIES, US, REGULATIONS, OIL INDUSTRY,
0850 ENVIRONMENTAL EFFECTS, OIL SHALE, PRODUCTION, EXTRACTION, SOLID WASTES, WASTEWATERS,
0852 ENVIRONMENTAL EFFECTS, ECONOMICS, OFFSHORE DEVELOPMENT,
0853 ENVIRONMENTAL EFFECTS, CALIFORNIA COAST, OFFSHORE DRILLING, OIL INDUSTRY, ONSHORE IMPACTS,
0854 ENVIRONMENTAL EFFECTS, COASTS, OFFSHORE DEVELOPMENT, OCS, SOCIO-ECONOMIC EFFECTS, MEXICO/GULF OF,
0856 ENVIRONMENTAL EFFECTS, CHRONIC EFFECTS, ATLANTIC COAST, OFFSHORE PRODUCTION, ERDA, OIL DISCHARGES,
0857 ENVIRONMENTAL EFFECTS, DEVELOPMENT, OIL SHALE, EXTRACTION,
0858 ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, DELAWARE, ATLANTIC COAST, OFFSHORE DEVELOPMENT, OCS,
0859 ENVIRONMENTAL EFFECTS, CALIFORNIA/SOUTHERN, OFFSHORE DEVELOPMENT, OCS, *GEOLOGIC HAZARDS,
0861 ENVIRONMENTAL EFFECTS, CONTAMINATION, OIL INDUSTRY, POLLUTION CONTROL,
0863 ENVIRONMENTAL EFFECTS, CONTAMINATION, TOXICITY, OFFSHORE PRODUCTION, MARINE ORGANISMS, *PRODUCED WATERS,
0865 ENVIRONMENTAL EFFECTS, BLM, ATLANTIC OCEAN, OFFSHORE DRILLING, OCS, MONITORING, GUIDELINES,

0866 ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS,
0867 ENVIRONMENTAL EFFECTS, OFFSHORE DRILLING, OIL SPILLS,
0869 ENVIRONMENTAL EFFECTS, BLM, ATLANTIC OCEAN, OFFSHORE DRILLING, PLATFORMS, OCS,
0870 ENVIRONMENTAL EFFECTS, ECONOMICS, OFFSHORE DEVELOPMENT, OFFSHORE DRILLING,
0871 ENVIRONMENTAL EFFECTS, OFFSHORE PRODUCTION, OIL INDUSTRY, HYDROCARBONS, MARINE ORGANISMS, SEDIMENTS, LOUISIANA,
0872 ENVIRONMENTAL EFFECTS, DEVELOPMENT, OIL SHALE, *LIQUID WASTES, SOLID WASTES, *LEACHING,
0873 ENVIRONMENTAL EFFECTS, ALASKA, OFFSHORE DEVELOPMENT, OCS, MARINE MAMMALS, *BASELINE STUDIES,
0874 ENVIRONMENTAL EFFECTS, BIRDS, ALASKA, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES,
0875 ENVIRONMENTAL EFFECTS, BIRDS, ALASKA, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES,
0876 ENVIRONMENTAL EFFECTS, BIRDS, ALASKA, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES,
0877 ENVIRONMENTAL EFFECTS, BERING SEA, BENTHOS, BEAUFORT SEA, ALASKA, OFFSHORE DEVELOPMENT, OCS, MARINE ORGANISMS, *BASELINE STUDIES,
0878 ENVIRONMENTAL EFFECTS, ALASKA, OFFSHORE DEVELOPMENT, OCS, FISH, MOLLUSKS, HABITAT, *BASELINE STUDIES,
0879 ENVIRONMENTAL EFFECTS, BENTHOS, ALASKA, OFFSHORE DEVELOPMENT, OCS, PLANKTON, FISHERIES, *BASELINE STUDIES,
0880 ENVIRONMENTAL EFFECTS, BIOLOGICAL EFFECTS, BIODEGRADATION, ALASKA, OFFSHORE DEVELOPMENT, OCS, HYDROCARBONS, MARINE ORGANISMS,
0881 ENVIRONMENTAL EFFECTS, DISTRIBUTION, CHEMICAL ANALYSIS, ALASKA, OFFSHORE DEVELOPMENT, OCS, MICROORGANISMS, HYDROCARBONS, *BASELINE STUDIES,
0882 ENVIRONMENTAL EFFECTS, DISTRIBUTION, BIODEGRADATION, ALASKA, OFFSHORE DEVELOPMENT, OCS, HYDROCARBONS, *BASELINE STUDIES,
0883 ENVIRONMENTAL EFFECTS, ALASKA, OFFSHORE DEVELOPMENT, OCS, SELINE STUDIES, *PHYSICAL OCEANOGRAPHY, *METEOROLOGY,
0884 ENVIRONMENTAL EFFECTS, ALASKA, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES, *GEOLOGIC HAZARDS, *MARINE GEOLOGY,
0885 ENVIRONMENTAL EFFECTS, ALASKA, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES, *GEOLOGIC HAZARDS,
0886 ENVIRONMENTAL EFFECTS, ARCTIC OCEAN, ALASKA, OFFSHORE DEVELOPMENT, OCS, ICE, *BASELINE STUDIES,
0888 ENVIRONMENTAL EFFECTS, COASTS, OFFSHORE DEVELOPMENT, ONSHORE IMPACTS, SOCIO-ECONOMIC EFFECTS, REFINERIES, PORTS, FLORIDA, GUIDELINES,
0890 ENVIRONMENTAL EFFECTS, CANADA, BEAUFORT SEA, ARCTIC, OFFSHORE DRILLING,
0891 ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, PUGET SOUND, MEXICO/GULF OF, FATE, HYDROCARBONS, TOXICITY, MARINE ORGANISMS, NOAA,
0893 ENVIRONMENTAL EFFECTS, ATLANTIC OCEAN, OIL SPILLS, OCS, OIL-GAS LEASING, FATE, *RISK ANALYSIS,
0894 ENVIRONMENTAL EFFECTS, EIS, DEVELOPMENT, PLATFORMS, SCOTLAND,
0895 ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, OIL SPILLS, PIPELINES, FLORIDA,
0898 ENVIRONMENTAL EFFECTS, ATLANTIC OCEAN, OFFSHORE DEVELOPMENT, OCS,
0899 ENVIRONMENTAL EFFECTS, ATLANTIC OCEAN, OFFSHORE DEVELOPMENT, SOCIO-ECONOMIC EFFECTS,
0901 ENVIRONMENTAL EFFECTS, ARCTIC, EXPLORATION, PRODUCTION, PLANTS, WILDLIFE, OIL SPILLS, MARINE ORGANISMS,
0904 ENVIRONMENTAL EFFECTS, CONTAMINANTS, BIOLOGICAL EFFECTS, ALASKA, OFFSHORE DEVELOPMENT, OCS, MONITORING, INFORMATION SYSTEMS,
0905 ENVIRONMENTAL EFFECTS, EIS, OFFSHORE DRILLING, SANTA BARBARA CHANNEL, *AIR QUALITY IMPACTS,
0914 ENVIRONMENTAL EFFECTS, BIODEGRADATION, OIL SPILLS, SOIL, FATE,
0941 ENVIRONMENTAL EFFECTS, CRUDE OIL, BIODEGRADATION, PETROLEUM PRODUCTS, MICROORGANISMS, OXIDATION,
0951 ENVIRONMENTAL EFFECTS, CANADA, BEHAVIOR, ARCTIC, ICE, OIL SPILLS, MOVEMENT, OFFSHORE DRILLING, *BLOWOUTS, *OIL-IN-ICE,
0965 ENVIRONMENTAL EFFECTS, BEACHES, METULA SPILL, FATE, TANKERS, ESTUARIES, MARINE ORGANISMS, MAGELLAN/STRAIT OF,
0976 ENVIRONMENTAL EFFECTS, CRUDE OIL, BEHAVIOR, HYDROCARBONS, SEDIMENTS, FATE, SOURCES,
0978 ENVIRONMENTAL EFFECTS, DECOMPOSITION, CARCINOGENS, PAH, FATE,
0985 ENVIRONMENTAL EFFECTS, ECONOMICS, DELAWARE, LEGISLATION, US, OCS, OFFSHORE DEVELOPMENT, POLLUTION CONTROL,
0987 ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, CRUDE OIL, REGULATIONS, PETROLEUM PRODUCTS, FEA, *MANDATORY OIL IMPORT PROGRAM,
0851 ENVIRONMENTAL MANAGEMENT, COASTS, OFFSHORE DEVELOPMENT, OCS, EPA, OIL SPILLS, WATER QUALITY, ESTUARIES,
0508 ENVIRONMENTAL PROTECTION, DESIGN-ENGINEERING, REMOTE SENSING, OIL SPILLS, SHIPS, SURVEILLANCE, LAW ENFORCEMENT, USCG,
0637 ENVIRONMENTAL PROTECTION, OIL SPILLS, TANKERS, METULA SPILL, OFFSHORE DRILLING, POLLUTION CONTROL,
0654 ENVIRONMENTAL PROTECTION, DEVELOPMENT, DESIGN-ENGINEERING, PORTS, REGULATIONS,
0720 ENVIRONMENTAL PROTECTION, CONTINGENCY PLANNING, OIL SPILLS, FATE, SANTA BARBARA CHANNEL, *CLEAN SEAS INC,
0735 ENVIRONMENTAL PROTECTION, OIL SPILLS, POLLUTION PREVENTION, SHORELINES, MARSHES,
0736 ENVIRONMENTAL PROTECTION, SHIPS, TANKERS, INLAND, OFFSHORE PRODUCTION, MONITORING,
0737 ENVIRONMENTAL PROTECTION, OIL SPILLS, TANKERS, COLOMBIA, IMCO,

0846 ENVIRONMENTAL PROTECTION, CONTAMINANTS, ATLANTIC COAST, OFFSHORE DRILLING, OCS, MOVEMENT, *SOUTHEASTERN U.S., ERDA,
0860 ENVIRONMENTAL PROTECTION, CALIFORNIA/SOUTHERN, ALASKA, OFFSHORE DRILLING, OFFSHORE DEVELOPMENT, REGULATIONS, MEXICO/GULF OF,
0902 ENVIRONMENTAL PROTECTION, ECONOMICS, OIL-GAS LEASING, OCS, OFFSHORE DEVELOPMENT, *USDI,
0903 ENVIRONMENTAL PROTECTION, EIS, BLM, OIL-GAS LEASING, OCS,
0984 ENVIRONMENTAL PROTECTION, ECONOMIC EFFECTS, DELAWARE, REGULATIONS, OFFSHORE DEVELOPMENT,
0501 EPA, MONITORING, HYDROCARBONS, OIL SPILLS, POLLUTION CONTROL, SURVEILLANCE, GOVERNMENT AGENCIES, USGS, USCG, *UN,
0512 EPA, CLEANUP, REMOTE SENSING, OIL SPILLS, POLLUTION CONTROL, LAW ENFORCEMENT,
0573 EPA, DESIGN-ENGINEERING, CONTAINMENT, BOOMS, OIL SPILLS, *OHMSETT,
0606 EPA, DISPERSANTS, CLEANUP, OIL SPILLS, TOXICITY,
0618 EPA, DESIGN-ENGINEERING, ABSORPTION, OIL SPILLS, RECOVERY, RIVERS, ESTUARIES, HARBORS, *OHMSETT,
0619 EPA, DISPERSANTS, DESIGN-ENGINEERING, CLEANUP, OIL SLICKS, *OHMSETT,
0624 EPA, CONTAINMENT, BOOMS, OIL SPILLS, RECOVERY, SKIMMERS, *OHMSETT,
0741 EPA, POLLUTION CONTROL, OIL INDUSTRY, REFINERIES,
0851 EPA, ENVIRONMENTAL MANAGEMENT, COASTS, OFFSHORE DEVELOPMENT, OCS, OIL SPILLS, WATER QUALITY, ESTUARIES,
0855 EPA, DEVELOPMENT, OIL SHALE, *ROCKY MOUNTAIN STATES,
0994 EPA, DRILLING, GUIDELINES, PRODUCTION, EXPLORATION, WASTEWATERS, *ONSHORE POINT SOURCE CATEGORY,
0995 EPA, GUIDELINES, PRODUCTION, EXTRACTION, OIL INDUSTRY, WASTEWATERS, *ONSHORE POINT SOURCE CATEGORY,
0846 ERDA, ENVIRONMENTAL PROTECTION, CONTAMINANTS, ATLANTIC COAST, OFFSHORE DRILLING, OCS, MOVEMENT, *SOUTHEASTERN U.S.,
0856 ERDA, ENVIRONMENTAL EFFECTS, CHRONIC EFFECTS, ATLANTIC COAST, OFFSHORE PRODUCTION, OIL DISCHARGES,
0514 ESTUARIES, DRIFT, DELAWARE BAY, REMOTE SENSING, *FRONTS, OIL SLICKS, SPREADING, MODELS,
0523 ESTUARIES, BENTHOS, ALASKA, SAMPLING, WATER QUALITY, *EPIFAUNA,
0530 ESTUARIES, CHEMICAL ANALYSIS, OIL SPILLS, FISH, FATE, HYDROCARBONS, WEATHERING, *FUNDULUS HETEROCLITUS,
0579 ESTUARIES, DESIGN-ENGINEERING, OIL SPILLS, RECOVERY, HARBORS, *CLEAN SWEEP,
0618 ESTUARIES, EPA, DESIGN-ENGINEERING, ABSORPTION, OIL SPILLS, RECOVERY, RIVERS, HARBORS, *OHMSETT,
0649 ESTUARIES, ENVIRONMENTAL EFFECTS, ANIMALS, OIL TRANSPORT, PIPELINES, PLANTS, MONITORING, FLORIDA,
0745 ESTUARIES, OIL SPILLS, POLLUTION CONTROL, MARSHES, MOVEMENT, *GRASS-CUTTING, *HACKENSACK ESTUARY,
0758 ESTUARIES, BIOLOGICAL EFFECTS, BENTHOS, ATLANTIC COAST, OIL SPILLS, WEATHERING, PLANKTON, FISH,
0762 ESTUARIES, CONTAMINATION, HYDROCARBONS, FISH, *MICROSOMAL MIXED FUNCTION OXIDASES, *FUNDULUS HETEROCLITUS,
0786 ESTUARIES, DISTRIBUTION, BACTERIA, OIL SPILLS, MICROORGANISMS,
0807 ESTUARIES, DELAWARE, TOXICITY, FUEL OIL, MARINE ORGANISMS, *ULTRA-VIOLET RADIATION,
0817 ESTUARIES, CRUDE OIL, BIOLOGICAL EFFECTS, FISH, METABOLISM, *MULLET,
0819 ESTUARIES, ECONOMIC EFFECTS, CARCINOGENS, PAH, MOLLUSKS, OREGON, *BENZO(A)PYRENE,
0832 ESTUARIES, ENVIRONMENTAL EFFECTS, CONTAMINATION, BIOLOGICAL EFFECTS, BIBLIOGRAPHIES, OIL SPILLS, OCEANS, FATE, MARINE ORGANISMS,
0851 ESTUARIES, EPA, ENVIRONMENTAL MANAGEMENT, COASTS, OFFSHORE DEVELOPMENT, OCS, OIL SPILLS, WATER QUALITY,
0945 ESTUARIES, CRUDE OIL, CHESAPEAKE BAY, BIODEGRADATION, MICROORGANISMS,
0965 ESTUARIES, ENVIRONMENTAL EFFECTS, BEACHES, METULA SPILL, FATE, TANKERS, MARINE ORGANISMS, MAGELLAN/STRAIT OF,
0972 ESTUARIES, BIODEGRADATION, ATLANTIC COAST, ADSORPTION, HYDROCARBONS, FATE, RIVERS, PAH,
0510 EUROPE, CONTAMINANTS, COASTS, REMOTE SENSING, OIL SLICKS, *NIMBUS SATELLITE,
0726 EUROPE, POLLUTION CONTROL, LEGISLATION, OIL DISCHARGES, *MARINE POLLUTION,
0848 EUROPE, DENMARK, OFFSHORE DEVELOPMENT, LIABILITY, UK, FRANCE, NORWAY, *POLLUTION DAMAGE,
0993 EUROPE, OIL INDUSTRY, REGULATIONS, PIPELINES, WASTEWATERS, GUIDELINES,
0563 EVAPORATION, CRUDE OIL, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SPECTROMETRY, PETROLEUM PRODUCTS, HYDROCARBONS, *WATER SOLUBLE FRACTIONS,
0950 EVAPORATION, OIL SPILLS, HYDROCARBONS, SOLUTION,
0954 EVAPORATION, MODELS, OIL SPILLS, WEATHERING,
0957 EVAPORATION, DISPERSIONS, CRUDE OIL, BIODEGRADATION, OIL SPILLS, FATE, OXIDATION, TAR,
0970 EVAPORATION, BIODEGRADATION, MODELS, HYDROCARBONS, OIL SPILLS, OCEANS, FATE, SPREADING,
0974 EVAPORATION, EMULSIFICATION, CRUDE OIL, ARCTIC, OIL SPILLS, FATE, WEATHERING, SOLUTION, TAR,
0975 EVAPORATION, CRUDE OIL, OIL SPILLS, WEATHERING, TAR, SOLUTION, *SULFUR COMPOUNDS,
0977 EVAPORATION, CRUDE OIL, CHROMATOGRAPHY, CHEMICAL ANALYSIS, BIODEGRADATION, OXIDATION, *PHOTOOXIDATION,
0471 EXPLORATION, DRILLING, OIL INDUSTRY, *MICHIGAN, *BAKER SANCTUARY,
0842 EXPLORATION, ECONOMICS, REGULATIONS, POLLUTION CONTROL, OIL INDUSTRY, REFINING, PRODUCTION,

0864 EXPLORATION, POLLUTION CONTROL, SEAWATER,
0901 EXPLORATION, ENVIRONMENTAL EFFECTS, ARCTIC, PRODUCTION, PLANTS, WILDLIFE, OIL SPILLS, MARINE ORGANISMS,
0994 EXPLORATION, EPA, DRILLING, GUIDELINES, PRODUCTION, WASTEWATERS, *ONSHORE POINT SOURCE CATEGORY,
0547 EXTRACTION, CONTAMINANTS, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, OIL SHALE, *BY-PRODUCT WATERS,
0557 EXTRACTION, CONTAMINANTS, CHEMICAL ANALYSIS, WASTEWATERS, *SOLVENT *IR SPECTROPHOTOMETRY,
0564 EXTRACTION, ANALYTICAL TECHNIQUES, SPECTROMETRY, SOLVENTS, *DETERGENTS, *OIL-IN-WATER,
0697 EXTRACTION, DESIGN-ENGINEERING, CONTAMINANTS, WASTEWATER TREATMENT, PATENT,
0850 EXTRACTION, ENVIRONMENTAL EFFECTS, OIL SHALE, PRODUCTION, SOLID WASTES, WASTEWATERS,
0857 EXTRACTION, ENVIRONMENTAL EFFECTS, DEVELOPMENT, OIL SHALE,
0995 EXTRACTION, EPA, GUIDELINES, PRODUCTION, OIL INDUSTRY, WASTEWATERS, *ONSHORE POINT SOURCE CATEGORY,
0530 FATE, ESTUARIES, CHEMICAL ANALYSIS, OIL SPILLS, FISH, HYDROCARBONS, WEATHERING, *FUNDULUS HETEROCLITUS,
0720 FATE, ENVIRONMENTAL PROTECTION, CONTINGENCY PLANNING, OIL SPILLS, SANTA BARBARA CHANNEL, *CLEAN SEAS INC,
0757 FATE, CONTAMINATION, COASTS, CHRONIC EFFECTS, ANALYTICAL TECHNIQUES, HYDROCARBONS, MARINE ORGANISMS,
0821 FATE, ARGO MERCHANT SPILL, OIL SPILLS, TANKERS, TOXICITY, HYDROCARBONS,
0823 FATE, COST ANALYSIS, CLEANUP, MODELS, OIL SPILLS, MOVEMENT, STATISTICAL ANALYSIS,
0824 FATE, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, OIL SPILLS, TANKERS, MODELS, WILDLIFE, *WORLD WAR II SPILLS,
0828 FATE, ARGO MERCHANT SPILL, OIL SPILLS, TANKERS, HYDROCARBONS, TOXICITY,
0832 FATE, ESTUARIES, ENVIRONMENTAL EFFECTS, CONTAMINATION, BIOLOGICAL EFFECTS, BIBLIOGRAPHIES, OIL SPILLS, OCEANS, MARINE ORGANISMS,
0891 FATE, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, PUGET SOUND, MEXICO/GULF OF, HYDROCARBONS, TOXICITY, MARINE ORGANISMS, NOAA,
0893 FATE, ENVIRONMENTAL EFFECTS, ATLANTIC OCEAN, OIL SPILLS, OCS, OIL-GAS LEASING, *RISK ANALYSIS,
0914 FATE, ENVIRONMENTAL EFFECTS, BIODEGRADATION, OIL SPILLS, SOIL,
0946 FATE, CRUDE OIL, BIODEGRADATION, BACTERIA, MONITORING, SAMPLING,
0956 FATE, OIL SPILLS, MOVEMENT, SAMPLING, MONITORING, OCEANS, NOAA,
0957 FATE, EVAPORATION, DISPERSIONS, CRUDE OIL, BIODEGRADATION, OIL SPILLS, OXIDATION, TAR,
0958 FATE, BIOLOGICAL EFFECTS, API, OIL SPILLS, MARINE ORGANISMS,
0961 FATE, CRUDE OIL, CONTAMINATION, OIL SPILLS, INLAND, MODELS, GROUNDWATER,
0962 FATE, CRUDE OIL, CONTAMINATION, OIL SPILLS, INLAND, GROUNDWATER, *PERSISTENCE,
0965 FATE, ESTUARIES, ENVIRONMENTAL EFFECTS, BEACHES, METULA SPILL, TANKERS, MARINE ORGANISMS, MAGELLAN/STRAIT OF,
0969 FATE, EMULSIFICATION, DECOMPOSITION, ADSORPTION, MODELS, OIL SPILLS, HYDROCARBONS, SPREADING, SOLUTION,
0970 FATE, EVAPORATION, BIODEGRADATION, MODELS, HYDROCARBONS, OIL SPILLS, OCEANS, SPREADING,
0971 FATE, CONTAMINATION, API, TOXICITY, OIL SPILLS, MARINE ORGANISMS,
0972 FATE, ESTUARIES, BIODEGRADATION, ATLANTIC COAST, ADSORPTION, HYDROCARBONS, RIVERS, PAH,
0974 FATE, EVAPORATION, EMULSIFICATION, CRUDE OIL, ARCTIC, OIL SPILLS, WEATHERING, SOLUTION, TAR,
0976 FATE, ENVIRONMENTAL EFFECTS, CRUDE OIL, BEHAVIOR, HYDROCARBONS, SEDIMENTS, SOURCES,
0978 FATE, ENVIRONMENTAL EFFECTS, DECOMPOSITION, CARCINOGENS, PAH,
0979 FATE, CHEDABUCTO BAY, BIOLOGICAL EFFECTS, BENTHOS, BEACHES, OIL SPILLS, MOVEMENT, SEDIMENTS, PLANKTON,
0980 FATE, CHEDABUCTO BAY, FUEL OIL, SEDIMENTS, WEATHERING, HYDROCARBONS, METABOLISM, MOLLUSKS,
0982 FATE, DRIFT, DELAWARE BAY, OIL SPILLS, MODELS, SPREADING,
1003 FATE, CRUDE OIL, CHROMATOGRAPHY, CARCINOGENS, BIBLIOGRAPHIES, ANALYTICAL TECHNIQUES, PAH, SOURCES, SPECTROSCOPY,
0987 FEA, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, CRUDE OIL, REGULATIONS, PETROLEUM PRODUCTS, *MANDATORY OIL IMPORT PROGRAM,
0667 FILTRATION, OIL-WATER SEPARATION, WASTEWATER TREATMENT, FLOTATION,
0678 FILTRATION, WASTEWATER TREATMENT, REFINERIES, OIL-WATER SEPARATION,
0680 FILTRATION, BILGES, WASTEWATER TREATMENT, OIL-WATER SEPARATION, *TUBULAR ULTRAFILTRATION SYSTEM,
0530 FISH, FATE, ESTUARIES, CHEMICAL ANALYSIS, OIL SPILLS, HYDROCARBONS, WEATHERING, *FUNDULUS HETEROCLITUS,
0537 FISH, CHROMATOGRAPHY, CHEMICAL ANALYSIS, HYDROCARBONS, MARINE ORGANISMS,
0540 FISH, CHROMATOGRAPHY, CHEMICAL ANALYSIS, HYDROCARBONS, MARINE ORGANISMS, *SHRIMP, *SQUID, *N-PARAFFINS,
0758 FISH, ESTUARIES, BIOLOGICAL EFFECTS, BENTHOS, ATLANTIC COAST, OIL SPILLS, WEATHERING, PLANKTON,
0759 FISH, CONTAMINATION, BENTHOS, BEHAVIOR, *SUNKEN OIL, *OIL-CONTAINING PREY, *FEEDING,
0762 FISH, ESTUARIES, CONTAMINATION, HYDROCARBONS, *MICROSOMAL MIXED FUNCTION OXIDASES, *FUNDULUS HETEROCLITUS,
0769 FISH, CANADA, WASTEWATERS, REFINERIES, TOXICITY, *AQUATIC LIFE,
0771 FISH, DISTRIBUTION, BEHAVIOR, *NAPHTHALENES, UPTAKE, RELEASE, *STRESS, *FUNDULUS SIMILUS

0788 FISH, BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, *MORONE SAXATILIS, *BENZENE,
0790 FISH, WASTEWATERS, REFINERIES, TOXICITY, FRESHWATER, INVERTEBRATES, *LETHAL CONCENTRATION,
0800 FISH, BIOLOGICAL EFFECTS, OIL SPILLS, FUEL OIL, RESTORATION, STREAMS, INVERTEBRATES, NEW MEXICO,
0803 FISH, CRUDE OIL, ALASKA, FUEL OIL, TOXICITY, MARINE ORGANISMS, INVERTEBRATES, INTERTIDAL ZONE,
0806 FISH, DESIGN-ENGINEERING, CRUDE OIL, CHRONIC EFFECTS, MARINE ORGANISMS, HYDROCARBONS, *FLOW-THROUGH SYSTEM,
0810 FISH, CONTAMINATION, BIOLOGICAL EFFECTS, HYDROCARBONS, METABOLISM,
0817 FISH, ESTUARIES, CRUDE OIL, BIOLOGICAL EFFECTS, METABOLISM, *MULLET,
0839 FISH, DEVELOPMENT, BIOLOGICAL EFFECTS, OIL SHALE, WILDLIFE, *US FISH & WILDLIFE SERVICE,
0878 FISH, ENVIRONMENTAL EFFECTS, ALASKA, OFFSHORE DEVELOPMENT, OCS, MOLLUSKS, HABITAT, *BASELINE STUDIES,
0820 FISHERIES, ECONOMIC EFFECTS, CARIBBEAN SEA, OIL SPILLS, SOCIAL EFFECTS, *GUATEMALA,
0837 FISHERIES, ENVIRONMENTAL EFFECTS, OIL SPILLS, OFFSHORE DRILLING, MARINE ORGANISMS, *GEORGES BANK,
0845 FISHERIES, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, US, REGULATIONS, OIL INDUSTRY,
0862 FISHERIES, COASTS, OFFSHORE DRILLING, OIL SPILLS, NEW YORK,
0879 FISHERIES, ENVIRONMENTAL EFFECTS, BENTHOS, ALASKA, OFFSHORE DEVELOPMENT, OCS, PLANKTON, *BASELINE STUDIES,
0896 FISHERIES, ECONOMIC EFFECTS, ATLANTIC COAST, OIL SPILLS, OFFSHORE DEVELOPMENT,
0666 FLOCCULATION, EMULSIONS, DESIGN-ENGINEERING, OIL-WATER SEPARATION, PRECIPITATION,
0671 FLOCCULATION, CONTAMINANTS, WASTEWATER TREATMENT, *FLOCCULANT-POLYELECTROLYTES,
0687 FLOCCULATION, EMULSIONS, OIL-WATER SEPARATION, WASTEWATERS, REFINERIES,
0642 FLORIDA, ENVIRONMENTAL EFFECTS, PORTS, OIL TRANSFER, MEXICO/GULF OF, SOCIO-ECONOMIC EFFECTS, LEGISLATION, *DEEPWATER PORTS,
0649 FLORIDA, ESTUARIES, ENVIRONMENTAL EFFECTS, ANIMALS, OIL TRANSPORT, PIPELINES, PLANTS, MONITORING,
0844 FLORIDA, ECONOMIC EFFECTS, OFFSHORE EXPLORATION, OIL-GAS LEASING, ONSHORE IMPACTS,
0887 FLORIDA, OFFSHORE EXPLORATION, OFFSHORE DEVELOPMENT, SOCIO-ECONOMIC EFFECTS, ONSHORE IMPACTS,
0888 FLORIDA, ENVIRONMENTAL EFFECTS, COASTS, OFFSHORE DEVELOPMENT, ONSHORE IMPACTS, SOCIO-ECONOMIC EFFECTS, REFINERIES, PORTS, GUIDELINES,
0895 FLORIDA, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, OCS, OIL SPILLS, PIPELINES,
0767 FLORIDA COAST, CORAL REEFS, BIOLOGICAL EFFECTS, OIL SPILLS, TROPICAL REGIONS, MARINE ORGANISMS, INTERTIDAL ZONE, MARSHES,
0667 FLOTATION, FILTRATION, OIL-WATER SEPARATION, WASTEWATER TREATMENT,
0689 FLOTATION, DESIGN-ENGINEERING, COALESCENCE, WASTEWATER TREATMENT, OIL-WATER SEPARATION, PATENT,
0700 FLOTATION, WASTEWATER TREATMENT, OIL-WATER SEPARATION, PATENT,
0641 FOOD WEB, DISTRIBUTION, HYDROCARBONS, OIL TRANSFER, OCEANS, MARINE ORGANISMS, *TRANSFER PROCESSES,
0764 FOOD WEB, CONTAMINATION, AROMATIC HYDROCARBONS, ACCUMULATION, WASTEWATERS, REFINERIES, MOLLUSKS, *FOOD CHAIN, *3,4-BENZOPYRENE,
0770 FOOD WEB, CHEMICAL ANALYSIS, BIRDS, BIOLOGICAL EFFECTS, HYDROCARBONS, METABOLISM, *EGGS,
0602 FRANCE, BOOMS, OIL SPILLS, RECOVERY, SKIMMERS, STORAGE,
0848 FRANCE, EUROPE, DENMARK, OFFSHORE DEVELOPMENT, LIABILITY, UK, NORWAY, *POLLUTION DAMAGE,
0790 FRESHWATER, FISH, WASTEWATERS, REFINERIES, TOXICITY, INVERTEBRATES, *LETHAL CONCENTRATION,
0809 FRESHWATER, CRUDE OIL, ALGAE, *NAPHTHALENE, TOXICITY, METABOLISM, *CHLAMYDOMONAS ANGULOSA,
0911 FRESHWATER, ECOSYSTEMS, BIODEGRADATION, HYDROCARBONS, MICROORGANISMS,
0915 FRESHWATER, COASTS, BIODEGRADATION, BACTERIA, HYDROCARBONS, OIL SLICKS,
0939 FRESHWATER, BIODEGRADATION, FUEL OIL, MICROORGANISMS, *CONTINUOUS CULTURE,
0620 FUEL OIL, CRUDE OIL, CANADA, OIL SPILLS, RECOVERY, SKIMMERS, OIL-WATER SEPARATION,
0755 FUEL OIL, BIRDS, BIOLOGICAL EFFECTS, MONITORING, *REPRODUCTION,
0756 FUEL OIL, CRUSTACEANS, BIOLOGICAL EFFECTS, BEHAVIOR, *KEROSENE, MOLLUSKS, *SUBLETHAL EFFECTS, *LOBSTER, *MUD SNAIL,
0760 FUEL OIL, CRUDE OIL, BENTHOS, ALGAE, TOXICITY, WASTE OIL, METABOLISM,
0792 FUEL OIL, BIOLOGICAL EFFECTS, PLANTS, TROPICAL REGIONS, MALAYSIA, *PIONEER MANGROVE, *AVICENNIA INTERMEDIA,
0800 FUEL OIL, FISH, BIOLOGICAL EFFECTS, OIL SPILLS, RESTORATION, STREAMS, INVERTEBRATES, NEW MEXICO,
0802 FUEL OIL, CONTAMINATION, BIOLOGICAL EFFECTS, SEDIMENTS, POLYCHAETES, METABOLISM, *FEEDING ACTIVITY, *ARENICOLA MARINA,
0803 FUEL OIL, FISH, CRUDE OIL, ALASKA, TOXICITY, MARINE ORGANISMS, INVERTEBRATES, INTERTIDAL ZONE,
0805 FUEL OIL, BIOLOGICAL EFFECTS, HYDROCARBONS, POLYCHAETES, UPTAKE, METABOLISM, *NEANTHES ARENACEODENTATA,
0807 FUEL OIL, ESTUARIES, DELAWARE, TOXICITY, MARINE ORGANISMS, *ULTRA-VIOLET RADIATION,

0815 FUEL OIL, CHEMICAL ANALYSIS, BIOLOGICAL EFFECTS, DISPERSONS, MARINE ORGANISMS, INTERTIDAL ZONE, *SPECIES DIVERSITY,
0934 FUEL OIL, BIODEGRADATION, BACTERIA, SOIL,
0939 FUEL OIL, FRESHWATER, BIODEGRADATION, MICROORGANISMS, *CONTINUOUS CULTURE,
0955 FUEL OIL, OXIDATION, TOXICITY, YEASTS, *HYDROPEROXIDES,
0980 FUEL OIL, FATE, CHEDABUCTO BAY, SEDIMENTS, WEATHERING, HYDROCARBONS, METABOLISM, MOLLUSKS,
1002 FUEL OIL, CARCINOGENS, BIBLIOGRAPHIES, ANALYTICAL TECHNIQUES, PAH, PETROLEUM PRODUCTS,
0542 FUELS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, HYDROCARBONS, PETROLEUM PRODUCTS, PETROCHEMICALS, WASTEWATERS,
0785 FUELS, PETROLEUM PRODUCTS, TOXICITY, PHYTOPLANKTON,
0925 FUELS, BIODEGRADATION, MICROORGANISMS, *SUPERSONIC AIRCRAFT FUEL,
0535 GASOLINE, CONTAMINATION, CHROMATOGRAPHY, CHEMICAL ANALYSIS, GROUNDWATER,
0622 GASOLINE, CONTAINMENT, LEAKAGE, OIL TANKS, RECOVERY, GROUNDWATER,
0721 GASOLINE, CONTINGENCY PLANNING, CLEANUP, OIL SPILLS, OIL INDUSTRY, *STANDARD OIL CO. INDIANA,
0926 GASOLINE, BIODEGRADATION, GROUNDWATER, *NUTRIENT ADDITION,
0927 GASOLINE, BIODEGRADATION, GROUNDWATER, PENNSYLVANIA, *NUTRIENT ADDITION,
0685 GERMANY, WEST, ECONOMICS, WASTEWATER TREATMENT, PETROCHEMICALS, LEGISLATION,
0501 GOVERNMENT AGENCIES, EPA, MONITORING, HYDROCARBONS, OIL SPILLS, POLLUTION CONTROL, SURVEILLANCE, USGS, USCG, *UN,
0847 GOVERNMENT AGENCIES, ENVIRONMENTAL DETERIORATION, DELAWARE, OFFSHORE DEVELOPMENT, OIL INDUSTRY, OIL SPILLS, *COASTAL RECREATION,
0477 GREAT LAKES , COASTS, OIL SPILLS, US, STATISTICAL ANALYSIS, MODELS, *DISCRIMINANT ANALYSIS,
0535 GROUNDWATER, CONTAMINATION, CHROMATOGRAPHY, CHEMICAL ANALYSIS, GASOLINE,
0591 GROUNDWATER, COST ANALYSIS, CONTINGENCY PLANNING, OIL SPILLS, RECOVERY, HYDROCARBONS,
0622 GROUNDWATER, GASOLINE, CONTAINMENT, LEAKAGE, OIL TANKS, RECOVERY,
0656 GROUNDWATER, ENVIRONMENTAL EFFECTS, CRUDE OIL, STORAGE, OIL SPILLS, VEGETATION, LOUISIANA, TEXAS, *SALT DOMES,
0926 GROUNDWATER, GASOLINE, BIODEGRADATION, *NUTRIENT ADDITION,
0927 GROUNDWATER, GASOLINE, BIODEGRADATION, PENNSYLVANIA, *NUTRIENT ADDITION,
0942 GROUNDWATER, CRUDE OIL, BIODEGRADATION, MICROORGANISMS, HYDROCARBONS, PETROLEUM PRODUCTS, USSR,
0953 GROUNDWATER, BEHAVIOR, OIL SPILLS, HYDROCARBONS, *SURFACE WATERS, *WATER-SOLUBLE FRACTIONS,
0961 GROUNDWATER, FATE, CRUDE OIL, CONTAMINATION, OIL SPILLS, INLAND, MODELS,
0962 GROUNDWATER, FATE, CRUDE OIL, CONTAMINATION, OIL SPILLS, INLAND, *PERSISTENCE,
0966 GROUNDWATER, CONTAMINATION, HYDROCARBONS, MOVEMENT, POLLUTION CONTROL,
0674 GUIDELINES, ACTIVATED SLUDGE , REFINERIES, WASTEWATER TREATMENT,
0865 GUIDELINES, ENVIRONMENTAL EFFECTS, BLM, ATLANTIC OCEAN, OFFSHORE DRILLING, OCS, MONITORING,
0888 GUIDELINES, FLORIDA, ENVIRONMENTAL EFFECTS, COASTS, OFFSHORE DEVELOPMENT, ONSHORE IMPACTS, SOCIO-ECONOMIC EFFECTS, REFINERIES, PORTS,
0993 GUIDELINES, EUROPE, OIL INDUSTRY, REGULATIONS, PIPELINES, WASTEWATERS,
0994 GUIDELINES, EXPLORATION, EPA, DRILLING, PRODUCTION, WASTEWATERS, *ONSHORE POINT SOURCE CATEGORY,
0995 GUIDELINES, EXTRACTION, EPA, PRODUCTION, OIL INDUSTRY, WASTEWATERS, *ONSHORE POINT SOURCE CATEGORY,
0996 GUIDELINES, DISTRIBUTION, WASTEWATER TREATMENT, PRODUCTION, STORAGE, OIL-WATER SEPARATION, POLLUTION CONTROL,
0997 GUIDELINES, ECONOMICS, WASTEWATER TREATMENT, OIL INDUSTRY, REFINERIES, LEGISLATION, WATER QUALITY,
0878 HABITAT, FISH, ENVIRONMENTAL EFFECTS, ALASKA, OFFSHORE DEVELOPMENT, OCS, MOLLUSKS, *BASELINE STUDIES,
0525 HARBORS, DISTRIBUTION, CONTAMINATION, SAMPLING, HYDROCARBONS, *EXTRACTABLE ORGANICS, NEW YORK,
0578 HARBORS, DESIGN-ENGINEERING, OIL SPILLS, RECOVERY, *CLEAN SWEEP,
0579 HARBORS, ESTUARIES, DESIGN-ENGINEERING, OIL SPILLS, RECOVERY, *CLEAN SWEEP,
0609 HARBORS, CLEANUP, OIL SPILLS, SKIMMERS, USN, *DEBRIS HANDLING SYSTEM,
0618 HARBORS, ESTUARIES, EPA, DESIGN-ENGINEERING, ABSORPTION, OIL SPILLS, RECOVERY, RIVERS, *OHMSETT,
0968 HARBORS, DRIFT, MODELS, OIL SPILLS, SPREADING, NEW YORK,
0868 HEALTH HAZARDS, ENVIRONMENTAL DETERIORATION, ATLANTIC OCEAN, OFFSHORE DEVELOPMENT, OCS, HYDROCARBONS,
0463 HYDROCARBONS, CHEMICAL ANALYSIS, ALASKA/GULF OF, NATURAL SEEPAGE,
0469 HYDROCARBONS, SOURCES, OCEANS, NATURAL SEEPAGE, *BIOGENIC HYDROCARBONS, *INPUT ESTIMATES,
0472 HYDROCARBONS, DISTRIBUTION, SOURCES, INDUSTRIES, REFINERIES, *MUNICIPAL DISCHARGES, *RUNOFF,
0490 HYDROCARBONS, CONTAMINANTS, ANALYTICAL TECHNIQUES, MONITORING, OCEANS, TAR, SAMPLING, MARINE ORGANISMS,
0493 HYDROCARBONS, DESIGN-ENGINEERING, MONITORING, *OIL-IN-WATER, *FLUORESCENCE,
0497 HYDROCARBONS, DISTRIBUTION, BEAUFORT SEA, MONITORING, WATER QUALITY,
0498 HYDROCARBONS, DISTRIBUTION, MONITORING, OCEANS, SURVEILLANCE,

