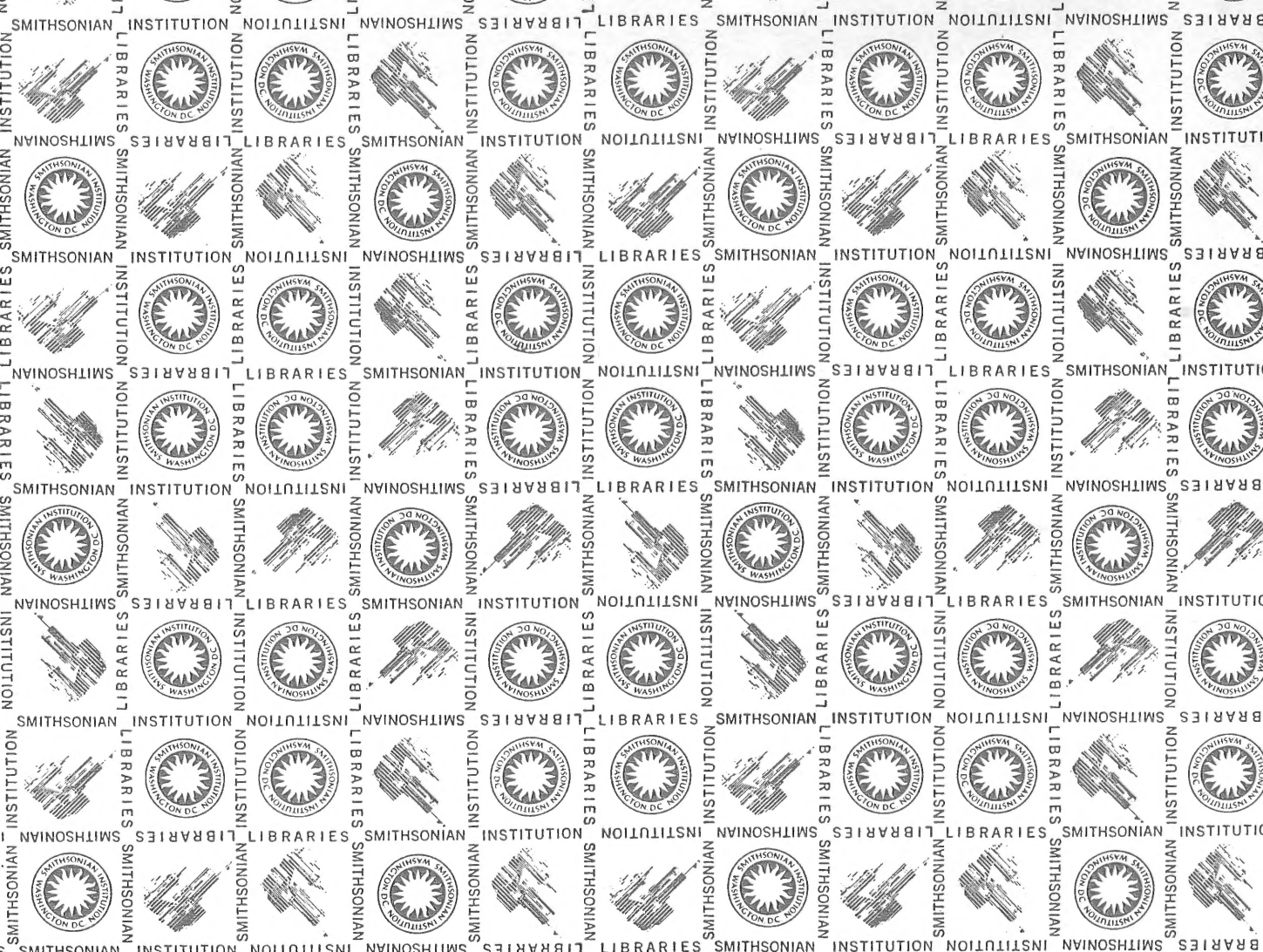
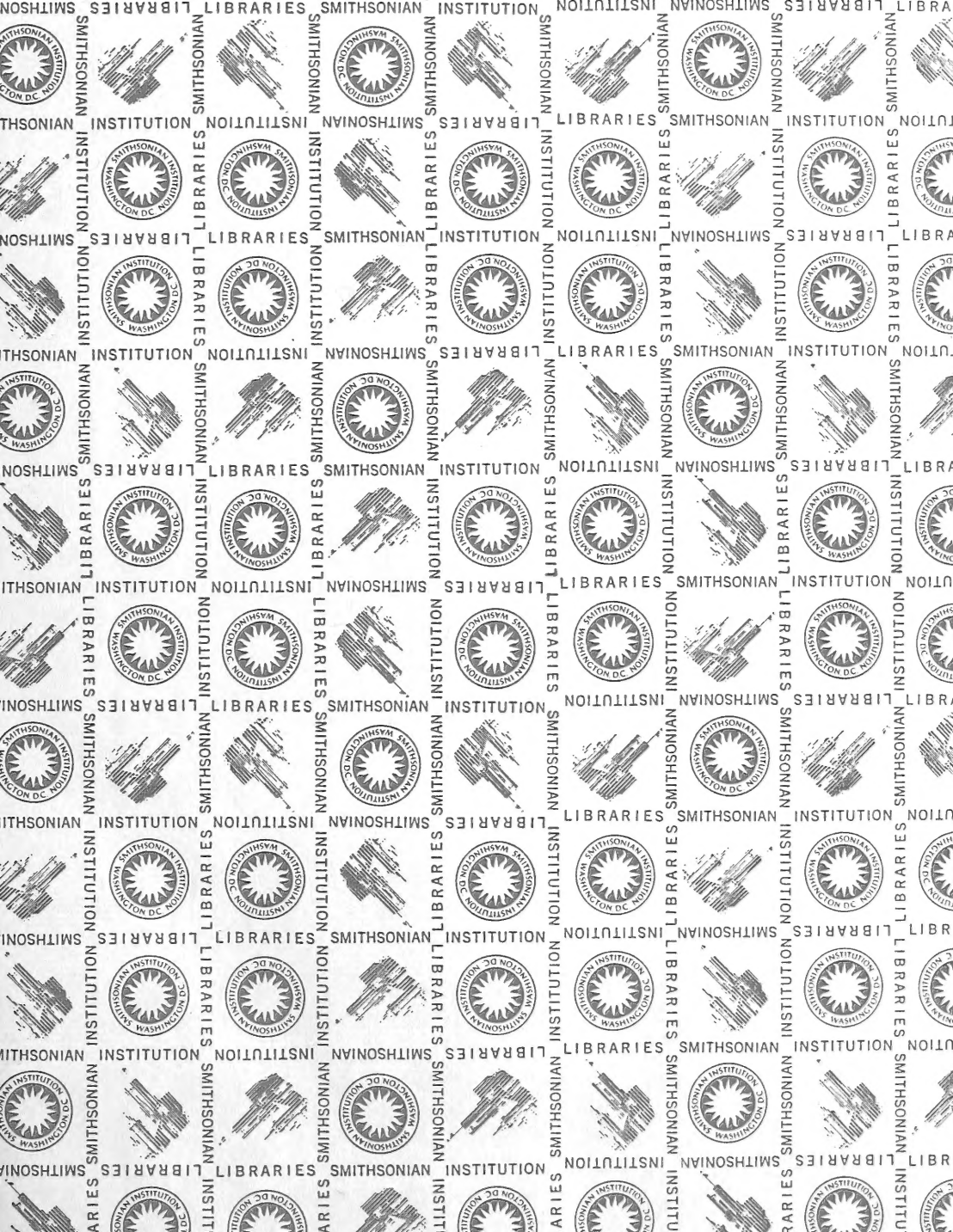

SMITHSONIAN INSTITUTION LIBRARIES


SMITHSONIAN INSTITUTION LIBRARIES

PB83-216069

Assessment of Past, Present, and Future Risks of Oil Spills in and Near the Present SEA Otter Range in California

Richard T. Tinney, Jr.

Prepared for

U.S. Marine Mammal Commission
Washington, D.C.

June 1983

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

Report No. MMC-83/01

ASSESSMENT OF PAST, PRESENT, AND FUTURE RISKS OF OIL SPILLS IN AND NEAR THE PRESENT SEA OTTER RANGE IN CALIFORNIA

Richard T. Tinney, Jr.
1501 South George Mason Drive
Arlington, Virginia

Published June 1983

Final Report to U.S. Marine Mammal Commission
in fulfillment of Contract No. MM2324944-0

Availability Unlimited

Prepared for

U.S. Marine Mammal Commission
1625 I Street, N.W.
Washington, D.C. 20006

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. MMC-83/01	2.	3. Recipient's Accession No. PB83-216069

4. Title and Subtitle

Assessment of Past, Present, and Future Risk of Oil Spills in and Near the Sea Otter Range in California

5. Report Date May 27,1983

6.

7. Author(s)

Richard T. Tinney, Jr.

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

Richard T. Tinney, Jr.
1501 South George Mason Drive
Arlington, Virginia 22204

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.

(C) MM2324944-0
(G)

12. Sponsoring Organization Name and Address

Marine Mammal Commission
1625 I Street, NW
Washington, D.C. 20006

13. Type of Report & Period Covered

Final

14.

15. Supplementary Notes The views, ideas and opinions expressed in this report are those of the author and are not necessarily shared by the Marine Mammal Commission, its staff, or its Committee of Scientific Advisors.

16. Abstract (Limit: 200 words)

In 1977 the U.S. Fish and Wildlife Service listed the Sea Otter in California as a threatened species, primarily because of the potential risk posed to the population by oil spills. This report examines the extent of the oil spill risk as it existed in 1977, as it exists now, and as it is expected to exist in 1988. Included are risk-related factors such as offshore oil exploration, development, production, and transportation, oil spill response capability, coastwise transportation of crude oil and refined products, and improved offshore technology.

17. Document Analysis a. Descriptors

Offshore oil and gas development; California sea otters; oil spill risk assessment.

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement

Availability Unlimited

19. Security Class (This Report)	21. No. of Pages
Unclassified	214
20. Security Class (This Page)	**22. Price**
Unclassified	

TABLE OF CONTENTS

Executive Summary..... iii
Introduction..... 1
I. Offshore Oil in and Near the Sea Otter Range..... 7
II. Oil Transportation in and Near the Sea Otter Range... 19
III. Oil Spill Data and Models..... 33
IV. Oil Spill Response..... 53
V. The Situation in 1977..... 69
VI. The Situation Expected in 1988..... 77
VII. Synthesis..... 92
Bibliography..... 100
Glossary..... 105
Appendices
A. Oil Spills from Platforms and Drillships in Southern California Waters..... 108
B. Spills in the Sea Otter Range 1977-Present.. 112
C. Example of Oil Spill Trajectories..... 128
D. Selected Drift Bottle Trajectories..... 133
E. Inventory of Equipment and Materials - Clean Seas and Clean Bays..... 146
F. Prediction of Oil Spill Movement..... 183
G. Prediction of Oil Spill Movement..... 196

EXECUTIVE SUMMARY

In 1977 there were 198 producing oil and gas wells in the federal offshore zone of southern California. Seven platforms were in place on the federal OCS, all but one of which were producing. In state waters, eight platforms and six subsea completions were in place.

Tanker traffic in the area involved 2,880 arrivals in 1977 at San Francisco (1217 tankers), Los Angeles (1220) and the ports in between of Moss Landing (87), Estero Bay (179), Port San Luis (96), Carpinteria (27), and Port Hueneme (54). Another 400 tankers of Alaskan crude were expected to begin arriving in the area upon the completion of the Alaska pipeline.

Lease Sale 48 in the federal OCS was to be held shortly. Spill rates were estimated to be 1.8 platform spills per billion barrels of oil produced and 2.3 pipeline spills per billion barrels. At the time, oil spill response technology and preparedness were at an early stage, with limited equipment and technology available to deal with any problem.

Since that time, much has changed. The State Lands Commission has decided to lease 40,000 acres of state tidelands for oil and gas development between Point Arguello and Point Conception. In federal waters, lease sales 48 and 68 were held in 1979 for tracts in the Santa Barbara channel, sale 53 was held for tracts in the Santa Maria

Basin at the southern end of the sea otter range. Significant new oil finds have been announced for the sale 53 area, and exploration and development in this area are proceeding rapidly.

Oil from a variety of sources is transported through the region. Vessel arrivals at Santa Barbara Channel marine terminals, where crude oil and some products are loaded, numbered 132 in 1980. Use of the Morro Bay and Moss Landing tanker facilities declined to 16 and 13 tankers each in 1981. Tanker calls at San Francisco dropped to 992 vessels, and at Los Angeles rose to 1,381. Other ports saw 200 tankers in 1981, most of which were by 6 or 7 vessels on repeated trips.

Oil spill rates for offshore operations were revised to reflect more recent experience. For spills of 1,000 barrels or greater, the new rates are 1.0 spills per billion barrels from platforms, 1.6 from pipelines, and 1.3 from tankers.

Oil spill trajectory modelling is still an inexact science. Industry and government models are very different, and both have been criticized. Apparently, currents and winds off the California coast are extremely complex, making genuinely representative models decidedly difficult to formulate.

As for oil spill response, the amount and location of response equipment has improved substantially. Nevertheless, oil spill response capability is generally regarded as inadequate for large spills or spills under severe weather or sea states.

By 1988 the oil spill risk situation should change substantially. Hundreds of new offshore oil wells are expected, both in the Santa Barbara Channel and the Santa Maria basin off the Central California coast. New platforms are planned for both areas, with Santa Maria basin tracts receiving their first platforms by 1985. Tracts in the Point Arguello state tidelands will also receive platforms. Oil from these areas is expected, at least in part, to be tankered to San Francisco, transiting the entire sea otter range in the process.

Alaskan production is expected to remain high, thereby keeping the amount of Alaskan oil transported south high.

Oil spill response equipment will continue to be acquired, although in terms of the area covered or the amount of equipment per volume unit of oil may not increase concomitantly.

INTRODUCTION

On January 14, 1977 the U.S. Fish and Wildlife Service issued a rulemaking which determined that the Southern Sea Otter (Enhydra lutra nereis) is a threatened species within the provisions of the Endangered Species Act, 16 U.S.C. 1531-43; 87 Stat. 884. (42 F.R. 2965-69). This determination came about after over a year and a half of analysis of extensive and complex information by the Service. The analysis had been triggered by a May 22, 1975 request for the listing as endangered species of 216 taxa of plants and animals, which included the Southern Sea Otter.

The sea otter formerly ranged around the rim of the North Pacific Ocean from the northern islands of Japan to central Baja California (Kenyon, 1981). In the mid-eighteenth century, extensive European exploitation of the sea otter began. The exploitation was so complete that by the beginning of the twentieth century the sea otter, while not in fact extinct, was widely believed to be doomed. Small remnant groups persisted however, including one in southern Monterey County, California. From this group of otters, numbering something more than 150 individuals, the present stock of Southern Sea Otters has sprung (Kenyon, 1969).

Although known to certain local ranchers, scientists, and California Department of Fish and Game personnel, the Monterey

County remnant group was publicly "rediscovered" in 1938. Both its range, which was centered in 1938 between Bixby Creek and Big Creek, and its population soon expanded. By 1977 sea otters had reached as far south as Avila and as far north as Sunset State Beach near Santa Cruz. The Southern Sea Otter population at that time was estimated to be 1789 animals (based on a count of 1561) and, like the range, growing. Since that time the range has expanded slightly to Pismo Beach in the south and Soquel Point to the north. A November 1982 count of 1,194 free-swimming otters has thrown the population question into uncertainty.

The original Fish and Wildlife Service decision to list the Southern Sea Otter as a threatened species was based primarily on the perceived threat that oil spills posed to the animals. Specifically, the Service expressed the conclusion that a "major spill of oil from a tanker in the waters in the vicinity of the range of the Southern Sea Otter is probably the most serious potential threat to the species." (42 F.R. 2965, 2966). At the time, important factors in the perception were the relatively small number of animals and the relatively restricted range, both of which were believed to be increasing.

The Service noted that oil unloading facilities existed at Moss Landing near the northern end of the sea otter's range and at Estero Bay near the southern end of the range. At the time of the listing, both terminals were the subjects of proposals for enlargement. Also noted as items of concern were tankered oil imports and the then-pending start-up of oil shipments from the Alaska Pipeline tanker facility at Valdez.

The Service stated that a single oil spill would not likely wipe out the entire sea otter population. There was concern that a major spill, under the right weather and sea conditions, could eliminate a significant portion of the population. The remaining animals could then be classified as "endangered" due to reduction in numbers, disruption, and vulnerability to further problems.

In designating the sea otter as threatened, the Service noted that the probability of an oil spill occurring could not be predicted. At the same time, however, the Service observed that an oil spill was possible. This possibility, together with the consequences of a spill, plus the projected increase in oil tanker activity in the sea otter area, led to the decision to make the listing.

The Endangered Species Act requires the Fish and Wildlife Service to conduct a review of all listed species at least once every five years. The purpose of this review is to ensure that the listing accurately reflects the most current information concerning the status of the listed species.

On September 27, 1982 the Fish and Wildlife Service published a notice of review for wildlife classified as threatened or endangered in 1977 (47 F.R. 42387-88). Among the species for which notice of review was given was the Southern Sea Otter. The notice of review solicited comments concerning the status of the listed species from the public, government agencies, the scientific community, industry, or any other interested party.

As background for its comments on the sea otter listing, the

Marine Mammal Commission contracted for this study of oil spill risks in and near the sea otter range.

Importantly, the Endangered Species Act requires that the five-year review be conducted in the same manner as the original listing. Accordingly, this project looks at oil spill risks from three perspectives. The first of these involves the conditions existing in 1977 when the original listing occurred. This includes the number, location, and extent of offshore leases, platforms, wells, and production as well as oil transportation to, from, and through the sea otter range and its vicinity. Also included are accident rates, oil spill response capabilities, and oil spill models.

The second look at these factors is from the present perspective. The Alaska Pipeline has been operational for years, and substantial new oil finds have been made near the sea otter range. At the same time, offshore technology has advanced and understanding of oceanographic conditions and oil spill dynamics has increased. Clearly the situation has changed since 1977, and this report will show how in the following chapters.

Finally, the report will attempt to look into the future, at what might be expected five years hence in 1988. While even the finest crystal balls are clouded, some reasonable predictions can be made, all with relevance to the question of the continued existence of an oil spill threat significant enough to constitute a likelihood of the sea otter becoming endangered.

Geographically, the focus of this project is the sea otter range. Important nearby areas are included, however, not so much

because they are likely range expansion sites, but because they are comparatively likely sources of oil spills or spill-causing agents, e.g. tankers. These areas include the offshore area out to and including the normal shipping lanes, areas to the north up to the San Francisco harbor entrance, and areas to the south as far as the eastern end of the Santa Barbara Channel (Figure 1).

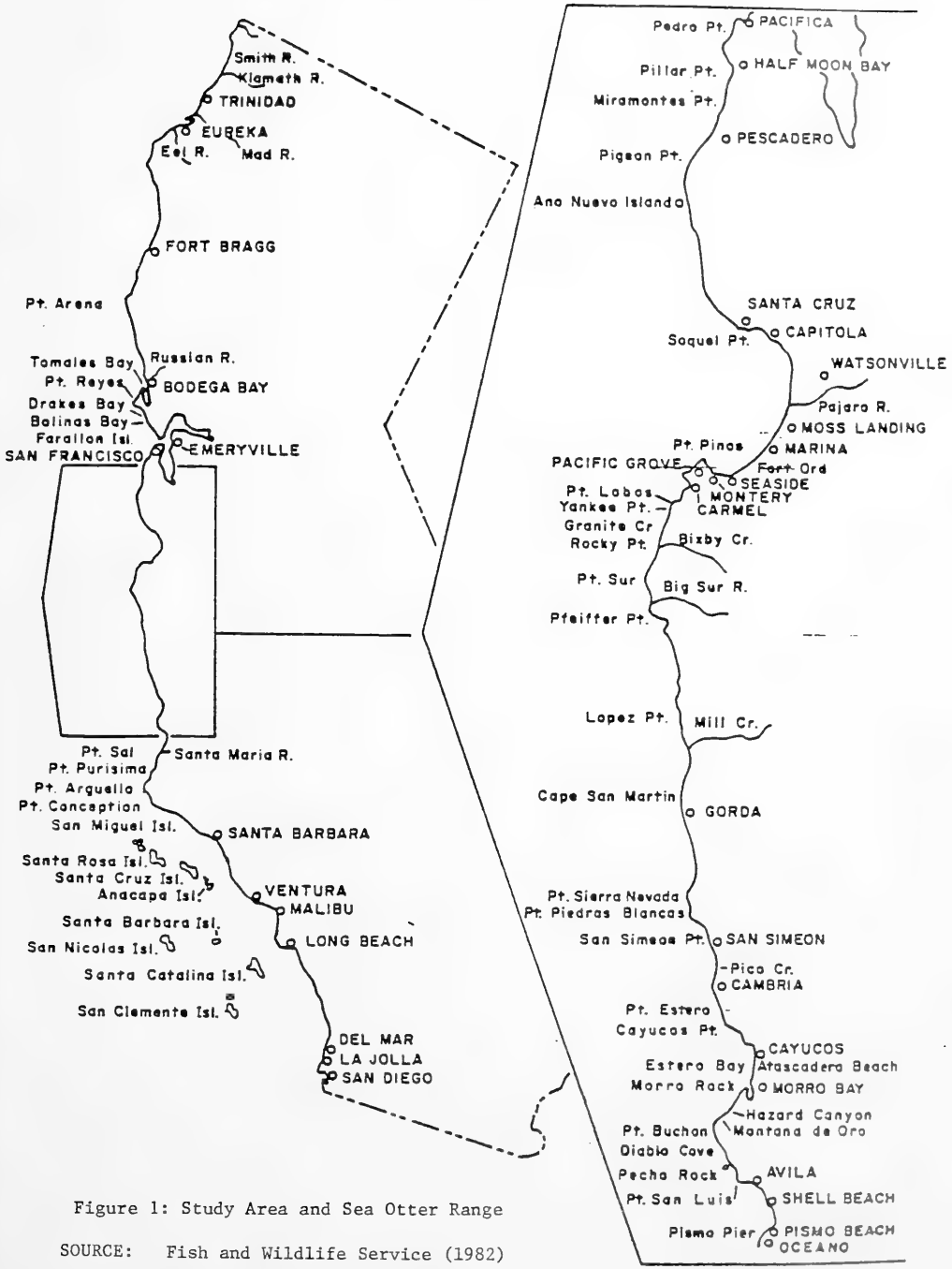


Figure 1: Study Area and Sea Otter Range

SOURCE: Fish and Wildlife Service (1982)

CHAPTER 1

Offshore Oil in and Near The Sea Otter Range

The world's first commercial offshore oil development occurred in the study area beginning in 1896 as wells were drilled from piers along the Santa Barbara Channel shoreline. State government leasing of oil drilling and development rights in the area began in 1929. The area's first federal lease sale, in waters seaward of the three-mile state jurisdiction, took place in 1963. Since these initial efforts the area has been the scene of substantial offshore oil and gas leasing, exploration, development, and production. The timing and size of state and federal lease sales are described on the following pages. In addition, information is provided about existing leases, numbers of wells, and platforms, and amount and value of production.

State Leases

State offshore leases were held periodically from the first sales in 1929 up to 1969. A blowout on a Santa Barbara Channel federal lease in 1969 led to the State Lands Commission declaring a moratorium on all new exploratory or production drilling in state waters. Figure 1A shows the extent of the spill from the blowout five days after it occurred. The spill eventually reached as far as Point Arguello at the western end of the

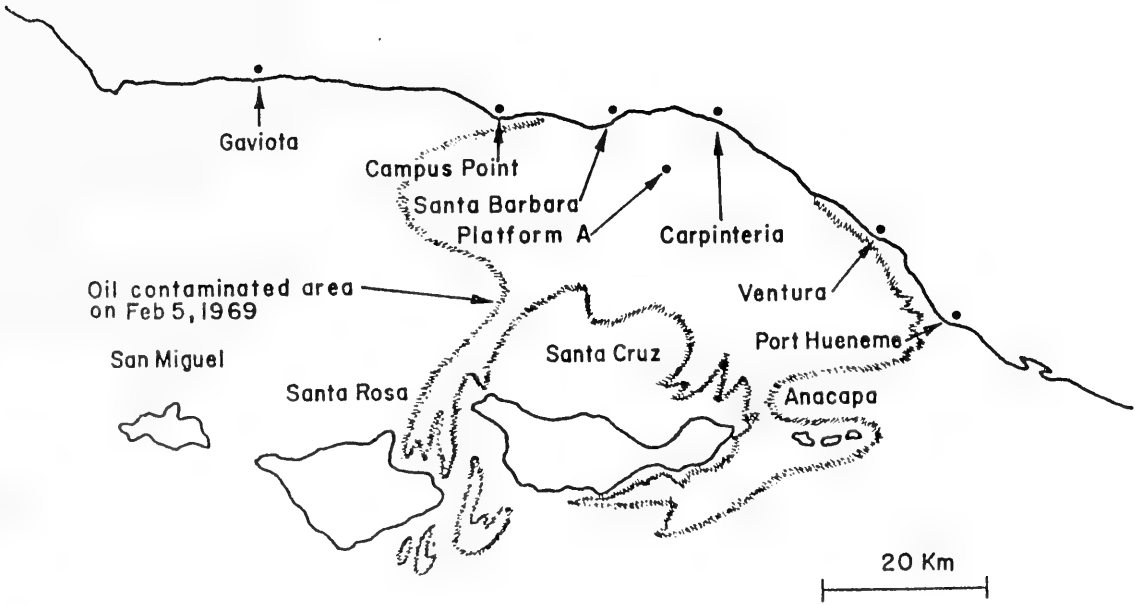


Figure 1A: Extent of Santa Barbara Channel Oil Spill on February 5,1969, Five Days After Spill Occurred.

Source: Modified from Santa Barbara Oil Spill: Hearings Before the Subcom. on Minerals. Materials, and Fuels of the Senate Com. on Interior and Insular Aff., 91st Cong., p.150 (1969).

Channel, and San Miguel Island to the south. In 1974, oil companies began to seek permission to drill on existing but undeveloped leases. Beginning in 1980, exploratory permits were again issued.

Up to 1969 (and since then as no new leases have been granted), offshore development in state lease areas has been confined to the Santa Barbara Channel and the Los Angeles and Orange County coasts. In Santa Barbara and Ventura Counties, the total area leased between 1929 and 1969 totals 152,987 acres, of which 136,278 acres is still under lease. See Table 1.

On the leased areas in state waters in the Santa Barbara Channel, eight platforms and six subsea completions are in place. The locations of these facilities are shown in Figure 3. Off Los Angeles and Orange Counties are two more platforms and six man-made islands in state waters. Total production of oil from all state leases through the end of 1980 has amounted to 1,752 million barrels. Gas production has amounted to almost 650 million cubic feet. See Table 2.

The State Lands Commission recently decided to lease eight tracts covering 40,000 acres between Point Conception and Point Arguello. Current plans call for bids to be opened on August 15, 1983 and accepted by November (Oil & Gas Journal, Jan. 3, 1983). The State Lands Commission estimates that the total undiscovered hydrocarbon resources in the lease area may range from 63 million barrels of oil and 53 billion cubic feet of gas to 274 million barrels and 219 billion cubic feet.

TABLE 1 - State of California offshore oil and gas leases

Parcel number	Present Lessee	Acreage	Date issued
Santa Barbara County			
129	Aminoil	254	1/27/44
208	Aminoil	1,920	1/18/46
308	Atlantic Richfield and others	1,920	3/4/47
309	Atlantic Richfield and others	1,920	3/4/47
421	Aminoil	68.48	10/22/29
424	Aminoil	20	11/12/29[a]
428	William L. Appleford	69.21	7/29/30
1824	Chevron-Exxon	5,500	1/10/57
2199	Chevron-Shell	3,840	7/25/58
2205	Phillips-Pauley and others	3,840	7/25/58[b]
2260	Texaco	3,840	7/25/58
2207	Phillips-Exxon and others	3,840	7/25/58[c]
2725	Texaco	4,250.14	5/4/61
2726	Atlantic Richfield and others	4,250.14	5/4/61
2793	Atlantic Richfield and others	4,250.14	10/26/61
2879	Union	5,653.10	4/26/62
2894	Chevron-Shell	4,250.14	6/28/62
2920	Shell-Chevron	4,250.14	8/28/62
2933	Phillips-Pauley	4,250.14	10/25/62
2955	Texaco	4,250.14	10/20/62
2991	Union	4,250.14	2/28/63
3004	Union-Exxon	3,150	4/25/63
3120	Atlantic Richfield-Mobil	3,324	4/29/64
3133	Exxon	5,535	5/28/64
3150	Atlantic Richfield-Standard	5,553	7/28/64
3242	Atlantic Richfield-Mobil	4,290	4/8/65
3498	Chevron-Exxon	1,165	6/15/66
3499	Phillips-Pan Petroleum	1,340	6/15/66
3503	Union	1,660	6/28/66
4000	Atlantic Richfield-Chevron	204	8/28/68
4001	Chevron	780	8/28/68
4002	Chevron	600	8/28/68
4031	Continental	2,332	8/28/68
Ventura County			
145	Energy Development Corp.	326	7/3/44
410	Norris	50	4/17/29
427	Mobil	148	5/19/30
429	Norris	80	4/21/31
735	Chevron	220	6/30/52
1446	Atlantic Richfield	1,175	8/29/55
3184	Chevron	5,540	9/24/64

Parcel number	Present Lessee	Acreage	Date issued
3314	Shell	5,430	7/2/65
3403	Chevron	5,300	11/18/65
3489	Mobil-Union	4,570	5/26/66
3490	Mobil-Union	5,305	5/26/66
3945	Shell	5,546	5/23/68
3946	Shell	5,589	5/23/68[d]
91	Aminoil, Exxon	589	5/21/43
163	Aminoil	640	11/15/44
186	Exxon-Texaco	1,255	9/24/45
392	Aminoil	835	9/26/38
425	Aminoil	835	2/10/50
426	Aminoil	640	2/10/50
3033	Union	2,113.245	7/25/63
3095	Chevron	3,360	1/30/69
3119	Mobil	3,420	4/29/64[e]
3177	Pauley Petroleum	1,549	8/18/64
3413	Union	1,871	12/1/65

[a]Quitclaimed 11/3/71
[b]Quitclaimed 4/8/68
[c]Quitclaimed 7/25/75
[d]Quitclaimed 4/18/73
[e]Quitclaimed 4/25/73

Source: Collins, et al., 1982

TABLE 2: TOTAL PRODUCTION FROM CALIFORNIA STATE LEASES

Year	Oil (thousands of barrels)	Gas (millions of cubic feet)
1953 and before	422,384	-----
1954	32,665	-----
1955	33,252	-----
1956	32,348	-----
1957	30,561	-----
1958	28,363	-----
1959	26,787	-----
1960	28,074	1,113
1961	29,887	5,903
1962	34,613	10,671
1963	38,346	25,769
1964	40,526	35,323
1965	42,772	40,770
1966	53,294	46,839
1967	64,807	46,732
1968	83,632	85,699
1969	86,530	76,446
1970	79,255	59,117
1971	70,185	44,758
1972	72,518	34,967
1973	70,482	30,441
1974	64,494	24,728
1975	64,456	23,454
1976	53,178	10,872
1977	48,158	11,670
1978	43,747	13,250
1979	41,661	13,095
1980	35,479	11,619
1981		
1982		

Source: U.S. Department of the Interior
Outer Continental Shelf Statistics, 1981

Federal Leases

Seven federal lease sales have been held in the waters seaward of the state waters in the study area. Most leasing and exploratory drilling in federal waters has taken place in the Santa Barbara Channel, as has virtually all development and production (except for two platforms off San Pedro with a total of 31 wells).

The first federal lease sale, designated "P1", was held on May 14, 1963. It resulted in the leasing of 57 tracts off Central and Northern California. All of these leases were relinquished after 20 exploratory wells were drilled and no commercial discoveries made. The relinquishments occurred between 1965 and 1967.

The second California-area federal lease sale was sale P3. It was held December 15, 1966 and involved only one tract, located immediately seaward of state leases in the Carpinteria Offshore field. The sale was held to protect the tract from drainage by wells in the state lease area. Six exploratory wells were drilled on the tract in 1967. A total of 92 development wells have been drilled on the tract, of which 47 are producing oil. Two platforms, Hogan and Houchin, exist on the tract, and were placed by the tract owner, Phillips Petroleum Company. Production began from the platforms in 1968 and 1969, respectively.

Lease sale P4 was held February 6, 1968, and resulted in the leasing of 71 tracts in the Santa Barbara Channel. Of these, 34

remain active. Approximately a year after this lease sale was held (on January 28, 1969), the blowout at Union Oil's Platform A in the Dos Cuadras field off Santa Barbara occurred. As a reult of the oil spill that followed, the Secretary of the Interior suspended all operations on federal Santa Barbara Channel leases as of February 7, 1969. The suspension was lifted shortly thereafter.

Almost six years passed before the next federal lease sale in the study area, number 35 on December 11, 1975. Fifty-six leases were awarded in that sale, of which four are still active. As of January 31, 1982, 40 exploratory wells had been drilled on the 56 leases. No production from within the study area has occurred as a result of this sale.

Lease sale 48 was the next Southern California sale, held June 29, 1979. It resulted in 54 leases in the Santa Barbara Channel, on Santa Rosa-Cortes Ridges, and in San Pedro Bay. All of these leases were still active in early 1982, with 14 exploratory wells having been drilled. One discovery has been announced from this sale.

A second sale off Central and Northern California, number 53, was held May 28, 1981. Despite plans to offer tracts from five basins, only tracts in the Santa Maria basin, the southernmost, were offered. A total of 111 tracts were offered, of which 55 were leased. Twenty-one additional tracts were bid upon, but the Bureau of Land Management was enjoined from accepting those bids. A modification of the injunction later allowed BLM to take action on two of those tracts, on one of which a lease was awarded.

Lease Sale 68 was held for Southern California tracts in June, 1982. Bids were received on 35 tracts, located in the Santa Barbara Channel and south of the Channel Islands.

Sale RS-2, a reoffering of previously offered tracts, was held in July, 1982. Included in RS-2 were tracts offered in sale 53 but not bid on, tracts for which bids were rejected, and tracts under litigation for which no bids were received.

Table 3 sets out pertinent statistics for these federal lease sales held in and near the sea otter range. Included there is information on tracts offered and leased, areas offered and leased, and total lease bonuses paid.

Several discoveries have resulted from the federal leasing activity in the study area. Most of these have been "unitized," a process through which two or more companies holding separate leases consolidate their operations, allowing one company to be the operator for exploration, development and production.

The first discovery in the federal offshore zone came in 1966 at the Carpinteria Offshore field in the tract lease in the 1966 drainage sale (P3). A second tract was added to this field in the 1968 lease sale. Platforms Hogan and Houchin have been installed on these tracts. Hogan produces 830 barrels of oil and 1.6 million cubic feet of gas a day. Houchin produces 3,258 barrels and 2.5 million cubic feet per day. Production from these two platforms is piped ashore. In 1979 a third platform, Henry, was placed in the western portion of the Carpinteria field, with development drilling beginning in February 1980 and production in May 1980. Production from Henry is piped ashore via Platform A and the Dos Cuadras Offshore field.

TABLE 3: Statistics for Federal Pacifc OCS lease sales

Statistic					
Lease Sale	Tracts offered	Acres offered	Tracts leased	Acres leased	Total bonus leased tracts (in thousands)
PI (1963)	129	669,777	57	312,945	$ 12,807
P3 (1966)	1	1,995	1	1,995	$ 21,189
P4 (1968)	110	540,609	71	363,181	$ 602,719
35 (1975)	231	1,257,593	56	310,049	$ 417,312
48 (1979)	148	792,845	54	288,260	$ 572,825
53[a] (1981)	111	603,611	55	292,099	$2,257,587
RS-2 (1981)	27		10		

[a] Statistics for Lease Sale 53 include all bids. The decision to accept or reject 19 bids received on some tracts is pending results of litigation. The sum of high bids on the 19 tracts in litigation is $220,632,072.

SOURCE: BLM, New Orleans OCS Office, 1981.

The Dos Cuadras field was leased in 1968 and currently produces oil and gas via four platforms, A,B,C, and Hillhouse. Production began from A,B, and C in 1969, 1970, and 1977 respectively. Hillhouse began producing in 1970.

The Pitas Point Unit is composed of tracts also leased in 1968. The first discovery was made that year, but no development took place until 1981. Platform Habitat was installed in October of 1981, and is the only platform in the federal portion of the Santa Barbara Channel devoted entirely to gas production. Gas from Habitat, initially 15 million cubic feet per day, but expected to peak at about 63 million cubic feet a day in 1983 and maintain at this rate for 4 or 5 years before beginning a 15 year decline, is piped ashore.

The first discovery in the Santa Clara unit occurred in 1970 on a tract leased in 1968. In 1979 Platform Grace was installed in the unit, followed by Gilda in 1981. Production from Grace is expected to peak in 1984 at 13,000 barrels of oil and 13 million cubic feet of gas a day. Gilda began producing in late 1981, and is expected to peak in 1983 at 18,000 barrels of oil and 19 million cubic feet of gas a day.

The Hueneme Offshore field is also on 1968 sale tracts. Platform Gina sits in this field, with production having begun in 1982. Peak production is expected in 1983 at 6,450 barrels of oil and 1.2 million cubic feet of gas a day.

The Santa Yuez Unit, in the western part of the Santa Barbara Channel, takes in four fields, only one of which, Hondo, is presently producing. Platform Hondo was installed in 1976, but production did not begin until April, 1981 due to controversy

over transport of produced hydrocarbons to shore. Current production, 35,000 barrels of oil and 15 million cubic feet of gas a day, is processed on an offshore storage and treatment vessel (a converted tanker) and then transferred to tankers for transport.

Oil companies have announced a number of other discoveries which have yet to be developed. The Santa Rosa unit, in the eastern end of the Channel is presently in the development planning stages. Chevron announced a discovery on Sale 48 acreage near Point Arguello in November 1981, and delineation drilling continues.

Big news was made in late 1982 when Chevron USA and Texaco USA announced major finds off Point Arguello and Point Conception. Initial estimates indicate that as much as 500 million to 1 billion barrels of oil are present there, making this the biggest find since Alaska's Prudhoe Bay.

Union Oil Co. in January, 1983 announced a separate find nearby, and rumors of additional finds in the area are rampant. Many leaseholders are actively drilling in the area or plan drilling soon. The Minerals Management Service has approved plans for 130 exploration wells in the Point Conception-Point Arguello area, with more plans under consideration. As many as 40 wells are expected to be drilled this year. One observer has characterized the area as perhaps the most significant U.S. oil play for the 1980's (Oil and Gas Journal, Nov. 1, 1982).

CHAPTER II

Oil Transportation
In and Near the Sea Otter Range

The transportation of oil - crude oil to refineries and refined products to consumers - has been identified as the largest source of marine oil pollution. It causes pollution in a number of ways, including bilge cleaning, tank deballasting (tankers with empty tanks will sometimes "ballast down" with sea water for stability, and then jettison the sea water, contaminated with whatever was left in the tank from earlier cargoes, prior to taking on new cargoes), and catastrophic accidents. With respect to sea otter risks, it is the accidents, with their potentially huge and relatively instantaneous oil discharges, that pose the gravest threat.

Oil transportation in the study area takes several forms. Oil (and gas) produced from offshore wells in the study area is taken ashore via pipelines or tankers, and some is later transferred to refineries. Crude oil from Alaska and Southeast Asia enters the study area as it is taken to refineries near the study area or is in transit to other refineries. Refined products are taken from refineries in the area to consumers both within and without the study area.

Crude Oil From Offshore Wells

At the beginning of 1982, about 74,000 barrels of oil and 44.6 million cubic feet of gas were being produced from federal leases in Southern California. All of this production, except that from Hondo and including that from Platforms A,B,C, Hillhouse, Henry, Hogan, Houchin, Gilda, Grace and Gina, is brought ashore via pipelines. Production from Hondo is collected on an offshore storage and treatment vessel located near the platform and periodically loaded on a tanker for shipment to Exxon's Baytown, Texas refinery. Table 4 shows existing and proposed pipelines in the federal offshore zone. Figure 1B shows the locations of the various platforms and other facilities in the Santa Barbara Channel.

Production from all state waters, including that from platforms, subsea completions, and Rincon island, is piped ashore. Table 5 shows pipelines in the state waters.

Once the oil and gas is ashore, it is given preliminary treatment to separate it from water and other contaminants produced with it. Treatment facilities are located at various points along the Santa Barbara Channel mainland shoreline (plus the offshore treatment vessel for Hondo). Table 6 shows the treatment facilities handling OCS production at this time. After treatment, gas is placed in pipelines for transmission elsewhere or use in local utility lines.

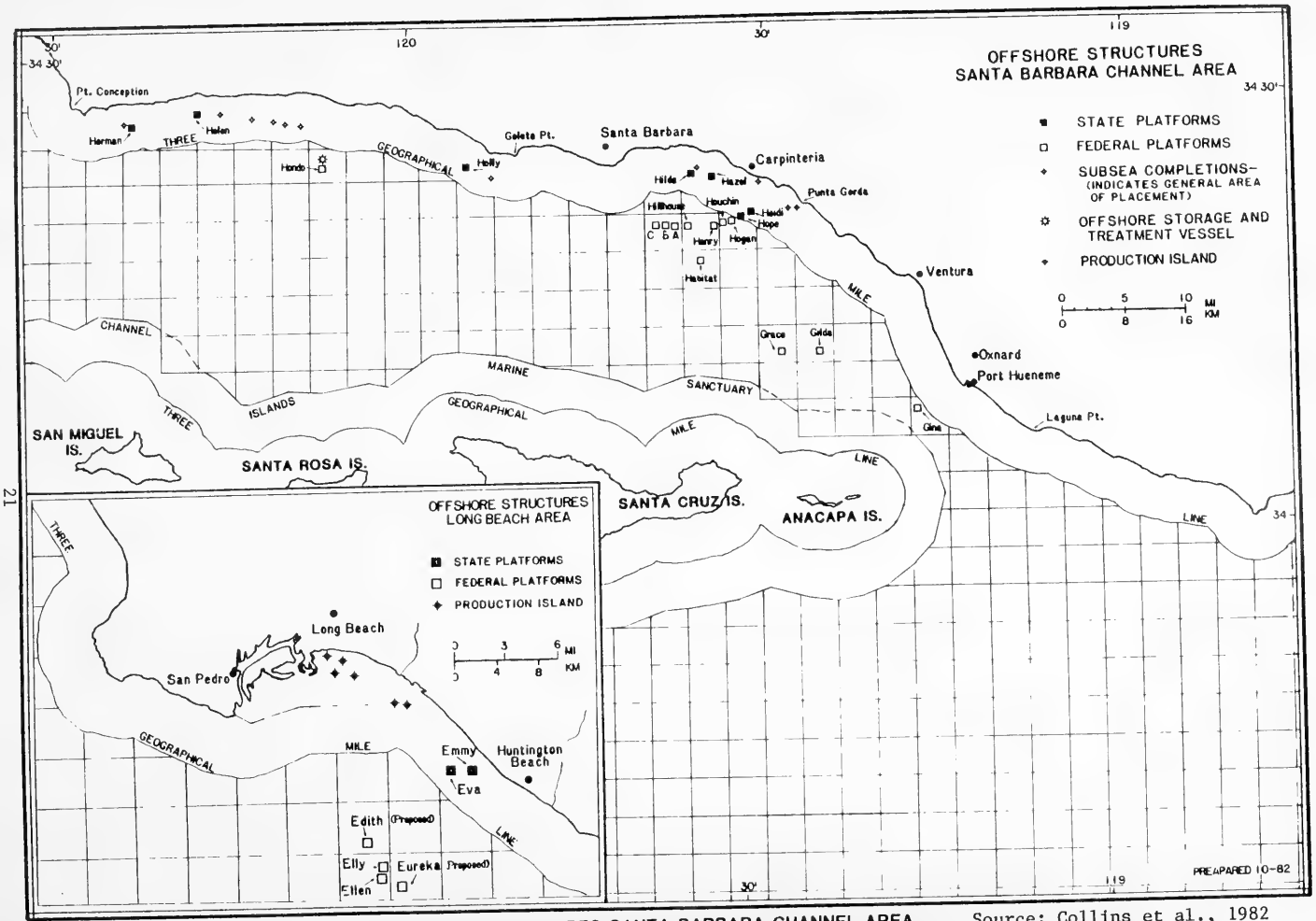


FIGURE 1B OFFSHORE STRUCTURES SANTA BARBARA CHANNEL AREA. Source: Collins et al., 1982

TABLE: 4

Existing and proposed OCS pipelines off Southern California

Unit/ (Field)	Pipeline operator	Platform	Landfall	Type and size	Status
Santa Ynez	POPCO	Hondo[1]	Las Flores Canyon	12-in gas	Approved not constructed
(Dos Cuadras/ Carpinteria Offshore)	Union and Sun	A, Henry Hillhouse B,C	Rincon	12-in oil 12-in gas	Existing
(Carpinteria Offshore)	Phillips	Hogan Houchin	La Conchita	10-in oil 12-in gas	Existing
Pitas Point	Pacific Interstate Offshore Company	Habitat	Carpinteria	12-in gas	Proposed
Santa Clara	Chevron	Grace to Hope	Carpinteria	12-in oil 10-in gas	Existing
	Union	Gilda	Mandalay Beach	12-in oil 10-in gas	Existing
(Hueneme Offshore)	Union	Gina	Mandalay Beach	10-in oil and gas	Existing

[1]Oil from Platform Hondo is stored and treated on an offshore storage and treatment vessel, then offloaded onto tankers.

SOURCES: Collins, et al. (1982).

