ANALYSIS OF THE RISK OF DAMAGE
TO THE STATES OF FLORIDA AND
TEXAS FROM THE SEADOCK, INC.,
PROPOSED DEEPWATER PORT

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
ENVIRONMENTAL DATA SERVICE
DEEPWATER PORTS PROJECT OFFICE

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U.S. DEPARTMENT OF COMMERCE
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EXECUTIVE SUMMARY

1. Results of the NOAA analysis indicate that the risk of damage to the coastal environment of Florida from the proposed SEADOCK, Inc., deepwater port is equal to or greater than the risk posed to the coastal environment of Texas.

2. This conclusion is based upon the following considerations:

   (a) Analyses of the relative risk of exposure from oil spill impacts of coastal environments of the two States indicate that the risk to Florida ranges from approximately one half to two times as great as the risk posed to Texas. The risk of exposure analysis involves the calculation of oil spill stranding for the major impact areas (determined by oil spill trajectory analysis) for the two States involved. Near the SEADOCK deepwater port site, the reduction in tanker pollution event probabilities and the extensive clean-up capability* proposed by the applicant tend to offset, in part, the difference in the potential for pollution events caused by the fewer number of tanker transits through the Straits of Florida than through the Yucatan Passage--an estimated 10-20 percent of the total will transit the Straits.

*Such an extensive cleanup capability is not presently known to be available to the State of Florida.

Consideration could be given to rerouting these tankers through the Yucatan Passage, thus minimizing potential impact on the Florida environment.

(b) Comparison between the two States of the value of vulnerable resources in the impact areas indicates that Florida has at risk 5 times as great a total value of recreation/fisheries resources and 15 times the value in major environmental amenities. To arrive at this comparison, the value and extent of selected coastal environmental resources vulnerable to oil within the impact area of each State have been tabulated and compared. These resources cover recreation, commercial fisheries, and environmental amenities. The extent of Florida's resource valuation within the impact area indicates that the potential for damage is significantly greater than that for Texas.

(c) Comparing the relative risk of exposure and the relative value of vulnerable resources exposed indicates that Florida suffers a greater risk of damage from potential oil spills than Texas. In addition, it is concluded that any damage from non-risk activities in Texas (e.g., pipeline implacement, tank farm construction) is offset by the difference in expected damage from oil spills between the two States.

I. INTRODUCTION

A. BACKGROUND

On December 31, 1975, SEADOCK, Inc., applied to the Secretary of Transportation for a license to own, construct, and operate a deep-water port in the Gulf of Mexico off the coast of the State of Texas. On February 4, 1976, the Honorable Reubin O'D. Askew, Governor of the State of Florida, petitioned the Secretary of Transportation to grant Florida adjacent coastal State (ACS) status for the SEADOCK project, pursuant to Section 9(a)(2) of the Deepwater Port Act of 1974 (the Act), 88 Stat. 2126, 33 USC 1501 - 1524.

On February 10, 1976, the Coast Guard notified the Administrator of NOAA that Florida had petitioned for ACS status and requested that the Administrator, in accordance with the provisions of Section 9(a)(2), recommend whether the risk of damage to Florida's coastal environment is equal to or greater than the risk posed to the coastal environment of Texas. This document provides an analysis of the relative risk to the two States.

B. SUMMARY OF SEADOCK PROJECT

The proposed SEADOCK deepwater port would be located approximately 26 miles off the coast of Texas in 110 feet of water and would consist of:

(1) a marine terminal consisting of four single point mooring (SPM) buoys and an operations platform;

(2) large diameter buried pipelines from the marine terminal to a storage facility 5 miles inland

(3) an onshore tank farm storage facility.

A summary of the SEADOCK application for a deepwater port license is provided in Appendix A.

C. SUMMARY OF FLORIDA PETITION

Florida's primary concern is the risk of damage posed to its coastal environment from tankers in transit off its coast to and from the SEADOCK deepwater port. Florida stresses the vulnerability to oil spills of its beach-related tourism which is a major economic activity, and the threat of such spills to its mangrove and marsh shorelines, coastal fisheries, and estuaries. A copy of the letter from the Governor of Florida requesting adjacent coastal State status is provided in Appendix B.

D. GENERAL CONSIDERATIONS

Section 9(a)(2) of the Act states that the Administrator of NOAA shall recommend to the Secretary of Transportation whether the risk of damage to the coastal environment of a State petitioning for ACS status is greater than or equal to the risk posed to the State directly connected by pipeline to the proposed deepwater port. Section 3(3) of the Act defines coastal environment to include "transitional and intertidal areas, bays, lagoons, salt marshes, estuaries, and beaches; the fish, and wildlife and other living resources thereof; and the recreational and scenic values of such lands, waters and resources."

In formulating its approach, NOAA considered several threshold issues of importance to the Section 9(a)(2) risk of damage analysis. Initial policy guidance was received from the U. S. Coast Guard, as lead agency under the Act, on December 2, 1975, in the form of a legal interpretation of Section 9(a)(2) rendered by its Chief Counsel. In essence, that legal opinion stated that the Congressional intent behind Section 9(a)(2) mandated a thorough evaluation of all possible risks to the coastal environment of the respective States under consideration including, but not limited to, oil spills occurring at the proposed deepwater port or within the safety zone. Moreover, that opinion also stated that a petitioning State could submit whatever evidence it desired to show the degree of risk posed to that State's coastal environment from the construction and operation of the proposed deepwater port and that such evidence would be considered by the Secretary of Transportation in making his designation.

In response to a NOAA request of January 12, 1976, for further guidance and elaboration of policy, the U. S. Coast Guard advised, by letter dated January 20, 1976, that any risk of damage analysis should include, inter alia, an evaluation of the potential risk of damage occurring as a result of tankers in transit to and from the proposed deepwater port. Additionally, the Coast Guard reiterated its position that the Secretary of Transportation would consider evidence of any potential risk of damage to the coastal environment of a State which was raised by that State in its petition for "adjacent coastal State" status.

On February 10, 1976, NOAA received a request from the U. S. Coast Guard, pursuant to Section 9(a)(2) of the Act, for a recommendation from the Administrator of NOAA as to whether there was a risk of damage to the coastal environment of Florida equal to or greater than the risk posed to the respective States of Texas and Louisiana with respect to the SEADOCK and LOOP deepwater port applications. Along with its request, the U. S. Coast Guard forwarded Florida's petition for ACS status dated February 4, 1976, which stated that its "primary concern relates to tankers in transit off the coast of Florida to and from the proposed deepwater ports".

As a result of the aforementioned guidance and application thereof to the State of Florida's ACS petition, NOAA determined it necessary to evaluate the potential risk of damage to the coastal environment of Florida which would result from tankers in transit off its coast. In this regard, if tankers in transit were not to be properly considered as an aspect of its risk of damage analysis, NOAA has determined that Florida could not qualify for designation as an "adjacent coastal State" pursuant to Section 9(a)(2) of the Act.

As a corollary issue to its consideration of risk of damage posed by tankers in transit, it has been suggested that the State of Florida's concern is invalid because it would benefit from the construction and operation of deepwater ports in the Gulf of Mexico, due to the fact that such ports would reduce the number of smaller tankers transitting the Florida Straits vis-a-vis the use of "supertankers".

According to this line of reasoning, Florida receives an ultimate benefit from a reduction in tanker traffic, it is thus precluded from raising any claim of risk of damage to its coastal environment resulting from the construction and operation of deepwater ports in the Gulf of Mexico.

After duly considering this argument, NOAA has determined that such an approach would be inappropriate. The environmental benefit from reducing the volume of small tanker traffic is one of the main justifications cited by Congress in support of the passage of the Deepwater Port Act of 1974. If one starts with this justification as a premise, the provisions of Section 9(a)(2) can be viewed only as an additional environmental safeguard or mechanism for bringing affected States into the deepwater port decision-making process.

Moreover, even if one were to assume that such a benefit should be considered in the Section 9(a)(2) risk of damage analysis, that section of the Act nonetheless requires that a comparative or relative analysis be conducted. Therefore, this approach would require an analysis of which State suffers a lesser benefit. Given the mandate of Section 9(a)(2), it is conceptually difficult to formulate a procedure to compare risk of damage between two States within this framework.

The NOAA analysis there proceeds on the assumption that if tankers in transit are to be considered, logic dictates that any risk of damage analysis must be conducted in a manner that compares the risk of damage to each respective State without attempting to include the benefits that generally accrue to the Nation as a result of the construction and operation of deepwater ports. Section 9(a)(2) of the Act speaks only in terms of comparing "risk of damage" and makes no reference to comparison of benefits.