0501 HYDROCARBONS, GOVERNMENT AGENCIES, EPA, MONITORING, OIL SPILLS, POLLUTION CONTROL, SURVEILLANCE, USGS, USCG, *UN,
0503 HYDROCARBONS, DETECTION, DESIGN-ENGINEERING, MONITORING, PATENT,
0505 HYDROCARBONS, CHEMICAL ANALYSIS, CALIFORNIA/SOUTHERN, MONITORING, SEDIMENTS, SOURCE IDENTIFICATION,
0509 HYDROCARBONS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, MONITORING, MARINE ORGANISMS, INTERTIDAL ZONE, METABOLISM, *BIOGENIC HYDROCARBONS,
0520 HYDROCARBONS, CHEMICAL ANALYSIS, SAMPLING, PACIFIC OCEAN, *TANKER ROUTES,
0521 HYDROCARBONS, DISTRIBUTION, SAMPLING, PACIFIC OCEAN, *TANKER ROUTES,
0522 HYDROCARBONS, DISTRIBUTION, CHEMICAL ANALYSIS, SAMPLING, SEDIMENTS, SOURCES, MEXICO/GULF OF,
0524 HYDROCARBONS, DISTRIBUTION, BACTERIA, SAMPLING, MICROORGANISMS, TAR, SEDIMENTS, OFFSHORE DEVELOPMENT, NORTH SEA,
0525 HYDROCARBONS, HARBORS, DISTRIBUTION, CONTAMINATION, SAMPLING, *EXTRACTABLE ORGANICS, NEW YORK,
0526 HYDROCARBONS, CHEMICAL ANALYSIS, BENTHOS, SAMPLING, SEDIMENTS, UPTAKE, TAR, *ABYSSAL DEPTHS,
0529 HYDROCARBONS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SEAWATER,
0530 HYDROCARBONS, FISH, FATE, ESTUARIES, CHEMICAL ANALYSIS, OIL SPILLS, WEATHERING, *FUNDULUS HETEROCLITUS,
0532 HYDROCARBONS, DISTRIBUTION, CHEMICAL ANALYSIS, ZOOPLANKTON, SOURCES, MEXICO/GULF OF, *BIOGENIC HYDROCARBONS,
0533 HYDROCARBONS, CHEMICAL ANALYSIS, *PHENOLS, *SURFACE WATERS,
0537 HYDROCARBONS, FISH, CHROMATOGRAPHY, CHEMICAL ANALYSIS, MARINE ORGANISMS,
0538 HYDROCARBONS, CHEMICAL ANALYSIS, OCEANS, SAMPLING,
0539 HYDROCARBONS, CHROMATOGRAPHY, ALGAE, SEDIMENTS, MEXICO/GULF OF, MISSISSIPPI RIVER, SAMPLING,
0540 HYDROCARBONS, FISH, CHROMATOGRAPHY, CHEMICAL ANALYSIS, MARINE ORGANISMS, *SHRIMP, *SQUID, *N-PARAFFINS,
0541 HYDROCARBONS, CHEMICAL ANALYSIS, *INDUSTRIAL ORGANIC COMPOUNDS, *TENNESSEE RIVER,
0542 HYDROCARBONS, FUELS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, PETROLEUM PRODUCTS, PETROCHEMICALS, WASTEWATERS,
0543 HYDROCARBONS, DETECTION, ANALYTICAL TECHNIQUES,
0545 HYDROCARBONS, CONTAMINANTS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, WASTEWATERS, *LIQUID CHROMATOGRAPHY,
0546 HYDROCARBONS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SPECTROMETRY, SEDIMENTS, INTERTIDAL ZONE, *WATER ANALYSIS,
0548 HYDROCARBONS, DELAWARE, WASTEWATERS, REFINERIES, *OIL CONTENT, *URBAN RUNOFF, *DELAWARE ESTUARY,
0549 HYDROCARBONS, DETECTION, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SEDIMENTS, SOLVENTS, *N-PARAFFINS,
0550 HYDROCARBONS, CRUDE OIL, CHROMATOGRAPHY, CHEMICAL ANALYSIS, *EELS, *ORGANIC SULFIDES,
0552 HYDROCARBONS, CRUDE OIL, CONTAMINATION, CHEMICAL ANALYSIS, BIOLOGICAL EFFECTS, *WATER-SOLUBLE FRACTION,
0558 HYDROCARBONS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, PAH, SOIL, *THIN-LAYER CHROMATOGRAPHY,
0560 HYDROCARBONS, DETECTION, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SOURCES, SEDIMENTS, LAKES, WASHINGTON,
0561 HYDROCARBONS, DELAWARE, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, WASTEWATERS, REFINERIES, *SEWAGE, *URBAN RUNOFF, REGULATIONS,
0562 HYDROCARBONS, CHEMICAL ANALYSIS,
0563 HYDROCARBONS, EVAPORATION, CRUDE OIL, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SPECTROMETRY, PETROLEUM PRODUCTS, *WATER SOLUBLE FRACTIONS,
0568 HYDROCARBONS, DISTRIBUTION, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, SPECTROMETRY, SARGASSO SEA,
0591 HYDROCARBONS, GROUNDWATER, COST ANALYSIS, CONTINGENCY PLANNING, OIL SPILLS, RECOVERY,
0593 HYDROCARBONS, DISPERSANTS, CLEANUP, BIODEGRADATION, OIL SLICKS, PATENT, *NITROGEN COMPOUNDS,
0594 HYDROCARBONS, DISPERSANTS, CLEANUP, BIODEGRADATION, OIL SLICKS, PATENT, *NITROGEN COMPOUNDS,
0595 HYDROCARBONS, DISPERSANTS, CLEANUP, BIODEGRADATION, OIL SLICKS, PATENT, *NITROGEN COMPOUNDS,
0605 HYDROCARBONS, CLEANUP, BIODEGRADATION, BACTERIA, OIL SPILLS, PATENT,
0641 HYDROCARBONS, FOOD WEB, DISTRIBUTION, OIL TRANSFER, OCEANS, MARINE ORGANISMS, *TRANSFER PROCESSES,
0669 HYDROCARBONS, DISPOSAL, BIODEGRADATION, OIL SPILLS, MANUALS, *DEBRIS,
0691 HYDROCARBONS, CONTAMINANTS, WASTEWATER TREATMENT, *VACUUM STRIPPING,
0757 HYDROCARBONS, FATE, CONTAMINATION, COASTS, CHRONIC EFFECTS, ANALYTICAL TECHNIQUES, MARINE ORGANISMS,
0762 HYDROCARBONS, FISH, ESTUARIES, CONTAMINATION, *MICROSOMAL MIXED FUNCTION OXIDASES, *FUNDULUS HETEROCLITUS,
0770 HYDROCARBONS, FOOD WEB, CHEMICAL ANALYSIS. BIRDS, BIOLOGICAL EFFECTS, METABOLISM, *EGGS,
0778 HYDROCARBONS, MOLLUSKS, UPTAKE, RELEASE, PLATFORMS, SEDIMENTS, TEXAS, *TRINITY BAY, *NAPHTHALENES, *CLAM, *RANGIA CUNEATA,
0784 HYDROCARBONS, ECOSYSTEMS, CRUDE OIL, TOXICITY, PETROLEUM PRODUCTS, MARINE ORGANISMS,

0791 HYDROCARBONS, CONTAMINATION, CHRONIC EFFECTS, ANIMALS, *IMMUNOLOGICAL RESPONSE,
0793 HYDROCARBONS, BIOLOGICAL EFFECTS, BERMUDA, TAR, INTERTIDAL ZONE, MARINE ORGANISMS,
0795 HYDROCARBONS, CONTAMINATION, BIOLOGICAL EFFECTS, MOLLUSKS, *SCALLOPS, *PECTEN YESSOENSIS,
0796 HYDROCARBONS, TOXICITY, PETROLEUM PRODUCTS,
0801 HYDROCARBONS, PAH, METABOLISM, MARINE ORGANISMS, *BENZO(A)PYRENE, *MICROSOMAL MIXED-FUNCTION OXIDASES,
0804 HYDROCARBONS, UPTAKE, METABOLISM, RELEASE, POLYCHAETES, SEDIMENTS, SEAWATER, *NEANTHES ARENACEODENTATA,
0805 HYDROCARBONS, FUEL OIL, BIOLOGICAL EFFECTS, POLYCHAETES, UPTAKE, METABOLISM, *NEANTHES ARENACEODENTATA,
0806 HYDROCARBONS, FISH, DESIGN-ENGINEERING, CRUDE OIL, CHRONIC EFFECTS, MARINE ORGANISMS, *FLOW-THROUGH SYSTEM,
0810 HYDROCARBONS, FISH, CONTAMINATION, BIOLOGICAL EFFECTS, METABOLISM,
0821 HYDROCARBONS, FATE, ARGO MERCHANT SPILL, OIL SPILLS, TANKERS, TOXICITY,
0825 HYDROCARBONS, ENVIRONMENTAL EFFECTS, DISPERSANTS, CLEANUP, OIL SPILLS, SHORELINES, PORTUGAL,
0828 HYDROCARBONS, FATE, ARGO MERCHANT SPILL, OIL SPILLS, TANKERS, TOXICITY,
0868 HYDROCARBONS, HEALTH HAZARDS, ENVIRONMENTAL DETERIORATION, ATLANTIC OCEAN, OFFSHORE DEVELOPMENT, OCS,
0871 HYDROCARBONS, ENVIRONMENTAL EFFECTS, OFFSHORE PRODUCTION, OIL INDUSTRY, MARINE ORGANISMS, SEDIMENTS, LOUISIANA,
0880 HYDROCARBONS, ENVIRONMENTAL EFFECTS, BIOLOGICAL EFFECTS, BIODEGRADATION, ALASKA, OFFSHORE DEVELOPMENT, OCS, MARINE ORGANISMS,
0881 HYDROCARBONS, ENVIRONMENTAL EFFECTS, DISTRIBUTION, CHEMICAL ANALYSIS, ALASKA, OFFSHORE DEVELOPMENT, OCS, MICROORGANISMS, *BASELINE STUDIES,
0882 HYDROCARBONS, ENVIRONMENTAL EFFECTS, DISTRIBUTION, BIODEGRADATION, ALASKA, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES,
0891 HYDROCARBONS, FATE, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, PUGET SOUND, MEXICO/GULF OF, TOXICITY, MARINE ORGANISMS, NOAA,
0908 HYDROCARBONS, CLEANUP, BIODEGRADATION, BACTERIA, OIL SLICKS, *NUTRIENT ENRICHMENT,
0909 HYDROCARBONS, BIODEGRADATION, SOIL, OXIDATION, MICROORGANISMS, *OXYGEN UPTAKE RATE,
0911 HYDROCARBONS, FRESHWATER, ECOSYSTEMS, BIODEGRADATION, MICROORGANISMS,
0913 HYDROCARBONS, BIODEGRADATION, BACTERIA, OIL SLICKS, *SUPERMICROBES,
0915 HYDROCARBONS, FRESHWATER, COASTS, BIODEGRADATION, BACTERIA, OIL SLICKS,
0916 HYDROCARBONS, BIODEGRADATION, BACTERIA, SEDIMENTS, SEAWATER, NARRAGANSETT BAY, RHODE ISLAND,
0917 HYDROCARBONS, BIODEGRADATION, BACTERIA, METABOLISM, *ALICYCLIC COMPOUNDS,
0920 HYDROCARBONS, BIODEGRADATION, BACTERIA, *MULTI-PLASMID MICROORGANISMS,
0921 HYDROCARBONS, BIODEGRADATION, OXIDATION, *OIL BIODEGRADATION RATE,
0928 HYDROCARBONS, CRUDE OIL, BIODEGRADATION, ANALYTICAL TECHNIQUES, *PETROLEUM VARIETIES,
0929 HYDROCARBONS, BIODEGRADATION, MICROORGANISMS,
0931 HYDROCARBONS, BIODEGRADATION, BENTHOS, METABOLISM, SEDIMENTS, MICROORGANISMS, MARINE ORGANISMS,
0932 HYDROCARBONS, BIODEGRADATION, MICROORGANISMS, SEAWATER,
0933 HYDROCARBONS, BIODEGRADATION, BACTERIA, SEAWATER, *HEXADECANE, *ORGANIC SUBSTANCES,
0937 HYDROCARBONS, BIODEGRADATION, METABOLISM, MICROORGANISMS,
0942 HYDROCARBONS, GROUNDWATER, CRUDE OIL, BIODEGRADATION, MICROORGANISMS, PETROLEUM PRODUCTS, USSR,
0944 HYDROCARBONS, BIODEGRADATION, SOIL, MONITORING, MODELS,
0948 HYDROCARBONS, BIODEGRADATION, METABOLISM, MICROORGANISMS, *BUTADIENE,
0950 HYDROCARBONS, EVAPORATION, OIL SPILLS, SOLUTION,
0953 HYDROCARBONS, GROUNDWATER, BEHAVIOR, OIL SPILLS, *SURFACE WATERS, *WATER-SOLUBLE FRACTIONS,
0960 HYDROCARBONS, REFINERIES, MEDITERRANEAN SEA, SAMPLING, *SURFACE MICROLAYER COMPOSITION,
0966 HYDROCARBONS, GROUNDWATER, CONTAMINATION, MOVEMENT, POLLUTION CONTROL,
0969 HYDROCARBONS, FATE, EMULSIFICATION, DECOMPOSITION, ADSORPTION, MODELS, OIL SPILLS, SPREADING, SOLUTION,
0970 HYDROCARBONS, FATE, EVAPORATION, BIODEGRADATION, MODELS, OIL SPILLS, OCEANS, SPREADING,
0972 HYDROCARBONS, FATE, ESTUARIES, BIODEGRADATION, ATLANTIC COAST, ADSORPTION, RIVERS, PAH,
0976 HYDROCARBONS, FATE, ENVIRONMENTAL EFFECTS, CRUDE OIL, BEHAVIOR, SEDIMENTS, SOURCES,
0980 HYDROCARBONS, FUEL OIL, FATE, CHEDABUCTO BAY, SEDIMENTS, WEATHERING, METABOLISM, MOLLUSKS,
0981 HYDROCARBONS, DISTRIBUTION, SEDIMENTS, LAKES,
0614 ICE, DESIGN-ENGINEERING, CANADA, ARCTIC, OIL SPILLS, RECOVERY, *CLEAN SWEEP,
0722 ICE, CONTINGENCY PLANNING, CLEANUP, BEAUFORT SEA, OIL SPILLS,
0751 ICE, DISPERSANTS, CONTAINMENT, BLOWOUT PREVENTION, OIL SPILLS, OFFSHORE DRILLING, INCINERATION,
0886 ICE, ENVIRONMENTAL EFFECTS, ARCTIC OCEAN, ALASKA, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES,
0949 ICE, CRUDE OIL, SPREADING, *OIL-ON-ICE,
0951 ICE, ENVIRONMENTAL EFFECTS, CANADA, BEHAVIOR, ARCTIC, OIL SPILLS, MOVEMENT, OFFSHORE DRILLING, *BLOWOUTS, *OIL-IN-ICE,
0983 ICE, OIL SLICKS, SPREADING, *CURRENT,
0737 IMCO, ENVIRONMENTAL PROTECTION, OIL SPILLS, TANKERS, COLOMBIA,

0739 IMCO, CONTINGENCY PLANNING, INTERNATIONAL CONVENTIONS, OIL SPILLS, SHIPS, OIL-WATER SEPARATION, POLLUTION PREVENTION,
0998 IMCO, INTERNATIONAL CONVENTIONS, REGULATIONS, TANKERS, POLLUTION PREVENTION,
0999 IMCO, INTERNATIONAL CONVENTIONS, POLLUTION PREVENTION, USCG,
0566 INCINERATION, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, PAH, OIL SPILLS,
0657 INCINERATION, WASTE OIL DISPOSAL, SOLID WASTES, *LIQUID WASTES,
0705 INCINERATION, DISPOSAL, CHESAPEAKE BAY, OIL SPILLS, *BLACK OIL,
0751 INCINERATION, ICE, DISPERSANTS, CONTAINMENT, BLOWOUT PREVENTION, OIL SPILLS, OFFSHORE DRILLING,
0472 INDUSTRIES, HYDROCARBONS, DISTRIBUTION, SOURCES, REFINERIES, *MUNICIPAL DISCHARGES, *RUNOFF,
0479 INDUSTRIES, DELAWARE, REFINERIES, *URBAN RUNOFF, *OIL CONTENT, *DELAWARE ESTUARY,
0682 INDUSTRIES, WASTEWATER TREATMENT,
0464 INFORMATION SYSTEMS, STATISTICS, OIL DISCHARGES, US,
0904 INFORMATION SYSTEMS, ENVIRONMENTAL EFFECTS, CONTAMINANTS, BIOLOGICAL EFFECTS, ALASKA, OFFSHORE DEVELOPMENT, OCS, MONITORING,
0631 INLAND, CONTAMINATION, RESTORATION, SOIL, OIL FIELDS, *BRINES,
0724 INLAND, CONTINGENCY PLANNING, CANADA, OIL SPILLS, PERSONNEL TRAINING,
0736 INLAND, ENVIRONMENTAL PROTECTION, SHIPS, TANKERS, OFFSHORE PRODUCTION, MONITORING,
0752 INLAND, ENVIRONMENTAL EFFECTS, CLEANUP, POLLUTION CONTROL, OIL SPILLS, OCEANS,
0952 INLAND, CANADA, BEHAVIOR, OIL SPILLS, STATISTICAL ANALYSIS, WEATHERING, PIPELINES,
0961 INLAND, GROUNDWATER, FATE, CRUDE OIL, CONTAMINATION, OIL SPILLS, MODELS,
0962 INLAND, GROUNDWATER, FATE, CRUDE OIL, CONTAMINATION, OIL SPILLS, *PERSISTENCE,
0467 INTERNATIONAL AGREEMENTS, CLEANUP, BIOLOGICAL EFFECTS, OIL SPILLS, POLLUTION PREVENTION, SURVEILLANCE,
0652 INTERNATIONAL AGREEMENTS, OIL SPILLS, TANKERS, US, REGULATIONS,
1001 INTERNATIONAL AGREEMENTS, BIBLIOGRAPHIES, LEGISLATION, US, OCEANS, SHIPS, OFFSHORE DRILLING, POLLUTION PREVENTION, OIL SPILLS,
0739 INTERNATIONAL CONVENTIONS, IMCO, CONTINGENCY PLANNING, OIL SPILLS, SHIPS, OIL-WATER SEPARATION, POLLUTION PREVENTION,
0998 INTERNATIONAL CONVENTIONS, IMCO, REGULATIONS, TANKERS, POLLUTION PREVENTION,
0999 INTERNATIONAL CONVENTIONS, IMCO, POLLUTION PREVENTION, USCG,
0509 INTERTIDAL ZONE, HYDROCARBONS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, MONITORING, MARINE ORGANISMS, METABOLISM, *BIOGENIC HYDROCARBONS,
0546 INTERTIDAL ZONE, HYDROCARBONS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SPECTROMETRY, SEDIMENTS, *WATER ANALYSIS,
0767 INTERTIDAL ZONE, FLORIDA COAST, CORAL REEFS, BIOLOGICAL EFFECTS, OIL SPILLS, TROPICAL REGIONS, MARINE ORGANISMS, MARSHES,
0793 INTERTIDAL ZONE, HYDROCARBONS, BIOLOGICAL EFFECTS, BERMUDA, TAR, MARINE ORGANISMS,
0803 INTERTIDAL ZONE, FUEL OIL, FISH, CRUDE OIL, ALASKA, TOXICITY, MARINE ORGANISMS, INVERTEBRATES,
0812 INTERTIDAL ZONE, CRUSTACEANS, CRUDE OIL, BIOLOGICAL EFFECTS, *BARNACLES, *CHTHAMALUS FISSUS,
0814 INTERTIDAL ZONE, CRUDE OIL, BIOLOGICAL EFFECTS, MARINE ORGANISMS,
0815 INTERTIDAL ZONE, FUEL OIL, CHEMICAL ANALYSIS, BIOLOGICAL EFFECTS, DISPERSONS, MARINE ORGANISMS, *SPECIES DIVERSITY,
0790 INVERTEBRATES, FRESHWATER, FISH, WASTEWATERS, REFINERIES, TOXICITY, *LETHAL CONCENTRATION,
0800 INVERTEBRATES, FUEL OIL, FISH, BIOLOGICAL EFFECTS, OIL SPILLS, RESTORATION, STREAMS, NEW MEXICO,
0803 INVERTEBRATES, INTERTIDAL ZONE, FUEL OIL, FISH, CRUDE OIL, ALASKA, TOXICITY, MARINE ORGANISMS,
0461 JAPAN, DISPERSANTS, CRUDE OIL, CLEANUP, BEACHES, OIL SPILLS, TANKERS, SPREADING, MOVEMENT,
0754 JAPAN, OIL SPILLS, RECOVERY, POLLUTION PREVENTION, *TEST FACILITIES,
0830 JAPAN, ENVIRONMENTAL EFFECTS, DEVELOPMENT, CONTAMINATION, SHORELINES, MARINE ORGANISMS,
0560 LAKES, HYDROCARBONS, DETECTION, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SOURCES, SEDIMENTS, WASHINGTON,
0780 LAKES, CRUDE OIL, ALGAE, TOXICITY, VEGETATION, SUBARCTIC REGIONS,
0981 LAKES, HYDROCARBONS, DISTRIBUTION, SEDIMENTS,
0508 LAW ENFORCEMENT, ENVIRONMENTAL PROTECTION, DESIGN-ENGINEERING, REMOTE SENSING, OIL SPILLS, SHIPS, SURVEILLANCE, USCG,
0512 LAW ENFORCEMENT, EPA, CLEANUP, REMOTE SENSING, OIL SPILLS, POLLUTION CONTROL,
0640 LAW ENFORCEMENT, TANKERS, REGULATIONS, OIL TRANSPORT, WASHINGTON, PUGET SOUND,
0833 LAW ENFORCEMENT, ARGO MERCHANT SPILL, OIL SPILLS, TANKERS, REGULATIONS,
0453 LEAKAGE, CONTINGENCY PLANNING, OFFSHORE DEVELOPMENT, NORTH SEA, OIL SPILLS, *NATO,
0496 LEAKAGE, DETECTION, DESIGN-ENGINEERING, MONITORING, OIL TANKS, PATENT,
0502 LEAKAGE, DETECTION, DESIGN-ENGINEERING, MONITORING, PIPELINES, OIL SLICKS, WASTEWATERS, PATENT,
0622 LEAKAGE, GROUNDWATER, GASOLINE, CONTAINMENT, OIL TANKS, RECOVERY,
0651 LEAKAGE, DETECTION, PIPELINES, *MINI-COMPUTERS,
0727 LEAKAGE, DESIGN-ENGINEERING, OIL TANKS, SOIL, POLLUTION PREVENTION, STORAGE, PATENT,
0728 LEAKAGE, DETECTION, DESIGN-ENGINEERING, OIL TANKS, PATENT,
0740 LEAKAGE, DETECTION, PETROLEUM PRODUCTS, PATENT,

0747 LEAKAGE, PIPELINES, POLLUTION PREVENTION, PATENT, *SEALING MATERIAL,
0750 LEAKAGE, DETECTION, DESIGN-ENGINEERING, OIL TANKS, PATENT,
0642 LEGISLATION, FLORIDA, ENVIRONMENTAL EFFECTS, PORTS, OIL TRANSFER, MEXICO/GULF OF, SOCIO-ECONOMIC EFFECTS, *DEEPWATER PORTS,
0685 LEGISLATION, GERMANY, WEST, ECONOMICS, WASTEWATER TREATMENT, PETROCHEMICALS,
0726 LEGISLATION, EUROPE, POLLUTION CONTROL, OIL DISCHARGES, *MARINE POLLUTION,
0829 LEGISLATION, ENVIRONMENTAL EFFECTS, DEVELOPMENT, CONTAMINATION, COASTS, *ECOLOGY,
0834 LEGISLATION, ENVIRONMENTAL EFFECTS, POLLUTION CONTROL, REGULATIONS, US,
0985 LEGISLATION, ENVIRONMENTAL EFFECTS, ECONOMICS, DELAWARE, US, OCS, OFFSHORE DEVELOPMENT, POLLUTION CONTROL,
0986 LEGISLATION, DELAWARE BAY, PORTS, OIL TRANSFER,
0988 LEGISLATION, ECONOMIC EFFECTS, US, POLLUTION CONTROL, REFINERIES, OIL INDUSTRY,
0990 LEGISLATION, COST ANALYSIS, CLEANUP, POLLUTION CONTROL, LIABILITY, *FEDERAL WATER POLLUTION CONTROL ACT,
0991 LEGISLATION, COMPENSATION, US, OIL SPILLS, LIABILITY, *SUPER-FUND,
0997 LEGISLATION, GUIDELINES, ECONOMICS, WASTEWATER TREATMENT, OIL INDUSTRY, REFINERIES, WATER QUALITY,
1001 LEGISLATION, INTERNATIONAL AGREEMENTS, BIBLIOGRAPHIES, US, OCEANS, SHIPS, OFFSHORE DRILLING, POLLUTION PREVENTION, OIL SPILLS,
0848 LIABILITY, FRANCE, EUROPE, DENMARK, OFFSHORE DEVELOPMENT, UK, NORWAY, *POLLUTION DAMAGE,
0990 LIABILITY, LEGISLATION, COST ANALYSIS, CLEANUP, POLLUTION CONTROL, *FEDERAL WATER POLLUTION CONTROL ACT,
0991 LIABILITY, LEGISLATION, COMPENSATION, US, OIL SPILLS, *SUPER-FUND,
0643 LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STORAGE, *BAYOU CHOCTAW SALT DOMES,
0644 LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STORAGE, *COTE BLANCHE MINE,
0645 LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STORAGE, *WEEKS ISLAND MINE,
0656 LOUISIANA, GROUNDWATER, ENVIRONMENTAL EFFECTS, CRUDE OIL, STORAGE, OIL SPILLS, VEGETATION, TEXAS, *SALT DOMES,
0871 LOUISIANA, HYDROCARBONS, ENVIRONMENTAL EFFECTS, OFFSHORE PRODUCTION, OIL INDUSTRY, MARINE ORGANISMS, SEDIMENTS,
0707 LUBRICATING OIL, WASTE OIL, RECLAMATION, PATENT,
0748 LUBRICATING OIL, POLLUTION CONTROL, PATENT,
0749 LUBRICATING OIL, POLLUTION PREVENTION, PATENT,
0965 MAGELLAN/STRAIT OF, FATE, ESTUARIES, ENVIRONMENTAL EFFECTS, BEACHES, METULA SPILL, TANKERS, MARINE ORGANISMS,
0772 MAINE, ENVIRONMENTAL EFFECTS, CONTAMINATION, CONTAINMENT, CLEANUP, OIL SPILLS, MARINE ORGANISMS, SEDIMENTS, *TOMANO SPILL,
0792 MALAYSIA, FUEL OIL, BIOLOGICAL EFFECTS, PLANTS, TROPICAL REGIONS, *PIONEER MANGROVE, *AVICENNIA INTERMEDIA,
0626 MANUALS, CLEANUP, BIOLOGICAL EFFECTS, OIL SPILLS, MARSHES,
0669 MANUALS, HYDROCARBONS, DISPOSAL, BIODEGRADATION, OIL SPILLS, *DEBRIS,
0704 MANUALS, DISPOSAL, WASTE OIL, PETROCHEMICALS, STORAGE, USN,
0779 MARINE MAMMALS, CRUDE OIL, BIOLOGICAL EFFECTS, METABOLISM, *SEALS,
0873 MARINE MAMMALS, ENVIRONMENTAL EFFECTS, ALASKA, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES,
0475 MARINE ORGANISMS, ENVIRONMENTAL EFFECTS, CHESAPEAKE BAY, BEACHES, OIL SPILLS, MARSHES,
0490 MARINE ORGANISMS, HYDROCARBONS, CONTAMINANTS, ANALYTICAL TECHNIQUES, MONITORING, OCEANS, TAR, SAMPLING,
0509 MARINE ORGANISMS, INTERTIDAL ZONE, HYDROCARBONS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, MONITORING, METABOLISM, *BIOGENIC HYDROCARBONS,
0537 MARINE ORGANISMS, HYDROCARBONS, FISH, CHROMATOGRAPHY, CHEMICAL ANALYSIS,
0540 MARINE ORGANISMS, HYDROCARBONS, FISH, CHROMATOGRAPHY, CHEMICAL ANALYSIS, *SHRIMP, *SQUID, *N-PARAFFINS,
0544 MARINE ORGANISMS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, PAH, *SHELLFISH,
0641 MARINE ORGANISMS, HYDROCARBONS, FOOD WEB, DISTRIBUTION, OIL TRANSFER, OCEANS, *TRANSFER PROCESSES,
0757 MARINE ORGANISMS, HYDROCARBONS, FATE, CONTAMINATION, COASTS, CHRONIC EFFECTS, ANALYTICAL TECHNIQUES,
0766 MARINE ORGANISMS, BIOLOGICAL EFFECTS, OIL SPILLS, RESTORATION, SAN FRANCISCO BAY,
0767 MARINE ORGANISMS, INTERTIDAL ZONE, FLORIDA COAST, CORAL REEFS, BIOLOGICAL EFFECTS, OIL SPILLS, TROPICAL REGIONS, MARSHES,
0772 MARINE ORGANISMS, MAINE, ENVIRONMENTAL EFFECTS, CONTAMINATION, CONTAINMENT, CLEANUP, OIL SPILLS, SEDIMENTS, *TOMANO SPILL,
0773 MARINE ORGANISMS, ECOSYSTEMS, CRUDE OIL, BIOLOGICAL EFFECTS, ALASKA, SEDIMENTS,
0781 MARINE ORGANISMS, CHESAPEAKE BAY, BIOLOGICAL EFFECTS, OIL SPILLS, MARSHES, MOLLUSKS, *MARSH GRASS,
0783 MARINE ORGANISMS, DESIGN-ENGINEERING, CONTAMINATION, CHRONIC EFFECTS, ACUTE EFFECTS, *CONTINUOUS FLOW BIOASSAY SYSTEM,
0784 MARINE ORGANISMS, HYDROCARBONS, ECOSYSTEMS, CRUDE OIL, TOXICITY, PETROLEUM PRODUCTS,
0793 MARINE ORGANISMS, INTERTIDAL ZONE, HYDROCARBONS, BIOLOGICAL EFFECTS, BERMUDA, TAR,
0794 MARINE ORGANISMS, CRUDE OIL, CHRONIC EFFECTS, OFFSHORE DRILLING, OFFSHORE PRODUCTION, PLATFORMS,
0797 MARINE ORGANISMS, CONTAMINATION, COASTS, BIOLOGICAL EFFECTS, OIL SPILLS, TROPICAL REGIONS, PUERTO RICO, *MANGROVES, *TURTLE GRASS,

0798 MARINE ORGANISMS, AROMATIC HYDROCARBONS, TOXICITY, PETROLEUM PRODUCTS, *SUBLETHAL EFFECTS, *RESPIRATION, *GROWTH,
0799 MARINE ORGANISMS, AROMATIC HYDROCARBONS, SEAWATER, UPTAKE, RELEASE,
0801 MARINE ORGANISMS, HYDROCARBONS, PAH, METABOLISM, *BENZO(A)PYRENE, *MICROSOMAL MIXED-FUNCTION OXIDASES,
0803 MARINE ORGANISMS, INVERTEBRATES, INTERTIDAL ZONE, FUEL OIL, FISH, CRUDE OIL, ALASKA, TOXICITY,
0806 MARINE ORGANISMS, HYDROCARBONS, FISH, DESIGN-ENGINEERING, CRUDE OIL, CHRONIC EFFECTS, *FLOW-THROUGH SYSTEM,
0807 MARINE ORGANISMS, FUEL OIL, ESTUARIES, DELAWARE, TOXICITY, *ULTRA-VIOLET RADIATION,
0811 MARINE ORGANISMS, CRUDE OIL, CHRONIC EFFECTS, NATURAL SEEPAGE, MOLLUSKS, SANTA BARBARA CHANNEL,
0814 MARINE ORGANISMS, INTERTIDAL ZONE, CRUDE OIL, BIOLOGICAL EFFECTS,
0815 MARINE ORGANISMS, INTERTIDAL ZONE, FUEL OIL, CHEMICAL ANALYSIS, BIOLOGICAL EFFECTS, DISPERSONS, *SPECIES DIVERSITY,
0816 MARINE ORGANISMS, OIL SPILLS, TANKERS, TOXICITY, *NANNOPLANKTERS,
0830 MARINE ORGANISMS, JAPAN, ENVIRONMENTAL EFFECTS, DEVELOPMENT, CONTAMINATION, SHORELINES,
0832 MARINE ORGANISMS, FATE, ESTUARIES, ENVIRONMENTAL EFFECTS, CONTAMINATION, BIOLOGICAL EFFECTS, BIBLIOGRAPHIES, OIL SPILLS, OCEANS,
0835 MARINE ORGANISMS, BIOLOGICAL EFFECTS, ATLANTIC OCEAN, OIL SPILLS, OFFSHORE DEVELOPMENT, OCS,
0836 MARINE ORGANISMS, BIOLOGICAL EFFECTS, PLATFORMS, OFFSHORE DRILLING, SANTA BARBARA CHANNEL,
0837 MARINE ORGANISMS, FISHERIES, ENVIRONMENTAL EFFECTS, OIL SPILLS, OFFSHORE DRILLING, *GEORGES BANK,
0863 MARINE ORGANISMS, ENVIRONMENTAL EFFECTS, CONTAMINATION, TOXICITY, OFFSHORE PRODUCTION, *PRODUCED WATERS,
0871 MARINE ORGANISMS, LOUISIANA, HYDROCARBONS, ENVIRONMENTAL EFFECTS, OFFSHORE PRODUCTION, OIL INDUSTRY, SEDIMENTS,
0877 MARINE ORGANISMS, ENVIRONMENTAL EFFECTS, BERING SEA, BENTHOS, BEAUFORT SEA, ALASKA, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES,
0880 MARINE ORGANISMS, HYDROCARBONS, ENVIRONMENTAL EFFECTS, BIOLOGICAL EFFECTS, BIODEGRADATION, ALASKA, OFFSHORE DEVELOPMENT, OCS,
0891 MARINE ORGANISMS, HYDROCARBONS, FATE, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, PUGET SOUND, MEXICO/GULF OF, TOXICITY, NOAA,
0901 MARINE ORGANISMS, EXPLORATION, ENVIRONMENTAL EFFECTS, ARCTIC, PRODUCTION, PLANTS, WILDLIFE, OIL SPILLS,
0931 MARINE ORGANISMS, HYDROCARBONS, BIODEGRADATION, BENTHOS, METABOLISM, SEDIMENTS, MICROORGANISMS,
0958 MARINE ORGANISMS, FATE, BIOLOGICAL EFFECTS, API, OIL SPILLS,
0965 MARINE ORGANISMS, MAGELLAN/STRAIT OF, FATE, ESTUARIES, ENVIRONMENTAL EFFECTS, BEACHES, METULA SPILL, TANKERS,
0971 MARINE ORGANISMS, FATE, CONTAMINATION, API, TOXICITY, OIL SPILLS,
0989 MARINE ORGANISMS, ENVIRONMENTAL DETERIORATION, ECONOMICS, COMPENSATION, OIL SPILLS, WILDLIFE, *LEGAL ASPECTS,
0475 MARSHES, MARINE ORGANISMS, ENVIRONMENTAL EFFECTS, CHESAPEAKE BAY, BEACHES, OIL SPILLS,
0517 MARSHES, DETECTION, CONTAMINATION, REMOTE SENSING, OIL SPILLS, *REMOTE LUMINESCENT SENSOR,
0626 MARSHES, MANUALS, CLEANUP, BIOLOGICAL EFFECTS, OIL SPILLS,
0735 MARSHES, ENVIRONMENTAL PROTECTION, OIL SPILLS, POLLUTION PREVENTION, SHORELINES,
0745 MARSHES, ESTUARIES, OIL SPILLS, POLLUTION CONTROL, MOVEMENT, *GRASS-CUTTING, *HACKENSACK ESTUARY,
0767 MARSHES, MARINE ORGANISMS, INTERTIDAL ZONE, FLORIDA COAST, CORAL REEFS, BIOLOGICAL EFFECTS, OIL SPILLS, TROPICAL REGIONS,
0781 MARSHES, MARINE ORGANISMS, CHESAPEAKE BAY, BIOLOGICAL EFFECTS, OIL SPILLS, MOLLUSKS, *MARSH GRASS,
0581 MEDITERRANEAN SEA, CLEANUP, SKIMMERS, OIL SPILLS, MONITORING,
0960 MEDITERRANEAN SEA, HYDROCARBONS, REFINERIES, SAMPLING, *SURFACE MICROLAYER COMPOSITION,
0509 METABOLISM, MARINE ORGANISMS, INTERTIDAL ZONE, HYDROCARBONS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, MONITORING, *BIOGENIC HYDROCARBONS,
0760 METABOLISM, FUEL OIL, CRUDE OIL, BENTHOS, ALGAE, TOXICITY, WASTE OIL,
0770 METABOLISM, HYDROCARBONS, FOOD WEB, CHEMICAL ANALYSIS, BIRDS, BIOLOGICAL EFFECTS, *EGGS,
0774 METABOLISM, CRUDE OIL, MOLLUSKS, *CLAMS, *MYA ARENARIA,
0779 METABOLISM, MARINE MAMMALS, CRUDE OIL, BIOLOGICAL EFFECTS, *SEALS,
0801 METABOLISM, MARINE ORGANISMS, HYDROCARBONS, PAH, *BENZO(A)PYRENE, *MICROSOMAL MIXED-FUNCTION OXIDASES,
0802 METABOLISM, FUEL OIL, CONTAMINATION, BIOLOGICAL EFFECTS, SEDIMENTS, POLYCHAETES, *FEEDING ACTIVITY, *ARENICOLA MARINA,
0804 METABOLISM, HYDROCARBONS, UPTAKE, RELEASE, POLYCHAETES, SEDIMENTS, SEAWATER, *NEANTHES ARENACEODENTATA,
0805 METABOLISM, HYDROCARBONS, FUEL OIL, BIOLOGICAL EFFECTS, POLYCHAETES, UPTAKE, *NEANTHES ARENACEODENTATA,
0809 METABOLISM, FRESHWATER, CRUDE OIL, ALGAE, *NAPHTHALENE, TOXICITY, *CHLAMYDOMONAS ANGULOSA,