TABLE: 5

EXISTING OIL PIPELINES LOCATED IN THE
STATE WATERS OFF SOUTHERN CALIFORNIA

ORIGINATING STRUCTURES	DIAMETER (Inches)	LENGTH (Miles)
HERMAN	6	2.3
HELEN	6	2.2
HOLLY	6	2.7
HILDA & HAZEL	6	5.0
HOPE & HEIDI	10	4.1
RINCON	6	0.6

SOURCE: BLM, FEIS Lease Sale 68 (1981)

TABLE 6
Separation and treatment facilities currently handling OCS production in Southern California

Unit/Field (OCS platforms)	Facility location	Facility operator	Current OCS throughput	Design capacity
Dos Cuadras Field (A,B,C, Hillhouse) Carpinteria Offshore Field (Henry)	Rincon, Ventura County	Mobil	Oil: 14,000 bpd Gas: 12,800,000 cfd	Oil: 95,000 bpd Gas: 60,000,000 cfd
Carpinteria Offshore Field (Houchin, Hogan)	La Conchita, Ventura County	Phillips	Oil: 3,400 bpd Gas: 1,500,000 cfd	Oil: 27,000 bpd Gas: 22,000,000 cfd
Santa Clara Unit (Grace)	Carpinteria, Santa Barbara County	Chevron	Oil: 5,500 bpd Gas: 12,000,000 cfd	Oil: 38,000 bpd Gas: 25,000,000 cfd
Santa Clara Unit (Gilda) Hueneme Offshore Field (Gina)	Mandalay Beach, Ventura County	Union	Oil: 1,000 bpd Gas: 250,000 cfd	Oil: 36,000 bpd Gas: 2,000,000 cfd

bpd = barrels per day; cfd = cubic feet per day.

SOURCE: Collins, et al. (1982)

TABLE 7 - MARINE TERMINALS IN SOUTHERN CALIFORNIA

County	Location	Terminal Operator	Function
Santa Barbara	Cojo Bay (Point Conception)	Union	Onloading crude oil
	Gaviota	Getty	Onloading crude oil
	Elwood	Aminoil	Onloading crude oil
	Carpinteria	Chevron	Onloading crude oil
Ventura	Ventura River	Getty	Onloading OCS and other crude oil and natural gasolines
	Ventura	Union	Onloading OCS and other crude oil
	Mandalay Beach	Southern CA. Edison	Offloading fuel oil

SOURCE: Collins et al., (1982)

Much of the crude oil produced in the Santa Barbara Channel is loaded onto tankers after onshore treatment and transported to refineries. Table 7 lists the marine terminals currently handling transshipment of treated crude oil for transportation via tanker to refineries.

Vessel traffic from the onshore treatment and transshipment facilities and from Hondo's offshore storage and treatment facility is not heavy. Statistics for the year ending October 31, 1980, the most recent statistics available, show a total of 132 seagoing vessels calling at these facilities to handle oil production. Present tanker use actually is less than these figures indicate due to the completion of two new onshore pipelines.

The first of these is Chevron's pipeline from Carpinteria in Santa Barbara County to the Rincon facility in Ventura County. The 10 inch pipeline is six miles long and has a capacity of 500,000 barrels per month. Oil from platform Grace in the federal OCS and from state leases is presently transported by the pipeline at a rate of 150,000 barrels per month. From Rincon the oil is transported to Los Angeles area refineries via existing pipelines. This Chevron pipeline has eliminated the need for tanker transport of oil from Carpinteria.

A second new pipeline connects Union Oil's new Mandalay Beach separation and treatment facility with an existing Union pipeline which runs from Ventura County to Union's Wilmington refinery. This new 2.5 mile pipeline, which began operating in December, 1981, has a capacity of about 30,000 barrels per month and handles production from platforms Gilda and Gina.

TABLE 8 : VESSEL ARRIVALS AT SANTA BARBARA CHANNEL MARINE TERMINALS

LOCATION	SEAGOING VESSEL ARRIVALS FOR 12 MONTHS ENDING OCTOBER 31, 1980
Cojo Bay	1
Gaviota	20
Elwood	20
Carpinteria	20
Ventura (Union)	0
Ventura (Getty)	61
Mandalay	10
TOTAL	132

SOURCE: U.S. Coast Guard (1981)

Crude Oil from Outside the Study Area

Crude oil from Alaska, Indonesia, and elsewhere regularly is brought into or through the study area as it is transported in tankers to U.S. refineries.

Alaskan Oil, including that from the North Slope and from southern Alaska, is delivered to the lower 48 states at a rate of about 1.6 million barrels a day (Department of the Interior, 1982). Of this total, only about 88,000 barrels is from southern Alaska, with the remainder coming from fields serviced by the Trans Alaska Pipeline System (TAPS). TAPS is a 48-inch diameter line with a design capacity of 2.0 million barrels a day, although it is currently operating at about three-quarters of that capacity. TAPS oil, from the 9.6 billion barrel Prudhoe Bay field and the 1.5 billion barrel Kuparuk field, is loaded into tankers at a terminal in Valdez, Alaska which can handle four tankers at one time. The average turnaround time for tankers at this facility is 24 hours.

About half of the Alaskan crude oil shipments are processed by west coast refineries. The remainder is sent to east and gulf coast refineries via the Panama Canal and the recently-opened Trans-Isthmus pipeline.

Refined Products

Refined products are delivered to various facilities within the study area via tanker. The two most prominent of these facilities are the Pacific Gas and Electric generating plants at Morro Bay and at Moss Landing.

The Morro Bay plant uses a ship's mooring consisting of seven buoys located 4,500 feet offshore in the south end of Estero Bay. Fuel oil is offloaded from tankers at the mooring through 305 feet of 16-inch sea hose which is connected to a 24-inch submarine pipeline. The pipeline has a capacity of 10,000 barrels per-hour. Onshore storage at Morro Bay consists of nine tanks with a total capacity of 1,836,000 barrels. As of June 1, 1982 there were 1,552,000 barrels of fuel oil stored in these tanks (Pacific Gas & Electric, 1982). Table 9 shows the number of vessels using this facility from 1974 to 1981, and the amount of fuel oil discharged.

The Moss Landing facility also consists of seven mooring buoys. It is located 3,200 feet offshore in 52 feet of water. A single 3,600 foot long, 18-inch pipeline runs from shore to the mooring, with 300 feet of hose at the end. Nineteen onshore tanks have a capacity of 5,965,000 barrels. As of June 1, 1982 there were 4,582,000 barrels in storage. Table 10 shows the number of tankers using the facility and the amount of oil discharged from 1974 to 1981.

TABLE 9 : USE OF THE MORRO BAY FUEL OIL OFFLOADING FACILITY

YEAR	NO. OF VESSELS	AMOUNT OF OIL DISCHARGED BBLS
1974	13	1,930,000
1975	17	2,070,000
1976	35	4,293,000
1977	24	3,193,000
1978	31	3,860,000
1979	36	4,195,336
1980	25	3,345,000
1981	16	2,466,000

SOURCE: PG & E (1982)

TABLE 10: USE OF THE MOSS LANDING FUEL OIL OFFLOADING FACILITY

YEAR	NO. OF VESSELS	AMOUNT OF OIL DISCHARGED BBLS.
1974	26	4,380,000
1975	28	4,415,000
1976	58	8,132,000
1977	87	13,250,000
1978	30	4,710,000
1979	44	7,080,000
1980	28	5,490,000
1981	13	3,200,000

SOURCE: PG & E (1982)

Crude Oil and Products to and from Other Ports

Tankers also call at crude oil loading facilities at Estero Bay and Port San Luis. Chevron operates two crude oil loading facilities as Estero Bay, and Union operates one at Port San Luis. At Morro Bay, the Navy and Texaco each operate facilities for the receipt of refined products. In 1981, annual port calls at these facilities by tankers totalled 200, most of which were made by 6 or 7 vessels on repeated trips (USCG, 1982).

At each end of the study area are large harbors, San Francisco Bay in the north and the Los Angeles/Long Beach complex in the south. In 1982, total tanker calls at San Francisco Bay amounted to 992 vessels (Marine Exchange of San Francisco, 1983). Tanker calls at Los Angeles/Long Beach in 1982 totalled 1,381 (Marine Exchange of Los Angeles-Long Beach Harbor, 1983).

CHAPTER III

Oil Spill Data and Models

The probability and likely trajectory of oil spills in and near the sea otter range has been a subject of lively discussion and debate at least since the 1969 Santa Barbara Channel oil spill from Platform A. The chief topics have been two: the technique used to predict the number of oil spills per unit of oil produced or transported; and the sophistication of the models used to predict the trajectory and effect of postulated spills.

The Minerals Management Service (MMS) has the federal governmental responsibility for oil spill risk assessment and modeling. The MMS efforts have been undergoing continued revision as new information and experience is gathered. They likewise have been undergoing continual criticism from all sides. The oil spill risk assessments for lease sales 53 and 68 provide the most recent examples of the MMS risk assessment for the spill areas, although a new risk assessment for Central and Northern California will be presented in the Draft Environmental Impact Statement for lease sale 73, which is expected to be issued in late February or early March.

Oil Spill Rates

The oil spill rates used in the lease sale 53 and 68 risk assessments were developed for three possible sources (platforms, pipelines, and tankers). Three possible sizes were used in sale 68 (50-1,000 barrels, 1,000 + barrels, and 10,000 + barrels) with two sizes (1,000 barrels or less, greater than 1,000 barrels) for sale 53. Oil spill rates in the MMS (then USGS) model are based on the assumption that realistic estimates of future spill frequencies can be based on past OCS experience. This analysis assumes that spills occur independently of each other as a Poisson process, and that the spill rate is dependent on the volume of oil produced or transported.

Accident rates for platforms on the U.S. OCS were derived from USGS accident files and from USGS production records. For spills less than 1,000 barrels in the lease sale 53 risk assessment, records through 1975 were used, they being the same as used in the risk assessment for the 1975 lease sale 35. (BLM, 1980) For larger spills, records as recent as 1978 were used with respect to platforms, 1975 for pipelines, and 1973 for tankers. For lease sale 68, updated records were used, generally including spill and production rates through 1979 (BLM, 1981). The lease sale 68 rates, being the more recent and based on more complete data, are the more meaningful for the present purposes. Table 11 presents the spill rates used in the lease sale 68 risk assessment.

The lease sale 53 risk analysis used rates of 1.8 spills

TABLE 11
OIL SPILL RATES USED IN THE LEASE SALE 68 RISK ASSESSMENT

SOURCE	SPILLS PER BILLION BARRELS		
	50-1,000 bbl	1,000+ bbl	10,000+ bbl
Platforms	8.42	2.05	0.91
Pipelines	3.43	1.82	0.46
Tankers	N/A	3.87	2.32

SOURCE: BLM (1981)

from platforms per billion barrels, 2.3 spills from pipelines per billion barrels, and 3.9 spills from tankers per billion barrels, all for spills of greater than 1,000 barrels.

A more recent MMS evaluation of risk, using data through 1980, shows decreased occurrence rates for most accidental spills (Lanfear & Amstutz, 1983). This evaluation looked only at larger spills (of 1,000 barrels or more) on the basis that these larger spills are the ones which are liable to travel long distances and do serious damage. As shown in Table 12, these rates are substantially different than those used in the lease sale 53 and 68 analyses.

The oil spill occurrence rates may be applied to the estimates of oil reserves in the lease sale areas to provide an estimate of the number of spills expected from production and transportation of oil from those areas.

For the lease sale 53 areas, the risked mean undiscovered recoverable oil resources were 402 million barrels for the Santa Maria basin and a total of 146 million barrels for the other four basins to the north. Using the lease sale 53 EIS occurrence rates, 0.97 platform spills, 1.19 pipeline spills, and 0.13 tanker spills, all over 1,000 barrels, are predicted, assuming that oil from the Santa Maria and Santa Cruz basins is piped ashore. If that oil is tankered, the pipeline spills decrease to 0.0 and the tanker spills increase to 2.13 spills. The actual transportation methods to be used in any northern or central California basins have not been determined.

The lease sale 68 areas were estimated to contain 63 million

TABLE: 12

OIL SPILL RATES DEVELOPED BY MMS IN 1983

SOURCE	SPILLS PER BILLION BARRELS	
	1,000+ bbl	10,000+ bbl
Platforms	1.0	0.44
Pipelines	1.6	0.67
Tankers	1.3	0.65

SOURCE: Lanfear & Amstutz (1983).

barrels for the Santa Barbara Channel and 58 million barrels for the inner and outer banks. Using the occurrence rates from the lease sale 68 risk analysis, spills in excess of 1,000 barrels are estimated to number 0.25 from platforms, 0.23 from pipelines, and 0.49 from tankers, for a total of about one spill greater than 1,000 barrels.

Applying the 1983 MMS oil spill rates to the sale 53 and 68 resource estimates substantially lowers the total expected number of spills for oil produced from tracts involved in these sales. Table 13 presents these figures along with those based on the earlier spill rates.

The Western Oil and Gas Association (WOGA) has criticized the MMS's oil spill occurrence frequencies (Bigham, et al., 1983). For example, WOGA states that the spill frequency (the number of spills per unit of oil produced or transported) is not adjusted for improved safety measures, technology, or intrinsic system variables such as climate or lease operator. These criticisms are not new, as review of comments submitted in response to the lease sale 53 and 68 draft environmental impact statements reveal. MMS (Lanfear and Samuels, 1983) responds to such criticisms by pointing out that many of these factors cancel each other out, and in any event, when there is a substantial base of experience the effects of these factors will become statistically apparent and the various hypotheses such as those advanced by WOGA and others will be statistically proven or disproven. At the present time, however, the record of the offshore industry has been sufficiently good that statistical

TABLE 13
SUMMARY OF PREDICTED OIL SPILL OCCURRENCE RATES
SPILLS GREATER THAN 1,000 BARRELS - LEASE SALES 53 AND 68

	Platform	Source Pipelines	Tankers	TOTAL
Lease Sale 68 Tracts Using MMS 1983 Spill Rates	.12	.19	.16	.47
Lease Sale 68 Tracts Using FEIS Spill Rates	.25	.23	.49	.97
Lease Sale 53 Tracts Using MMS 1983 Spill Rates (100% Tankering)	.55		.71	1.26
Lease Sale 53 Tracts Using MMS 1983 Spill Rates (Pipeline-Tanker Mix)	.55	.82	.04	1.41
Lease Sale 53 Tracts Using FEIS Spill Rates (100% Tankering)	.97		2.13	3.1
Lease Sale 53 Tracts Using FEIS Spill Rates (Pipeline-Tanker Mix)	.97	1.19	0.13	2.29

Source: BLM (1980 and 1981)

tests of various hypotheses are very difficult and clear superiority of various factors in determining spill rates impossible to demonstrate.

Once spill frequencies are known, spill probabilities can be calculated by assuming a Poisson distribution using volume of oil produced or handled as the exposure variable. This is based on the assumption that all spills occur randomly, that the number of spills in an interval of time is proportional to the size of the interval, and that a very small interval may be identified so that no more than one spill is possible in any interval of that size.

The chief criticism of the MMS model in this regard is the exposure variable - amount of oil produced or handled (Bigham et al). Variables such as wells drilled, pipeline-kilometer, rig year, and others have been suggested, but none have been statistically verified. The MMS notes that in any event most of these suggested exposure variables are factors of volume (Langfear & Samuels, 1983).

For lease sale 68, the probability of one or more spills of 1,000 barrels or greater was calculated to be 0.67, and 0.39 for one or more spills of 10,000 barrels or more (BLM, 1981). For lease sale 53, these figures are 0.62 and 0.37 respectively assuming a pipeline-tanker transportation mix, and 0.63 and 0.37 assuming 100% tankering (BLM, 1980).

Oil Spill Trajectories

The MMS trajectory simulation process results in a large number of hypothetical oil spill trajectories that collectively represent both the general trend and the variability of winds and currents. The trajectory model looks only at the route of the center of the mass of spilled oil. No explicit attempt is made to account for weathering effects or other factors which may affect the impact of the oil spill on the marine life and habitats with which it may come in contact. This is appropriate since all MMS is attempting to do is model trajectories, not effects.

The modeling is based on selection of representative platform spill sites as well as tanker and pipeline routes and existing leases. Figure 2, from the lease sale 53 trajectory analysis, shows the subdivisions of the proposed leases into production spill launch areas. Figure 3 likewise shows subdivisions of existing leases in the lease sale 53 analysis, and Figure 4 shows transportation route segments. Figure 5 shows the coastline divided into target segments. Figure 6 shows special oil spill "targets" selected for lease sale 53.

In the lease sale 53 analysis, 500 spills were simulated for each production spill launch area (proposed and existing lease subdivisions) and transportation route segment for each of four seasons. In the lease sale 68 analysis, 50 simulations were run for each production spill launch area and 500 for each

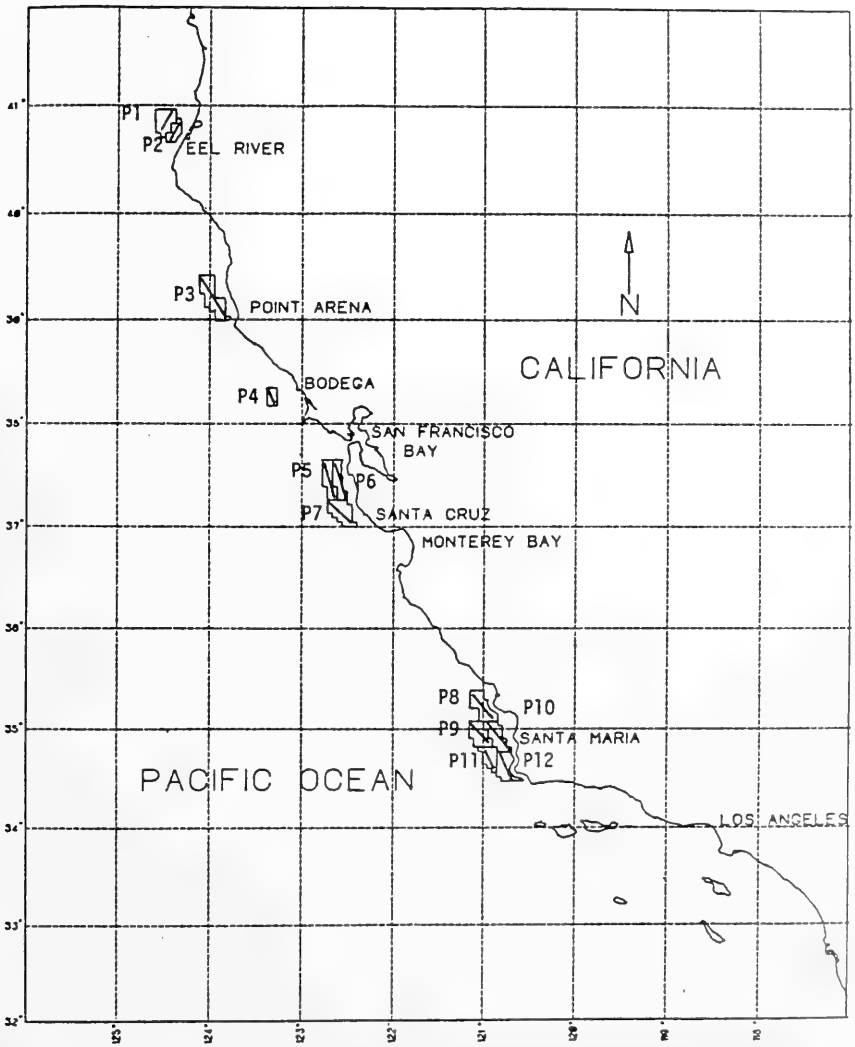


Figure 2: **Map showing subdivisions of the proposed leases for Central and Northern California OCS Lease Sale 53.**

Source: BLM (1980).

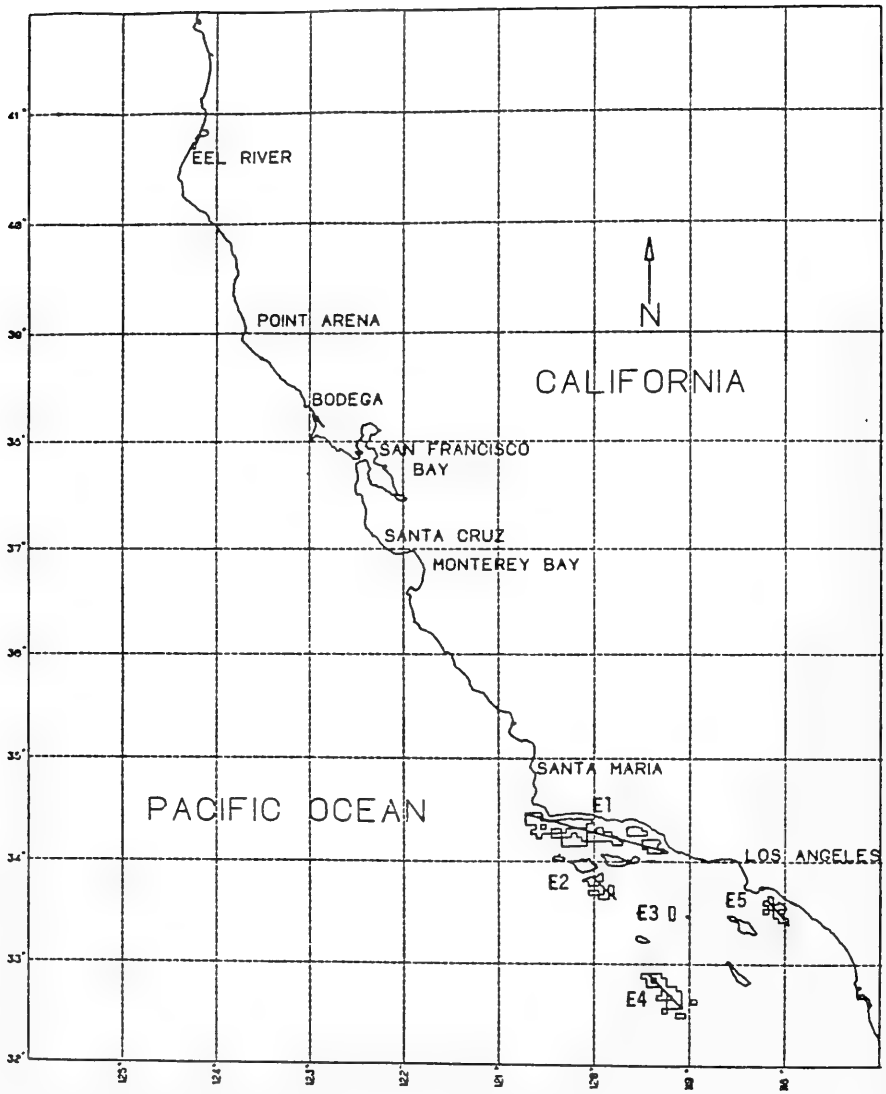


Figure 3: Map showing the subdivisions of the existing leases in the study area.
Source: BLM (1980).

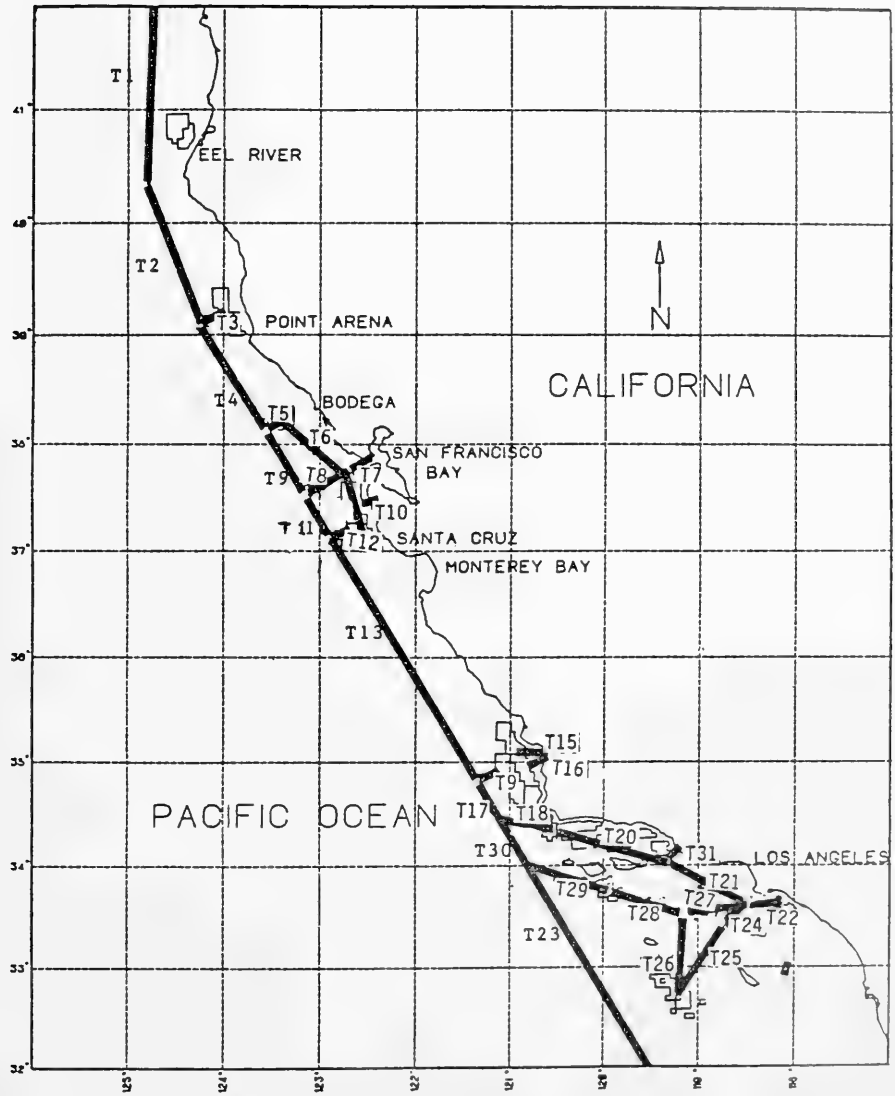


Figure 4: Map showing the transportation route segments (T1 - T31); polygons represent proposed and existing lease tracts.

Source: BLM (1980).

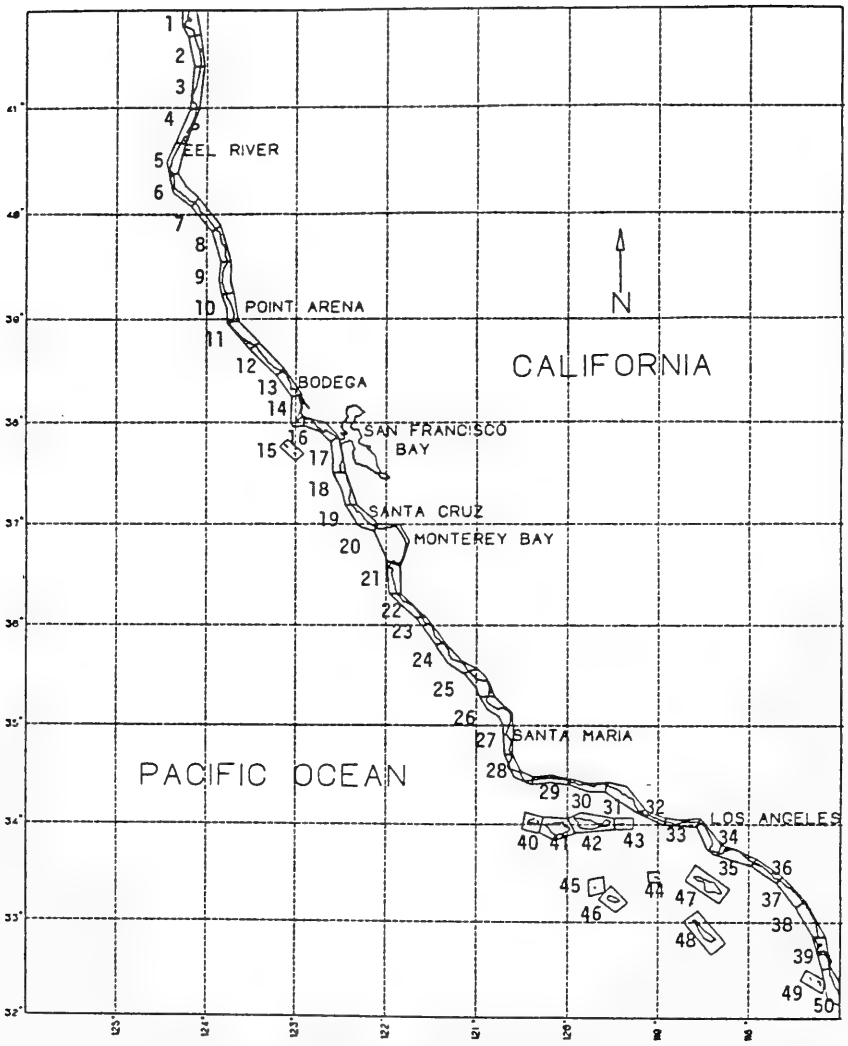


Figure 5: Map showing the division of the shoreline of Central and Northern California into segments of approximately equal length.
Source: BLM (1980).

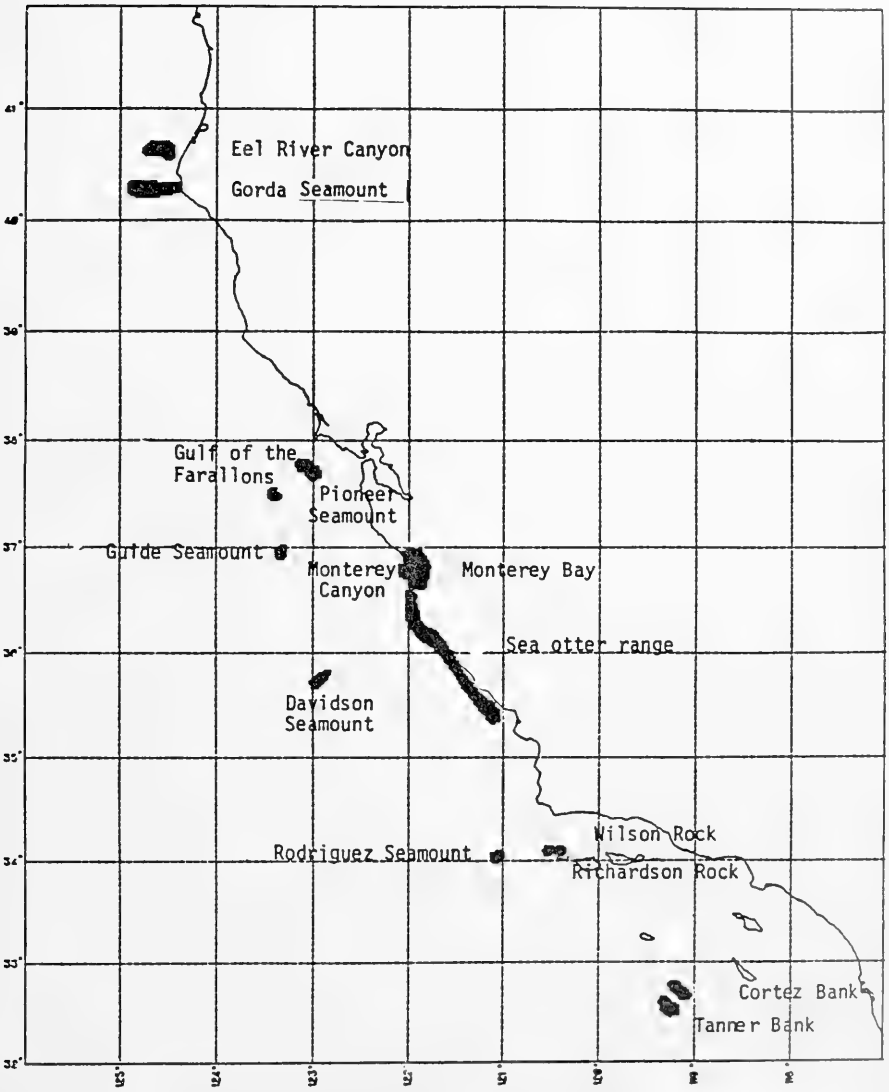


Figure 6: Map showing the locations of 14 targets, Northern and Central California OCS Lease Sale 53: cross hatching indicates areal extent of targets.

Source: BLM (1980).

transportation route segment. Spills along transportation routes are evenly spaced.

Once a spill is "launched", its trajectory is determined by a series of determinations of wind vectors and current vectors. In the lease sale 53 and 68 analysis, the current vector was determined by the spill's location and the simulated month, generally based on CALCOFI geostrophic flow, except in shallow waters (less than 600 feet) where specialized studies or high altitude or satellite photos were used. Interestingly, the CALCOFI drift bottle studies shows that general trends notwithstanding, currents are capable of carrying objects or substances to the north in any month. See Appendix D for charts of selected release and recovery records from the CALCOFI studies. The wind vector was determined by taking the date from wind stations having hourly recorded data continuously for at least a five-year period, constructing wind transition matrix with elements consisting of probabilities that a particular wind direction and speed will be succeeded by another wind direction and speed in the next time step, and sampling that matrix. Adjustments are made for Coreolis effects.

Once the targets, winds, currents, and launch points are known, oil spills trajectories are simulated. By examining data from the trajectory simulations, the MMS model then calculates the probability that, if an oil spill occurs at a given launch point, it will contact a particular target within 3, 10 or 30 days. These three time periods were chosen to represent various milestones during an oil spill:

3 days - Most toxic fractions of the oil will have evaporated or dissolved.

10 days - Sufficient time for clean up measures to have been employed.

30 days - The oil spill will not be detectable if it is still at sea

Note that the model treats all three of these points in time the same. No assumptions change after three or ten days since these are merely the points at which "snapshots" of the spill trajectories are made.

The probability of a spill reaching a particular target is termed a "conditional probability," the condition being that a spill has occurred.

The conditional probability of a spill hitting a target, multiplied by the probability of spill of a given size occurring, produces the probability that a spill will occur and hit a target. The lease sale 53 oil spill risk analysis calculated the probability of oil spills reaching the sea otter range from proposed sale 53 tracts as shown in Table 14. The maximum probability there is 22 percent, based on the combined effect of sale 53 tracts plus projected oil transport activities, and looking at 30 day impact time. Shorter impact times reduce the probability of contact to as little as six percent.

As stated above, MMS uses 3, 10 and 30 day points of reference in oil spill trajectory modeling. In their oil spill

TABLE 14

PROBABILTY OF OIL SPILL IMPACT ON SEA OTTER RANGE

	3 DAYS	10 DAYS	30 DAYS
Assuming Pipeline-Tanker Mix	.09	.16	.22
Assuming 100% Tankering	.06	.11	.17

SOURCE: BLM, FEIS SALE 53 (1980).

contingency plans, the oil industry typically uses much shorter periods. For example, Shell Oil Company, in its oil spill contingency plan for OCS lease no. P-0435 in the Santa Maria basin terminates its oil spill trajectory figures after a maximum of 48 hours (Shell Oil Co., 1982). ARCO, in its oil spill contingency plan for the Santa Maria basin terminated its trajectories after a maximum of 144 hours (ARCO, 1982). In both cases, trajectories were based on vectors resulting from combining wind and current vectors, although in a simpler method than that used by MMS, based on monthly averages. Figure 7 is typical of the ARCO and Shell trajectory modeling.

An interesting empirical illustration of a spill trajectory is presented by the February 12, 1978 lumber spill which occurred 40 km off Point Sur in central California. Within 30 days of the spill, lumber beached itself along two sections of coastline, one of about 42 km around Point Sur, and one of 120 km between Cape San Martin and Diablo Canyon. Patches of lumber were sighted elsewhere, both on the beach and at sea, reaching as far south as San Miguel Island in the western end of the Santa Barbara Channel (VanBlaricom & Jameson, 1982).

The authors of the lumber spill review related that spill to an oil spill. After noting that spilled oil weathers differently depending on type (e.g. crude oil is more persistent than light refined oils), they observed that a spill from a blowout or a large tanker grounding would pose particular dangers to the sea otters. Oil from a prolonged spill of that type, they noted, would be carried toward shore and then along shore by the

prevailing winds. This lumber spill seems to show that spill transport is more complex than either the USGS or oil company analyses indicate.

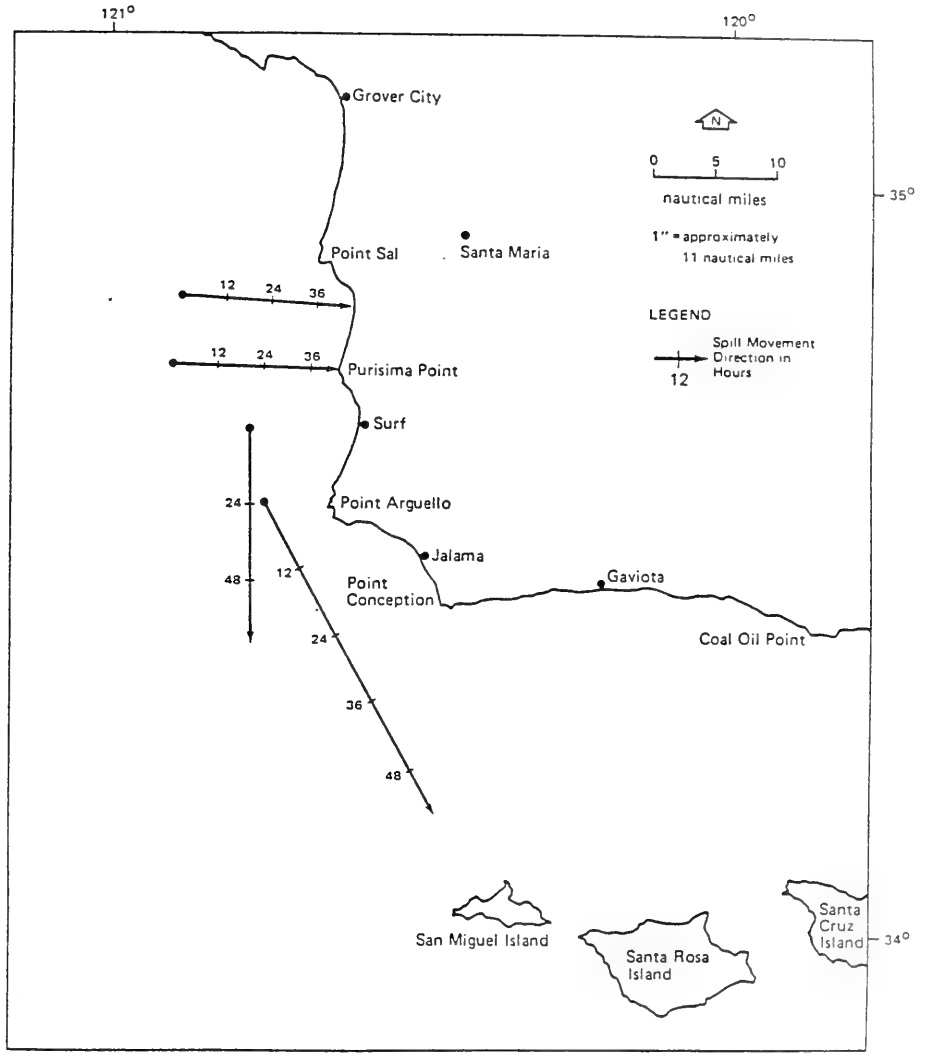


Figure 7: Typical ARCO Trajectory Model
Source: ARCO (1982).

CHAPTER IV

Oil Spill Response

The response to oil spills is, after prevention, the most important human-related factor in the risk of oil spills. The better the response, in terms of timeliness and effectiveness, the less the risk to the sea otters and their habitat. Prevention is accomplished through the use of blow-out preventers, well-maintained state-of-the-art equipment, well-trained personnel, well-engineered drilling programs, adhered-to operational procedures and good housekeeping practices. Oil spill response is optimized through preparation.

Pacific Region OCS Order No. 7 requires that each leasee maintain or have available to it, pollution control materials and equipment. Specifically, the order requires "containment booms, skimming apparatus, cleanup materials, chemical agents, and other items needed for the existing climactic conditions." (P.R. OCS Order No. 7, Section 3.1).

The Order does not specify exactly what equipment, other than general types, should be available for use. The Pacific OCS Region Oil Spill Contingency Plan Guidelines (July 29, 1982), however, require that oil spill response capabilities be "state-of-the-art." It goes on to define "state-of-the-art", based on R&D studies, observations, and experiences" as capable of

operating in 8-10 foot seas and 20 knot winds with deployment accomplished in 5-6 foot seas. The guidelines also note that certain local conditions, such as high energy sea states with short wave lengths, may not allow these operational criteria to be met.

The exploration plans and oil spill contingency plans prepared by the individual leasees contain listings of the materials and equipment carried on board the drilling rigs or on standby supports vessels (required to be within 15 minutes of the rigs.) Table 15, from Chevron USA's exploration plan for OCS leases P-0451, P-0452, and P-0453, in the Santa Maria Basin (February 23, 1982), provides a typical list of materials and equipment.

A second list of equipment and materials held on-site is provided by Union Oil Company of California's Oil Spill Contingency Plan for exploration activities on lease P-0203, located at the eastern end of the Santa Barbara Channel. This list is presented here in Table 16.

As a general rule, the onsite spill containment and cleanup equipment and materials are adequate for use with only small spills. Union Oil Company's equipment listed in Table 16 is described in the Oil Spill Contingency Plan as being capable of containing and cleaning up spills involving up to 100 barrels of oil. For spills of up to 10 barrels, the onsite equipment is the sole equipment used. For larger spills, the onsite equipment is deployed as part of the initial response effort.

In the event of large spills, equipment and materials are

Table 15: Chevron USA Oil Spill Equipment and Materials Inventory

1500 ft. - OSD 3-12-24-050-6 oil containment Boom 12" Freeboard x 24" Draft

1 - 1977 Model 10011 Skim Skimmer Inc. with hoses, connectors & floats

2 - 1200 Gal Kepner Sea Containers (60 bbl. equivalent)

240 ft. - 3M or Conwed Sorbent Boom

1 Box - 3M or Conwed Sorbent Pads 18"x18"

3 Drums - Corexit 9527 Dispersant

1 Drum - Shell Oil Herder Surface Collecting Agent

Source: Chevron USA (1982).

Table 16: Union Oil Company Spill Equipment and Materials Inventory

On Drilling Vessel

5-10 Bales - 3M Sorbent Pads 18" x 18"

500 Ft. - 3M Sorbent Boom

2 Drums - Corexit 9527 Dispersant

10 Drums - Shell Oil Herder

2 - Backpack Sprayers for Chemical Agent Application

On Standby Vessel

1500 Ft. - Mode 4300 Whitaker Expandi Boom, 18" freeboard x 25" draft

1 - Walosep W3 Oil Recovery System (Skimmer), including Oil/Water Separator

2 - 5000 gallon capacity sea containers

2 - Sea Anchors

SOURCE: Union Oil Company of California (1982).

available from a variety of sources. Most leasees in the study area are members of oil spill cooperatives which maintain substantial amounts of equipment and materials. The oil spill cooperatives respond to any oil spill call, free for members (who underwrite the cooperative) and at a fee for non-members.

Two oil spill cooperatives operate within the study area. The larger of these, Clean Seas, Inc., is based in Santa Barbara and is responsible for the Santa Barbara Channel and the Central California coast as far north as Cape San Martin. Clean Bay, Inc., based in Concord on San Francisco Bay, operates to the north.

In addition to these two cooperatives, equipment and materials are available from other sources including other cooperatives to the north and south, other platforms and oil company facilities, government agencies, and private contractors.

The Clean Seas, Inc. inventory and structure is the most elaborate and, given the present limits to drilling and production activity, the most important with respect to offshore oil operations in the study area. Table 17 lists the sites where Clean Seas facilities and equipment are located. Appendix E fully lists and describes the equipment and materials maintained by Clean Seas and where each item is located. Also in Appendix E is the Clean Bay equipment inventory.

Clean Seas presently operates two vessels dedicated solely to oil spill containment and clean up. Mr. Clean is a 136 foot diesel powered boat capable of a speed of 12 knots. It is based at Santa Barbara and carries a skimmer, various containment

TABLE 17: Location of Clean Seas Equipment

Carpinteria
Gaviota
Avila
Ventura
Santa Barbara
Point Dume
Morro Bay
Point Mugu

SOURCE: Union Oil Company of California (1982)

booms, absorbents, and dispersants. Mr. Clean II, a 130 foot boat, is based at Port San Luis and carries similar equipment and materials.

Clean Seas also stores equipment and materials on shore in eight mobile oil spill response vans stationed at Point Dume, Port Hueneme, Ventura, Carpinteria, Santa Barbara, Gaviota, Avila, and Morro Bay. These are 40 foot enclosed trailer vans and are stocked with booms, sorbents, small skimmers, and miscellaneous cleanup equipment. Figure 8 shows the locations of the vans and the Mr. Clean and Mr. Clean II.

Once notified, Clean Seas mobilizes its equipment in the time necessary to allow the personnel to reach the equipment storage sites. This is nominally two hours, although it may be less during normal working hours. All Clean Seas equipment is on 24 hour standby.

In most open water spill situations, the first equipment to be sent to the site would be that onboard one of the other of the Mr. Cleans, depending on the location. Figure 9 shows vessel travel times to potential spill sites in the Santa Barbara Channel. Figure 10 shows the travel times to potential spill sites in the Santa Maria basin. Note that this area is only the extreme southern part of the otter range.

Uphore in eight mobile oil spill response vans stationed at Point Dume, Port Hueneme, Ventura, Carpinteria, Santa Barbara, Gaviota, Avila, and Morro Bay. These are 40 foot enclosed trailer vans and are stocked with booms, sorbents, small skimmers, to the beginning of oil recovery is estimated to be 2.5

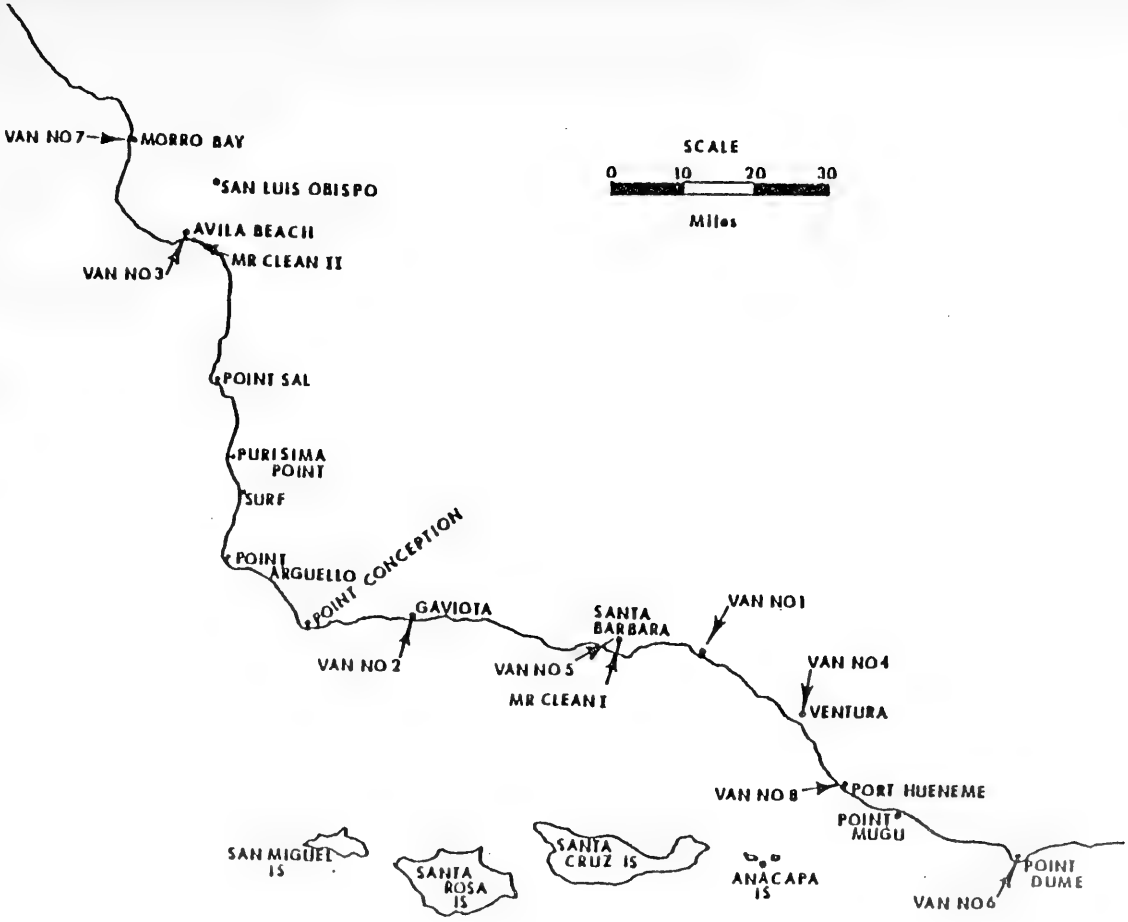


Figure 8: Location of Clean Seas Oil Spill Equipment
Source: Union Oil Company of California (1982).