II. NOAA APPROACH TO ADJACENT COASTAL STATE RECOMMENDATION

The NOAA approach focuses on risk of damage from oil spills posed both by operations at the deepwater port and by tankers in transit to the port. The methodology employed has the following framework:

A. RISK OF EXPOSURE ANALYSIS

B. VULNERABLE RESOURCE ANALYSIS

C. RISK OF DAMAGE ANALYSIS AND COMPARISON

The level of DWP activity used for the following analyses are for the period of peak DWP throughput--1990's; 726 tanker visits per year; 4 million barrel per day throughput. The data on resource utilization are the the latest available statistics obtainable for the two States.

A. RISK OF EXPOSURE ANALYSIS

The risk of exposure from oil spills to the coastal environment is measured by the annual average amount of oil expected to reach the shore. The projection of risk of exposure considers the expectation of different spill sizes from oil tanker casualities, port operations, and pipeline failure, and the probability of the spill being transported to a particular location. The analyses also include consideration of cleanup potential, average oil spill transit times, and meteorological conditions.

The methodology employed by NOAA to determine the average annual stranding of oil is similar to that used by the applicant (SEADOCK Environmental Assissment (EA) Chapter 5) and is discussed in Section III, A, below, along with results for the two States.

B. VULNERABLE RESOURCE ANALYSIS

Where possible, the value of the major vulnerable resources such as commercial fisheries, and coastal recreation is expressed in dollars. Not all values, however, may be expressed in economic terms. It is difficult to assign a dollar value to a mangrove swamp, a coral reef, or a coastal marsh. For these cases, the risk of damage is reflected by the recognition accorded certain environmental amenities such as parks and wildlife areas exposed to impact. For comparative purposes, a tabulation of vulnerable resources has been prepared for the two States from qualified sources and is presented in Section III, B, below.

C. RISK OF DAMAGE COMPARISON

A comparison of risk of damage involves a comparison of both the relative risk of exposure to the two States and the relative value of the resources vulnerable to damage from oil. A comparison of such relative risks for Florida and Texas is presented in Section III, C. It has been suggested by the U. S. Coast Guard that non-risk impacts from construction and operations (e.g., pipeline implacement, platform construction, brine disposal) should be considered in comparing risk of damage. NOAA has included such considerations of these non-risk activities in its deliberations.

III. RISK OF DAMAGE ANALYSIS

A. RISK OF DAMAGE ANALYSIS

This section describes the analysis used to evaluate the risk of exposure from oil spills to the coastal environments of Florida and Texas. Risk of exposure involves potential accidents from oil tankers, terminal operations, pipelines, and storage terminals. The risk of exposure attributable to the operation of the proposed deepwater port (including tankers in transit to the port) is the annual average amount of oil expected to be stranded on beaches or in marshes or estuaries of a given impact area.

The analytical methodology presented is similar to that used by SEADOCK, Inc. (the applicant) in preparing his Environmental Analysis (Chapter 5 of the SEADOCK Environmental Analysis (EA), and consists of four essential steps as shown below:

1. Analysis of Expected Frequency of Occurrence of a Polluting Event → 2.
2. Spill Size/Frequency Distribution Analysis → 4.
3. Trajectory Analysis Impact Probabilities and Transit Times → 4.
4. Risk Exposure Analysis (Annual) Average Expected Stranding of Oil for Impact Areas)

1. <u>Analysis of Expected Annual Frequency of Polluting Events</u>

The analytic procedures used in this section are similar to those applied by SEADOCK, in Section 5.2 of its Environmental Analysis. In determining the risk of exposure of oil stranding in Texas, SEADOCK, in its environmental analysis, selected the period of oil throughput in the late 1990's as follows:

726 tanker visits per year - 4 million barrels per day

The subsequent analyses and comparisons are based upon such peak period conditions as they affect both Florida and Texas.

(a) Tankers off Texas

The analysis is presented below in stepwise fashion. Reference is made to Table 1 (for column notation below) and Chapter 5.2 of the SEADOCK, Inc., EA for comparison.

A series of statistics on worldwide pollution event probabilities per vessel year is taken from the SEADOCK application as a starting point for this analysis (Column 1) (SEADOCK, Inc., EA Table 5.2-1). These statistics are broken out for vessels in the 0-30,000 dwt (bunkering and service vessels) and >70,000 dwt (tanker) classes which are the two categories of concern.

The worldwide pollution event probability statistics (Column 1) are first converted to those event probabilities that more truly represent a coastal or harbor condition as defined by the applicant for SEADOCK, Inc. The application of a multiplier (Column 2a--fraction of accidents in coastal/harbor waters) and divisor (Column 2b--fraction of year vessel spends in coastal/harbor waters) constitutes this conversion factor (SEADOCK, Inc., EA, Table 5.2-2). This conversion yields coastal/harbor event probabilities (Column 3).

TABLE 1

Expected Frequency of Occurrence of a Polluting Event from Tankers off Texas

	(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
							Peak Period			
SEADOCK Casualty Mode	Worldwide Pollution Event Probability Per Vessel Year	Coastal/Harbor Conversion Factor Multi-plier	Divisor	Coastal/Harbor Event Probab. (PVY)	Risk Reduction Factor	DWP Event Probab.	Exposure (Vessel-Years)	Overall Spill Freq. (Annual)	Ave. Spill Size (bbls)	Annual Oil Spill Expectation (bbls)
Collision										
0-30,000dwt	.00717	1.00	1.00	.00717	.1350	.00097	6	.0058	292	1.696
> 70,000dwt	.00604	.72	.136	.03198	.0945	.00302	5.8	.0175	11,447	200.62
Sealane Collision	.00604	.72	.136	.03198	*	.03198	.3	.0096	11,447	109.82
Grounding										
0-30,000dwt	.00745	.45	.27	.01242	.0200	.00025	6	.0015	475	0.71
> 70,000dwt	.00745	.45	.27	.01242	.0200	.00025	5.8	.0014	4,331	6.24
Structural Failure										
0-30,000dwt	.00310	1.00	1.00	.00310	.6000	.00186	6	.0111	24	.268
> 70,000dwt	.00887	.29	.194	.01326	.3000	.00398	5.8	.0231	12,190	281.24
Ramming										
0-30,000dwt	.00157	1.00	1.00	.00157	.3150	.00050	2	.0010	10	.01
> 70,000dwt	.00177	.18	.194	.00164	.3150	.00052	5.8	.0030	1,336	4.03
Fire										
0-30,000dwt	.00235	1.00	1.00	.00235	*	.00235	6	.0141	360	5.076
> 70,000dwt	.00292	.73	.194	.01099	.3600	.00395	5.8	.0295	360	
Explosion										
0-30,000dwt	.00250	1.00	1.00	.00250	*	.00250	6	.0150	2,490	37.35
> 70,000dwt	.00174	.56	.194	.00502	*	.00502	5.8	.0291	13,814	402.21
Capsizing										
0-30,000dwt	.00088	.32	.27	.00104	.1600	.00017	6	.0010	332	.339
> 70,000	.00088	.32	.27	.00104	.1600	.00017	5.8	.0009	33,927	33.45
Breakdown										
0-30,000dwt	.00110	.53	.27	.00216	*	.00216	6	.0130	3	.039
> 70,000dwt	.00110	.53	.27	.00216	*	.00216	5.8	.0127	9	.109
							Total	.1893	Total	1083.2

The applicant has calculated a "risk reduction factor" (Column 4) which should apply in the vicinity of his DWP and which essentially reduces the probability of accidents occurring in that area. These factors are based upon geography, DWP geometry, traffic control, regulation, and communications (SEADOCK EA, Section 5) Column 3 multiplied by Column 4 yields the SEADOCK pollution event probability per vessel year.

The number of vessel years that will be exposed to the SEADOCK pollution event probabilities is calculated as follows (Column 6).

(1) 726 tanker (>70,000 dwt class) transits/year 3 days/transit = 5.8 vessel years

(2) Each tanker spends 4 hours in the sealane crossing 50 miles from SEADOCK and is particularly exposed to such risk = .3 vessel years

In the above calculations, an additional collision risk is considered for the more catastrophic spills at the intersection of the DWP Fairway and the off-shore safety fairway 50 miles seaward of the DWP facility. A similar approach was used in the LOOP EA.

(3) Six bunkering vessels (0-30,000 dwt class) full time at DWP = 6 vessel years.