0810 METABOLISM, HYDROCARBONS, FISH, CONTAMINATION, BIOLOGICAL EFFECTS,
0817 METABOLISM, FISH, ESTUARIES, CRUDE OIL, BIOLOGICAL EFFECTS, *MULLET,
0917 METABOLISM, HYDROCARBONS, BIODEGRADATION, BACTERIA, *ALICYCLIC COMPOUNDS,
0931 METABOLISM, MARINE ORGANISMS, HYDROCARBONS, BIODEGRADATION, BENTHOS, SEDIMENTS, MICROORGANISMS,
0937 METABOLISM, HYDROCARBONS, BIODEGRADATION, MICROORGANISMS,
0943 METABOLISM, BIODEGRADATION, PETROCHEMICALS, MICROORGANISMS,
0948 METABOLISM, HYDROCARBONS, BIODEGRADATION, MICROORGANISMS, *BUTADIENE,
0980 METABOLISM, HYDROCARBONS, FUEL OIL, FATE, CHEDABUCTO BAY, SEDIMENTS, WEATHERING, MOLLUSKS,
0637 METULA SPILL, ENVIRONMENTAL PROTECTION, OIL SPILLS, TANKERS, OFFSHORE DRILLING, POLLUTION CONTROL,
0965 METULA SPILL, MARINE ORGANISMS, MAGELLAN/STRAIT OF, FATE, ESTUARIES, ENVIRONMENTAL EFFECTS, BEACHES, TANKERS,
0455 MEXICO/GULF OF, ENVIRONMENTAL EFFECTS, OIL SPILLS, OCS, *USGS REPORT,
0522 MEXICO/GULF OF, HYDROCARBONS, DISTRIBUTION, CHEMICAL ANALYSIS, SAMPLING, SEDIMENTS, SOURCES,
0532 MEXICO/GULF OF, HYDROCARBONS, DISTRIBUTION, CHEMICAL ANALYSIS, ZOOPLANKTON, SOURCES, *BIOGENIC HYDROCARBONS,
0539 MEXICO/GULF OF, HYDROCARBONS, CHROMATOGRAPHY, ALGAE, SEDIMENTS, MISSISSIPPI RIVER, SAMPLING,
0642 MEXICO/GULF OF, LEGISLATION, FLORIDA, ENVIRONMENTAL EFFECTS, PORTS, OIL TRANSFER, SOCIO-ECONOMIC EFFECTS, *DEEPWATER PORTS,
0854 MEXICO/GULF OF, ENVIRONMENTAL EFFECTS, COASTS, OFFSHORE DEVELOPMENT, OCS, SOCIO-ECONOMIC EFFECTS,
0860 MEXICO/GULF OF, ENVIRONMENTAL PROTECTION, CALIFORNIA/SOUTHERN, ALASKA, OFFSHORE DRILLING, OFFSHORE DEVELOPMENT, REGULATIONS,
0891 MEXICO/GULF OF, MARINE ORGANISMS, HYDROCARBONS, FATE, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, PUGET SOUND, TOXICITY, NOAA,
0897 MEXICO/GULF OF, CALIFORNIA COAST, BLOWOUT PREVENTION, ATLANTIC COAST, OFFSHORE DRILLING, OCS, TANKERS, OIL TRANSPORT, OIL SPILLS,
0524 MICROORGANISMS, HYDROCARBONS, DISTRIBUTION, BACTERIA, SAMPLING, TAR, SEDIMENTS, OFFSHORE DEVELOPMENT, NORTH SEA,
0782 MICROORGANISMS, CANADA, BIOLOGICAL EFFECTS, OIL SPILLS, VEGETATION, SOIL,
0786 MICROORGANISMS, ESTUARIES, DISTRIBUTION, BACTERIA, OIL SPILLS,
0881 MICROORGANISMS, HYDROCARBONS, ENVIRONMENTAL EFFECTS, DISTRIBUTION, CHEMICAL ANALYSIS, ALASKA, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES,
0906 MICROORGANISMS, CRUDE OIL, BIODEGRADATION, ARCTIC, ALASKA,
0907 MICROORGANISMS, BIODEGRADATION, AFRICA/SOUTH, OIL SPILLS, WASTE OIL, PATENT,
0909 MICROORGANISMS, HYDROCARBONS, BIODEGRADATION, SOIL, OXIDATION, *OXYGEN UPTAKE RATE,
0911 MICROORGANISMS, HYDROCARBONS, FRESHWATER, ECOSYSTEMS, BIODEGRADATION,
0919 MICROORGANISMS, CRUDE OIL, BIODEGRADATION, OCEANS, *NUTRIENT REQUIREMENTS,
0923 MICROORGANISMS, CARCINOGENS, BIODEGRADATION, AROMATIC HYDROCARBONS, PAH,
0924 MICROORGANISMS, CARCINOGENS, BIODEGRADATION, BACTERIA, PAH,
0925 MICROORGANISMS, FUELS, BIODEGRADATION, *SUPERSONIC AIRCRAFT FUEL,
0929 MICROORGANISMS, HYDROCARBONS, BIODEGRADATION,
0930 MICROORGANISMS, BIODEGRADATION, BACTERIA, ATLANTIC OCEAN, OXIDATION, POLLUTION CONTROL,
0931 MICROORGANISMS, METABOLISM, MARINE ORGANISMS, HYDROCARBONS, BIODEGRADATION, BENTHOS, SEDIMENTS,
0932 MICROORGANISMS, HYDROCARBONS, BIODEGRADATION, SEAWATER,
0935 MICROORGANISMS, DECOMPOSITION, BIODEGRADATION, OIL SPILLS, SOIL, MODELS, *NUTRIENT DEMAND,
0936 MICROORGANISMS, BIODEGRADATION, BARENT SEA, BALTIC SEA, ATLANTIC OCEAN, PETROLEUM PRODUCTS,
0937 MICROORGANISMS, METABOLISM, HYDROCARBONS, BIODEGRADATION,
0938 MICROORGANISMS, BIODEGRADATION, OIL SPILLS,
0939 MICROORGANISMS, FUEL OIL, FRESHWATER, BIODEGRADATION, *CONTINUOUS CULTURE,
0941 MICROORGANISMS, ENVIRONMENTAL EFFECTS, CRUDE OIL, BIODEGRADATION, PETROLEUM PRODUCTS, OXIDATION,
0942 MICROORGANISMS, HYDROCARBONS, GROUNDWATER, CRUDE OIL, BIODEGRADATION, PETROLEUM PRODUCTS, USSR,
0943 MICROORGANISMS, METABOLISM, BIODEGRADATION, PETROCHEMICALS,
0945 MICROORGANISMS, ESTUARIES, CRUDE OIL, CHESAPEAKE BAY, BIODEGRADATION,
0948 MICROORGANISMS, METABOLISM, HYDROCARBONS, BIODEGRADATION, *BUTADIENE,
0539 MISSISSIPPI RIVER, MEXICO/GULF OF, HYDROCARBONS, CHROMATOGRAPHY, ALGAE, SEDIMENTS, SAMPLING,
0477 MODELS, GREAT LAKES , COASTS, OIL SPILLS, US, STATISTICAL ANALYSIS, *DISCRIMINANT ANALYSIS,
0514 MODELS, ESTUARIES, DRIFT, DELAWARE BAY, REMOTE SENSING, *FRONTS, OIL SLICKS, SPREADING,
0603 MODELS, COST ANALYSIS, CLEANUP, OIL SPILLS, RECOVERY,
0734 MODELS, ECONOMIC EFFECTS, POLLUTION CONTROL, OIL SPILLS, *COSTS, *POLLUTER RESPONSE,
0823 MODELS, FATE, COST ANALYSIS, CLEANUP, OIL SPILLS, MOVEMENT, STATISTICAL ANALYSIS,
0824 MODELS, FATE, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, OIL SPILLS, TANKERS, WILDLIFE, *WORLD WAR II SPILLS,

0935 MODELS, MICROORGANISMS, DECOMPOSITION, BIODEGRADATION, OIL SPILLS, SOIL, *NUTRIENT DEMAND,
0944 MODELS, HYDROCARBONS, BIODEGRADATION, SOIL, MONITORING,
0954 MODELS, EVAPORATION, OIL SPILLS, WEATHERING,
0961 MODELS, INLAND, GROUNDWATER, FATE, CRUDE OIL, CONTAMINATION, OIL SPILLS,
0963 MODELS, DRIFT, ALASKA/GULF OF, OIL SPILLS, MOVEMENT, OCS,
0964 MODELS, DISPERSIONS, CONTAINMENT, BOOMS, OIL SLICKS, *DISPERSIVE OIL LOSSES,
0967 MODELS, DRIFT, BEAUFORT SEA, OIL SPILLS, SHORELINES, OCS, *STORM MODELING,
0968 MODELS, HARBORS, DRIFT, OIL SPILLS, SPREADING, NEW YORK,
0969 MODELS, HYDROCARBONS, FATE, EMULSIFICATION, DECOMPOSITION, ADSORPTION, OIL SPILLS, SPREADING, SOLUTION,
0970 MODELS, HYDROCARBONS, FATE, EVAPORATION, BIODEGRADATION, OIL SPILLS, OCEANS, SPREADING,
0973 MODELS, DELAWARE, COASTS, OIL SPILLS, MOVEMENT, OFFSHORE DRILLING, PORTS, NEW JERSEY,
0982 MODELS, FATE, DRIFT, DELAWARE BAY, OIL SPILLS, SPREADING,
0487 MOLLUSKS, CARCINOGENS, CALIFORNIA/SOUTHERN, MONITORING, PAH, *MUSSELS, *BENZO(A)PYRENE,
0586 MOLLUSKS, CLEANUP, OIL SPILLS, SEAWATER, OXIDATION, *WATER PURIFICATION, *MUSSELS, *MYTILUS EDULIS,
0694 MOLLUSKS, BALLAST, WASTEWATER TREATMENT, TANKERS, *MYTILUS GALLOPROVINCIALIS,
0756 MOLLUSKS, FUEL OIL, CRUSTACEANS, BIOLOGICAL EFFECTS, BEHAVIOR, *KEROSENE, *SUBLETHAL EFFECTS, *LOBSTER, *MUD SNAIL,
0764 MOLLUSKS, FOOD WEB, CONTAMINATION, AROMATIC HYDROCARBONS, ACCUMULATION, WASTEWATERS, REFINERIES, *FOOD CHAIN, *3,4-BENZOPYRENE,
0774 MOLLUSKS, METABOLISM, CRUDE OIL, *CLAMS, *MYA ARENARIA,
0778 MOLLUSKS, HYDROCARBONS, UPTAKE, RELEASE, PLATFORMS, SEDIMENTS, TEXAS, *TRINITY BAY, *NAPHTHALENES, *CLAM, *RANGIA CUNEATA,
0781 MOLLUSKS, MARSHES, MARINE ORGANISMS, CHESAPEAKE BAY, BIOLOGICAL EFFECTS, OIL SPILLS, *MARSH GRASS,
0789 MOLLUSKS, AROMATIC HYDROCARBONS, UPTAKE, RELEASE, *MODIOLUS DEMISSUS, *CRASSOSTREA VIRGINICA, *PETRO-SULFUR COMPOUNDS,
0795 MOLLUSKS, HYDROCARBONS, CONTAMINATION, BIOLOGICAL EFFECTS, *SCALLOPS, *PECTEN YESSOENSIS,
0808 MOLLUSKS, CRUDE OIL, CHEMICAL ANALYSIS, BIOLOGICAL EFFECTS, BEHAVIOR, SEDIMENTS, *CLAM, *MACOMA BALTHICA,
0811 MOLLUSKS, MARINE ORGANISMS, CRUDE OIL, CHRONIC EFFECTS, NATURAL SEEPAGE, SANTA BARBARA CHANNEL,
0819 MOLLUSKS, ESTUARIES, ECONOMIC EFFECTS, CARCINOGENS, PAH, OREGON, *BENZO(A)PYRENE,
0878 MOLLUSKS, HABITAT, FISH, ENVIRONMENTAL EFFECTS, ALASKA, OFFSHORE DEVELOPMENT, OCS, *BASELINE STUDIES,
0980 MOLLUSKS, METABOLISM, HYDROCARBONS, FUEL OIL, FATE, CHEDABUCTO BAY, SEDIMENTS, WEATHERING,
0478 MONITORING, BIOLOGICAL EFFECTS, OIL SPILLS,
0482 MONITORING, ATLANTIC OCEAN, ARGO MERCHANT SPILL, OIL SPILLS, REMOTE SENSING, SPREADING, MOVEMENT,
0483 MONITORING, DETECTION, DESIGN-ENGINEERING, SHIPS, USCG, *OIL-IN-WATER,
0484 MONITORING, OIL SLICKS, PATENT, *OIL CONTENT, *ECHO SOUNDING,
0485 MONITORING, ABSORPTION, OIL SLICKS, SHIPS, SOLVENTS, SPECTROSCOPY, *LASER BEAM,
0486 MONITORING, COASTS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, CARCINOGENS, PAH, SAMPLING, *FLUORIMETRY, *COASTAL WATERS,
0487 MONITORING, MOLLUSKS, CARCINOGENS, CALIFORNIA/SOUTHERN, PAH, *MUSSELS, *BENZO(A)PYRENE,
0488 MONITORING, DETECTION, ANALYTICAL TECHNIQUES, WASTEWATERS, *LIGHT SCATTERING, *PARTICULATES, *OIL-IN-WATER,
0489 MONITORING, DESIGN-ENGINEERING, BALLAST, OIL DISCHARGES, TANKERS,
0490 MONITORING, MARINE ORGANISMS, HYDROCARBONS, CONTAMINANTS, ANALYTICAL TECHNIQUES, OCEANS, TAR, SAMPLING,
0491 MONITORING, WASTEWATERS, OIL-WATER SEPARATION, PATENT,
0492 MONITORING, DETECTION, CHEMICAL ANALYSIS, WASTEWATERS,
0493 MONITORING, HYDROCARBONS, DESIGN-ENGINEERING, *OIL-IN-WATER, *FLUORESCENCE,
0494 MONITORING, CONTAMINATION, BILGES, BALLAST, SHIPS,
0495 MONITORING, DISTRIBUTION, ATLANTIC OCEAN, TAR, SAMPLING,
0496 MONITORING, LEAKAGE, DETECTION, DESIGN-ENGINEERING, OIL TANKS, PATENT,
0497 MONITORING, HYDROCARBONS, DISTRIBUTION, BEAUFORT SEA, WATER QUALITY,
0498 MONITORING, HYDROCARBONS, DISTRIBUTION, OCEANS, SURVEILLANCE,
0499 MONITORING, DETECTION, CRUDE OIL, CHROMATOGRAPHY, SEDIMENTS, *OIL-IN-WATER, *BIOLOGICAL MATERIALS,
0500 MONITORING, EIS, COASTS, BLM, OCS, OIL-GAS LEASING, REGULATIONS, *ENVIRONMENTAL STUDIES PROJECT,
0501 MONITORING, HYDROCARBONS, GOVERNMENT AGENCIES, EPA, OIL SPILLS, POLLUTION CONTROL, SURVEILLANCE, USGS, USCG, *UN,
0502 MONITORING, LEAKAGE, DETECTION, DESIGN-ENGINEERING, PIPELINES, OIL SLICKS, WASTEWATERS, PATENT,
0503 MONITORING, HYDROCARBONS, DETECTION, DESIGN-ENGINEERING, PATENT,
0504 MONITORING, DESIGN-ENGINEERING, OIL SLICKS, RIVERS, *INFRARED SCANNING OIL SENSOR,
0505 MONITORING, HYDROCARBONS, CHEMICAL ANALYSIS, CALIFORNIA/SOUTHERN, SEDIMENTS, SOURCE IDENTIFICATION

0506 MONITORING, DESIGN-ENGINEERING, OIL DISCHARGES, WASTEWATERS, SHIPS, USN, *OIL CONTENT,
0507 MONITORING, BILGES, WASTEWATERS, SHIPS, OIL-WATER SEPARATION, PATENT,
0509 MONITORING, METABOLISM, MARINE ORGANISMS, INTERTIDAL ZONE, HYDROCARBONS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, *BIOGENIC HYDROCARBONS,
0519 MONITORING, REMOTE SENSING, REFINERIES, WASTEWATERS, OIL SLICKS,
0551 MONITORING, CHEMICAL ANALYSIS, PETROLEUM PRODUCTS, WASTEWATERS,
0581 MONITORING, MEDITERRANEAN SEA, CLEANUP, SKIMMERS, OIL SPILLS,
0649 MONITORING, FLORIDA, ESTUARIES, ENVIRONMENTAL EFFECTS, ANIMALS, OIL TRANSPORT, PIPELINES, PLANTS,
0729 MONITORING, POLLUTION CONTROL, REFINERIES, *NATURAL GAS PLANTS, WASTEWATERS, SOLID WASTES,
0736 MONITORING, INLAND, ENVIRONMENTAL PROTECTION, SHIPS, TANKERS, OFFSHORE PRODUCTION,
0738 MONITORING, CLEANUP, POLLUTION PREVENTION, OIL DISCHARGES, SHIPS, WASTE OIL TREATMENT, USN,
0755 MONITORING, FUEL OIL, BIRDS, BIOLOGICAL EFFECTS, *REPRODUCTION,
0865 MONITORING, GUIDELINES, ENVIRONMENTAL EFFECTS, BLM, ATLANTIC OCEAN, OFFSHORE DRILLING, OCS,
0904 MONITORING, INFORMATION SYSTEMS, ENVIRONMENTAL EFFECTS, CONTAMINANTS, BIOLOGICAL EFFECTS, ALASKA, OFFSHORE DEVELOPMENT, OCS,
0944 MONITORING, MODELS, HYDROCARBONS, BIODEGRADATION, SOIL,
0946 MONITORING, FATE, CRUDE OIL, BIODEGRADATION, BACTERIA, SAMPLING,
0956 MONITORING, FATE, OIL SPILLS, MOVEMENT, SAMPLING, OCEANS, NOAA,
0461 MOVEMENT, JAPAN, DISPERSANTS, CRUDE OIL, CLEANUP, BEACHES, OIL SPILLS, TANKERS, SPREADING,
0482 MOVEMENT, MONITORING, ATLANTIC OCEAN, ARGO MERCHANT SPILL, OIL SPILLS, REMOTE SENSING, SPREADING,
0745 MOVEMENT, MARSHES, ESTUARIES, OIL SPILLS, POLLUTION CONTROL, *GRASS-CUTTING, *HACKENSACK ESTUARY,
0823 MOVEMENT, MODELS, FATE, COST ANALYSIS, CLEANUP, OIL SPILLS, STATISTICAL ANALYSIS,
0846 MOVEMENT, ERDA, ENVIRONMENTAL PROTECTION, CONTAMINANTS, ATLANTIC COAST, OFFSHORE DRILLING, OCS, *SOUTHEASTERN U.S.,
0951 MOVEMENT, ICE, ENVIRONMENTAL EFFECTS, CANADA, BEHAVIOR, ARCTIC, OIL SPILLS, OFFSHORE DRILLING, *BLOWOUTS, *OIL-IN-ICE,
0956 MOVEMENT, MONITORING, FATE, OIL SPILLS, SAMPLING, OCEANS, NOAA,
0963 MOVEMENT, MODELS, DRIFT, ALASKA/GULF OF, OIL SPILLS, OCS,
0966 MOVEMENT, HYDROCARBONS, GROUNDWATER, CONTAMINATION, POLLUTION CONTROL,
0973 MOVEMENT, MODELS, DELAWARE, COASTS, OIL SPILLS, OFFSHORE DRILLING, PORTS, NEW JERSEY,
0979 MOVEMENT, FATE, CHEDABUCTO BAY, BIOLOGICAL EFFECTS, BENTHOS, BEACHES, OIL SPILLS, SEDIMENTS, PLANKTON,
0463 NATURAL SEEPAGE, HYDROCARBONS, CHEMICAL ANALYSIS, ALASKA/GULF OF,
0468 NATURAL SEEPAGE, CRUDE OIL, STATISTICAL ANALYSIS, *OIL INPUT, SOURCES, OCEANS, WASTE OIL, OIL DISCHARGES, TANKERS,
0469 NATURAL SEEPAGE, HYDROCARBONS, SOURCES, OCEANS, *BIOGENIC HYDROCARBONS, *INPUT ESTIMATES,
0511 NATURAL SEEPAGE, DETECTION, REMOTE SENSING, OIL SLICKS, SURVEILLANCE, SANTA BARBARA CHANNEL,
0515 NATURAL SEEPAGE, DETECTION, REMOTE SENSING, OIL SLICKS, PLATFORMS, SANTA BARBARA CHANNEL, USCG, *SIDE-LOOKING RADAR,
0811 NATURAL SEEPAGE, MOLLUSKS, MARINE ORGANISMS, CRUDE OIL, CHRONIC EFFECTS, SANTA BARBARA CHANNEL,
0973 NEW JERSEY, MOVEMENT, MODELS, DELAWARE, COASTS, OIL SPILLS, OFFSHORE DRILLING, PORTS,
0800 NEW MEXICO, INVERTEBRATES, FUEL OIL, FISH, BIOLOGICAL EFFECTS, OIL SPILLS, RESTORATION, STREAMS,
0525 NEW YORK, HYDROCARBONS, HARBORS, DISTRIBUTION, CONTAMINATION, SAMPLING, *EXTRACTABLE ORGANICS,
0862 NEW YORK, FISHERIES, COASTS, OFFSHORE DRILLING, OIL SPILLS,
0968 NEW YORK, MODELS, HARBORS, DRIFT, OIL SPILLS, SPREADING,
0891 NOAA, MEXICO/GULF OF, MARINE ORGANISMS, HYDROCARBONS, FATE, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, PUGET SOUND, TOXICITY,
0956 NOAA, MOVEMENT, MONITORING, FATE, OIL SPILLS, SAMPLING, OCEANS,
0453 NORTH SEA, LEAKAGE, CONTINGENCY PLANNING, OFFSHORE DEVELOPMENT, OIL SPILLS, *NATO,
0454 NORTH SEA, OIL SPILLS, OFFSHORE PRODUCTION, PLATFORMS, *OXYGEN CORROSION,
0524 NORTH SEA, MICROORGANISMS, HYDROCARBONS, DISTRIBUTION, BACTERIA, SAMPLING, TAR, SEDIMENTS, OFFSHORE DEVELOPMENT,
0718 NORTH SEA, CONTINGENCY PLANNING, CLEANUP, OIL SPILLS, PERSONNEL TRAINING, OIL FIELDS, *BP FORTIES OILFIELD,
0753 NORTH SEA, CONTAINMENT, BLOWOUT PREVENTION, OFFSHORE DRILLING, OIL SPILLS,
0848 NORWAY, LIABILITY, FRANCE, EUROPE, DENMARK, OFFSHORE DEVELOPMENT, UK, *POLLUTION DAMAGE,
0468 OCEANS, NATURAL SEEPAGE, CRUDE OIL, STATISTICAL ANALYSIS, *OIL INPUT, SOURCES, WASTE OIL, OIL DISCHARGES, TANKERS,
0469 OCEANS, NATURAL SEEPAGE, HYDROCARBONS, SOURCES, *BIOGENIC HYDROCARBONS, *INPUT ESTIMATES,
0490 OCEANS, MONITORING, MARINE ORGANISMS, HYDROCARBONS, CONTAMINANTS, ANALYTICAL

TECHNIQUES, TAR, SAMPLING,
0498 OCEANS, MONITORING, HYDROCARBONS, DISTRIBUTION, SURVEILLANCE,
0538 OCEANS, HYDROCARBONS, CHEMICAL ANALYSIS, SAMPLING,
0641 OCEANS, MARINE ORGANISMS, HYDROCARBONS, FOOD WEB, DISTRIBUTION, OIL TRANSFER, *TRANSFER PROCESSES,
0732 OCEANS, ENVIRONMENTAL EFFECTS, POLLUTION PREVENTION, STORAGE, OIL SPILLS,
0752 OCEANS, INLAND, ENVIRONMENTAL EFFECTS, CLEANUP, POLLUTION CONTROL, OIL SPILLS,
0831 OCEANS, PAH,
0832 OCEANS, MARINE ORGANISMS, FATE, ESTUARIES, ENVIRONMENTAL EFFECTS, CONTAMINATION, BIOLOGICAL EFFECTS, BIBLIOGRAPHIES, OIL SPILLS,
0919 OCEANS, MICROORGANISMS, CRUDE OIL, BIODEGRADATION, *NUTRIENT REQUIREMENTS,
0956 OCEANS, NOAA, MOVEMENT, MONITORING, FATE, OIL SPILLS, SAMPLING,
0970 OCEANS, MODELS, HYDROCARBONS, FATE, EVAPORATION, BIODEGRADATION, OIL SPILLS, SPREADING,
1001 OCEANS, LEGISLATION, INTERNATIONAL AGREEMENTS, BIBLIOGRAPHIES, US, SHIPS, OFFSHORE DRILLING, POLLUTION PREVENTION, OIL SPILLS,
0455 OCS, OIL SPILLS, ENVIRONMENTAL EFFECTS, MEXICO/GULF OF, *USGS REPORT,
0458 OCS, PIPELINES, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, ECONOMICS, ALASKA, *TRANS-ALASKA PIPELINE,
0500 OCS, MONITORING, COASTS, EIS, OIL-GAS LEASING, REGULATIONS, BLM, *ENVIRONMENTAL STUDIES PROJECT,
0835 OCS, OIL SPILLS, OFFSHORE DEVELOPMENT, BIOLOGICAL EFFECTS, MARINE ORGANISMS, ATLANTIC OCEAN,
0841 OCS, OFFSHORE DEVELOPMENT, SOCIO-ECONOMIC EFFECTS, ALASKA,
0846 OCS, OFFSHORE DRILLING, ATLANTIC COAST, ENVIRONMENTAL PROTECTION, MOVEMENT, CONTAMINANTS, *SOUTHEASTERN U.S., ERDA,
0851 OCS, OFFSHORE DEVELOPMENT, EPA, ENVIRONMENTAL MANAGEMENT, OIL SPILLS, WATER QUALITY, ESTUARIES, COASTS,
0854 OCS, OFFSHORE DEVELOPMENT, COASTS, ENVIRONMENTAL EFFECTS, SOCIO-ECONOMIC EFFECTS, MEXICO/GULF OF,
0858 OCS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, DELAWARE, ATLANTIC COAST,
0859 OCS, OFFSHORE DEVELOPMENT, CALIFORNIA/SOUTHERN, ENVIRONMENTAL EFFECTS, *GEOLOGIC HAZARDS,
0865 OCS, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, MONITORING, GUIDELINES, ATLANTIC OCEAN, BLM,
0866 OCS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS,
0868 OCS, OFFSHORE DEVELOPMENT, HYDROCARBONS, ENVIRONMENTAL DETERIORATION, HEALTH HAZARDS, ATLANTIC OCEAN,
0869 OCS, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, PLATFORMS, ATLANTIC OCEAN, BLM,
0873 OCS, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, ALASKA, MARINE MAMMALS, *BASELINE STUDIES,
0874 OCS, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, ALASKA, BIRDS, *BASELINE STUDIES,
0875 OCS, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, ALASKA, BIRDS, *BASELINE STUDIES,
0876 OCS, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, ALASKA, BIRDS, *BASELINE STUDIES,
0877 OCS, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, ALASKA, BENTHOS, MARINE ORGANISMS, BEAUFORT SEA, BERING SEA, *BASELINE STUDIES,
0878 OCS, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, ALASKA, FISH, MOLLUSKS, HABITAT, *BASELINE STUDIES,
0879 OCS, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, ALASKA, PLANKTON, BENTHOS, FISHERIES, *BASELINE STUDIES,
0880 OCS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, BIOLOGICAL EFFECTS, ALASKA, HYDROCARBONS, MARINE ORGANISMS, BIODEGRADATION,
0881 OCS, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, ALASKA, MICROORGANISMS, HYDROCARBONS, CHEMICAL ANALYSIS, DISTRIBUTION, *BASELINE STUDIES,
0882 OCS, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, ALASKA, BIODEGRADATION, HYDROCARBONS, DISTRIBUTION, *BASELINE STUDIES,
0883 OCS, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, ALASKA, *BASELINE STUDIES, *PHYSICAL OCEANOGRAPHY, *METEOROLOGY,
0884 OCS, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, ALASKA, *BASELINE STUDIES, *GEOLOGIC HAZARDS, *MARINE GEOLOGY,
0885 OCS, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, ALASKA, *BASELINE STUDIES, *GEOLOGIC HAZARDS,
0886 OCS, ENVIRONMENTAL EFFECTS, OFFSHORE DEVELOPMENT, ALASKA, ICE, ARCTIC OCEAN, *BASELINE STUDIES,
0889 OCS, ATLANTIC OCEAN, EIS, *GEOLOGIC FRAMEWORK,
0893 OCS, OIL SPILLS, OIL-GAS LEASING, FATE, ENVIRONMENTAL EFFECTS, ATLANTIC OCEAN, *RISK ANALYSIS,
0895 OCS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, OIL SPILLS, PIPELINES, FLORIDA,
0897 OCS, OFFSHORE DRILLING, BLOWOUT PREVENTION, TANKERS, OIL TRANSPORT, OIL SPILLS, ATLANTIC COAST, CALIFORNIA COAST, MEXICO/GULF OF,
0898 OCS, OFFSHORE DEVELOPMENT, ATLANTIC OCEAN, ENVIRONMENTAL EFFECTS,
0902 OCS, OIL-GAS LEASING, OFFSHORE DEVELOPMENT, ECONOMICS, ENVIRONMENTAL PROTECTION, *USDI,
0903 OCS, OIL-GAS LEASING, EIS, ENVIRONMENTAL PROTECTION, BLM,
0904 OCS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, ALASKA, BIOLOGICAL EFFECTS, CONTAMINANTS, MONITORING, INFORMATION SYSTEMS,

0963 OCS, MODELS, OIL SPILLS, MOVEMENT, DRIFT, ALASKA/GULF OF,
0967 OCS, MODELS, OIL SPILLS, DRIFT, SHORELINES, BEAUFORT SEA, *STORM MODELING,
0985 OCS, LEGISLATION, US, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, POLLUTION CONTROL, ECONOMICS, DELAWARE,
0453 OFFSHORE DEVELOPMENT, NORTH SEA, OIL SPILLS, LEAKAGE, CONTINGENCY PLANNING, *NATO,
0458 OFFSHORE DEVELOPMENT, OCS, PIPELINES, ENVIRONMENTAL EFFECTS, ECONOMICS, ALASKA, *TRANS-ALASKA PIPELINE,
0462 OFFSHORE DEVELOPMENT, OIL SPILLS, STATISTICS, TANKERS, PIPELINES, *SPILL PREDICTIONS,
0524 OFFSHORE DEVELOPMENT, SAMPLING, HYDROCARBONS, DISTRIBUTION, MICROORGANISMS, BACTERIA, TAR, SEDIMENTS, NORTH SEA,
0638 OFFSHORE DEVELOPMENT, PORTS, TANKERS, SOCIO-ECONOMIC EFFECTS, ENVIRONMENTAL EFFECTS, *DEEPWATER TERMINALS,
0835 OFFSHORE DEVELOPMENT, OCS, OIL SPILLS, BIOLOGICAL EFFECTS, MARINE ORGANISMS, ATLANTIC OCEAN,
0841 OFFSHORE DEVELOPMENT, OCS, SOCIO-ECONOMIC EFFECTS, ALASKA,
0843 OFFSHORE DEVELOPMENT, ECONOMIC EFFECTS, ONSHORE IMPACTS, SCOTLAND,
0845 OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, FISHERIES, US, REGULATIONS, OIL INDUSTRY,
0847 OFFSHORE DEVELOPMENT, OIL INDUSTRY, OIL SPILLS, ENVIRONMENTAL DETERIORATION, DELAWARE, GOVERNMENT AGENCIES, *COASTAL RECREATION,
0848 OFFSHORE DEVELOPMENT, LIABILITY, EUROPE, UK, FRANCE, DENMARK, NORWAY, *POLLUTION DAMAGE,
0851 OFFSHORE DEVELOPMENT, OCS, EPA, ENVIRONMENTAL MANAGEMENT, OIL SPILLS, WATER QUALITY, ESTUARIES, COASTS,
0852 OFFSHORE DEVELOPMENT, ECONOMICS, ENVIRONMENTAL EFFECTS,
0854 OFFSHORE DEVELOPMENT, OCS, COASTS, ENVIRONMENTAL EFFECTS, SOCIO-ECONOMIC EFFECTS, MEXICO/GULF OF,
0858 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, DELAWARE, ATLANTIC COAST,
0859 OFFSHORE DEVELOPMENT, OCS, CALIFORNIA/SOUTHERN, ENVIRONMENTAL EFFECTS, *GEOLOGIC HAZARDS,
0860 OFFSHORE DEVELOPMENT, OFFSHORE DRILLING, ENVIRONMENTAL PROTECTION, REGULATIONS, ALASKA, CALIFORNIA/SOUTHERN, MEXICO/GULF OF,
0866 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS,
0868 OFFSHORE DEVELOPMENT, OCS, HYDROCARBONS, ENVIRONMENTAL DETERIORATION, HEALTH HAZARDS, ATLANTIC OCEAN,
0870 OFFSHORE DEVELOPMENT, ECONOMICS, ENVIRONMENTAL EFFECTS, OFFSHORE DRILLING,
0873 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ALASKA, MARINE MAMMALS, *BASELINE STUDIES,
0874 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ALASKA, BIRDS, *BASELINE STUDIES,
0875 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ALASKA, BIRDS, *BASELINE STUDIES,
0876 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ALASKA, BIRDS, *BASELINE STUDIES,
0877 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ALASKA, BENTHOS, MARINE ORGANISMS, BEAUFORT SEA, BERING SEA, *BASELINE STUDIES,
0878 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ALASKA, FISH, MOLLUSKS, HABITAT, *BASELINE STUDIES,
0879 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ALASKA, PLANKTON, BENTHOS, FISHERIES, *BASELINE STUDIES,
0880 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, BIOLOGICAL EFFECTS, ALASKA, HYDROCARBONS, MARINE ORGANISMS, BIODEGRADATION,
0881 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ALASKA, MICROORGANISMS, HYDROCARBONS, CHEMICAL ANALYSIS, DISTRIBUTION, *BASELINE STUDIES,
0882 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ALASKA, BIODEGRADATION, HYDROCARBONS, DISTRIBUTION, *BASELINE STUDIES,
0883 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ALASKA, *BASELINE STUDIES, *PHYSICAL OCEANOGRAPHY, *METEOROLOGY,
0884 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ALASKA, *BASELINE STUDIES, *GEOLOGIC HAZARDS, *MARINE GEOLOGY,
0885 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ALASKA, *BASELINE STUDIES, *GEOLOGIC HAZARDS,
0886 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ALASKA, ICE, ARCTIC OCEAN, *BASELINE STUDIES,
0887 OFFSHORE DEVELOPMENT, OFFSHORE EXPLORATION, SOCIO-ECONOMIC EFFECTS, ONSHORE IMPACTS, FLORIDA,
0888 OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, ONSHORE IMPACTS, SOCIO-ECONOMIC EFFECTS, REFINERIES, PORTS, COASTS, FLORIDA, GUIDELINES,
0891 OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, PUGET SOUND, MEXICO/GULF OF, FATE, HYDROCARBONS, TOXICITY, MARINE ORGANISMS, NOAA,
0895 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, OIL SPILLS, PIPELINES, FLORIDA,
0896 OFFSHORE DEVELOPMENT, OIL SPILLS, FISHERIES, ECONOMIC EFFECTS, ATLANTIC COAST,
0898 OFFSHORE DEVELOPMENT, OCS, ATLANTIC OCEAN, ENVIRONMENTAL EFFECTS,
0899 OFFSHORE DEVELOPMENT, SOCIO-ECONOMIC EFFECTS, ENVIRONMENTAL EFFECTS, ATLANTIC OCEAN,
0902 OFFSHORE DEVELOPMENT, OCS, OIL-GAS LEASING, ECONOMICS, ENVIRONMENTAL PROTECTION, *USDI,
0904 OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ALASKA, BIOLOGICAL EFFECTS, CONTAMINANTS, MONITORING, INFORMATION SYSTEMS,
0984 OFFSHORE DEVELOPMENT, REGULATIONS, ENVIRONMENTAL PROTECTION, ECONOMIC EFFECTS, DELAWARE

0985 OFFSHORE DEVELOPMENT, OCS, LEGISLATION, US, ENVIRONMENTAL EFFECTS, POLLUTION CONTROL, ECONOMICS, DELAWARE,
0473 OFFSHORE DRILLING, OIL SPILLS, ENVIRONMENTAL EFFECTS, ALASKA, *KACHEMAK BAY,
0637 OFFSHORE DRILLING, OIL SPILLS, TANKERS, METULA SPILL, ENVIRONMENTAL PROTECTION, POLLUTION CONTROL,
0751 OFFSHORE DRILLING, OIL SPILLS, BLOWOUT PREVENTION, ICE, DISPERSANTS, CONTAINMENT, INCINERATION,
0753 OFFSHORE DRILLING, BLOWOUT PREVENTION, CONTAINMENT, OIL SPILLS, NORTH SEA,
0794 OFFSHORE DRILLING, OFFSHORE PRODUCTION, CHRONIC EFFECTS, CRUDE OIL, PLATFORMS, MARINE ORGANISMS,
0836 OFFSHORE DRILLING, PLATFORMS, BIOLOGICAL EFFECTS, MARINE ORGANISMS, SANTA BARBARA CHANNEL,
0837 OFFSHORE DRILLING, OIL SPILLS, ENVIRONMENTAL EFFECTS, FISHERIES, MARINE ORGANISMS, *GEORGES BANK,
0846 OFFSHORE DRILLING, OCS, ATLANTIC COAST, ENVIRONMENTAL PROTECTION, MOVEMENT, CONTAMINANTS, *SOUTHEASTERN U.S., ERDA,
0853 OFFSHORE DRILLING, OIL INDUSTRY, ENVIRONMENTAL EFFECTS, CALIFORNIA COAST, ONSHORE IMPACTS,
0860 OFFSHORE DRILLING, OFFSHORE DEVELOPMENT, ENVIRONMENTAL PROTECTION, REGULATIONS, ALASKA, CALIFORNIA/SOUTHERN, MEXICO/GULF OF,
0862 OFFSHORE DRILLING, OIL SPILLS, FISHERIES, COASTS, NEW YORK,
0865 OFFSHORE DRILLING, OCS, ENVIRONMENTAL EFFECTS, MONITORING, GUIDELINES, ATLANTIC OCEAN, BLM,
0867 OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, OIL SPILLS,
0869 OFFSHORE DRILLING, OCS, ENVIRONMENTAL EFFECTS, PLATFORMS, ATLANTIC OCEAN, BLM,
0870 OFFSHORE DRILLING, OFFSHORE DEVELOPMENT, ECONOMICS, ENVIRONMENTAL EFFECTS,
0890 OFFSHORE DRILLING, ARCTIC, ENVIRONMENTAL EFFECTS, BEAUFORT SEA, CANADA,
0897 OFFSHORE DRILLING, OCS, BLOWOUT PREVENTION, TANKERS, OIL TRANSPORT, OIL SPILLS, ATLANTIC COAST, CALIFORNIA COAST, MEXICO/GULF OF,
0900 OFFSHORE DRILLING, BLOWOUT PREVENTION, POLLUTION CONTROL, ARCTIC, BEAUFORT SEA,
0905 OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, EIS, SANTA BARBARA CHANNEL, *AIR QUALITY IMPACTS,
0951 OFFSHORE DRILLING, ICE, OIL SPILLS, MOVEMENT, BEHAVIOR, ENVIRONMENTAL EFFECTS, ARCTIC, CANADA, *BLOWOUTS, *OIL-IN-ICE,
0973 OFFSHORE DRILLING, MODELS, OIL SPILLS, MOVEMENT, COASTS, PORTS, NEW JERSEY, DELAWARE,
1001 OFFSHORE DRILLING, BIBLIOGRAPHIES, LEGISLATION, US, INTERNATIONAL AGREEMENTS, OCEANS, SHIPS, POLLUTION PREVENTION, OIL SPILLS,
0840 OFFSHORE EXPLORATION, CONTAMINANTS, SPREADING, DISPERSIONS, PLATFORMS, OIL TRANSPORT,
0844 OFFSHORE EXPLORATION, OIL-GAS LEASING, ECONOMIC EFFECTS, FLORIDA, ONSHORE IMPACTS,
0887 OFFSHORE EXPLORATION, OFFSHORE DEVELOPMENT, SOCIO-ECONOMIC EFFECTS, ONSHORE IMPACTS, FLORIDA,
0454 OFFSHORE PRODUCTION, OIL SPILLS, PLATFORMS, NORTH SEA, *OXYGEN CORROSION,
0736 OFFSHORE PRODUCTION, ENVIRONMENTAL PROTECTION, SHIPS, TANKERS, INLAND, MONITORING,
0794 OFFSHORE PRODUCTION, OFFSHORE DRILLING, CHRONIC EFFECTS, CRUDE OIL, PLATFORMS, MARINE ORGANISMS,
0856 OFFSHORE PRODUCTION, ATLANTIC COAST, ERDA, ENVIRONMENTAL EFFECTS, OIL DISCHARGES, CHRONIC EFFECTS,
0863 OFFSHORE PRODUCTION, ENVIRONMENTAL EFFECTS, TOXICITY, CONTAMINATION, MARINE ORGANISMS, *PRODUCED WATERS,
0871 OFFSHORE PRODUCTION, OIL INDUSTRY, ENVIRONMENTAL EFFECTS, HYDROCARBONS, MARINE ORGANISMS, SEDIMENTS, LOUISIANA,
0464 OIL DISCHARGES, STATISTICS, US, INFORMATION SYSTEMS,
0468 OIL DISCHARGES, STATISTICAL ANALYSIS, *OIL INPUT, SOURCES, OCEANS, CRUDE OIL, WASTE OIL, TANKERS, NATURAL SEEPAGE,
0476 OIL DISCHARGES, OIL SPILLS, PORTS, PIPELINES, REFINERIES, WATER QUALITY, *PETROLEUM FACILITIES,
0481 OIL DISCHARGES, US, SOURCES, USCG, *CAUSES,
0489 OIL DISCHARGES, MONITORING, BALLAST, TANKERS, DESIGN-ENGINEERING,
0506 OIL DISCHARGES, MONITORING, WASTEWATERS, SHIPS, DESIGN-ENGINEERING, USN, *OIL CONTENT,
0647 OIL DISCHARGES, TANKERS, WASTEWATER TREATMENT, *SLOP TANK,
0648 OIL DISCHARGES, OIL TRANSFER, POLLUTION PREVENTION, STATISTICAL ANALYSIS, REGULATIONS, USCG,
0726 OIL DISCHARGES, POLLUTION CONTROL, LEGISLATION, EUROPE, *MARINE POLLUTION,
0738 OIL DISCHARGES, POLLUTION PREVENTION, SHIPS, WASTE OIL TREATMENT, CLEANUP, MONITORING, USN,
0856 OIL DISCHARGES, OFFSHORE PRODUCTION, ATLANTIC COAST, ERDA, ENVIRONMENTAL EFFECTS, CHRONIC EFFECTS,
0992 OIL DISCHARGES, REGULATIONS, US, SHIPS, OIL TRANSFER, BILGES, USCG,
0631 OIL FIELDS, RESTORATION, INLAND, CONTAMINATION, SOIL, *BRINES,
0718 OIL FIELDS, CONTINGENCY PLANNING, OIL SPILLS, CLEANUP, PERSONNEL TRAINING, NORTH SEA, *BP FORTIES OILFIELD,
0500 OIL-GAS LEASING, OCS, MONITORING, COASTS, EIS, REGULATIONS, BLM, *ENVIRONMENTAL STUDIES PROJECT,
0844 OIL-GAS LEASING, OFFSHORE EXPLORATION, ECONOMIC EFFECTS, FLORIDA, ONSHORE IMPACTS,