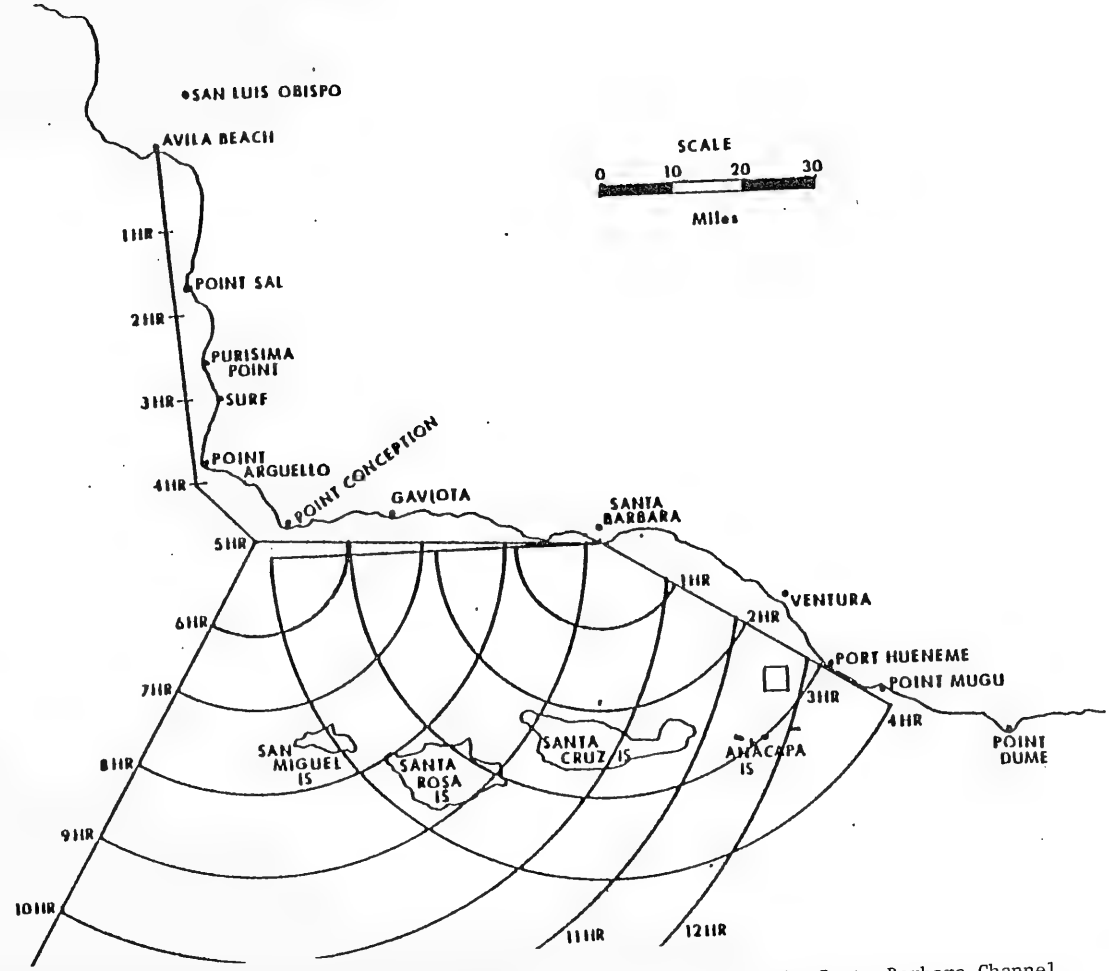


Figure 9: Vessel Response Times at Ten Knots to Potential Spill Sites in the Santa Barbara Channel
Source: Union Oil Company of California (1982).

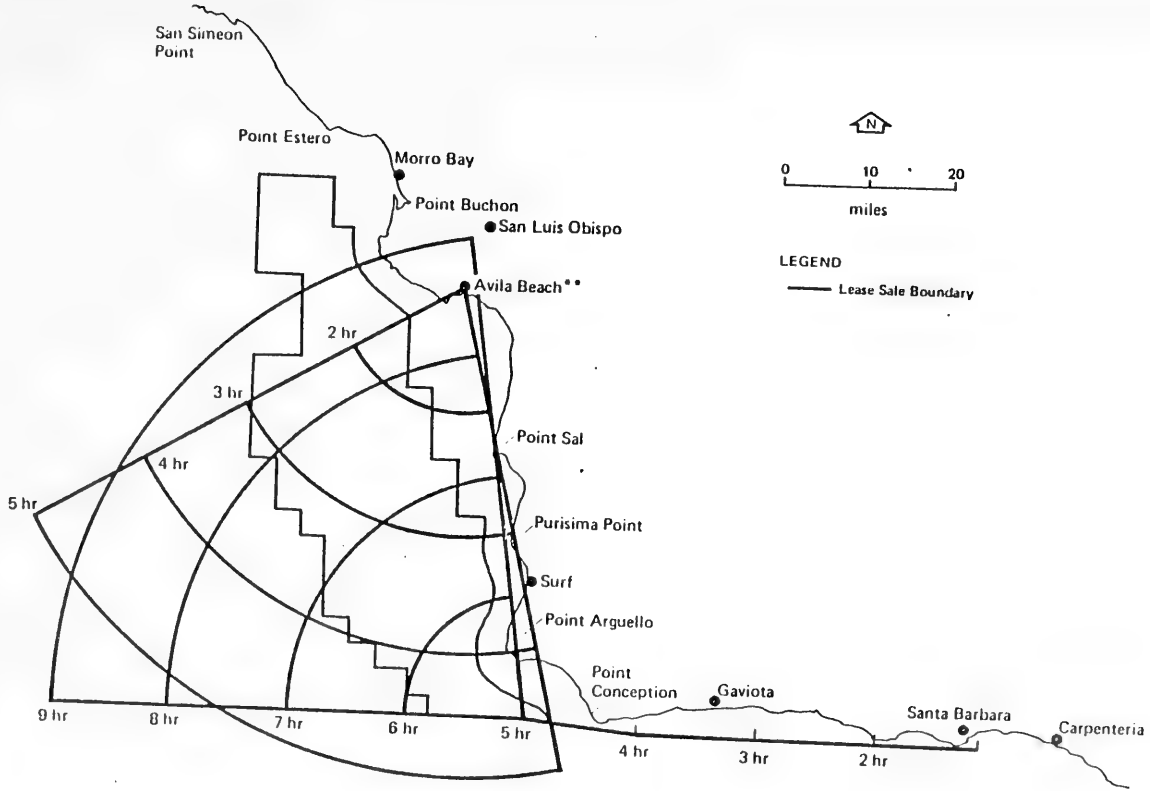


Figure 10: VESSEL RESPONSE TIMES FROM AVILA BEACH AND SANTA BARBARA (at 12 knots)*

*Includes a one hour initial mobilization time

**Add one hour to response time if originating from Morro Bay

Source: ARCO (1982).

hours, plus travel time.

Other equipment is stored at a variety of locations along the west coast. Staging areas for transport of equipment to spill sites have been designated at Santa Barbara and Port San Luis. Travel and response times for this equipment to the staging areas via overland routes in given in Table 18. Once the equipment reaches the staging area it will be transported by boat or helicopter to the spill site. The travel times from the staging areas to the spill sites by boat are those shown in Figures 9 and 10. Helicopter travel times are shown in Figure 11 for spills in the Santa Barbara Channel and in the Santa Maria Basin. Again, this is only the extreme southern end of the otter range. Response to more northerly areas, of course, would be longer.

In the event that an oil spill threatens an area along the mainland coastline, Clean Seas' mobile oil spill response vans will be activated. Total response times to areas within Clean Seas' current operational area, i.e., the Santa Barbara Channel and the area south of Morro Bay, including mobilization, travel, and equipment deployment, range from two to five hours, with mobilization and travel times being dependent on traffic conditions, types of roads, and weather. Importantly, the landslides accompanying the recent winter storms in California cut the main coastal roads in many places. Some of these cuts will take many months to repair. These coastal roads are the main routes of access for the vans, giving significance to a road blockage factor in response times.

TABLE 18

OVERLAND RESPONSE TIMES FOR OIL SPILL CONTAINMENT AND CLEANUP EQUIPMENT TO STAGING AREAS

Source Location	Destination	Mobilization Time	Approximate Distance to Destination (miles)	Travel Time to Destination at 30 mph (hours)	Total Response Time to Destination
Clean Seas, Morro Bay	Santa Barbara	1-2 hours	120	4 hours	5 hrs to 6 hrs
	Port San Luis	1-2 hours	18	40 minutes	1 hr 40 min to 2 hrs 40 min
Clean Seas, Avila Beach	Santa Barbara	1-2 hours	95	3 hr 10 min	4 hrs 10 min to 5 hrs 10 min
	Port San Luis	1-2 hours	N/A	N/A	1 hr to 2 hrs
Clean Seas, Santa Barbara	Santa Barbara	1-2 hours	N/A	N/A	1 hr to 2 hrs
	Port San Luis	1-2 hours	102	3 hr 25 min	4 hrs 25 min to 5 hrs 25 min
Clean Seas, Carpinteria	Santa Barbara	1-2 hours	18	40 minutes	1 hr 40 min to 2 hrs 40 min
	Port San Luis	1-2 hours	122	4 hrs 5 min	5 hrs 5 min to 6 hrs 5 min
Clean Coastal Waters, Long Beach	Santa Barbara	3 hours	110	3hr 40 min	6 hrs 40 min
	Port San Luis	3 hours	212	7 hr 5 min	10 hrs 5 min
Clean Bay, Concord	Santa Barbara	3 hours	350	11 hr 40 min	14 hrs 40 min
	Port San Luis	3 hours	243	8 hr 10 min	11 hrs 10 min

TABLE (cont.)

Source Location	Destination	Mobilization Time[1]	Approximate Distance to Destination (miles)	Travel Time to Destination at 30 mph[2] (hours)	Total Response Time to Destination[3]
U.S. Navy, Stockton	Santa Barbara	3 hours	370	12 hrs 20 min	15 hrs 20 min
	Port San Luis	3 hours	263	8 hrs 45 min	11 hrs 45 min

SOURCE: Union Oil Company of California (1982).

The California Coastal Commission (CCC) is presently conducting a study of oil spill cooperatives along the California coast in order to evaluate their capabilities and assure that they are providing the maximum feasible oil spill response. The CCC's staff issued a preliminary draft report on Clean Seas, Inc. in April 1981.

The CCC staff concluded that an oil spill can never be totally contained and cleaned up regardless of the technology used. Clean Seas has developed a reasonable response capability for small to medium spills, the staff said (California Coastal Commission, 1981).

The CCC staff also concluded that Clean Seas estimates of response time and efficiencies of mechanical and chemical spill control methods are optimistic. In particular, the staff felt that staging facilities at the western end of the Santa Barbara Channel and the Santa Maria Basin needed improvement. The staff also felt that yearly oil spill equipment deployment drills should be run, although it praised the Clean Seas personnel training program and found the Clean Seas oil spill response manual adequate (California Coastal Commission, 1981).

In an appendix to the report were two memoranda on oil spill response drills conducted on offshore drilling rigs in late 1980. The first of these involved a delay in getting the standby oil spill vessel underway. Once the boat was underway (one hour and fifteen minutes after the drill began, although it was anchored only several hundred yards from the drill rig) boom deployment and other actions went smoothly. The second drill was

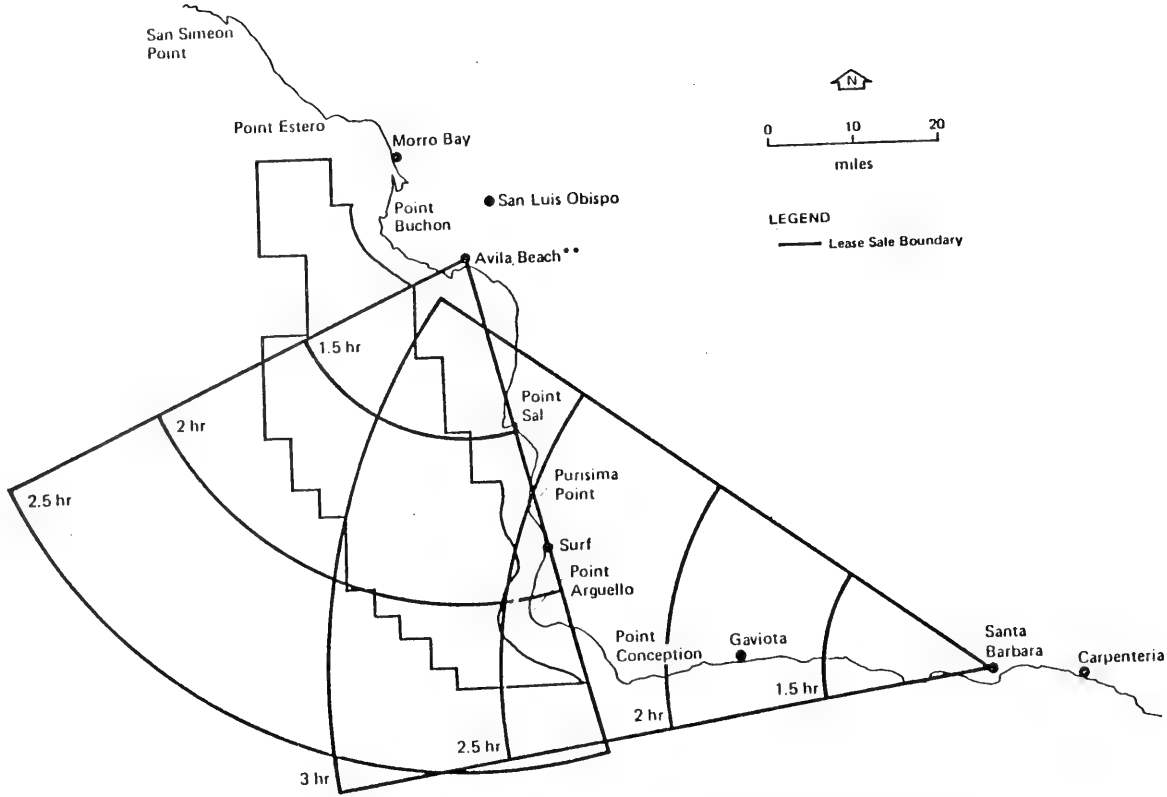


Figure 11: HELICOPTER RESPONSE TIMES FROM AVILA BEACH AND SANTA BARBARA (at 40 mph)*

*Includes a one hour initial mobilization time
**Add one hour to response time if originating from Morro Bay

Source: ARCO (1982).

"conducted in an exceptionally efficient and rapid manner," with the standby vessel coming alongside the drilling vessel from its nearby anchorage in 17 minutes. Within 25 minute of the start of the drill, the 1500 foot boom was in the water in a proper configuration and the oil skimmer over the side.

The CCC staff also noted that even if equipment is properly and timely deployed it may not be capable of containing and cleaning up a spill except in calm seas under ideal circumstances. In rough weather, high winds can cause the boom to lay over, allowing oil to splash out. In currents stronger than 0.75 knots oil may be lost under the boom due to entrainment of oil droplets in the water column. And of course in really severe weather the boom may break apart (California Coastal Commission, 1981).

Time may have changed the situation which the CCC evaluated. Clean Seas has purchased additional equipment and materials since the CCC study was undertaken, including the Mr. Clean II. At the time of the CCC study, the original Mr. Clean had only recently been purchased. The state of the oil spill response art itself, however, has not changed.

CHAPTER V

The Situation in 1977

The Southern Sea Otter was placed on the threatened species list in 1977 primarily because of the perceived menace of oil spills. As might be expected, the situation regarding the risk of oil spills was different in 1977 than it is now. The Trans Alaska Pipeline System had not yet begun to send North Slope oil to the waiting tankers at Valdez. OCS lease sale 35 had been held two years before and sale 48 was coming up two years hence. In this chapter, these and other factors of oil spill risk will be examined from the perspective of 1977.

Offshore Oil Development

Federal Offshore oil and gas operations in 1977 were limited to southern California. A sale had been held for tracts in central and northern California in 1963, but by 1967 all of those tracts had been relinquished. By the end of 1977, a total of 356 wells had been drilled in southern California, of which 198 were active producers and 20 were shut-in producers. A total of 121 wells had been plugged and abandoned, and 5 wells were actively drilling. During 1977, 58 new wells were started and 26

completed. Thirty-two were plugged and abandoned (U.S. Department of the Interior, 1981).

Through the end of 1977, oil production from the California OCS amounted to 167,897,088 barrels, on which $100,477,752 in royalties had been paid. Gas production totaled 67,156,731 thousand cubic feet, with royalties amounting to $3,169,709 (Mineral Management Service, 1981). Production in 1977 came to 12,267,598 barrels of oil (worth $58,205,617 with a royalty value of $9,707,115) and 3,289,963 thousand cubic feet of gas (worth $1,699,845 with a royalty value of $283,381).

Production from state leases in 1977 amounted to 47,930,000 barrels of oil worth $227,667,500 and 11,669,000 thousand cubic feet of gas, worth $6,067,880.

In 1977, there were seven platforms in place on the California OCS: Hogan, Houchin, Hondo, Hillhouse, A,B, and C. Of these, all except Hondo were producing. Controversies over transportation schemes prevented initiation of production from Hondo until 1981. The eight platforms and six subsea completions currently in place on state leases have been in place since before 1977.

Tanker Traffic in the Study Area

Tanker traffic in the study area in 1977 was somewhat differently distributed than in 1982. For example, at the Moss Landing PG & E plant, the 1977 number of tanker arrivals was 87 compared to less than 30 per year in the early 1980's. Traffic

at the Morro Bay PG & E plant, in contrast, has remained fairly constant, with the 1977 arrivals numbering 24 vessels (PG & E, 1982).

Other tanker ports in the study area had the following arrival rates in 1976 (USAF, 1977):

Los Angeles/Long Beach - 1220 tankers

Port Hueneme - 54 tankers

Carpinteria - 27 tankers

Port San Luis - 96 tankers

Estero Bay - 179 tankers

Additionally, 1217 tankers called at San Francisco Bay in 1977 (Sabella Moreno, Corps of Engineers, pers. comm. March 24, 1983).

At the time of the sea otter listing in 1977, oil and natural gas from Alaska was very much in the public mind and those of oil industry and government planners. Alaskan oil and gas was seen as making significant contributions to the overall tanker traffic in the region.

In 1977, the State of California's Office of Planning & Research was projecting that crude oil from Valdez, Alaska would be tankered to Long Beach and other pipelined to Texas and California refineries (Office of Planning & Research, 1977). OPR used figures of 1.1 tanker trips per day to the study area, using ships with a mean size of 136,825 DWT, carrying a total of 1.2 million barrels a day. This would have amounted to 400 tankers per year.

The proposed Pt. Conception LNG terminal was seen in 1977 as

a substantial contributor to vessel traffic in the study area. Office of Planning and Research estimates showed that from 3.5 to 4.6 trips a day were made to the terminal and to other southern California harbors (Oxnard and Los Angeles/Long Beach). Four billion cubic feet a day of LNG was projected for each of the three terminals (Office of Planning & Research, 1977).

Oil Spill Risk

The oil spill risk analysis for OCS Lease Sale 48 was prepared in 1978. It gives some idea of the perceived threat of oil spills at the time the sea otter was listed, despite the fact that it came over a year after the listing took place.

In the sale 48 analysis, existing and proposed leases were confined to southern California. Transportation routes extended from this area to include coastwise traffic from and to San Francisco, traffic from Alaska, and traffic from Southeast Asia.

Proprietary USGS data on oil reserve estimates were used to calculate expected platform, pipeline, and tanker spill frequencies and probabilities for spills greater than 1,000 barrels. The results of these calculations are shown in Table 19. The probability of one or more spills occurring and hitting the sea otter range, assuming tanker transportation, was no higher than eight percent, and this probability level occurred only with 30 and 60 days time periods (USGS, 1978). In all cases, the most likely number of spills predicted to occur and impact the sea otter range was 0. All these predictions were

TABLE 19

Oilspill probability estimates for spills greater than 1,000 barrels in the Southern California area

A. Tanker Transportation

	Proposed Leases	Existing Leases	Both
Expected Number	4.1	7.5	11.6
Probability of at least one spill	.98	*	*

B. Mixed Transportation

	Proposed Leases	Existing Leases	Both
Expected Numer	5.0	9.3	14.2
Probability of at least one spill	.99	*	*

C. Platform Spills Alone

	Proposed Leases	Existing Leases	Both
Expected Number	1.3	2.4	3.7
Probability of at least one spill	.70	.88	.96

* Greater than 0.995

SOURCE: USGS (1978)

based on spill rates of 1.8 platform spills per billion barrels produced, 2.3 pipeline spills per billion barrels. Applying these rates to the then-estimated reserves in state leases resulted in an estimated 0.0868 spills of 1,000 barrels or more (BLM, FEIS Lease Sale 48, 1978).

Recent work by MMS (Lanfear and Amstutz, 1983) shows that oil spill rates were decreasing beginning in 1974, and could have been statistically discernable by 1978. This was not noticed, however, and the oil spill risks as stated in the 1978 lease sale 48 oil spill risk assessment were overstated.

Oil Spill Response

One measure of oil spill response capability is the availability of equipment and materials for containing anad cleaning up oil spills. In measuring this capability, one should look at two aspects of availability: equipment and materials at the well site, and equipment and materials at the nearest oil spill cooperative.

Table 20 lists equipment described by Shell Oil Company in December 1976 as being aboard its drilling unit assigned to exploratory work in the lease sale 35 area (Shell Oil Co., 1976). Table 21 lists the Clean Seas, Inc. inventory of equipment as of March 1976.

TABLE 20

OIL SPILL PREVENTION, CONTAINMENT AND RETRIEVAL

Equipment Aboard the Drilling Unit

A. All blowout prevention equipment listed in Final OCS Order, Drilling Procedure, effective May 1, 1976, U.S. Geological Survey.

B. Curbs, gutters, drains, and drip pans properly designed and placed to collect contaminants from the deck areas and prevent them from discharging into ocean waters.

C. A Vikoma Seapack fast deployment containment system with 1600 feet of boom.

D. A Vikoma Komara Miniskimmer capable of recovering 70 barrels per hour of crude or 14 barrels per hour of diesel oil.

E. A Workboat on stand-by service with the rig at all times.

F. Ten bales of 3M type 156 Sorbent Pads 18" x 18".

G. Two bales of 3M type 1070 Sorbent Boom (five 8-foot booms per bale).

H. Two 55-gallon drums of Shell Oil Herder(R) collecting agent.

I. Ten 55-gallon drums of Corexit 7664 dispersant.

J. Spray application equipment.

K. Two pillow tanks, 1200 gallons each, Sea Containers.

L. Communications equipment as described in the Appendix.

SOURCE: Shell Oil Co., 1976

TABLE 21

CLEAN SEAS, INC. - INVENTORY OF EQUIPMENT
(as of March 1976)

Containment - Ocean Protection Booms

1 - 2000' Bottom Tension Boom
2 - 1600' Vikoma Sea Pack and Boom

Containment - Harbor Protection Booms

2000' Medium Duty Boom
2000' Light Duty Boom
1210' Goodyear Sea Sentury Medium Boom
1700' Expanding Medium Boom

Recovery

1 - CSI Skimmer System
1 - Sea Dragon Skimmer
2 - Mark II Skimmers
3 - Exxon Floating Weir Skimmers
1 - Acme 39T Gasoline/Air Pump
1 - Acme 51T Gasoline/Air Pump
1 - Tide-Mar VII Barge
2 - Air-Driven Pumps
4 - Floating Storage Bags (two 500 gal., two 1200 gal.)
1 - Oil Mop MK-11-9

Miscellaneous Absorbants and Chemicals

Large inventory of absorbants, sweeps, blankets, booms, rugs, Shell Oil Herder.

Equipment

1 - Work Boat (19' Skiff)
1 - 2 1/2 -ton Truck
2 - 40' Enclosed Trailer Vans
1 - Compressor (600 CFM Rotary)

SOURCE: Shell Oil Co., 1976.

CHAPTER VI

The Situation Expected in 1988

Just as the Fish and Wildlife Service in 1977 looked forward at such things as Alaskan oil and natural gas, decision makers today should look forward over the next five years and consider the risk of oil spills that sea otters will be facing between now and 1988.

Offshore Oil Development

Big changes will come to the study area in terms of offshore oil development and all that accompanies it. The OCS tracts leased in sales 53, 68 and 73 will undergo much of their exploration phase and development phase and can be expected to be in the initial stages of production. Tables 22, 23 and 23A show the expected drilling schedules from sales 53, 68 and 73 respectively.

Lease sale 53 is likely to bring about the most significant changes in the OCS of the study area by 1988. Major oil finds from the area announced by Chevron USA at Point Arguello (Oil & Gas Journal, Nov. 16, 1981 and Oct. 25, 1982), Texaco at Point Conception (Oil & Gas Journal, June 28, 1982), Union Oil Company

TABLE 22
LEASE SALE 53

Santa Maria Basin Development Timetable
(Low - Most Probable - High Resource Estimates)

	Exploratory Wells	Delineation Wells[a]	Development Wells	Platforms	Subsea[b]
1981	3- 4- 5				
1982	5- 6- 8	4- 6-10			
1983	3- 5- 6	6-12-14			
1984	2- 3- 3-	3- 8-11			
1985	0- 1- 1-	3- 4 -8			
1986		0- 3- 6	14- 18- 18	3[c]- 3[c]- 3[c]	
1987		0- 0- 3	35- 63- 72	1 - 4[d]- 5[c]	
1988			23- 82- 116	1 - 2 - 4	0-1-1-
1989			30- 69- 115	2 - 2 - 4[d]	0-0-0-
1990			30- 64- 88	0 - 2 - 2	0-1-1-
1991			5- 46- 66	0 - 0 - 2	0-0-1
1992			0- 9- 40		
1993			0- 0- 8		
Total	13-19-23	16-33-52	137-351-523	7 -13 -20	0-2-3

[a]These are sometimes also termed exploratory wells.
[b]Subsea or floating production system.
[c]One of which is an offshore storage and loading facility.
[d]One of which is an alternate gas processing platform.

SOURCE: BLM, Lease Sale 53 FEIS

TABLE 23
LEASE SALE 68
Santa Barbara Channel

	Exploratory Wells	Delineation Wells	Platforms Wells	Platforms	Subsea Completions
1981					
1982	1-3-5				
1983	2-9-16	2-6-9			
1984	3-12-21	3-8-13			
1985	3-10-17	3-10-16			
1986	1-6-10	5-16-25			
1987		2-8-12	3-9-18	1-1-1	
1988			5-13-24	1-1	
1989			4-12-23	1*	
1990			4-23-23		0-0-1
1991			1-6-11		0-0-1
1992					0-0-0-
1993					
1994					
1995					
1996					
Total	10-40-69	15-48-75	17-52-99	1-2-3	0-0-2

INNER BANKS AND BASINS

	Exploratory Wells	Delineation Wells	Platforms Wells	Platforms	Subsea Completions
1981					
1982	1-1-6				
1983	1-2-11	1-2-7			
1984	2-3-17	1-3-11			
1985	1-3-17	2-5-18			
1986	1-4	2-6-22			
1987		1-3-12	2-9-19	1-1-1	
1988			4-17-34	0-1*-1	
1989			2-8-16	0-0-1*	
1990					0-0-1
1991					0-0-1
1992					
1993					
1994					
1995					
1996					
Total	5-10-55	7-19-70	8-34-69	1-2*-3*	0-0-2

*Deep Water

SOURCE: BLM (1981)

TABLE 23A
LEASE SALE 73
Santa Maria Basin Development Timetable
(Most Likely-Conditional Mean Resource Estimates)

Year	ML Exploration well	CM Exploration well	ML Delineation well	CM Delineation well	ML Development well	CM Development well	ML Platform	CM Platform	ML Subsea Completion	CM Subsea Completion
1983	3	13								
1984	4	22	3	8						
1985	3	17	4	12						
1986	2	10	2	9						
1987		7		4		26		2		
1988		4		3	14	76	2	5		
1989		2		1	49	124	2	6		
1990		2		1	64	144	1	5		2
1991		2		1	28	131		4		
1992		1		1		115		4		
1993						91		2		
1994						55		1		
1995						20				
1996						1				
1997						5		1*		
1998						7				
1999						5				
Total	12	80	9	40	155	800	5	30	0	2

*Ten Year Lease

SOURCE: Minerals Management Service. 1983. Lease Sale 73 DEIS.

of California at Point Pendernales (Oil & Gas Journal, Jan. 24, 1983), and Oxy Petroleum Inc. at Point Sal (Oil & Gas Journal, Feb. 7, 1983), will bring quick development to the area described as the hottest prospect since Prudhoe Bay on Alaska's North Slope.

News reports of Chevron USA's and Texaco's development plans indicate that these plans are already well underway. Chevron USA has let a contract for a platform to be erected in mid-1985 on its Santa Maria basin strike, the first of what could be four Chevron platforms on this field producing as much as 100,000 to 150,000 barrels of oil per day (Oil & Gas Journal, Oct. 4, 1982). Texaco has also let a platform contract for its discovery, one of possibly two yielding perhaps 100,000 barrels a day by 1986. The Texaco platform is expected to be installed before the end of 1985 with production beginning a few months later. Exploration continues in the Santa Maria basin at a brisk pace with 40 or more exploratory wells to be drilled this year alone and with rumors of additional discoveries abounding (Oil & Gas Journal, Jan. 24, 1983).

Adjacent state waters also hold the prospect of substantial hydrocarbon exploration and development inthe next five years. The California State Lands Commission has taken initial steps toward a sale of 40,000 acres of oil rights in eight tracts between Point Conception and Point Arguello. This would be the

first issuance of state oil and gas leases since 1968. The sale is expected to take place by the end of 1983. The State Lands Commission has estimated that total undiscovered hydrocarbon resources in the eight tracts amount to 274 million barrels of oil and 219 billion cubic feet of gas at 5 percent probability, 153 million barrels and 117 billion cubic feet at 50 percent probability, and 63 million barrels and 55 billion cubic feet at 95 percent probability (Oil & Gas Journal, Jan. 3, 1983).

Additional development is expected in state waters in the Santa Barbara Channel. The South Elwood offshore field will be further developed by ARCO using a two platform complex expected to double the current output of the field to 20,000 barrels per day. Other operators are also seeking permission to undertake exploration in the Channel's state waters, including Texaco, Phillips, Chevron, Shell and Union (Oil & Gas Journal, Oct. 4, 1982).

In the Channel's federal waters, further development is planned by Exxon at the Santa Ynez Unit on the Hondo, Pescado, and Secate fields. Reserves for these three fields are estimated to total 400 million barrels of oil and 700 billion cubic feet of gas. Two to four additional platforms are anticipated, with two of them, Hondo B and a Pescado platform in over 1,000 feet of water, possibly exceeding the U.S. water depth record. Production from the Unit is expected to rise from its present

40,000 barrels per day to 125,000 barrels of oil per day and 135 million cubic feet of gas per day (Oil & Gas Journal, Nov. 22, 1982). Exploration and development of other existing leases will likely go ahead between now and 1988.

More lease sales in the federal waters of the study area are scheduled for the next five years. Lease sale 73, in central and northern California, is slated for late 1983. Sale number 80, a southern California sale, is set for early 1984. Number 91, central and northern California is scheduled for late 1985, and number 95, southern California, for early 1986.

Transportation

The future transportation situation in the study area is uncertain. The changing infrastructure for oil transport, coupled with the range of options open for future production makes prediction of transportation methods and rates a risky business.

The greatest impact on transportation of oil in the study area will come from the new Santa Maria basin discoveries. Exactly how oil from those finds will be transported is unknown at this time, although it will probably be moved ashore initially by pipeline (Oil & Gas Journal, Jan. 17, 1983). Once ashore, the oil may be treated and then reloaded on tankers for transport to

refineries, or new pipelines may be built to take it to refineries overland. Much of the Santa Maria basin crude is unsuitable for existing southern California refineries and so may need to be transported to San Francisco Bay area refineries or to out of state refineries. If the San Francisco option is pursued via tankers, this would expose the entire sea otter range to the possibility of spills from these tankers. Initial production from the Santa Maria basin will amount to more than 200,000 barrels a day from the Chevron and Texaco finds, plus whatever oil is produced from the other finds in the area.

Several proposals are pending for expanded marine terminals in the Santa Barbara Channel. Getty proposes to expand its Gaviota terminal from its present 50,000 barrels per day capacity to 300,000 barrels per day, with an initial storage capacity of one million barrels. Storage capacity would eventually be increased to 2 million barrels (Oil & Gas Journal, Jan. 17, 1983). The terminal would include a mooring facility for crude oil tankers, and is intended to treat, separate, and store production from recent and anticipated discoveries in the Santa Barbara Channel and Santa Maria basin.

Exxon proposes a terminal at Las Flores Canyon to handle the increased production from the Santa Ynez Unit. Capacities are set to be 125,000 barrels per day of oil and 135 million cubic feet of gas per day. Both terminals are expected to be on-line

by 1986.

Chevron also proposes a Gaviota terminal, with a 200,000 barrel per day capacity, with the intention of handling oil from the Santa Maria basin finds. Apparently either the Getty or the Chevron proposals will be approved, but not both. Aminoil proposes to expand its Coal Oil Point marine terminal from a capacity of 30,000 barrels per day to 80,000 barrels per day.

The State Lands Commission estimates that the 63,000 barrels per day peak production from the Point Arguello-Point Conception area might require as many as 10 tanker calls a month (State Lands Commission, 1982).

Other influences on oil transportation within the study area come from outside it, especially from Alaska. The Prudhoe Bay field is expected to begin its decline during 1985-87, reducing the amoung of oil being sent south via TAPS and the tankers from Valdez. Offsetting this decrease, however, will be an increase in production from the nearby Kuparuk field, from present levels of less than 100,000 barrels per day to about 250,000 barrels per day by 1989. In addition to the 4 to 5 billion barrel reserves at Kuparuk, of which about 1.25 billion barrels are thought to be recoverable (compared with 23 billion barrels and 13 billion barrels respectively for Prudhoe Bay), Kuparuk holds 18-40 billion barrels of heavy oil that ARCO may develop in the future (Oil & Gas Journal, July 12, 1982).

The tracts leased offshore in the 1982 OCS lease sale 71 in the Beaufort Sea could add as much as 100,000 barrels per day to North Slope production by 1988. Conoco's Milne Point unit could add another 50,000 barrels per day. Thus, these fields, plus the Kuparuk field could keep the level of tankers going to the study area at or above its present level.

Further complicating the picture is the prospect of the Northern Tier pipeline being built from Washington State to the Midwest. This pipeline, if built, would carry Alaskan crude and do away with the tankering past the terminal in Washington State. The prospects of building this pipeline, once bright, are unknown at the present time, although the project appears to be moribund, especially since there have been movements recently to allow export to Japan of Alaskan oil (Oil & Gas Journal, Jan. 31, 1983).

Another apparently moribund project is the Point Conception LNG terminal. The present date for initial operation of this facility is 1990, with construction starting about two years before that (Joe Cook, Western LNG Associates, pers. comm., Feb. 14, 1983). When fully operational, as early as 1992, the facility should receive 130 tankers per year.

Oil Spill Risk

As shown by the MMS (Lanfear and Amstutz, 1983) and the Western Oil and Gas Association (Bigham, et al., 1983) oil spill risks have been declining over time. WOGA's analysis shows that the rate of decline has itself been decreasing and the spill rate may in fact have reached a leveling out. If this is the case, then the risk of a spill between now and 1988 per unit of volume produced or transported should remain the same as it is now. As WOGA notes, the change in spill rate over the last five years for platform spills has been minimal, converging on a rate somewhat less than one spill of 1,000 barrels or more per billion barrels produced (Bigham, et al., 1983). This is consistent with the MMS rate of 1.0 per billion barrels (Lanfear and Amstutz, 1983).

The current Department of the Interior five-year plan for OCS oil and gas lease sales lists five lease sales for the California coast: the recently-held number 68, and the future 73, 80, 91 and 95. According to Interior, a mean estimate of about 1.4 billion barrels of oil and 2.2 trillion cubic feet of gas will be recovered from tracts leased in these sales (these projections were made before the strikes in the Santa Maria basin were announced).

In producing and transporting this oil and gas, Interior estimated that 0.7 spills of 1,000 barrels or more would result

from platforms in southern California, and 2.6 spills from transportation. For central and northern California these figures are 0.4 and 1.6 respectively (DOI, 1981). These spill frequencies were calculated prior to the determination of the new MMS spill rates.

Revising the spill frequencies for expected production and transportation off California result in the following figures (assuming evenly mixed transportation):

* Southern California platforms - 0.9 spills
* Southern California transportation - 1.3 spills
* Central and Northern California platforms - 0.5 spills
* Central and Northern California transportation - 0.7 spills

Interior estimated that production would begin from both areas in 1987 and continue for at least 35 years.

Oil Spill Response

The future adequacy of oil spill response capabilities is not easily assessed. Since past and present adequacy has been examined in terms of equipment and materials and their loation, future plans for equipment acquisition and placement can give some indication of future response capabilities.

With respect to equipment and materials located on platforms, more platforms intuitively means better respose capabilities as more equipment is placed close together. In the event of a spill, equipment from nearby platforms can be brought to bear on the problem relatively quickly.

As for oil spill cooperatives, new equipment and facilities may likewise be interpreted to result in enhanced response capabilities. Clean Seas, Inc. has recently announced plans to increase its fleet of dedicated vessels from two to three and its 40-foot trailer fleet from eight to eleven. The third vessel could be purchased as early as the first quarter of 1984, but the actual date depends on the need created by activity in the federal and state lease areas in the Point Conception-Point Arguello region. The vessel would initially be based at Cojo Bay, then moved to Gaviota when the new terminal or terminals are built there (Waage, Clean Seas, Inc., pers. comm., Feb. 15, 1983).

The three trailers will be purchased shortly. One will be stationed at Avila and two will be stationed at Carpinteria. The trailers will enhance response capabilities from those areas

rather than extend equipment basing and coverage to new areas.

As development and production increase in the Santa Maria basin, Clean Seas likely will establish a permanently staffed facility in the San Luis Obispo area. From two to four full time employees will be stationed there. At the present time, no full time employees are based in the area. Instead, employees from the Santa Barbara area make weekly visits to the northern area (Waage, Clean Seas, Inc., pers. comm., Feb. 15, 1983).

The intent of all these changes is to improve the response time for spill containment as the new Santa Maria basin lease areas open up. The effect would be to make equipment availability and response times in these new areas comparable to those presently existing in the more established regions of the Santa Barbara Channel.

In the northern part of the study area (north of Cape San Martin), Clean Bay is responsible for oil spill response. Like Clean Seas, Clean Bay is constantly updating and improving its inventory of equipment of materials. Given the more distant prospect of offshore leasing in this northern area, Clean Bay has no plans to base equipment or establish facilities outside of the Bay area, although it is under study (Jack Mortenson, Clean Bay, Inc., pers. comm., Feb. 15, 1983).

Worth noting in regard to oil spill response is that the offshore oil industry, through the American Petroleum Institute and the Western Oil and Gas Association, is planning to undertake a study of sea otter deoiling, although funding for this study has recently been eliminated from current research funds. This

study is intended to look at methods of capturing oiled otters, removing oil from their pelts, rehabilitating them (including their fur, replacing natural oils with other natural or synthetic oils, blood chemistry, and physiology), and ways to lessen and deal with the trauma of the capture and cleanup process (Chamberlain, pers. comm., Feb. 9, 1983). This, too, may figure in future oil spill response plans should successful and acceptable methods of capturing, cleaning, and rehabilitating sea otters be found.

CHAPTER VII

Synopsis

On the following pages is a series of tables bringing together the information and data presented in the preceding chapters. These tables are intended to permit a quick comparison of probative facts regarding the past, present, and future risks of oil spills in and near the sea otter range.

TABLE S-1: OCS LEASE SALES

	Through 1977	Through 1983	Through 1988 (estimate)
Tracts offered[a]	471	870	?
Acres offered[a]	4,583,296	6,696,618	?
Tracts leased[a]	195	329	?
Acres leased[a]	988,170	1,744,782	?
Total bonuses[a]	$1,054,027,000	$4,016,692,000	?
Total royalties[b]	$100,477,752	215,740,587 (through 1981)	?

[a]Source: Collins, et al., 1982

[b]Source: MMS, Royalties (1982)

TABLE S-2: OFFSHORE OIL AND GAS LEASES

	1977	1983	1988
Number of Active Leases	121	182	?
Acreage of Active Leases	640,027	1,229,037	?

SOURCE: USGS, Outer Continental Shelf Statistics (1982)

TABLE S-3: PLATFORMS AND WELLS

	1977	1983	1988
Number of Platforms-Federal Waters	9	12	14-16 minimum in Santa Barbara Channel 2-6 minimum in Santa Maria basin
Number of Platforms-State Waters	8 (plus 1 island)	8 plus 1 island	10 minimum (plus one island) in Santa Barbara Channel 6 minimum in Santa Maria basin
Number of Subsea Completions	6	6	7 minimum
Number of Exploratory Wells			?
Number of Production Wells	306 (Santa Barbara Channel)	605 (Santa Barbara Channel)	200 minimum in Santa Maria Basin 775 minimum in Santa Barbara Channel

TABLE S-4: PRODUCTION

	Through 1977	Through 1981	Through 1988
Quantity of Produced Oil	167,897,088 bbl	217,549,934	?
Value of Produced Oil	$602,829,366	$1,261,896,255	?
Quantity of Produced Natural Gas	67,156,731 thousand cubic feet	84,314,419	?
Value of Produced Natural Gas	$19,017,810	$33,675,164	?

SOURCE: MMS, Royalties (1982)

TABLE S-5: TRANSPORTATION

	1977	1982	1988
Quantity of Offshore Oil Transported to Shore by Pipeline (State & Federal)	60,198,000 barrels	44,910,000(1980)	?
Quantity of Offshore Oil Transported to Shore by Tanker (State & Federal)	0	0(1980)	?
Number of Tanker Trips from Marine Terminals Carrying Crude from Offshore Wells	81	132 (1980)	?
Number of Tanker Trips to Moorings Carrying Refined Products	111	29 (1981)	?
Number of Other Tanker Trips Including Los Angeles and San Francisco Traffic	2,423	2,373	?

TABLE S-6: OIL SPILL RESPONSE CAPABILITIES

	1977	1983	1988
Number of Dedicated Vessels - Clean Seas	0	2	3
Number of Skimmers - Clean Seas	7	20	?
Feet of Containment Boom - Clean Seas	6910	34,957	?
Number of Dedicated Vessels - Clean Bay	0	0	0
Number of Skimmers - Clean Bay	?	8	?
Feet of Containment Boom - Clean Bay	?	16,440	?

TABLE S-7: OIL SPILL MODELS

	1977	1983	1988
Projected Spill Rate per Billion Barrels (spills greater than 1,000 barrels)			
Platform	1.8	1.0	?
Pipeline	2.3	1.6	?
Tanker			?
Probability of Otter Range Being Impacted by OCS Spill	.08[a]	.22[b]	?

[a]Lease Sale 48
[b]Lease Sale 53

Bibliography

ARCO (1982), Oil Spill Contingency Plan for the Santa Maria Basin.

Bigham et al. (1983), An Overview of Sea Otter Oil Spill Risk Analysis.

Bureau of Land Management (1982a), Final Environmental Impact Statement, Proposed Oil & Gas Lease Sale 71, Diapir Field.

_____ (1982b), Final Environmental Impact Statement, Proposed Oil & Gas Lease Sale 70, St. George Basin.

_____ (1981), Final Environmental Impact Statement, OCS Sale No. 68.

_____ (1980), Final Environmental Impact Statement, OCS Sale No. 53.

_____ (1979), Final Environmental Impact Statement, OCS Sale No. 48.

_____ (no date), Final Supplement to the Final Environmental Statement, Proposed Five-year OCS Oil & Gas Lease Sale Schedule January 1982-December 1986.

_____, New Orleans Office (1981), Outer Continental Shelf Statistics.

California Coastal Commission (1981), Oil Spill Response Capability Study.

Chevron USA (1982), Exploration Plan, OCS Leases P-0451, P-0452, and P-0453, Outer Continental Shelf, Santa Maria Basin, Offshore California.

Collins et al. (1982), Pacific Summary Report 2, USGS Open File Report 82-21.

Danenberger (1980), Outer Continental Shelf Oil and Gas Blowouts, USGS Open-file Report 80-101.

Department of the Interior (1981), Secretarial Issue Document for Tentative Proposed Final 5-Year OCS Leasing Program.

Fish & Wildlife Service (1977a), Proceedings of the 1977 Oil Spill Response Workshop, FWS/OBS/77-24.

_____ (1977b), Determination that the Southern Sea Otter is a Threatened Species, 42 F.R. 2965 (January 14, 1977).

_____ (1980), Biological Opinion Regarding Outer Continental Shelf Leasing and Exploration Offshore Central and Northern California.