The average oil spill size for each casuality mode has been listed in the application (SEADOCK EA) and is reflected in Column 8. Column 7 multiplied by Column 8 yields annual oil spill expectation in bbls (Column 9).

The expected annual frequency from this analysis is computed by summing Column 7 and is set forth below along with the annual expected oil spill in barrels.

TEXAS

Annual Spill Frequency	.1893
Annual Oil Spill Expectation (bbls)	1083

(b) Tankers off Florida

The same approach as utilized in (a), above also has been used to calculate annual oil spill frequency for Florida starting from the worldwide statistics. Four tables have been calculated because of the necessity to consider a range of vessel-exposure years. (See below.) Refer to Tables 2 - 4 for the following:

(1) The Straits of Florida is where the major tanker accident risk occurs and represents a coastal condition similar to that defined for offshore Texas; the Column 1 to Column 3 conversion is applied.

(2) The risk reduction factor, that applies at the SEADOCK site, does not apply for Florida.

(3) It is unclear as to the precise number of vessel years to which Florida will be exposed to a pollution casuality

TABLE 2

Expected Frequency of Occurrence of a Polluting Event From Tankers Off Florida
(.15 vessel exposure years)

FLORIDA Casualty Mode	(1) Worldwide Pollution Event Probability Per Vessel Year	(2) Coastal/Harbor Conversion Factor Multiplier	 Divisor	(3) Coastal/Harbor Event Probab. (PVY)	(4) Peak Period Exposure (Vessel-Years)	(5) Overall Spill. Freq. (Annual)	(6) Ave. Spill Size (bbls)	(7) Annual Oil Spill Expectation (bbls)
Collision								
> 70,000dwt	.00604	.72	.136	.03198	.15	.00479	11,447	54.9
Grounding								
> 70,000dwt	.00745	.45	.27	.01242	.15	.00186	4,331	8.1
Structural Failure								
> 70,000dwt	.00887	.29	.194	.01326	.15	.00199	12,190	24.3
Ramming								
> 70,000dwt	.00177	.18	.194	.00164	.15	.00025	1,336	.3
Fire								
> 70,000dwt	.00292	.73	.194	.01099	.15	.00165	360	.6
Explosion								
> 70,000dwt	.00174	.56	.194	.00502	.15	.00075	13,814	10.4
Capsizing								
> 70,000dwt	.00088	.32	.27	.00104	.15	.00016	33,927	5.3
Breakdown								
> 70,000dwt	.00110	.53	.27	.00216	.15	.00032	9	0
					Total	.0118		103.9

TABLE 2 A

Expected Frequency of Occurrence of a Polluting Event From Tankers Off Florida
(.30 vessel exposure years)

FLORIDA Casualty Mode	(1) Worldwide Pollution Event Probability Per Vessel Year	(2) Coastal/Harbor Conversion Factor Multi-plier	(2) Coastal/Harbor Conversion Factor Divisor	(3) Coastal/Harbor Event Probab. (PVY)	(4) Peak Period Exposure (Vessel-Years)	(5) Overall Spill Freq. (Annual)	(6) Ave. Spill Size (bbls)	(7) Annual Oil Spill Expectation (bbls)
Collision								
> 70,000dwt	.00604	.72	.136	.03198	.30	.00959	11,447	109.8
Grounding								
> 70,000 dwt	.00745	.45	.27	.01242	30	.00373	4,331	16.1
Structural Failure								
> 70,000dwt	.00807	.29	.194	.01326	30	00398	12,190	48.5
Ramming								
> 70,000dwt	.00177	.18	.194	.00164	.30	.00049	1,336	.7
Fire								
> 70,000dwt	.00292	.73	.194	.01099	.30	.00329	360	1.2
Explosion								
> 70,000dwt	.00174	.56	.194	.00502	.30	.00151	13,814	20.8
Capsizing								
> 70,000dwt	.00088	.32	.27	.00104	.30	.00031	33,927	10.6
Breakdown								
> 70,000dwt	.00110	.53	.27	.00216	.30	.00065	9	0
					Total	.0236		207.7

TABLE 3

Expected Frequency of Occurrence of a Polluting Event From Tankers Off Florida
(.41 vessel exposure years)

FLORIDA Casualty Mode	(1) Worldwide Pollution Event Probability Per Vessel Year	(2) Coastal/Harbor Conversion Factor Multi-plier	(2) Coastal/Harbor Conversion Factor Divisor	(3) Coastal/Harbor Event Probab. (PVY)	(4) Peak Period Exposure (Vessel-Years)	(5) Peak Period Overall Spill Freq. (Annual)	(6) Peak Period Ave. Spill Size (bbls)	(7) Peak Period Annual Oil Spill Expectation (bbls)
Collision								
> 70,000dwt	.00604	.72	.136	.03198	.41	.0131	11,447	150.07
Grounding								
> 70,000dwt	.00745	.45	.27	.01242	.41	.0051	4,331	22.05
Structural Failure								
> 70,000dwt	.00887	.29	.194	.01326	.41	.0054	12,190	66.27
Ramming								
> 70,000dwt	.00177	.18	.194	.00164	.41	.0007	1,336	.899
Fire								
> 70,000dwt	.00292	.73	.194	.01099	.41	.0045	360	1.62
Explosion								
> 70,000dwt	.00174	.56	.194	.00502	.41	.0021	13,814	28.45
Capsizing								
> 70,000dwt	.00088	.32	.27	.00104	.41	.0004	33,927	14.51
Breakdown								
> 70,000dwt	.00110	.53	.27	.00216	.41	.0009	9	.0079
					Total	.0322		283.9

TABLE 4

Expected Frequency of Occurrence of a Polluting Event From Tankers Off Florida
(.55 vessel exposure years)

FLORIDA	(1)	(2)		(3)	(4)	(5)	(6)	(7)
					Peak Period			
Casualty Mode	Worldwide Pollution Event Probability Per Vessel Year	Coastal/Harbor Conversion Factor Multi-plier	Coastal/Harbor Conversion Factor Divisor	Coastal/Harbor Event Probab. (PVY)	Exposure (Vessel-Years)	Overall Spill Freq. (Annual)	Ave. Spill Size (bbls)	Annual Oil Spill Expectation (bbls)
Collision								
> 70,000dwt	.00604	.72	.136	.03198	.55	.0176	11,447	201.32
Grounding								
> 70,000dwt	.00745	.45	.27	.01242	.55	.0068	4,331	29.58
Structural Failure								
> 70,000dwt	.00887	.29	.194	.01326	.55	.0073	12,190	88.89
Ramming								
> 70,000dwt	.00177	.18	.194	.00164	.55	.0009	1,336	1.21
Fire								
> 70,000dwt	.00292	.73	.194	.01099	.55	.0060	360	2.18
Explosion								
> 70,000dwt	.00174	.56	.194	.00502	.55	.0028	13,814	38.16
Capsizing								
> 70,000dwt	.00088	.32	.27	.00104	.55	.0006	33,927	19.46
Breakdown								
> 70,000dwt	.00110	.53	.27	.00216	.55	.0012	9	.01
					Total	.0432		380.81

risk. Moreover, there are conflicting estimates between the applicant and, among others, the USCG's independent contractor. This issue is further explained in Appendix C. The range of exposure values estimated by NOAA are presented below:

At One Day Exposure Per Transit

55 transits	.15 vessel years
110 transits	.30 vessel-years
150 transits	.41 vessel-years
200 transits	.55 vessel-years

(4) Overall spill frequency and annual oil spill expectation (Column 5 and 7) are calculated as in A. above.

FLORIDA

	Exposure (vessel years)			
	.15	.30	.41	.55
Annual Spill Frequency	.0118	.0236	.0322	.0432
Annual Oil Spill Expectation (bbls)	104	208	284	381

2. Spill Size/Frequency Distribution Analysis

This analysis generates a relationship between spill size (from catastrophic to minor) and frequency of occurrence--the total frequency summing to the value calculated in the previous section for Texas or Florida respectively. Input to this analysis is the overall frequency of polluting events calculated in Section III, A,1. The results of this analysis will be used in the estimation of the annual average expected stranding of oil in Section III, A,3. The SEADOCK frequency distribution analysis is further discussed in Appendix D.