0893 OIL-GAS LEASING, OCS, OIL SPILLS, FATE, ENVIRONMENTAL EFFECTS, ATLANTIC OCEAN, *RISK ANALYSIS,
0902 OIL-GAS LEASING, OFFSHORE DEVELOPMENT, OCS, ECONOMICS, ENVIRONMENTAL PROTECTION, *USDI,
0903 OIL-GAS LEASING, OCS, EIS, ENVIRONMENTAL PROTECTION, BLM,
0452 OIL INDUSTRY, TANKERS, DEVELOPMENT, CALIFORNIA/SOUTHERN, *SANSINENA EXPLOSION,
0471 OIL INDUSTRY, EXPLORATION, DRILLING, *MICHIGAN, *BAKER SANCTUARY,
0662 OIL INDUSTRY, ECONOMICS, WASTEWATERS, WASTE OIL, SOLID WASTES, DISPOSAL, RECYCLING,
0714 OIL INDUSTRY, PERSONNEL TRAINING, POLLUTION CONTROL, OIL SPILLS, CLEANUP, RECOVERY, RESTORATION,
0715 OIL INDUSTRY, CONTINGENCY PLANNING, OIL SPILLS, POLLUTION CONTROL, CLEANUP, PERSONNEL TRAINING, CANADA,
0721 OIL INDUSTRY, CONTINGENCY PLANNING, OIL SPILLS, GASOLINE, CLEANUP, *STANDARD OIL CO. INDIANA,
0731 OIL INDUSTRY, POLLUTION PREVENTION, REFINING, SOURCES,
0741 OIL INDUSTRY, POLLUTION CONTROL, REFINERIES, EPA,
0842 OIL INDUSTRY, REGULATIONS, POLLUTION CONTROL, ECONOMICS, REFINING, EXPLORATION, PRODUCTION,
0845 OIL INDUSTRY, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, FISHERIES, US, REGULATIONS,
0847 OIL INDUSTRY, OFFSHORE DEVELOPMENT, OIL SPILLS, ENVIRONMENTAL DETERIORATION, DELAWARE, GOVERNMENT AGENCIES, *COASTAL RECREATION,
0853 OIL INDUSTRY, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, CALIFORNIA COAST, ONSHORE IMPACTS,
0861 OIL INDUSTRY, ENVIRONMENTAL EFFECTS, CONTAMINATION, POLLUTION CONTROL,
0871 OIL INDUSTRY, OFFSHORE PRODUCTION, ENVIRONMENTAL EFFECTS, HYDROCARBONS, MARINE ORGANISMS, SEDIMENTS, LOUISIANA,
0892 OIL INDUSTRY, DEVELOPMENT, PIPELINES, STORAGE, SCOTLAND, *SULLOM VOE TERMINAL,
0988 OIL INDUSTRY, LEGISLATION, US, POLLUTION CONTROL, REFINERIES, ECONOMIC EFFECTS,
0993 OIL INDUSTRY, REGULATIONS, PIPELINES, WASTEWATERS, GUIDELINES, EUROPE,
0995 OIL INDUSTRY, GUIDELINES, PRODUCTION, EXTRACTION, WASTEWATERS, EPA, *ONSHORE POINT SOURCE CATEGORY,
0997 OIL INDUSTRY, GUIDELINES, WASTEWATER TREATMENT, REFINERIES, LEGISLATION, WATER QUALITY, ECONOMICS,
0547 OIL SHALE, EXTRACTION, ANALYTICAL TECHNIQUES, CHROMATOGRAPHY, CONTAMINANTS, *BY-PRODUCT WATERS,
0839 OIL SHALE, DEVELOPMENT, BIOLOGICAL EFFECTS, FISH, WILDLIFE, *US FISH & WILDLIFE SERVICE,
0849 OIL SHALE, DEVELOPMENT, EIS, COLORADO,
0850 OIL SHALE, PRODUCTION, EXTRACTION, ENVIRONMENTAL EFFECTS, SOLID WASTES, WASTEWATERS,
0855 OIL SHALE, DEVELOPMENT, EPA, *ROCKY MOUNTAIN STATES,
0857 OIL SHALE, DEVELOPMENT, ENVIRONMENTAL EFFECTS, EXTRACTION,
0872 OIL SHALE, DEVELOPMENT, ENVIRONMENTAL EFFECTS, *LIQUID WASTES, SOLID WASTES, *LEACHING,
0484 OIL SLICKS, MONITORING, PATENT, *OIL CONTENT, *ECHO SOUNDING,
0485 OIL SLICKS, MONITORING, SHIPS, SOLVENTS, SPECTROSCOPY, ABSORPTION, *LASER BEAM,
0502 OIL SLICKS, MONITORING, LEAKAGE, PIPELINES, WASTEWATERS, DETECTION, DESIGN-ENGINEERING, PATENT,
0504 OIL SLICKS, MONITORING, RIVERS, DESIGN-ENGINEERING, *INFRARED SCANNING OIL SENSOR,
0510 OIL SLICKS, REMOTE SENSING, CONTAMINANTS, COASTS, EUROPE, *NIMBUS SATELLITE,
0511 OIL SLICKS, REMOTE SENSING, DETECTION, SURVEILLANCE, NATURAL SEEPAGE, SANTA BARBARA CHANNEL,
0513 OIL SLICKS, REMOTE SENSING, DETECTION, SOURCE IDENTIFICATION, *MICROWAVE RADIOMETRY,
0514 OIL SLICKS, REMOTE SENSING, ESTUARIES, *FRONTS, DELAWARE BAY, DRIFT, SPREADING, MODELS,
0515 OIL SLICKS, REMOTE SENSING, DETECTION, NATURAL SEEPAGE, PLATFORMS, SANTA BARBARA CHANNEL, USCG, *SIDE-LOOKING RADAR,
0519 OIL SLICKS, REMOTE SENSING, REFINERIES, WASTEWATERS, MONITORING,
0527 OIL SLICKS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, SPECTROSCOPY, DETECTION,
0528 OIL SLICKS, PETROLEUM PRODUCTS, DETECTION, ANALYTICAL TECHNIQUES, ABSORPTION,
0570 OIL SLICKS, CONTAINMENT, BOOMS, DESIGN-ENGINEERING, PATENT,
0574 OIL SLICKS, CONTAINMENT, BOOMS, BEAUFORT SEA, *ICE RIDGE KEEL,
0582 OIL SLICKS, RECOVERY, SKIMMERS, OIL-WATER SEPARATION,
0590 OIL SLICKS, RECOVERY, DESIGN-ENGINEERING, PATENT, *OLEOPHILIC CONTAINER,
0592 OIL SLICKS, RECOVERY, SKIMMERS, DESIGN-ENGINEERING, PATENT,
0593 OIL SLICKS, DISPERSANTS, HYDROCARBONS, CLEANUP, BIODEGRADATION, PATENT, *NITROGEN COMPOUNDS,
0594 OIL SLICKS, DISPERSANTS, HYDROCARBONS, CLEANUP, BIODEGRADATION, PATENT, *NITROGEN COMPOUNDS,
0595 OIL SLICKS, DISPERSANTS, HYDROCARBONS, CLEANUP, BIODEGRADATION, PATENT, *NITROGEN COMPOUNDS,
0596 OIL SLICKS, SKIMMERS, RECOVERY, DESIGN-ENGINEERING, PATENT,
0607 OIL SLICKS, CLEANUP, PETROLEUM PRODUCTS, ABSORPTION, DESIGN-ENGINEERING, PATENT,
0610 OIL SLICKS, SKIMMERS, RECOVERY, PATENT, DESIGN-ENGINEERING,
0619 OIL SLICKS, CLEANUP, DISPERSANTS, DESIGN-ENGINEERING, EPA, *OHMSETT,
0629 OIL SLICKS, SKIMMERS, RECOVERY, DESIGN-ENGINEERING, PATENT,
0908 OIL SLICKS, BIODEGRADATION, HYDROCARBONS, BACTERIA, CLEANUP, *NUTRIENT ENRICHMENT,
0913 OIL SLICKS, BIODEGRADATION, HYDROCARBONS, BACTERIA, *SUPERMICROBES,

0915 OIL SLICKS, BIODEGRADATION, HYDROCARBONS, BACTERIA, COASTS, FRESHWATER,
0964 OIL SLICKS, DISPERSIONS, CONTAINMENT, BOOMS, MODELS, *DISPERSIVE OIL LOSSES,
0983 OIL SLICKS, SPREADING, ICE, *CURRENT,
0450 OIL SPILLS, TANKERS, REGULATIONS, TAR, ARGO MERCHANT SPILL, *LIBERIAN TANKERS,
0453 OIL SPILLS, OFFSHORE DEVELOPMENT, NORTH SEA, LEAKAGE, CONTINGENCY PLANNING, *NATO,
0454 OIL SPILLS, OFFSHORE PRODUCTION, PLATFORMS, NORTH SEA, *OXYGEN CORROSION,
0455 OIL SPILLS, OCS, ENVIRONMENTAL EFFECTS, MEXICO/GULF OF, *USGS REPORT,
0457 OIL SPILLS, ATLANTIC COAST, TANKERS, ENVIRONMENTAL EFFECTS, ARGO MERCHANT SPILL,
0456 OIL SPILLS, TANKERS, CLEANUP, ARGO MERCHANT SPILL, *OLYMPIC GAMES SPILL, *SANSINENA SPILL,
0457 OIL SPILLS, ATLANTIC COAST, TANKERS, ENVIRONMENTAL EFFECTS, ARGO MERCHANT SPILL,
0459 OIL SPILLS, TANKERS, ENVIRONMENTAL EFFECTS, CLEANUP, ALASKA, *COLD BAY,
0460 OIL SPILLS, CONTAMINATION, COASTS, SPAIN, *SHELLFISH, *URQUIOLA SPILL,
0461 OIL SPILLS, CRUDE OIL, TANKERS, SPREADING, MOVEMENT, CLEANUP, DISPERSANTS, BEACHES, JAPAN,
0462 OIL SPILLS, OFFSHORE DEVELOPMENT, STATISTICS, TANKERS, PIPELINES, *SPILL PREDICTIONS,
0465 OIL SPILLS, *SALT WATER SPILLS, STATISTICS, PIPELINES, CANADA, *ALBERTA,
0466 OIL SPILLS, WASTE OIL, RIVERS, ENVIRONMENTAL EFFECTS, VEGETATION, PENNSYLVANIA, *SCHUYLKILL SPILL,
0467 OIL SPILLS, BIOLOGICAL EFFECTS, POLLUTION PREVENTION, CLEANUP, SURVEILLANCE, INTERNATIONAL AGREEMENTS,
0470 OIL SPILLS, CLEANUP, RECOVERY, DISPOSAL, ECOSYSTEMS, ARCTIC,
0473 OIL SPILLS, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, ALASKA, *KACHEMAK BAY,
0474 OIL SPILLS, CLEANUP, POLLUTION PREVENTION, BIRDS, WILDLIFE, CHESAPEAKE BAY, USCG,
0475 OIL SPILLS, ENVIRONMENTAL EFFECTS, BEACHES, MARSHES, MARINE ORGANISMS, CHESAPEAKE BAY,
0476 OIL SPILLS, OIL DISCHARGES, PORTS, PIPELINES, REFINERIES, WATER QUALITY, *PETROLEUM FACILITIES,
0477 OIL SPILLS, US, STATISTICAL ANALYSIS, MODELS, GREAT LAKES , COASTS, *DISCRIMINANT ANALYSIS,
0478 OIL SPILLS, BIOLOGICAL EFFECTS, MONITORING,
0480 OIL SPILLS, ENVIRONMENTAL EFFECTS, TANKERS, CLEANUP, ARGO MERCHANT SPILL,
0482 OIL SPILLS, MONITORING, REMOTE SENSING, SPREADING, MOVEMENT, ATLANTIC OCEAN, ARGO MERCHANT SPILL,
0501 OIL SPILLS, MONITORING, HYDROCARBONS, POLLUTION CONTROL, SURVEILLANCE, GOVERNMENT AGENCIES, EPA, USGS, USCG, *UN,
0508 OIL SPILLS, REMOTE SENSING, SHIPS, SURVEILLANCE, DESIGN-ENGINEERING, LAW ENFORCEMENT, ENVIRONMENTAL PROTECTION, USCG,
0512 OIL SPILLS, REMOTE SENSING, POLLUTION CONTROL, CLEANUP, LAW ENFORCEMENT, EPA,
0516 OIL SPILLS, REMOTE SENSING, DETECTION, SURVEILLANCE, USCG, *AIRBORNE COASTAL PATROL,
0517 OIL SPILLS, REMOTE SENSING, DETECTION, MARSHES, CONTAMINATION, *REMOTE LUMINESCENT SENSOR,
0518 OIL SPILLS, REMOTE SENSING, BEAUFORT SEA, *OPTICAL TECHNIQUES,
0530 OIL SPILLS, ESTUARIES, CHEMICAL ANALYSIS, FISH, FATE, HYDROCARBONS, WEATHERING, *FUNDULUS HETEROCLITUS,
0565 OIL SPILLS, SOURCE IDENTIFICATION, ANALYTICAL TECHNIQUES, CHROMATOGRAPHY, SPECTROSCOPY, SAMPLING, USCG,
0566 OIL SPILLS, SOURCE IDENTIFICATION, PAH, INCINERATION, CHEMICAL ANALYSIS,
0567 OIL SPILLS, SOURCE IDENTIFICATION, ANALYTICAL TECHNIQUES, OIL TRANSPORT, POLLUTION PREVENTION, USCG,
0569 OIL SPILLS, CONTAINMENT, BOOMS, DESIGN-ENGINEERING, *HIGH CURRENTS,
0571 OIL SPILLS, CONTAINMENT, BOOMS, DESIGN-ENGINEERING, PATENT,
0572 OIL SPILLS, CONTAINMENT, RIVERS, DESIGN-ENGINEERING, *HYDROFOIL DEFLECTORS,
0573 OIL SPILLS, CONTAINMENT, BOOMS, DESIGN-ENGINEERING, EPA, *OHMSETT,
0575 OIL SPILLS, CONTAINMENT, BOOMS, RIVERS, CONTINGENCY PLANNING, CANADA, US, *DETROIT-ST. CLAIR RIVER SYSTEM,
0576 OIL SPILLS, CONTAINMENT, COAGULATION, PATENT, *POLYMERS,
0577 OIL SPILLS, SKIMMERS, RECOVERY, DESIGN-ENGINEERING, PUGET SOUND,
0578 OIL SPILLS, RECOVERY, HARBORS, DESIGN-ENGINEERING, *CLEAN SWEEP,
0579 OIL SPILLS, RECOVERY, HARBORS, ESTUARIES, DESIGN-ENGINEERING, *CLEAN SWEEP,
0580 OIL SPILLS, CLEANUP, SKIMMERS, USCG, ARGO MERCHANT SPILL,
0581 OIL SPILLS, SKIMMERS, MONITORING, CLEANUP, MEDITERRANEAN SEA,
0583 OIL SPILLS, CLEANUP, ECONOMICS, TANKERS, PIPELINES, ALASKA, *OIL SPILL FUND,
0584 OIL SPILLS, CLEANUP, SKIMMERS, CONTAINMENT, DESIGN-ENGINEERING, ALASKA/GULF OF, COST ANALYSIS,
0585 OIL SPILLS, CLEANUP, RECOVERY, PATENT, DESIGN-ENGINEERING, *OLEOPHILIC SPONGE,
0586 OIL SPILLS, CLEANUP, SEAWATER, MOLLUSKS, OXIDATION, *WATER PURIFICATION, *MUSSELS, *MYTILUS EDULIS,
0587 OIL SPILLS, DISPERSANTS, CLEANUP, TOXICITY, BIODEGRADATION,
0588 OIL SPILLS, RECOVERY, ABSORPTION, DESIGN-ENGINEERING,
0589 OIL SPILLS, DISPERSANTS, CHEMICAL ANALYSIS, *DILUTION RATE,
0591 OIL SPILLS, RECOVERY, HYDROCARBONS, GROUNDWATER, CONTINGENCY PLANNING, COST ANALYSIS,
0597 OIL SPILLS, DISPERSANTS, CLEANUP, ENVIRONMENTAL EFFECTS, CONTINGENCY PLANNING, API,
0598 OIL SPILLS, RECOVERY, BOOMS, SKIMMERS, OIL-WATER SEPARATION, DESIGN-ENGINEERING, *OHMSETT,
0599 OIL SPILLS, CLEANUP, POLLUTION CONTROL, ECONOMICS, TEXAS, *CORPUS CHRISTI,

0600 OIL SPILLS, RECOVERY, SKIMMERS, DESIGN-ENGINEERING, USCG,
0601 OIL SPILLS, CLEANUP, DISPERSANTS, CANADA, *CANADIAN COAST GUARD,
0602 OIL SPILLS, RECOVERY, SKIMMERS, BOOMS, STORAGE, FRANCE,
0603 OIL SPILLS, MODELS, CLEANUP, RECOVERY, COST ANALYSIS,
0604 OIL SPILLS, RESTORATION, CLEANUP, CANADA, *MAYTON OIL SPILL,
0605 OIL SPILLS, HYDROCARBONS, CLEANUP, BIODEGRADATION, BACTERIA, PATENT,
0606 OIL SPILLS, DISPERSANTS, CLEANUP, TOXICITY, EPA,
0608 OIL SPILLS, RECOVERY, SKIMMERS, BOOMS, CONTAINMENT, DESIGN-ENGINEERING, USCG,
0609 OIL SPILLS, CLEANUP, SKIMMERS, HARBORS, USN, *DEBRIS HANDLING SYSTEM,
0611 OIL SPILLS, CLEANUP, POLLUTION CONTROL, CALIFORNIA, *OAKLAND ESTUARY, *TELECOMMUNICATIONS SYSTEM,
0612 OIL SPILLS, RECOVERY, CONTAINMENT, DESIGN-ENGINEERING, PATENT, *COLLECTION BARGE,
0614 OIL SPILLS, RECOVERY, ICE, DESIGN-ENGINEERING, ARCTIC, CANADA, *CLEAN SWEEP,
0615 OIL SPILLS, ARCTIC, RECOVERY, CONTAINMENT, REMOTE SENSING, STORAGE, DISPOSAL,
0617 OIL SPILLS, CLEANUP, DISPERSANTS,
0618 OIL SPILLS, RECOVERY, ABSORPTION, RIVERS, ESTUARIES, HARBORS, DESIGN-ENGINEERING, EPA, *OHMSETT,
0620 OIL SPILLS, RECOVERY, CRUDE OIL, FUEL OIL, SKIMMERS, OIL-WATER SEPARATION, CANADA,
0621 OIL SPILLS, RECOVERY, SKIMMERS, EMULSIFICATION, CANADA,
0623 OIL SPILLS, RECOVERY, SKIMMERS, OIL-WATER SEPARATION, DESIGN-ENGINEERING,
0624 OIL SPILLS, RECOVERY, CONTAINMENT, SKIMMERS, BOOMS, EPA, *OHMSETT,
0625 OIL SPILLS, RECOVERY, SKIMMERS, DESIGN-ENGINEERING, PATENT,
0626 OIL SPILLS, CLEANUP, MARSHES, BIOLOGICAL EFFECTS, MANUALS,
0627 OIL SPILLS, CLEANUP, SKIMMERS, BOOMS, SURFACTANTS, ABSORPTION, DESIGN-ENGINEERING, USN,
0630 OIL SPILLS, RESTORATION, WILDLIFE, SOLVENTS, TOXICITY, *DETERGENTS,
0632 OIL SPILLS, RESTORATION, SOIL, VEGETATION, *FORESTS,
0633 OIL SPILLS, RESTORATION, SOIL, BIODEGRADATION, PLANTS, *FERTILIZERS,
0634 OIL SPILLS, RESTORATION, SOIL, CANADA,
0635 OIL SPILLS, RESTORATION, BIRDS, CLEANUP, SOLVENTS, DELAWARE, *OLYMPIC GAMES SPILL,
0636 OIL SPILLS, OIL TRANSPORT, SHIPS, TANKERS, POLLUTION PREVENTION, OIL-WATER SEPARATION,
0637 OIL SPILLS, OFFSHORE DRILLING, TANKERS, METULA SPILL, ENVIRONMENTAL PROTECTION, POLLUTION CONTROL,
0639 OIL SPILLS, PORTS, ENVIRONMENTAL EFFECTS, SOCIO-ECONOMIC EFFECTS, COASTS, *DEEPWATER PORTS,
0650 OIL SPILLS, TANKERS, OIL TRANSPORT, ECONOMICS, POLLUTION CONTROL, REGULATIONS, *STANDARDS,
0652 OIL SPILLS, TANKERS, US, REGULATIONS, INTERNATIONAL AGREEMENTS,
0653 OIL SPILLS, OIL TRANSPORT, PIPELINES, TANKERS, STATISTICAL ANALYSIS,
0655 OIL SPILLS, PORTS, OIL TRANSPORT, STORAGE, SOCIAL EFFECTS, ENVIRONMENTAL EFFECTS, PACIFIC OCEAN, *PALAU, *SUPERPORT,
0656 OIL SPILLS, CRUDE OIL, STORAGE, ENVIRONMENTAL EFFECTS, GROUNDWATER, VEGETATION, LOUISIANA, TEXAS, *SALT DOMES,
0669 OIL SPILLS, DISPOSAL, HYDROCARBONS, BIODEGRADATION, MANUALS, *DEBRIS,
0670 OIL SPILLS, CLEANUP, WASTE OIL, ABSORPTION, PATENT, *METALLURGICAL PUMICE,
0705 OIL SPILLS, DISPOSAL, INCINERATION, CHESAPEAKE BAY, *BLACK OIL,
0710 OIL SPILLS, PERSONNEL TRAINING, POLLUTION PREVENTION, CLEANUP, CONTINGENCY PLANNING, TEXAS,
0711 OIL SPILLS, PERSONNEL TRAINING, POLLUTION CONTROL, CONTINGENCY PLANNING, USCG, *HIATUSPORT EXERCISE,
0712 OIL SPILLS, PERSONNEL TRAINING, POLLUTION CONTROL, CLEANUP, CONTINGENCY PLANNING, CANADA,
0713 OIL SPILLS, PERSONNEL TRAINING, TEXAS, *SPILL CONTROL COURSE,
0714 OIL SPILLS, OIL INDUSTRY, PERSONNEL TRAINING, POLLUTION CONTROL, CLEANUP, RECOVERY, RESTORATION,
0715 OIL SPILLS, OIL INDUSTRY, CONTINGENCY PLANNING, POLLUTION CONTROL, CLEANUP, PERSONNEL TRAINING, CANADA,
0716 OIL SPILLS, CONTINGENCY PLANNING, US, CANADA, ST. LAWRENCE RIVER,
0717 OIL SPILLS, CONTINGENCY PLANNING, ENVIRONMENTAL EFFECTS, CLEANUP, ST. LAWRENCE RIVER,
0718 OIL SPILLS, OIL FIELDS, CONTINGENCY PLANNING, CLEANUP, PERSONNEL TRAINING, NORTH SEA, *BP FORTIES OILFIELD,
0719 OIL SPILLS, CONTINGENCY PLANNING, CANADA, *RESOURCE SENSITIVITY MAPS, *BRITISH COLUMBIA,
0720 OIL SPILLS, CONTINGENCY PLANNING, FATE, ENVIRONMENTAL PROTECTION, SANTA BARBARA CHANNEL, *CLEAN SEAS INC,
0721 OIL SPILLS, OIL INDUSTRY, CONTINGENCY PLANNING, GASOLINE, CLEANUP, *STANDARD OIL CO. INDIANA,
0722 OIL SPILLS, CONTINGENCY PLANNING, CLEANUP, BEAUFORT SEA, ICE,
0723 OIL SPILLS, CONTINGENCY PLANNING, CLEANUP, COASTS, CANADA,
0724 OIL SPILLS, CONTINGENCY PLANNING, INLAND, CANADA, PERSONNEL TRAINING,
0725 OIL SPILLS, CONTINGENCY PLANNING, CLEANUP, POLLUTION CONTROL, ECONOMICS, *LOCAL GOVERNMENTS,
0730 OIL SPILLS, POLLUTION PREVENTION, STORAGE, PETROLEUM PRODUCTS, CONTINGENCY PLANNING, *OIL STORAGE PLAN,
0732 OIL SPILLS, POLLUTION PREVENTION, OCEANS, STORAGE, ENVIRONMENTAL EFFECTS,
0733 OIL SPILLS, POLLUTION CONTROL, DETECTION, CONTAINMENT, RECOVERY, DISPOSAL,

0734 OIL SPILLS, POLLUTION CONTROL, *COSTS, ECONOMIC EFFECTS, MODELS, *POLLUTER RESPONSE,
0735 OIL SPILLS, POLLUTION PREVENTION, ENVIRONMENTAL PROTECTION, SHORELINES, MARSHES,
0737 OIL SPILLS, TANKERS, ENVIRONMENTAL PROTECTION, COLOMBIA, IMCO,
0739 OIL SPILLS, INTERNATIONAL CONVENTIONS, SHIPS, OIL-WATER SEPARATION, CONTINGENCY PLANNING, POLLUTION PREVENTION, IMCO,
0742 OIL SPILLS, POLLUTION CONTROL, CLEANUP, DESIGN-ENGINEERING, USCG, *EQUIPMENT DELIVERY SYSTEM,
0744 OIL SPILLS, PERSONNEL TRAINING, POLLUTION CONTROL, CONTINGENCY PLANNING,
0745 OIL SPILLS, POLLUTION CONTROL, ESTUARIES, MARSHES, MOVEMENT, *GRASS-CUTTING, *HACKENSACK ESTUARY,
0746 OIL SPILLS, POLLUTION PREVENTION, CLEANUP, WASTE OIL DISPOSAL, *FOREST INDUSTRY,
0751 OIL SPILLS, OFFSHORE DRILLING, BLOWOUT PREVENTION, ICE, DISPERSANTS, CONTAINMENT, INCINERATION,
0752 OIL SPILLS, POLLUTION CONTROL, OCEANS, INLAND, ENVIRONMENTAL EFFECTS, CLEANUP,
0753 OIL SPILLS, OFFSHORE DRILLING, BLOWOUT PREVENTION, CONTAINMENT, NORTH SEA,
0754 OIL SPILLS, RECOVERY, POLLUTION PREVENTION, JAPAN, *TEST FACILITIES,
0758 OIL SPILLS, ESTUARIES, BIOLOGICAL EFFECTS, WEATHERING, PLANKTON, FISH, BENTHOS, ATLANTIC COAST,
0766 OIL SPILLS, BIOLOGICAL EFFECTS, RESTORATION, MARINE ORGANISMS, SAN FRANCISCO BAY,
0767 OIL SPILLS, BIOLOGICAL EFFECTS, TROPICAL REGIONS, MARINE ORGANISMS, INTERTIDAL ZONE, MARSHES, CORAL REEFS, FLORIDA COAST,
0772 OIL SPILLS, ENVIRONMENTAL EFFECTS, CONTAMINATION, MARINE ORGANISMS, SEDIMENTS, CONTAINMENT, CLEANUP, MAINE, *TOMANO SPILL,
0776 OIL SPILLS, CRUDE OIL, VEGETATION, BIOLOGICAL EFFECTS, ARCTIC, CANADA,
0781 OIL SPILLS, BIOLOGICAL EFFECTS, MARSHES, MARINE ORGANISMS, MOLLUSKS, CHESAPEAKE BAY, *MARSH GRASS,
0782 OIL SPILLS, BIOLOGICAL EFFECTS, VEGETATION, MICROORGANISMS, SOIL, CANADA,
0786 OIL SPILLS, ESTUARIES, DISTRIBUTION, MICROORGANISMS, BACTERIA,
0797 OIL SPILLS, BIOLOGICAL EFFECTS, CONTAMINATION, MARINE ORGANISMS, TROPICAL REGIONS, COASTS, PUERTO RICO, *MANGROVES, *TURTLE GRASS,
0800 OIL SPILLS, FUEL OIL, BIOLOGICAL EFFECTS, RESTORATION, STREAMS, INVERTEBRATES, FISH, NEW MEXICO,
0813 OIL SPILLS, ARCTIC, PLANTS, ANIMALS, USN,
0816 OIL SPILLS, TANKERS, TOXICITY, MARINE ORGANISMS, *NANNOPLANKTERS,
0818 OIL SPILLS, ECONOMIC EFFECTS, TOXICITY, POLLUTION CONTROL, *SHELL OIL CO.,
0820 OIL SPILLS, SOCIAL EFFECTS, ECONOMIC EFFECTS, FISHERIES, CARIBBEAN SEA, *GUATEMALA,
0821 OIL SPILLS, TANKERS, TOXICITY, FATE, HYDROCARBONS, ARGO MERCHANT SPILL,
0823 OIL SPILLS, MODELS, FATE, MOVEMENT, CLEANUP, COST ANALYSIS, STATISTICAL ANALYSIS,
0824 OIL SPILLS, TANKERS, FATE, ENVIRONMENTAL EFFECTS, MODELS, WILDLIFE, ECONOMIC EFFECTS, *WORLD WAR II SPILLS,
0825 OIL SPILLS, ENVIRONMENTAL EFFECTS, HYDROCARBONS, CLEANUP, DISPERSANTS, SHORELINES, PORTUGAL,
0826 OIL SPILLS, ENVIRONMENTAL EFFECTS, BIODEGRADATION, SOURCES, CLEANUP, RECOVERY, *BOOK REVIEW,
0828 OIL SPILLS, TANKERS, ARGO MERCHANT SPILL, HYDROCARBONS, FATE, TOXICITY,
0832 OIL SPILLS, CONTAMINATION, OCEANS, ESTUARIES, BIOLOGICAL EFFECTS, FATE, ENVIRONMENTAL EFFECTS, MARINE ORGANISMS, BIBLIOGRAPHIES,
0833 OIL SPILLS, TANKERS, ARGO MERCHANT SPILL, LAW ENFORCEMENT, REGULATIONS,
0835 OIL SPILLS, OFFSHORE DEVELOPMENT, OCS, BIOLOGICAL EFFECTS, MARINE ORGANISMS, ATLANTIC OCEAN,
0837 OIL SPILLS, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, FISHERIES, MARINE ORGANISMS, *GEORGES BANK,
0847 OIL SPILLS, OIL INDUSTRY, OFFSHORE DEVELOPMENT, ENVIRONMENTAL DETERIORATION, DELAWARE, GOVERNMENT AGENCIES, *COASTAL RECREATION,
0851 OIL SPILLS, OFFSHORE DEVELOPMENT, OCS, EPA, ENVIRONMENTAL MANAGEMENT, WATER QUALITY, ESTUARIES, COASTS,
0862 OIL SPILLS, OFFSHORE DRILLING, FISHERIES, COASTS, NEW YORK,
0867 OIL SPILLS, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS,
0893 OIL SPILLS, OIL-GAS LEASING, OCS, FATE, ENVIRONMENTAL EFFECTS, ATLANTIC OCEAN, *RISK ANALYSIS,
0895 OIL SPILLS, OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, PIPELINES, FLORIDA,
0896 OIL SPILLS, OFFSHORE DEVELOPMENT, FISHERIES, ECONOMIC EFFECTS, ATLANTIC COAST,
0897 OIL SPILLS, OFFSHORE DRILLING, OCS, BLOWOUT PREVENTION, TANKERS, OIL TRANSPORT, ATLANTIC COAST, CALIFORNIA COAST, MEXICO/GULF OF,
0901 OIL SPILLS, EXPLORATION, PRODUCTION, ARCTIC, ENVIRONMENTAL EFFECTS, PLANTS, WILDLIFE, MARINE ORGANISMS,
0907 OIL SPILLS, BIODEGRADATION, WASTE OIL, MICROORGANISMS, PATENT, AFRICA/SOUTH,
0910 OIL SPILLS, BIODEGRADATION, BACTERIA, CLEANUP, *MICROBIAL GENETIC ENGINEERING,
0914 OIL SPILLS, BIODEGRADATION, SOIL, FATE, ENVIRONMENTAL EFFECTS,
0935 OIL SPILLS, BIODEGRADATION, SOIL, DECOMPOSITION, MICROORGANISMS, MODELS, *NUTRIENT DEMAND,
0938 OIL SPILLS, BIODEGRADATION, MICROORGANISMS,
0947 OIL SPILLS, BIODEGRADATION, SEDIMENTS, BACTERIA, CHESAPEAKE BAY, *COLGATE CREEK,
0950 OIL SPILLS, HYDROCARBONS, EVAPORATION, SOLUTION,
0951 OIL SPILLS, OFFSHORE DRILLING, ICE, MOVEMENT, BEHAVIOR, ENVIRONMENTAL EFFECTS, ARCTIC,

CANADA, *BLOWOUTS, *OIL-IN-ICE,
0952 OIL SPILLS, BEHAVIOR, STATISTICAL ANALYSIS, WEATHERING, PIPELINES, CANADA, INLAND,
0953 OIL SPILLS, BEHAVIOR, HYDROCARBONS, GROUNDWATER, *SURFACE WATERS, *WATER-SOLUBLE FRACTIONS,
0954 OIL SPILLS, MODELS, EVAPORATION, WEATHERING,
0956 OIL SPILLS, FATE, MOVEMENT, SAMPLING, MONITORING, OCEANS, NOAA,
0957 OIL SPILLS, CRUDE OIL, FATE, EVAPORATION, DISPERSIONS, BIODEGRADATION, OXIDATION, TAR,
0958 OIL SPILLS, FATE, BIOLOGICAL EFFECTS, MARINE ORGANISMS, API,
0959 OIL SPILLS, CRUDE OIL, CLEANUP, DISPERSANTS, SPREADING, EMULSIFICATION, WEATHERING,
0961 OIL SPILLS, INLAND, FATE, CRUDE OIL, MODELS, CONTAMINATION, GROUNDWATER,
0962 OIL SPILLS, FATE, INLAND, CRUDE OIL, CONTAMINATION, GROUNDWATER, *PERSISTENCE,
0963 OIL SPILLS, OCS, MODELS, MOVEMENT, DRIFT, ALASKA/GULF OF,
0967 OIL SPILLS, OCS, MODELS, DRIFT, SHORELINES, BEAUFORT SEA, *STORM MODELING,
0968 OIL SPILLS, MODELS, HARBORS, SPREADING, DRIFT, NEW YORK,
0969 OIL SPILLS, MODELS, FATE, HYDROCARBONS, SPREADING, SOLUTION, EMULSIFICATION, ADSORPTION, DECOMPOSITION,
0970 OIL SPILLS, MODELS, HYDROCARBONS, OCEANS, FATE, SPREADING, EVAPORATION, BIODEGRADATION,
0971 OIL SPILLS, FATE, TOXICITY, CONTAMINATION, MARINE ORGANISMS, API,
0973 OIL SPILLS, OFFSHORE DRILLING, MODELS, MOVEMENT, COASTS, PORTS, NEW JERSEY, DELAWARE,
0974 OIL SPILLS, FATE, ARCTIC, CRUDE OIL, EVAPORATION, WEATHERING, SOLUTION, EMULSIFICATION, TAR,
0975 OIL SPILLS, CRUDE OIL, WEATHERING, TAR, EVAPORATION, SOLUTION, *SULFUR COMPOUNDS,
0979 OIL SPILLS, BEACHES, FATE, MOVEMENT, SEDIMENTS, BIOLOGICAL EFFECTS, PLANKTON, BENTHOS, CHEDABUCTO BAY,
0982 OIL SPILLS, FATE, MODELS, DRIFT, SPREADING, DELAWARE BAY,
0989 OIL SPILLS, ENVIRONMENTAL DETERIORATION, COMPENSATION, WILDLIFE, MARINE ORGANISMS, ECONOMICS, *LEGAL ASPECTS,
0991 OIL SPILLS, LEGISLATION, US, LIABILITY, COMPENSATION, *SUPER-FUND,
1000 OIL SPILLS, BIBLIOGRAPHIES, SOURCE IDENTIFICATION, ANALYTICAL TECHNIQUES, SPECTROSCOPY, SPECTROMETRY, CHROMATOGRAPHY,
1001 OIL SPILLS, OFFSHORE DRILLING, BIBLIOGRAPHIES, LEGISLATION, US, INTERNATIONAL AGREEMENTS, OCEANS, SHIPS, POLLUTION PREVENTION,
1004 OIL SPILLS, BIBLIOGRAPHIES, OIL-WATER SEPARATION, POLLUTION CONTROL, RECOVERY, BALLAST, BILGES,
0451 OIL TANKS, TANKERS, CLEANUP, *EXPLOSIONS, *SAFETY SYSTEMS,
0496 OIL TANKS, MONITORING, LEAKAGE, DETECTION, DESIGN-ENGINEERING, PATENT,
0616 OIL TANKS, TANKERS, CLEANUP, SURFACTANTS,
0622 OIL TANKS, LEAKAGE, GASOLINE, RECOVERY, CONTAINMENT, GROUNDWATER,
0727 OIL TANKS, LEAKAGE, SOIL, POLLUTION PREVENTION, STORAGE, DESIGN-ENGINEERING, PATENT,
0728 OIL TANKS, LEAKAGE, DETECTION, DESIGN-ENGINEERING, PATENT,
0750 OIL TANKS, LEAKAGE, DETECTION, DESIGN-ENGINEERING, PATENT,
0641 OIL TRANSFER, HYDROCARBONS, OCEANS, DISTRIBUTION, MARINE ORGANISMS, FOOD WEB, *TRANSFER PROCESSES,
0642 OIL TRANSFER, PORTS, FLORIDA, MEXICO/GULF OF, ENVIRONMENTAL EFFECTS, SOCIO-ECONOMIC EFFECTS, LEGISLATION, *DEEPWATER PORTS,
0648 OIL TRANSFER, OIL DISCHARGES, POLLUTION PREVENTION, STATISTICAL ANALYSIS, REGULATIONS, USCG,
0986 OIL TRANSFER, PORTS, LEGISLATION, DELAWARE BAY,
0992 OIL TRANSFER, OIL DISCHARGES, REGULATIONS, US, SHIPS, BILGES, USCG,
0567 OIL TRANSPORT, OIL SPILLS, SOURCE IDENTIFICATION, ANALYTICAL TECHNIQUES, POLLUTION PREVENTION, USCG,
0636 OIL TRANSPORT, OIL SPILLS, SHIPS, TANKERS, POLLUTION PREVENTION, OIL-WATER SEPARATION,
0640 OIL TRANSPORT, TANKERS, REGULATIONS, LAW ENFORCEMENT, WASHINGTON, PUGET SOUND,
0646 OIL TRANSPORT, ENVIRONMENTAL EFFECTS, PIPELINES, ECONOMIC EFFECTS, ALASKA, CALIFORNIA,
0649 OIL TRANSPORT, PIPELINES, ENVIRONMENTAL EFFECTS, ESTUARIES, PLANTS, ANIMALS, MONITORING, FLORIDA,
0650 OIL TRANSPORT, OIL SPILLS, TANKERS, ECONOMICS, POLLUTION CONTROL, REGULATIONS, *STANDARDS,
0653 OIL TRANSPORT, OIL SPILLS, PIPELINES, TANKERS, STATISTICAL ANALYSIS,
0655 OIL TRANSPORT, OIL SPILLS, PORTS, STORAGE, SOCIAL EFFECTS, ENVIRONMENTAL EFFECTS, PACIFIC OCEAN, *PALAU, *SUPERPORT,
0840 OIL TRANSPORT, OFFSHORE EXPLORATION, CONTAMINANTS, SPREADING, DISPERSIONS, PLATFORMS,
0897 OIL TRANSPORT, OIL SPILLS, OFFSHORE DRILLING, OCS, BLOWOUT PREVENTION, TANKERS, ATLANTIC COAST, CALIFORNIA COAST, MEXICO/GULF OF,
0491 OIL-WATER SEPARATION, MONITORING, WASTEWATERS, PATENT,
0507 OIL-WATER SEPARATION, MONITORING, WASTEWATERS, BILGES, SHIPS, PATENT,
0582 OIL-WATER SEPARATION, OIL SLICKS, RECOVERY, SKIMMERS,
0598 OIL-WATER SEPARATION, OIL SPILLS, RECOVERY, BOOMS, SKIMMERS, DESIGN-ENGINEERING, *OHMSETT,
0620 OIL-WATER SEPARATION, OIL SPILLS, RECOVERY, CRUDE OIL, FUEL OIL, SKIMMERS, CANADA,
0623 OIL-WATER SEPARATION, OIL SPILLS, RECOVERY, SKIMMERS, DESIGN-ENGINEERING,
0636 OIL-WATER SEPARATION, OIL TRANSPORT, OIL SPILLS, SHIPS, TANKERS, POLLUTION PREVENTION,
0658 OIL-WATER SEPARATION, DESIGN-ENGINEERING, PATENT,
0659 OIL-WATER SEPARATION, DESIGN-ENGINEERING, PATENT,
0660 OIL-WATER SEPARATION, WASTEWATER TREATMENT, REFINERIES, BELGIUM,