_____ (1982), Southern Sea Otter Recovery Plan.

General Accounting Office (1978), Coast Guard Response to Oil Spills -- Trying to do too much with too little, CED-77-71.

Interagency Committee on Ocean Pollution Research, Development, and Monitoring (1981), Marine Oil Pollution: Federal Program Review.

Holmes & DeWitt (1970), Santa Barbara Oil Symposium.

Kenyon (1981), Sea Otter, in Ridgway & Harrison, eds., Handbook of Marine Mammals.

_____ (1969), The Sea Otter in The Eastern Pacific Ocean.

Lanfear & Amstutz (1983), A Reexamination of Occurrence Rates for Accidental Oilspills on the U.S. Outer Continental Shelf.

Lanfear & Samuels (1981), Documentation and User's Guide to the U.S. Geological Survey Oilspill Risk Analysis Model: Oilspill Trajectories and Calculation of Conditional Responsibilities, USGS Open-file Report 81-316.

Macpherson & Bernstein (1980), Outer Continental Shelf Oil and Gas Activities in the Pacific (Southern California) and their Onshore Impacts: A Summary Report, May 1980, USGS Open-file Report 80-645.

Mansvelt Beck & Wiig (1977), The Economics of Offshore Oil and Gas Supplies.

Marine Exchange of Los Angeles-Long Beach Harbor (1983), Vessel Arrivals and Departures at Los Angeles-Long Beach Harbor.

Marine Exchange of San Francisco (1983), Vessel Arrivals & Departures at San Francisco Harbor.

Minerals Management Service (1982), Royalties.

National Academy of Sciences (1975), Petroleum in the Marine Environment.

_____ (1981), Safety and Offshore Oil.

Office of Planning & Research (1977), Offshore Oil in California.

Oil and Gas Journal (various dates), various articles.

Pacific Gas & Electric (1982), Prepared Testimony of R.G. Mohr and N.B. Wheelock.

Samuels et al. (1981), An Oilspill Risk Analysis for the Southern California (Proposed Sale 68) Outer Continental Shelf Lease Area, USGS Open-file Report 81-605.

Shell Oil Co. (1982), Oil Spill Contingency Plan, Trout Prospect, OSC Lease No. P-0435.

_____ (1976), Oil Spill Contingency Plan for Exploratory Drilling, OCS Lease No. 35 Area.

Slack et al. (1978), An Oilspill Risk Analysis for the Southern California (Proposed Sale 48) Outer Continental Shelf Lease Area, USGS Water-resources Investigations 78-80.

Smith et al. (1980), The oilspill Risk Analysis of the U.S. Geological Survey, USGS Open-file Report 80-687.

State Lands Commission (1982), Program Environmental Impact Report, Leasing, Exploration and Development of Oil and Gas Resources on State Tide and Submerged Lands, Point Conception to Point Arguello, Santa Barbara County, California.

Stolzenbach et al. (1977), A Preview and Evaluation of Basic Techniques for Predicting the Behavior of Surface Oil Slicks.

Union Oil Company of California (1982), Oil Spill Contingency Plan for Exploration Activities on Lease OCS-P 0203 in the Santa Barbara Channel, Offshore California.

U.S. Air Force (1977), Environmental Impact Analysis Process Reference Document to Environmental Impact Statement Space Shuttle Program.

U.S. Coast Guard (various dates), Polluting Incidents in and around U.S. Waters.

U.S. Coast Guard (1982), Port Access Route Study, 12th District.

U.S. Coast Guard (1981), Seagoing Vessel Arrivals.

USGS (no date), Accidents Connected With Federal Oil and Gas Operations in the Outer Continental Shelf Pacific Region.

_____ (1981), Federal and Indian Lands Oil and Gas Production, Royalty Income, and Related Statistics.

VanBlaricom & Jameson (1982), "Lumber Spill in Central California Waters: Implications for Oil Spills and Sea Otters," Science, v. 215, pp. 1503-1505.

List of Persons Contacted

Brian Baird
California Coastal Commission
San Francisco, California

Robert L. Brownell
Fish & Wildlife Service
San Simeon, California

D. W. Chamberlain
Senior Science Advisor
Atlantic Richfield Co.
Los Angeles, California

Joe Cook
Pacific LNG Associates
Los Angeles, California

Ruthann Corwin
OCS Planner
Marin County
San Rafael, California

Carol Fulton
Friends of the Sea Otter
Pacific Grove, California

Susan Hansch
California Coastal Commission
San Francisco, California

Jack Mortenson
Manager
Clean Bay, Inc.
Concord, California

Sabella Moreno
Construction Operations
San Francisco District Office
Corps of Engineers
San Francisco, California

Jan Terveen
Chief, OCS Management Branch
11th Coast Guard District
Long Beach, California

Bud Waage
Manager
Clean Seas, Inc.
Santa Barbara, California

William Walkers
12th Coast Guard District
San Francisco, California

Cal Weide
Minerals Management Service
Los Angeles, California

GLOSSARY

BASIN- A depression of the earth in which sedimentary materials accumulate or have accumulated, usually characterized by continuous deposition over a long period of time; a broad area of the earth beneath which the strata dip, usually from the sides toward the center.

BLOCK- A geographical area of approximately 9 square miles (5,760 acres or 2,330 hectares), which is used in official BLM protraction diagrams or leasing maps.

BLOWOUT- An uncontrolled flow of gas, oil, and other fluids from a well to the atmosphere. A blowout occurs when formation pressure exceeds pressure applied to the well by the column of drilling fluid.

BONUS- Money paid by the lessee for the execution of an oil and gas lease.

CONTINGENCY PLAN A plan for possible offshore emergencies prepared and submitted by the oil or gas operator as part of the plan of development and production.

DEVELOPMENT- Activities that take place following exploration for, discovery of, and delineation of minerals in commercial quantities, including but not limited to geophysical activity, drilling, platform construction, and operation of all directly related onshore support facilities; and that are for the purpose of ultimately producing the minerals discovered.

EXPLORATION- The process of searching for minerals. Exploration activities include (1) geophysical surveys where magnetic, gravity, seismic, or other systems are used to detect or infer the geologic conditions conducive to the accumulation of such minerals and (2) any drilling, except development drilling, whether on or off known geological structures. Exploration also includes the drilling of a well in which a discovery of oil or natural gas in paying quantities is made and the drilling of any additional well after such a discovery that is needed to delineate a reservoir and to enable the lessee to determine whether to proceed with development and production.

FIELD- An area within which hydrocarbons have been concentrated and trapped in economically producible quantities in one or more structural or stratigraphically related reservoirs.

LEASE SALE- The public opening of sealed bids made after competitive auction for leases granting companies or individuals the right to explore for and develop certain minerals within a defined period of time.

OFFLOADING- Another name for unloading; offloading refers more specifically to liquid cargo - crude oil, and refined products.

OFFSHORE STORAGE AND TREATMENT VESSEL (OS&T) A converted tanker anchored by a platform and used to remove natural gas, water, and other impurities from crude oil and to store the treated product until it is offloaded by a shuttle tanker.

OUTER CONTINENTAL SHELF (OCS) All submerged lands that comprise the Continental Margin adjacent to the United States and seaward of State offshore lands. The OCS has been subject to Federal jurisdiction and control since enactment of the Submerged Lands Act of 1953 (43 U.S.C. 1301 and 1302).

PLATFORM- A steel or concrete structure from which offshore wells are drilled.

PRODUCTION- Activities that take place after the successful completion of any means for the removal of minerals, including such removal, field operations, transfer of minerals to shore, operation monitoring, maintenance, and work overdrilling.

RESERVES- Portion of the identified oil or gas resource that can be economically extracted.

RIG- Equipment used for drilling an oil or gas well.

TIDELANDS- The portion of the Continental Shelf between the shore and the boundaries claimed by the States.

TRACT- The geographic and legal extent of a single lease area; a convenient way of numbering blocks offered for sale.

TREATMENT FACILITY A facility that separates hydrocarbons from water emulsions, and other impurities.

UNDISCOVERED RESOURCES Quantities of oil and gas estimated to exist outside known fields.

UNIT- Administrative consolidation of OCS leases held by two or more companies but explored, developed, and/or produced by one operator for purposes of conservation, eliminating duplication of operations, and/or maximizing resources recovered.

APPENDIX A

OIL SPILLS FROM PLATFORMS AND DRILLSHIPS
IN SOUTHERN CALIFORNIA WATERS

1969 TO PRESENT

Oil Spills From Platforms and Drillships in Southern California Waters
1969 to Present

Sources: CCGDELEVEN(m) & Minerals Management Service - Pacific OCS Region

Date	Platform/Drillship	Owner/Operator	Gal.	Type	Cause/Remarks
69/01/28	Platform A	Union Oil Co.	99999	Crude	25,000 bbl spill from blow out
76/11/27	Platform Hillhouse	Sun Oil Co.	84	Crude	Blocked Filter
77/05/18	Platform A	Union Oil Co.	30	Crude	Unknown
77/06/24	Platform Hondo	Exxon	21	Diesel	Loading tanks, hi level shutdown bypassed
77/06/30	Platform Hondo	Exxon	1	Diesel	Oil drained from line after plug removed
77/07/04	Platform Hondo	Exxon	1	Diesel	Cracked elbow in diesel return line
77/07/20	Platform Hondo	Exxon	1	Diesel	Broken sight glass on fuel line
77/09/10	Platform Hondo	Exxon	1	Diesel	Hole in bottom of drum
77/10/03	Platform Hondo	Exxon	15	Diesel	Sump screen became plugged
77/10/06	Platform Hondo	Exxon	1	Diesel	While moving tank
78/02/06	Platform Hondo	Exxon	15	Diesel	Hose rupture on line to tank
78/02/24	Platform Emmy	Aminoil USA	200	Crude	Broken undersea pipeline
78/04/06	Glomar Coral Sea	Exxon	1	Waste	Pumping Bilges
78/06/28	Platform A	Union Oil Co.	210	Crude	Failure in water knockout
78/09/24	Platform Hondo	Exxon	7	Diesel	Mooring line broke causing hose to fall in water
79/03/13	Platform Hondo	Exxon	21	Diesel	Line parted from platform to workboat
79/05/25	Platform Hondo	Exxon	2	Diesel	Tank overflow when hi level alarm failed
79/09/22	Platform Henry	Sun Oil Co.	84	Diesel	Diesel displaced from hole while going in hole
/12/18	Platform Grace	Chevron USA	40	Diesel	Unknown
80/01/27	Platform Henry	Sun Oil Co.	42	Diesel	Unknown
80/01/27	Platform Hillhouse	Sun Oil Co.	84	Diesel	Contaminated drilling mud spilled during production ops
80/07/06	Platform Hillhouse	Sun Oil Co.	20	Crude	Settling tank overflowed due to equipment failure
80/07/22	Platform Henry	Sun Oil Co.	1	Diesel	During oil transfer with supply vessel
80/08/06	Platform Henry	Sun Oil Co.	1	Crude	Pressurived line was opened at pig trap during prod ops
80/08/26	Platform Henry	Sun Oil Co.	42	Diesel	While filling sand blast compressor
80/09/02	Platform Hondo	Exxon	1	Diesel	Broken Connection
80/09/19	Platform C	Union Oil Co.	1	Diesel	Fill line spill
80/10/16	Platform Hillhouse	Sun Oil Co.	42	Crude	Shipping pump cannister leaked during production ops
80/10/17	Platform Hogan	Phillips	210	Crude	Production well pump failure during production ops
80/10/24	Platform Grace	Chevron USA	5	Crude	Tank overflowed
80/11/16	Platform Hondo	Exxon	4	Lube	Deck drain plugged
81/08/01	Platform Hondo	Exxon	5	Wet Gas	Alarm on sump removed for repair and sump overflowed
81/01/1_	Platform Hondo	Exxon	1	Diesel	Hose clamp failed
81/01/22	Platform Grace	Chevron	20	Wet Gas	Picked up by gas in tank vent
81/01/28	Platform Elly	Shell Oil Co.	2	Crude	Valve open in catch basin
81/02/01	Platform Grace	Chevron USA	42	Crude	Oil trapped in tube by sand spilled during tube removal
81/02/25	Exxon Santa Ynez	Exxon	42	Heating	Flange parted
81/03/21	Platform Elly	Shell Oil Co.	3	Crude	Washdown hose mistakenly connected to oil source
81/04/01/	Platform Ellen	Shell Oil Co.	20	Crude	Mud pit containing oil overflowed during production ops

Date	Platform/Drillship	Owner/Operator	Gal.	Type	Cause/Remarks
81/04/07	Platform Ellen	Shell Oil Co.	20	Crude	Mud pit discharge mistakenly opened during production ops
81/04/10	Exxon Santa Ynez	Exxon	42	Crude	Transfer system leak
81/04/26	Platform Hogan	Phillips	3	Crude	Settling tank overflowed
81/05/15	Platform Eva	Union Oil Co.	2	Crude	Valve malfunction during production ops
81/05/29	Exxon Santa Ynez	Exxon	21	Wet Gas	Carrried over from flare stack
81/06/10	Platform Hondo	Exxon	5	Crude	Nipple removed from prover lap
81/07/04	Platform Ellen	Shell Oil Co.	25	Crude	Valve mishandling during production ops
81/07/09	Platform Hondo	Exxon	210	Waste	Hose rupture during production ops
81/08/06	Glomar Atlantic	Chevron	21	Fuel	Loose hose connection
81/08/11	Platform Hondo	Exxon	8	Crude	Residue from previous spill left in cutting tube
81/08/23	Platform Henry	Sun Oil Co.	210	Diesel	Fill hose parted
81/09/01	Platform Grace	Chevron USA	10	Hydraulic	Drum ruptured while being loaded
81/09/13	Platform Ellen	Shell Oil Co.	100	Crude	Mishandled valve during production ops
81/09/13	Platform Henry	Sun Oil Co.	420	Crude	Dump valve on scrubber failed.
81/10/11	Platform Hondo	Exxon	5	Crude	Oil residues mixed with mud washed down cuttings tube
81/10/18	Platform Elly	Shell Oil Co.	84	Crude	Valve left open on free water knock out vessel
81/10/20	Platform A	Union Oil Co.	10	Crude	Valve failure during production ops
81/10/23	Platform Henry	Sun Oil Co.	420	Diesel	Fuel filling nozzle accidently jammed open
81/10/24	Platform Elly	Shell Oil Co.	714	Crude	Sump overflowed when hi level larma in skim pile failed
81/11/06	Platform B	Union Oil Co.	42	Crude	Broken header line
81/11/14	Platform Hillhouse	Sun Oil Co.	75	Crude	Settling tank overfilled after power failure
81/11/21	Glomar Coral Sea	Global Marine	20	Crude	Drill was reversed out of well during exploration ops
81/12/29	Platform Hondo	Exxon	1050	Crude	Crack in nipple of pig launcher
82/01/04	Platform Henry	Sun Oil Co.	20	Crude	Carry over from vent scrubber
82/01/22	Platform Hondo	Exxon	2	Diesel	Diesel transfer line dropped
82/02/07	Platform Hondo	Exxon	1	Lube	Wind blew oil from bleed-off into water
82/02/13	Platform Hondo	Exxon	65	Crude	Pump failure on sump tank
82/03/10	Platform Hondo	Exxon	1	Lube	Floor leak in compressor building
82/03/19	Platform Hondo	Exxon	1	Lube	Drip pan on crane overflowed due to plugged drain
82/03/25	Platform Hondo	Exxon	1	Crude	Oil diverted to flare boom during routine system shutdown
82/04/03	Platform Hondo	Exxon	420	Diesel	Diesel oil accumulated in cutting chute
82/04/05	Platform Emmy	Aminoil USA	210	Crude	Valve leak thru bottom less sump
82/04/12	Platform Hondo	Exxon	1	Diesel	Drip pan on crane plugged and wind blew oil out
82/05/06	Platform Gina	Union Oil Co.	1	Crude	Valve failed to seat in belly tank due to foreign matter
82/05/25	Platform Hondo	Exxon	1	Diesel	PVC pipe rupture
82/06/04	Platform Hillhouse	Sun Oil Co.	10	Crude	Well kicked during testing
82/06/06	Platform Hondo	Exxon	1	Diesel	Oil went down cutting shute and pumped into shaker screen
82/06/13	Glomar Java Sea	Arco	5	Crude	Minor exploration in test line during hot work
82/07/11	Platform Hillhouse	Sun Oil Co.	3	Crude	Heater treater upset causing Wemco to overflow
82/07/13	Platform Grace	Chevron	1	Crude	Valve left open while lifting tank from workboat
82/07/21	Platform Hillhouse	Sun Oil Co.	12	Diesel	House broke while fueling
82/07/30	Platform Eva	Union Oil Co.	100	Crude	Broken undersea pipeline

Date	Platform/Drillship	Owner/Operator	Gal.	Type	Cause/Remarks
82/08/10	Platform Grace	Chevron USA	3	Crude	Waste water treatment plant malfunction
82/08/16	Glomar Coral Sea	Phillips	5	Crude	Hose burst while pressure testing
82/08/16	Platform Grace	Chevron	3	Crude	Catch pan under pipe tong unit spilled over
32/08/19	Platform Emmy	Aminoil USA	1	Crude	Slop tank overflow due to pump failure
82/08/29	Platform Gina	Union Oil Co.	100	Crude	Belly tank overflowed ater valve
82/09/03	Platform Emmy	Aminoil USA	10	Wet Gas	Contaminated mud pumped into bottomless sump by mistake
82/09/13	Platform Henry	Sun Oil Co.	1	Hydraulic	Hydraulic line blew on crane
32/10/07	Glomar Java Sea	Arco	1	Diesel	Fuel line to crane ruptured
32/10/18	Platform Ellen	Shell Oil Co.	25	Diesel	Drain overflow
32/11/07	Penrod 73	Oxy	10	Hydraulic	Broken line on BOP stack
82/12/15	Platform Gilda	Union Oil Co.	1	Crude	Oily cuttings from cutting chute
82/12/31	Penrod 73	Oxy	8	Crude	Carryover thru test separator
33/01/11	Diamond M General	Union Oil Co.	42	Crude	Off test separator
93/1/19	Penrod 73	Oxy	20	Crude	Baker tank explosion resulted in four bbls oil/water mix.

APPENDIX B

SPILLS IN THE SEA OTTER RANGE
1977 - PRESENT

US COAST GUARD, 1983

WATERBODY

DEFINITION Describes the type of waterbody in which the incident occurrred.

DISCUSSION Inland and coastal areas are defined in accordance with 40 CFR 1510.5 (e) and (f) (The National Contingency Plan) as implemented by the applicable Regional Contingency Plan.

CODES The first character position identifies the general area, while the remainder of the field further refines the body of water.

CODES for the first position:

1 Inland Area

2 Atlantic Coast

3 Pacific Coast

4 Gulf Coast

5 Great Lakes Coast

6 Arctic Coast/Alaska Coast (North-northwest of the Aleutian Islands)

7 Central and Western Pacific (used only for spills in American Samoa, Guam or northern Mariana Islands)

Applicable if the CODE in the first character position is:	CODES for the second and third positions		
1	01	NA	Lake, roadstead or other large body of open internal water
2, 3, 4, 5, 6, or 7	01	X	Bay, estuary or a sound
all ~~1, 2, 3, 4, 5, 6, or 7~~	02	NA	River area, channel or other restricted navigable waterway
1, 2, 3, 4, 5, 6, or 7	03	X	Port or harbor area (including terminal or dock)
1, 2, 3, 4, 5, 6, or 7	04	NA	Non-navigable tributary to navigable waters
1, 2, 3, 4, 5, 6, or 7	05	NA	Other non-navigable area (including seqage or drainage ditches)
1, 2, 3, 4, 5, 6, or 7	06	NA	Beach/shore adjoining navigable water or a tributary to a navigable water
1, 2, 3, 4, 5, 6, or 7	07		Other beach or shore
2, 3, 4, 6, 7	08		Territorial Seas (baseline to 3 miles)
2, 3, 4, 6, 7	09		Contiguous Zone (3 to 12 miles)
2, 3, 4, 6, 7	10		High Seas (12 to 50 miles)
2, 3, 4, 6, 7	11		High Seas (50 to 100 miles)
2, 3, 4, 6, 7	12		High Seas (more than 100 miles)

MATERIAL

Crude Oil
1000 Light crude oil
1001 Heavy crude oil
1002 Medium crude oil

Gasoline
1010 Natural (casing head) gasoline
1011 Gasoline (aviation or automotive)

Other Distillate Fuel Oil
1020 Jet fuel (JP-1 through JP-5)
1021 Kerosene
1022 Other distillate fuel oil

Solvents
1030 Naptha
1031 Mineral spirits
1032 Other petroleum solvent

Diesel Oil
1040 Light diesel oil
1041 Heavy diesel oil

Residual Fuel Oil
1050 #4 Fuel oil
1051 #5 Fuel oil
1052 #6 Fuel oil

Asphalt or Other Residual
1060 Creosote
1061 Asphalt or road oil
1062 Coal tar or pitch

Animal or Vegetable Oil
1070 Animal oil
1071 Vegetable oil

Waste Oil
1080 Waste oil

Other Oil
1089 Lube oil
1090 Liquefied petroleum gas
1091 Hydraulic fluid
1092 Lacquer-based paint
1093 Paraffin wax
1094 Grease
1095 Mixture of two or more petroleum products
1096 Oil-based pesticides
1097 Unidentified light oil
1098 Unidentified heavy oil
1099 Other oil or unknown

2088	Tetraethyl Lead	2210	Vanadium Compounds
2203	Tetraethyl Pyrophosate	2094	Vinyl Acetate
2089	Toluene	2095	Vinylidene Chloride
2204	Toxaphene		
2205	Tuchlorfon	2096	Xylene
2090	Trichloroethane	2211	Xylenol
2091	Trichloroethylene		
2206	Trichlorophenal	2212	Zectran
2092	Triethanolamine	2213	Zinc Compounds
2207	Triethylamine	2214	Zirconium Compounds
2208	Trimethylamine		
2093	Turpentine	2097	Other hazardous substances
2209	Uranuim Compounds		

Other Pollutant

7001	Dredged spoil	7012	Wrecked or discarded equipment
7002	Solid waste		
7003	Incinerator residue	7013	Rock
7004	Sewage	7014	Sand
7005	Sewage sludge	7015	Cellar dirt
7006	Garbage	7016	Industrial waste
7007	Munitions	7017	Municipal waste
7008	Chemical wastes	7018	Agricultural waste
7009	Biological materials	7019	Coal dust
7010	Radioactive materials	7020	Coke
7011	Heat	7021	Salt water

8000 Natural Substance

9000 Other Material

9999 Unknown Material

UNIT

Actual Spill	"Potential" Spill
G = Gallons	X = Gallons
P = Pounds	Y = Pounds
S = Sheen	
U = Unknown	

SOURCE

Marine Traffic Systems

VESSEL:

000	Other vessel		
001	Unknown but suspected vessel		
01_	Tankship	__0	0 - 149 Gross Tons
		__1	150 - 299 Gross Tons
03_	Tank Barge	__2	300 - 499 Gross Tons
		__3	500 - 999 Gross Tons
		__4	1,000 - 9,999 Gross Tons
		__5	10,000 - 19,999 Gross Tons
		__6	20,000 - 34,999 Gross Tons
		__7	35,000 - 49,999 Gross Tons
		__8	50,000 - 99,999 Gross Tons
		__9	100,000 Gross Tons or more
050	Dry Cargoship		
051	Dry Cargo Barge		
052	Tugboat or Towboat		
053	Fishing Vessel		
054	Passenger Vessel		
055	Recreational Vessel		
056	Combatant Vessel (All Naval vessels except Tank Vessels)		
057	Other Public Vessels		
058	Coast Guard Vessel		
059	Service Vessel		
060	Research Vessel		
061	Crew Boat		

MARINE FACILITY:

100	Other transportation-related marine facility
101	Onshore bulk cargo transfer
102	Onshore Fueling
103	Onshore non-bulk cargo transfer

104 Offshore bulk cargo transfer
105 Offshore Fueling
106 Offshore non-bulk cargo transfer
107 Deepwater Port Complex
108 Single Point Mooring
109 Gas Freeing Plant

Other Transportation Systems

VEHICLE:

200 Other land vehicle
201 Rail vehicle liquid bulk
202 Rail vehicle dry bulk
203 Rail vehicle general cargo
204 Rail vehicle transfer
205 Highway vehicle liquid bulk
206 Highway vehicle dry bulk
207 Highway vehicle general cargo
208 Highway vehicle passenger
209 Aircraft
210 Tank Truck
250 Unknown type of land vehicle

LAND FACILITIES:

300 Other land transportation facility
301 Railway cargo transfer
302 Railway fueling facility
303 Highway cargo transfer
304 Highway fueling
305 Unknown type of land transportation facility

207 Highway vehicle general cargo
208 Highway vehicle passenger
209 Aircraft
210 Tank truck
250 Unknown type of land vehicle

(4) Land Facilities.

300 Other land transportation facility
301 Railway cargo transfer
302 Railway fueling facility
303 Highway cargo transfer
304 Highway fueling
305 Unknown type of land transportation facility

(5) Transportation Related Pipelines.

401 Onshore pipeline
402 Offshore pipeline

(6) Non-Transportation-Related Facilities.

500 Other onshore non-transportation-related facility
501 Onshore refinery
502 Onshore bulk storage facility (includes tank farms)
503 Onshore industrial plant or processing facility
504 Onshore oil or gas production facility
505 Other offshore non-transportation-related facility
506 Offshore production facility
507 Power plant
508 Pipeline within non-transportation-related facility

(7) Miscellaneous.

900 Miscellaneous
901 Natural oil seep
902 Natural material other than oil or hazardous substance
999 Unknown type of source

d. EDIT CONSIDERATIONS.

(1) This is a REQUIRED field. Blank spaces are not acceptable.

(2) Only the codes described above are acceptable.

CAUSE

IMMEDIATE CAUSE:		CONTRIBUTING FACTOR:	
Structural Failure or Loss			
A	Hull rupture or leak	A	Collision
B	Tank rupture or leak	B	Grounding
C	Transportation pipeline rupture or leak	C	Fire/Explosion
		D	Capsizing/Overturning
D	Dike rupture or leak	E	Sinking
E	Container lost intact	F	Other casulty
F	Well blow-out	G	Adverse weather or sea conditions
		H	Earthquake or other natural disaster
H	Other structural failure	I	Minor damage
		J	Material fault
		K	Design fault
		L	Personnel error (PE) improper maintenance
		M	PE - overpressurization
		N	Other personnel error
		O	Corrosion
		P	Sand cutouts
		Q	Other or unknown factor
		R	Ramming
Equipment Failure			
I	Pipe rupture or leak	A	Minor damage
J	Hose rupture or Leak	B	Excessive wear
K	Manifold rupture or leak	C	Corrosion
L	Loading arm failure, rupture or leak	D	Material fault
		E	Design fault
M	Valve failure	F	PE -improper installation
N	Pump Failure	G	PE -improper maintenance
O	Flange failure	H	PE-Hose, pipe, or loading arm cut or severed
P	Gasket failure		

		I	PE-Hose, pipe, or loading arm twisted or kinked
R	Other equipment failure	J	PE-improper valve operation
		K	PE-Flanges improperly secured
		L	PE-overpressurization
		M	Other personnel error
		P	Other or unknown factor

Personnel Error (Unintentional Discharge)

S	Tank overflow	A	Inadequate sounding
T	Improper equipment handling or operation	B	Failure to shut down
		C	Topping off at excessive rate
		D	Loading too many tanks simultaneously
W	Other personnel error	E	Overfilling (and subsequent overflow)
		F	Improper hose handling
		G	Improper valve operation
		H	Flanges improperly secured
		I	Failure to communicate
		J	Inattention to duty
		K	Other or unknown factor
		L	Improper training

Intentional Discharge

X	Intentional discharge	A	Bilge pumping
		B	Ballast pumping
		C	Tank cleaning or stripping
		D	Emergency discharge
		E	Disposal of waste
		F	Discharge under COE/EPA permit
		G	Sabotage or vandalism
		H	Salvage operations
		J	Other or unknown factor

Other Transportation Casualty

Q	Railroad accident	A	Personnel error
U	Highway accident	B	Adverse weather
V	Aircraft accident	C	Overturning
		D	Equipment failure
		E	Collision/crash
		F	Other or unknown factor

Natural or Chronic Phenomenon

Y	Natural or chronic phenomenon	A	Natural seepage from sea bottom
		B	Natural substance reported as oil slick
		C	Leaching from saturated ground
		E	Other factor

Unknown Cause

Z	Unknown	A	False Alarm/Potential Spill
		Z	Unknown

OPERATION.

DEFINITION. Indicates the type of operation in which the source or suspected source was engaged at the time of the discharge.

CODES.

Type of Operation

00 No operation in progress

Facility and Land Transportation-Related Operations

01 Routine industrial or manufacturing process
02 Starting, stopping, or changing industrial or manufacturing process
03 Repair, modification, or maintenance of plant of equipment
04 Internal transfer or shifting of liquid
05 Transfer of bulk liquid to or from transportation mode
06 Transport of bulk liquid by pipeline or vehicle
07 Receiving fuel
08 Storage of bulk liquid
09 Tank stripping process
10 Tank cleanup process
11 Other cleaning process
12 Ship breaking
13 Deepwater port (DWP) cargo transfer plem (pipeline end manifold) to platform
14 DWP - cargo transfer platform to shoreside
20 Other facility or land transportation-related operation

Non-Transportation-Related Operations

40 Exploration for natural resource
41 Industrial or manufacturing process
42 Repair, modification, or maintenance of plant of equipment
43 Internal transfer or shifting of liquid
44 Receiving fuel
45 Production from a natural resource
46 Storage of bulk liquid
47 Tank stripping or cleaning process
48 Other cleaning process
49 Other non-transportation related operation

Vessel-Related Operations

50 Receiving dry cargo
51 Off-loading dry cargo
52 Receiving liquid cargo at an onshore facility
53 Discharging liquid cargo at an onshore facility
54 Receiving fuel
55 Taking on ballast
56 Discharging ballast
57 Pumping bilges
58 Stripping tanks
59 Cleaning tanks
60 Other cleaning process
61 Transfer or shifting of liquid within vessel
62 Repair, modification, or maintenance of vessel
63 Repair, modification, or maintenance of equipment
64 Mooring at dock
65 Departing from dock
66 Moored (not engaged in any operation listed above)
67 Anchored (not engaged in any operation listed above)
68 Underway
69 Lightering
70 Dredging
71 Deepwater port - cargo transfer vessel to plem (pipeline end manifold)
80 Other vessel-related operation
99 Unknown operation or "potential" spill

	DATE	LOCATION	WATER BODY	MATERIAL	QUANTITY	UNIT	SOURC	CAUSE	IMMEDIATE CONTRIB	FACTOR	AMOUNT RECOVERED (Same units as 'Unit')	OPERATION
YEAR 77												
SPILL 1200012	770629	L351012045	~~104~~	1000 light crude	250	Gallons	504	C	Q	light crude		00
SPILL 1200102	770108	L365812200	303	1040 light diesel	5	G	053	S	E			61
SPILL 1200104	770122	L363212155	307	1001 heavy crude		Unknown	999	7	Z			99
SPILL 1200105	770126	L352112051	303	1040 light diesel		Steam	053	W	B			88
SPILL 1200106	770210	L352412053	301	1098 unid heavy oil	7	G	999	7	Z			99
SPILL 1200107	770216	L363712153	303	9000 other	1	G	900	W	K			00
SPILL 1200108	770217	L363612153	303	1080 waste oil		S	053	W	J			57
SPILL 1200112	770307	L363612153	303	1080 ~~gas~~	1	G	052	J	P			66
SPILL 1200113	770310	L363612153	303	1089 tube oil		S	900	W	E			00
SPILL 1200114	770312	L352312051	308	9000 other		S	999	7	Z			99
SPILL 1200115	770320	L364912149	303	1040 light diesel	2	G	999	7	Z			99
SPILL 1200117	770401	L352412053	301	1091 hydraulic fluid	3	G	015	H	O			52
SPILL 1200118	770404	L352212051	303	1040 light diesel	4	G	999	7	Z			99
SPILL 1200119	770405	L363612153	303	1010 natural gasoline	2	G	053	N	P			66
SPILL 1200120	770407	L352112051	301	1040 light diesel	5	G	999	7	Z			99
SPILL 1200121	770407	L355412148	308	1098 unid heavy oil	5000	G	999	7	Z	unid heavy oil		99
SPILL 1200122	770409	L352212051	301	1080	10	G	053	H	O			00
SPILL 1200123	770411	L352212051	301	1040	5	G	999	7	Z			99
SPILL 1200124	770424	L364912149	303	1080	5	G	053	X	E			66
SPILL 1200125	770508	L363612153	303	1095	4	G	053	W	J			66
SPILL 1200126	770508	L361512150	308	1000		U	900	Y	A			00
SPILL 1200127	770512	L351012040	~~304~~	1097	6	G	999	7	Z			99
SPILL 1200128	770525	L364212151	308	1080		U	999	7	Z			99
SPILL 1200129	770608	L352412052	301	1089	5	G	015	R	P			71
SPILL 1200130	770610	L363612153	303	1040		S	999	7	Z			99
SPILL 1200131	770610	L352212051	303	1011	130	G	055	J	K	gasoline		66
SPILL 1200132	770612	L364412149	308	8000		U	900	Y	R			00
SPILL 1200133	770615	L352212051	301	1040	10	G	999	7	Z			99
SPILL 1200134	770616	L352212051	301	1080	2	G	000	Y	A			57
SPILL 1200135	770617	L363612153	303	8000		U	900	X	E			45
SPILL 1200136	770626	L365812200	303	1040	2	G	999	7	Z			99
SPILL 1200137	770702	L344812147	303	1099	6	G	508	P	B			42
SPILL 1200138	770702	L352112051	301	1040	5	G	999	7	Z			99
SPILL 1200139	770708	L352212051	303	1040	1	G	053	X	A			57
SPILL 1200140	770811	L351012044	303	1040	5	G	999	7	Z			99
SPILL 1200142	770812	L363612153	303	1040	2	G	999	7	Z			99
SPILL 1200143	770815	L364812147	303	1095	2	G	000	W	K			57
SPILL 1200144	770815	L363712154	303	1040	2	G	999	7	Z			00
SPILL 1200145	770822	L352212052	303	1097		U	999	7	Z			00
SPILL 1200146	770823	L364812147	303	1040	5	G	999	7	Z			99
SPILL 1200147	770830	L352212051	303	1040	5	G	999	7	Z			99
SPILL 1200148	770913	L363812156	308	9999		U	000	7	Z			99
SPILL 1200149	770925	L350512110	309	1099		U	999	7	Z			99
SPILL 1200150	771003	L363612153	303	1040		S	999	7	Z			99
SPILL 1200151	771010	L364812147	308	1040	10	G	999	7	Z			99
SPILL 1200153	771209	L352112051	301	1099	10	G	999	7	Z			99
SPILL 1200155	771212	L363612153	303	1040		S	999	7	Z			99
SPILL 1200156	771212	L363612153	303	1040		S	999	7	Z			99
SPILL 1200157	771217	L352212051	303	1040	4	G	999	7	Z			99
SPILL 1200158	771220	L352412053	301	1001		G	015	R	P			52

	DATE	LOCATION	WATER BODY	MATERIAL	QUANTITY	UNIT	SOURCE	CAUSE	IMMEDIATE	CONTRIB	FACTOR	AMOUNT RECOVERED	OPERATION
SPILL 1200159	771221	L352112051	303	1099		S	055	W		M			63
SPILL 1200160	771223	L352112051	303	1080		S	053	X		A			57
SPILL 1200161	771221	L352112051	303	1099		S	055	W		M			63
SPILL 1200385	770222	L361812208	309	9999	50	G	050	7		Z	unk. material		68
SPILL 1300561	770623	L352612202	301	9999		S	999	7		Z			99
SPILL 1300567	770625	L352612202	303	1041		S	999	7		Z			99
SPILL 1300790	770914	L352612202	301	1040	1	G	999	7		Z			99
TOTAL 77					5563								
YEAR 78													
SPILL 1200002	780105	L352112051	303	1040		S	102	J		P			04
SPILL 1200003	780106	L352112051	303	1040	2	G	999	7		Z			99
SPILL 1200004	780106	L352412054	306	1097	2	G	999	7		Z			99
SPILL 1200102	780105	L352112051	303	1040		S	102	J		P			04
SPILL 1200106	780120	L352212051	303	1080	4	G	999	7		Z			99
SPILL 1200108	780131	L351112144	303	1001		S	101	I		P			00
SPILL 1200109	780207	L352212051	303	1095	1	G	052	X		A			66
SPILL 1200111	780207	L352212051	303	1095		S	052	X		A			66
SPILL 1200112	780209	L352212051	303	1097	2	G	999	7		Z			99
SPILL 1200113	780209	L352212051	303	1097		S	999	7		Z			99
SPILL 1200114	780214	L352212051	303	1097		S	999	7		Z			99
SPILL 1200116	780223	L352212051	303	1097		S	999	7		Z			99
SPILL 1200117	780228	L352112050	303	1097		S	999	7		Z			99
SPILL 1200119	780305	L352212052	301	1001	100	G	999	7		Z	heavy crude		99
SPILL 1200120	780307	L351612140	306	1011		S	304	R		Q			00
SPILL 1200121	780317	L365812154	306	1032	5	G	500	W		K			49
SPILL 1200124	780424	L352412053	301	9999		U	999	7		Z			99
SPILL 1200125	780430	L363612153	303	1099	350	G	999	7		Z	pine oil		99
SPILL 1200126	780502	L351012045	301	1097	30	G	999	7		Z			99
SPILL 1200127	780503	L363612153	303	1040		S	999	7		Z			99
SPILL 1200129	780520	L365812201	303	7001		S	900	Y		A			70
SPILL 1200130	780527	L352212051	303	1080	1	G	999	7		Z			99
SPILL 1200131	780602	L365812201	303	1040	10	G	000	7		Z			66
SPILL 1200134	780623	L363612153	303	1022		S	102	I		C			00
SPILL 1200135	780624	L365112148	307	1000	50	G	999	Z		Z			99
SPILL 1200136	780627	L364812147	103	1040	80	G	205	U		E			05
SPILL 1200137	780629	L364812147	303	1001	2100	G	106	P	corrosion	P	heavy crude		00
SPILL 1200138	780704	L362012150	301	1097	2	G	999	Z		Z			99
SPILL 1200141	780715	L352212051	301	1097		S	999	7		Z			99
SPILL 1200142	780717	L364812147	301	1099		U	015	A		D			80
SPILL 1200143	780719	L363612153	301	9999	1	G	999	7		Z			99
SPILL 1200144	780720	L352212052	301	1097	2	G	999	7		Z			99
SPILL 1200145	780720	L352412052	301	1097		S	999	7		Z			99
SPILL 1200146	780729	L351512055	303	1040		U	053	X		A			00
SPILL 1200148	780802	L352012055	303	1040		U	053	X		A			00
SPILL 1200150	780811	L352212052	301	1097	5	G	999	Z		Z			99
SPILL 1200152	780815	L352212051	301	1097		S	999	7		Z			99
SPILL 1200153	780818	L352212051	301	1097		S	999	7		Z			99
SPILL 1200154	780821	L352212051	301	1097		S	999	7		Z			99
SPILL 1200155	780821	L352212051	301	1097		S	053	W		K			66
SPILL 1200156	780825	L352212051	301	1097		S	999	Z		Z			99
SPILL 1200157	780831	L364812147	303	1095	1	G	053	X		A			57

	DATE	LOCATION	WATER BODY	MATERIAL	QUANTITY	UNIT	SOURCE	CAUSE	IMMEDIATE	CONTRIB	FACTOR	AMOUNT RECOVERED	OPERATION
SPILL 1200160	780908	L3522120S1	301	1097		S	999		Z	Z			99
SPILL 1200162	781004	L3522120S1	301	1097		S	999		Z	Z			99
SPILL 1200163	781010	L3522120S1	301	1097		S	999		Z	Z			99
SPILL 1200164	781010	L3522120S1	301	1097		S	999		Z	Z			99
SPILL 1200165	781011	L3522120S1	301	1097		S	999		Z	Z			99
SPILL 1200166	781018	L3522120S1	301	1097		S	999		Z	Z			99
SPILL 1200167	781018	L3522120S1	301	1097	5	G	999		Z	Z			99
SPILL 1200168	781025	L3515120S5	303	1040		U	053		X	A			00
SPILL 1200169	781028	L3522120S1	301	1097		S	053		W	M			66
SPILL 1200170	781031	L3522120S1	301	1097	3	G	999		Z	Z			99
SPILL 1200171	781106	L3522120S1	301	1097		S	999		Z	Z			99
SPILL 1200172	781107	L3522120S1	301	1097		S	999		Z	Z			99
SPILL 1200174	781111	L3521120S1	301	1040	5	G	053		A	E			66
SPILL 1200175	781119	L3522120S1	301	1097		S	999		Z	Z			99
SPILL 1200179	781210	L3522120S1	301	1097		S	999		Z	Z			99
SPILL 1200182	781227	L3522120S1	301	1097		S	999		Z	Z			99
SPILL 1200185	781231	L3522120S1	301	1097		S	999		Z	Z			99
TOTAL 78					2761								
YEAR 79													
SPILL 1200003	790106	L3522120S1	301	1097		S	999		Z	Z			99
SPILL 1200006	790108	L3636121S3	303	7014		U	900		Y	R			00
SPILL 1200007	790111	L3521120S1	301	1095	5	G	053		A	E			66
SPILL 1200009	790120	L3524120S3	301	1097		S	999		Z	Z			99
SPILL 1200010	790122	L3523120S2	~~304~~	9999		U	999		Z	Z			00
SPILL 1200011	790124	L3648121S7	303	1080	5	G	053		X	A			57
SPILL 1200013	790129	L3522120S1	301	1097	2	G	999		Z	Z			00
SPILL 1200014	790131	L3522120S1	301	1095	1	G	900		W	K			00
SPILL 1200015	790202	L3636121S2	303	9999		U	999		Z	Z			99
SPILL 1200016	790201	L3522120S1	301	1097		U	999		Z	Z			00
SPILL 1200019	790213	L3636121S3	~~304~~	9999		U	999		Z	Z			99
SPILL 1200020	790222	L3636121S3	303	1040		S	900		W	K			00
SPILL 1200021	790225	L3636121S3	303	9999		U	999		Z	Z			99
SPILL 1200023	790227	L3638121S7	303	1040	75	G	999		Z	Z			99
SPILL 1200024	790328	L3523120S2	~~304~~	9999		U	999		Z	Z			00
SPILL 1200025	790308	L3524120S3	303	1001	250	G	016	tanker	M	J	heavy crude		71
SPILL 1200026	790312	L3522120S1	301	1040	1	G	999		Z	Z			00
SPILL 1200027	790312	L3520120S4	303	1040	5	G	999		Z	Z			57
SPILL 1200030	790329	L3521120S3	~~306~~	1001	5	G	999		Z	Z			00
SPILL 1200032	790404	L3636121S3	303	1040		U	999		Z	Z			99
SPILL 1200033	790411	L3517120S9	~~304~~	1080		S	999		Z	Z			00
SPILL 1200035	790415	L3658122S0	303	1040	10	G	053		Z	Z			66
SPILL 1200038	790424	L3536121S9	~~304~~	1041	1	G	053		X	D			99
SPILL 1200039	790502	L3636121S3	303	1040		S	053		R	A			00
SPILL 1200076	790308	L3524120S3	303	1001	250	G	016	tanker	M	J	heavy crude		71
SPILL 1200143	790715	L3542121S6	309	1040		S	999		Z	Z			99
SPILL 1200146	790709	L3517120S9	~~304~~	1097		S	999		Z	Z			00
SPILL 1200147	790715	L3545121S7	309	1097	3	G	999		Z	Z			00
SPILL 1200148	790719	L3522120S1	301	1097		S	999		Z	Z			00
SPILL 1200149	790725	L3636121S3	303	9999		U	999		Z	Z			00
SPILL 1200150	790726	L3636121S3	303	1040		S	102		R	P			00
SPILL 1200154	790827	L3658122S1	303	1040		S	053		Z	Z			99

(3) (3)

	DATE	LOCATION	WATER BODY	MATERIAL	QUANTITY	UNIT	SOURCE	CAUSE	IMMEDIATE	CONTRIB FACTOR	AMOUNT RECOVERED	OPERATION
SPILL 1200157	790907	L352112051	301	1095	3	G	055	A	E			66
SPILL 1200160	790920	L363612153	303	9999		U	999	7	Z			00
SPILL 1200162	791003	L352112051	301	1097	1	G	999	7	Z			00
SPILL 1200163	791004	L363612153	301	1040	5	G	999	7	Z			99
SPILL 1200165	791020	L351712039	304	1097		S	999	7	Z			00
SPILL 1200168	791020	L363612153	303	1011	7	G	999	7	Z		7	99
SPILL 1200169	791028	L352212052	306	1001	10	G	999	7	Z			00
SPILL 1200170	791030	L351612040	304	1080	30	G	500	A	D			08
SPILL 1200171	791106	L363612153	303	1040	3	G	999	7	Z			99
SPILL 1200173	791114	L352212052	301	1040		U	000	A	E			68
SPILL 1200175	791125	L364812147	303	1091	1	G	999	Z	Z			99
SPILL 1200177	791218	L352412053	301	1001	420	G	015	S	E	heavy crude		06
SPILL 1200179	791226	L352412052	301	1097	42	G	015	W	E			57
TOTAL 79					1135						7	
YEAR 80												
SPILL 1200102	800114	L352612052	301	1001	150	G	900	A	D		130	00
SPILL 1200103	800115	L361812154	107	1080	20	G	500	S	J			20
SPILL 1200104	800120	L363612153	303	1040	60	G	999	7	Z		58	99
SPILL 1200107	800206	L363612153	303	1040	8	G	000	X	A		4	00
SPILL 1200108	800206	L352112051	303	1089	2	G	053	X	A		1	00
SPILL 1200109	800209	L364812147	301	1040		S	999	7	Z			53
SPILL 1200110	800212	L350912046	104	1011	10	G	200	U	D			99
SPILL 1200116	800313	L354212152	310	9999	5	U	999	7	Z			99
SPILL 1200117	800408	L352212048	303	1097		S	300	W	K			00
SPILL 1200119	800415	L363612153	303	1095	10	G	055	H	E		8	00
SPILL 1200122	800501	L351712039	304	1011	10	G	999	7	Z			00
SPILL 1200123	800521	L363612153	303	1092	1	G	053	7	Z			80
SPILL 1200126	800607	L353912116	301	1091		S	053	7	Z			99
SPILL 1200127	800609	L363612153	303	1040	75	G	053	S	L		35	80
SPILL 1200128	800609	L363612153	303	1040	15	G	053	X	A		10	00
SPILL 1200129	800615	L352312052	301	1001	20	G	900	X	A			00
SPILL 1200130	800617	L351012044	301	1040		S	053	7	Z			00
SPILL 1200131	800620	L352112051	301	1040		S	999	7	Z			99
SPILL 1200132	800620	L363612153	303	1095	20	G	053	H	E			00
SPILL 1200134	800627	L363612153	303	1040		S	053	X	A			00
SPILL 1200136	800702	L351612038	302	1011	10	G	999	7	Z			00
SPILL 1200137	800703	L363612153	301	1040	1	G	000	X	A			00
SPILL 1200138	800707	L352112051	301	1040	40	G	999	7	Z		35	00
SPILL 1200139	800709	L363612153	303	1095	1	G	053	X	A			00
SPILL 1200140	800720	L352612053	306	1098		U	999	7	Z			99
SPILL 1200141	800721	L365812291	306	1061	100	G	205	H	E	road oil		00
SPILL 1200142	800722	L363812156	301	1040	1	G	000	7	Z			00
SPILL 1200143	800722	L363612153	303	1011	2	G	401	C	N			49
SPILL 1200144	800731	L364112155	301	1040	30	G	053	X	J			00
SPILL 1200145	800811	L350912046	104	1089	1	G	999	X	E		1	03
SPILL 1200146	800814	L363612153	301	1011		S	053	A	D			00
SPILL 1200148	800902	L363612153	301	1095	10	G	999	7	Z			00
SPILL 1200150	800910	L352412052	301	1097		S	100	7	Z			00
SPILL 1200152	800917	L363612153	303	1040	50	G	999	7	Z	light diesel	32	99
SPILL 1200153	800923	L363812140	107	1011	4000	G	500	S	E	gasoline		44
SPILL 1200154	801001	L363612153	303	1040		S	000	Z	Z			99

(4) (4)

	DATE	LOCATION	WATER BODY	MATERIAL	QUANTITY	UNIT	SOURC	CAUSE	IMMEDIATE CONTR	FACTOR	AMOUNT RECOVERED	OPERATION	
SPILL 1200156	A01004	L351012137	~~302~~	1000	126	G	504	S		E	126	01	
SPILL 1200157	A01006	L364812147	303	1089	1	G	053	X		A		57	
SPILL 1200161	A01029	L361112155	308	1001		U	999	7		Z		99	
SPILL 1200162	A01128	L363612153	~~304~~	1011	20000	G	304	R	tank rupture	Q	Gas	00	
SPILL 1200163	A01208	L352112051	301	1040	20	G	053	S		I		66	
SPILL 1200164	A01210	L353212033	~~307~~	1000	3024	G	103	7		Z	Light crude	3024	99
SPILL 1200165	A01210	L351712041	~~304~~	1097	5	G	999	7		Z		5	99
SPILL 1200166	A01211	L365812201	303	1089	1	G	999	7		Z		1	99
SPILL 1200167	A01214	L364812147	303	1099	5	G	507	7		Z		5	99
SPILL 1200168	A01215	L351112043	~~307~~	1011		S	999	7		Z			00
SPILL 1200169	A01216	L364812147	303	1099	2	G	507	7		Z			99
SPILL 1216380	A01208	L352112051	301	1040	20	G	053	S		I			66
SPILL 1216580	A01210	L351712041	~~305~~	1097	5	G	999	7		Z		5	00
TOTAL 80					27861						3480		
YEAR 81													
SPILL 1200106	A10406	L351712038	~~302~~	1000	6300	G	401	T		M	Light crude	6250	06
SPILL 1200108	A10529	L363012157	~~304~~	1040	3000	G	205	U		C		100	06
SPILL 1200109	A10530	L363612100	303	1089		S	053	X		E			07
SPILL 1200112	A10728	L363612153	303	1089	1	G	053	W		K		1	62
SPILL 1200113	A10801	L364812147	303	1040	100	G	053	P		E		75	66
SPILL 1200117	A10913	L363612153	303	1089	1	G	200	X		G			00
SPILL 1200119	A11203	L363812156	307	1020		S	209	R		F			80
SPILL 1200120	A11221	L363612153	303	1040	450	G	103	J		E		435	99
SPILL 1200338	A10529	L350012206	~~308~~	1080	200	G	300	S		J			48
TOTAL 81					10052						6861		
GRAND TOTAL					47372						10348		

114 661.