TABLE 5

SEADOCK SPILL SIZE/FREQUENCY DISTRIBUTION

Size, barrels	Spill Expectation (barrels)	Annual Frequency
0-200	4	.026
200-500	9	.024
500-1,000	20	.02670
1-2 M	52	.03466
2-5 M	119	.03400
5-10 M	221	.029470
10-20 M	319	.021270
20-50 M	291	.008310
50-100 M	186	.002480
100-200 M	112	.000747
200-500 M	69	.000147
500-1,000 M	39	.000052
1-2 MM	22	.000015
2-5 MM	11	.000003
	1,474	.207904

The interpolated values for selected spill size classes are shown below (from Seadock, Inc., EA, Page 5.2-19 and Table 5.5-5.).

Spill Size	Probabilities
120,000 - 100,000	13.2 E-4
100,000 - 75,000	12.4 E-4
75,000 - 50,000	12.4 E-4
50,000 - 25,000	6.9 E-3
25,000 - 5,000	52.2 E-3
5,000 - 0	145.0 E-3
Catastrophic	
120,000 - 200,000	7.0 E-4
200,000 - 500,000	1.47 E-4
500,000 - 1 x 10^6	5.2 E-5
1 x 10^6 - 2 x 10^6	1.5 E-5

TABLE 6

TEXAS TANKER SPILL FREQUENCIES

Spill Category (bbls)	Orig.Freq. (Table 5)	Quotient*	Recalculated Texas Spill Frequency
120-100	13.2E-4	.911	12.0E-4
100- 75	12.4E-4	.911	11.3E-4
75- 50	12.4E-4	.911	11.3E-4
50- 25	6.9E-3	.911	6.3E-3
25- 5	52.5E-3	.911	47.8E-3
5- 0	1.45E-1	.911	1.3E-1
120-200	6.0E-4	.911	5.4E-4
200-500	1.5E-4	.911	1.3E-4
500- 10^6	5.2E-5	.911	4.7E-5
$1x10^6$-$2x10^6$	1.5E-5	.911	1.3E-5

$$\text{*Quotient} = \frac{\text{Recalculated SEADOCK Frequency}}{\text{Original SEADOCK Frequency}} = \frac{.1893}{.2079} = .9105$$

TABLE 7a

FLORIDA TANKER SPILL FREQUENCIES

Low Exposure - 55 Tankers/yr

Spill Category (bbls)	Orig. Freq (Table 5)	Quotient*	Recalculated Florida Spill Frequency
120-100	13.2E-4	.0568	.75E-4
100- 75	12.4E-4	.0568	.70E-4
75- 50	12.4E-4	.0568	.70E-4
50- 25	6.9E-3	.0568	3.9E-4
25- 5	52.5E-3	.0568	2.98
5- 0	1.45E-1	.0568	8.2E-3
120-200	6.0E-4	.0568	3.4E-5
200-500	1.5E-4	.0568	8.5E-6
500- 10^6	5.2E-5	.0568	2.9E-6
1×10^6-2×10^6	1.5E-5	.0568	8.5E-6

$$*\text{Quotient} = \frac{\text{Florida Frequency}}{\text{Original SEADOCK Frequency}} = \frac{.0118}{.2079} = .0568$$

TABLE 7b

FLORIDA TANKER SPILL FREQUENCIES

Low Exposure - 110 Tankers/yr.

Spill Category (bbls)	Orig. Freq. (Table 5)	Quotient*	Recalculated Florida Spill Frequency
120-100	13.2E-4	.1135	1.49E-4
100- 75	12.4E-4	.1135	1.4E-4
75- 50	12.4E-4	.1135	1.4E-4
50- 25	6.9E-3	.1135	7.8E-4
25- 5	52.5E-3	.1135	5.95
5- 0	1.45E-1	.1135	1.6E-2
120-200	6.0E-4	.1135	6.8E-5
200-500	1.5E-4	.1135	1.7E-5
500- 10^6	5.2E-5	.1135	5.9E-6
$1X10^6$-$2x10^6$	1.5E-5	.1135	1.7E-6

$$\text{*Quotient} = \frac{\text{Florida Frequency}}{\text{Original SEADOCK Frequency}} = \frac{.0236}{.2079} = .1135$$

TABLE 7c

FLORIDA TANKER SPILL FREQUENCIES

Medium Exposure - 150 Tankers/yr.

Spill Category (bbls)	Orig. Freq. (Table 5)	Quotient*	Recalculated Florida Spill Frequency
120-100	13.2E-4	.1545	2.0E-4
100- 75	12.4E-4	.1545	1.9E-4
75- 50	12.4E-4	.1545	1.9E-4
50- 25	6.9E-3	.1545	1.1E-3
25- 5	52.5E-3	.1545	8.1E-3
5- 0	1.45E-1	.1545	2.2E-2
120-200	6.0E-4	.1545	9.2E-5
200-500	1.5E-4	.1545	2.3E-5
500- 10^6	5.2E-5	.1545	8.0E-6
$1x10^6$-$2x10^6$	1.5E-5	.1545	2.3E-5

$$\text{*Quotient} = \frac{\text{Florida Frequency}}{\text{Original SEADOCK Frequency}} = \frac{.0236}{.2079} = .1135$$

TABLE 7d

FLORIDA TANKER SPILL FREQUENCIES

High Exposure - 200 Tankers/yr.

Spill Category (bbls)	Orig. Freq. (Table 5)	Quotient*	Recalculated Florida Spill Frequency
120-100	13.2E-4	.2078	2.7E-4
100- 75	12.4E-4	.2078	2.58E-4
75- 50	12.4E-4	.2078	2.58E-4
50- 25	6.9E-3	.2078	1.4E-3
25- 5	52.5E-3	.2078	10.9E-3
5- 0	1.45E-1	.2078	3.0E-2
120-200	6.0E-4	.2078	1.2E-4
200-500	1.5E-4	.2078	3.1E-5
500- 10^6	5.2E-5	.2078	1.1E-5
$1x10^6$-$2x10^6$	1.5E-5	.2078	3.1E-6

$$\text{*Quotient} = \frac{\text{Florida Frequency}}{\text{Original SEADOCK Frequency}} = \frac{.0432}{.2079} = .2078$$

The SEADOCK distribution is presented in Table 5. The distributions of spill frequencies vs. spill size for both Texas and Florida have been determined by assuming a proportional relationship. The frequencies vs. spill size for both Texas and Florida have been determined by assuming a proportional relationship. The frequencies used in this analysis have been determined by multiplying the quotient of recalculated SEADOCK or Florida overall frequency over the original SEADOCK frequency (.2079) times the original SEADOCK frequency table. The results for both Texas and Florida are presented in Tables 6 and 7a-d.

3. Oil Spill Trajectory Analysis

Trajectory analyses are essential for estimating areas of coastline exposed to potential impact and the average times it takes oil to reach selected sectors of the coast. The designation of impact area is important for the subsequent evaluation of the exposure of vulnerable resources. The computation of average times to spill impact is important for estimating the amount of oil that can be cleaned up, where such clean-up capabilities exist. The results of trajectory analyses for both Texas and Florida are presented below.