0663 OIL-WATER SEPARATION, WASTEWATER TREATMENT, CONTAMINANTS, COALESCENCE, DESIGN-ENGINEERING, PATENT,
0664 OIL-WATER SEPARATION, DISPERSIONS, COALESCENCE, DESIGN-ENGINEERING, PATENT,
0665 OIL-WATER SEPARATION, EMULSIONS, COALESCENCE, PATENT,
0666 OIL-WATER SEPARATION, EMULSIONS, FLOCCULATION, PRECIPITATION, DESIGN-ENGINEERING,
0667 OIL-WATER SEPARATION, WASTEWATER TREATMENT, FILTRATION, FLOTATION,
0672 OIL-WATER SEPARATION, WASTEWATER TREATMENT, BALLAST, COALESCENCE, PATENT,
0678 OIL-WATER SEPARATION, WASTEWATER TREATMENT, REFINERIES, FILTRATION,
0680 OIL-WATER SEPARATION, WASTEWATER TREATMENT, BILGES, FILTRATION, *TUBULAR ULTRAFILTRATION SYSTEM,
0681 OIL-WATER SEPARATION, WASTEWATER TREATMENT, ADSORPTION, PRECIPITATION, PH CONTROL, PATENT,
0683 OIL-WATER SEPARATION, WASTEWATER TREATMENT, ADSORPTION, PATENT, *POLYOLEFIN,
0686 OIL-WATER SEPARATION, WASTEWATER TREATMENT, COALESCENCE, DESIGN-ENGINEERING, PATENT,
0687 OIL-WATER SEPARATION, WASTEWATERS, REFINERIES, EMULSIONS, FLOCCULATION,
0689 OIL-WATER SEPARATION, WASTEWATER TREATMENT, COALESCENCE, FLOTATION, DESIGN-ENGINEERING, PATENT,
0690 OIL-WATER SEPARATION, WASTEWATER TREATMENT, ADSORPTION, *DETERGENTS,
0692 OIL-WATER SEPARATION, WASTEWATER TREATMENT, EMULSIONS, COAGULATION, PATENT,
0693 OIL-WATER SEPARATION, WASTEWATER TREATMENT, DESIGN-ENGINEERING, PATENT,
0698 OIL-WATER SEPARATION, OIL WELLS, DESIGN-ENGINEERING, PATENT,
0699 OIL-WATER SEPARATION, WASTEWATER TREATMENT, REFINERIES, WATER QUALITY, *ENERGY REQUIREMENTS,
0700 OIL-WATER SEPARATION, WASTEWATER TREATMENT, FLOTATION, PATENT,
0701 OIL-WATER SEPARATION, BILGES, SHIPS, DESIGN-ENGINEERING, USN,
0702 OIL-WATER SEPARATION, WASTEWATER TREATMENT, ABSORPTION, PATENT,
0739 OIL-WATER SEPARATION, OIL SPILLS, INTERNATIONAL CONVENTIONS, SHIPS, CONTINGENCY PLANNING, POLLUTION PREVENTION, IMCO,
0996 OIL-WATER SEPARATION, GUIDELINES, WASTEWATER TREATMENT, PRODUCTION, STORAGE, DISTRIBUTION, POLLUTION CONTROL,
1004 OIL-WATER SEPARATION, OIL SPILLS, BIBLIOGRAPHIES, POLLUTION CONTROL, RECOVERY, BALLAST, BILGES,
0698 OIL WELLS, OIL-WATER SEPARATION, DESIGN-ENGINEERING, PATENT,
0912 OIL WELLS, BIODEGRADATION, WASTE OIL, BACTERIA, SOIL, *PETROLEUM WASTE,
0843 ONSHORE IMPACTS, OFFSHORE DEVELOPMENT, ECONOMIC EFFECTS, SCOTLAND,
0844 ONSHORE IMPACTS, OIL-GAS LEASING, OFFSHORE EXPLORATION, ECONOMIC EFFECTS, FLORIDA,
0853 ONSHORE IMPACTS, OIL INDUSTRY, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, CALIFORNIA COAST,
0887 ONSHORE IMPACTS, OFFSHORE EXPLORATION, OFFSHORE DEVELOPMENT, SOCIO-ECONOMIC EFFECTS, FLORIDA,
0888 ONSHORE IMPACTS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, SOCIO-ECONOMIC EFFECTS, REFINERIES, PORTS, COASTS, FLORIDA, GUIDELINES,
0819 OREGON, PAH, CARCINOGENS, MOLLUSKS, ESTUARIES, ECONOMIC EFFECTS, *BENZO(A)PYRENE,
0586 OXIDATION, OIL SPILLS, CLEANUP, SEAWATER, MOLLUSKS, *WATER PURIFICATION, *MUSSELS, *MYTILUS EDULIS,
0909 OXIDATION, BIODEGRADATION, HYDROCARBONS, SOIL, MICROORGANISMS, *OXYGEN UPTAKE RATE,
0921 OXIDATION, BIODEGRADATION, HYDROCARBONS, *OIL BIODEGRADATION RATE,
0930 OXIDATION, BIODEGRADATION, MICROORGANISMS, BACTERIA, POLLUTION CONTROL, ATLANTIC OCEAN,
0941 OXIDATION, BIODEGRADATION, CRUDE OIL, PETROLEUM PRODUCTS, ENVIRONMENTAL EFFECTS, MICROORGANISMS,
0955 OXIDATION, FUEL OIL, TOXICITY, YEASTS, *HYDROPEROXIDES,
0957 OXIDATION, OIL SPILLS, CRUDE OIL, FATE, EVAPORATION, DISPERSIONS, BIODEGRADATION, TAR,
0977 OXIDATION, CRUDE OIL, CHEMICAL ANALYSIS, CHROMATOGRAPHY, EVAPORATION, BIODEGRADATION, *PHOTOOXIDATION,
0520 PACIFIC OCEAN, SAMPLING, HYDROCARBONS, CHEMICAL ANALYSIS, *TANKER ROUTES,
0521 PACIFIC OCEAN, SAMPLING, HYDROCARBONS, DISTRIBUTION, *TANKER ROUTES,
0655 PACIFIC OCEAN, OIL TRANSPORT, OIL SPILLS, PORTS, STORAGE, SOCIAL EFFECTS, ENVIRONMENTAL EFFECTS, *PALAU, *SUPERPORT,
0486 PAH, MONITORING, COASTS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, SAMPLING, CARCINOGENS, *FLUORIMETRY, *COASTAL WATERS,
0487 PAH, MONITORING, MOLLUSKS, CALIFORNIA/SOUTHERN, CARCINOGENS, *MUSSELS, *BENZO(A)PYRENE,
0544 PAH, CHEMICAL ANALYSIS, CHROMATOGRAPHY, MARINE ORGANISMS, *SHELLFISH,
0555 PAH, CHEMICAL ANALYSIS, CHROMATOGRAPHY, PETROLEUM PRODUCTS, REFINERIES, WASTEWATERS, *LIQUID CHROMATOGRAPHY,
0558 PAH, CHEMICAL ANALYSIS, CHROMATOGRAPHY, HYDROCARBONS, SOIL, *THIN-LAYER CHROMATOGRAPHY,
0566 PAH, OIL SPILLS, SOURCE IDENTIFICATION, INCINERATION, CHEMICAL ANALYSIS,
0801 PAH, HYDROCARBONS, METABOLISM, MARINE ORGANISMS, *BENZO(A)PYRENE, *MICROSOMAL MIXED-FUNCTION OXIDASES,
0819 PAH, OREGON, CARCINOGENS, MOLLUSKS, ESTUARIES, ECONOMIC EFFECTS, *BENZO(A)PYRENE,
0831 PAH, OCEANS,
0923 PAH, BIODEGRADATION, AROMATIC HYDROCARBONS, CARCINOGENS, MICROORGANISMS,
0924 PAH, BIODEGRADATION, MICROORGANISMS, BACTERIA, CARCINOGENS,
0972 PAH, HYDROCARBONS, FATE, ESTUARIES, RIVERS, ATLANTIC COAST, ADSORPTION, BIODEGRADATION,
0978 PAH, CARCINOGENS, FATE, DECOMPOSITION, ENVIRONMENTAL EFFECTS,

1002 PAH, BIBLIOGRAPHIES, FUEL OIL, CARCINOGENS, ANALYTICAL TECHNIQUES, PETROLEUM PRODUCTS,
1003 PAH, BIBLIOGRAPHIES, SOURCES, FATE, ANALYTICAL TECHNIQUES, CHROMATOGRAPHY, SPECTROSCOPY, CARCINOGENS, CRUDE OIL,
0484 PATENT, OIL SLICKS, MONITORING, *OIL CONTENT, *ECHO SOUNDING,
0491 PATENT, OIL-WATER SEPARATION, MONITORING, WASTEWATERS,
0496 PATENT, OIL TANKS, MONITORING, LEAKAGE, DETECTION, DESIGN-ENGINEERING,
0502 PATENT, OIL SLICKS, MONITORING, LEAKAGE, PIPELINES, WASTEWATERS, DETECTION, DESIGN-ENGINEERING,
0503 PATENT, MONITORING, HYDROCARBONS, DETECTION, DESIGN-ENGINEERING,
0507 PATENT, OIL-WATER SEPARATION, MONITORING, WASTEWATERS, BILGES, SHIPS,
0570 PATENT, OIL SLICKS, CONTAINMENT, BOOMS, DESIGN-ENGINEERING,
0571 PATENT, OIL SPILLS, CONTAINMENT, BOOMS, DESIGN-ENGINEERING,
0576 PATENT, OIL SPILLS, CONTAINMENT, COAGULATION, *POLYMERS,
0585 PATENT, OIL SPILLS, CLEANUP, RECOVERY, DESIGN-ENGINEERING, *OLEOPHILIC SPONGE,
0590 PATENT, OIL SLICKS, RECOVERY, DESIGN-ENGINEERING, *OLEOPHILIC CONTAINER,
0592 PATENT, OIL SLICKS, RECOVERY, SKIMMERS, DESIGN-ENGINEERING,
0593 PATENT, OIL SLICKS, DISPERSANTS, HYDROCARBONS, CLEANUP, BIODEGRADATION, *NITROGEN COMPOUNDS,
0594 PATENT, OIL SLICKS, DISPERSANTS, HYDROCARBONS, CLEANUP, BIODEGRADATION, *NITROGEN COMPOUNDS,
0595 PATENT, OIL SLICKS, DISPERSANTS, HYDROCARBONS, CLEANUP, BIODEGRADATION, *NITROGEN COMPOUNDS,
0596 PATENT, OIL SLICKS, SKIMMERS, RECOVERY, DESIGN-ENGINEERING,
0605 PATENT, OIL SPILLS, HYDROCARBONS, CLEANUP, BIODEGRADATION, BACTERIA,
0607 PATENT, OIL SLICKS, CLEANUP, PETROLEUM PRODUCTS, ABSORPTION, DESIGN-ENGINEERING,
0610 PATENT, OIL SLICKS, SKIMMERS, RECOVERY, DESIGN-ENGINEERING,
0612 PATENT, OIL SPILLS, RECOVERY, CONTAINMENT, DESIGN-ENGINEERING, *COLLECTION BARGE,
0613 PATENT, WASTE OIL, CLEANUP, ABSORPTION,
0625 PATENT, OIL SPILLS, RECOVERY, SKIMMERS, DESIGN-ENGINEERING,
0628 PATENT, ADSORPTION, CONTAMINANTS, *POLYURETHANE FOAM,
0629 PATENT, OIL SLICKS, SKIMMERS, RECOVERY, DESIGN-ENGINEERING,
0658 PATENT, OIL-WATER SEPARATION, DESIGN-ENGINEERING,
0659 PATENT, OIL-WATER SEPARATION, DESIGN-ENGINEERING,
0663 PATENT, OIL-WATER SEPARATION, WASTEWATER TREATMENT, CONTAMINANTS, COALESCENCE, DESIGN-ENGINEERING,
0664 PATENT, OIL-WATER SEPARATION, DISPERSIONS, COALESCENCE, DESIGN-ENGINEERING,
0665 PATENT, OIL-WATER SEPARATION, EMULSIONS, COALESCENCE,
0670 PATENT, OIL SPILLS, CLEANUP, WASTE OIL, ABSORPTION, *METALLURGICAL PUMICE,
0672 PATENT, OIL-WATER SEPARATION, WASTEWATER TREATMENT, BALLAST, COALESCENCE,
0681 PATENT, OIL-WATER SEPARATION, WASTEWATER TREATMENT, ADSORPTION, PRECIPITATION, PH CONTROL,
0683 PATENT, OIL-WATER SEPARATION, WASTEWATER TREATMENT, ADSORPTION, *POLYOLEFIN,
0684 PATENT, WASTE OIL, RECLAMATION, REFINING,
0686 PATENT, OIL-WATER SEPARATION, WASTEWATER TREATMENT, COALESCENCE, DESIGN-ENGINEERING,
0689 PATENT, OIL-WATER SEPARATION, WASTEWATER TREATMENT, COALESCENCE, FLOTATION, DESIGN-ENGINEERING,
0692 PATENT, OIL-WATER SEPARATION, WASTEWATER TREATMENT, EMULSIONS, COAGULATION,
0693 PATENT, OIL-WATER SEPARATION, WASTEWATER TREATMENT, DESIGN-ENGINEERING,
0695 PATENT, WASTEWATER TREATMENT, WASTE OIL, EMULSIONS,
0696 PATENT, WASTEWATER TREATMENT, PETROLEUM PRODUCTS,
0697 PATENT, WASTEWATER TREATMENT, EXTRACTION, CONTAMINANTS, DESIGN-ENGINEERING,
0698 PATENT, OIL WELLS, OIL-WATER SEPARATION, DESIGN-ENGINEERING,
0700 PATENT, OIL-WATER SEPARATION, WASTEWATER TREATMENT, FLOTATION,
0702 PATENT, OIL-WATER SEPARATION, WASTEWATER TREATMENT, ABSORPTION,
0703 PATENT, WASTE OIL TREATMENT, ADSORPTION,
0707 PATENT, WASTE OIL, LUBRICATING OIL, RECLAMATION,
0727 PATENT, OIL TANKS, LEAKAGE, SOIL, POLLUTION PREVENTION, STORAGE, DESIGN-ENGINEERING,
0728 PATENT, OIL TANKS, LEAKAGE, DETECTION, DESIGN-ENGINEERING,
0740 PATENT, LEAKAGE, DETECTION, PETROLEUM PRODUCTS,
0743 PATENT, BLOWOUT PREVENTION, DRILLING, DESIGN-ENGINEERING,
0747 PATENT, LEAKAGE, PIPELINES, POLLUTION PREVENTION, *SEALING MATERIAL,
0748 PATENT, POLLUTION CONTROL, LUBRICATING OIL,
0749 PATENT, POLLUTION PREVENTION, LUBRICATING OIL,
0750 PATENT, OIL TANKS, LEAKAGE, DETECTION, DESIGN-ENGINEERING,
0907 PATENT, OIL SPILLS, BIODEGRADATION, WASTE OIL, MICROORGANISMS, AFRICA/SOUTH,
0466 PENNSYLVANIA, OIL SPILLS, WASTE OIL, RIVERS, ENVIRONMENTAL EFFECTS, VEGETATION, *SCHUYLKILL SPILL,
0927 PENNSYLVANIA, BIODEGRADATION, GASOLINE, GROUNDWATER, *NUTRIENT ADDITION,
0710 PERSONNEL TRAINING, OIL SPILLS, POLLUTION PREVENTION, CLEANUP, CONTINGENCY PLANNING, TEXAS,
0711 PERSONNEL TRAINING, OIL SPILLS, POLLUTION CONTROL, CONTINGENCY PLANNING, USCG, *HIATUSPORT EXERCISE,
0712 PERSONNEL TRAINING, OIL SPILLS, POLLUTION CONTROL, CLEANUP, CONTINGENCY PLANNING, CANADA,
0713 PERSONNEL TRAINING, OIL SPILLS, TEXAS, *SPILL CONTROL COURSE,

0714 PERSONNEL TRAINING, OIL SPILLS, OIL INDUSTRY, POLLUTION CONTROL, CLEANUP, RECOVERY, RESTORATION,
0715 PERSONNEL TRAINING, OIL SPILLS, OIL INDUSTRY, CONTINGENCY PLANNING, POLLUTION CONTROL, CLEANUP, CANADA,
0718 PERSONNEL TRAINING, OIL SPILLS, OIL FIELDS, CONTINGENCY PLANNING, CLEANUP, NORTH SEA, *BP FORTIES OILFIELD,
0724 PERSONNEL TRAINING, OIL SPILLS, CONTINGENCY PLANNING, INLAND, CANADA,
0744 PERSONNEL TRAINING, OIL SPILLS, POLLUTION CONTROL, CONTINGENCY PLANNING,
0534 PETROCHEMICALS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, CONTAMINANTS, WASTEWATERS, PETROLEUM PRODUCTS, *GAS CHROMATOGRAPHY,
0542 PETROCHEMICALS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, HYDROCARBONS, PETROLEUM PRODUCTS, FUELS, WASTEWATERS,
0685 PETROCHEMICALS, WASTEWATER TREATMENT, ECONOMICS, LEGISLATION, GERMANY, WEST,
0688 PETROCHEMICALS, WASTEWATER TREATMENT,
0704 PETROCHEMICALS, DISPOSAL, WASTE OIL, STORAGE, MANUALS, USN,
0943 PETROCHEMICALS, BIODEGRADATION, MICROORGANISMS, METABOLISM,
0528 PETROLEUM PRODUCTS, OIL SLICKS, DETECTION, ANALYTICAL TECHNIQUES, ABSORPTION,
0534 PETROLEUM PRODUCTS, PETROCHEMICALS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, CONTAMINANTS, WASTEWATERS, *GAS CHROMATOGRAPHY,
0542 PETROLEUM PRODUCTS, PETROCHEMICALS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, HYDROCARBONS, FUELS, WASTEWATERS,
0551 PETROLEUM PRODUCTS, CHEMICAL ANALYSIS, WASTEWATERS, MONITORING,
0555 PETROLEUM PRODUCTS, PAH, CHEMICAL ANALYSIS, CHROMATOGRAPHY, REFINERIES, WASTEWATERS, *LIQUID CHROMATOGRAPHY,
0563 PETROLEUM PRODUCTS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, SPECTROMETRY, CRUDE OIL, HYDROCARBONS, EVAPORATION, *WATER SOLUBLE FRACTIONS,
0607 PETROLEUM PRODUCTS, PATENT, OIL SLICKS, CLEANUP, ABSORPTION, DESIGN-ENGINEERING,
0696 PETROLEUM PRODUCTS, PATENT, WASTEWATER TREATMENT,
0730 PETROLEUM PRODUCTS, OIL SPILLS, POLLUTION PREVENTION, STORAGE, CONTINGENCY PLANNING, *OIL STORAGE PLAN,
0740 PETROLEUM PRODUCTS, PATENT, LEAKAGE, DETECTION,
0784 PETROLEUM PRODUCTS, CRUDE OIL, HYDROCARBONS, TOXICITY, MARINE ORGANISMS, ECOSYSTEMS,
0785 PETROLEUM PRODUCTS, FUELS, TOXICITY, PHYTOPLANKTON,
0796 PETROLEUM PRODUCTS, TOXICITY, HYDROCARBONS,
0798 PETROLEUM PRODUCTS, TOXICITY, AROMATIC HYDROCARBONS, MARINE ORGANISMS, *SUBLETHAL EFFECTS, *RESPIRATION, *GROWTH,
0936 PETROLEUM PRODUCTS, BIODEGRADATION, MICROORGANISMS, BARENT SEA, BALTIC SEA, ATLANTIC OCEAN,
0940 PETROLEUM PRODUCTS, BIODEGRADATION, CRUDE OIL, BACTERIA, CASPIAN SEA, USSR,
0941 PETROLEUM PRODUCTS, OXIDATION, BIODEGRADATION, CRUDE OIL, ENVIRONMENTAL EFFECTS, MICROORGANISMS,
0942 PETROLEUM PRODUCTS, BIODEGRADATION, MICROORGANISMS, HYDROCARBONS, CRUDE OIL, GROUNDWATER, USSR,
0987 PETROLEUM PRODUCTS, REGULATIONS, CRUDE OIL, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, FEA, *MANDATORY OIL IMPORT PROGRAM,
1002 PETROLEUM PRODUCTS, PAH, BIBLIOGRAPHIES, FUEL OIL, CARCINOGENS, ANALYTICAL TECHNIQUES,
0681 PH CONTROL, PATENT, OIL-WATER SEPARATION, WASTEWATER TREATMENT, ADSORPTION, PRECIPITATION,
0785 PHYTOPLANKTON, PETROLEUM PRODUCTS, FUELS, TOXICITY,
0458 PIPELINES, OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ECONOMICS, ALASKA, *TRANS-ALASKA PIPELINE,
0462 PIPELINES, OIL SPILLS, OFFSHORE DEVELOPMENT, STATISTICS, TANKERS, *SPILL PREDICTIONS,
0465 PIPELINES, OIL SPILLS, *SALT WATER SPILLS, STATISTICS, CANADA, *ALBERTA,
0476 PIPELINES, OIL SPILLS, OIL DISCHARGES, PORTS, REFINERIES, WATER QUALITY, *PETROLEUM FACILITIES,
0502 PIPELINES, PATENT, OIL SLICKS, MONITORING, LEAKAGE, WASTEWATERS, DETECTION, DESIGN-ENGINEERING,
0583 PIPELINES, OIL SPILLS, CLEANUP, ECONOMICS, TANKERS, ALASKA, *OIL SPILL FUND,
0646 PIPELINES, OIL TRANSPORT, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, ALASKA, CALIFORNIA,
0649 PIPELINES, OIL TRANSPORT, ENVIRONMENTAL EFFECTS, ESTUARIES, PLANTS, ANIMALS, MONITORING, FLORIDA,
0651 PIPELINES, LEAKAGE, DETECTION, *MINI-COMPUTERS,
0653 PIPELINES, OIL TRANSPORT, OIL SPILLS, TANKERS, STATISTICAL ANALYSIS,
0747 PIPELINES, PATENT, LEAKAGE, POLLUTION PREVENTION, *SEALING MATERIAL,
0892 PIPELINES, OIL INDUSTRY, DEVELOPMENT, STORAGE, SCOTLAND, *SULLOM VOE TERMINAL,
0895 PIPELINES, OIL SPILLS, OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, FLORIDA,
0952 PIPELINES, OIL SPILLS, BEHAVIOR, STATISTICAL ANALYSIS, WEATHERING, CANADA, INLAND,
0993 PIPELINES, OIL INDUSTRY, REGULATIONS, WASTEWATERS, GUIDELINES, EUROPE,
0758 PLANKTON, OIL SPILLS, ESTUARIES, BIOLOGICAL EFFECTS, WEATHERING, FISH, BENTHOS, ATLANTIC COAST,
0879 PLANKTON, OFFSHORE DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, ALASKA, BENTHOS, FISHERIES, *BASELINE STUDIES,
0979 PLANKTON, OIL SPILLS, BEACHES, FATE, MOVEMENT, SEDIMENTS, BIOLOGICAL EFFECTS, BENTHOS, CHEDABUCTO BAY,
0633 PLANTS, OIL SPILLS, RESTORATION, SOIL, BIODEGRADATION, *FERTILIZERS,

0649 PLANTS, PIPELINES, OIL TRANSPORT, ENVIRONMENTAL EFFECTS, ESTUARIES, ANIMALS, MONITORING, FLORIDA,
0729 PLANTS, POLLUTION CONTROL, REFINERIES, *NATURAL GAS MONITORING, WASTEWATERS, SOLID WASTES,
0792 PLANTS, FUEL OIL, BIOLOGICAL EFFECTS, TROPICAL REGIONS, MALAYSIA, *PIONEER MANGROVE, *AVICENNIA INTERMEDIA,
0813 PLANTS, OIL SPILLS, ARCTIC, ANIMALS, USN,
0901 PLANTS, OIL SPILLS, EXPLORATION, PRODUCTION, ARCTIC, ENVIRONMENTAL EFFECTS, WILDLIFE, MARINE ORGANISMS,
0454 PLATFORMS, OIL SPILLS, OFFSHORE PRODUCTION, NORTH SEA, *OXYGEN CORROSION,
0515 PLATFORMS, OIL SLICKS, REMOTE SENSING, DETECTION, NATURAL SEEPAGE, SANTA BARBARA CHANNEL, USCG, *SIDE-LOOKING RADAR,
0778 PLATFORMS, HYDROCARBONS, MOLLUSKS, UPTAKE, RELEASE, SEDIMENTS, TEXAS, *TRINITY BAY, *NAPHTHALENES, *CLAM, *RANGIA CUNEATA,
0794 PLATFORMS, OFFSHORE PRODUCTION, OFFSHORE DRILLING, CHRONIC EFFECTS, CRUDE OIL, MARINE ORGANISMS,
0836 PLATFORMS, OFFSHORE DRILLING, BIOLOGICAL EFFECTS, MARINE ORGANISMS, SANTA BARBARA CHANNEL,
0840 PLATFORMS, OIL TRANSPORT, OFFSHORE EXPLORATION, CONTAMINANTS, SPREADING, DISPERSIONS,
0869 PLATFORMS, OFFSHORE DRILLING, OCS, ENVIRONMENTAL EFFECTS, ATLANTIC OCEAN, BLM,
0894 PLATFORMS, DEVELOPMENT, EIS, ENVIRONMENTAL EFFECTS, SCOTLAND,
0501 POLLUTION CONTROL, OIL SPILLS, MONITORING, HYDROCARBONS, SURVEILLANCE, GOVERNMENT AGENCIES, EPA, USGS, USCG, *UN,
0512 POLLUTION CONTROL, OIL SPILLS, REMOTE SENSING, CLEANUP, LAW ENFORCEMENT, EPA,
0599 POLLUTION CONTROL, OIL SPILLS, CLEANUP, ECONOMICS, TEXAS, *CORPUS CHRISTI,
0611 POLLUTION CONTROL, OIL SPILLS, CLEANUP, CALIFORNIA, *OAKLAND ESTUARY, *TELECOMMUNICATIONS SYSTEM,
0637 POLLUTION CONTROL, OIL SPILLS, OFFSHORE DRILLING, TANKERS, METULA SPILL, ENVIRONMENTAL PROTECTION,
0650 POLLUTION CONTROL, OIL TRANSPORT, OIL SPILLS, TANKERS, ECONOMICS, REGULATIONS, *STANDARDS,
0673 POLLUTION CONTROL, WASTEWATER TREATMENT, REFINERIES, CONSERVATION, *WATER REUSE,
0711 POLLUTION CONTROL, PERSONNEL TRAINING, OIL SPILLS, CONTINGENCY PLANNING, USCG, *HIATUSPORT EXERCISE,
0712 POLLUTION CONTROL, PERSONNEL TRAINING, OIL SPILLS, CLEANUP, CONTINGENCY PLANNING, CANADA,
0714 POLLUTION CONTROL, PERSONNEL TRAINING, OIL SPILLS, OIL INDUSTRY, CLEANUP, RECOVERY, RESTORATION,
0715 POLLUTION CONTROL, PERSONNEL TRAINING, OIL SPILLS, OIL INDUSTRY, CONTINGENCY PLANNING, CLEANUP, CANADA,
0725 POLLUTION CONTROL, OIL SPILLS, CONTINGENCY PLANNING, CLEANUP, ECONOMICS, *LOCAL GOVERNMENTS,
0726 POLLUTION CONTROL, OIL DISCHARGES, LEGISLATION, EUROPE, *MARINE POLLUTION,
0729 POLLUTION CONTROL, PLANTS, REFINERIES, *NATURAL GAS MONITORING, WASTEWATERS, SOLID WASTES,
0733 POLLUTION CONTROL, OIL SPILLS, DETECTION, CONTAINMENT, RECOVERY, DISPOSAL,
0734 POLLUTION CONTROL, OIL SPILLS, *COSTS, ECONOMIC EFFECTS, MODELS, *POLLUTER RESPONSE,
0741 POLLUTION CONTROL, OIL INDUSTRY, REFINERIES, EPA,
0742 POLLUTION CONTROL, OIL SPILLS, CLEANUP, DESIGN-ENGINEERING, USCG, *EQUIPMENT DELIVERY SYSTEM,
0744 POLLUTION CONTROL, PERSONNEL TRAINING, OIL SPILLS, CONTINGENCY PLANNING,
0745 POLLUTION CONTROL, OIL SPILLS, ESTUARIES, MARSHES, MOVEMENT, *GRASS-CUTTING, *HACKENSACK ESTUARY,
0748 POLLUTION CONTROL, PATENT, LUBRICATING OIL,
0752 POLLUTION CONTROL, OIL SPILLS, OCEANS, INLAND, ENVIRONMENTAL EFFECTS, CLEANUP,
0818 POLLUTION CONTROL, OIL SPILLS, ECONOMIC EFFECTS, TOXICITY, *SHELL OIL CO.,
0834 POLLUTION CONTROL, ENVIRONMENTAL EFFECTS, REGULATIONS, LEGISLATION, US,
0842 POLLUTION CONTROL, OIL INDUSTRY, REGULATIONS, ECONOMICS, REFINING, EXPLORATION, PRODUCTION,
0861 POLLUTION CONTROL, OIL INDUSTRY, ENVIRONMENTAL EFFECTS, CONTAMINATION,
0864 POLLUTION CONTROL, EXPLORATION, SEAWATER,
0900 POLLUTION CONTROL, OFFSHORE DRILLING, BLOWOUT PREVENTION, ARCTIC, BEAUFORT SEA,
0930 POLLUTION CONTROL, OXIDATION, BIODEGRADATION, MICROORGANISMS, BACTERIA, ATLANTIC OCEAN,
0966 POLLUTION CONTROL, GROUNDWATER, CONTAMINATION, HYDROCARBONS, MOVEMENT,
0985 POLLUTION CONTROL, OFFSHORE DEVELOPMENT, OCS, LEGISLATION, US, ENVIRONMENTAL EFFECTS, ECONOMICS, DELAWARE,
0988 POLLUTION CONTROL, OIL INDUSTRY, LEGISLATION, US, REFINERIES, ECONOMIC EFFECTS,
0990 POLLUTION CONTROL, LEGISLATION, CLEANUP, LIABILITY, COST ANALYSIS, *FEDERAL WATER POLLUTION CONTROL ACT,
0996 POLLUTION CONTROL, OIL-WATER SEPARATION, GUIDELINES, WASTEWATER TREATMENT, PRODUCTION , STORAGE, DISTRIBUTION,
1004 POLLUTION CONTROL, OIL-WATER SEPARATION, OIL SPILLS, BIBLIOGRAPHIES, RECOVERY, BALLAST, BILGES,
0467 POLLUTION PREVENTION, OIL SPILLS, BIOLOGICAL EFFECTS, CLEANUP, SURVEILLANCE, INTERNATIONAL AGREEMENTS,

0474 POLLUTION PREVENTION, OIL SPILLS, CLEANUP, BIRDS, WILDLIFE, CHESAPEAKE BAY, USCG,
0567 POLLUTION PREVENTION, OIL TRANSPORT, OIL SPILLS, SOURCE IDENTIFICATION, ANALYTICAL TECHNIQUES, USCG,
0636 POLLUTION PREVENTION, OIL-WATER SEPARATION, OIL TRANSPORT, OIL SPILLS, SHIPS, TANKERS,
0648 POLLUTION PREVENTION, OIL TRANSFER, OIL DISCHARGES, STATISTICAL ANALYSIS, REGULATIONS, USCG,
0661 POLLUTION PREVENTION, WASTEWATER TREATMENT, REFINERIES, *SURFACE WATERS, BELGIUM,
0710 POLLUTION PREVENTION, PERSONNEL TRAINING, OIL SPILLS, CLEANUP, CONTINGENCY PLANNING, TEXAS,
0727 POLLUTION PREVENTION, PATENT, OIL TANKS, LEAKAGE, SOIL, STORAGE, DESIGN-ENGINEERING,
0730 POLLUTION PREVENTION, PETROLEUM PRODUCTS, OIL SPILLS, STORAGE, CONTINGENCY PLANNING, *OIL STORAGE PLAN,
0731 POLLUTION PREVENTION, OIL INDUSTRY, REFINING, SOURCES,
0732 POLLUTION PREVENTION, OIL SPILLS, OCEANS, STORAGE, ENVIRONMENTAL EFFECTS,
0735 POLLUTION PREVENTION, OIL SPILLS, ENVIRONMENTAL PROTECTION, SHORELINES, MARSHES,
0738 POLLUTION PREVENTION, OIL DISCHARGES, SHIPS, WASTE OIL TREATMENT, CLEANUP, MONITORING, USN,
0739 POLLUTION PREVENTION, OIL-WATER SEPARATION, OIL SPILLS, INTERNATIONAL CONVENTIONS, SHIPS, CONTINGENCY PLANNING, IMCO,
0746 POLLUTION PREVENTION, OIL SPILLS, CLEANUP, WASTE OIL DISPOSAL, *FOREST INDUSTRY,
0747 POLLUTION PREVENTION, PIPELINES, PATENT, LEAKAGE, *SEALING MATERIAL,
0749 POLLUTION PREVENTION, PATENT, LUBRICATING OIL,
0754 POLLUTION PREVENTION, OIL SPILLS, RECOVERY, JAPAN, *TEST FACILITIES,
0998 POLLUTION PREVENTION, INTERNATIONAL CONVENTIONS, IMCO, REGULATIONS, TANKERS,
0999 POLLUTION PREVENTION, INTERNATIONAL CONVENTIONS, IMCO, USCG,
1001 POLLUTION PREVENTION, OIL SPILLS, OFFSHORE DRILLING, BIBLIOGRAPHIES, LEGISLATION, US, INTERNATIONAL AGREEMENTS, OCEANS, SHIPS,
0802 POLYCHAETES, CONTAMINATION, SEDIMENTS, FUEL OIL, BIOLOGICAL EFFECTS, METABOLISM, *FEEDING ACTIVITY, *ARENICOLA MARINA,
0804 POLYCHAETES, HYDROCARBONS, UPTAKE, METABOLISM, RELEASE, SEDIMENTS, SEAWATER, *NEANTHES ARENACEODENTATA,
0805 POLYCHAETES, HYDROCARBONS, FUEL OIL, BIOLOGICAL EFFECTS, UPTAKE, METABOLISM, *NEANTHES ARENACEODENTATA,
0476 PORTS, PIPELINES, OIL SPILLS, OIL DISCHARGES, REFINERIES, WATER QUALITY, *PETROLEUM FACILITIES,
0638 PORTS, OFFSHORE DEVELOPMENT, TANKERS, SOCIO-ECONOMIC EFFECTS, ENVIRONMENTAL EFFECTS, *DEEPWATER TERMINALS,
0639 PORTS, OIL SPILLS, ENVIRONMENTAL EFFECTS, SOCIO-ECONOMIC EFFECTS, COASTS, *DEEPWATER PORTS,
0642 PORTS, OIL TRANSFER, FLORIDA, MEXICO/GULF OF, ENVIRONMENTAL EFFECTS, SOCIO-ECONOMIC EFFECTS, LEGISLATION, *DEEPWATER PORTS,
0654 PORTS, DEVELOPMENT, ENVIRONMENTAL PROTECTION, REGULATIONS, DESIGN-ENGINEERING,
0655 PORTS, PACIFIC OCEAN, OIL TRANSPORT, OIL SPILLS, STORAGE, SOCIAL EFFECTS, ENVIRONMENTAL EFFECTS, *PALAU, *SUPERPORT,
0888 PORTS, ONSHORE IMPACTS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, SOCIO-ECONOMIC EFFECTS, REFINERIES, COASTS, FLORIDA, GUIDELINES,
0973 PORTS, OIL SPILLS, OFFSHORE DRILLING, MODELS, MOVEMENT, COASTS, NEW JERSEY, DELAWARE,
0986 PORTS, OIL TRANSFER, LEGISLATION, DELAWARE BAY,
0825 PORTUGAL, OIL SPILLS, ENVIRONMENTAL EFFECTS, HYDROCARBONS, CLEANUP, DISPERSANTS, SHORELINES,
0666 PRECIPITATION, OIL-WATER SEPARATION, EMULSIONS, FLOCCULATION, DESIGN-ENGINEERING,
0681 PRECIPITATION, PH CONTROL, PATENT, OIL-WATER SEPARATION, WASTEWATER TREATMENT, ADSORPTION,
0842 PRODUCTION, POLLUTION CONTROL, OIL INDUSTRY, REGULATIONS, ECONOMICS, REFINING, EXPLORATION,
0850 PRODUCTION, OIL SHALE, EXTRACTION, ENVIRONMENTAL EFFECTS, SOLID WASTES, WASTEWATERS,
0901 PRODUCTION, PLANTS, OIL SPILLS, EXPLORATION, ARCTIC, ENVIRONMENTAL EFFECTS, WILDLIFE, MARINE ORGANISMS,
0995 PRODUCTION, OIL INDUSTRY, GUIDELINES, EXTRACTION, WASTEWATERS, EPA, *ONSHORE POINT SOURCE CATEGORY,
0996 PRODUCTION, POLLUTION CONTROL, OIL-WATER SEPARATION, GUIDELINES, WASTEWATER TREATMENT, STORAGE, DISTRIBUTION,
0797 PUERTO RICO, OIL SPILLS, BIOLOGICAL EFFECTS, CONTAMINATION, MARINE ORGANISMS, TROPICAL REGIONS, COASTS, *MANGROVES, *TURTLE GRASS,
0577 PUGET SOUND, OIL SPILLS, SKIMMERS, RECOVERY, DESIGN-ENGINEERING,
0640 PUGET SOUND, OIL TRANSPORT, TANKERS, REGULATIONS, LAW ENFORCEMENT, WASHINGTON,
0768 PUGET SOUND, CONTAMINATION, BIOLOGICAL EFFECTS,
0827 PUGET SOUND, CONTAMINATION, ENVIRONMENTAL EFFECTS,
0891 PUGET SOUND, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, MEXICO/GULF OF, FATE, HYDROCARBONS, TOXICITY, MARINE ORGANISMS, NOAA,
0684 RECLAMATION, PATENT, WASTE OIL, REFINING,
0707 RECLAMATION, PATENT, WASTE OIL, LUBRICATING OIL,
0708 RECLAMATION, WASTE OIL, CRUDE OIL,
0709 RECLAMATION, WASTE OIL TREATMENT,
0470 RECOVERY, OIL SPILLS, CLEANUP, DISPOSAL, ECOSYSTEMS, ARCTIC,