APPENDIX C

EXAMPLE OIL SPILL TRAJECTORIES

OIL SPILL RISK ANALYSIS LEASE SALE 48
USGS, 1978

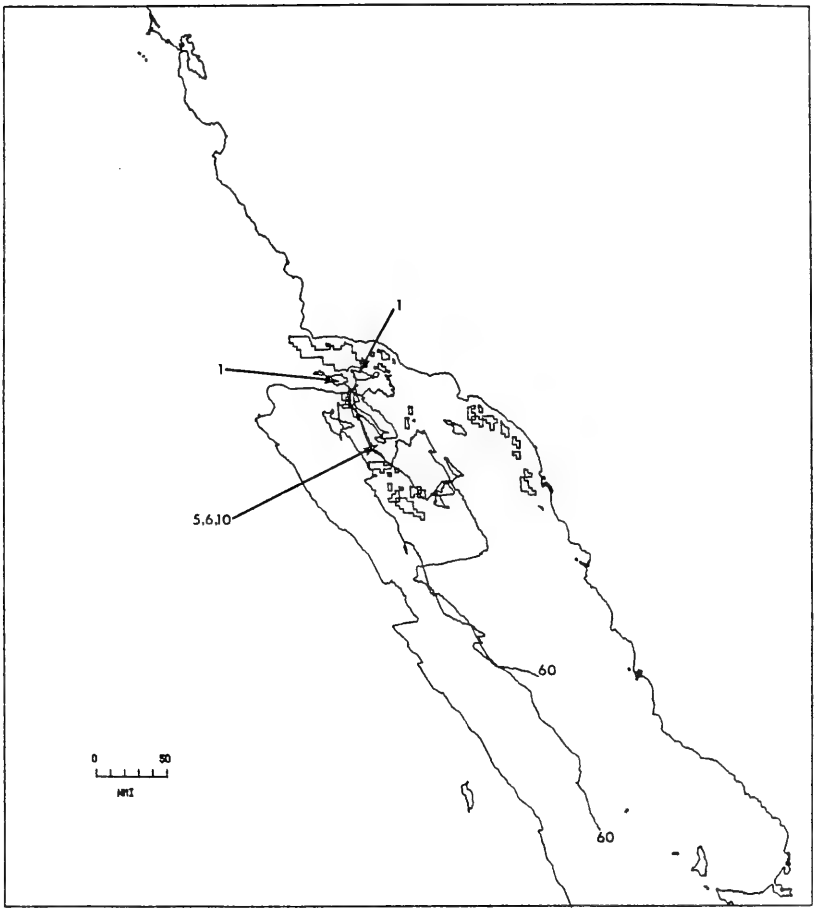


Figure C1 --Example oilspill trajectories for a spill site near the center of the proposed lease area: winter conditions. Number on trajectory is the time to the end point in days.

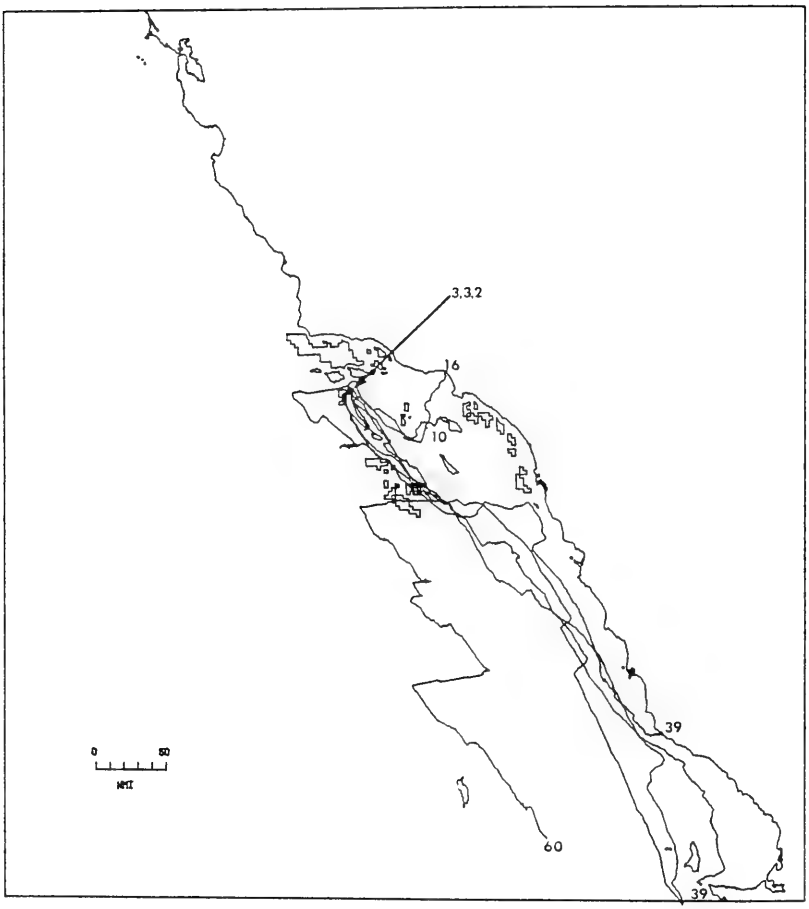


Figure C2 --Example oilspill trajectories for a spill site near the center of the proposed lease area: spring conditions. Number on trajectory is the time to the end point in days.

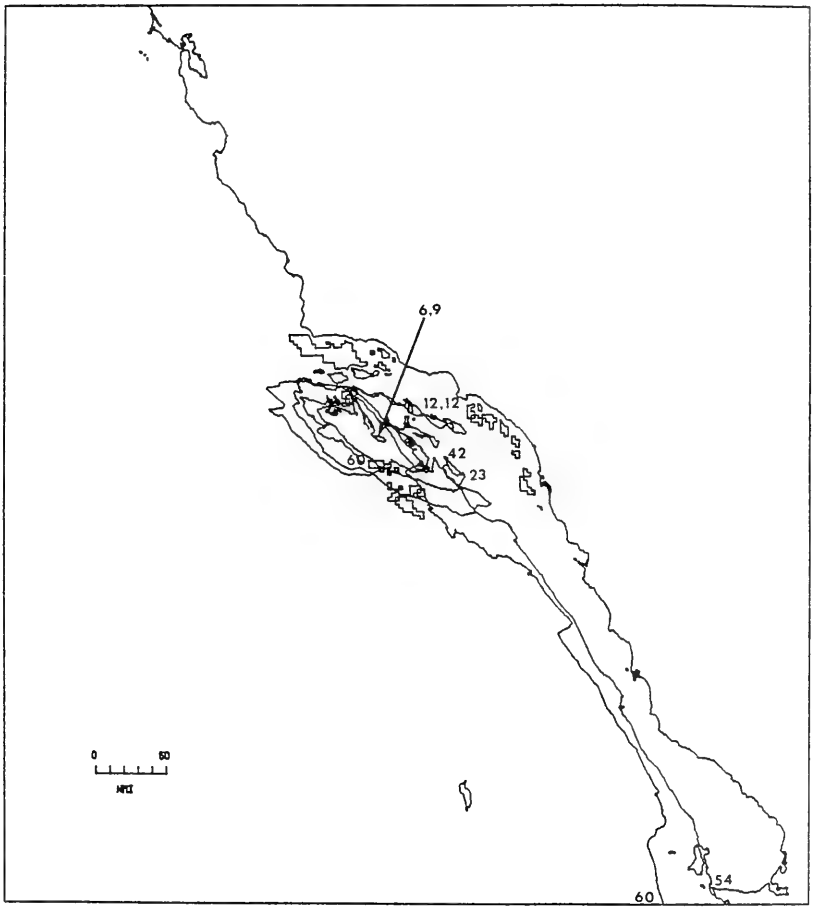


Figure C3 .--Example oilspill trajectories for a spill site near the center of the proposed lease area: summer conditions. Number on trajectory is the time to the end point in days.

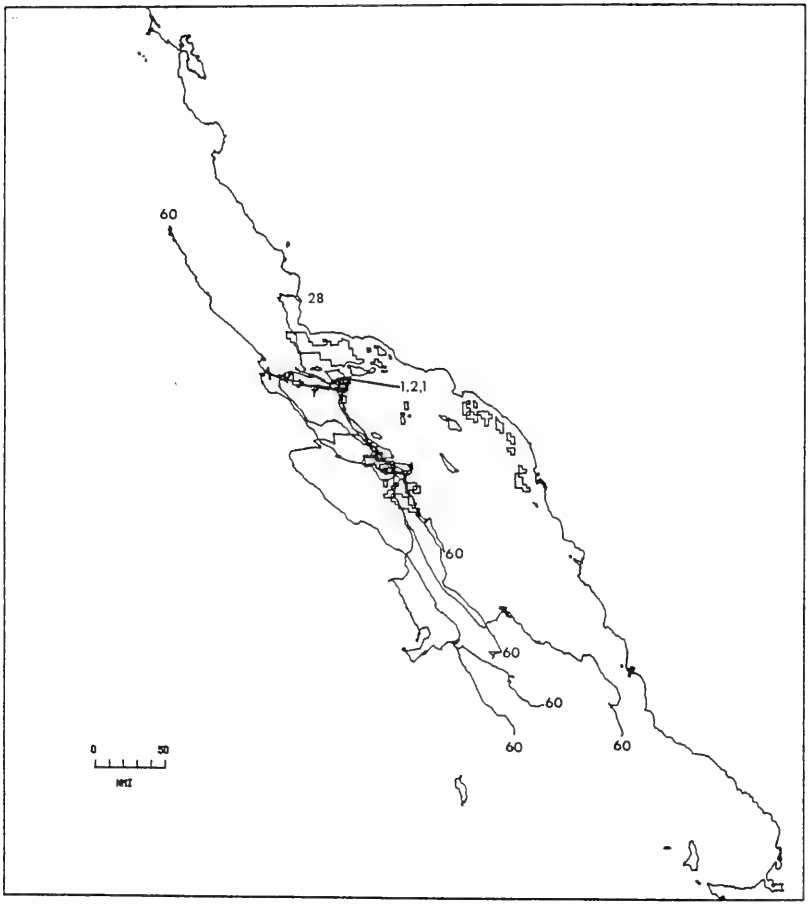


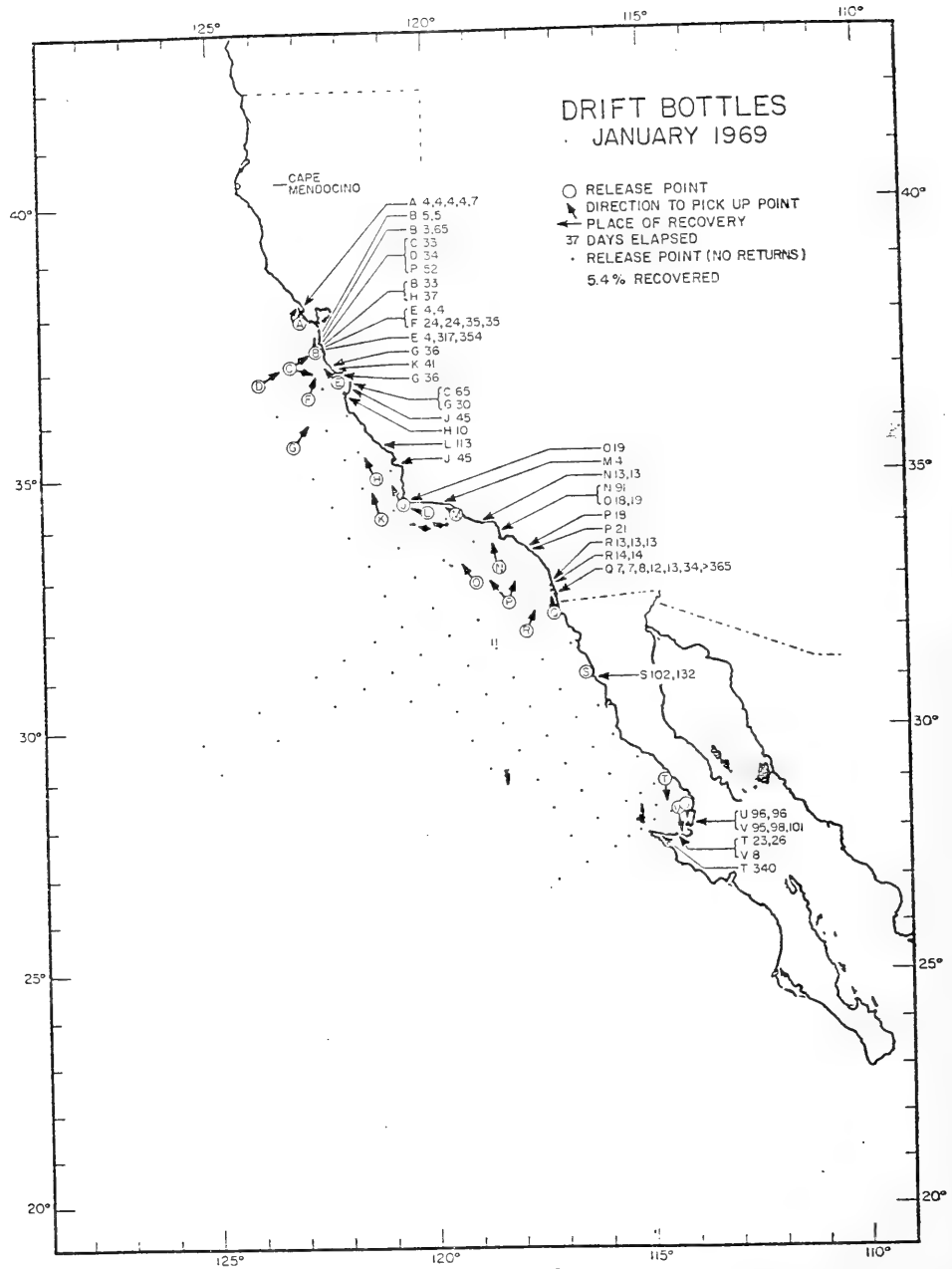
Figure C4 .--Example oilspill trajectories for a spill site near the center of the proposed lease area: autumn conditions. Number on trajectory is the time to the end point in days.

APPENDIX D

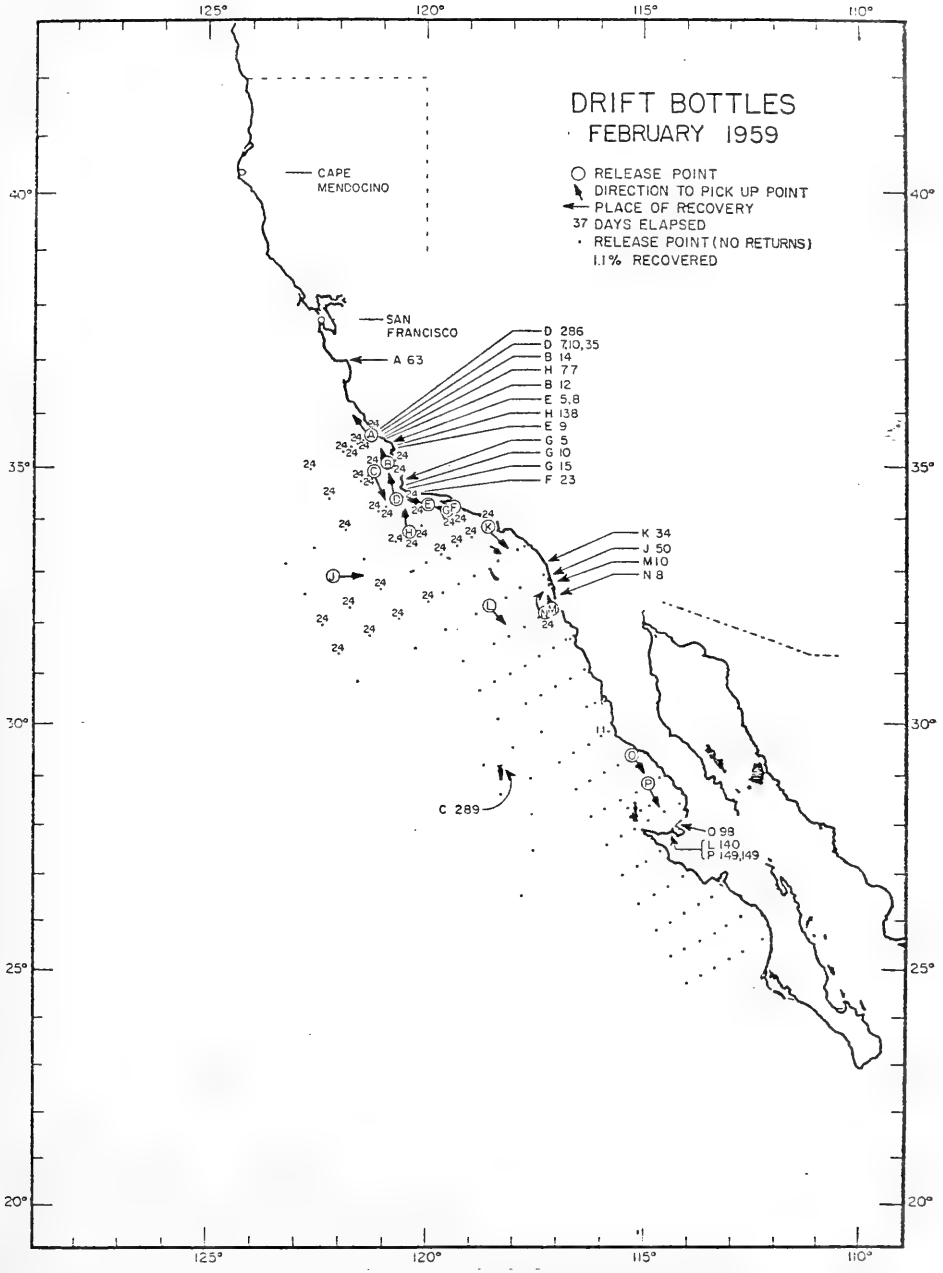
Selected Drift Bottle Trajectories

Source: F.J. Crowe & R.A. Schwartzlose, Release and Recovery Records of Drift Bottles in the California Current Region 1955 through 1971, CalCOFI Atlas No. 16.

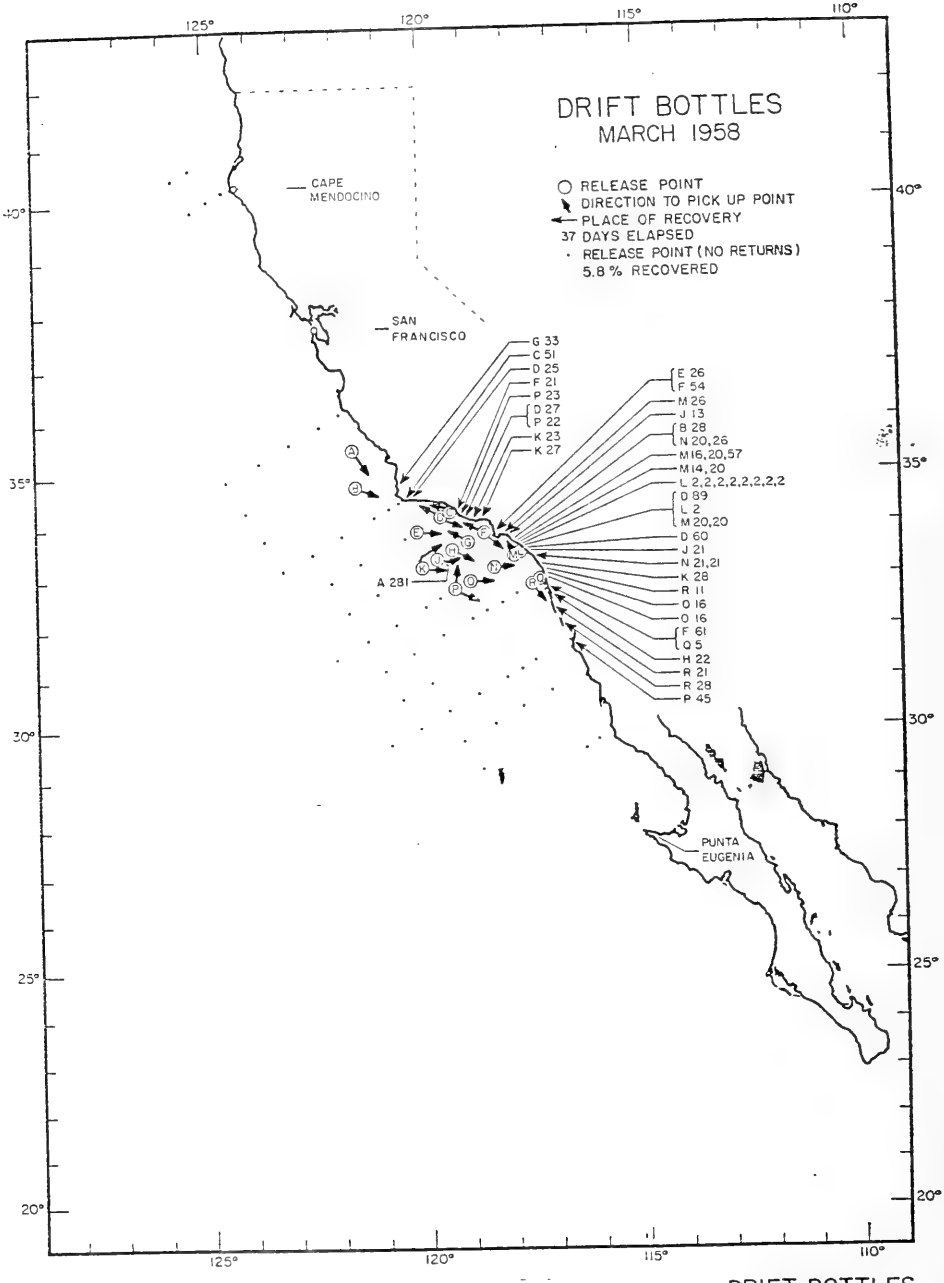
N.B. These trajectories were selected specifically to show northward flowing currents in each month, and as such are not necessarily representative of normal current flows.