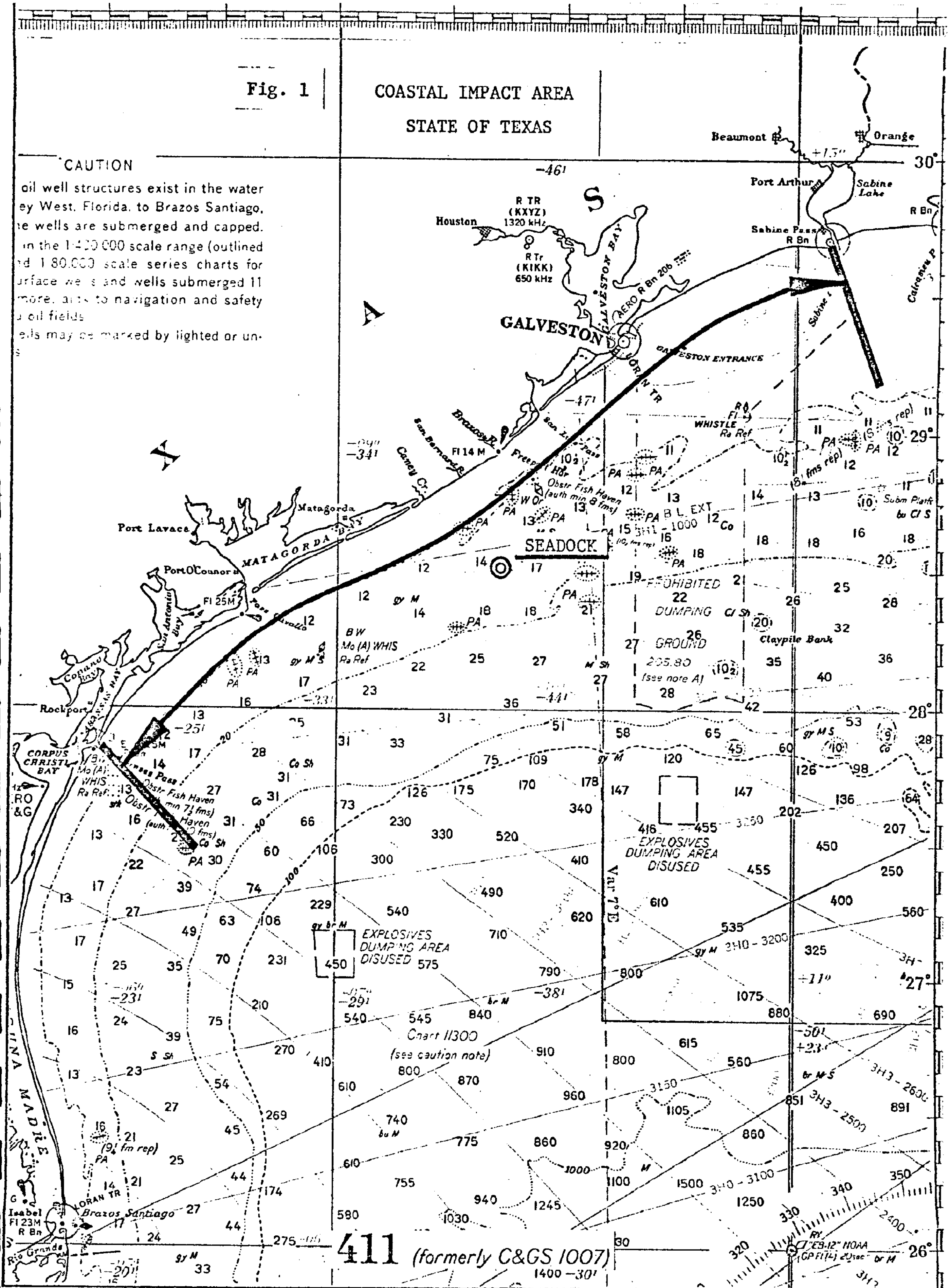
(a) Texas

The SEADOCK EA contained trajectory analyses for spills at the DWP site which indicated that spills would reach the coast 95 % of the time and impact on area from Port Arthur to Corpus Christi. The SEADOCK, Trajectory Analysis procedures and results are fully discussed in Appendix E. NOAA trajectory analyses of oil spills at the SEADOCK site

Fig. 1

COASTAL IMPACT AREA

STATE OF TEXAS



confirm in general, the results in the SEADOCK, Inc., EA and are presented in Appendix F. The designated impact area for Texas is depicted in Figure 1.

(b) Florida

There are two major considerations in modeling trajectories in the Straits of Florida:

(1) conflicting information on tanker routes, and

(2) the extreme velocities and horizontal velocity gradients and unpredictable small-scale current meandering and spin-off eddies that characterize the coastal portion of this area where tankers tend to transit.

Based upon information in the application and discussions with several independent sources, the most likely routes for tankers transitting to and from LOOP, Inc., have been plotted and are shown in Figure 2 (see also Appendix C). NOAA analytic procedures, data input, selection of representative spill sites, and results are presented in Appendix F.

NOAA has determined that an oil spill along the tanker route inside the axis of the Gulf Stream, between Biscayne Bay and Key West, will impact the coast 50% of the time, with an average transit time of 3 days. The impact area that NOAA has designated for further analysis is depicted in Figure 3.

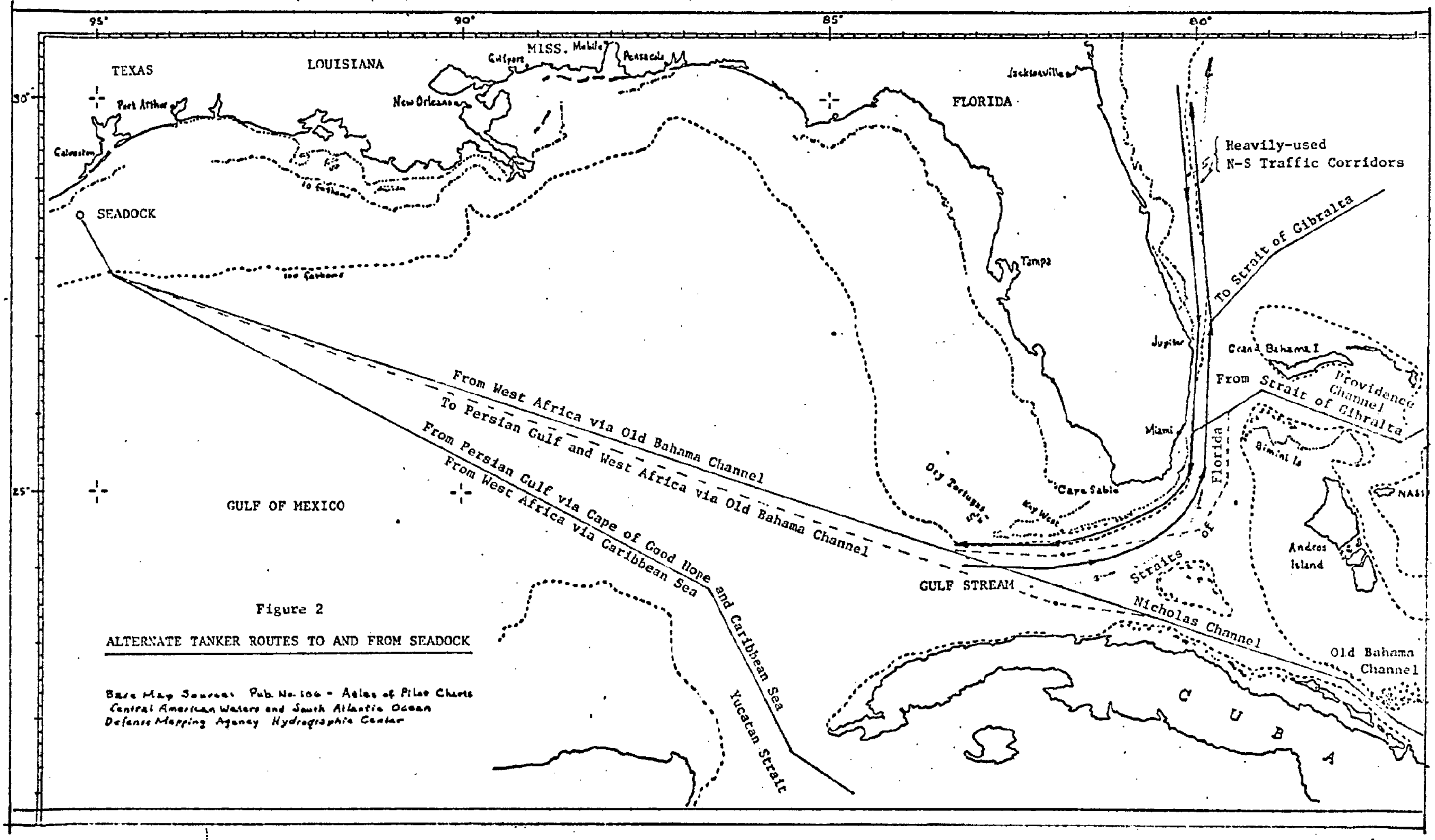
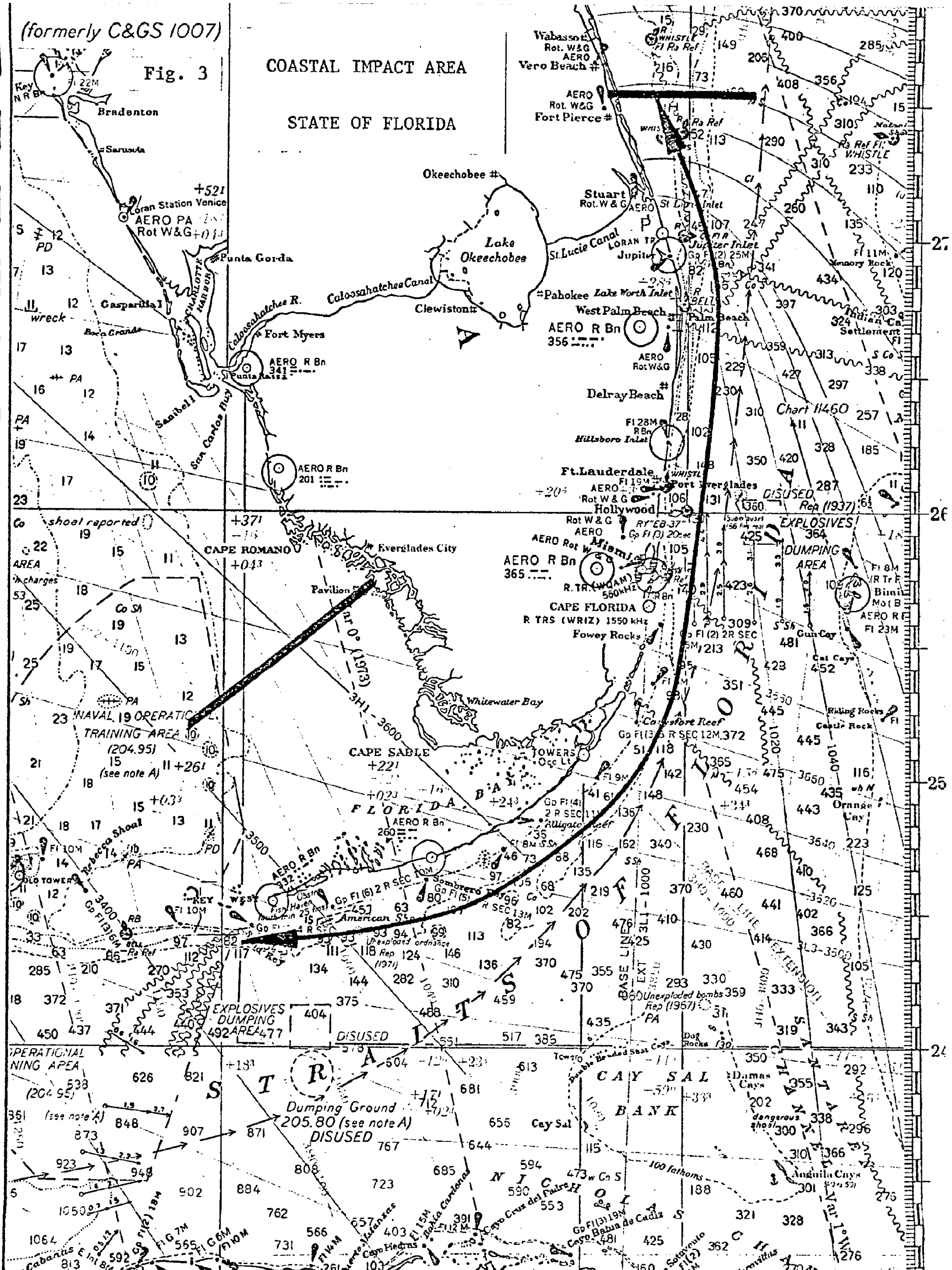