0577 RECOVERY, PUGET SOUND, OIL SPILLS, SKIMMERS, DESIGN-ENGINEERING,
0578 RECOVERY, OIL SPILLS, HARBORS, DESIGN-ENGINEERING, *CLEAN SWEEP,
0579 RECOVERY, OIL SPILLS, HARBORS, ESTUARIES, DESIGN-ENGINEERING, *CLEAN SWEEP,
0582 RECOVERY, OIL-WATER SEPARATION, OIL SLICKS, SKIMMERS,
0585 RECOVERY, PATENT, OIL SPILLS, CLEANUP, DESIGN-ENGINEERING, *OLEOPHILIC SPONGE,
0588 RECOVERY, OIL SPILLS, ABSORPTION, DESIGN-ENGINEERING,
0590 RECOVERY, PATENT, OIL SLICKS, DESIGN-ENGINEERING, *OLEOPHILIC CONTAINER,
0591 RECOVERY, OIL SPILLS, HYDROCARBONS, GROUNDWATER, CONTINGENCY PLANNING, COST ANALYSIS,
0592 RECOVERY, PATENT, OIL SLICKS, SKIMMERS, DESIGN-ENGINEERING,
0596 RECOVERY, PATENT, OIL SLICKS, SKIMMERS, DESIGN-ENGINEERING,
0598 RECOVERY, OIL-WATER SEPARATION, OIL SPILLS, BOOMS, SKIMMERS, DESIGN-ENGINEERING, *OHMSETT,
0600 RECOVERY, OIL SPILLS, SKIMMERS, DESIGN-ENGINEERING, USCG,
0602 RECOVERY, OIL SPILLS, SKIMMERS, BOOMS, STORAGE, FRANCE,
0603 RECOVERY, OIL SPILLS, MODELS, CLEANUP, COST ANALYSIS,
0608 RECOVERY, OIL SPILLS, SKIMMERS, BOOMS, CONTAINMENT, DESIGN-ENGINEERING, USCG,
0610 RECOVERY, PATENT, OIL SLICKS, SKIMMERS, DESIGN-ENGINEERING,
0612 RECOVERY, PATENT, OIL SPILLS, CONTAINMENT, DESIGN-ENGINEERING, *COLLECTION BARGE,
0614 RECOVERY, OIL SPILLS, ICE, DESIGN-ENGINEERING, ARCTIC, CANADA, *CLEAN SWEEP,
0615 RECOVERY, OIL SPILLS, ARCTIC, CONTAINMENT, REMOTE SENSING, STORAGE, DISPOSAL,
0618 RECOVERY, OIL SPILLS, ABSORPTION, RIVERS, ESTUARIES, HARBORS, DESIGN-ENGINEERING, EPA, *OHMSETT,
0620 RECOVERY, OIL-WATER SEPARATION, OIL SPILLS, CRUDE OIL, FUEL OIL, SKIMMERS, CANADA,
0621 RECOVERY, OIL SPILLS, SKIMMERS, EMULSIFICATION, CANADA,
0622 RECOVERY, OIL TANKS, LEAKAGE, GASOLINE, CONTAINMENT, GROUNDWATER,
0623 RECOVERY, OIL-WATER SEPARATION, OIL SPILLS, SKIMMERS, DESIGN-ENGINEERING,
0624 RECOVERY, OIL SPILLS, CONTAINMENT, SKIMMERS, BOOMS, EPA, *OHMSETT,
0625 RECOVERY, PATENT, OIL SPILLS, SKIMMERS, DESIGN-ENGINEERING,
0629 RECOVERY, PATENT, OIL SLICKS, SKIMMERS, DESIGN-ENGINEERING,
0714 RECOVERY, POLLUTION CONTROL, PERSONNEL TRAINING, OIL SPILLS, OIL INDUSTRY, CLEANUP, RESTORATION,
0733 RECOVERY, POLLUTION CONTROL, OIL SPILLS, DETECTION, CONTAINMENT, DISPOSAL,
0754 RECOVERY, POLLUTION PREVENTION, OIL SPILLS, JAPAN, *TEST FACILITIES,
0826 RECOVERY, OIL SPILLS, ENVIRONMENTAL EFFECTS, BIODEGRADATION, SOURCES, CLEANUP, *BOOK REVIEW,
1004 RECOVERY, POLLUTION CONTROL, OIL-WATER SEPARATION, OIL SPILLS, BIBLIOGRAPHIES, BALLAST, BILGES,
0662 RECYCLING, OIL INDUSTRY, ECONOMICS, WASTEWATERS, WASTE OIL, SOLID WASTES, DISPOSAL,
0706 RECYCLING, WASTE OIL, REUSE, DISPOSAL, BIOLOGICAL EFFECTS,
0918 RECYCLING, BIODEGRADATION, WASTEWATERS, REFINERIES,
0472 REFINERIES, HYDROCARBONS, SOURCES, DISTRIBUTION, INDUSTRIES, *MUNICIPAL DISCHARGES, *RUNOFF,
0476 REFINERIES, PORTS, PIPELINES, OIL SPILLS, OIL DISCHARGES, WATER QUALITY, *PETROLEUM FACILITIES,
0479 REFINERIES, INDUSTRIES, DELAWARE, *URBAN RUNOFF, *OIL CONTENT, *DELAWARE ESTUARY,
0519 REFINERIES, OIL SLICKS, REMOTE SENSING, WASTEWATERS, MONITORING,
0531 REFINERIES, WASTEWATERS, ANALYTICAL TECHNIQUES, CHROMATOGRAPHY, SPECTROMETRY,
0548 REFINERIES, WASTEWATERS, HYDROCARBONS, DELAWARE, *OIL CONTENT, *URBAN RUNOFF, *DELAWARE ESTUARY,
0555 REFINERIES, PETROLEUM PRODUCTS, PAH, CHEMICAL ANALYSIS, CHROMATOGRAPHY, WASTEWATERS, *LIQUID CHROMATOGRAPHY,
0561 REFINERIES, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, HYDROCARBONS, WASTEWATERS, *SEWAGE, *URBAN RUNOFF, REGULATIONS, DELAWARE,
0660 REFINERIES, OIL-WATER SEPARATION, WASTEWATER TREATMENT, BELGIUM,
0661 REFINERIES, POLLUTION PREVENTION, WASTEWATER TREATMENT, *SURFACE WATERS, BELGIUM,
0668 REFINERIES, WASTEWATER TREATMENT, DISPOSAL, CONSERVATION,
0673 REFINERIES, POLLUTION CONTROL, WASTEWATER TREATMENT, CONSERVATION, *WATER REUSE,
0674 REFINERIES, WASTEWATER TREATMENT, ACTIVATED SLUDGE , GUIDELINES,
0675 REFINERIES, WASTEWATER TREATMENT, CONTAMINANTS, *INTERMEDIATE TREATMENT,
0676 REFINERIES, WASTEWATER TREATMENT, *COLLOID DESTABILIZATION,
0677 REFINERIES, WASTEWATER TREATMENT, *CHEMICAL TREATMENT, *WATERBORNE COLLOIDS,
0678 REFINERIES, OIL-WATER SEPARATION, WASTEWATER TREATMENT, FILTRATION,
0679 REFINERIES, WASTEWATER TREATMENT, CONTAMINANTS, ACTIVATED SLUDGE , *BIOCHEMISTRY,
0687 REFINERIES, OIL-WATER SEPARATION, WASTEWATERS, EMULSIONS, FLOCCULATION,
0699 REFINERIES, OIL-WATER SEPARATION, WASTEWATER TREATMENT, WATER QUALITY, *ENERGY REQUIREMENTS,
0729 REFINERIES, POLLUTION CONTROL, PLANTS, *NATURAL GAS MONITORING, WASTEWATERS, SOLID WASTES,
0741 REFINERIES, POLLUTION CONTROL, OIL INDUSTRY, EPA,
0764 REFINERIES, AROMATIC HYDROCARBONS, WASTEWATERS, CONTAMINATION, MOLLUSKS, FOOD WEB, *FOOD CHAIN ACCUMULATION, *3,4-BENZOPYRENE,
0769 REFINERIES, WASTEWATERS, TOXICITY, FISH, *AQUATIC LIFE, CANADA,
0790 REFINERIES, WASTEWATERS, TOXICITY, FRESHWATER, FISH, INVERTEBRATES, *LETHAL CONCENTRATION,
0888 REFINERIES, PORTS, ONSHORE IMPACTS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS,

SOCIO-ECONOMIC EFFECTS, COASTS, FLORIDA, GUIDELINES,
0918 REFINERIES, RECYCLING, BIODEGRADATION, WASTEWATERS,
0960 REFINERIES, HYDROCARBONS, MEDITERRANEAN SEA, SAMPLING, *SURFACE MICROLAYER COMPOSITION,
0988 REFINERIES, POLLUTION CONTROL, OIL INDUSTRY, LEGISLATION, US, ECONOMIC EFFECTS,
0997 REFINERIES, OIL INDUSTRY, GUIDELINES, WASTEWATER TREATMENT, LEGISLATION, WATER QUALITY, ECONOMICS,
0684 REFINING, RECLAMATION, PATENT, WASTE OIL,
0731 REFINING, POLLUTION PREVENTION, OIL INDUSTRY, SOURCES,
0842 REFINING, PRODUCTION, POLLUTION CONTROL, OIL INDUSTRY, REGULATIONS, ECONOMICS, EXPLORATION,
0450 REGULATIONS, OIL SPILLS, TANKERS, TAR, ARGO MERCHANT SPILL, *LIBERIAN TANKERS,
0500 REGULATIONS, OIL-GAS LEASING, OCS, MONITORING, COASTS, EIS, BLM, *ENVIRONMENTAL STUDIES PROJECT,
0561 REGULATIONS, REFINERIES, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, HYDROCARBONS, WASTEWATERS, *SEWAGE, *URBAN RUNOFF, DELAWARE,
0640 REGULATIONS, PUGET SOUND, OIL TRANSPORT, TANKERS, LAW ENFORCEMENT, WASHINGTON,
0648 REGULATIONS, POLLUTION PREVENTION, OIL TRANSFER, OIL DISCHARGES, STATISTICAL ANALYSIS, USCG,
0650 REGULATIONS, POLLUTION CONTROL, OIL TRANSPORT, OIL SPILLS, TANKERS, ECONOMICS, *STANDARDS,
0652 REGULATIONS, OIL SPILLS, TANKERS, US, INTERNATIONAL AGREEMENTS,
0654 REGULATIONS, PORTS, DEVELOPMENT, ENVIRONMENTAL PROTECTION, DESIGN-ENGINEERING,
0833 REGULATIONS, OIL SPILLS, TANKERS, ARGO MERCHANT SPILL, LAW ENFORCEMENT,
0834 REGULATIONS, POLLUTION CONTROL, ENVIRONMENTAL EFFECTS, LEGISLATION, US,
0842 REGULATIONS, REFINING, PRODUCTION, POLLUTION CONTROL, OIL INDUSTRY, ECONOMICS, EXPLORATION,
0845 REGULATIONS, OIL INDUSTRY, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, FISHERIES, US,
0860 REGULATIONS, OFFSHORE DRILLING, OFFSHORE DEVELOPMENT, ENVIRONMENTAL PROTECTION, ALASKA, CALIFORNIA/SOUTHERN, MEXICO/GULF OF,
0984 REGULATIONS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL PROTECTION, ECONOMIC EFFECTS, DELAWARE,
0987 REGULATIONS, PETROLEUM PRODUCTS, CRUDE OIL, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, FEA, *MANDATORY OIL IMPORT PROGRAM,
0992 REGULATIONS, OIL TRANSFER, OIL DISCHARGES, US, SHIPS, BILGES, USCG,
0993 REGULATIONS, PIPELINES, OIL INDUSTRY, WASTEWATERS, GUIDELINES, EUROPE,
0998 REGULATIONS, POLLUTION PREVENTION, INTERNATIONAL CONVENTIONS, IMCO, TANKERS,
0771 RELEASE, FISH, *NAPHTHALENES, DISTRIBUTION, UPTAKE, *STRESS BEHAVIOR, *FUNDULUS SIMILUS,
0778 RELEASE, PLATFORMS, HYDROCARBONS, MOLLUSKS, UPTAKE, SEDIMENTS, TEXAS, *TRINITY BAY, *NAPHTHALENES, *CLAM, *RANGIA CUNEATA,
0789 RELEASE, AROMATIC HYDROCARBONS, MOLLUSKS, UPTAKE, *MODIOLUS DEMISSUS, *CRASSOSTREA VIRGINICA, *PETRO-SULFUR COMPOUNDS,
0799 RELEASE, AROMATIC HYDROCARBONS, SEAWATER, MARINE ORGANISMS, UPTAKE,
0804 RELEASE, POLYCHAETES, HYDROCARBONS, UPTAKE, METABOLISM, SEDIMENTS, SEAWATER, *NEANTHES ARENACEODENTATA,
0482 REMOTE SENSING, OIL SPILLS, MONITORING, SPREADING, MOVEMENT, ATLANTIC OCEAN, ARGO MERCHANT SPILL,
0508 REMOTE SENSING, OIL SPILLS, SHIPS, SURVEILLANCE, DESIGN-ENGINEERING, LAW ENFORCEMENT, ENVIRONMENTAL PROTECTION, USCG,
0510 REMOTE SENSING, OIL SLICKS, CONTAMINANTS, COASTS, EUROPE, *NIMBUS SATELLITE,
0511 REMOTE SENSING, OIL SLICKS, DETECTION, SURVEILLANCE, NATURAL SEEPAGE, SANTA BARBARA CHANNEL,
0512 REMOTE SENSING, POLLUTION CONTROL, OIL SPILLS, CLEANUP, LAW ENFORCEMENT, EPA,
0513 REMOTE SENSING, OIL SLICKS, DETECTION, SOURCE IDENTIFICATION, *MICROWAVE RADIOMETRY,
0514 REMOTE SENSING, OIL SLICKS, ESTUARIES, *FRONTS, DELAWARE BAY, DRIFT, SPREADING, MODELS,
0515 REMOTE SENSING, PLATFORMS, OIL SLICKS, DETECTION, NATURAL SEEPAGE, SANTA BARBARA CHANNEL, USCG, *SIDE-LOOKING RADAR,
0516 REMOTE SENSING, OIL SPILLS, DETECTION, SURVEILLANCE, USCG, *AIRBORNE COASTAL PATROL,
0517 REMOTE SENSING, OIL SPILLS, DETECTION, MARSHES, CONTAMINATION, *REMOTE LUMINESCENT SENSOR,
0518 REMOTE SENSING, OIL SPILLS, BEAUFORT SEA, *OPTICAL TECHNIQUES,
0519 REMOTE SENSING, REFINERIES, OIL SLICKS, WASTEWATERS, MONITORING,
0615 REMOTE SENSING, RECOVERY, OIL SPILLS, ARCTIC, CONTAINMENT, STORAGE, DISPOSAL,
0604 RESTORATION, OIL SPILLS, CLEANUP, CANADA, *MAYTON OIL SPILL,
0630 RESTORATION, OIL SPILLS, WILDLIFE, SOLVENTS, TOXICITY, *DETERGENTS,
0631 RESTORATION, OIL FIELDS, INLAND, CONTAMINATION, SOIL, *BRINES,
0632 RESTORATION, OIL SPILLS, SOIL, VEGETATION, *FORESTS,
0633 RESTORATION, PLANTS, OIL SPILLS, SOIL, BIODEGRADATION, *FERTILIZERS,
0634 RESTORATION, OIL SPILLS, SOIL, CANADA,
0635 RESTORATION, OIL SPILLS, BIRDS, CLEANUP, SOLVENTS, DELAWARE, *OLYMPIC GAMES SPILL,
0714 RESTORATION, RECOVERY, POLLUTION CONTROL, PERSONNEL TRAINING, OIL SPILLS, OIL INDUSTRY, CLEANUP,
0766 RESTORATION, OIL SPILLS, BIOLOGICAL EFFECTS, MARINE ORGANISMS, SAN FRANCISCO BAY,
0777 RESTORATION, CONSERVATION, BIRDS, AFRICA/SOUTH, *JACKASS PENGUIN,
0800 RESTORATION, OIL SPILLS, FUEL OIL, BIOLOGICAL EFFECTS, STREAMS, INVERTEBRATES, FISH,

NEW MEXICO,
0673 REUSE, REFINERIES, POLLUTION CONTROL, WASTEWATER TREATMENT, CONSERVATION, *WATER
0706 REUSE, RECYCLING, WASTE OIL, DISPOSAL, BIOLOGICAL EFFECTS,
0916 RHODE ISLAND, BIODEGRADATION, HYDROCARBONS, BACTERIA, SEDIMENTS, SEAWATER, NARRAGANSETT BAY,
0466 RIVERS, OIL SPILLS, WASTE OIL, ENVIRONMENTAL EFFECTS, VEGETATION, PENNSYLVANIA, *SCHUYLKILL SPILL,
0504 RIVERS, OIL SLICKS, MONITORING, DESIGN-ENGINEERING, *INFRARED SCANNING OIL SENSOR,
0572 RIVERS, OIL SPILLS, CONTAINMENT, DESIGN-ENGINEERING, *HYDROFOIL DEFLECTORS,
0575 RIVERS, OIL SPILLS, CONTAINMENT, BOOMS, CONTINGENCY PLANNING, CANADA, US, *DETROIT-ST. CLAIR RIVER SYSTEM,
0618 RIVERS, RECOVERY, OIL SPILLS, ABSORPTION, ESTUARIES, HARBORS, DESIGN-ENGINEERING, EPA, *OHMSETT,
0972 RIVERS, PAH, HYDROCARBONS, FATE, ESTUARIES, ATLANTIC COAST, ADSORPTION, BIODEGRADATION,
0486 SAMPLING, PAH, MONITORING, COASTS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, CARCINOGENS, *FLUORIMETRY, *COASTAL WATERS,
0490 SAMPLING, MONITORING, CONTAMINANTS, OCEANS, HYDROCARBONS, TAR, ANALYTICAL TECHNIQUES, MARINE ORGANISMS,
0495 SAMPLING, MONITORING, TAR, DISTRIBUTION, ATLANTIC OCEAN,
0520 SAMPLING, PACIFIC OCEAN, HYDROCARBONS, CHEMICAL ANALYSIS, *TANKER ROUTES,
0521 SAMPLING, PACIFIC OCEAN, HYDROCARBONS, DISTRIBUTION, *TANKER ROUTES,
0522 SAMPLING, HYDROCARBONS, SEDIMENTS, CHEMICAL ANALYSIS, SOURCES, DISTRIBUTION, MEXICO/GULF OF,
0523 SAMPLING, BENTHOS, ESTUARIES, WATER QUALITY, ALASKA, *EPIFAUNA,
0524 SAMPLING, OFFSHORE DEVELOPMENT, HYDROCARBONS, DISTRIBUTION, MICROORGANISMS, BACTERIA, TAR, SEDIMENTS, NORTH SEA,
0525 SAMPLING, HYDROCARBONS, *EXTRACTABLE ORGANICS, HARBORS, NEW YORK, CONTAMINATION, DISTRIBUTION,
0526 SAMPLING, HYDROCARBONS, SEDIMENTS, BENTHOS, UPTAKE, CHEMICAL ANALYSIS, TAR, *ABYSSAL DEPTHS,
0538 SAMPLING, HYDROCARBONS, OCEANS, CHEMICAL ANALYSIS,
0539 SAMPLING, HYDROCARBONS, SEDIMENTS, ALGAE, CHROMATOGRAPHY, MEXICO/GULF OF, MISSISSIPPI RIVER,
0565 SAMPLING, OIL SPILLS, SOURCE IDENTIFICATION, ANALYTICAL TECHNIQUES, CHROMATOGRAPHY, SPECTROSCOPY, USCG,
0946 SAMPLING, BIODEGRADATION, CRUDE OIL, BACTERIA, MONITORING, FATE,
0956 SAMPLING, OIL SPILLS, FATE, MOVEMENT, MONITORING, OCEANS, NOAA,
0960 SAMPLING, REFINERIES, HYDROCARBONS, MEDITERRANEAN SEA, *SURFACE MICROLAYER COMPOSITION,
0766 SAN FRANCISCO BAY, RESTORATION, OIL SPILLS, BIOLOGICAL EFFECTS, MARINE ORGANISMS,
0511 SANTA BARBARA CHANNEL, REMOTE SENSING, OIL SLICKS, DETECTION, SURVEILLANCE, NATURAL SEEPAGE,
0515 SANTA BARBARA CHANNEL, REMOTE SENSING, PLATFORMS, OIL SLICKS, DETECTION, NATURAL SEEPAGE, USCG, *SIDE-LOOKING RADAR,
0720 SANTA BARBARA CHANNEL, OIL SPILLS, CONTINGENCY PLANNING, FATE, ENVIRONMENTAL PROTECTION, *CLEAN SEAS INC,
0811 SANTA BARBARA CHANNEL, CRUDE OIL, NATURAL SEEPAGE, CHRONIC EFFECTS, MARINE ORGANISMS, MOLLUSKS,
0836 SANTA BARBARA CHANNEL, PLATFORMS, OFFSHORE DRILLING, BIOLOGICAL EFFECTS, MARINE ORGANISMS,
0905 SANTA BARBARA CHANNEL, OFFSHORE DRILLING, ENVIRONMENTAL EFFECTS, EIS, *AIR QUALITY IMPACTS,
0568 SARGASSO SEA, SOURCE IDENTIFICATION, HYDROCARBONS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, SPECTROMETRY, DISTRIBUTION,
0843 SCOTLAND, ONSHORE IMPACTS, OFFSHORE DEVELOPMENT, ECONOMIC EFFECTS,
0892 SCOTLAND, PIPELINES, OIL INDUSTRY, DEVELOPMENT, STORAGE, *SULLOM VOE TERMINAL,
0894 SCOTLAND, PLATFORMS, DEVELOPMENT, EIS, ENVIRONMENTAL EFFECTS,
0529 SEAWATER, HYDROCARBONS, CHEMICAL ANALYSIS, CHROMATOGRAPHY,
0553 SEAWATER, DISPERSANTS, CHEMICAL ANALYSIS, BIODEGRADATION,
0586 SEAWATER, OXIDATION, OIL SPILLS, CLEANUP, MOLLUSKS, *WATER PURIFICATION, *MUSSELS, *MYTILUS EDULIS,
0799 SEAWATER, RELEASE, AROMATIC HYDROCARBONS, MARINE ORGANISMS, UPTAKE,
0804 SEAWATER, RELEASE, POLYCHAETES, HYDROCARBONS, UPTAKE, METABOLISM, SEDIMENTS, *NEANTHES ARENACEODENTATA,
0864 SEAWATER, POLLUTION CONTROL, EXPLORATION,
0916 SEAWATER, RHODE ISLAND, BIODEGRADATION, HYDROCARBONS, BACTERIA, SEDIMENTS, NARRAGANSETT BAY,
0932 SEAWATER, BIODEGRADATION, HYDROCARBONS, MICROORGANISMS,
0933 SEAWATER, BIODEGRADATION, HYDROCARBONS, BACTERIA, *HEXADECANE, *ORGANIC SUBSTANCES,
0499 SEDIMENTS, MONITORING, CRUDE OIL, DETECTION, CHROMATOGRAPHY, *OIL-IN-WATER, *BIOLOGICAL MATERIALS,
0505 SEDIMENTS, MONITORING, HYDROCARBONS, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, CALIFORNIA/SOUTHERN,
0522 SEDIMENTS, SAMPLING, HYDROCARBONS, CHEMICAL ANALYSIS, SOURCES, DISTRIBUTION, MEXICO/GULF OF,
0524 SEDIMENTS, SAMPLING, OFFSHORE DEVELOPMENT, HYDROCARBONS, DISTRIBUTION, MICROORGANISMS,

BACTERIA, TAR, NORTH SEA,
0526 SEDIMENTS, SAMPLING, HYDROCARBONS, BENTHOS, UPTAKE, CHEMICAL ANALYSIS, TAR, *ABYSSAL DEPTHS,
0539 SEDIMENTS, SAMPLING, HYDROCARBONS, ALGAE, CHROMATOGRAPHY, MEXICO/GULF OF, MISSISSIPPI RIVER,
0546 SEDIMENTS, HYDROCARBONS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, SPECTROMETRY, INTERTIDAL ZONE, *WATER ANALYSIS,
0549 SEDIMENTS, DETECTION, HYDROCARBONS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, SOLVENTS, *N-PARAFFINS,
0560 SEDIMENTS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, SOURCES, HYDROCARBONS, DETECTION, LAKES, WASHINGTON,
0772 SEDIMENTS, OIL SPILLS, ENVIRONMENTAL EFFECTS, CONTAMINATION, MARINE ORGANISMS, CONTAINMENT, CLEANUP, MAINE, *TOMANO SPILL,
0773 SEDIMENTS, CRUDE OIL, BIOLOGICAL EFFECTS, MARINE ORGANISMS, ECOSYSTEMS, ALASKA,
0778 SEDIMENTS, RELEASE, PLATFORMS, HYDROCARBONS, MOLLUSKS, UPTAKE, TEXAS, *TRINITY BAY, *NAPHTHALENES, *CLAM, *RANGIA CUNEATA,
0802 SEDIMENTS, POLYCHAETES, CONTAMINATION, FUEL OIL, BIOLOGICAL EFFECTS, METABOLISM, *FEEDING ACTIVITY, *ARENICOLA MARINA,
0804 SEDIMENTS, SEAWATER, RELEASE, POLYCHAETES, HYDROCARBONS, UPTAKE, METABOLISM, *NEANTHES ARENACEODENTATA,
0808 SEDIMENTS, CRUDE OIL, BIOLOGICAL EFFECTS, MOLLUSKS, BEHAVIOR, CHEMICAL ANALYSIS, *CLAM, *MACOMA BALTHICA,
0838 SEDIMENTS, DRILLING, CORALS, *DRILL MUD, *CLEARING RATES,
0871 SEDIMENTS, OIL INDUSTRY, OFFSHORE PRODUCTION, ENVIRONMENTAL EFFECTS, HYDROCARBONS, MARINE ORGANISMS, LOUISIANA,
0916 SEDIMENTS, SEAWATER, RHODE ISLAND, BIODEGRADATION, HYDROCARBONS, BACTERIA, NARRAGANSETT BAY,
0931 SEDIMENTS, BIODEGRADATION, HYDROCARBONS, METABOLISM, MICROORGANISMS, MARINE ORGANISMS, BENTHOS,
0947 SEDIMENTS, OIL SPILLS, BIODEGRADATION, BACTERIA, CHESAPEAKE BAY, *COLGATE CREEK,
0976 SEDIMENTS, HYDROCARBONS, FATE, CRUDE OIL, BEHAVIOR, SOURCES, ENVIRONMENTAL EFFECTS,
0979 SEDIMENTS, PLANKTON, OIL SPILLS, BEACHES, FATE, MOVEMENT, BIOLOGICAL EFFECTS, BENTHOS, CHEDABUCTO BAY,
0980 SEDIMENTS, FUEL OIL, FATE, WEATHERING, HYDROCARBONS, METABOLISM, MOLLUSKS, CHEDABUCTO BAY,
0981 SEDIMENTS, HYDROCARBONS, DISTRIBUTION, LAKES,
0483 SHIPS, MONITORING, DETECTION, DESIGN-ENGINEERING, USCG, *OIL-IN-WATER,
0485 SHIPS, OIL SLICKS, MONITORING, SOLVENTS, SPECTROSCOPY, ABSORPTION, *LASER BEAM,
0494 SHIPS, MONITORING, CONTAMINATION, BALLAST, BILGES,
0506 SHIPS, OIL DISCHARGES, MONITORING, WASTEWATERS, DESIGN-ENGINEERING, USN, *OIL CONTENT,
0507 SHIPS, PATENT, OIL-WATER SEPARATION, MONITORING, WASTEWATERS, BILGES,
0508 SHIPS, REMOTE SENSING, OIL SPILLS, SURVEILLANCE, DESIGN-ENGINEERING, LAW ENFORCEMENT, ENVIRONMENTAL PROTECTION, USCG,
0636 SHIPS, POLLUTION PREVENTION, OIL-WATER SEPARATION, OIL TRANSPORT, OIL SPILLS, TANKERS,
0701 SHIPS, OIL-WATER SEPARATION, BILGES, DESIGN-ENGINEERING, USN,
0736 SHIPS, OFFSHORE PRODUCTION, ENVIRONMENTAL PROTECTION, TANKERS, INLAND, MONITORING,
0738 SHIPS, POLLUTION PREVENTION, OIL DISCHARGES, WASTE OIL TREATMENT, CLEANUP, MONITORING, USN,
0739 SHIPS, POLLUTION PREVENTION, OIL-WATER SEPARATION, OIL SPILLS, INTERNATIONAL CONVENTIONS, CONTINGENCY PLANNING, IMCO,
0992 SHIPS, REGULATIONS, OIL TRANSFER, OIL DISCHARGES, US, BILGES, USCG,
1001 SHIPS, POLLUTION PREVENTION, OIL SPILLS, OFFSHORE DRILLING, BIBLIOGRAPHIES, LEGISLATION, US, INTERNATIONAL AGREEMENTS, OCEANS,
0735 SHORELINES, POLLUTION PREVENTION, OIL SPILLS, ENVIRONMENTAL PROTECTION, MARSHES,
0825 SHORELINES, PORTUGAL, OIL SPILLS, ENVIRONMENTAL EFFECTS, HYDROCARBONS, CLEANUP, DISPERSANTS,
0830 SHORELINES, CONTAMINATION, JAPAN, DEVELOPMENT, ENVIRONMENTAL EFFECTS, MARINE ORGANISMS,
0967 SHORELINES, OIL SPILLS, OCS, MODELS, DRIFT, BEAUFORT SEA, *STORM MODELING,
0577 SKIMMERS, RECOVERY, PUGET SOUND, OIL SPILLS, DESIGN-ENGINEERING,
0580 SKIMMERS, OIL SPILLS, CLEANUP, USCG, ARGO MERCHANT SPILL,
0581 SKIMMERS, OIL SPILLS, MONITORING, CLEANUP, MEDITERRANEAN SEA,
0582 SKIMMERS, RECOVERY, OIL-WATER SEPARATION, OIL SLICKS,
0584 SKIMMERS, OIL SPILLS, CLEANUP, CONTAINMENT, DESIGN-ENGINEERING, ALASKA/GULF OF, COST ANALYSIS,
0592 SKIMMERS, RECOVERY, PATENT, OIL SLICKS, DESIGN-ENGINEERING,
0596 SKIMMERS, RECOVERY, PATENT, OIL SLICKS, DESIGN-ENGINEERING,
0598 SKIMMERS, RECOVERY, OIL-WATER SEPARATION, OIL SPILLS, BOOMS, DESIGN-ENGINEERING, *OHMSETT,
0600 SKIMMERS, RECOVERY, OIL SPILLS, DESIGN-ENGINEERING, USCG,
0602 SKIMMERS, RECOVERY, OIL SPILLS, BOOMS, STORAGE, FRANCE,
0608 SKIMMERS, RECOVERY, OIL SPILLS, BOOMS, CONTAINMENT, DESIGN-ENGINEERING, USCG,
0609 SKIMMERS, OIL SPILLS, CLEANUP, HARBORS, USN, *DEBRIS HANDLING SYSTEM,
0610 SKIMMERS, RECOVERY, PATENT, OIL SLICKS, DESIGN-ENGINEERING,
0620 SKIMMERS, RECOVERY, OIL-WATER SEPARATION, OIL SPILLS, CRUDE OIL, FUEL OIL, CANADA,

0621 SKIMMERS, RECOVERY, OIL SPILLS, EMULSIFICATION, CANADA,
0623 SKIMMERS, RECOVERY, OIL-WATER SEPARATION, OIL SPILLS, DESIGN-ENGINEERING,
0624 SKIMMERS, RECOVERY, OIL SPILLS, CONTAINMENT, BOOMS, EPA, *OHMSETT,
0625 SKIMMERS, RECOVERY, PATENT, OIL SPILLS, DESIGN-ENGINEERING,
0627 SKIMMERS, OIL SPILLS, CLEANUP, BOOMS, SURFACTANTS, ABSORPTION, DESIGN-ENGINEERING, USN,
0629 SKIMMERS, RECOVERY, PATENT, OIL SLICKS, DESIGN-ENGINEERING,
0655 SOCIAL EFFECTS, PORTS, PACIFIC OCEAN, OIL TRANSPORT, OIL SPILLS, STORAGE, ENVIRONMENTAL EFFECTS, *PALAU, *SUPERPORT,
0820 SOCIAL EFFECTS, OIL SPILLS, ECONOMIC EFFECTS, FISHERIES, CARIBBEAN SEA, *GUATEMALA,
0638 SOCIO-ECONOMIC EFFECTS, PORTS, OFFSHORE DEVELOPMENT, TANKERS, ENVIRONMENTAL EFFECTS, *DEEPWATER TERMINALS,
0639 SOCIO-ECONOMIC EFFECTS, PORTS, OIL SPILLS, ENVIRONMENTAL EFFECTS, COASTS, *DEEPWATER PORTS,
0642 SOCIO-ECONOMIC EFFECTS, PORTS, OIL TRANSFER, FLORIDA, MEXICO/GULF OF, ENVIRONMENTAL EFFECTS, LEGISLATION, *DEEPWATER PORTS,
0841 SOCIO-ECONOMIC EFFECTS, OFFSHORE DEVELOPMENT, OCS, ALASKA,
0854 SOCIO-ECONOMIC EFFECTS, OFFSHORE DEVELOPMENT, OCS, COASTS, ENVIRONMENTAL EFFECTS, MEXICO/GULF OF,
0887 SOCIO-ECONOMIC EFFECTS, ONSHORE IMPACTS, OFFSHORE EXPLORATION, OFFSHORE DEVELOPMENT, FLORIDA,
0888 SOCIO-ECONOMIC EFFECTS, REFINERIES, PORTS, ONSHORE IMPACTS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, COASTS, FLORIDA, GUIDELINES,
0899 SOCIO-ECONOMIC EFFECTS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, ATLANTIC OCEAN,
0558 SOIL, PAH, CHEMICAL ANALYSIS, CHROMATOGRAPHY, HYDROCARBONS, *THIN-LAYER CHROMATOGRAPHY,
0631 SOIL, RESTORATION, OIL FIELDS, INLAND, CONTAMINATION, *BRINES,
0632 SOIL, RESTORATION, OIL SPILLS, VEGETATION, *FORESTS,
0633 SOIL, RESTORATION, PLANTS, OIL SPILLS, BIODEGRADATION, *FERTILIZERS,
0634 SOIL, RESTORATION, OIL SPILLS, CANADA,
0727 SOIL, POLLUTION PREVENTION, PATENT, OIL TANKS, LEAKAGE, STORAGE, DESIGN-ENGINEERING,
0782 SOIL, OIL SPILLS, BIOLOGICAL EFFECTS, VEGETATION, MICROORGANISMS, CANADA,
0909 SOIL, OXIDATION, BIODEGRADATION, HYDROCARBONS, MICROORGANISMS, *OXYGEN UPTAKE RATE,
0912 SOIL, OIL WELLS, BIODEGRADATION, WASTE OIL, BACTERIA, *PETROLEUM WASTE,
0914 SOIL, OIL SPILLS, BIODEGRADATION, FATE, ENVIRONMENTAL EFFECTS,
0934 SOIL, BIODEGRADATION, FUEL OIL, BACTERIA,
0935 SOIL, OIL SPILLS, BIODEGRADATION, DECOMPOSITION, MICROORGANISMS, MODELS, *NUTRIENT DEMAND,
0944 SOIL, BIODEGRADATION, HYDROCARBONS, MONITORING, MODELS,
0657 SOLID WASTES, WASTE OIL DISPOSAL, INCINERATION, *LIQUID WASTES,
0662 SOLID WASTES, RECYCLING, OIL INDUSTRY, ECONOMICS, WASTEWATERS, WASTE OIL, DISPOSAL,
0729 SOLID WASTES, REFINERIES, POLLUTION CONTROL, PLANTS, *NATURAL GAS MONITORING, WASTEWATERS,
0850 SOLID WASTES, PRODUCTION, OIL SHALE, EXTRACTION, ENVIRONMENTAL EFFECTS, WASTEWATERS,
0872 SOLID WASTES, OIL SHALE, DEVELOPMENT, ENVIRONMENTAL EFFECTS, *LIQUID WASTES, *LEACHING,
0536 SOLUBILITY, AROMATIC HYDROCARBONS, CHEMICAL ANALYSIS,
0556 SOLUBILITY, CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, *ALKYLBENZENES,
0950 SOLUTION, OIL SPILLS, HYDROCARBONS, EVAPORATION,
0969 SOLUTION, OIL SPILLS, MODELS, FATE, HYDROCARBONS, SPREADING, EMULSIFICATION, ADSORPTION, DECOMPOSITION,
0974 SOLUTION, OIL SPILLS, FATE, ARCTIC, CRUDE OIL, EVAPORATION, WEATHERING, EMULSIFICATION, TAR,
0975 SOLUTION, OIL SPILLS, CRUDE OIL, WEATHERING, TAR, EVAPORATION, *SULFUR COMPOUNDS,
0485 SOLVENTS, SHIPS, OIL SLICKS, MONITORING, SPECTROSCOPY, ABSORPTION, *LASER BEAM,
0549 SOLVENTS, SEDIMENTS, DETECTION, HYDROCARBONS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, *N-PARAFFINS,
0564 SOLVENTS, ANALYTICAL TECHNIQUES, SPECTROMETRY, EXTRACTION, *DETERGENTS, *OIL-IN-WATER,
0630 SOLVENTS, RESTORATION, OIL SPILLS, WILDLIFE, TOXICITY, *DETERGENTS,
0635 SOLVENTS, RESTORATION, OIL SPILLS, BIRDS, CLEANUP, DELAWARE, *OLYMPIC GAMES SPILL,
0505 SOURCE IDENTIFICATION, SEDIMENTS, MONITORING, HYDROCARBONS, CHEMICAL ANALYSIS, CALIFORNIA/SOUTHERN,
0513 SOURCE IDENTIFICATION, REMOTE SENSING, OIL SLICKS, DETECTION, *MICROWAVE RADIOMETRY,
0561 SOURCE IDENTIFICATION, REGULATIONS, REFINERIES, CHEMICAL ANALYSIS, HYDROCARBONS, WASTEWATERS, *SEWAGE, *URBAN RUNOFF, DELAWARE,
0565 SOURCE IDENTIFICATION, SAMPLING, OIL SPILLS, ANALYTICAL TECHNIQUES, CHROMATOGRAPHY, SPECTROSCOPY, USCG,
0566 SOURCE IDENTIFICATION, PAH, OIL SPILLS, INCINERATION, CHEMICAL ANALYSIS,
0567 SOURCE IDENTIFICATION, POLLUTION PREVENTION, OIL TRANSPORT, OIL SPILLS, ANALYTICAL TECHNIQUES, USCG,
0568 SOURCE IDENTIFICATION, SARGASSO SEA, HYDROCARBONS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, SPECTROMETRY, DISTRIBUTION,
1000 SOURCE IDENTIFICATION, OIL SPILLS, BIBLIOGRAPHIES, ANALYTICAL TECHNIQUES, SPECTROSCOPY, SPECTROMETRY, CHROMATOGRAPHY,
0468 SOURCES, OIL DISCHARGES, STATISTICAL ANALYSIS, *OIL INPUT, OCEANS, CRUDE OIL, WASTE OIL, TANKERS, NATURAL SEEPAGE,
0469 SOURCES, HYDROCARBONS, OCEANS, NATURAL SEEPAGE, *BIOGENIC HYDROCARBONS, *INPUT ESTIMATES,