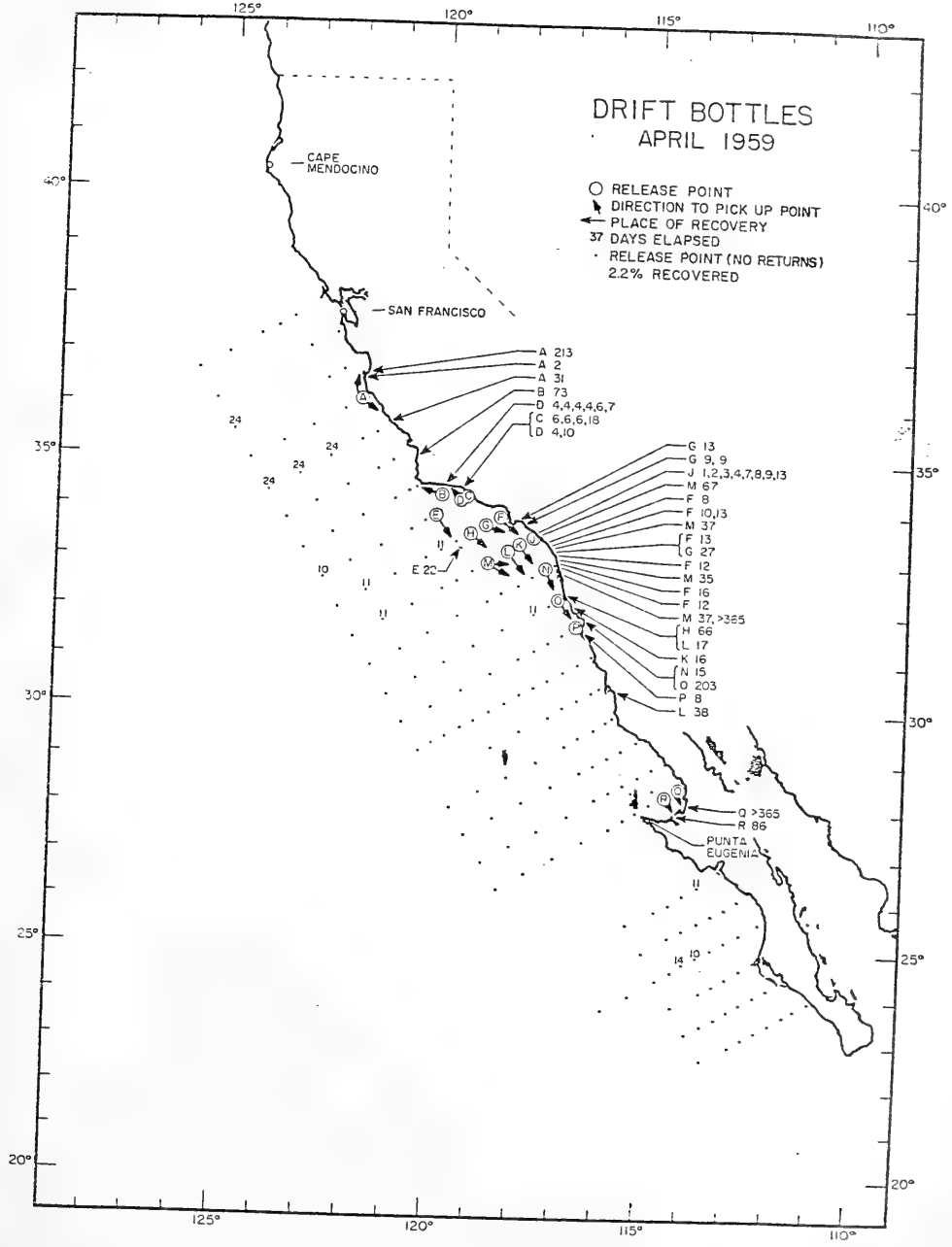
DRIFT BOTTLES
JANUARY 1969



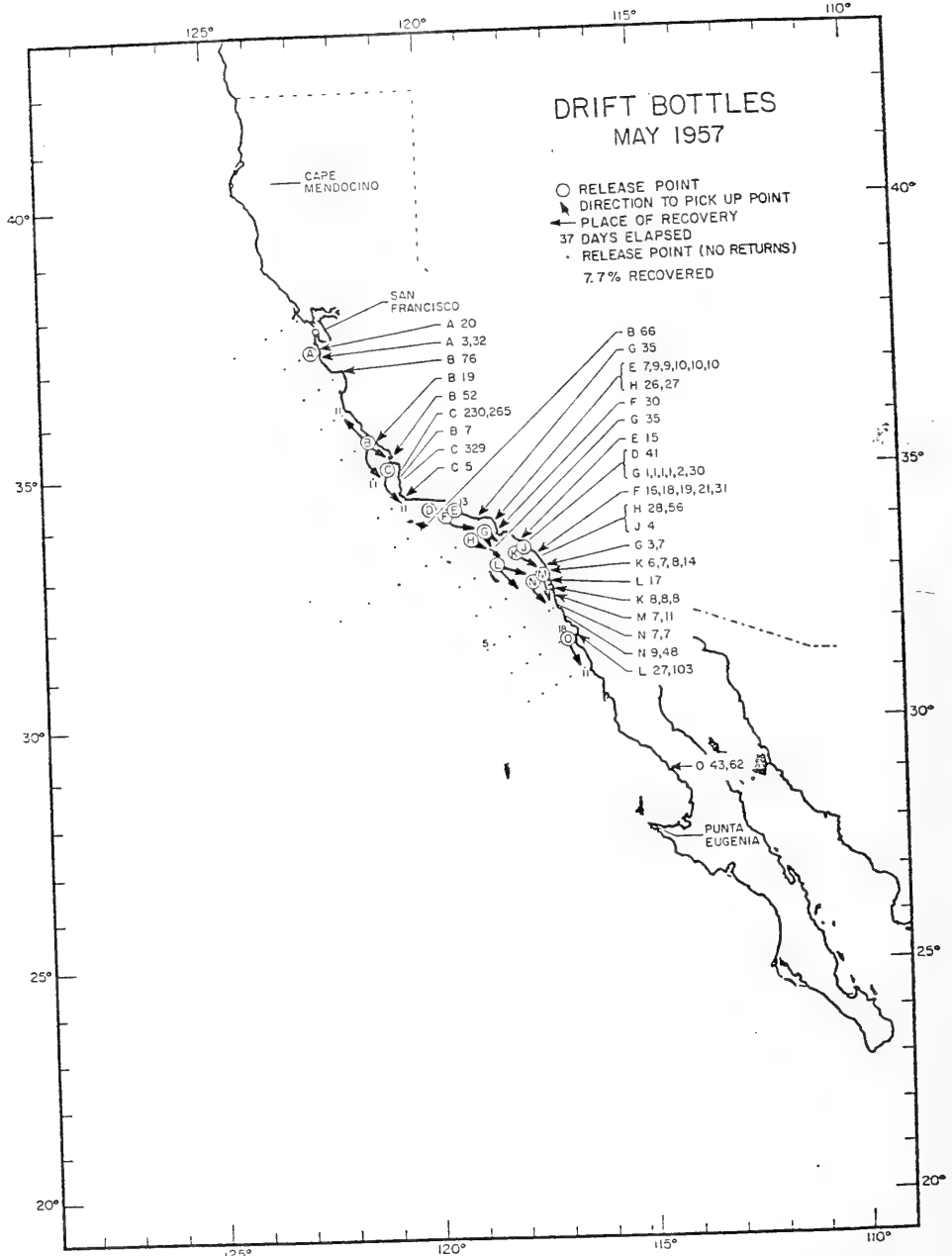
DRIFT BOTTLES
FEBRUARY 1959



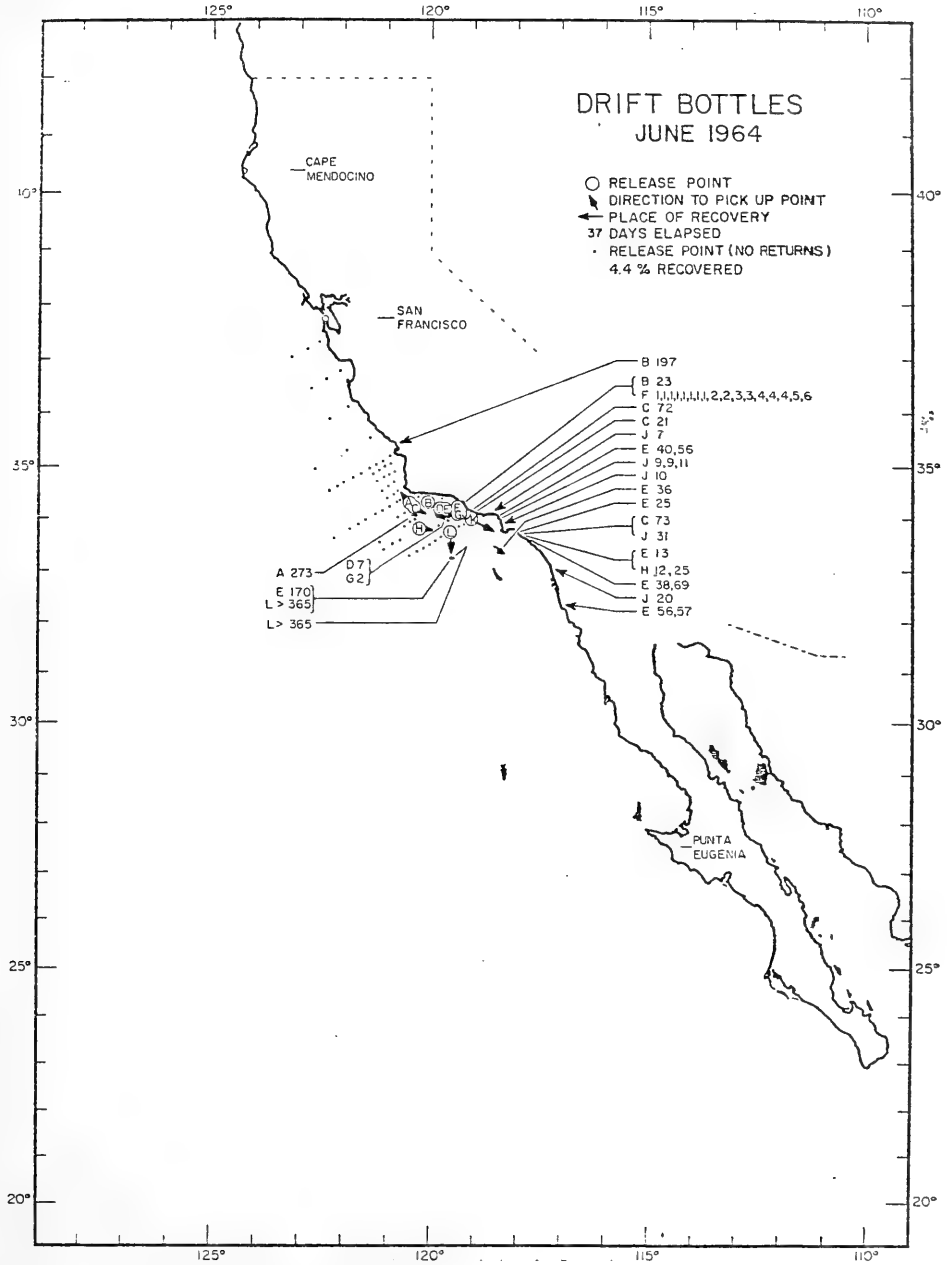
DRIFT BOTTLES
MARCH 1958



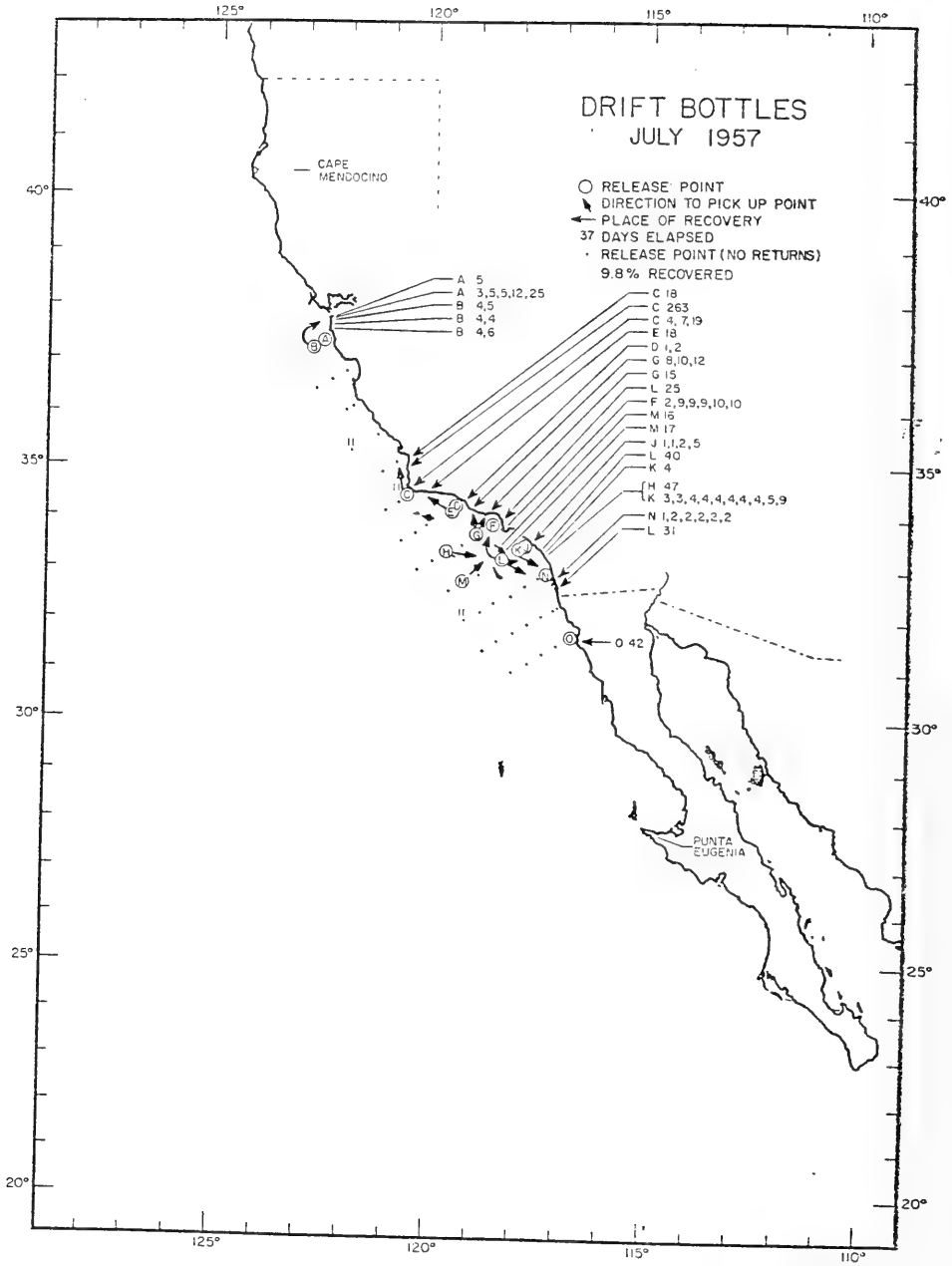
DRIFT BOTTLES
APRIL 1959



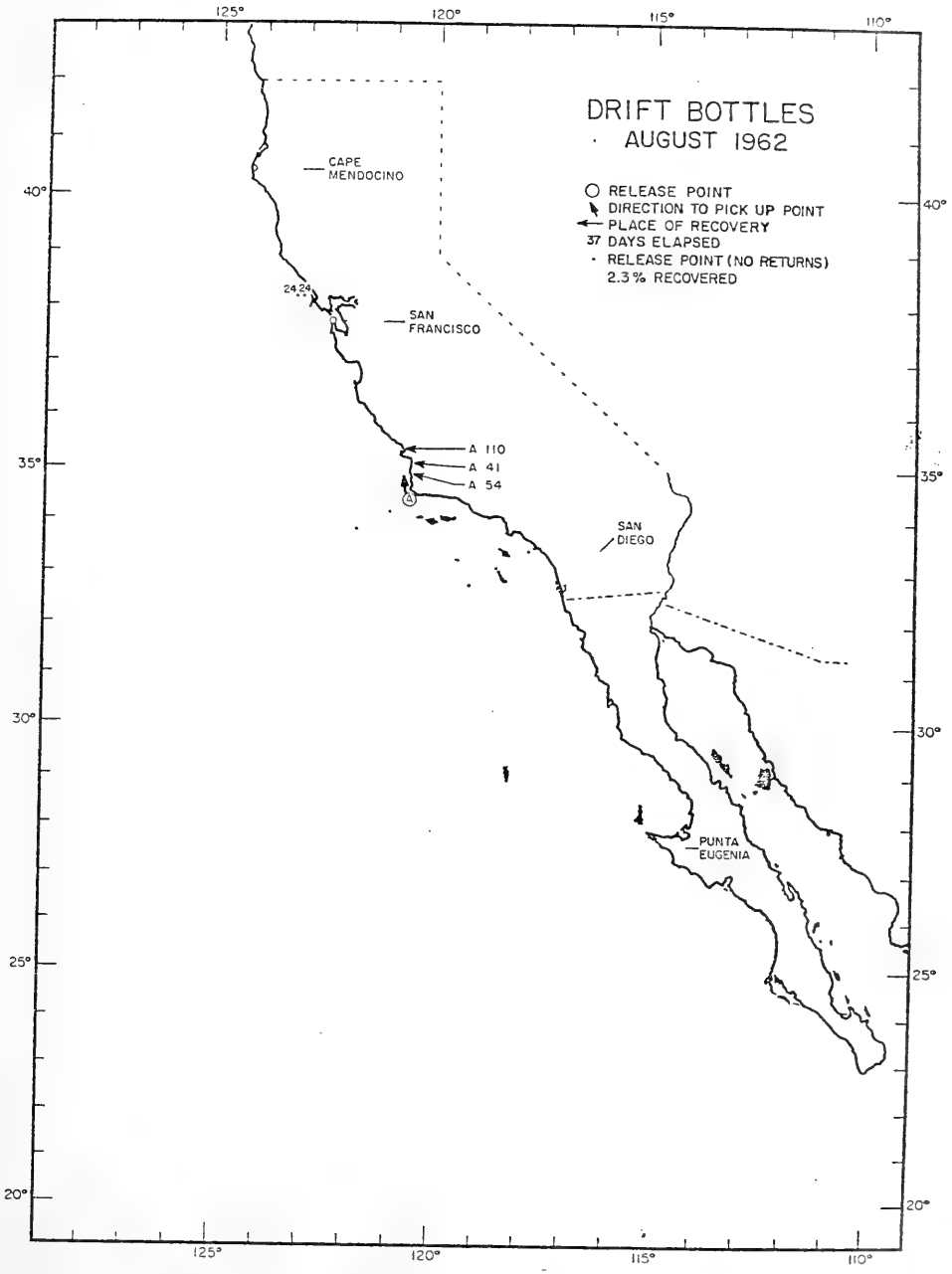
DRIFT BOTTLES
MAY 1957



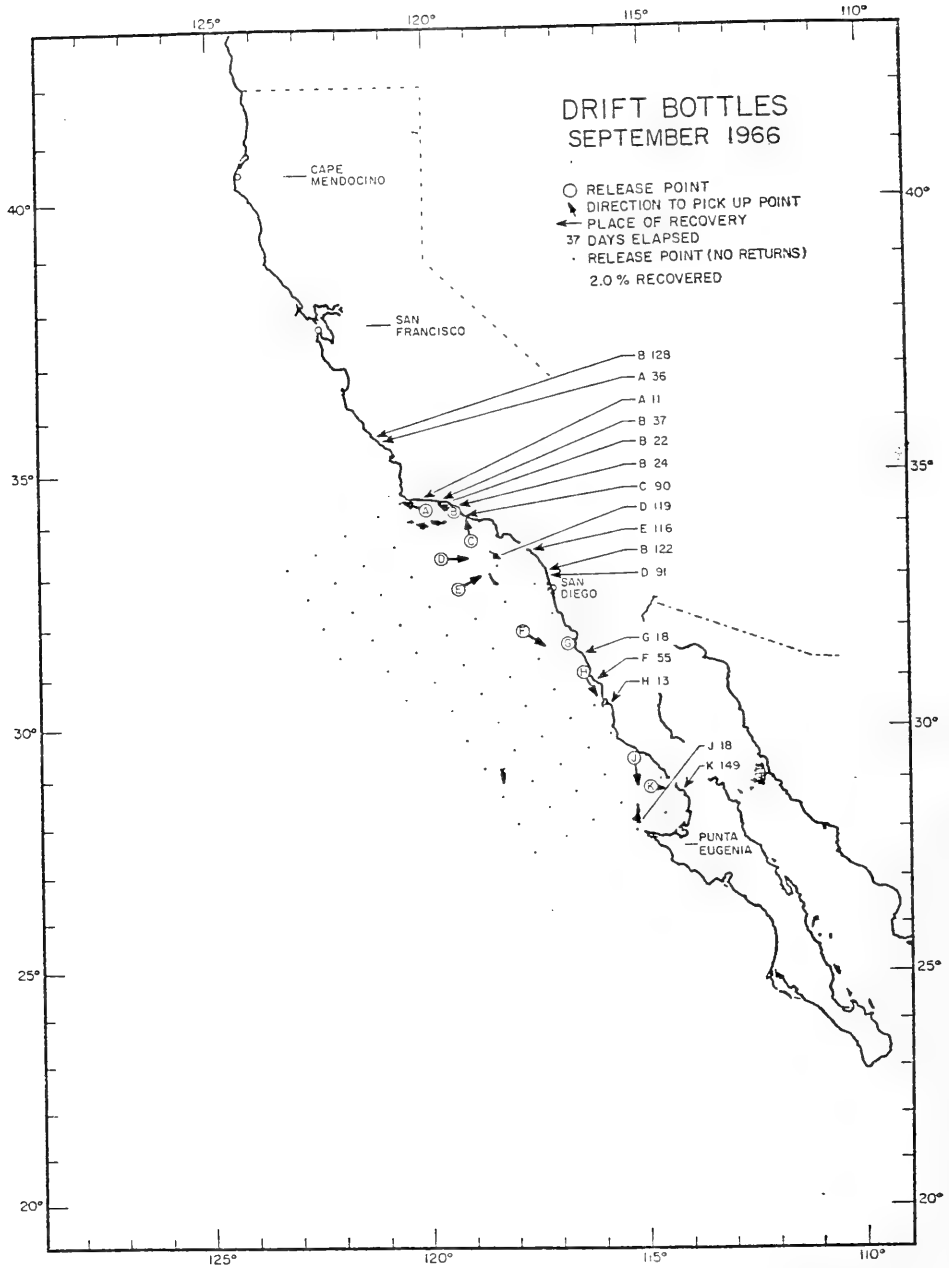
DRIFT BOTTLES
JUNE 1964



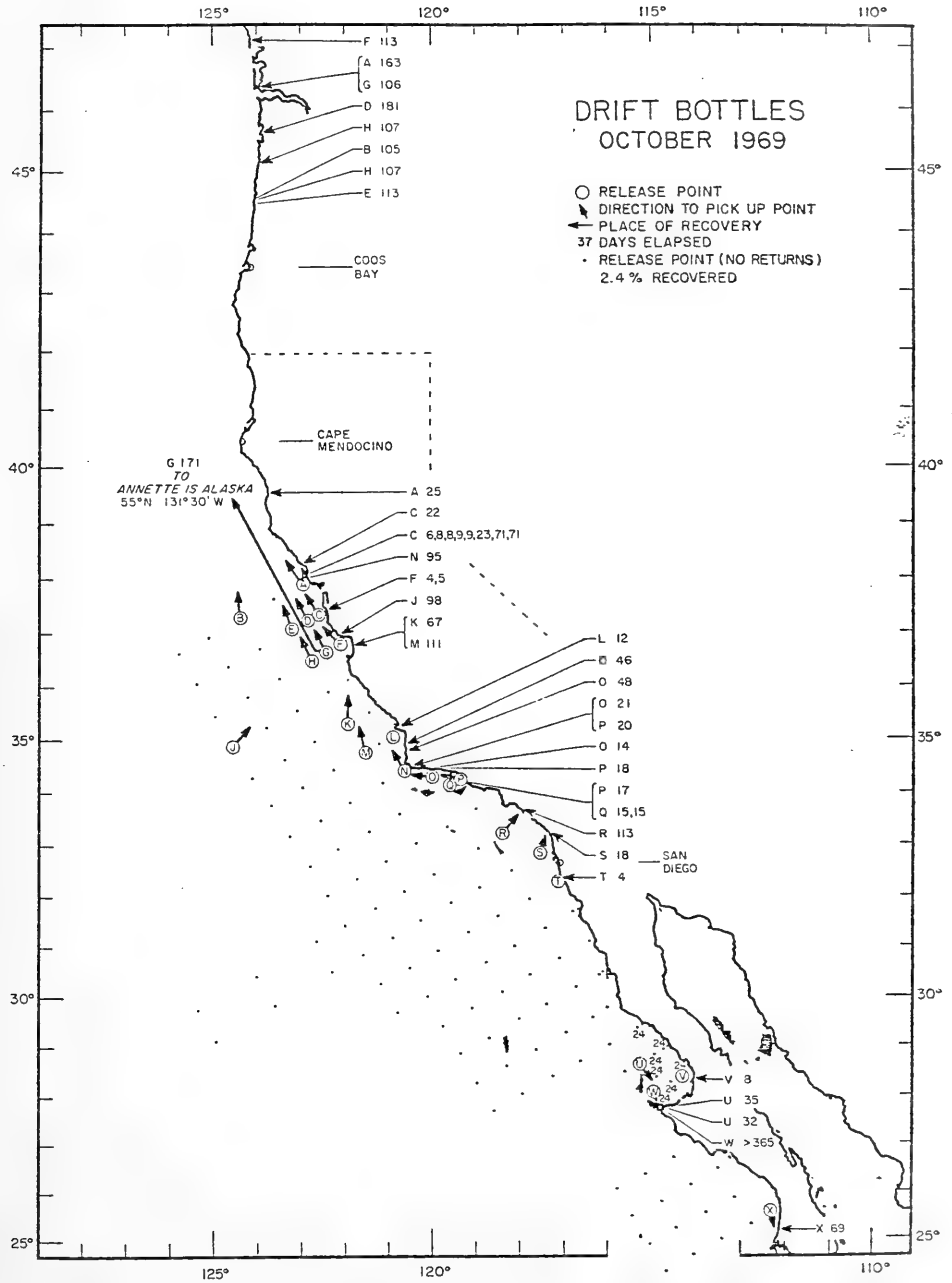
DRIFT BOTTLES
JULY 1957

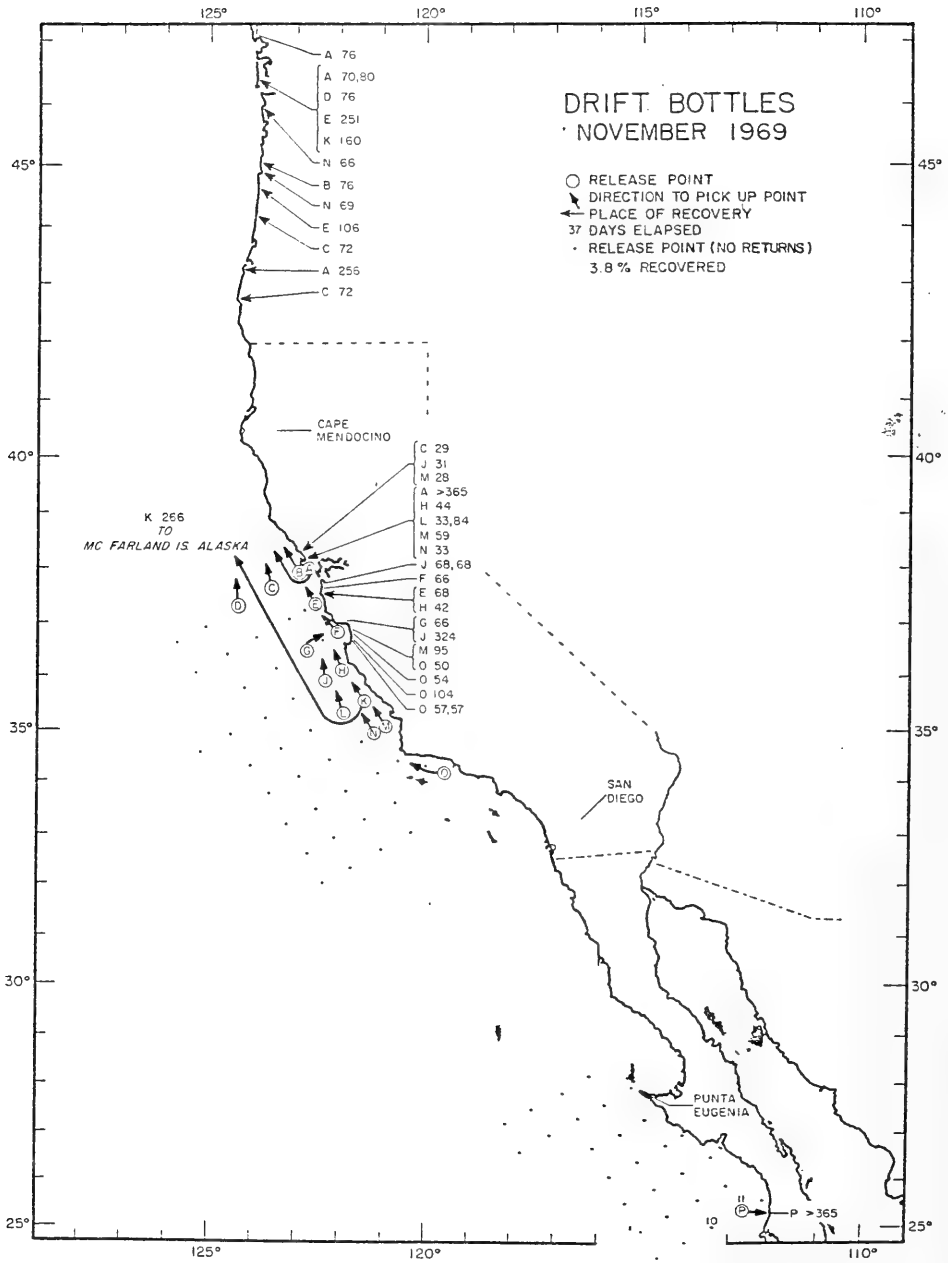


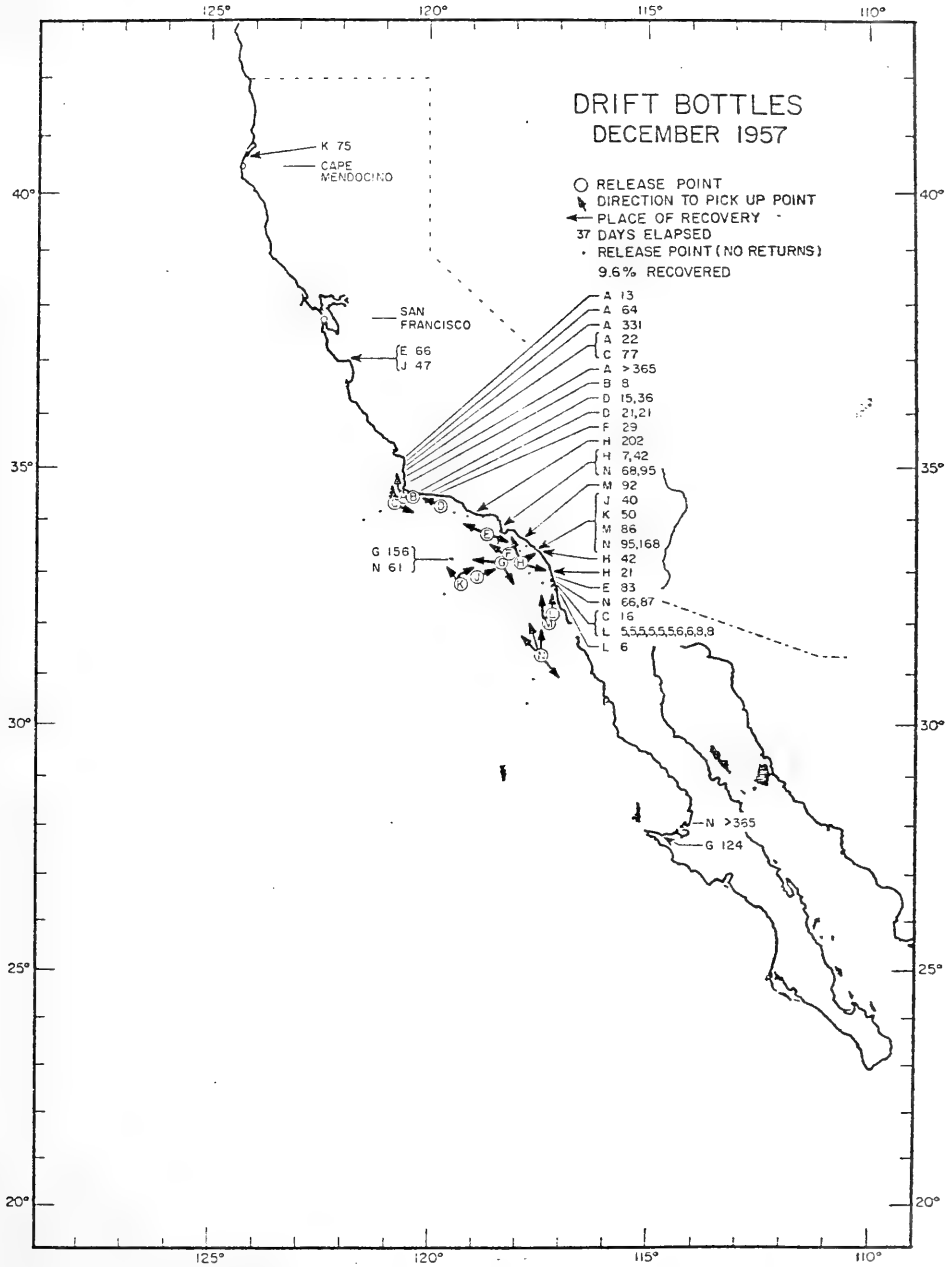
DRIFT BOTTLES
AUGUST 1962



DRIFT BOTTLES
SEPTEMBER 1966


DRIFT BOTTLES
OCTOBER 1969
RELEASE POINT
DIRECTION TO PICK UP POINT
PLACE OF RECOVERY
37 DAYS ELAPSED
RELEASE POINT (NO RETURNS)
2.4 % RECOVERED
125°
120°
115°
110°
45°
40°
35°
30°
25°
F 113
A 163
G 106
D 181
H 107
B 105
H 107
E 113
COOS BAY
CAPE MENDOCINO
G 171
TO
ANNETTE IS ALASKA
55°N 131°30' W
A 25
C 22
C 6,8,8,9,9,23,71,71
N 95
F 4,5
J 98
K 67
M 111
L 12
O 46
O 48
O 21
P 20
O 14
P 18
P 17
Q 15,15
R 113
S 18
T 4
SAN DIEGO
V 8
U 35
U 32
W >365
X 69
DRIFT BOTTLES
OCTOBER 1969


DRIFT BOTTLES
NOVEMBER 1969
RELEASE POINT
DIRECTION TO PICK UP POINT
PLACE OF RECOVERY
37 DAYS ELAPSED
RELEASE POINT (NO RETURNS)
3.8 % RECOVERED
125°
120°
115°
110°
45°
40°
35°
30°
25°
A 76
A 70,80
D 76
E 251
K 160
N 66
B 76
N 69
E 106
C 72
A 255
C 72
CAPE MENDOCINO
C 29
J 31
M 28
A >365
H 44
L 33,84
M 59
N 33
J 68,68
F 66
E 68
H 42
G 66
J 324
M 95
O 50
O 54
O 104
O 57,57
K 266
TO
MC FARLAND IS. ALASKA
SAN DIEGO
PUNTA EUGENIA
P >365
DRIFT BOTTLES
NOVEMBER 1969



DRIFT BOTTLES
DECEMBER 1957

APPENDIX E

Inventory of Equipment and Materials -- Clean Seas & Clean Bay

CLEAN SEAS INVENTORY OF EQUIPMENT AND MATERIALS

I. CONTAINMENT

a) 2,000' Bottom Tension Boom

This is a heavy duty, open ocean containment boom with 4' x 13' floats and 8' curtains extending 3½' above water line and 4½' below the water line. It is usually stored on land and deployed from the beach, requiring 24-36 hours for assembly.

Capability: Will contain oil in 6'-8' significant waves and winds to 25 knots at currents up to 1½ knots.

b) Vikoma Seapack with 1,600' boom

2 Units.

For very fast response to an oil spill. The Vikoma Seapack is based on a 23' hull and contains 1,600' of seaboom connected at one end to a diesel driven fan and ducted propeller water pump. The Vikoma Seapack unit can be transported by road trailer, towed by a small vessel, or carried on a workboat or tanker. It could also be transported by an aircraft.

Capability: Experience over the past several years indicates this boom can be on a scene and deployed in less than an hour. It is effective in preventing spread of oil in significant waves up to six feet and winds of 20 to 25 knots. In the mode in which this boom is used, there is little or no current across the boom which could cause loss of oil due to underflow. Clean Seas exercises with this boom would parallel this in response and deployment

time. Response is the most important factor. Deployment is instantaneously accomplished on arrival at the site, 10-12 minutes.

c) Oil Containment Booms

.. 2,000 feet medium duty boom (16" x 12" skirt Kepner Sea Curtain) for harbor protection.
.. 2,000 feet light duty boom (8" x 12" skirt Kepner Sea Curtain) for secondary harbor protection.
.. 2,695 feet (12" x 24" Goodyear Sea Sentry) for harbor protection and offshore containment boom.
.. 5,527 feet (Model 3,000 Expandi light duty oil boom). This boom may be used for offshore rapid deployment for containment as well as harbor protection.
.. 9,100 feet (Model 4,300 Expandi) medium duty oil boom. This boom would primarily be used for offshore rapid deployment and containment.
.. 2,500 feet (36" Supermax) 50 sections of 28oz. fabric with 3/4" cable.
.. 5,500 feet (Minimax boom) 55 sections of 22oz. fabric with 5/8" chain.
.. 2,035 feet (14" x 24" Goodyear Sea Sentry) offshore containment boom.

d) Tide-Mar VII Barge:

One (1) 641 ton tank barge, Tide-Mar VII, for collecting oil picked up by skimmers as they work in an oil spill. This is a 160' x 39' ocean going barge with 10 tanks, capacity of 7,840 barrels and six (6) diesel engine driven pumps. Presently moored in Santa Barbara Harbor.

e) Floating Storage Bags:

Six (6) 5,000 gallon Kepner Floating Storage Bags
Six (6) 1,200 gallon Kepner Floating Storage Bags
One (1) 6,000 gallon Dracone Floating Barge

These bags to be used as interim storage awaiting arrival of the Tide-Mar VII or similar tank barge/vessels.

II. RECOVERY

a) Cyclonet-100:

One (1) Cyclonet-100 skimmer. This skimmer is an open sea skimmer and is fitted to the Mr. Clean I (OSRV). This skimmer contains a diesel engine, hydraulic unit and pumping system.

b) Cyclonet-050:

One (1) Cyclonet-050 skimmer fitted to a Zodiac Mark-V inflatable dinghy. This skimmer is primarily for protected and semi-protected waters but may be used in the open ocean in light sea conditions. This skimmer is self-propelled, contains a pump system and small oil storage.

c) Acme 39T Weir Skimmer:

One (1) Acme 39T weir skimmer, gasoline driven pump. This pump is designed to collect oil in somewhat heavy concentration. Ideal for harbor areas. Will recover oil in open ocean in light seas. Fluid recovery rates up to 340 GPM. Light in weight and can be handled by two men.

d) Acme 51T Weir Skimmers:

Five (5) Acme 51T weir skimmers, gasoline driven pumps. These pumps are designed to collect oil in somewhat heavy concentration. Ideal for harbor area. Will recover oil in open ocean in light seas. Fluid recovery rates up to 340 GPM. Light weight and can be handled by two men.

e) Oil Mop-MK-II-9:

Two (2) Oil Mop MK-II-9 systems each consisting of a two-wheel trailer, oil mop machine, tail pulleys and 400' of 9" mop. This system is primarily used in protected waters will recover all grades of oil. Maximum capacity 100 bbls/hr.

f) Komara Miniskimmer:

One (1) Floating Disc Skimmer hydraulically driven disc and pump. This pump is designed to collect oil in concentrated areas and is ideal for containment booms. Will recover oil in open ocean in light sea conditions. Fluid rate 15 to 76 bbl/hr. Light weight, can be handled by manpower.

g) CS Skimmer System:

One (1) CS skimmer system consisting of 45' x 17' x 6' catamaran-type adjustable weir skimmer barge; two (2) 240' lengths of 30" Kepner Sea Curtain boom; a 2,000 GPM pumping system; and two (2) 100 barrel oil-water separation tanks or a 5,000 gallon floating storage bag. The CS Skimmer is currently in dry storage at the Clean Seas yard in Carpinteria.

Capability: This system is capable of recovering all grades of oil from light to bunker C at rates up to 2,000 GPM plus some debris and sorbent material in moderate sea states. Modification to this skimmer eliminates the necessity of the tanks by installing a pump onboard and a 5,000 gallon floating storage bag. Also, may be pumped directly into the Tide-Mar VII barge.

h) Mark-II Skimmer:

Two (2) Mark-II skimmers, 14' x 30' weir type, are available in Carpineria Yard. These may be used one on each side of a vessel, singularly with a vessel, or may be used independently with O/B motors in a harbor situation. Recovery system can be either an 80 barrel, skid-mounted vacuum tank or compressed air-driven Wilden pumps and 100 bbl. oil-water separation tanks, or a self-contained pump and floating 1,200 gallon storage bag, all of which are available.

Capability: These are very simple skimmers and may be used in a number of ways to solve the particular problem at hand. All grades of oil from light to bunker C can be recovered plus small amounts of debris. Fluid recovery rates from 50 GPM to 200 GPM are available. These skimmers are limited to light winds and light sea states. Trailers capable of carrying these skimmers on the highway have been constructed.

i) Floating Weir Skimmers:

Three (3) Floating weir skimmers, compressed air-driven Acme type pump. These were designed to collect oil concentrated in the B-T boom area and work in harbor area and quiet waters.

Capability: These skimmers will handle light to fairly heavy oil, no debris, in 2-3 foot waves. Fluid recovery rates are up to 300 GPM for each skimmer.

j) Offshore Device Skimming Barrier:

Two ODI offshore oil containment barrier and high seas skimming and pumping system are located on Mr. Clean II berthed at Port San Luis. The systems are comprised of two (2) offshore device skimming barriers with 3 pumps each, with total capability of 750 gallons per minute. The 48" barrier is fitted to a 130' OSRV (MR. CLEAN II).

Capability: The ODI open water barrier and skimming system has been successfully tested in open water with high seas. It is capable of operating in winds up to 20 knots and wave highs of five feet. However, performance at much higher wave heights has been good.

k) Walosep Skimmer:

One (1) Walosep skimmer (W3) stationary skimmer with all accessory equipment, including pumps, power pack, hoses, etc. is stored on MR. CLEAN II at Port San Luis.

The Walosep W3 is a low weight, high capacity oil recovery system which can recover up to 100 m^3/hr (629 bph) of oil.

Capability: Official tests have shown that the Walosep W3 can operate in waves up to 10 feet and wind speeds of around 20 mph.

III. VEHICLES/TRAILERS

a) Truck

One (1) 2½ ton. Used to tow Vikoma Seapack, boats, haul boom, absorbents, etc.

b) 40' Enclosed Trailer Vans

Eight (8) trailers stocked with booms, absorbents, small skimmers, miscellaneous cleanup equipment. Stored in strategic locations in CS area of interest.

c) 25' Mobile Communications Center

Has mobile base station, portable radios, auxiliary electrical power and all other equipment for self containment.

d) 36' Flatbed Trailer

One (1) 36' Flatbed trailer for use with the 100 bbl. vacuum tank.

e) Harbor Trailer

Fast Response Harbor Trailer (FRHT) equipped with pollution control equipment.

f) Tank Wagon Trailers

Two (2) 100 bbl. tank wagon trailers loaded with dispersant. (Corexit 9527).

g) Truck

Rapid Response Truck (RRT). One (1) 2½ ton. Enclosed bed. Equipped with pollution control equipment.

IV. BOATS/VESSELS

a) Oil Spill Response Vessel (OSRV) "Mr. Clean I"

136' x 36'. Powered by two (2) V-12 diesel engines providing 1,600 HP, capable of a speed of 12 knots. Fuel capacity of 99,500 gals. Two (2) 60 kw generators for electrical power.

Major items onboard include: Cyclonet-100 Acme skimmer, 2,000' of 43" Expandi boom on a 10' powered reel, 2,500' of heavy duty Goodyear boom, Vikoma Seapack, with 1,600' of inflatable boom, 12 ton crane, oil/water separation tank (100 bbl). In addition, a 16' skiff, a 32' boom boat, and storage of absorbents and dispersants with necessary applicators. 6,000 gl. Dracone storage bags.

b) Oil Spill Response Vessel (OSRV) "Mr. Clean II"

130' x 36'. Powered by two (2) 16-V-92 diesel engines. Fuel capacility of 25,000 gals. Two (2) 75 kw generators for electrical power. SOA 13 knots.

Major items onboard include: Two (2) Offshore Devices' Advancing Skimmers 750 gpm each and all accessory equipment, Walosep Skimmer, Vikoma Seapack, 2,000' of 14' x 24' Goodyear boom, 2,000' of 4,300 Expandi boom, 100 bbl. oil/water separation system, 32' aluminum boom boat with 175 HP/OB, 14 ton pedestal crane, surface dispersant spray

system, four (4) Kepner storage bags, 14' Skiff with outboard. In addition, storage of absorbents and dispersants.

c) Fast Response Boom Boats (FRBB)

Two (2) high speed response vessels, one for each Oil Spill Response Vessel (OSRV) "Mr. Clean I" and "Mr. Clean II". 32' x 8' aluminum boom boats.

d) One (1) 19' Larson skiff with 75 HP Johnson motor, kept in Santa Barbara harbor or Clean Seas' yard, for use as work boat around skimmers and barge.

Five (5) 14' aluminum skiffs with OB-one on Mr. Clean II, two on Mr. Clean I, one in the Van in Avila Beach, and one on the FRHT.

One (1) 21' Monark Utility boat with O/B for use as a workboat-stored in Clean Seas' yard in Carpinteria.

One (1) 10' Avon Rubber Raft with O/B-stored in Clean Seas' yard in Carpinteria.

V. ABSORBENTS/CHEMICALS/DISPERSANTS

a) A large inventory of absorbents including Conwed: sweeps, blankets, booms and rugs; 3M Company: sweeps, sheets, booms, and Dow Imbiber bags and blankets.

Stored in the Carpinteria warehouse are smaller quantities of Oil Herder, 101 boxes of booms (3,376'), 138 boxes of sweeps (100 per box), 9 rolls of blankets (300' each), 7 rolls of rugs (300' each), 18 boxes of sweeps (100' each). The above are from Conwed and 3M Company.

199 Dow Imbiber Blankets

11 boxes of Oil Snare

Additional quantities are available as "back-up" from warehouses in the Los Angeles area.

b) Corexit #9527

225 Drums (200 drums stored in tank wagons)

c) Helicopter Chemical Dispersant Spray Units

Two (2) Simplex Model 2000, with 150 gallon buckets and 32' boom.

d) Surface Chemical Dispersant Spray Units

Two (2) Surface Chemical Dispersant Spray Units with pump, booms and mountings for different types of vessels.

e) DC-4 Aircraft

With crew, dispersant spraying equipment, radio, portable dispersant loading equipment, 3,000 gal. per/load.

f) Model 10 Fluorometer, Turner Designs

For use during dispersant applications.

VI. RADIO COMMUNICATIONS SYSTEM

a) A complete radio system consisting of UHF on 454.459.00 MHz and VHF on 158.445/159.480 MHz. This provides solid

communication throughout the Clean Seas area of interest. This system consists of:

1 each VHF/UHF base station in Santa Barbara office
1 each VHF/UHF base station in Carpinteria warehouse
1 repeater on Santa Ynez Peak (158.445 MHz)
1 each VHF/UHF mobile unit in car and mobile van
20 portable Handie-Talkie units (UHF)
12 portable Handi-Talker units (VHF)
1 transportable repeater 454.00 MHZ

VII. MISCELLANEOUS

a) Air Driven Pumps:

Two (2) M15 Wilden double diaphram pumps used with MK-11 Skimmers and miscellaneous equipment.

b) Six (6) Scare-Away Exploders:

Bird frightening devices. Operates automatically on LP gas.

c) One (1) Wiggins Model WD-44 Forklift

4000#

d) One (1) Vikoma Seaboom Vulcanizer Machine

For repair of boom

e) One (1) Power Block

For Vikoma Boom recovery

f) 100 bbl. Skid-Mounted Vacuum Tank with Trailer

One (1) 100 bbl. Vacuum Tank used with MK-II Skimmers or may be used independently.

g) 100 bbl. Oil/Water Recovery Tanks

Two (2) Oil/Water Recovery Tanks, Coast Guard approved. Used with the CS Skimmer or other skimmer systems.

h) 100 bbl. Flat Storage Tanks

Four (4) 100 bbl. Flat Storage Tanks. Used with all skimmer systems.

i) Bridger Shoulder Line Gun

One (1) Line Gun with rewinding machine, Model N, with accessories-for use with Vans in boom launching operations.

j) Compressor

One (1) Gardner-Denver 600 CFM rotary, diesel engine driven, wheel mounted compressor stored in Carpinteria yard. Usually used with air tools and to drive the Exxon Floating Weir Skimmers, Acme Skimmers or the Wilden pumps.

k) Lines, Hoses, Tools

Complete set of all necessary sizes of nylon and poly lines for deploying and towing booms and skimmers. All hoses are fitted with Camlock fittings. Air hoses for compressors and complete sets of tools for all equipment.

l) Skim-Pak Head and Control System

4,200 SH Double Port 4,000 gpm CS Control Wand, 4,000 E Extender.

m) 2-43" 900# Magnets-adaptors for the Expandi Boom.

Van #1 (Green)

Carpinteria Yard

800' 16" Kepner boom
600' 8" Kepner boom

Sorbents

Conwed	
Booms	5 bales/24' per
Sweeps	5 boxes/100'per
Rugs	2 rolls/300' per
3M Company	
Booms	15 bales/40' per
Sheets	10 bales/100' per
Sweeps	2 bales/100'per
Dow Imbibers	
Bags	1 box/100 per
Blankets	20 boxes/1 per
Oil Snare	1 box/30 per

51T Acme Skimmer w/1,200 gal. bag
25':3" hose w/2"-3" valves
25':3" skimmer discharge hose
1/30' bouy line w/bouy
½" nylon, 3/4" nylon, ½" manila
5 - Floats/Skimmer
1 - Rake
2 - Pitchforks
Miscellaneous Tools
2 - 55 gallon Drum
4 - Anchors 3/40#, 1/22#
4 - Anchor Line 200':½" nylon
4 - Crown Line w/bouy 200'
1 - Towing Bridle-5/8" wire
15 - Chemical Lights
4 - Life Preservers
5 - Mops

VAN #2 (Blue)

Getty Oil Terminal-Gaviota

800' 16" Kepner Boom

Sorbents

Conwed	
Booms	10 bales/24' per
Sweeps	5 boxes/100' per
3M Company	
Sheets	10 bales/100' per
Sweeps	2 bales/100' per
Dow Imbibers	
Bags	1 box/100 per
Blankets	20 boxes/1 per
Oil Snare	1 box/30 per

51T Acme Skimmer with 5,000 gal. bag
1 - 25':3" hose with 30':½" bouy line and with bouy
2 - Skimmer hoses 75':3" blue (51T)
1 each - 100':½" nylon, 100':3/4" tow line
1 box - 1,000':½" manila line
5 - Hose floats
4 - Life Preservers
2 - Pitchforks
1 - Rake
Miscellaneous Tools
2 - 55 gallon drums
4 - Anchors, 3/40#, 1/22#
4 - Anchor Line 200':½" nylon
4 - Crown Line 200':½" poly with bouy
2 - 3" valve
5 - chemical lights

VAN #3 (Red)

Avila

1,300':43" Expandi boom
990':30" Expandi boom (12 sections)

Sorbents

Conwed	
Booms	5 bales/24' per
Sweeps	3 boxes/100' per
3M Company	
Boom	5 bale/40' per
Sheets	5 bales/100 per
Sweeps	2 bales/100' per
Dow Imbibers	
Bags	1 box/100 per
Blankets	20 boxes/1 per
Oil Snare	1 box/100 per

51T Acme Skimmer with 1,200 gal. bag
2 - Skimmer hoses
1 - 25':3" Discharge hose
2 - 3" Valve
1 - 30':¼" poly bouy line with bouy
1 each - 100':¼" nylon, 100':3/4" tow line
1 - 1,000':¼" manila line
1 box - 1,000':¼" manila line
5 - Hose floats
5 - Life Preservers
2 - Pitchforks
1 - Rake
Miscellaneous Tools
2 - 55 gallon drums
4 - Anchors, 22#
4 - Anchor Line 200':½" nylon
4 - Crown Line 200':½" poly with bouy
5 - Chemical Lights
1 - 14' Skiff with OB

Van #4 (Yellow)

Port Hueneme (1,200')	Ventura (1,500')	Channel Islands (1,500')

4,200':43" Expandi boom
743':30" Expandi boom (9 sections)

Sorbents

3M Company	
Boom	20 bales/40' per
Sheets	12 bales/100 per
Sweeps	5 bales/100' per
Type 100 Roll	1 roll/150' per

Dow Imbibers

Bags	1 box/100 per
Blankets	20 boxes/1 per

Oil Snare	1 box/30 per

51T Acme Skimmer with 1,200 gal. bag
2 - Skimmer hoses
1 - 25':3" hose
2 - 3" Valve
1 - 30':½" poly line with bouy
1 each - 100':½" nylon, 100':3/4" tow line
1 - 1,000':½" manila line
1 - 1,000':½" manila line
5 - Hose floats
4 - Life Preservers
2 - Pitchforks
1 - Rake
Miscellaneous Tools
2 - 55 gallon drums
3 - Anchors, 22#
4 - Anchor Line 200':½" nylon
4 - Crown Line 200':½" poly with bouy
10 - Chemical Lights
1 - 14' Skiff with OB

Van #5 (Black)

Santa Barbara

1,500':43" Expandi boom
1,400':8" Kepner boom

Sorbents

Conwed

Sweeps	1 box/100' per
Blankets	1 roll/200' per

3M Company

Booms	10 bale/40' per
Sheets	5 bale/100 per
Sweeps	4 bale/100' per

Dow Imbibers

Bags	1 box/100 per
Blankets	20 boxes/1 per

Oil Snare	1 box/30 per

39T Acme Skimmer with 1,200 gal. bag
2 - Skimmer hoses
1 - 25':3" Discharge hose
2 - 3" Valve

1 - 30':½" poly line
1 each - 100':½" nylon, 100':3/4" tow line
1 - 1,000':½" manila line
5 - Hose floats
4 - Life Preservers
2 - Pitchforks
1 - Rake
Miscellaneous Tools
2 - 55 gallon drums
2 - Anchors, 22#
4 - Anchor Line 200':½" nylon
4 - Crown Line 200':½" poly with bouy
5 - Mops
10 - Chemical Lights

Van #6 (White)

Point Dume

2,475':30" Expandi boom (30 sections)

Sorbents

Conwed	
Sweeps	6 boxes/100' per
3M Company	
Booms	11 bale/40' per
Sheets	10 bale/100 per
Sweeps	2 bale/100' per
Dow Imbibers	
Bags	1 box/100 per
Blankets	20 boxes/1 per
Oil Snare	1 box/30 per

51T Acme Skimmer with 1,200 gal. bag
2 - Skimmer hoses
1 - 25':3" Discharge hose
2 - 3" Valves
1 - 30':½" poly line with bouy
1 each - 100':½", 100':3/4" tow line
1 - 1,000':½" manila line
5 - Hose floats
4 - Life Preservers
2 - Pitchforks
1 - Rake
Miscellaneous Tools
2 - 55 gallon drums
2 - Anchors, 22#
4 - Anchor Line 200':½" poly with bouy
4 - Crown Line 200':½" poly with bouy
5 - Chemical Lights

Van #7 (Brown)

Morro Bay

495':30" Expandi boom - 6 sections
1,050':43" Expandi Boom - 21 sections

Sorbents

3M Company	
Booms	5 bale/40' per
Sheets	15 bale/100 per
Sweeps	5 bale/100' per
Dow Imbibers	
Bags	1 box/100 per
Blankets	20 boxes/1 per
Oil Snare	1 box/30 per

4 - Life Preservers
Miscellaneous Tools
2 - Pitchforks
2 - Rakes
2 - 55 gallon drums
4 - Anchors, 22#
4 - Anchor Line 200':½" nylon
4 - Crown Line 200':½" poly with bouy
1 - 100':3/4" Tow Line
1 - 1,000':½" manila line

Van #8 (Orange)

Port Mugu

825':30" Expandi boom - 10 sections
1,050':43" Expandi Boom - 21 sections

Sorbents

3M Company	
Booms	5 bale/40' per
Sheets	15 bale/100 per
Sweeps	5 bale/100' per
Dow Imbibers	
Bags	1 box/100 per
Blankets	20 boxes/1 per
Oil Snare	1 box/30 per

4 - Life Preservers
Miscellaneous Tools
2 - Pitchforks

2 - Rakes
2 - 55 gallon drums
4 - Anchors, 22#
4 - Anchor Line 200':½" nylon
4 - Crown Line 200':½" poly with bouy
1 - 100':3/4" Tow Line
1 - 1,000':¼" manila line

801 CLEAN BAY CLEANUP EQUIPMENT AND MATERIALS

This equipment is owned by Clean Bay. It is stored at locations shown in the itemized listing which follows. The following locations are frequently referred to by name only in the listings. The addresses are shown here.

Clean Bay (CB)	2070 Commerce Avenue Concord, CA 94520
Diablo Hitch & Trailer	2241 Commerce Avenue Concord, CA 94520
IT Corporation	4575 Pacheco Blvd. Martinez, CA 94553

Calling Procedure

All equipment listed may be obtained by calling:

Clean Bay Manager	415/685-2800 (24 hr.)

Hauling service from the storage sites listed is available from many companies. Contractors with established contracts for hauling are:

Diablo Hitch & Trailer	415/676-4216
IT Corporation	415/228-5100 (24 hr.)

Where CB has a preferred hauling procedure for hauling any item, the name of that hauler has been shown.

801 CLEAN BAY CLEANUP EQUIPMENT AND MATERIALS

1. MOBILE HEADQUARTERS TRAILER

8' x 25' Office Trailer w/tandem axle

Location

Union Oil Refinery, Rodeo, Calif.

Hauling

Union Oil Company will provide a driver and vehicle to deliver the trailer at any time to a location as directed by Clean Bay.

Call (415) 799-4411, Ext. 471; ask for Bulk Shift Foreman. If the Bulk Shift Foreman is unavailable, ask for Marine Terminal Dispatcher. Tell him that you are calling for the Clean Bay Mobile Headquarters Trailer and give him the exact location for delivery, your name, company and telephone number.

During Off-Hours -(415) 799-2478 or 799-4411 and ask for the Bulk Shift Foreman. If the Bulk Shift Foreman is unavailable, ask for the Marine Terminal Dispatcher and proceed as above.

A list of the equipment in the trailer is as follows:

Mobile Headquarters Trailer - Equipment List

8	Batteries, 1.5 volt, Size C
6	" , 1.5 volt, Size D
1 pr.	Binoculars
2	Blankets
1	Camera, Polarois w/case, film & flash cubes
1	Combustible Gas Tester, J-W
Many	Directories, Telephone for CB area

Electrical Equipment

1 gal.	Battery Water, Distilled
2	Extension cords, McGill, 50 ft.
1	" " , ITT, 100 ft.
1	" " , Hubbell, 50 ft.
1	Generator, gasoline, Onan
2	Lights, trouble, McGill

Emergency Equipment, Road

30	Flares, road, 15 min.
3	Flashlights w/batteries
12	Hand Lanterns w/batteries
1 bx.	Hand tools, assorted
6	Reflectors, road
4	Fire Extinguishers
1	First Aid Kit
4	Folding Chairs
6	Flagpoles, w/CB flags
Many	Hardhats
Minor	Kitchen Supplies
10	Life Vests, Sterns San-Souci

Maps & Charts

12	California Road Maps
6	Map Overlays
2 sets	Nautical Charts for CB Area
1 set	Petroleum pipeline maps
4	Tide & Current Books, pocket size
2 sets	USGS maps for CB Area

Mobile Headquarters Trailer - Equipment list (cont.)

	Office Supplies
1	File
Assorted	Forms, supplies
1	Tapewriter, Dymo Model 2300 w/case & 6 rolls tape
	Oil
2 qts.	Motor oil, HD SAE 30
1	Funnel
	Radio & Telephone
1	AM Receiver, Craftsman, multi-band
2	Chargers, Motorola, multi-unit
2 sets	Headphones
6 sets	Headsets, helicopter
1	Marine Base Station, Intech (Channels 10, 16, 18A & 22A)
1	Marine Radio Telephone Manual
1	Mobile Radio, UHF, Motorola
10	Paksets, 6 watt, Motorola & Cases w/belts
1	Scan Receiver, Intech (Channels 10, 16, 18A, 22A & WXI)
2 coils	Telephone Cable
12	Raincoats
	Recording Equipment
1	Tape Recorder, Sony Cassetts
1 bx.	Tapes, Cassette, Sony
18	Sample jars, pint

2. OIL CONTAINMENT BOOM

A - VIKOMA SEAPACK

1600' Ocean boom, 27" float x 17" water tube, stored in 23' boat on trailer.

Location

The complete unit is stored at Diablo Hitch & Trailer, and is packed for quick deployment

Hauling

Diablo Hitch & Trailer

B - KEPNER SEACURTAIN BOOM

4600 ' - 16" float x 12" curtain; 3/8" chain weight in curtains.

Location (1) 2000'

Two (2) 35' semi-trailer vans, each containing 1000' of this boom stored at IT Corporation yard, Martinez. Each trailer has 5 -200' sections joined by Navy connectors, making 1000' boom. Boom is packed for easy deployment; one end with towing bridle attached is at the rear door and ready to be pulled. The trailing end of the boom is fitted with a quick release sea anchor. Navy connectors are installed at each end so that the two booms can be quickly joined to create a single 2000' boom.

Hauling (1)

IT Corporation

Location (2) 2600'

Two (2) 40' chassis mounted on ocean container type vans; one (1) containing 1200' and one (1) containing 1400'. These are stored at Diablo Hitch & Trailer. One trailer has 6 -200' lengths and one has 7 -200' lengths joined by Navy connectors. The boom is packed for easy deployment; one end with towing bridle attached is at rear door and ready to be pulled. The trailing end of the boom fitted with a quick release sea anchor. Navy connectors are installed at each end so that the 2 booms can be quickly joined to

Kepner SeaCurtain/Location 2 (cont.)

create a single 2600' boom. It should be noted that the 2000' (Location 1) and this 2600' in sea containers can be joined quickly to form a single 4600' length.

C - AMERICAN MARINE OPTIMAX BOOM

6400' of 6" float x 12" skirt, "Optimax" boom w/universal connectors at each end.

Location (1)

1400' stored in trailer at CB Warehouse. The trailer contains 14 -100' separated sections with Navy connectors. In addition, the trailer contains anchors, lines and floats to deploy the boom.

Hauling (1)

Diablo Hitch & Trailer

Location (2)

5000' in 100' lengths with universal connectors (not Navy type) located in CB warehouse.

D - WHITTAKER CORPORATION EXPANDI-BOOM

1640' of 30" Expandi-Boom; manufactured in 82' sections. This is a fast deployable boom that can be handled by one or two men; boom weight, 1½#/ft.

Location

Stored in CB warehouse:

492' on pallett; can be moved by forklift, helicopter or crane - wt. 1300#, incl. pallet

820' on pallett; can be moved by forklift, helicopter or crane - wt. 1720#, incl. pallet

328' in 82' sections, boxed and stored in 4 boxes

3. PUMPING EQUIPMENT

Location

All located at CB warehouse

A - TANKER LIGHTERING EQUIPMENT

An ADAPTS type tanker lightering system consisting of:

(1) a 40 HP air-cooled diesel engine prime mover mounted in a fiberglass container complete w/hydraulic pump

(2) one (1) 8" submersible pump and one (1) 6" submersible pump each with 1000 GPM capacity

(3) 1600' of 8" floating discharge hose
800' of 6" " " "

(4) accessory equipment for handling prime mover, pumps and hoses, incl. 1 drum hydraulic oil.

B - DIAPHRAGM PUMP

Two (2) Wilden M15B spark free, disphragm pumps; compressed air driven, 150 GPM w/100 PSI air pressure.

C - PORTABLE PUMPS

One (1) 2" gasoline driven, portable pump w/hoses
Two (2) 3" " " " " "
One (1) 6" " " " " "
One (1) 356 CFM portable air compressor

D - OIL HERDER HELICOPTER SPRAY PUMPING UNIT

One (1) Simplex Pumping Unit; consists of fiberglass bucket, 150 gal. cap., 3 HP Briggs & Stratton gas engine and small gear pump, set at 1 GPM flow rate. Designed as helicopter undersling unit. Includes 4 drums of Shell Oil Herder.

5. SKIMMING EQUIPMENT

A - MARCO CLASS III OIL RECOVERY VESSELS

1 - M/V Spill Spoiler maintained at San Francisco
1 - " " " " " Martinez Marina

These two vessels are 58' x 24' jet propelled Bay skimmers w/2 -3' wide Martin-Marietta filterbelts and 90 bbls. onboard storage capacity. Capable of recovering all grades of oil and debris at oil recovery rates up to 750 GPM in 3-4 ft. waves.

Can be obtained by calling IT Corporation.

B - MARCO CLASS I OIL RECOVERY VESSELS

1 - M/V Mini Spoiler maintained at Long Wharf, Richmond
1 - " " " " " Union Oil Co., Rodeo

These two MARCO Class I oil recovery modules are mounted on a 34' x 10' catamaran and powered by twin 50 HP outboard motors. Floodlights for night operation. One (1) 500 gal. storage bag towed behind vessel; one (1) 250 gal. storage bag on deck.

Skimmers are stored on three-axle trailers; can be towed over road to scene or powered through water at 16 knots.

Require a long launching ramp and high water, or a 10-ton crane for launching.