Figure 2

ALTERNATE TANKER ROUTES TO AND FROM SEADOCK

Base Map Source: Pub. No. 106 - Atlas of Pilot Charts
Central American Waters and South Atlantic Ocean
Defense Mapping Agency Hydrographic Center


(formerly C&GS 1007)
Fig. 3
COASTAL IMPACT AREA
STATE OF FLORIDA
Vero Beach
Fort Pierce
Okeechobee
Lake Okeechobee
Stuart
St. Lucie Canal
Caloosahatchee Canal
Caloosahatchee R.
Clewiston
Pahokee
West Palm Beach
Delray Beach
Ft. Lauderdale
Port Everglades
Hollywood
Miami
CAPE FLORIDA
Fowey Rocks
Bradenton
Sarasota
Punta Gorda
Fort Myers
Everglades City
CAPE ROMANO
Whitewater Bay
CAPE SABLE
NAVAL OPERATIONS TRAINING AREA
EXPLOSIVES DUMPING AREA
DISUSED
Dumping Ground 205.80 (see note A) DISUSED
Chart 1160
CAY SAL BANK
Cay Sal
Anguila Cays
Riding Rocks
Castle Rock
Orange Cay
Gun Cay
Cat Cays
Key West
Sombrero
American Shoal
Alligator Reef
Carysfort Reef
Rebecca Shoal

4. Risk of Exposure Analysis

This section combines the spill size/occurrence frequency results from Section 2 with the results from Section 3, above, along with other information to compute the expected average amount of oil reaching the coastline annually.

After an oil spill has occurred, it may (1) be transported either to the coast or offshore, (2) be cleaned up prior to reaching the coast, and/or (3) evaporate, dissolve, or otherwise be removed. The applicant has presented his own analysis of these events which NOAA, for the purpose of this comparison has accepted.* In addition, NOAA has undertaken risk analyses of oil spills reaching the coast (stranding) for the Straits of Florida using the average impact times and frequency of impact resulting from the trajectory analysis discussed above. A summary of the risk of exposure analysis for conditions off both the Texas and Florida coasts is presented below:

(a) Texas

The procedure for the risk of exposure to oil spill stranding applied by SEADOCK, Inc., in its Environmental Analysis and

*(The SEADOCK risk of exposure analysis is based upon an overall spill frequency of .2079. NOAA has recalculated this value to be .1888. The average annual expected stranding of oil calculated by SEADOCK therefore overestimates the amount actually expected.)

results are provided in Appendix G. This analysis combines the following factors:

(1) The frequency (percent time) that the wind is in a given sector (octant) and the frequency that the wind in that octant is in a given speed group;

(2) The chance that a spill of the given size occurs (from both tankers and other port-related activities, the latter provided by the applicant);

(3) A spill class averaging factor which accounts for the fact that the spill conditions are determined by the largest spill in the size interval.

The amount of oil expected at stranding for each spill class is computed using average transit times and the applicant's estimate of clean-up potential (SEADOCK EA, Table 5.5-2). These results are as follows:

TEXAS	
Expected Annual Average Oil Stranding	103 barrels*

(b) Florida

The Florida analysis has been undertaken in a manner similar to that for SEADOCK and is presented in Appendix H. Unlike the Texas situation, the stranding of oil can occur anywhere along the coast from Key West/Dry Tortugas to Miami, based upon assumed tanker routes. NOAA has not attempted to localize where stranding might occur, but rather, it has taken the results to represent an average annual expected stranding within the impact area.

The results of the Florida analysis are summarized below:

	Exposure (bbls)	
Vessel Transits/Year	All Spill Ashore	75% Spill Ashore
55	56	42
110	113	85
150	154	115
200	207	155

*(75 bbls from SEADOCK EA plus 28 bbls from NOAA analysis of catastrophic spills at the fairway intersection. Subject to downward revision.)

5. <u>A Comparison of Exposure Between Texas and Florida</u>.

The expected exposure in bbls from Section 4(a) and 4(b) Texas and Florida respectively) can be compared as a ratio.

Florida Exposure Range (bbls)	Texas Exposure (bbls)	Ratio (times as great to Texas)
43 - 207	103	2.40 - .50

B. COMPARISON OF VULNERABLE RESOURCES

To compare the vulnerable resources of the two States, "impact areas" were delimited using the trajectory analyses described above. The impact areas are depicted in Figures 1 & 3. The general environmental characteristics of the areas are described below, as are selected resources in the areas that are vulnerable to damage by spilled oil.

1. Texas Impact Area

The Texas impact area extends from Port Arthur to Corpus Christi. The area measures 200 statute miles along the territorial boundary, and consists primarily of the barrier islands separating the Texas bay system from the Gulf of Mexico. With the exception of the immediate vicinities of Houston-Galveston and Corpus Christi, the impact area is not extensively developed. The Texas bay system consists of an interconnected series of shallow and highly productive bays and estuaries that serve as habitats and nursery areas for many species of commercial and recreational importance. The bays are effectively separated from open waters of the Gulf by the barrier islands, however, and the major effects of oil spills will likely be realized on the seaward beaches of the islands rather than in the bays.

2. Florida Impact Area

The Florida impact area extends from Ft. Pierce to Key West, a distance of approximately 260 statute miles as measured along the territorial sea limit, and also includes that portion of the Florida coast surrounding Everglades National Park. The impact area contains small islands, beaches, coral reefs, bays, seagrass beds, estuaries, and extensive coastal marshes. The waters within the impact area are inhabited by a variety of organisms of economic and aesthetic importance, and commercial and recreational harvesting of finfish and shellfish in the region is a major industry. The impact area includes the highest valued coastal properties in Florida, and tourism in the region forms a major segment of the State's economy.