0472 SOURCES, REFINERIES, HYDROCARBONS, DISTRIBUTION, INDUSTRIES, *MUNICIPAL DISCHARGES, *RUNOFF,
0481 SOURCES, OIL DISCHARGES, US, USCG, *CAUSES,
0522 SOURCES, SEDIMENTS, SAMPLING, HYDROCARBONS, CHEMICAL ANALYSIS, DISTRIBUTION, MEXICO/GULF OF,
0532 SOURCES, HYDROCARBONS, ZOOPLANKTON, CHEMICAL ANALYSIS, DISTRIBUTION, MEXICO/GULF OF, *BIOGENIC HYDROCARBONS,
0560 SOURCES, SEDIMENTS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, HYDROCARBONS, DETECTION, LAKES, WASHINGTON,
0731 SOURCES, REFINING, POLLUTION PREVENTION, OIL INDUSTRY,
0826 SOURCES, RECOVERY, OIL SPILLS, ENVIRONMENTAL EFFECTS, BIODEGRADATION, CLEANUP, *BOOK REVIEW,
0976 SOURCES, SEDIMENTS, HYDROCARBONS, FATE, CRUDE OIL, BEHAVIOR, ENVIRONMENTAL EFFECTS,
1003 SOURCES, PAH, BIBLIOGRAPHIES, FATE, ANALYTICAL TECHNIQUES, CHROMATOGRAPHY, SPECTROSCOPY, CARCINOGENS, CRUDE OIL,
0460 SPAIN, OIL SPILLS, CONTAMINATION, COASTS, *SHELLFISH, *URQUIOLA SPILL,
0531 SPECTROMETRY, REFINERIES, WASTEWATERS, ANALYTICAL TECHNIQUES, CHROMATOGRAPHY,
0546 SPECTROMETRY, SEDIMENTS, HYDROCARBONS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, INTERTIDAL ZONE, *WATER ANALYSIS,
0563 SPECTROMETRY, PETROLEUM PRODUCTS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, CRUDE OIL, HYDROCARBONS, EVAPORATION, *WATER SOLUBLE FRACTIONS,
0564 SPECTROMETRY, SOLVENTS, ANALYTICAL TECHNIQUES, EXTRACTION, *DETERGENTS, *OIL-IN-WATER,
0568 SPECTROMETRY, SOURCE IDENTIFICATION, SARGASSO SEA, HYDROCARBONS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, DISTRIBUTION,
1000 SPECTROMETRY, SOURCE IDENTIFICATION, OIL SPILLS, BIBLIOGRAPHIES, ANALYTICAL TECHNIQUES, SPECTROSCOPY, CHROMATOGRAPHY,
0485 SPECTROSCOPY, SOLVENTS, SHIPS, OIL SLICKS, MONITORING, ABSORPTION, *LASER BEAM,
0527 SPECTROSCOPY, OIL SLICKS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, DETECTION,
0565 SPECTROSCOPY, SOURCE IDENTIFICATION, SAMPLING, OIL SPILLS, ANALYTICAL TECHNIQUES, CHROMATOGRAPHY, USCG,
1000 SPECTROSCOPY, SPECTROMETRY, SOURCE IDENTIFICATION, OIL SPILLS, BIBLIOGRAPHIES, ANALYTICAL TECHNIQUES, CHROMATOGRAPHY,
1003 SPECTROSCOPY, SOURCES, PAH, BIBLIOGRAPHIES, FATE, ANALYTICAL TECHNIQUES, CHROMATOGRAPHY, CARCINOGENS, CRUDE OIL,
0461 SPREADING, OIL SPILLS, CRUDE OIL, TANKERS, MOVEMENT, CLEANUP, DISPERSANTS, BEACHES, JAPAN,
0482 SPREADING, REMOTE SENSING, OIL SPILLS, MONITORING, MOVEMENT, ATLANTIC OCEAN, ARGO MERCHANT SPILL,
0514 SPREADING, REMOTE SENSING, OIL SLICKS, ESTUARIES, *FRONTS, DELAWARE BAY, DRIFT, MODELS,
0840 SPREADING, PLATFORMS, OIL TRANSPORT, OFFSHORE EXPLORATION, CONTAMINANTS, DISPERSIONS,
0949 SPREADING, CRUDE OIL, ICE, *OIL-ON-ICE,
0959 SPREADING, OIL SPILLS, CRUDE OIL, CLEANUP, DISPERSANTS, EMULSIFICATION, WEATHERING,
0968 SPREADING, OIL SPILLS, MODELS, HARBORS, DRIFT, NEW YORK,
0969 SPREADING, SOLUTION, OIL SPILLS, MODELS, FATE, HYDROCARBONS, EMULSIFICATION, ADSORPTION, DECOMPOSITION,
0970 SPREADING, OIL SPILLS, MODELS, HYDROCARBONS, OCEANS, FATE, EVAPORATION, BIODEGRADATION,
0982 SPREADING, OIL SPILLS, FATE, MODELS, DRIFT, DELAWARE BAY,
0983 SPREADING, OIL SLICKS, ICE, *CURRENT,
0716 ST. LAWRENCE RIVER, OIL SPILLS, CONTINGENCY PLANNING, US, CANADA,
0717 ST. LAWRENCE RIVER, OIL SPILLS, CONTINGENCY PLANNING, ENVIRONMENTAL EFFECTS, CLEANUP,
0468 STATISTICAL ANALYSIS, SOURCES, OIL DISCHARGES, *OIL INPUT, OCEANS, CRUDE OIL, WASTE OIL, TANKERS, NATURAL SEEPAGE,
0477 STATISTICAL ANALYSIS, OIL SPILLS, US, MODELS, GREAT LAKES , COASTS, *DISCRIMINANT ANALYSIS,
0648 STATISTICAL ANALYSIS, REGULATIONS, POLLUTION PREVENTION, OIL TRANSFER, OIL DISCHARGES, USCG,
0653 STATISTICAL ANALYSIS, PIPELINES, OIL TRANSPORT, OIL SPILLS, TANKERS,
0823 STATISTICAL ANALYSIS, OIL SPILLS, MODELS, FATE, MOVEMENT, CLEANUP, COST ANALYSIS,
0952 STATISTICAL ANALYSIS, PIPELINES, OIL SPILLS, BEHAVIOR, WEATHERING, CANADA, INLAND,
0462 STATISTICS, PIPELINES, OIL SPILLS, OFFSHORE DEVELOPMENT, TANKERS, *SPILL PREDICTIONS,
0464 STATISTICS, OIL DISCHARGES, US, INFORMATION SYSTEMS,
0465 STATISTICS, PIPELINES, OIL SPILLS, *SALT WATER SPILLS, CANADA, *ALBERTA,
0602 STORAGE, SKIMMERS, RECOVERY, OIL SPILLS, BOOMS, FRANCE,
0615 STORAGE, REMOTE SENSING, RECOVERY, OIL SPILLS, ARCTIC, CONTAINMENT, DISPOSAL,
0643 STORAGE, CRUDE OIL, ENVIRONMENTAL EFFECTS, EIS, LOUISIANA, *BAYOU CHOCTAW SALT DOMES,
0644 STORAGE, CRUDE OIL, ENVIRONMENTAL EFFECTS, EIS, LOUISIANA, *COTE BLANCHE MINE,
0645 STORAGE, CRUDE OIL, ENVIRONMENTAL EFFECTS, EIS, LOUISIANA, *WEEKS ISLAND MINE,
0655 STORAGE, SOCIAL EFFECTS, PORTS, PACIFIC OCEAN, OIL TRANSPORT, OIL SPILLS, ENVIRONMENTAL EFFECTS, *PALAU, *SUPERPORT,
0656 STORAGE, OIL SPILLS, CRUDE OIL, ENVIRONMENTAL EFFECTS, GROUNDWATER, VEGETATION, LOUISIANA, TEXAS, *SALT DOMES,
0704 STORAGE, PETROCHEMICALS, DISPOSAL, WASTE OIL, MANUALS, USN,
0727 STORAGE, SOIL, POLLUTION PREVENTION, PATENT, OIL TANKS, LEAKAGE, DESIGN-ENGINEERING,
0730 STORAGE, POLLUTION PREVENTION, PETROLEUM PRODUCTS, OIL SPILLS, CONTINGENCY PLANNING,

*OIL STORAGE PLAN,
0732 STORAGE, POLLUTION PREVENTION, OIL SPILLS, OCEANS, ENVIRONMENTAL EFFECTS,
0892 STORAGE, SCOTLAND, PIPELINES, OIL INDUSTRY, DEVELOPMENT, *SULLOM VOE TERMINAL,
0996 STORAGE, PRODUCTION, POLLUTION CONTROL, OIL-WATER SEPARATION, GUIDELINES, WASTEWATER TREATMENT, DISTRIBUTION,
0800 STREAMS, RESTORATION, OIL SPILLS, FUEL OIL, BIOLOGICAL EFFECTS, INVERTEBRATES, FISH, NEW MEXICO,
0780 SUBARCTIC REGIONS, CRUDE OIL, TOXICITY, ALGAE, VEGETATION, LAKES,
0616 SURFACTANTS, OIL TANKS, TANKERS, CLEANUP,
0627 SURFACTANTS, SKIMMERS, OIL SPILLS, CLEANUP, BOOMS, ABSORPTION, DESIGN-ENGINEERING, USN,
0467 SURVEILLANCE, POLLUTION PREVENTION, OIL SPILLS, BIOLOGICAL EFFECTS, CLEANUP, INTERNATIONAL AGREEMENTS,
0498 SURVEILLANCE, MONITORING, HYDROCARBONS, OCEANS, DISTRIBUTION,
0501 SURVEILLANCE, POLLUTION CONTROL, OIL SPILLS, MONITORING, HYDROCARBONS, GOVERNMENT AGENCIES, EPA, USGS, USCG, *UN,
0508 SURVEILLANCE, SHIPS, REMOTE SENSING, OIL SPILLS, DESIGN-ENGINEERING, LAW ENFORCEMENT, ENVIRONMENTAL PROTECTION, USCG,
0511 SURVEILLANCE, SANTA BARBARA CHANNEL, REMOTE SENSING, OIL SLICKS, DETECTION, NATURAL SEEPAGE,
0516 SURVEILLANCE, REMOTE SENSING, OIL SPILLS, DETECTION, USCG, *AIRBORNE COASTAL PATROL,
0450 TANKERS, REGULATIONS, OIL SPILLS, TAR, ARGO MERCHANT SPILL, *LIBERIAN TANKERS,
0451 TANKERS, OIL TANKS, CLEANUP, *EXPLOSIONS, *SAFETY SYSTEMS,
0452 TANKERS, OIL INDUSTRY, DEVELOPMENT, CALIFORNIA/SOUTHERN, *SANSINENA EXPLOSION,
0457 TANKERS, OIL SPILLS, ATLANTIC COAST, ENVIRONMENTAL EFFECTS, ARGO MERCHANT SPILL,
0456 TANKERS, OIL SPILLS, CLEANUP, ARGO MERCHANT SPILL, *OLYMPIC GAMES SPILL, *SANSINENA SPILL,
0457 TANKERS, OIL SPILLS, ATLANTIC COAST, ENVIRONMENTAL EFFECTS, ARGO MERCHANT SPILL,
0459 TANKERS, OIL SPILLS, ENVIRONMENTAL EFFECTS, CLEANUP, ALASKA, *COLD BAY,
0461 TANKERS, SPREADING, OIL SPILLS, CRUDE OIL, MOVEMENT, CLEANUP, DISPERSANTS, BEACHES, JAPAN,
0462 TANKERS, STATISTICS, PIPELINES, OIL SPILLS, OFFSHORE DEVELOPMENT, *SPILL PREDICTIONS,
0468 TANKERS, STATISTICAL ANALYSIS, SOURCES, OIL DISCHARGES, *OIL INPUT, OCEANS, CRUDE OIL, WASTE OIL, NATURAL SEEPAGE,
0480 TANKERS, OIL SPILLS, ENVIRONMENTAL EFFECTS, CLEANUP, ARGO MERCHANT SPILL,
0489 TANKERS, OIL DISCHARGES, MONITORING, BALLAST, DESIGN-ENGINEERING,
0583 TANKERS, PIPELINES, OIL SPILLS, CLEANUP, ECONOMICS, ALASKA, *OIL SPILL FUND,
0616 TANKERS, SURFACTANTS, OIL TANKS, CLEANUP,
0636 TANKERS, SHIPS, POLLUTION PREVENTION, OIL-WATER SEPARATION, OIL TRANSPORT, OIL SPILLS,
0637 TANKERS, POLLUTION CONTROL, OIL SPILLS, OFFSHORE DRILLING, METULA SPILL, ENVIRONMENTAL PROTECTION,
0638 TANKERS, SOCIO-ECONOMIC EFFECTS, PORTS, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, *DEEPWATER TERMINALS,
0640 TANKERS, REGULATIONS, PUGET SOUND, OIL TRANSPORT, LAW ENFORCEMENT, WASHINGTON,
0647 TANKERS, OIL DISCHARGES, WASTEWATER TREATMENT, *SLOP TANK,
0650 TANKERS, REGULATIONS, POLLUTION CONTROL, OIL TRANSPORT, OIL SPILLS, ECONOMICS, *STANDARDS,
0652 TANKERS, REGULATIONS, OIL SPILLS, US, INTERNATIONAL AGREEMENTS,
0653 TANKERS, STATISTICAL ANALYSIS, PIPELINES, OIL TRANSPORT, OIL SPILLS,
0694 TANKERS, WASTEWATER TREATMENT, BALLAST, MOLLUSKS, *MYTILUS GALLOPROVINCIALIS,
0736 TANKERS, SHIPS, OFFSHORE PRODUCTION, ENVIRONMENTAL PROTECTION, INLAND, MONITORING,
0737 TANKERS, OIL SPILLS, ENVIRONMENTAL PROTECTION, COLOMBIA, IMCO,
0816 TANKERS, OIL SPILLS, TOXICITY, MARINE ORGANISMS, *NANNOPLANKTERS,
0821 TANKERS, OIL SPILLS, TOXICITY, FATE, HYDROCARBONS, ARGO MERCHANT SPILL,
0824 TANKERS, OIL SPILLS, FATE, ENVIRONMENTAL EFFECTS, MODELS, WILDLIFE, ECONOMIC EFFECTS, *WORLD WAR II SPILLS,
0828 TANKERS, OIL SPILLS, ARGO MERCHANT SPILL, HYDROCARBONS, FATE, TOXICITY,
0833 TANKERS, REGULATIONS, OIL SPILLS, ARGO MERCHANT SPILL, LAW ENFORCEMENT,
0897 TANKERS, OIL TRANSPORT, OIL SPILLS, OFFSHORE DRILLING, OCS, BLOWOUT PREVENTION, ATLANTIC COAST, CALIFORNIA COAST, MEXICO/GULF OF,
0965 TANKERS, METULA SPILL, FATE, ENVIRONMENTAL EFFECTS, BEACHES, ESTUARIES, MARINE ORGANISMS, MAGELLAN/STRAIT OF,
0998 TANKERS, REGULATIONS, POLLUTION PREVENTION, INTERNATIONAL CONVENTIONS, IMCO,
0450 TAR, TANKERS, REGULATIONS, OIL SPILLS, ARGO MERCHANT SPILL, *LIBERIAN TANKERS,
0490 TAR, SAMPLING, MONITORING, CONTAMINANTS, OCEANS, HYDROCARBONS, ANALYTICAL TECHNIQUES, MARINE ORGANISMS,
0495 TAR, SAMPLING, MONITORING, DISTRIBUTION, ATLANTIC OCEAN,
0524 TAR, SEDIMENTS, SAMPLING, OFFSHORE DEVELOPMENT, HYDROCARBONS, DISTRIBUTION, MICROORGANISMS, BACTERIA, NORTH SEA,
0526 TAR, SEDIMENTS, SAMPLING, HYDROCARBONS, BENTHOS, UPTAKE, CHEMICAL ANALYSIS, *ABYSSAL DEPTHS,
0793 TAR, INTERTIDAL ZONE, MARINE ORGANISMS, BIOLOGICAL EFFECTS, HYDROCARBONS, BERMUDA,
0957 TAR, OXIDATION, OIL SPILLS, CRUDE OIL, FATE, EVAPORATION, DISPERSIONS, BIODEGRADATION,
0974 TAR, SOLUTION, OIL SPILLS, FATE, ARCTIC, CRUDE OIL, EVAPORATION, WEATHERING, EMULSIFICATION,
0975 TAR, SOLUTION, OIL SPILLS, CRUDE OIL, WEATHERING, EVAPORATION, *SULFUR COMPOUNDS,

0599 TEXAS, POLLUTION CONTROL, OIL SPILLS, CLEANUP, ECONOMICS, *CORPUS CHRISTI,
0656 TEXAS, STORAGE, OIL SPILLS, CRUDE OIL, ENVIRONMENTAL EFFECTS, GROUNDWATER, VEGETATION, LOUISIANA, *SALT DOMES,
0710 TEXAS, POLLUTION PREVENTION, PERSONNEL TRAINING, OIL SPILLS, CLEANUP, CONTINGENCY PLANNING,
0713 TEXAS, PERSONNEL TRAINING, OIL SPILLS, *SPILL CONTROL COURSE,
0778 TEXAS, SEDIMENTS, RELEASE, PLATFORMS, HYDROCARBONS, MOLLUSKS, UPTAKE, *TRINITY BAY, *NAPHTHALENES, *CLAM, *RANGIA CUNEATA,
0587 TOXICITY, OIL SPILLS, DISPERSANTS, CLEANUP, BIODEGRADATION,
0606 TOXICITY, OIL SPILLS, DISPERSANTS, CLEANUP, EPA,
0630 TOXICITY, SOLVENTS, RESTORATION, OIL SPILLS, WILDLIFE, *DETERGENTS,
0760 TOXICITY, FUEL OIL, CRUDE OIL, WASTE OIL, METABOLISM, BENTHOS, ALGAE,
0761 TOXICITY, CRUDE OIL, CRUSTACEANS, ALASKA, *WATER SOLUBLE FRACTIONS, *LARVAL STAGES, *SHRIMP, *CRABS,
0763 TOXICITY, CRUDE OIL, CRUSTACEANS, *WATER-SOLUBLE FRACTIONS, *CANCER MAGISTER DANA,
0769 TOXICITY, REFINERIES, WASTEWATERS, FISH, *AQUATIC LIFE, CANADA,
0780 TOXICITY, SUBARCTIC REGIONS, CRUDE OIL, ALGAE, VEGETATION, LAKES,
0784 TOXICITY, PETROLEUM PRODUCTS, CRUDE OIL, HYDROCARBONS, MARINE ORGANISMS, ECOSYSTEMS,
0785 TOXICITY, PHYTOPLANKTON, PETROLEUM PRODUCTS, FUELS,
0790 TOXICITY, REFINERIES, WASTEWATERS, FRESHWATER, FISH, INVERTEBRATES, *LETHAL CONCENTRATION,
0796 TOXICITY, PETROLEUM PRODUCTS, HYDROCARBONS,
0798 TOXICITY, PETROLEUM PRODUCTS, AROMATIC HYDROCARBONS, MARINE ORGANISMS, *SUBLETHAL EFFECTS, *RESPIRATION, *GROWTH,
0803 TOXICITY, CRUDE OIL, FUEL OIL, MARINE ORGANISMS, ALASKA, FISH, INVERTEBRATES, INTERTIDAL ZONE,
0807 TOXICITY, FUEL OIL, MARINE ORGANISMS, ESTUARIES, DELAWARE, *ULTRA-VIOLET RADIATION,
0809 TOXICITY, CRUDE OIL, *NAPHTHALENE, FRESHWATER, ALGAE, METABOLISM, *CHLAMYDOMONAS ANGULOSA,
0816 TOXICITY, TANKERS, OIL SPILLS, MARINE ORGANISMS, *NANNOPLANKTERS,
0818 TOXICITY, POLLUTION CONTROL, OIL SPILLS, ECONOMIC EFFECTS, *SHELL OIL CO.,
0821 TOXICITY, TANKERS, OIL SPILLS, FATE, HYDROCARBONS, ARGO MERCHANT SPILL,
0828 TOXICITY, TANKERS, OIL SPILLS, ARGO MERCHANT SPILL, HYDROCARBONS, FATE,
0863 TOXICITY, OFFSHORE PRODUCTION, ENVIRONMENTAL EFFECTS, CONTAMINATION, MARINE ORGANISMS, *PRODUCED WATERS,
0891 TOXICITY, PUGET SOUND, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, MEXICO/GULF OF, FATE, HYDROCARBONS, MARINE ORGANISMS, NOAA,
0955 TOXICITY, OXIDATION, FUEL OIL, YEASTS, *HYDROPEROXIDES,
0971 TOXICITY, OIL SPILLS, FATE, CONTAMINATION, MARINE ORGANISMS, API,
0767 TROPICAL REGIONS, OIL SPILLS, BIOLOGICAL EFFECTS, MARINE ORGANISMS, INTERTIDAL ZONE, MARSHES, CORAL REEFS, FLORIDA COAST,
0792 TROPICAL REGIONS, PLANTS, FUEL OIL, BIOLOGICAL EFFECTS, MALAYSIA, *PIONEER MANGROVE, *AVICENNIA INTERMEDIA,
0797 TROPICAL REGIONS, PUERTO RICO, OIL SPILLS, BIOLOGICAL EFFECTS, CONTAMINATION, MARINE ORGANISMS, COASTS, *MANGROVES, *TURTLE GRASS,
0449 UK, CONTAMINATION, BIRDS, COASTS, *MORTALITY,
0848 UK, OFFSHORE DEVELOPMENT, LIABILITY, EUROPE, FRANCE, DENMARK, NORWAY, *POLLUTION DAMAGE,
0526 UPTAKE, TAR, SEDIMENTS, SAMPLING, HYDROCARBONS, BENTHOS, CHEMICAL ANALYSIS, *ABYSSAL DEPTHS,
0771 UPTAKE, RELEASE, FISH, *NAPHTHALENES, DISTRIBUTION, *STRESS BEHAVIOR, *FUNDULUS SIMILUS,
0778 UPTAKE, TEXAS, SEDIMENTS, RELEASE, PLATFORMS, HYDROCARBONS, MOLLUSKS, *TRINITY BAY, *NAPHTHALENES, *CLAM, *RANGIA CUNEATA,
0789 UPTAKE, RELEASE, AROMATIC HYDROCARBONS, MOLLUSKS, *MODIOLUS DEMISSUS, *CRASSOSTREA VIRGINICA, *PETRO-SULFUR COMPOUNDS,
0799 UPTAKE, SEAWATER, RELEASE, AROMATIC HYDROCARBONS, MARINE ORGANISMS,
0804 UPTAKE, SEDIMENTS, SEAWATER, RELEASE, POLYCHAETES, HYDROCARBONS, METABOLISM, *NEANTHES ARENACEODENTATA,
0805 UPTAKE, POLYCHAETES, HYDROCARBONS, FUEL OIL, BIOLOGICAL EFFECTS, METABOLISM, *NEANTHES ARENACEODENTATA,
0464 US, STATISTICS, OIL DISCHARGES, INFORMATION SYSTEMS,
0477 US, STATISTICAL ANALYSIS, OIL SPILLS, MODELS, GREAT LAKES , COASTS, *DISCRIMINANT ANALYSIS,
0481 US, SOURCES, OIL DISCHARGES, USCG, *CAUSES,
0575 US, RIVERS, OIL SPILLS, CONTAINMENT, BOOMS, CONTINGENCY PLANNING, CANADA, *DETROIT-ST. CLAIR RIVER SYSTEM,
0652 US, TANKERS, REGULATIONS, OIL SPILLS, INTERNATIONAL AGREEMENTS,
0716 US, ST. LAWRENCE RIVER, OIL SPILLS, CONTINGENCY PLANNING, CANADA,
0834 US, REGULATIONS, POLLUTION CONTROL, ENVIRONMENTAL EFFECTS, LEGISLATION,
0845 US, REGULATIONS, OIL INDUSTRY, OFFSHORE DEVELOPMENT, ENVIRONMENTAL EFFECTS, FISHERIES,
0985 US, POLLUTION CONTROL, OFFSHORE DEVELOPMENT, OCS, LEGISLATION, ENVIRONMENTAL EFFECTS, ECONOMICS, DELAWARE,
0988 US, REFINERIES, POLLUTION CONTROL, OIL INDUSTRY, LEGISLATION, ECONOMIC EFFECTS,
0991 US, OIL SPILLS, LEGISLATION, LIABILITY, COMPENSATION, *SUPER-FUND,

0992 US, SHIPS, REGULATIONS, OIL TRANSFER, OIL DISCHARGES, BILGES, USCG,
1001 US, SHIPS, POLLUTION PREVENTION, OIL SPILLS, OFFSHORE DRILLING, BIBLIOGRAPHIES, LEGISLATION, INTERNATIONAL AGREEMENTS, OCEANS,
0474 USCG, POLLUTION PREVENTION, OIL SPILLS, CLEANUP, BIRDS, WILDLIFE, CHESAPEAKE BAY,
0481 USCG, US, SOURCES, OIL DISCHARGES, *CAUSES,
0483 USCG, SHIPS, MONITORING, DETECTION, DESIGN-ENGINEERING, *OIL-IN-WATER,
0501 USCG, SURVEILLANCE, POLLUTION CONTROL, OIL SPILLS, MONITORING, HYDROCARBONS, GOVERNMENT AGENCIES, EPA, USGS, *UN,
0508 USCG, SURVEILLANCE, SHIPS, REMOTE SENSING, OIL SPILLS, DESIGN-ENGINEERING, LAW ENFORCEMENT, ENVIRONMENTAL PROTECTION,
0515 USCG, SANTA BARBARA CHANNEL, REMOTE SENSING, PLATFORMS, OIL SLICKS, DETECTION, NATURAL SEEPAGE, *SIDE-LOOKING RADAR,
0516 USCG, SURVEILLANCE, REMOTE SENSING, OIL SPILLS, DETECTION, *AIRBORNE COASTAL PATROL,
0565 USCG, SPECTROSCOPY, SOURCE IDENTIFICATION, SAMPLING, OIL SPILLS, ANALYTICAL TECHNIQUES, CHROMATOGRAPHY,
0567 USCG, SOURCE IDENTIFICATION, POLLUTION PREVENTION, OIL TRANSPORT, OIL SPILLS, ANALYTICAL TECHNIQUES,
0580 USCG, SKIMMERS, OIL SPILLS, CLEANUP, ARGO MERCHANT SPILL,
0600 USCG, SKIMMERS, RECOVERY, OIL SPILLS, DESIGN-ENGINEERING,
0608 USCG, SKIMMERS, RECOVERY, OIL SPILLS, BOOMS, CONTAINMENT, DESIGN-ENGINEERING,
0648 USCG, STATISTICAL ANALYSIS, REGULATIONS, POLLUTION PREVENTION, OIL TRANSFER, OIL DISCHARGES,
0711 USCG, POLLUTION CONTROL, PERSONNEL TRAINING, OIL SPILLS, CONTINGENCY PLANNING, *HIATUSPORT EXERCISE,
0742 USCG, POLLUTION CONTROL, OIL SPILLS, CLEANUP, DESIGN-ENGINEERING, *EQUIPMENT DELIVERY SYSTEM,
0992 USCG, US, SHIPS, REGULATIONS, OIL TRANSFER, OIL DISCHARGES, BILGES,
0999 USCG, POLLUTION PREVENTION, INTERNATIONAL CONVENTIONS, IMCO,
0501 USGS, USCG, SURVEILLANCE, POLLUTION CONTROL, OIL SPILLS, MONITORING, HYDROCARBONS, GOVERNMENT AGENCIES, EPA, *UN,
0506 USN, SHIPS, OIL DISCHARGES, MONITORING, WASTEWATERS, DESIGN-ENGINEERING, *OIL CONTENT,
0609 USN, SKIMMERS, OIL SPILLS, CLEANUP, HARBORS, *DEBRIS HANDLING SYSTEM,
0627 USN, SURFACTANTS, SKIMMERS, OIL SPILLS, CLEANUP, BOOMS, ABSORPTION, DESIGN-ENGINEERING,
0701 USN, SHIPS, OIL-WATER SEPARATION, BILGES, DESIGN-ENGINEERING,
0704 USN, STORAGE, PETROCHEMICALS, DISPOSAL, WASTE OIL, MANUALS,
0738 USN, SHIPS, POLLUTION PREVENTION, OIL DISCHARGES, WASTE OIL TREATMENT, CLEANUP, MONITORING,
0813 USN, PLANTS, OIL SPILLS, ARCTIC, ANIMALS,
0940 USSR, PETROLEUM PRODUCTS, BIODEGRADATION, CRUDE OIL, BACTERIA, CASPIAN SEA,
0942 USSR, PETROLEUM PRODUCTS, BIODEGRADATION, MICROORGANISMS, HYDROCARBONS, CRUDE OIL, GROUNDWATER,
0466 VEGETATION, RIVERS, OIL SPILLS, WASTE OIL, ENVIRONMENTAL EFFECTS, PENNSYLVANIA, *SCHUYLKILL SPILL,
0632 VEGETATION, SOIL, RESTORATION, OIL SPILLS, *FORESTS,
0656 VEGETATION, TEXAS, STORAGE, OIL SPILLS, CRUDE OIL, ENVIRONMENTAL EFFECTS, GROUNDWATER, LOUISIANA, *SALT DOMES,
0776 VEGETATION, OIL SPILLS, CRUDE OIL, BIOLOGICAL EFFECTS, ARCTIC, CANADA,
0780 VEGETATION, TOXICITY, SUBARCTIC REGIONS, CRUDE OIL, ALGAE, LAKES,
0782 VEGETATION, SOIL, OIL SPILLS, BIOLOGICAL EFFECTS, MICROORGANISMS, CANADA,
0560 WASHINGTON, SOURCES, SEDIMENTS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, HYDROCARBONS, DETECTION, LAKES,
0640 WASHINGTON, TANKERS, REGULATIONS, PUGET SOUND, OIL TRANSPORT, LAW ENFORCEMENT,
0466 WASTE OIL, VEGETATION, RIVERS, OIL SPILLS, ENVIRONMENTAL EFFECTS, PENNSYLVANIA, *SCHUYLKILL SPILL,
0468 WASTE OIL, TANKERS, STATISTICAL ANALYSIS, SOURCES, OIL DISCHARGES, *OIL INPUT, OCEANS, CRUDE OIL, NATURAL SEEPAGE,
0613 WASTE OIL, PATENT, CLEANUP, ABSORPTION,
0662 WASTE OIL, SOLID WASTES, RECYCLING, OIL INDUSTRY, ECONOMICS, WASTEWATERS, DISPOSAL,
0670 WASTE OIL, PATENT, OIL SPILLS, CLEANUP, ABSORPTION, *METALLURGICAL PUMICE,
0684 WASTE OIL, REFINING, RECLAMATION, PATENT,
0695 WASTE OIL, PATENT, WASTEWATER TREATMENT, EMULSIONS,
0704 WASTE OIL, USN, STORAGE, PETROCHEMICALS, DISPOSAL, MANUALS,
0706 WASTE OIL, REUSE, RECYCLING, DISPOSAL, BIOLOGICAL EFFECTS,
0707 WASTE OIL, RECLAMATION, PATENT, LUBRICATING OIL,
0708 WASTE OIL, RECLAMATION, CRUDE OIL,
0760 WASTE OIL, TOXICITY, FUEL OIL, CRUDE OIL, METABOLISM, BENTHOS, ALGAE,
0907 WASTE OIL, PATENT, OIL SPILLS, BIODEGRADATION, MICROORGANISMS, AFRICA/SOUTH,
0912 WASTE OIL, SOIL, OIL WELLS, BIODEGRADATION, BACTERIA, *PETROLEUM WASTE,
0657 WASTE OIL DISPOSAL, SOLID WASTES, INCINERATION, *LIQUID WASTES,
0746 WASTE OIL DISPOSAL, POLLUTION PREVENTION, OIL SPILLS, CLEANUP, *FOREST INDUSTRY,
0703 WASTE OIL TREATMENT, PATENT, ADSORPTION,
0709 WASTE OIL TREATMENT, RECLAMATION,
0738 WASTE OIL TREATMENT, USN, SHIPS, POLLUTION PREVENTION, OIL DISCHARGES, CLEANUP, MONITORING,
0488 WASTEWATERS, MONITORING, DETECTION, ANALYTICAL TECHNIQUES, *LIGHT SCATTERING,

*PARTICULATES, *OIL-IN-WATER,
0491 WASTEWATERS, PATENT, OIL-WATER SEPARATION, MONITORING,
0492 WASTEWATERS, MONITORING, DETECTION, CHEMICAL ANALYSIS,
0502 WASTEWATERS, PIPELINES, PATENT, OIL SLICKS, MONITORING, LEAKAGE, DETECTION, DESIGN-ENGINEERING,
0506 WASTEWATERS, USN, SHIPS, OIL DISCHARGES, MONITORING, DESIGN-ENGINEERING, *OIL CONTENT,
0507 WASTEWATERS, SHIPS, PATENT, OIL-WATER SEPARATION, MONITORING, BILGES,
0519 WASTEWATERS, REMOTE SENSING, REFINERIES, OIL SLICKS, MONITORING,
0531 WASTEWATERS, SPECTROMETRY, REFINERIES, ANALYTICAL TECHNIQUES, CHROMATOGRAPHY,
0534 WASTEWATERS, PETROLEUM PRODUCTS, PETROCHEMICALS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, CONTAMINANTS, *GAS CHROMATOGRAPHY,
0542 WASTEWATERS, PETROLEUM PRODUCTS, PETROCHEMICALS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, HYDROCARBONS, FUELS,
0545 WASTEWATERS, CHEMICAL ANALYSIS, CHROMATOGRAPHY, CONTAMINANTS, HYDROCARBONS, *LIQUID CHROMATOGRAPHY,
0548 WASTEWATERS, REFINERIES, HYDROCARBONS, DELAWARE, *OIL CONTENT, *URBAN RUNOFF, *DELAWARE ESTUARY,
0551 WASTEWATERS, PETROLEUM PRODUCTS, CHEMICAL ANALYSIS, MONITORING,
0555 WASTEWATERS, REFINERIES, PETROLEUM PRODUCTS, PAH, CHEMICAL ANALYSIS, CHROMATOGRAPHY, *LIQUID CHROMATOGRAPHY,
0557 WASTEWATERS, CHEMICAL ANALYSIS, CONTAMINANTS, *SOLVENT EXTRACTION, *IR SPECTROPHOTOMETRY,
0561 WASTEWATERS, SOURCE IDENTIFICATION, REGULATIONS, REFINERIES, CHEMICAL ANALYSIS, HYDROCARBONS, *SEWAGE, *URBAN RUNOFF, DELAWARE,
0662 WASTEWATERS, WASTE OIL, SOLID WASTES, RECYCLING, OIL INDUSTRY, ECONOMICS, DISPOSAL,
0687 WASTEWATERS, REFINERIES, OIL-WATER SEPARATION, EMULSIONS, FLOCCULATION,
0729 WASTEWATERS, SOLID WASTES, REFINERIES, POLLUTION CONTROL, PLANTS, *NATURAL GAS MONITORING,
0764 WASTEWATERS, REFINERIES, AROMATIC HYDROCARBONS, CONTAMINATION, MOLLUSKS, FOOD WEB, *FOOD CHAIN ACCUMULATION, *3,4-BENZOPYRENE,
0769 WASTEWATERS, TOXICITY, REFINERIES, FISH, *AQUATIC LIFE, CANADA,
0790 WASTEWATERS, TOXICITY, REFINERIES, FRESHWATER, FISH, INVERTEBRATES, *LETHAL CONCENTRATION,
0850 WASTEWATERS, SOLID WASTES, PRODUCTION, OIL SHALE, EXTRACTION, ENVIRONMENTAL EFFECTS,
0918 WASTEWATERS, REFINERIES, RECYCLING, BIODEGRADATION,
0993 WASTEWATERS, REGULATIONS, PIPELINES, OIL INDUSTRY, GUIDELINES, EUROPE,
0994 WASTEWATERS, GUIDELINES, PRODUCTION, EXPLORATION, DRILLING, EPA, *ONSHORE POINT SOURCE CATEGORY,
0995 WASTEWATERS, PRODUCTION, OIL INDUSTRY, GUIDELINES, EXTRACTION, EPA, *ONSHORE POINT SOURCE CATEGORY,
0647 WASTEWATER TREATMENT, TANKERS, OIL DISCHARGES, *SLOP TANK,
0660 WASTEWATER TREATMENT, REFINERIES, OIL-WATER SEPARATION, BELGIUM,
0661 WASTEWATER TREATMENT, REFINERIES, POLLUTION PREVENTION, *SURFACE WATERS, BELGIUM,
0663 WASTEWATER TREATMENT, PATENT, OIL-WATER SEPARATION, CONTAMINANTS, COALESCENCE, DESIGN-ENGINEERING,
0667 WASTEWATER TREATMENT, OIL-WATER SEPARATION, FILTRATION, FLOTATION,
0668 WASTEWATER TREATMENT, REFINERIES, DISPOSAL, CONSERVATION,
0671 WASTEWATER TREATMENT, CONTAMINANTS, FLOCCULATION, *FLOCCULANT-POLYELECTROLYTES,
0672 WASTEWATER TREATMENT, PATENT, OIL-WATER SEPARATION, BALLAST, COALESCENCE,
0673 WASTEWATER TREATMENT, REUSE, REFINERIES, POLLUTION CONTROL, CONSERVATION,
0674 WASTEWATER TREATMENT, REFINERIES, ACTIVATED SLUDGE , GUIDELINES,
0675 WASTEWATER TREATMENT, REFINERIES, CONTAMINANTS, *INTERMEDIATE TREATMENT,
0676 WASTEWATER TREATMENT, REFINERIES, *COLLOID DESTABILIZATION,
0677 WASTEWATER TREATMENT, REFINERIES, *CHEMICAL TREATMENT, *WATERBORNE COLLOIDS,
0678 WASTEWATER TREATMENT, REFINERIES, OIL-WATER SEPARATION, FILTRATION,
0679 WASTEWATER TREATMENT, REFINERIES, CONTAMINANTS, ACTIVATED SLUDGE , *BIOCHEMISTRY,
0680 WASTEWATER TREATMENT, OIL-WATER SEPARATION, BILGES, FILTRATION, *TUBULAR ULTRAFILTRATION SYSTEM,
0681 WASTEWATER TREATMENT, PRECIPITATION, PH CONTROL, PATENT, OIL-WATER SEPARATION, ADSORPTION,
0682 WASTEWATER TREATMENT, INDUSTRIES,
0683 WASTEWATER TREATMENT, PATENT, OIL-WATER SEPARATION, ADSORPTION, *POLYOLEFIN,
0685 WASTEWATER TREATMENT, PETROCHEMICALS, ECONOMICS, LEGISLATION, GERMANY, WEST,
0686 WASTEWATER TREATMENT, PATENT, OIL-WATER SEPARATION, COALESCENCE, DESIGN-ENGINEERING,
0688 WASTEWATER TREATMENT, PETROCHEMICALS,
0689 WASTEWATER TREATMENT, PATENT, OIL-WATER SEPARATION, COALESCENCE, FLOTATION, DESIGN-ENGINEERING,
0690 WASTEWATER TREATMENT, OIL-WATER SEPARATION, ADSORPTION, *DETERGENTS,
0691 WASTEWATER TREATMENT, HYDROCARBONS, CONTAMINANTS, *VACUUM STRIPPING,
0692 WASTEWATER TREATMENT, PATENT, OIL-WATER SEPARATION, EMULSIONS, COAGULATION,
0693 WASTEWATER TREATMENT, PATENT, OIL-WATER SEPARATION, DESIGN-ENGINEERING,
0694 WASTEWATER TREATMENT, TANKERS, BALLAST, MOLLUSKS, *MYTILUS GALLOPROVINCIALIS,
0695 WASTEWATER TREATMENT, WASTE OIL, PATENT, EMULSIONS,
0696 WASTEWATER TREATMENT, PETROLEUM PRODUCTS, PATENT,
0697 WASTEWATER TREATMENT, PATENT, EXTRACTION, CONTAMINANTS, DESIGN-ENGINEERING,