C - FLOATING WEIR SKIMMERS

Two (2) Exxon Open Seas 77" dia. floating weir skimmers designed for use in recovering fairly thick oil concentrated within a boom. Each skimmer equipped with an air driven pump, 200' of Acme 4" discharge hose w/hose floats and 150' of 1" Dayco air hose.

Each skimmer weighs 400# and, together with steel container, grosses 1500#; they require crane for hoisting and are designed to work in conjunction with a barge. Air supply can be provided by CB's 356 CFM air compressor.

Location

Skimmers w/related equipment located in CB warehouse; portable air compressor located at Diablo Hitch & Trailer.

6. RAIDER SRV 34' SPILL RESPONSE BOATS

Location

1 - Raider boat maintained at Union Oil Company, Rodeo
1 - " " " " Shell Oil Company, Martinez

These boats are shallow draft, all-purpose workboats, each powered by two (2) 175 HP outboard motors. Cabin equipment includes radar, radio, compass and depthfinder. The boats are also equipped with three each quartz-iodine floodlights for night work. The shallow draft and bow door allows beaching of boats for loading/unloading personnel and equipment or for cleanup operations in marshes and shallow water areas. With the portable mop machine and motor generator (stored in CB warehouse) mounted on deck, together with 2-3 gal. drums for receiving recovered oil, these boats become versatile and efficient skimmers.

A wide-load permit is necessary for over-the-road movement, and the boat/trailer must be clearly and prominently marked "WIDE LOAD".

7. BOSTON WHALER 16'

Trailer mounted with 40 HP outboard motor. Towing requires a 2" ball. Towing and operating instructions are on the boat.

Location

CB Warehouse

Hauling

No preference; CB company car is fitted to tow this boat and trailer.

8. SORBENTS & DISPERSANTS

A - Sorbent Trailer

35' semi-trailer van; inventory of equipment & supplies in trailer shown below.

Location - IT Corporation yard, Martinez

Quantity	Item
1 coil	Manila rope, 1" (600')
1 coil	" " 3/4" (1200')
1 coil	" " 1/2" (600')
10 ctns.	3M Type 270 sorbent booms
42 bales	3M Type 151/156 pads, 18" x 18" x 3/8"
8 bxs.	3M Type 356, 25/bx.
16 rolls	Conwed Sorbent Blankets, 35" x 200' roll
10 ctns.	" " Pads, 17" x 17" x 1/4"
5½ rolls	" " Rug, 40" x 300' roll
1 bx.	" " Sweep, 17" x 17", 120/bx.
2 ctns.	" " heavy duty boom, 10" x 8"
3 ctns.	Johns-Manville Adsorbent boom, 10/container
5 ea.	Hedwin 5-gal. plastic containers
1 coil	Rope, wire, 1/2", black (200')
2 bxs.	Rags, approx. 3' x' x 4' boxes
3 bxs.	Grefco Sorbent boom
2	#52 Merrill Drum Lifter Clamp
2	Morse Model 85A drum carrier
1 bx.	Assorted Shackles w/screw pins, galvanized
2	Ansul A-5, 5 lb. fire extinguishers
1	MS Medical First-Aid Kit

B - Dispersant

50 drums - Corexit 9527 Oil Spill Dispersant Concentrate

Location

IT Corporation yard

Hauling

Not to be moved except by explicit instructions from CB Manager

9. PORTABLE RADIO REPEATER TRAILER

This radio repeater trailer can be used in conjunction with the radio paksets in remote areas to improve communications. It contains a primary and secondary radio repeater and has two batteries which make the repeater independent for 48 hrs. If available, 110 VAC should be connected to the self-contained battery charger. 110 VAC is also available for this unit from the Floodlight Trailer or from the diesel generating unit of the Oil Mop machine.

The trailer requires a 2" ball hitch and standard 4-plus, 12 v. electrical adapter to the towing vehicle for stoplights and brake lights.

Gross vehicle weight is 2000#; it is recommended that the vehicle be towed with a heavy duty station wagon or larger. The CB station wagon is equipped with a 2" ball hitch and standard electrical adapter and has sufficient GVW to tow this trailer.

Location

CB Warehouse

10. FLOODLIGHT TRAILER

A 12.5 KW Onan diesel-driven generator with four (4) 1500 watt tungsten halogen quartz lights on a telescoping tower.

Equipment mounted on a 2-wheel trailer requiring a 2 -5/16" ball hitch and standard 4-plug, 12 v. electrical adapter to the towing vehicle for stoplights and brake lights. Gross vehicle weight 3560#; it is recommended that this vehicle be towed with a 1/2 t. pickup truck or larger.

Generator is equipped with a 25', 240 volt, single phase, female end, standard plus extension cord. A distribution box contains two 240 volt single phase, standard female receptacles and four 120 volt single phase standard female receptacles. Generator uses No. 2 diesel fuel and has a tank capacity of 7½ gals. At full load, it will consume approximately 1.5 gals/hour.

Location

Diablo Hitch & Trailer yard

11. TOOL TRAILER

Trailer requires at least a 1-ton truck to move. Unladen trailer weighs 6640 lbs. Tongue hitch requires a 2-5/16" ball or can be converted to a ring hitch; ball and ring stored in front storage section of trailer. License is taped to inside front door; trailer has surge brakes on both axles. Tool trailer inventory listed below.

Location

CB Warehouse

Quantity	Item
1	Axe
2	Boats, plastic
1	Chain Bar & sprocket oil
1	Chain Saw
4	Gas Tanks w/hose attachments (empty)
1	Hitch, ball
1	" , tow ring
15	Hoes
2	" , large
1 pr.	Jumper cables
10	Life Jackets
1/2 qt.	Oil, 2-cycle
4	Outboard Motors (also shown in whse, inventory) (Item 13)
1 gal.	Paint, blue enamel
6 rolls	Plastic sheet
12	Pitchforks
100	Rainsuits, vinyl
25 pr.	Rubber boots
100 pr.	" gloves
21	Shovels (19 square/3 round)
2	Sledge hammers
7	Sickles, long handle
13	" , short
1	Spray nozzle
1 roll	Twine

Tool Box No. 1

1 bx. ea.	Bolts & Nuts, 5/8
4	Drum lifting clamps
2	Mechanics Wire, 5#

Tool Trailer Inventory (continued)

Quantity	Item
Tool Box No. 2	
1	Bolt Cutters
5	Flashlights (w/o batteries)
3	Hammers, machinists
2	Knives, utility
2	Pliers
1	Saw, hand
1	" , pruning
1	Strap
1	Wrench, adjustable

12. ADDITIONAL WAREHOUSE INVENTORY

Following is a list of other items available in the Clean Bay Warehouse:

Quantity	Item
	Absorbents - see Sorbent
2	Anchors, Danforth (225) w/att. rope & chain
	Belts & Filterpads
4 sets	MARCO Class III Filterpads (5 pads/set)
4 sets	" " I " (4 pads/set)
2 ea.	3' Backing Belts, MARCO III
4 ea.	1' " " " I
3	Bird Scare-Away Guns w/2 propane bottles
1	Bird Scarer (Av-Alarm)
	Boats
2	Skiffs, Aluminum, 10' John Boats
2	" , Plastic, Pioneer 12, unsinkable
	Booms
500 ft.	AQUAFENCE boom, 12' x 12", in 5 fiberglass containers 30" x 46" x 90". Belt type w/rigid plastic floats
	Boom Accessories
Assorted	Repair Kits, connectors, etc.
14	Buoys, mooring
8	Containers, trash, plastic
1 drum	Diesel fuel
8 rolls	Fencing, Chain link, plastic w/spreader bars
1	Forklift, Clark, electric
1 set	Forklift extension
4	Heaters, electric, Arvin
	Hose (palletized)
250 ft.	8" transfer hose, 25' & 50' lengths
525 ft.	6" " " " " "
900 ft.	3" vacuum hose
200 ft.	$1\frac{1}{2}$" " "
200 ft.	1/4" " "
400 ft.	hydraulic hose
400 ft.	air hose

Additional Warehouse Inventory (continued)

Quantity	Item
1	Inflatable Life Raft (15 person cap.)
10	Life Vests
	Oil Skimmers
1	Oil-HAWG
1	Oil Mop, Model I-4E, w/3.5 KW M-G set
2	Skim Paks (for use with vac. hose)
1	Skimmer - Skim, Inc.
	Outboard Motors
2	50 HP Johnson Outboard (spares for Mini I & II)
2	15 HP Evinrude " w/gas tanks (In Tool Trlr.) (Item 11)
2	6 HP " " " " " (" " ") (" ")
	Pipe Fittings, misc.
	Pumps
1	Barrel pump
1	Radio Repeater Trailer
200 ft.	Rope, polypropylene
	Sorbents The warehouse carries a small sorbent inventory of various sizes and types for current usage. Deployable sorbent inventory is in the Sorbent Trailer (Item 8).
2	Winches - air driven w/stands

13. EQUIPMENT UNDER LEASE TO CLEAN BAY

Contractor: Marine Pollution Control Service, Inc.
305 First Street
Benicia, CA 94510

J. L. Garske, Jr.
(707) 745-2949 (24 hr.)

Equipment located at Exxon Crude Dock, Benicia:

2 Mark II Oil Skimmers
1 56' LCM Boat, SPONGE

Equipment located at C&H Sugar Co. Wharf, Crockett:

2 Mark II Oil Skimmers
1 56' LCM Boat, SQUEEGEE

APPENDIX F

PREDICTION OF OIL SPILL MOVEMENT

OIL SPILL CONTINGENCY PLAN FOR THE SANTA MARIA BASIN
ARCO OIL & GAS CO., 1982

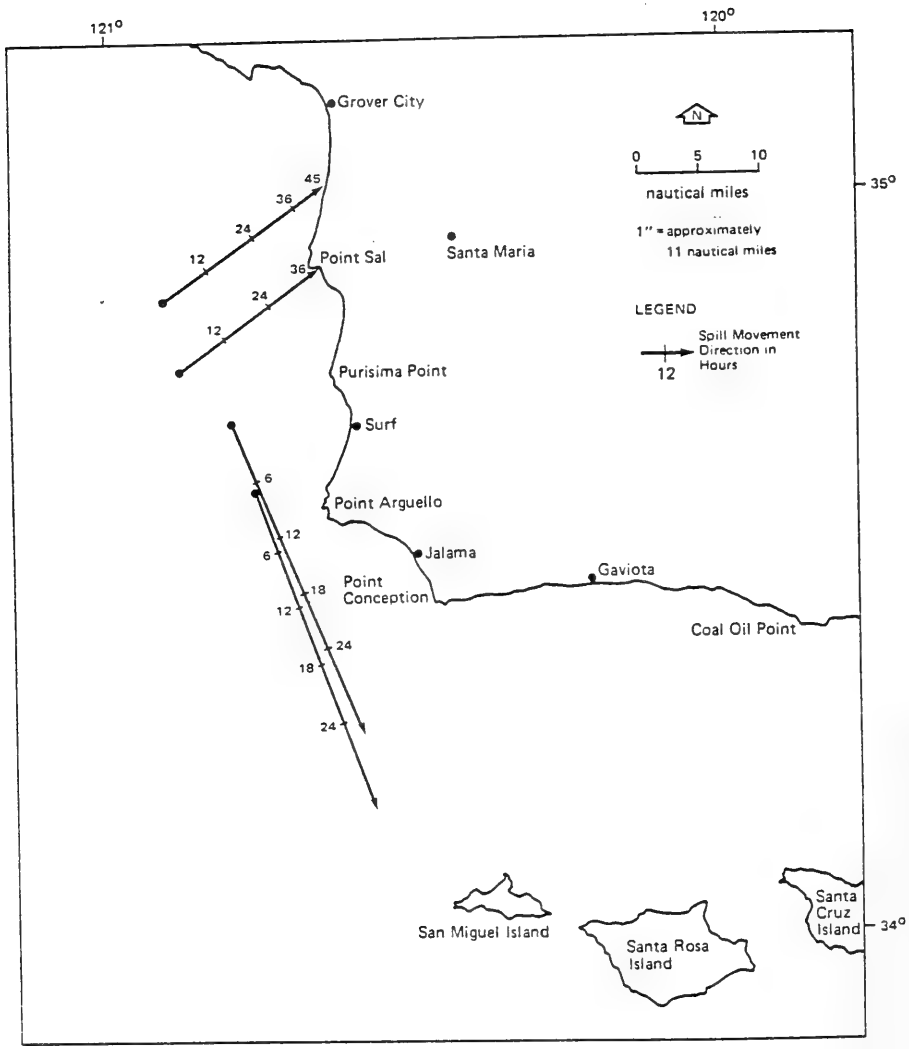


Figure 2-3. PREDICTION OF SPILL MOVEMENT-JANUARY

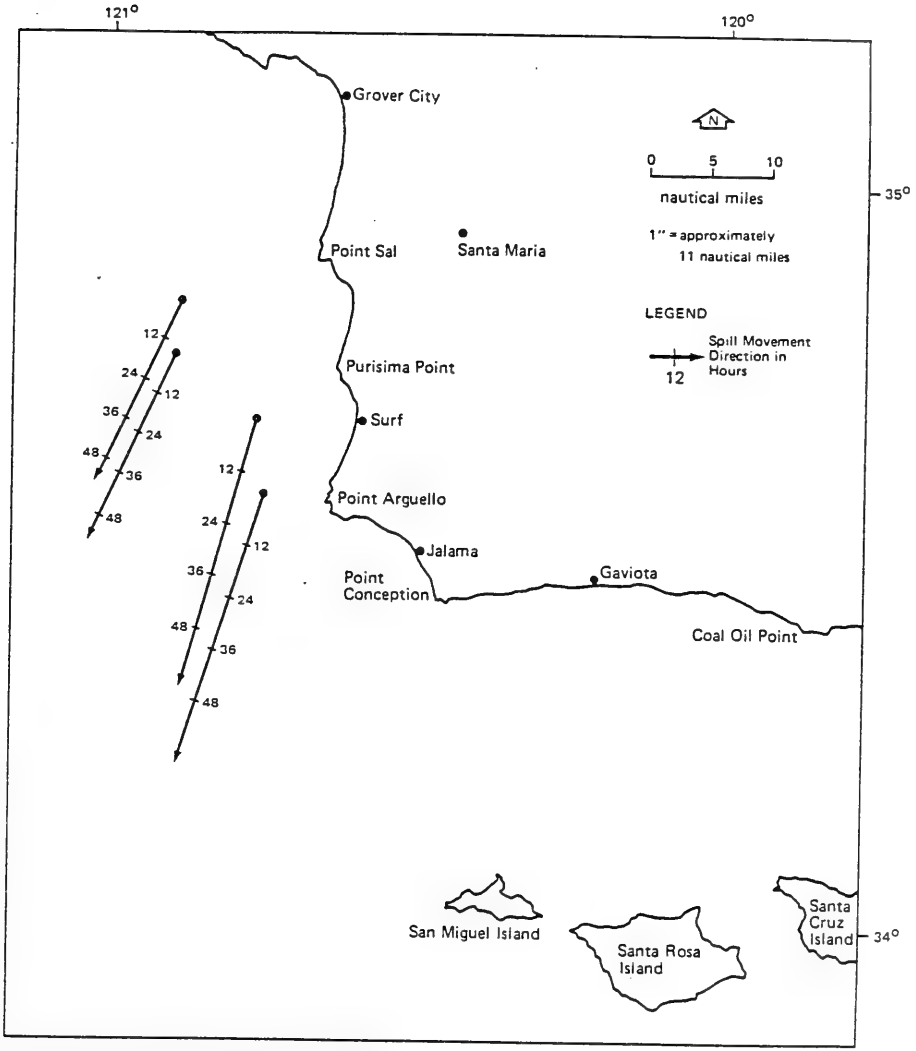


Figure 2-4. PREDICTION OF SPILL MOVEMENT-FEBRUARY

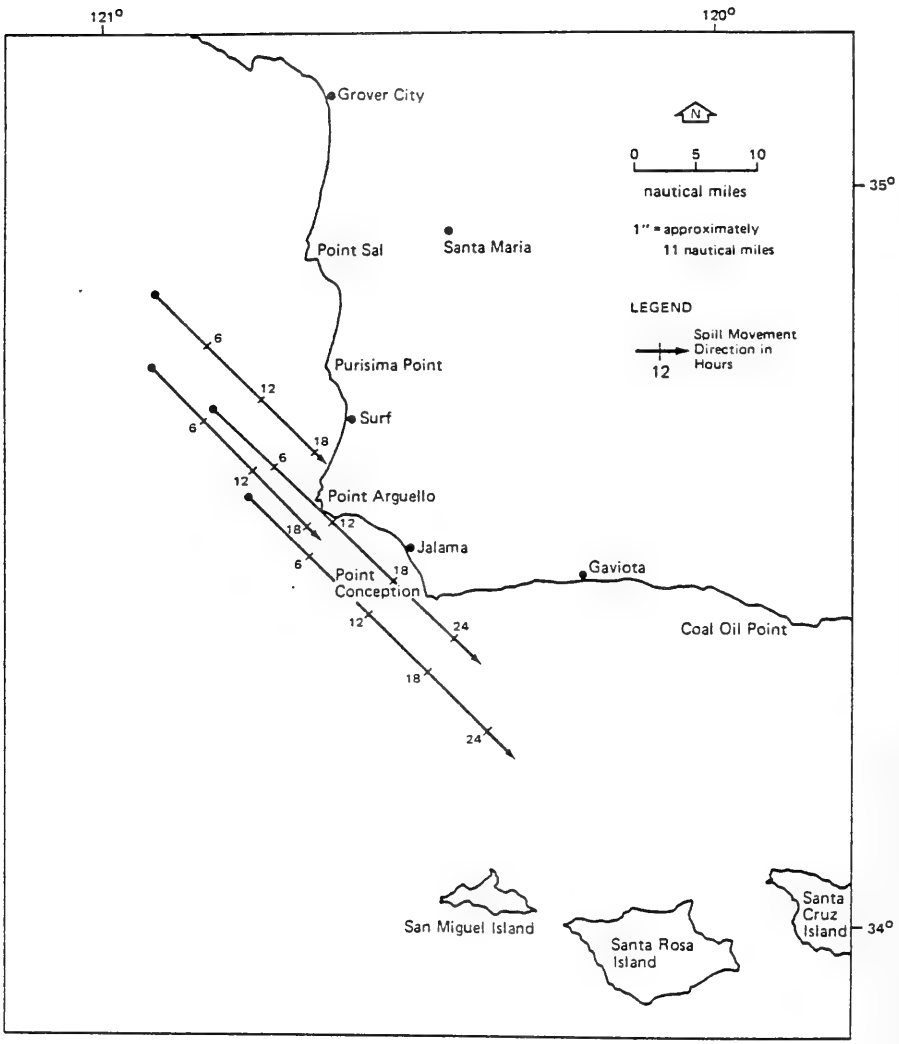


Figure 2-5. PREDICTION OF SPILL MOVEMENT-MARCH

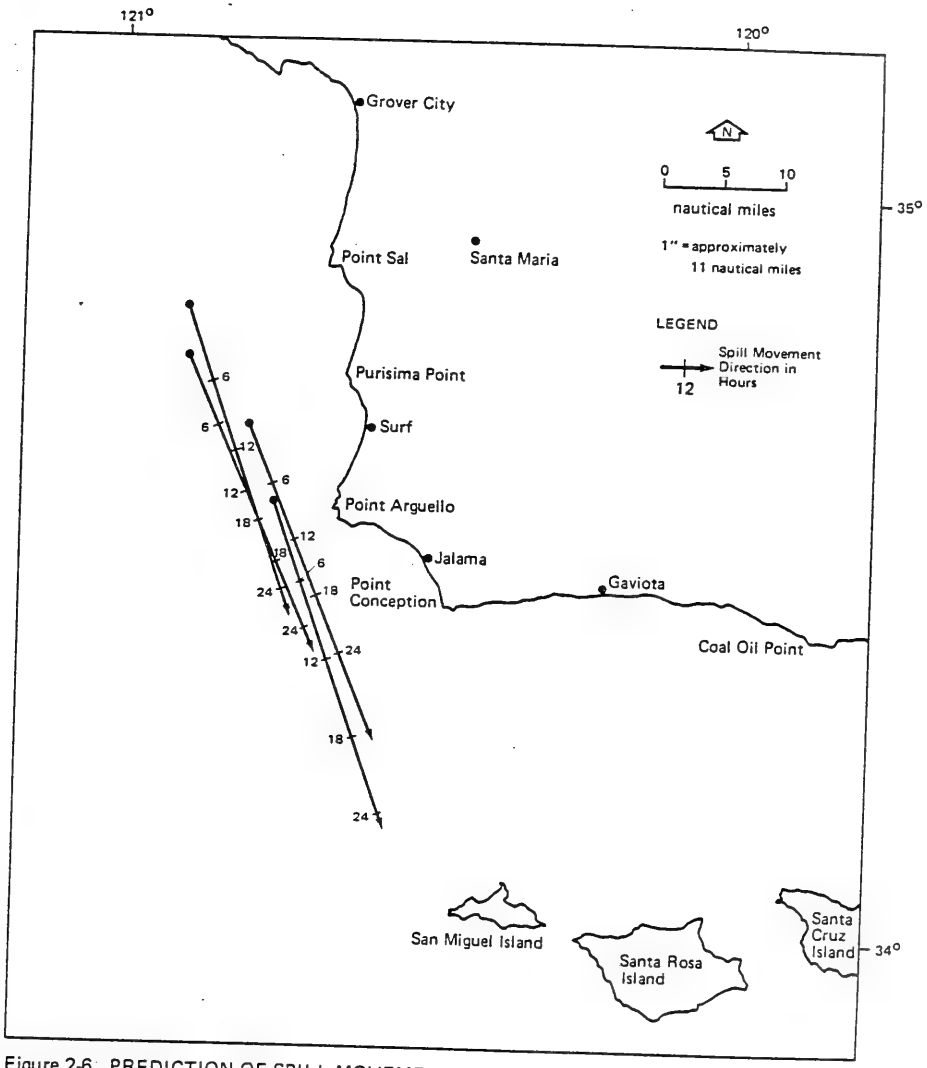


Figure 2-6. PREDICTION OF SPILL MOVEMENT-APRIL

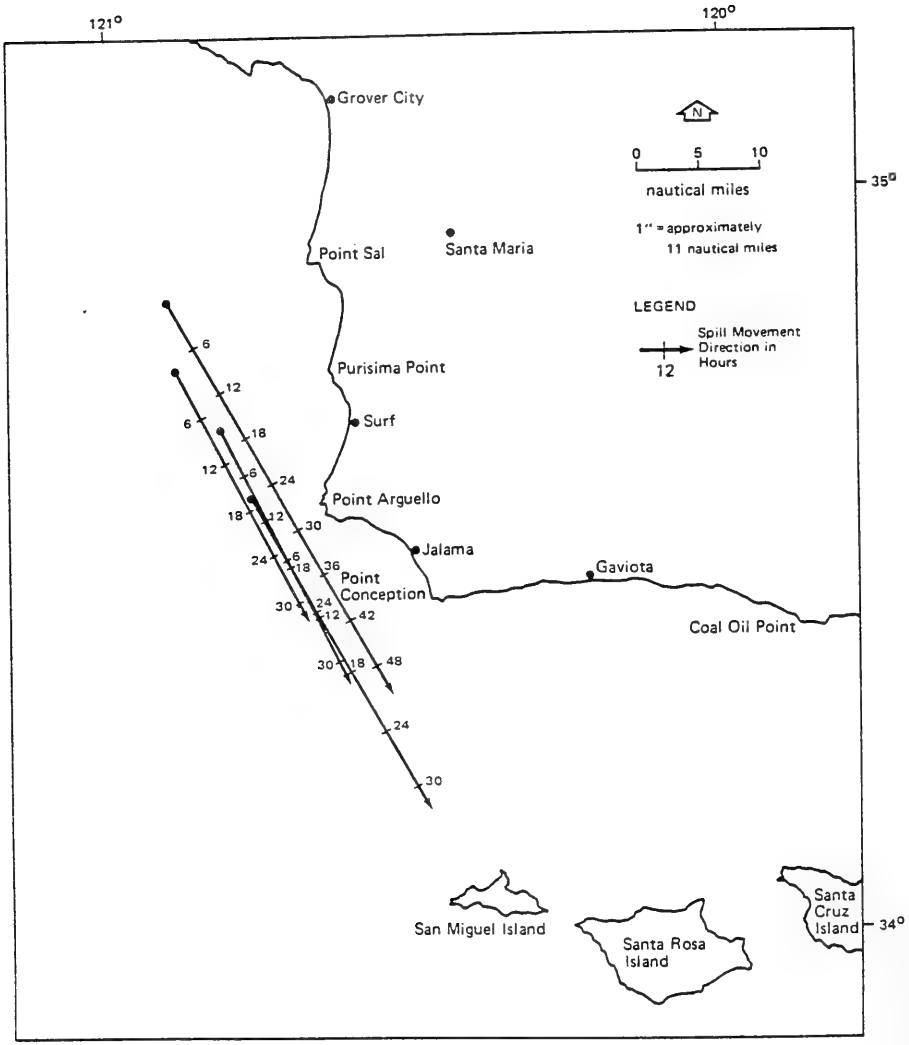


Figure 2-7. PREDICTION OF SPILL MOVEMENT-MAY

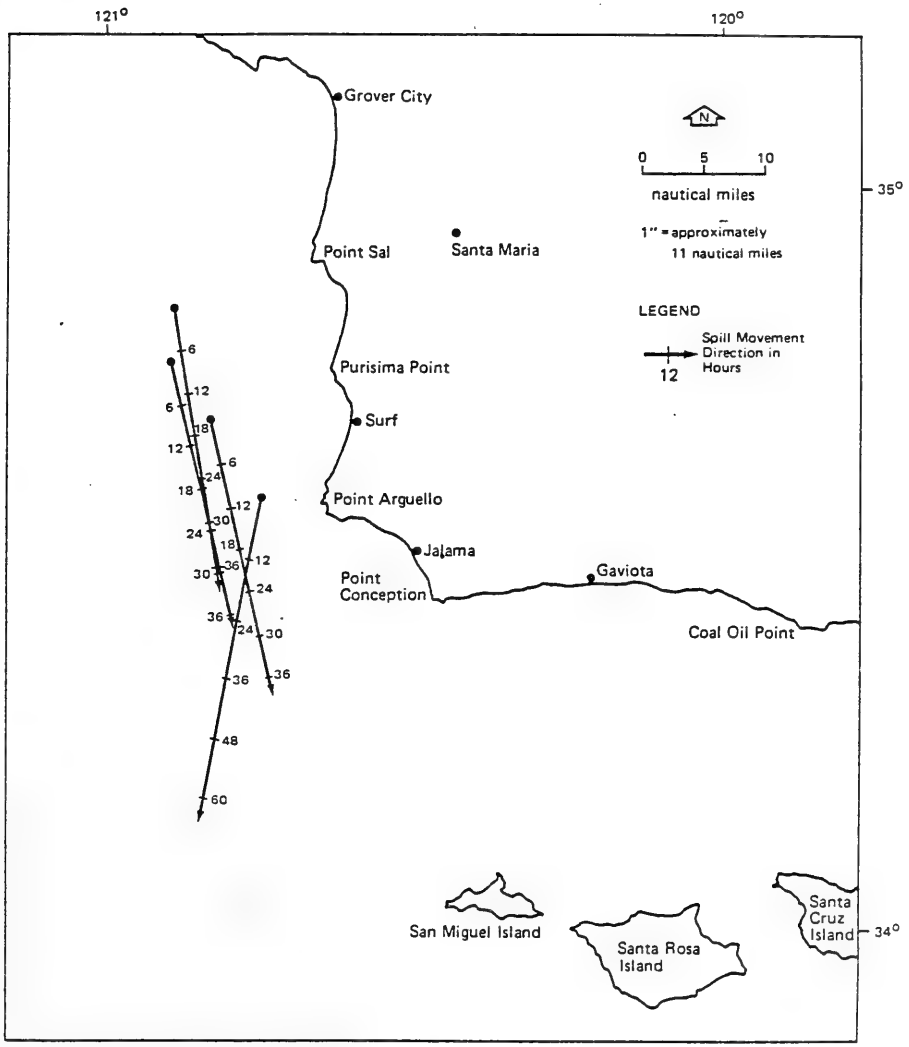


Figure 2-8. PREDICTION OF SPILL MOVEMENT-JUNE

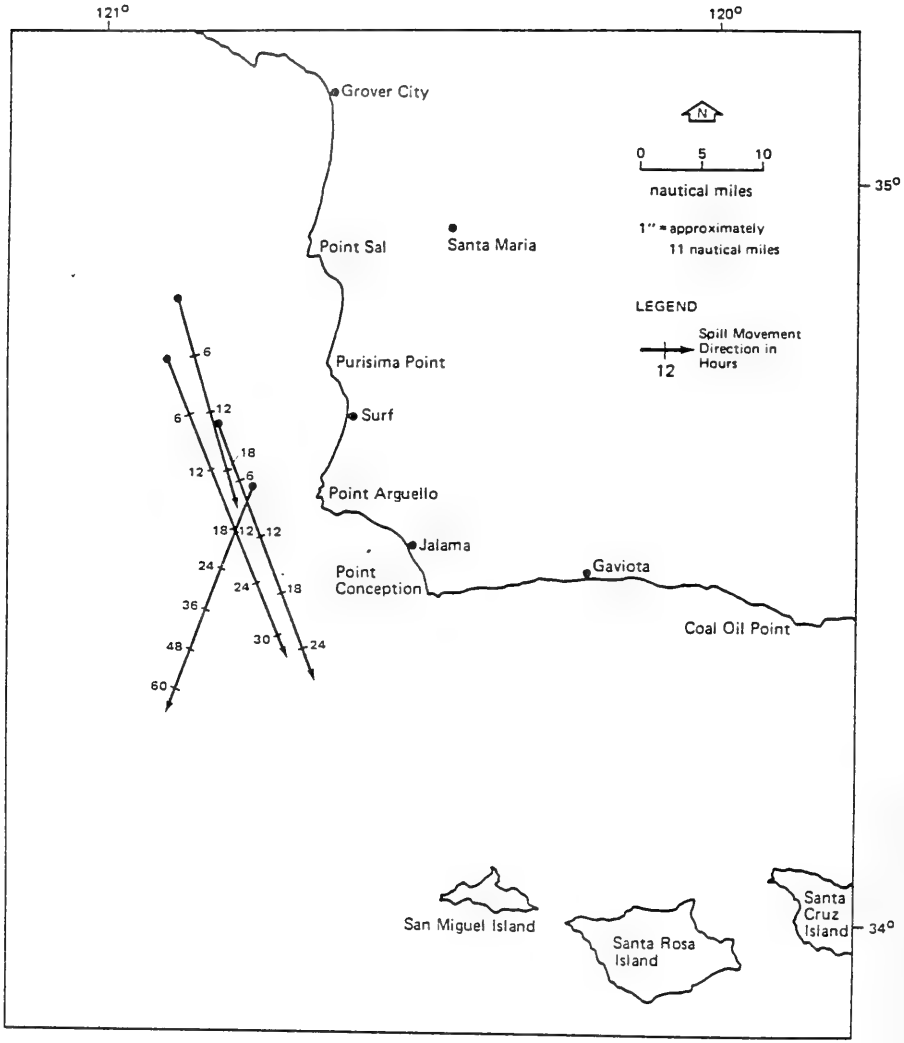


Figure 2-9. PREDICTION OF SPILL MOVEMENT-JULY

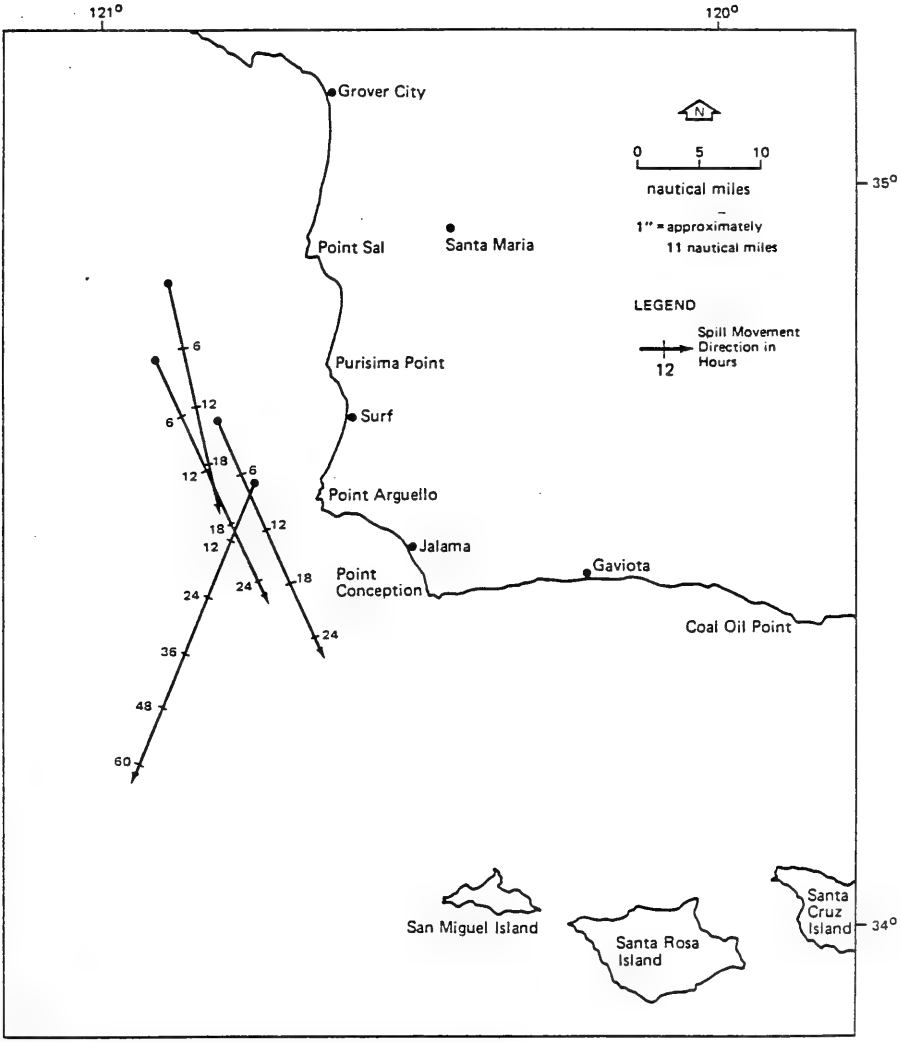


Figure 2-10. PREDICTION OF SPILL MOVEMENT-AUGUST

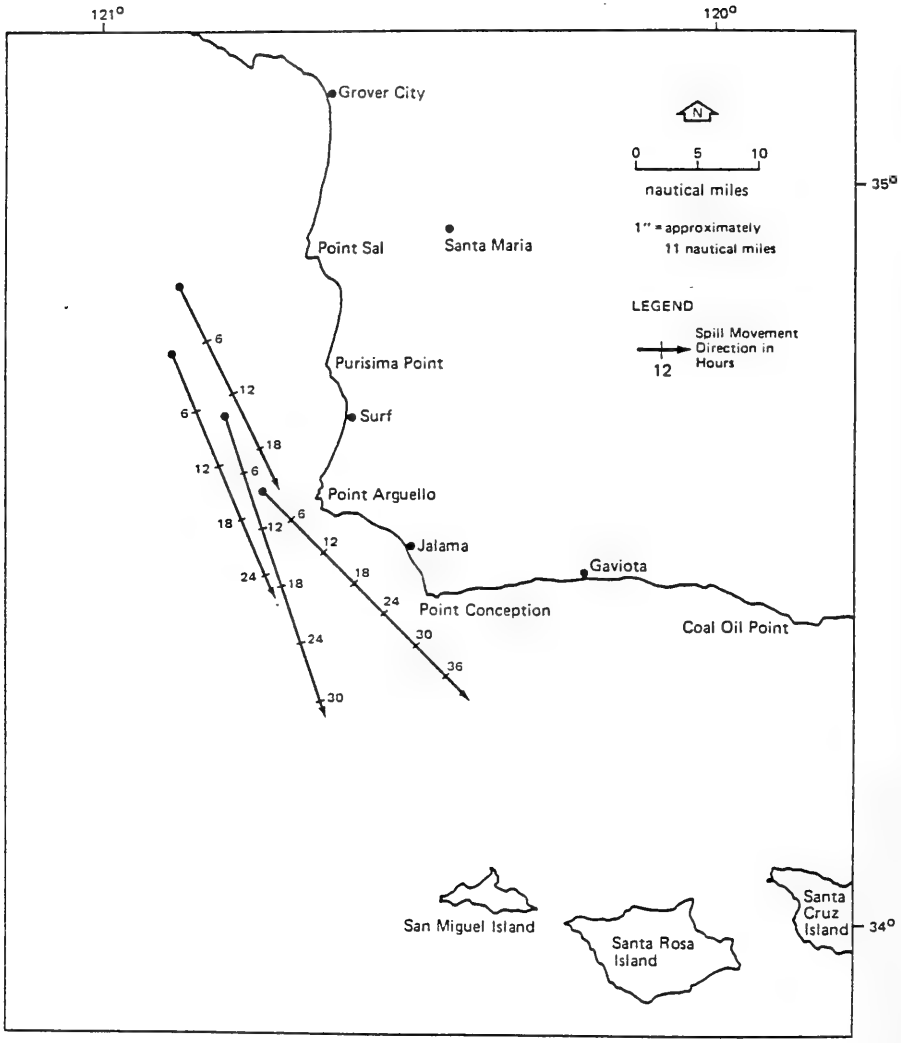


Figure 2-11. PREDICTION OF SPILL MOVEMENT-SEPTEMBER

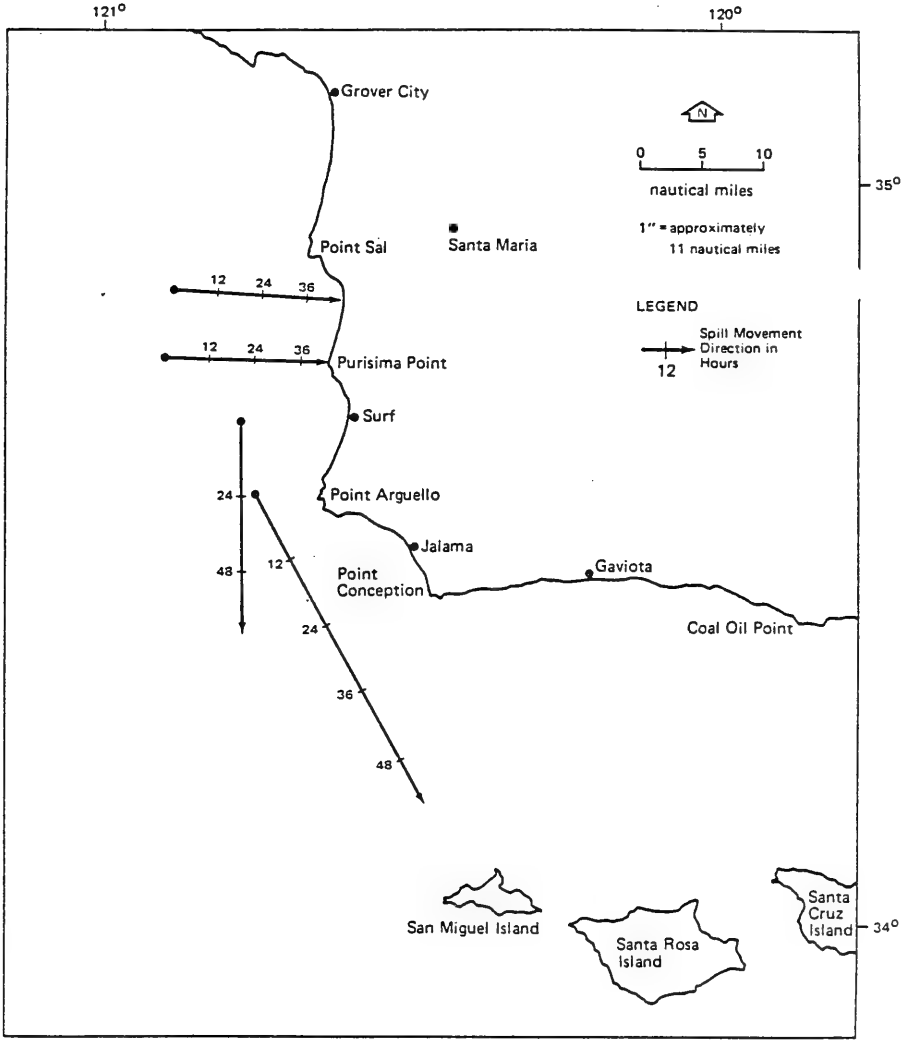


Figure 2-12. PREDICTION OF SPILL MOVEMENT-OCTOBER

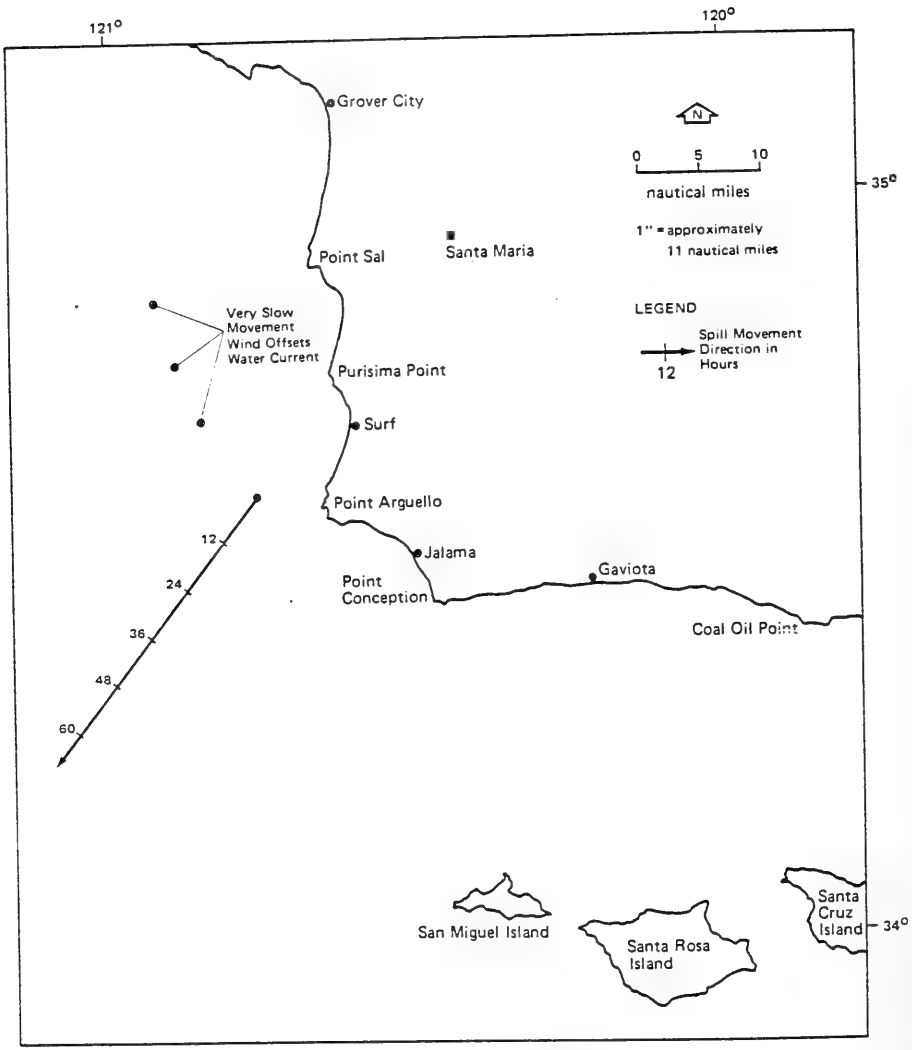


Figure 2-13. PREDICTION OF SPILL MOVEMENT-NOVEMBER

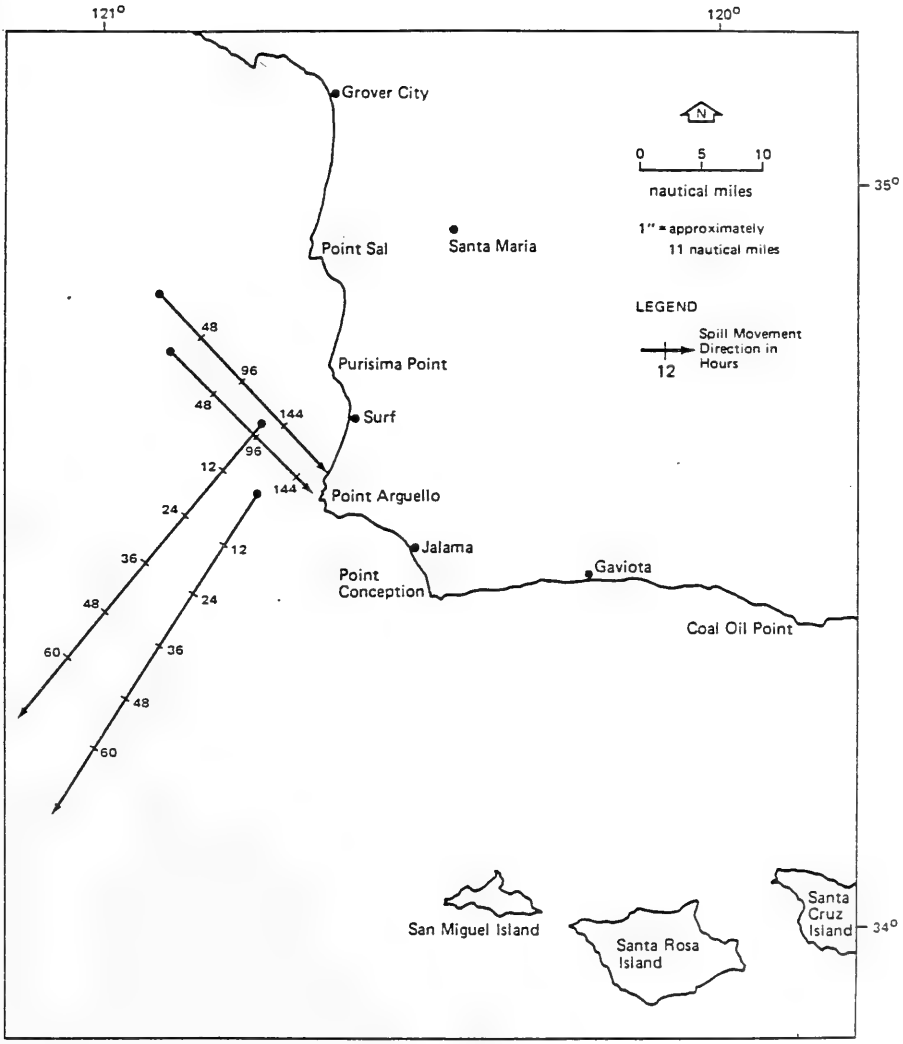


Figure 2-14. PREDICTION OF SPILL MOVEMENT-DECEMBER

APPENDIX G

PREDICTION OF OIL SPILL MOVEMENT

OIL SPILL CONTINGENCY PLAN
TROUT PROSPECT
OCS LEASE NO. P-0435

SHELL OIL CO., 1982

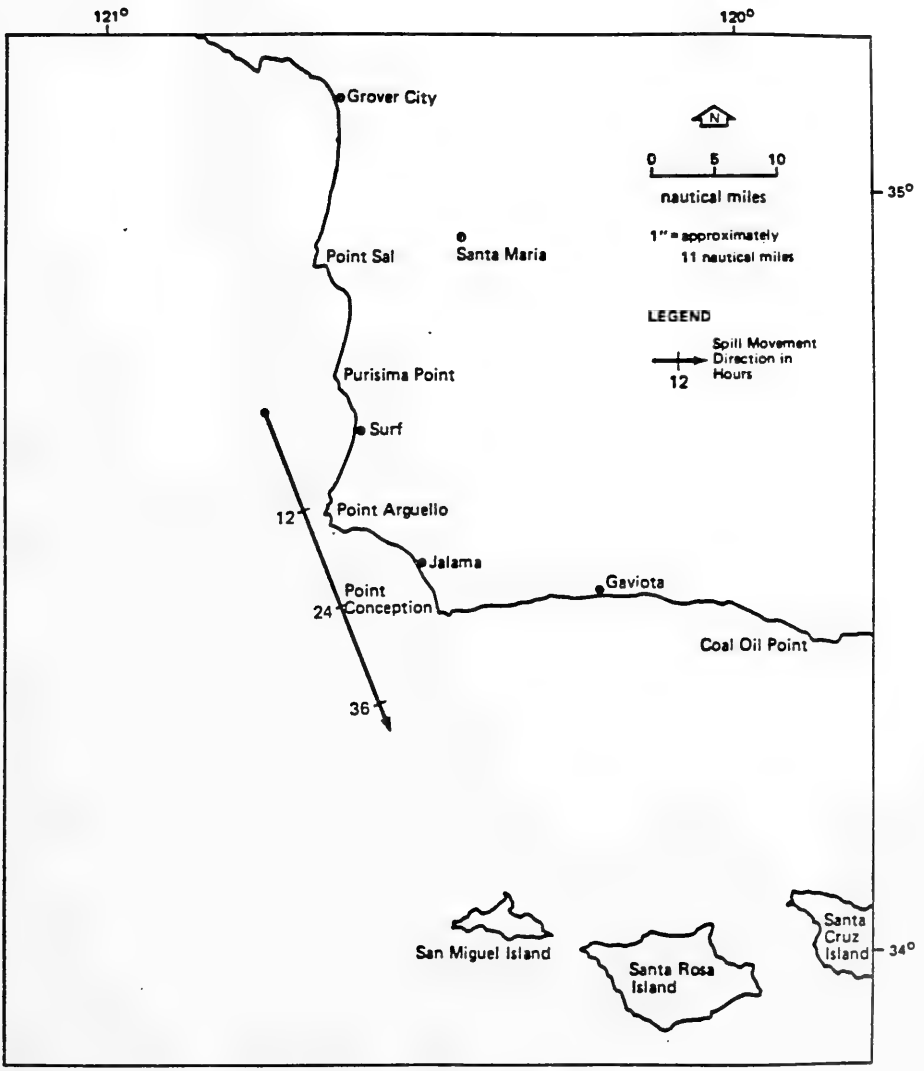


Figure 1. PREDICTION OF SPILL MOVEMENT- JANUARY

10/82

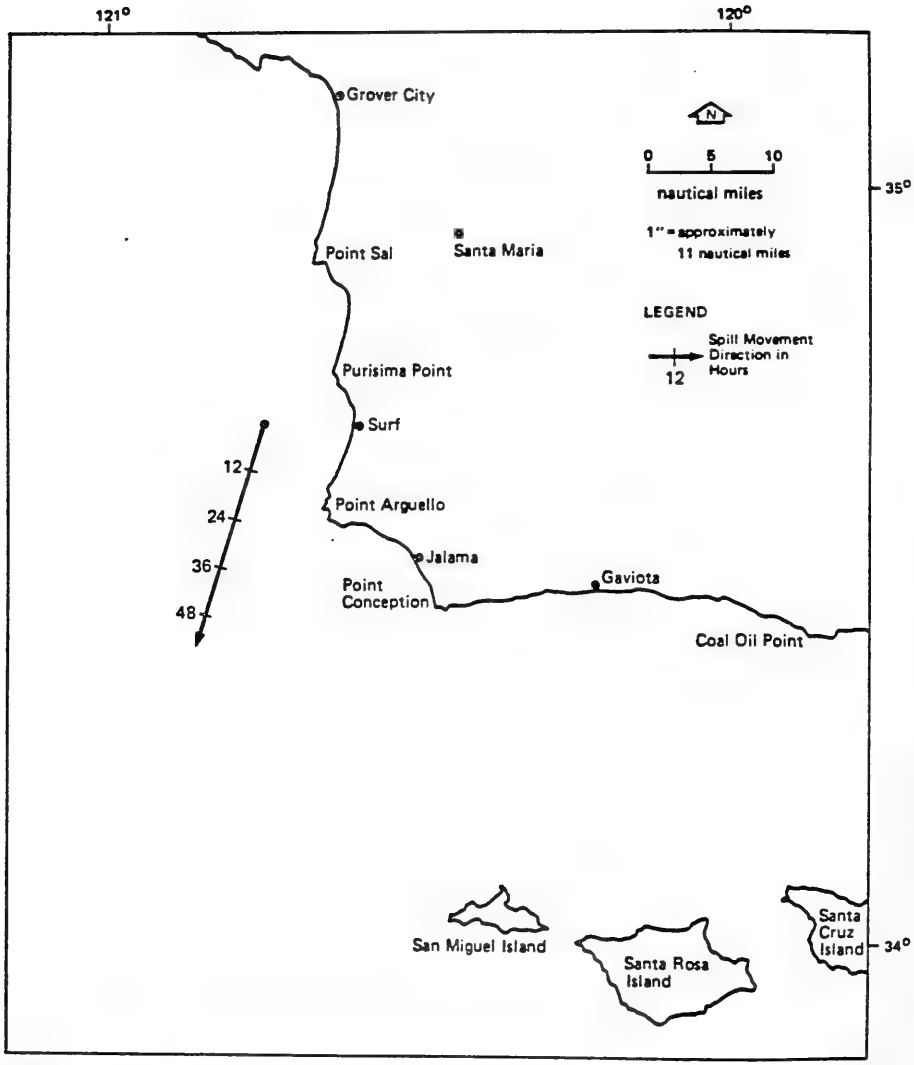


Figure 2. PREDICTION OF SPILL MOVEMENT- FEBRUARY

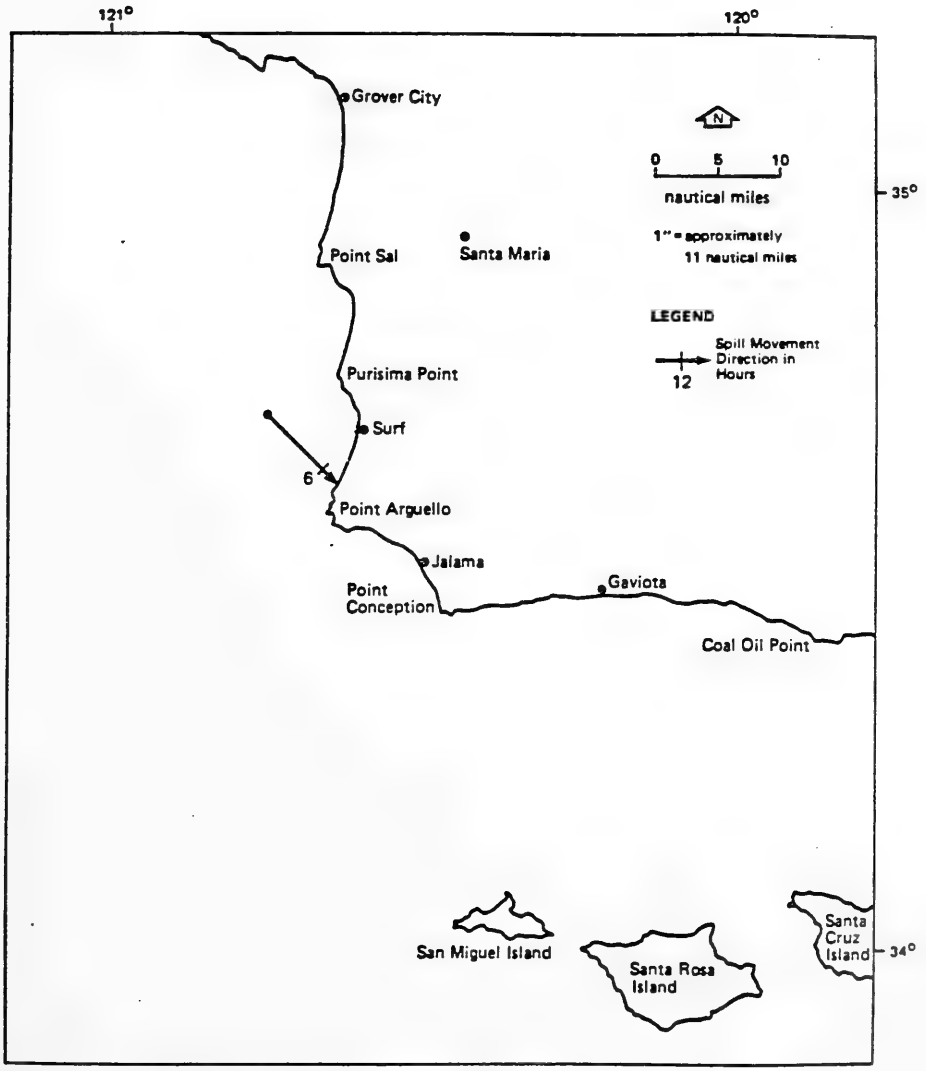


Figure 3. PREDICTION OF SPILL MOVEMENT- MARCH

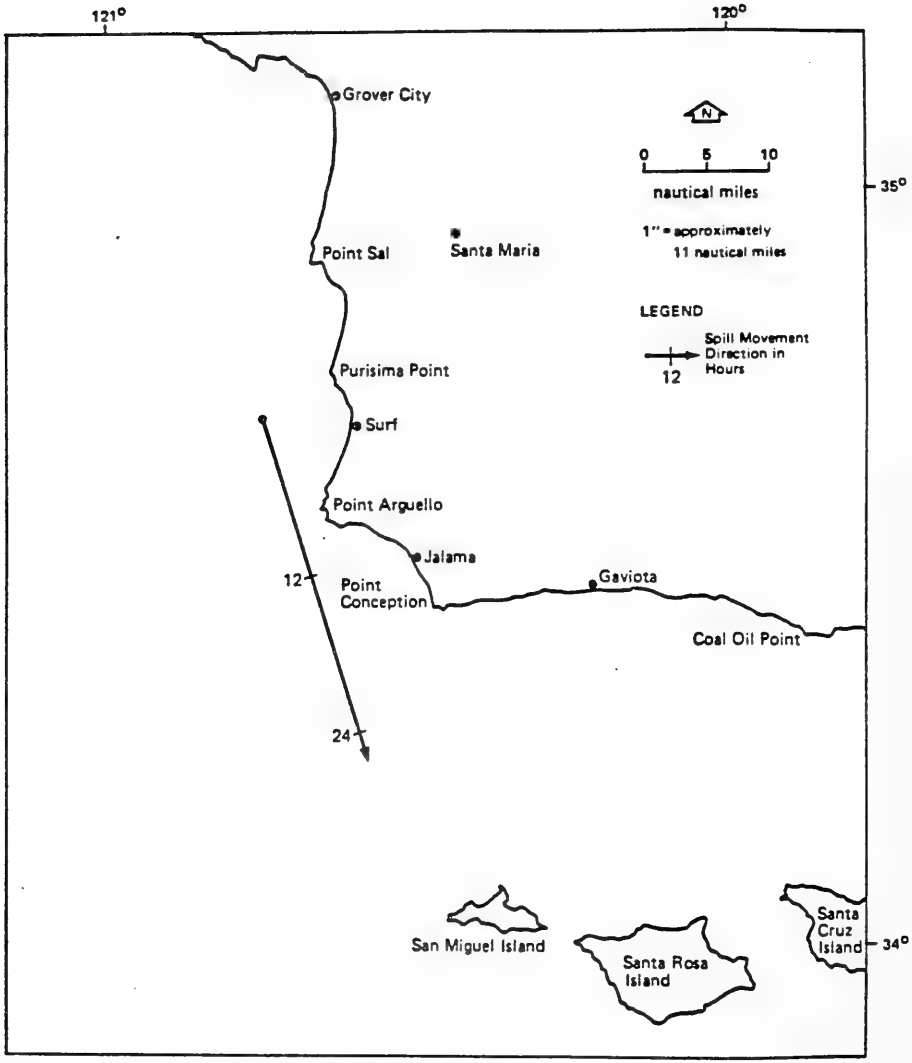


Figure 4. PREDICTION OF SPILL MOVEMENT- APRIL

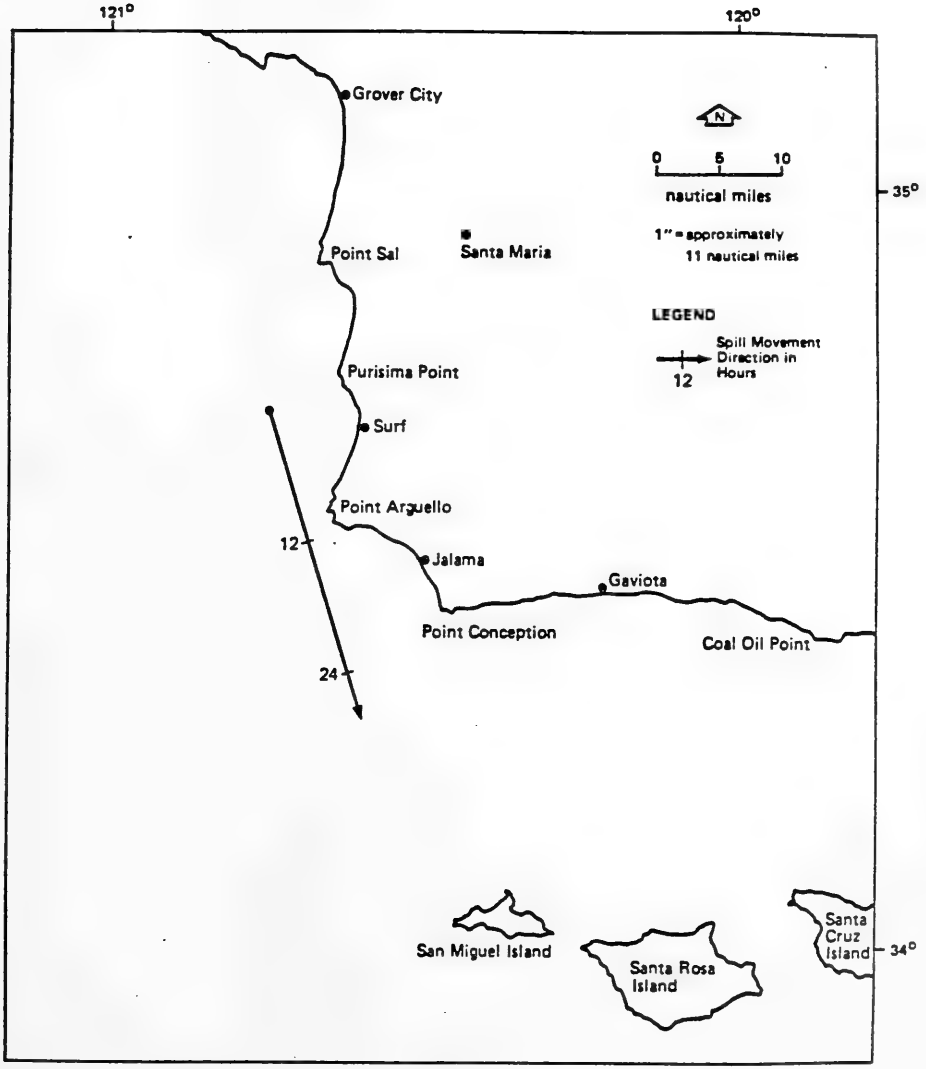


Figure 5. PREDICTION OF SPILL MOVEMENT- MAY

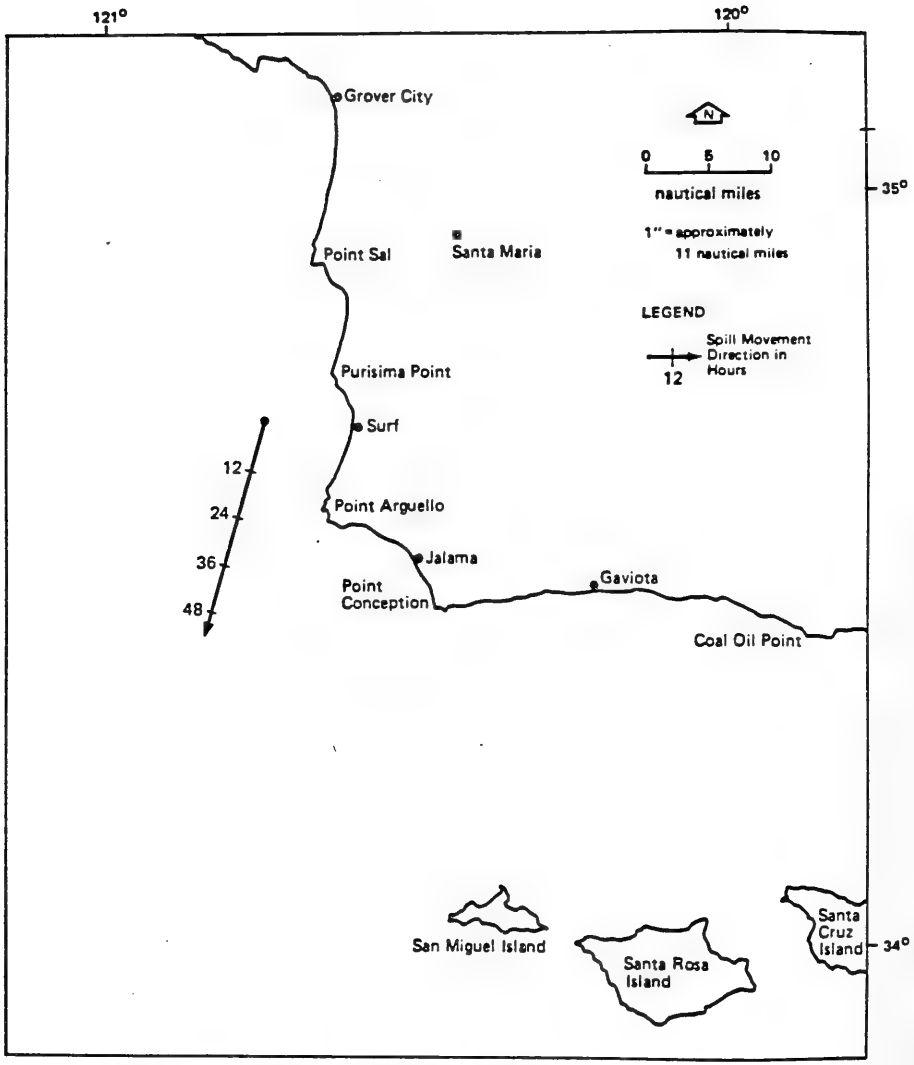


Figure 6. PREDICTION OF SPILL MOVEMENT- JUNE

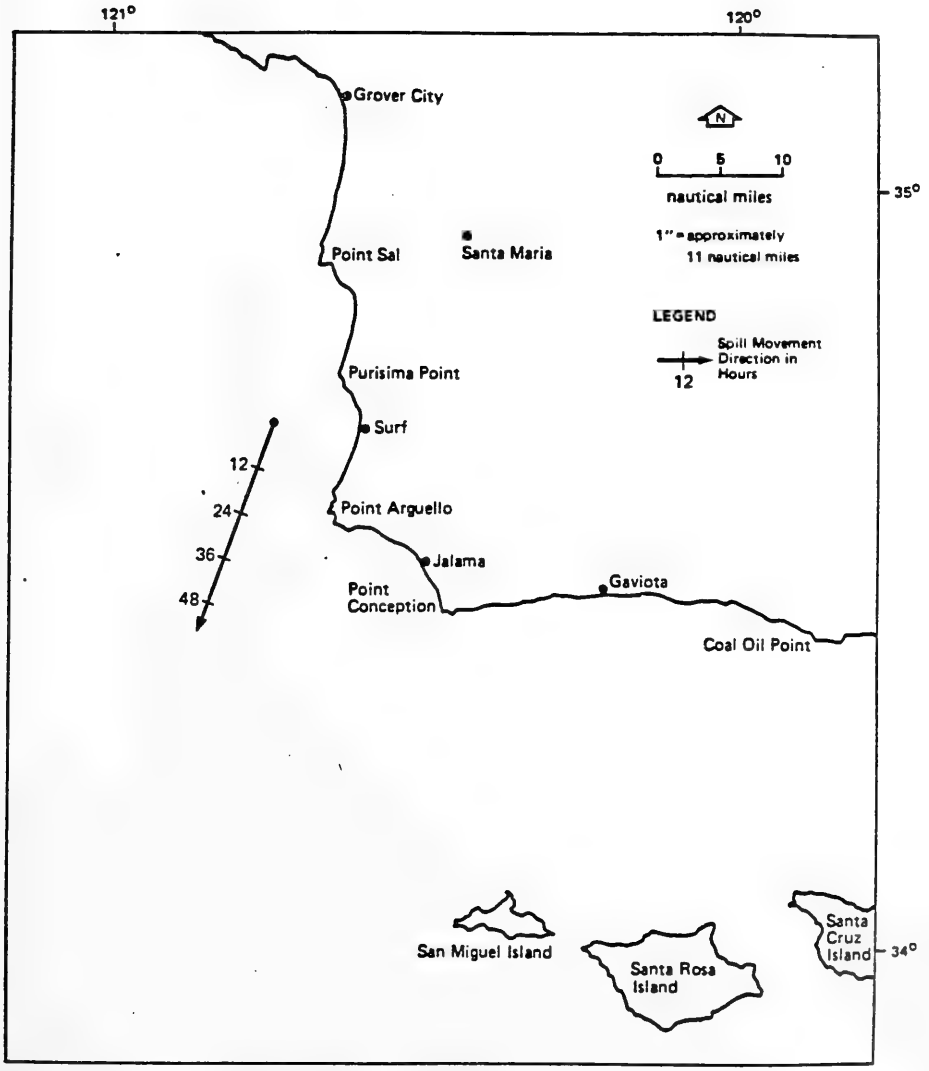


Figure 7. PREDICTION OF SPILL MOVEMENT- JULY

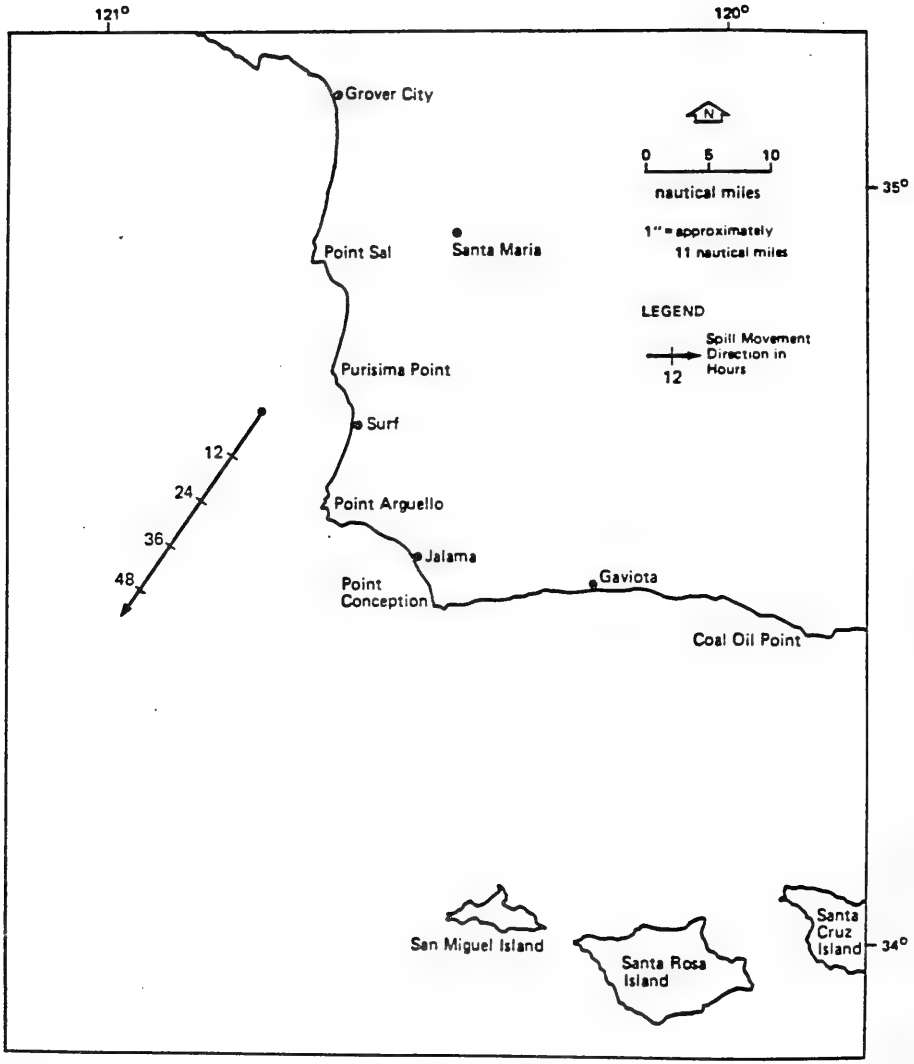


Figure 8. PREDICTION OF SPILL MOVEMENT- AUGUST

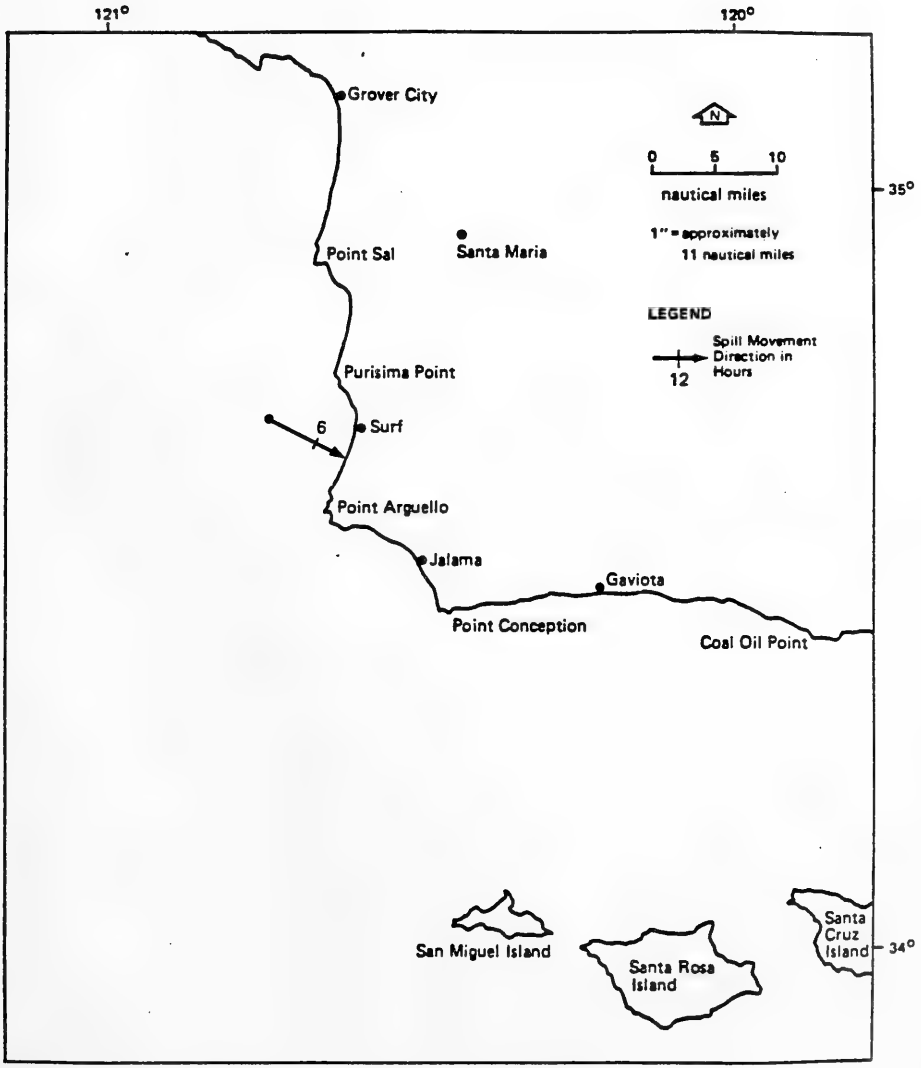


Figure 9. PREDICTION OF SPILL MOVEMENT-SEPTEMBER

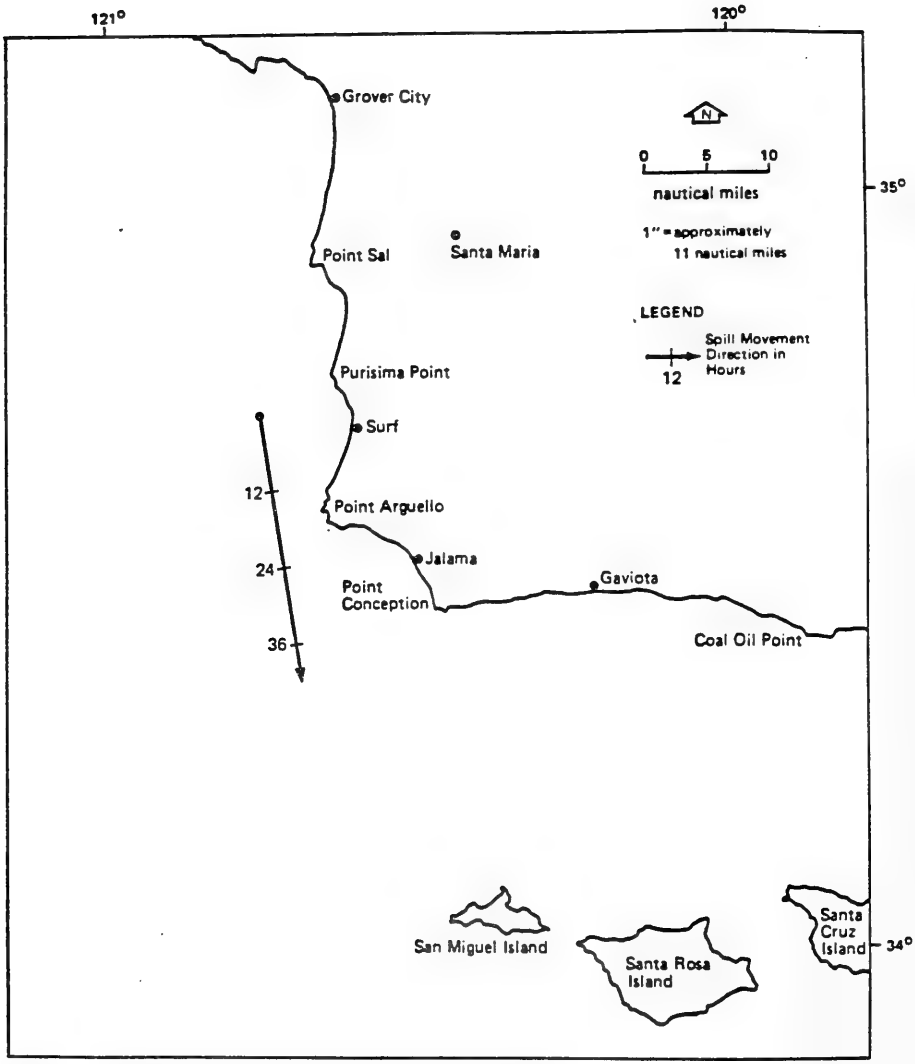


Figure 10. PREDICTION OF SPILL MOVEMENT- OCTOBER

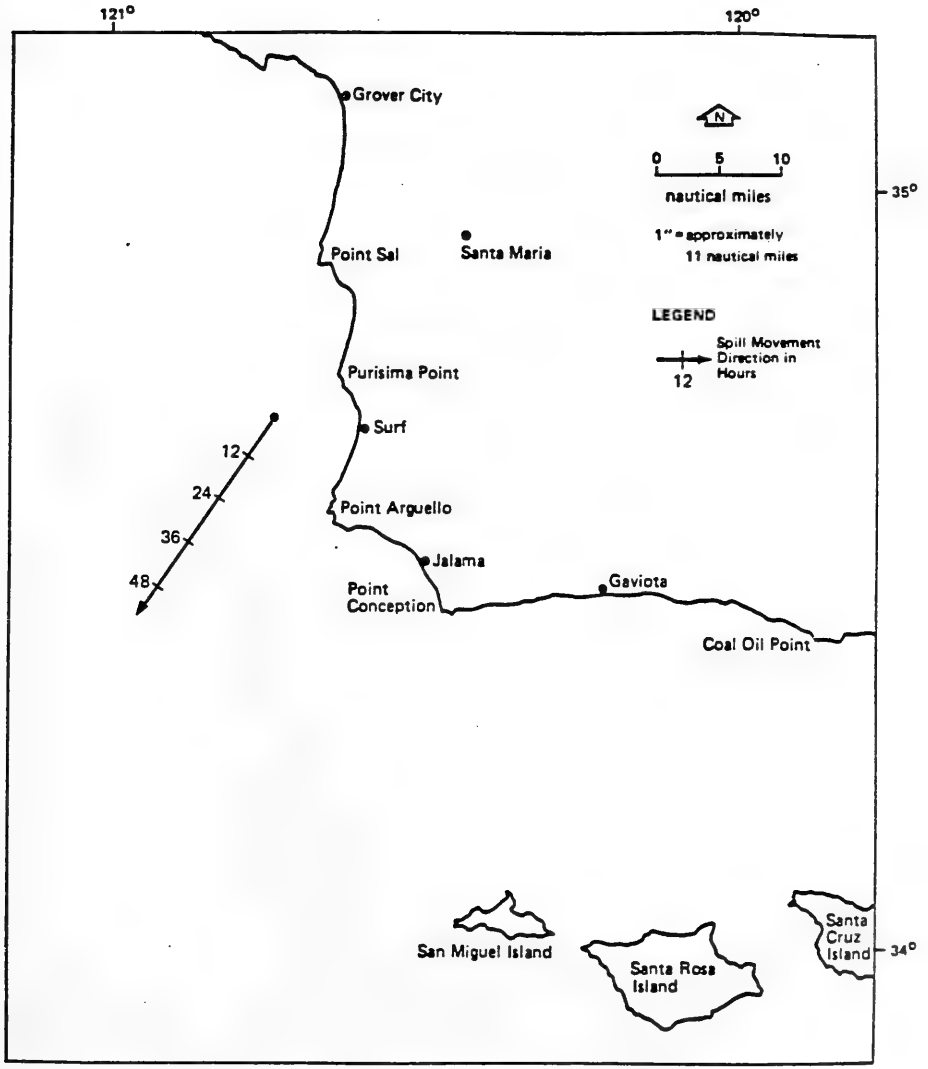


Figure 11. PREDICTION OF SPILL MOVEMENT- NOVEMBER

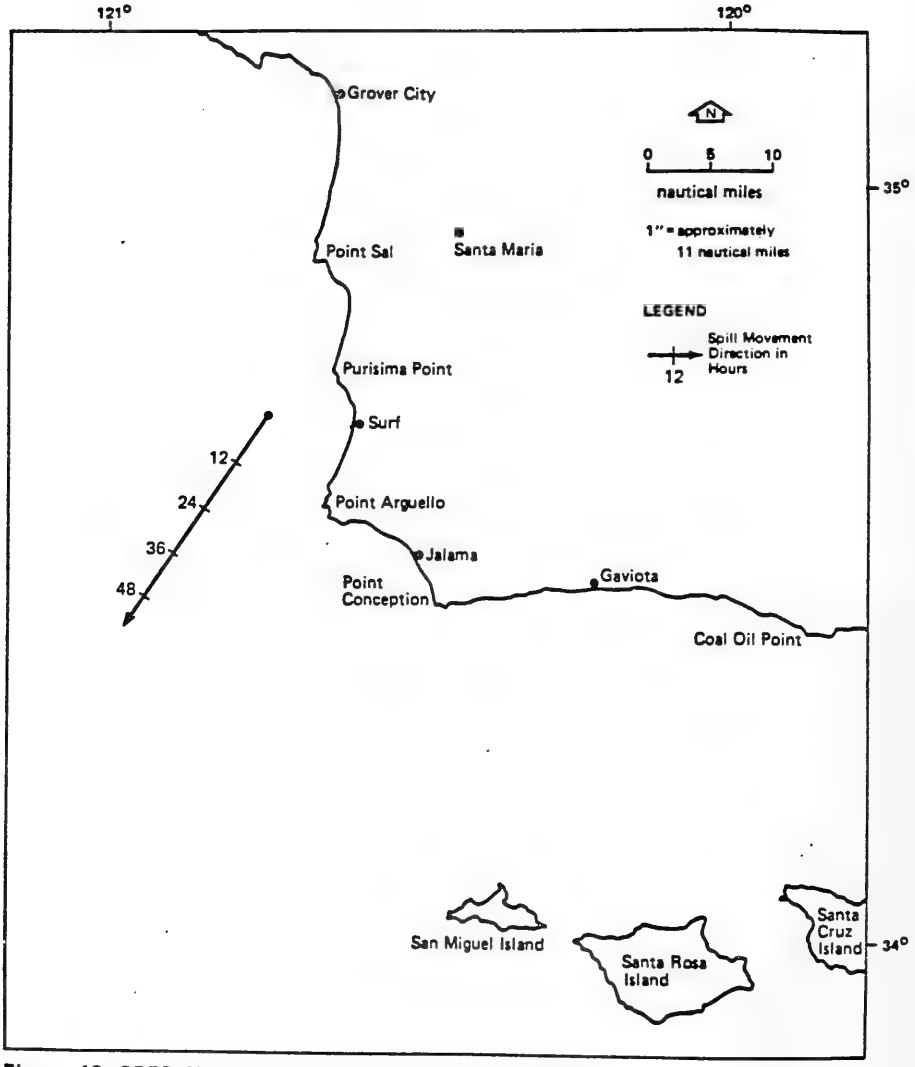
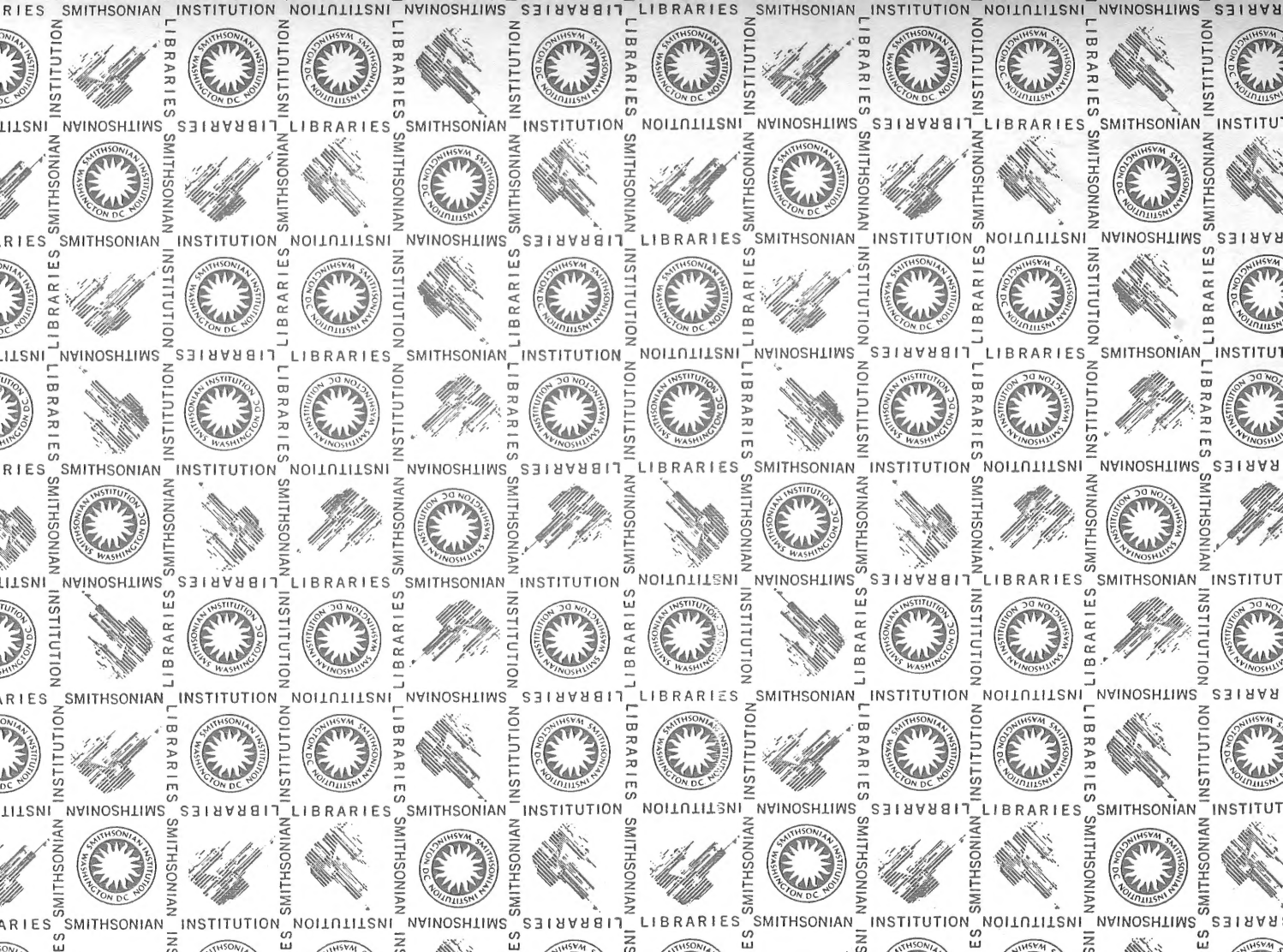
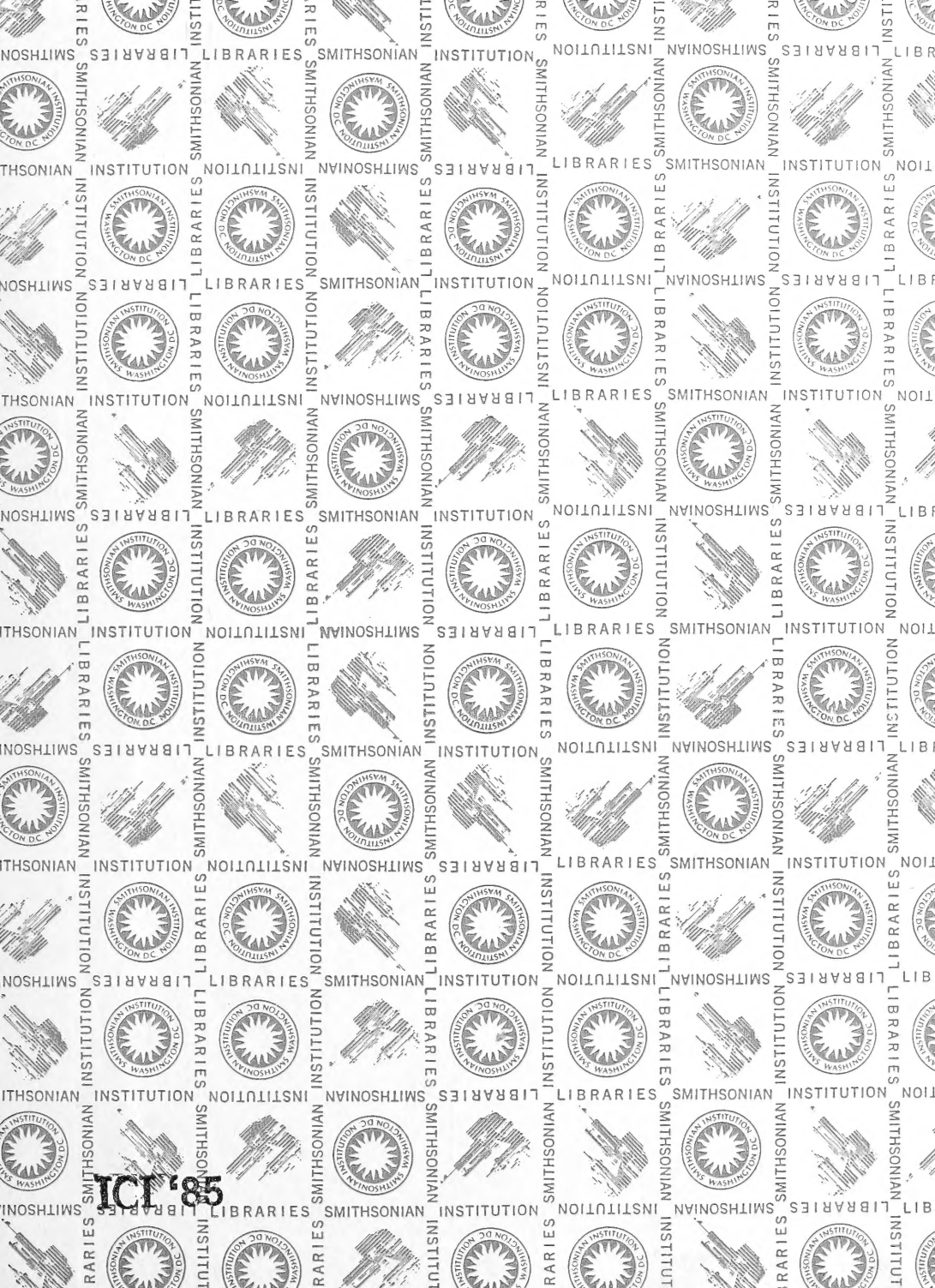


Figure 12. PREDICTION OF SPILL MOVEMENT- DECEMBER


SMITHSONIAN INSTITUTION LIBRARIES


ICI '85