3. Resource Comparison

To compare risk of damage from oil spill stranding between two areas, one must compute not only risk of exposure but also the extent and value of the resources vulnerable to oil damage. NOAA selected for comparison three coastal resource categories that encompass the major portion of the vulnerable resource base for the two States.

- Recreation
- Commercial Fisheries
- Environmental Amenities

The categories selected here do not include all economic and environmental resources available in the coastal areas under consideration, but do include those resources considered to be most susceptible to oil spill damage.

(a) Recreation

All recreation that depends on the marine environment could be affected by an oil spill. NOAA selected for comparison three recreation activities that it considers to be most vulnerable to oil damage and to represent the major proportion of recreational activity in exposed sections of the two States: beach use, boating and sportfishing. While other recreational areas could be included in this analysis, NOAA considers that the overall comparison of vulnerable resource values would not be significantly altered by doing so. A discussion of the recreational resources, data sources and values used here is presented in Appendix H.

User-occasion statistics for the Florida and Texas impact areas for each of the recreational activities are presented below:

	1975 User-Occasions	
	Florida	Texas
Beach	100,389,000	8,296,700
Boating	28,233,000	3,204,361
Sportfishing	24,399,000	7,786,000

Values of user-occasions for each of the recreational activities were also compiled, and average values used in subsequent calculations are as follows:

	Range of User Day Valuations	Average Valuation
Beach	$3.50/4.00	3.75
Boating	$11.59/20.00	15.80
Sportfishing	$21.00/22.16	21.58

Using the average of the above user-occasion values, the estimated value of the selected recreational resources for 1975 for the two States are:

	Florida ($)	Texas ($)
Beach use	376,458,750	31,112,625
Boating use	446,081,400	50,628,904
Sportfishing use	526,530,420	168,021,880
Total	$1,349,070,570	$249,763,409

(b) Commercial Fisheries

NOAA realizes that all fishery resources may be vulnerable to damage by oil spills--standing stocks, nursery areas, and the food chains that support commercially important species. In the geographical areas of concern, however, it was possible to identify commercial fisheries resources particularly vulnerable to oil spill damage. These include stocks that are either confined to bay, estuarine or marsh habitats, or confined to vulnerable nearshore habitats such as coral reefs. To estimate the overall value of vulnerable commercial fisheries resources, landing values of selected stocks in each of the two impact areas were chosen as representative of the most vulnerable aspect of the commercial fishery resource.

Landing values for each of the impact areas are given in Table 8 and are summarized below.

	1974 Landing Values	
	Florida	Texas
Selected Vulnerable Stocks	$22,449,600	$45,878,500

The total 1974 landing values for Texas and Florida are presented in Appendix I.

(c) Environmental Amenities

Recreational activities and commercial fisheries have values that can be expressed in dollars. To provide an index for non-commensurate values for the two impact areas, certain environmental amenities were selected for consideration that are particularly vulnerable to oil damage, and that represent areas or biological populations designated by authorities as unique. These amenities include State and national parks, wildlife areas, sanctuaries and preserves and recognized endangered species.

TABLE 8

Selected Vulnerable Commercial Fisheries Landed within Impact Areas[1]

Species	Texas		Florida	
	lbs landed	$ value	lbs landed	$ value
Pink shrimp	n/s[2]	---	11,230,500	7,459,200
White shrimp	10,054,000	13,561,300	n/s	---
Brown shrimp	22,249,200	30,010,700	n/s	---
Blue crabs	6,062,900	829,400	40,600	5,100
Oysters	1,240,400	1,112,000	n/s	---
Spotted sea trout	1,101,100	365,100	163,500	64,400
Spiny lobster	---	---	10,743,600	12,428,600
Scamp, groupers	n/s	---	957,700	336,300
Snappers	n/s	---	1,472,600	577,600
Sponges	---	---	18,300	55,900
Mullet	n/s	---	1,208,100	148,600
King mackerel	n/s	---	4,367,600	1,373,900
Total selected resources in dollars		45,878,500		22,449,600

[1]1974 landings.

[2]Not significant.

Public areas exposed to oil damage in the impact areas are presented in Table 9. The Federal category includes lands such as national parks, monuments and wildlife areas. The State categories include holdings such as parks, recreation areas and wilderness areas. The Florida State land total does not include acreages for several State aquatic preserves located in the impact areas as values were not available. The State land total for Texas includes the area of a planned State park that may be developed for public use in the near future.

Exposed State and Federal Lands in Florida and Texas (expressed in acres)

	Florida	Texas
Federal	1,561,821	53,233
State	73,503	56,278
Total	1,635,324	109,511

The Federal holdings in Florida are located at seven different sites, while those for Texas occupy four localities. State holdings for Florida represent 15 localities, and State holdings for Texas occupy seven different locations.

Table 9. State and Federal Lands in Florida and Texas Vulnerable to Damage by Oil Spills

Florida

Federal Holdings	Acres	State Holdings	Acres
Biscayne NM	103,865	John Pennekamp Coral Reef SP	55,012
Everglades NP	1,400,633	St. Lucie Inlet SP	928
Fort Jefferson NM	47,125	Jonathon Dickinson SP	10,284
Great White Heron NWR	2,764	Bahia Honda SRA	276
Hobe Sound NWR	773	Bill Braggs Cape Florida SRA	900
Key Deer NWR	4,642	Broward Beach SRA	244
Key West NWR	2,019	Ft. Pierce Inlet SRA	338
		Long Key SRA	966
		Pepper Park SRA	1,002
		Hugh Taylor Birch SRA	180
		Indian Key SHS	115
		Lignumvitae SBS	550
		Turkey Point WA	2,500
		Bahia Honda EEL prop.	37
		Fisher Island EEL prop.	180
Total	1,561,821	Total	73,503

Total Florida State and Federal Holdings: 1,635,324[1]

Texas

Federal Holdings	Acres	State Holdings	Acres
Aransas NWR	28,254	Sabine Pass SHS	25
San Bernard NWR	10,086	Sea-Rim SP	15,109
Brazoria NWR	5,863	Galveston Island SP	1,921
Anahuac NWR	9,030	Bryan Beach SRA	509
		Matagorda Island SP[2]	30,000
		J. D. Murphree SWMA	8,407
		Goose Island SP	307
Total	53,233	Total	56,278

Total Texas State and Federal Holdings: 109,511

[1]This total does not include the following Florida State Aquatic Preserves, for which no acreage values were available: Biscayne Bay, Coupon Bight, Lignumvitae Key, Indian River--Vero Beach to Ft. Pierce, Jensen Beach to Jupiter Inlet.

[2]Planned State Park

NM=National Monument; NP=National Park; NWR=National Wildlife Refuge; SP=State Park; SRA=State Recreation Area; SHS=State Historical Site; SBS=State Botanical Site; WA=Wilderness Area; EEL=Environmentally Endangered Land.

The Federally-recognized endangered species occupying coastal areas of Florida and Texas that are likely to be damaged by spilled oil are listed in Table 10, and brief summaries of the survival status of the organisms are provided in Appendix J. Rough estimates of the degree of damage populations of these organisms inhabiting the impact areas could suffer from oil spills are also indicated in Table 10. Species mentioned in the table as having a potential for catastrophic damage are limited in distribution entirely to small sections of the impact areas, and have life habits and reproductive cycles that are wholly dependent upon segments of the coastal marine ecosystem that could be heavily damaged by an oil spill. Survival of those species would be jeopardized by oil spills in that a heavy spill could possibly extirpate the sole remaining reproductive populations of the species.

The group of endangered species considered here does not include all endangered species occupying southern Florida and southeastern Texas, nor does it include migratory endangered species known to pass through the general regions of the impact areas at different times of the year. The endangered species mentioned here are organisms whose primary habitats, either permanently or only during reproductive seasons, are limited to sections of the Texas and Florida coasts that are highly vulnerable to oil spill damage. Entire populations of these species could be damaged or destroyed by a major oil spill. Although spilled oil could kill individuals of migratory species such as the peregrine falcon that appear periodically in the impact areas, it is doubtful that loss of a few individuals would profoundly effect the reproductive status of the remaining populations of the species. It is also doubtful that spilled oil would seriously affect the survival status of endangered species whose feeding and reproductive habitats are restricted to inland sections of the impact areas, hence such organisms are not considered here.

Five species of whales recognized as endangered inhabit Florida waters, and occasionally appear in offshore sections of the Florida impact area. Although little is known about the effects of spilled oil on whale populations, whales are mentioned here in that oil spills could be harmful to those present in offshore Florida waters.