0699 WASTEWATER TREATMENT, REFINERIES, OIL-WATER SEPARATION, WATER QUALITY, *ENERGY REQUIREMENTS,
0700 WASTEWATER TREATMENT, PATENT, OIL-WATER SEPARATION, FLOTATION,
0702 WASTEWATER TREATMENT, PATENT, OIL-WATER SEPARATION, ABSORPTION,
0996 WASTEWATER TREATMENT, STORAGE, PRODUCTION, POLLUTION CONTROL, OIL-WATER SEPARATION, GUIDELINES, DISTRIBUTION,
0997 WASTEWATER TREATMENT, REFINERIES, OIL INDUSTRY, GUIDELINES, LEGISLATION, WATER QUALITY, ECONOMICS,
0476 WATER QUALITY, REFINERIES, PORTS, PIPELINES, OIL SPILLS, OIL DISCHARGES, *PETROLEUM FACILITIES,
0497 WATER QUALITY, MONITORING, HYDROCARBONS, DISTRIBUTION, BEAUFORT SEA,
0523 WATER QUALITY, SAMPLING, BENTHOS, ESTUARIES, ALASKA, *EPIFAUNA,
0554 WATER QUALITY, DRILLING, ANALYTICAL TECHNIQUES, *DRILLING MUDS,
0699 WATER QUALITY, WASTEWATER TREATMENT, REFINERIES, OIL-WATER SEPARATION, *ENERGY REQUIREMENTS,
0851 WATER QUALITY, OIL SPILLS, OFFSHORE DEVELOPMENT, OCS, EPA, ENVIRONMENTAL MANAGEMENT, ESTUARIES, COASTS,
0997 WATER QUALITY, WASTEWATER TREATMENT, REFINERIES, OIL INDUSTRY, GUIDELINES, LEGISLATION, ECONOMICS,
0530 WEATHERING, OIL SPILLS, ESTUARIES, CHEMICAL ANALYSIS, FISH, FATE, HYDROCARBONS, *FUNDULUS HETEROCLITUS,
0758 WEATHERING, PLANKTON, OIL SPILLS, ESTUARIES, BIOLOGICAL EFFECTS, FISH, BENTHOS, ATLANTIC COAST,
0952 WEATHERING, STATISTICAL ANALYSIS, PIPELINES, OIL SPILLS, BEHAVIOR, CANADA, INLAND,
0954 WEATHERING, OIL SPILLS, MODELS, EVAPORATION,
0959 WEATHERING, SPREADING, OIL SPILLS, CRUDE OIL, CLEANUP, DISPERSANTS, EMULSIFICATION,
0974 WEATHERING, TAR, SOLUTION, OIL SPILLS, FATE, ARCTIC, CRUDE OIL, EVAPORATION, EMULSIFICATION,
0975 WEATHERING, TAR, SOLUTION, OIL SPILLS, CRUDE OIL, EVAPORATION, *SULFUR COMPOUNDS,
0980 WEATHERING, SEDIMENTS, FUEL OIL, FATE, HYDROCARBONS, METABOLISM, MOLLUSKS, CHEDABUCTO BAY,
0474 WILDLIFE, USCG, POLLUTION PREVENTION, OIL SPILLS, CLEANUP, BIRDS, CHESAPEAKE BAY,
0630 WILDLIFE, TOXICITY, SOLVENTS, RESTORATION, OIL SPILLS, *DETERGENTS,
0824 WILDLIFE, TANKERS, OIL SPILLS, FATE, ENVIRONMENTAL EFFECTS, MODELS, ECONOMIC EFFECTS, *WORLD WAR II SPILLS,
0839 WILDLIFE, OIL SHALE, DEVELOPMENT, BIOLOGICAL EFFECTS, FISH, *US FISH & WILDLIFE SERVICE,
0901 WILDLIFE, PRODUCTION, PLANTS, OIL SPILLS, EXPLORATION, ARCTIC, ENVIRONMENTAL EFFECTS, MARINE ORGANISMS,
0989 WILDLIFE, OIL SPILLS, ENVIRONMENTAL DETERIORATION, COMPENSATION, MARINE ORGANISMS, ECONOMICS, *LEGAL ASPECTS,
0955 YEASTS, TOXICITY, OXIDATION, FUEL OIL, *HYDROPEROXIDES,
0532 ZOOPLANKTON, SOURCES, HYDROCARBONS, CHEMICAL ANALYSIS, DISTRIBUTION, MEXICO/GULF OF, *BIOGENIC HYDROCARBONS,

AUTHOR INDEX

ABELSON, P.H. 0821
ADACHI, T. 0740
AHEARN, D.G. 0915
ALBAIGES, J. 0527
ALIEV, S.N. 0940
ALLEN, D.W. 0845
ALLEN, R.B. 0845
ANDERSEN, L.J. 0727
ANDERSON, J.W. 0771
ANDERSON, J.W. 0798
ANDERSON, J.W. 0799
ANISFIELD, S. 0745
ANUFRIEVA, N.M. 0528
AOKI, S. 0461
ARCHER, P. 0848
ARMSTRONG, H.W. 0778
ATLAS, R.M. 0906
ATEMA, J. 0756
AYERS, R.R. 0584
AYERS, R.R. 0569
AYRES, R.P. 0758
AZAROWICZ, E.N. 0907
BACON, J.C. 0973
BAGOT, H.E. 0585
BAHNSCH, J. 0728
BARBER, R.T. 0835
BARNETT, A.V. 0584
BARTHA, R. 0908
BASCOM, W. 0836
BASCOPE, A.H. 0658
BATES, C.C. 0464
BATTERTON, J.C. 0552
BATUTIS, E.P. 0483
BAUER, J. 0622
BEAN, R.M. 0529
BEAN, R.M. 0815
BECKER, G.L. 0998
BECKETT, C.J. 0716
BECKETT, C.J. 0575
BELLANCA, M.A. 0475
BEND, J.R. 0801
BENDER, M.E. 0758
BENTZ, A.P. 1000
BENVILLE, P., JR. 0788
BEPPU, Y. 0748
BERGQUIST, E.T. 0797
BERKNER, A.B. 0630
BERNHARD, M. 0822
BESTUL, A.B. 0956
BEYER, A.H. 0462
BIEHL, E.R. 0544
BIERI, R.H. 0530
BIOKO, E.V. 0586
BISWANGER, K. 0659
BLACK, R.E. 0845
BLACKMAN, R.A.A. 0759
BLAIKLEY, D.R. 0823
BLAKEBROUGH, N. 0909
BLANKENSHIP, D.W. 0955
BLASKO, D.P. 0463
BLAYLOCK, J.W. 0815
BLM 0899
BLUMER, M. 1003
BOCARD, C. 0587
BOCARD, C. 0593
BORDEAUX, J. 0485
BOSSUYT, L. 0660
BOSSUYT, L. 0661
BOTT, T.L. 0760
BOURQUIN, A.W. 0915
BOUVIER, D.G.P. 0750
BOVEE, D.H. 0806
BOYD, B.D. 0464
BRAGAW, L.K. 0638
BRIDGWATER, A.V. 0662
BRIGHT, T.J. 0838
BROADRIBB, M.P. 0663
BRODERSON, C.C. 0761
BROWN, C.W. 0568
BROWN, D. 0639
BROWN, D. 0890
BROWN, L.R. 0499
BROWN, R.A. 0520
BROWN, R.J. 1001
BROWNING, R.J. 0640
BROWNRIGG, J.T. 0493
BRUNK, P.A. 0705
BRUNNER, D.E. 0588
BRUSHETT, E.R. 0465
BRUSHETT, E.R. 0715
BUDDE, H. 0728
BUIKEMA, A.L., JR. 0790
BURLINGAME, A.L. 0531
BURNS, K.A. 0537
BURNS, K.A. 0762
BUSDOSH, M. 0906
BUSH, B. 0535
BUTLER, J.N. 0957
BUTSEVA, L.N. 0671
BOCARD, C. 0594
BOCARD, C. 0595
BOGNER, J. 0554
BOHME, V.E. 0715
BOLZMANN, H. 0484
CAIRNS, J., JR. 0790
CALDARONE, E.M. 0763
CALDER, J.A. 0532
CALDER, J.A. 0536
CALDER, J.A. 0556
CALEJO MONTEIRO, J.D. 0825
CALLAHAN, A. 0813
CAMPBELL, B. 0824
CAMPBELL, J.R. 0982
CANELAS, L.D. 0825
CANEVARI, G.P. 0589
CAPONE, W. 0764
CARPENTER, R. 0560
CARVEN, C.J. 0998
CASTELLI, J.L. 0664
CAVANAUGH, E.C. 0729
CENTER-STUDY/MARINE POLICY 0986
CEQ 0732
CHAKRABARTY, A.M. 0910
CHAKRABARTY, A.M. 0920
CHAMBERS, D.B. 0665
CHAMBERS, J.E. 0765
CHAMBERS, J.E. 0817
CHAN, G.L. 0766
CHAN, H.S. 0540
CHARLES, D.K. 0949

CHEEK, L.M. 0773
CHEL'TSOV, A.V. 0551
CHEN, E.C. 0949
CHEN, E.I. 0767
CHESLER, S.N. 0546
CHEW, R.T., III 0849
CHIHARA, K. 0461
CHISHOLM, B.R. 0493
CICHORZ, R.S. 1002
CLADWELL, R.S. 0763
CLAGGETT, F.M. 0958
CLARK, B.R. 0547
CLARK, D.A. 0730
CLARK, G.J. 0631
CLARK, R. 0827
CLARK, R.B. 0826
CLARK, R.C., JR. 0768
CLARKE, S.H., JR. 0859
CLOW, J.C. 0565
COBB, C.B. 0733
COIGN, M.J. 0499
COLIN, J. 0731
COLLEY, J.D. 0729
COLLIER, T.K. 0806
COLWELL, R.R. 0945
COLWELL, R.R. 0946
COLWELL, R.R. 0947
COMMISSION-EUROPEAN COMM. 0533
CONCAWE SECRETARIAT 0993
CONROY, P.D. 0701
COOK, W.L. 0915
COOKE, B. 0666
COONEY, J.J. 0911
COOPER, C.B. 0476
COOPER, J. 0777
COOPER, R.E. 0912
CORBETT, C.R. 0716
CORMACK, D. 0959
COTE, R.P. 0769
COTTIGLIA, M. 0764
COTTRELL, K. 0913
COX, B.A. 0798
COX, B.A. 0799
CRESSWELL, L.W. 0914
CRIDER, C. 0651
CROW, S.A. 0915
CUBERES, M.R. 0527
CUEMAN, M.K. 0530
CUILLERY, C. 0659
CUILLERY, C. 0667
CUNDELL, A.M. 0916
D'ALESSANDRO, P.L. 0733
DAUMAS, R.A. 0960
DAVIDSON, J.W. 0850
DAVIS, G. 0514
DAVIS, W.P. 0851
DAWE, L.L. 0553
DAY, G. 0837
DE BORGER, R. 0944
DEGEN, L. 0605
DEGOBERT, P. 0590
DE JONG, E. 0634
DE LEEUW, J.W. 0531
DELL'ACQUA, R. 0534
DELL'AQUA, R. 0535
DENNIS, D.M. 0591
DER, J.J. 0570
DER, J.J. 0588
DESLAURIERS, P.C. 0615
DES ROSIERS, P.E. 0741
DE VOSS, E.A. 0592
DICK, J.P.P. 0489
DIETES, M.P. 0770
DIETZEL, G.F.L. 0823
DITMARS, J.D. 0982
DIXIT, D. 0771
DIXIT, D. 0799
DOHNERT, E.H. 0476
DONOGHUE, N.A. 0917
DORFMAN, R. 0852
DORRLER, J.S. 0618
DOYLE, W.T. 0853
DUBOIS, B.J. 0571
DUCE, R.A. 0641
DUFFY, J.J. 0961
DUFFY, J.J. 0962
DUNN, B.P. 0486
DUNN, B.P. 0487
DURIF-VARAMBON, B. 0587
DURIF-VARAMBON, B. 0593
DURIF-VARAMBON, B. 0594
DURIF-VARAMBON, B. 0595
DZHALILOV, R.K. 0918
DZIERLENGA, P.S. 0729
DZURIK, A. 0642
EDGERTON, A.T. 0516
EGAN, J. 0535
EGANHOUSE, R.P. 0536
ENVIRONMENTAL CONSULTANTS 0854
EPA 0466
EPA 0467
EPA 0706
EPA 0772
EPA 0855
EPA 0994
EPA 0995
EPPLE, D. 0734
ERYUZLU, N.E. 0572
ESTES, J.E. 0515
FARBER, A.L. 0668
FALLAH, M.H. 0964
FALXA, H. 0596
FARLOW, J.S. 0669
FARRINGTON, J.W. 0537
FARRINGTON, J.W. 0538
FARRINGTON, J.W. 0828
FEA 0643
FEA 0644
FEA 0645
FEA 0987
FEDER, H.M. 0773
FELIX, V.M. 0729
FIELD, M.E. 0859
FINGAS, M.F. 0621
FITZGERALD, D.E. 0597
FLANAGAN, P. 0773
FLEISCHER, C.A. 0848
FLEMING, K. 0489
FLOODGATE, G.D. 0919
FOGET, C.R. 0735
FOLEY, J.P. 0717
FOLSOM, B.A. 0598
FONG, W.C. 0774
FORNS, J.M. 0775
FORSTER, W.O. 0856
FRADKIN, P.L. 0646
FRANK, R.A. 0736
FRANK, U. 0543
FRANKLIN, H.L. 0599
FREEDMAN, W. 0776
FREESTONE, F.J. 0573
FRIEDMAN, B. 0488
FRIEDMAN, J.M. 0845
FRIELLO, D.A. 0920
FROST, P.G.H. 0777
FUCIK, K.W. 0778
FUELLING, W. 0670
FUKUDA, S. 0647
FULLEYLOVE, R.J. 0718
FUNKHOUSER, S.P. 0585
GALLOWAY, T.R. 0687
GALT, J.A. 0963
GANDURINA, L.V. 0671
GARBER, D.C. 0672
GARDNER, G.R. 0783
GARNER, P.J. 0909
GARY, J.H. 0857
GASSMANN, G. 0524

GATELLIER, C. 0587
GATELLIER, C. 0593
GATELLIER, C. 0594
GATELLIER, C. 0595
GEARING, J.N. 0522
GEARING, J.N. 0539
GEARING, P. 0539
GEARING, P.J. 0522
GEBELEIN, C.D. 0509
GEBELEIN, C.D. 0793
GERACI, J.R. 0779
GETMAN, J.H. 0600
GIAM, C.-S. 0540
GIAM, C.S. 0641
GIBBS, C.F. 0921
GIBSON, C.I. 0814
GIBSON, C.I. 0815
GIBSON, D.T. 0922
GIBSON, D.T. 0923
GIBSON, D.T. 0924
GIERING, L.P. 0493
GILCHRIST, R.E. 0710
GILL, S.D. 0601
GLASS, A.W. 0823
GOLDBERG, E.D. 0490
GOLDSTEIN, P. 0673
GOMINGER, D. 0807
GOODLEY, P.C. 0541
GOODMAN, J.M. 0858
GOODWIN, S.R. 0950
GORDON, D.C., JR. 0802
GORDON, M. 0541
GORNITSKY, A.B. 0528
GRANT, M.G. 0491
GRAY, W.O. 0998
GREGORY, S.A. 0662
GRIFFIN, M. 0917
GRIFFITHS, R.A. 0608
GRIGOR'EV, V.D. 0551
GRIZZARD, E.H. 0658
GRASSLE, J.F. 0828
GREEN, H.G. 0859
GROB, R.L. 0542
GROSSLING, B.F. 0468
GRUENFELD, M. 0543
GRUTSCH, J.F. 0674
GRUTSCH, J.F. 0675
GRUTSCH, J.F. 0676
GRUTSCH, J.F. 0677
GRUTSCH, J.F. 0678
GRUTSCH, J.F. 0679
GUERIN, M.R. 0547
GUERIN, P. 0602
GUERRERO, H. 0544
GUMP, B.H. 0546
GUNKEL, W. 0524
HAGIWARA, K. 0492
HALL, D. 0588
HAMES, M.O. 0801
HAMILTON, C.E. 0545
HAMM, P. 0746
HANN, R.W., JR. 0965
HANNA, B.M. 0780
HARDEN, J.W. 0701
HARPER, T.R. 0966
HARRALD, J.R. 0464
HARRALD, J.R. 0648
HARRISS, L.R. 0680
HAUSSER, R. 0572
HAYES, T.M. 0737
HEDRICK, H.G. 0912
HEITZ, J.R. 0765
HEITZ, J.R. 0817
HELLEBUST, J.A. 0780
HELLEBUST, J. 0782
HELLEBUST, J.A. 0809
HELLMANN, H. 0796
HEPPELL, D. 0909
HERSHNER, C. 0781
HERSHNER, C. 0789
HERTZ, H.S. 0546
HERWIG, R. 0786
HICKMAN, R.R. 0860
HINCKLEY, A.D. 0829
HINO, K. 0703
HILL, E.C. 0925
HITES, R.A. 0566
HO, C.H. 0547
HOARD, M.G. 0614
HODGSON, G. 0953
HOLMES, P.D. 0603
HONDA, T. 0613
HORIKOSHI, H. 0943
HORN, D. 0824
HORNIG, A.W. 0493
HOSONO, Y. 0613
HOULIHAN, T.M. 0494
HOVIS, W.A. 0511
HSIEH, C.-H. 0861
HUANG, C.P. 0954
HUDSON, J.O. 0926
HUDSON, J.O., JR. 0927
HUFFMAN, H.L., JR. 0525
HUFFORD, G.L. 0967
HUM, S. 0719
HUNT, D. 0843
HUNT, L.H. 0955
HUNTER, J.V. 0479
HUNTER, J.V. 0548
HUNTER, J.V. 0561
HURA, M. 0738
HUTCHINSON, T.C. 0776
HUTCHINSON, T.C. 0780
HUTCHINSON, T.C. 0782
HUTCHINSON, T.C. 0787
HUTCHINSON, T.C. 0809
HYLAND, J.L. 0783
HYLAND, J.L. 0784
IMCO 0739
IMANAKA, M. 0550
IRANI, C.A. 0681
ISEYA, Z. 0549
ISEYA, Z. 0795
ITO, T. 0702
ITO, T. 0703
JAKUBEK, P. 0659
JAMISON, V.W. 0926
JAMISON, V.W. 0927
JANKEVICIUS, K. 0785
JENSEN, A.C. 0862
JERNELÖV, A. 0820
JEWETT, S.C. 0773
JOHNSON, C. 0598
JOHNSTON, H.N. 0990
JOHNSTON, M.H. 0773
JONES, D.C. 0729
JONES, D.R. 0504
JONES, D.R. 0511
JONES, D.R. 0512
JUKNEVICIUS, L. 0785
JURKOVICH, G. 0700
KALLIO, R.E. 0928
KANGETER, E.B., III 0711
KAPLAN, I.R. 0505
KARAYEVA, N.I. 0918
KARINEN, J.F. 0761
KARINEN, J.F. 0803
KARWAN, K.R. 0648

KASKI, K. 0513
KATSUTA, K. 0682
KATOR, H. 0786
KAUSS, P.B. 0787
KAUWLING, T.J. 0832
KAWASE, Y. 0708
KAWASE, Y. 0709
KAY, G.H. 0712
KEITH, L.H. 0531
KEIZER, P.D. 0980
KELLEY, A.M. 0506
KENNER, C.T. 0544
KERMARREC, F. 0590
KERN, E. 0824
KERNODLE, D.R. 0523
KIMBLE, B.J. 0531
KING, K.I. 0819
KISHIKAWA, H. 0740
KLEMAS, V. 0514
KNAP, A.H. 0909
KNIGHT, M. 0478
KOBAYASHI, E. 0703
KOBAYASHI, I. 0461
KOBAYASHI, Y. 0683
KOLLMEYER, R.C. 0968
KOLPACK, R.L. 0969
KOLPACK, R.L. 0970
KONDO, G. 0977
KONDO, M. 0684
KOONS, C.B. 0469
KOONS, C.B. 0521
KOONS, C.B. 0863
KORN, S. 0788
KRAUS, S.P. 0515
KRAUSE, G. 0685
KRUEGER, D.L. 0686
KURITA, H. 0748
LABOUREUR, P. 0587
LABORDE, P.L. 0960
LACY, W.J. 0741
LAEAEPERI, A. 0513
LAKE, J.L. 0789
LAMANNA, C. 0929
LANDERS, R. 0512
LANDRETH, R. 0669
LAPP, P.A. 0518
LARRABEE, R.M. 0742
LARSON, R.A. 0955
LASDAY, A.H. 0971
LAU, Y.L. 0574
LAUGHLIN, R.B., JR. 0798
LEATHEN, W.W. 0941
LEBED, A.A. 0930
LEBED, A.A. 0936
LEDENEVA, V.V. 0671
LEE, D.R. 0790
LEE, R.F. 0931
LEE, R.F. 0932
LEE, R.F. 0972
LEE, W.T. 0568
LEON, H. 0741
LEONE, R.A. 0988
LE PETIT, J. 0933
LEROUAX, R.K. 0743
LESTER, T.E. 0718
LEVY, E.M. 0495
LEYBOLD HERAEUS GMBH CO. 0496
LEWIS, E.L. 0951
LIMOGES, L. 0649
LINDENBAUM, Y.M. 0551
LINKER, F.I. 0859
LINSTEDT-SIVA, J. 0720
LISSAUER, I.M. 0967
LISSAUER, I.M. 0973
LIU, C.-F. 0864
LIU, D. 0934
LOADER, J.G. 0604
LOGAN, W.J. 0621
LOGAN, W.J. 0751
LUCHINSKII, V.V. 0551
LUNEY, P.R. 0897
LUTHY, R.G. 0687
LUTZ, R.E., II 0989
LYONS, B.J. 0688
LYTLE, J.S. 0522
LYTLE, J.S. 0539
LYTLE, T.F. 0522
LYTLE, T.F. 0539
MAATSCHAPPI, B.V. 0689
MAY, W.E. 0546
MACDONALD, R.W. 0497
MAC GREGOR, C. 0974
MAC GREGOR, D.R.C. 0975
MACKAY, D. 0950
MACKAY, D. 0952
MAGERRAMOVA, N.R. 0918
MALLATT, R.C. 0674
MALLATT, R.C. 0675
MALLATT, R.C. 0676
MALLATT, R.C. 0677
MALLATT, R.C. 0678
MALLATT, R.C. 0679
MALLON, L.G. 0845
MALLON, M.H. 0763
MAMEDOV, A.M. 0791
MANKIEWICZ, P. 0505
MARCONI, W. 0605
MARCUS, E. 0744
MARCUS, H.S. 0638
MARTIN, A. 1003
MARTIN, C. 0622
MARTY, J.C. 0960
MARUM, J.P. 0721
MASALA, M.L.T. 0764
MASCIA, C. 0764
MASSOGLIA, M.F. 0865
MATHIAS, J.A. 0792
MATSUMOTO, R. 0557
MATSUMOTO, T. 0690
MATSUNAGA, K. 0550
MATTSON, C.P. 0745
MAURER, A.T. 0516
MAYNARD, N.G. 0509
MAYNARD, N.G. 0793
MC AULIFFE, C.D. 0498
MC AULIFFE, C.D. 0863
MC AULIFFE, C.D. 0866
MC CARTHY, L.T., JR. 0606
MC CRACKEN, W.E. 0619
MC CRACKEN, W.E. 0573
MC CRAY, A.W. 0607
MC FARLANE, C. 0517
MC GILL, J.C. 0691
MC GILL, W. 0632
MC GILL, W. 0935
MC GRATH, F.K. 0494
MC GREW, J.L. 0692
MC HUGH, D.J. 0681
MC LEAN, A.Y. 0974
MC LEOD, D.L. 0470
MC LEOD, W.R. 0470
MC NEIL, W.R. 0518
MEARNS, A.J. 0832
MEARNS, A.J. 0836
MECK, J.P. 0989
MECKLENBURG, T.A. 0761
MEDEIROS, G.C. 0537
MEEKS, D.C. 0516

MEIER, K. 0693
MELVILLE, L. 0746
MENARD, W. 0867
MENZEL, D. 0868
MENZEL, D. 0869
MERTENS, E.W. 0794
MERTENS, E.W. 0971
MEYERS, P.A. 0976
MILES, D.H. 0499
MILGRAM, J.H. 0608
MILLER, M.C. 0973
MILOVIDOVA, N.YU. 0694
MIRONOV, O.G. 0936
MITCHELL, E.J. 0870
MITCHELL, J.G. 0471
MIX, M.C. 0819
MIYAKE, Y. 0550
MIZUMAKI, K. 0613
MOHTADI, M.F. 0961
MOHTADI, M.F. 0962
MOIR, J.R. 0574
MONAGHAN, P.H. 0469
MONASTERO, F.C. 0500
MONASTERO, F.C. 0501
MOORE, G.E. 0475
MOORE, K. 0781
MOORE, L.J. 0814
MOORE, L.J. 0815
MOORE, M.D. 0836
MORGAN, J.P. 0871
MORGAN, R.H. 0504
MORRIS, B.F. 0957
MORTON, B.S. 0830
MOSTERT, N. 0650
MOTOHIRO, T. 0549
MOTOHIRO, T. 0795
MOUSSAVI, M. 0872
MULLER, D. 0796
MUMFORD, C.J. 0662
MYASNIKOV, I.N. 0671
MYERORE, J.R. 0920
MYERS, L.H. 0472
MYERS, L.H. 0741
NADAUD, Y. 0590
NADEAU, P.F. 0609
NADEAU, R.J. 0797
NAGATA, S. 0977
NAIDU, A.S. 0773
NAKAJIMA, M. 0647
NAKAMURA, Y. 0502
NAUMAN, J.W. 0523
NAZAROV, A.D. 0942
NEFF, G.S. 0540
NEFF, J.M. 0778
NEFF, J.M. 0798
NEFF, J.M. 0799
NEMIROVSKAYA, I.A. 0528
NERYNG, A. 0937
NESTEROVA, M.P. 0528
NETZELL, E.S. 0610
NICHOLS, J.A. 0959
NOAA 0873
NOAA 0874
NOAA 0875
NOAA 0876
NOAA 0877
NOAA 0878
NOAA 0879
NOAA 0880
NOAA 0881
NOAA 0882
NOAA 0883
NOAA 0884
NOAA 0885
NOAA 0886
NORRELL, S.A. 0773
NORRIS, D.B. 0917
NORRIS, W.H. 0990
NYBORG, M. 0632
OCHSENSCHLAEGER, M. 0695
ODDO, N. 0605
OGATA, M. 0550
OHTSU, T. 0502
OKADA, K. 0749
OLDHAM, G.F. 0696
OLSON, D.G. 0508
ONITAKE, T. 0683
ONUMA, T. 0702
OPPENHEIMER, C.H. 0524
O'ROURKE, C. 0722
OSIPOV, V.M. 0551
OWENS, E.H. 0723
PAINTER, L.J. 0462
PALMORK, K.H. 0831
PANITCH, M. 0473
PARKER, J.G. 0688
PARKER, P.L. 0538
PARKER, P.L. 0552
PARKER, P.L. 0563
PARKER, P.L. 0641
PASSAVANT WERKE MICHE HUTTE 0697
PATTERSON, R.R. 0800
PAUL, A.J. 0773
PAUL, A.J. 0808
PAWLACZYK-SZPILOWA, M. 0938
PAYNE, J.L. 0713
PEAKE, E. 0953
PEAKE, E. 0961
PEAKE, E. 0962
PEARCE, R.B. 0611
PEARMAN, A.L. 0887
PEARMAN, A.L. 0888
PEASE, C.H. 0963
PENROSE, W.R. 0980
PENROSE, W.R. 0553
PERSON, L. 0587
PETCHUL R.K. 0612
PETCHUL, S.L. 0612
PETER, T. 0700
PETTIGREW, R.K. 0724
PETROV, YU.M. 0586
PFEIFFER, P. 0695
PHILLIPS, R.D. 0651
PHILPOT, R.M. 0801
PICHON, J. 0602
PILCHER, D.W. 0698
PILKEY, O.H. 0889
PIMLOTT,D. 0890
PITKETHLY, R.C. 0663
PLANT, A.F. 0652
PLUTCHAK, N.B. 0970
POLIS, D. 0514
POTERA, G. 0745
PRATHER, B.V. 0699
PRESS (WILLIAM) & SON LTD 0747
PRESSMAN, A. 0512
PRITCHARD, P.H. 0939
PROUSE, N.J. 0802
PUGH, W.L. 0956
PUTNAM, W.H. 0725
QUANSTROM, W.R. 0721
QUINN, J.G. 0537
QUINN, J.G. 0568
RAFFAELE, G.C. 0638
RAISBECK, J.M. 0909
RALET, C. 0503
RALET, D. 0503
RAMBIE, G.S., JR. 0504

RAYMOND, R.L. 0926
RAYMOND, R.L. 0927
REED, W.E. 0505
REEVES, D. 0622
RETI, I. 0700
REIGER, G. 0474
REISH, D.J. 0832
RENAULT, PH. 0587
REYNOLDS, J.L. 0991
RICCI, R.J. 0506
RICE, S.D. 0761
RICE, S.D. 0803
RILEY, R.T. 0819
RINKEL, M. 0840
RIVERA, J. 0527
ROBERTS, W.F. 0567
ROBERTSON, A. 0575
ROBINSON, E.A., JR. 0537
ROGENMUSER, K. 0760
ROGERSON, P.F. 0783
ROLAND, J.V. 0475
ROSENBERG, D.H. 0841
ROSENBLUM, I. 0820
ROSS, C.W. 0751
ROSS, C.W. 0621
ROSS, D.E. 0669
ROSS, S.L. 0751
ROSSI, S.S. 0798
ROSSI, S.S. 0804
ROSSI, S.S. 0805
ROUBAL, W.T. 0806
ROWELL, M.J. 0633
RUCKER, J.B. 0891
RYAN, C. 0932
SABO, D.J. 0810
SAEKI, M. 0613
SAGE, B. 0892
SAILOT, A. 0960
SALMANOV, M.A. 0940
SAM, K. 0890
SANDEMAN, M.J. 0553
SANDERS, H.L. 0828
SANDSTROM, M. 0505
SCALAN, R.C. 0552
SCARBOROUGH, A. 0773
SCHAFFER, R.L. 0819
SCHARFENSTEIN, C.F. 0614
SCHEIER, A. 0807
SCHIMKE, G.R. 0476
SCHNEIDER, E.D. 0784
SCHUBERT, F.P. 0999
SCHULTZ, L.A. 0615
SCHWARTZ, R.D. 0941
SCHWIETE, R. 0695
SCOTT, E.S. 0531
SEARL, T.D. 0520
SEARL, T.D. 0525
SEIKE, Y. 0647
SEIKE, Y. 0623
SELLECK, R.E. 0687
SEMANOV, G.N. 0616
SEMANOV, G.N. 0617
SHAKHMATOVA, Z.N. 0940
SHAMOLINA, E.P. 0942
SHAW, D. 0773
SHAW, D.G. 0808
SHAW, S.H. 0618
SHEARLS, E.A. 0758
SHIBATA, M. 0748
SHIBATA, M. 0749
SHIMUZU, I. 0748
SHIMUZU, I. 0749
SHIU, W.Y. 0950
SHORT, J.W. 0761
SHORT, J.W. 0803
SHORT, T.E. 0741
SIEGFRIED, W.R. 0777
SILLION, B. 0593
SILLION, B. 0594
SILLION, B. 0595
SILLS, D.L. 0833
SIOZADE, J.E. 0750
SKEWES, R.L. 0483
SKEWES, R.L. 0493
SLACK, J.R. 0893
SLEETER, T.D. 0957
SMITH, D.C. 0630
SMITH, D.J. 0745
SMITH, E.L. 0662
SMITH, E.R. 0808
SMITH, G.F. 0619
SMITH, M.F. 1004
SMITH, R.A. 0893
SMITH, T.G. 0779
SMOOKLER, A.L. 0701
SOLSBERG, L.B. 0620
SOLSBERG, L.B. 0621
SOMERVILLE, H.J. 0948
SOTO, C. 0809
SOWINSKI, E.J. 0555
SPHERE ENVIRN CONSULTANTS 0894
STAFFORD, J.W. 0844
STAFFORD, J.W. 0888
STAFFORD, J.W. 0895
STAMOUDIS, V.C. 0530
STARK, R.M. 0964
STASCH, M.J. 0531
STEGEMAN, J.J. 0810
STENSTROM, B.H. 0507
STEWART, R.J. 0653
STICH, H.F. 0486
STONE, C.M. 0648
STRANAHAN, S.I. 0806
STRAUGHAN, D. 0811
STRAUGHAN, D. 0812
STROSHER, M. 0554
STROSHER, M. 0953
STROSHER, M.T. 0953
STRUHSAKER, J.W. 0788
SUESS, M.J. 0978
SUFFETT, I.H. 0555
SUFLITA, J.M. 0939
SUGIMOTO, A. 0502
SUMMERS, R.J. 0911
SUTTON, C. 0556
SUZUKI, R. 0557
SUZUKI, T. 0702
TAGGER, S. 0933
TAGUCHI, K. 0461
TAKAOKA, S. 0707
TAKESHITA, H. 0623
TALTS, A. 0622
TANIGUCHI, H. 0647
TATEM, H.E. 0798
TEAL, J.M. 0526
TEAL, J.M. 0537
TEAL, J.M. 0538
TEAL, J.M. 0828
TELFORD, M. 0782
TEXACO 0996
THIMM, H.F. 0631
THOMAS, A.R. 0925
THOMAS, J.P. 0525
THOMPSON, B.D. 0967
THOMPSON, J.H. 0838
THOMPSON, M.E. 0968
THORNBURG, W. 0558
THORNE, P. 0760

THORNTON, D.E. 0751
TIDESWELL, M.W. 0663
TOCK, D.G. 0477
TORRADAS, J.M. 0527
TOWNES, B. 0896
TOWNLEY, J.R. 0638
TOYAMA, M. 0703
TRAVERS, W.B. 0897
TRAXLER, R.W. 0916
TRENHOLM, S.R. 0819
TRESIDDER, S.J. 0717
TRUDGILL, P.W. 0917
TSAI, M.-H. 0559
UCHIDA, S. 0623
UJFALUSSY, B. 0700
UNDERWOOD, D. 0813
USAMI, T. 0740
USCG 0654
USCG 0481
US FISH & WILDLIFE SERVICE 0839
USGS 0898
USN 0624
USN SUPPLY SYSTEMS COMMAND 0704
UYEMA, H. 0943
UZUNER, M.S. 0983
VALLARIO, N.C. 0745
VAN BAALEN, C. 0552
VANDERMEULEN, J.H. 0979
VANDERMEULEN, J.H. 0980
VAN GELDER-OTTWAY, S. 0478
VAN KLEEF, P.J. 0823
VANLOOCKE, R. 0944
VENTULLO, R.M. 0939
VESILIND, P.A. 0834
VERLINDE, A. 0944
VERSTRAETE, W. 0944
VISSCHER, M. 0734
VOLLMERS, R.R. 0515
WADE, T.L. 0537
WADE, T.L. 0568
WADHAMS, P. 0900
WAGNER, H.C. 0859
WAKEHAM, S.G. 0560
WAKEHAM, S.G. 0981
WALKER, J.D. 0945
WALKER, J.D. 0946
WALKER, J.D. 0947
WALSH, J. 0655
WALTON, A. 0495
WANG, H. 0954
WANG, H. 0982
WARD, R. 0742
WARDLEY-SMITH, J. 0752
WATKINSON, R.J. 0948
WATSON, R. 0517
WEISKOPF, F.B. 0983
WEISS, F.T. 0863
WEST, G.C. 0901
WEST, G.L. 0625
WESTERGAARD, R.H. 0753
WESTREE, B. 0626
WETMORE, W.C. 0714
WHELAN, J. 0902
WHIPPLE, W.,JR. 0479
WHIPPLE, W., JR. 0561
WHITBY, F.J. 0562
WILEY, M.A. 0997
WILL, R.G. 0721
WILLIAMS, A.S. 0630
WILSON, D.M. 0531
WILSON, J.E. 0627
WINCHESTER, E. 0903
WINTERS, K. 0552
WINTERS, K. 0563
WISE, N. 0705
WOLFE, D.A. 0904
WONG, P.T.S. 0934
WORTHINGTON, V. 0656
WORTHINGTON, V. 0635
WOODWARD-CLYDE CONSULTANTS 0905
VANDERHORST, J.R. 0814
VANDERHORST, J.R. 0815
VANDERKOOY, N. 0575
WHIPPLE, W. JR. 0548
WHITE, R.A. 0634
WILKINSON, P. 0814
WILKINSON, P. 0815
WILLIAMS, L.G. 0816
WORTHINGTON, V. 0480
WRIGHT, G.P. 0508
WRIGHT, J.A. 0519
YAMAGUCHI, N. 0557
YANG, W.E. 0954
YARBROUGH, J.D. 0765
YARBROUGH, J.D. 0817
YAZAKI, A. 0754
YEN, T.F. 0872
YOKOTA, K. 0628
YOUNG, D.R. 0487
YOUNG, E.P. 0699
YU, S.H. 0561
YU, S.L. 0479
YU, S.L. 0548
YU, T.S. 0564
ZALL, D.M. 0576
ZATTERA, A. 0822
ZHOVNIROVSKAYA, A.B. 0671
ZSOLNAY, A. 0509
ZSOLNAY, A. 0793
ZUBAKOVA, L.B. 0671

APPENDIX

Periodicals Reviewed

Abstracts on Health Effects of Environmental Pollutants
Alaska Seas and Coasts
Alternatives: Perspectives on Society and Environment
Ambio
American Fisheries Society Transactions
Applied Energy
Applied Microbiology
Applied Science & Technology Index
Aquatic Sciences & Fisheries Abstracts
Audubon
Australian Science Index
Berichte der Deutschen Wissenschaftlichen Kommission fuer Meeresforschung
Biological Abstracts
Bioscience
British Birds
Bulletin of Environmental Contamination and Toxicology
California Water Pollution Control Association Bulletin
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemical Engineering Progress
Chemical Week
Chemistry in Canada
Chemosphere
Current Contents: Life Sciences
Current Contents: Physical and Chemical Sciences
Deep-Sea Research
Ecolibrium
Ecological Abstracts
Ecological Modelling
Ecological Society of America Bulletin
Ecology Law Quarterly
Energy Information Abstracts
Energy Review
Environment
Environment Abstracts
Environmental Action
Environmental Conservation
Environmental Geology
Environmental Health and Pollution Control

Environmental Periodicals Bibliography
Environmental Pollution
Environmental Science & Technology
Environmental Technology and Economics
EPA Reports Bibliography Quarterly
Erdoel und Kohle Erdgas Petrochemie vereinigt mit Brennstoffchemie
Estuarine and Coastal Marine Science
Fuel Abstracts and Current Titles
Government Reports Announcements
Hydrocarbon Processing
IMS Newsletter
India Journal of Environmental Health
Industrial Wastes Information Bulletin
International Aerospace Abstracts
International Journal of Ecology and Environmental Science
International Journal of Environmental Analytical Chemistry
International Petroleum Abstracts
Iranian Journal of Science and Technology
Journal of Canadian Petroleum Technology
Journal of Chromatography
Journal of Environmental Science and Health
Journal of Environmental Sciences
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 Fisheries Review
Marine Geology
Marine Geotechnology
Marine Newsletter
Marine Pollution Bulletin
Marine Science Contents Tables
Marine Technology Society, Journal
Maritime Research Information Service Abstracts
Massachusetts Audubon
Microbial Ecology
National Fisherman
National Petroleum News
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
Ocean Oil Weekly Report
Oceanic Abstracts

Oceanus
Offshore
Offshore Abstracts
Oil and Gas Journal
Outdoor California
Pacific Oil World
Petroleum Abstracts
Petroleum Engineer International
Petroleum Today
Pollution Abstracts
Pollution Engineering
Proceedings in Print
Resources
Resource Recovery and Conservation
Royal Society of London, Proceedings, Series B, Biological Sciences
Science
Science News
Science of the Total Environment
Scientific and Technical Aerospace Reports
Sea Frontiers
Sea Secrets
Sea Technology
Selected References on Environmental Quality
Selected Water Resources Abstracts
Sierra Club, San Francisco, Bulletin
Technical Book Review
The Ecologist
The Engineering Index
The International Journal of Environmental Studies
The Sciences
UDS Water Quality Control Digest
Underwater Information Bulletin
Underwater Naturalist
Water, Air, and Soil Pollution
Water Pollution Control
Water Pollution Control Federation, Journal
Water Research
WRC Information
Western Fisheries

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16. ABSTRACT

The February 1977 - April 1977 issue of Oil Spill and Oil Pollution Reports is a quarterly compilation of oil pollution publications and ongoing project summaries. Presented in the report are: (a) summaries and citations of published literature and patents; (b) summaries and status of current research projects; and (c) current oil-related conferences. This report is submitted in partial fulfillment of EPA Grant No. R-805052 by the Marine Science Institute, University of California, Santa Barbara, under the sponsorship of the Environmental Protection Agency.

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