Table 10. Endangered Species Vulnerable to Oil Spills, Florida and Texas Impact Areas

Organism	Critical Distribution Area: Florida	Critical Distribution Area: Texas
Red wolf	Recently extinct	L-M
Brown pelican	S	S
Leatherback turtle	C	Not Present
Atlantic ridley	Not Present	C
Florida manatee	S	M
American alligator	L-M	L-M
Southern bald eagle	M-S	M-S
American crocodile	C	Not Present
Key deer	L	Not Present
Key Largo woodrat*	L	Not Present
Key Largo deermouse*	L	Not Present
Whooping crane	Not Present	C

*Species presently candidates for Federal endangered status.

Degree of vulnerability to spill oil: L=light; M=moderate; S=severe; C=catastrophic.

It should also be mentioned that at least one semienclosed bay in the Florida impact area serves as a winter habitat for large flocks of different kinds of ducks and other migratory water birds. Major oil spills in the immediate vicinity of the Florida rafting and roosting areas could damage or destroy entire flocks of game birds.

4. Relative Value of Vulnerable Environmental Resources.

The ratios of the values of the selected vulnerable resources are presented below:

RESOURCE	FLA/TEXAS RATIO (Times as Great for Florida)
Total Commensurate	5
Recreation	5
° Beach Use	12
° Boating Use	9
° Sportfishing	3
Commercial Fishing	.5
Total Non-Commensurate	15
° Parks and other designated areas (acreage)	

C. RISK OF DAMAGE

The relative risk of damage may be estimated by computing the product of the relative risk of exposure (Exposure Ratio) to relative value of vulnerable resources exposed (Resource Value Ratio). The Exposure Ratio and Resource Value Ratio of the two impact areas are shown below:

Exposure Ratio (from A.5)* (Times as Great for Florida)	Resource Value Ratio (Times as Great for Florida)	
.42 - 2.0	Commensurate	5
	Non-commensurate	15

*Inverse of Ratio in Section III, A.5

The product of the exposure and resource value ratio, for both commensurate and non-commensurate values, are greater than one for the full range of exposure conditions considered:

Commensurate	(.42 - 2.0) x 5 = 2.1 - 10
Non-commensurate	(.42 - 2.0) x15 = 6.3 - 30

IV. CONCLUSION

The NOAA analysis indicates that the risk of damage posed to the coastal environment of Florida is from 2.1 to 10 times as great as the risk of damage posed to the coastal environment of Texas for commensurate values and 6.3 to 30 times as great for non-commensurate values. In addition, NOAA has considered the potential damage from non-risk activities in Louisiana (e.g., pipeline implacement, tank farm construction) and has concluded that any unavoidable adverse impacts will not offset the difference in expected damage from oil spills between the two States.

APPENDICES

A. DESCRIPTION OF SEADOCK, INC., PROPOSED DEEPWATER PORT

B. FLORIDA ADJACENT COASTAL STATE PETITION

C. SEADOCK TANKER ROUTES

D. SPILL SIZE FREQUENCY DISTRIBUTION ANALYSIS

E. SEADOCK TRAJECTORY ANALYSIS

F. NOAA TRAJECTORY ANALYSIS

G. STRANDING ANALYSIS

H. RECREATIONAL RESOURCES

I. ANNUAL SUMMARY OF COMMERCIAL FISH LANDINGS (1974)

J. ENDANGERED SPECIES

K. NON-RISK IMPACTS

APPENDIX A.

DESCRIPTION OF SEADOCK, INC., PROPOSED DEEPWATER PORT

SEADOCK

LOCATION: 28° 30′ 31″ N 95° 16′ 59″ W
APPROX. 26 STATUTE MILES SOUTH OF FREEPORT, TEXAS

WATER DEPTH: 100 FEET
CAPABLE OF HANDLING 500,000 DWT TANKERS

THRUPUT: 2.5 MILLION BBLS/DAY
(MAXIMUM 4 MILLION BBLS/DAY)

DESCRIPTION: MARINE TERMINAL

PUMPING AND OPERATIONS PLATFORM
FOUR SINGLE POINT MOORINGS
(ULTIMATE CONFIGURATION - 6 SPM'S)
52″ PIPELINE CONNECTING EACH SPM TO PUMPING PLATFORM

PIPELINE TO SHORE

TWO 52″ BURIED PIPELINES - 31 MILES
(ULTIMATE CONFIGURATION 3 52″ PIPELINES)
ONE 6″ LIQUID FUEL PIPELINE

ONSHORE TERMINAL

28 TANKS
22 MILLION BARREL TOTAL CAPACITY

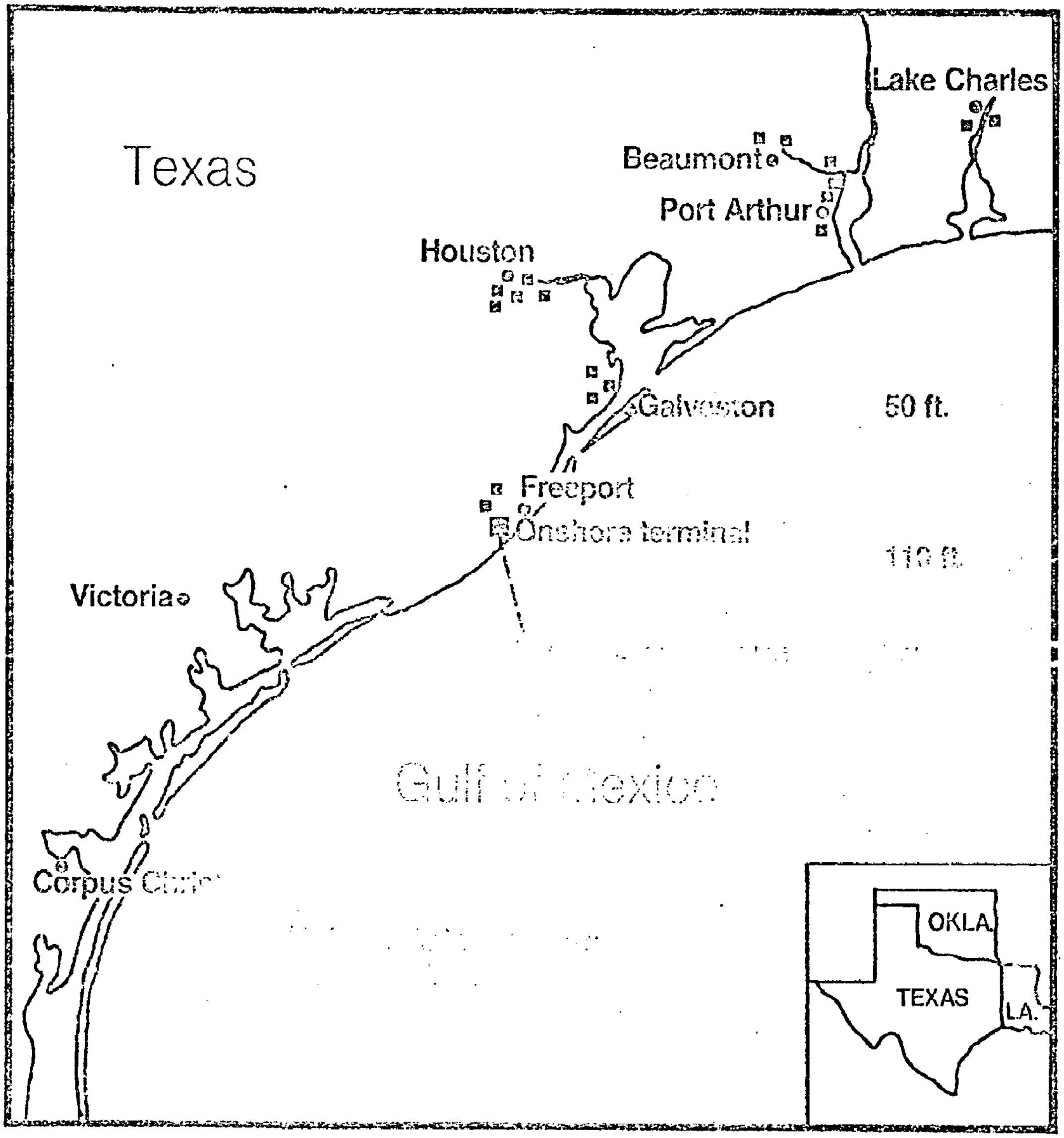


Figure 1
Seadock Project Location

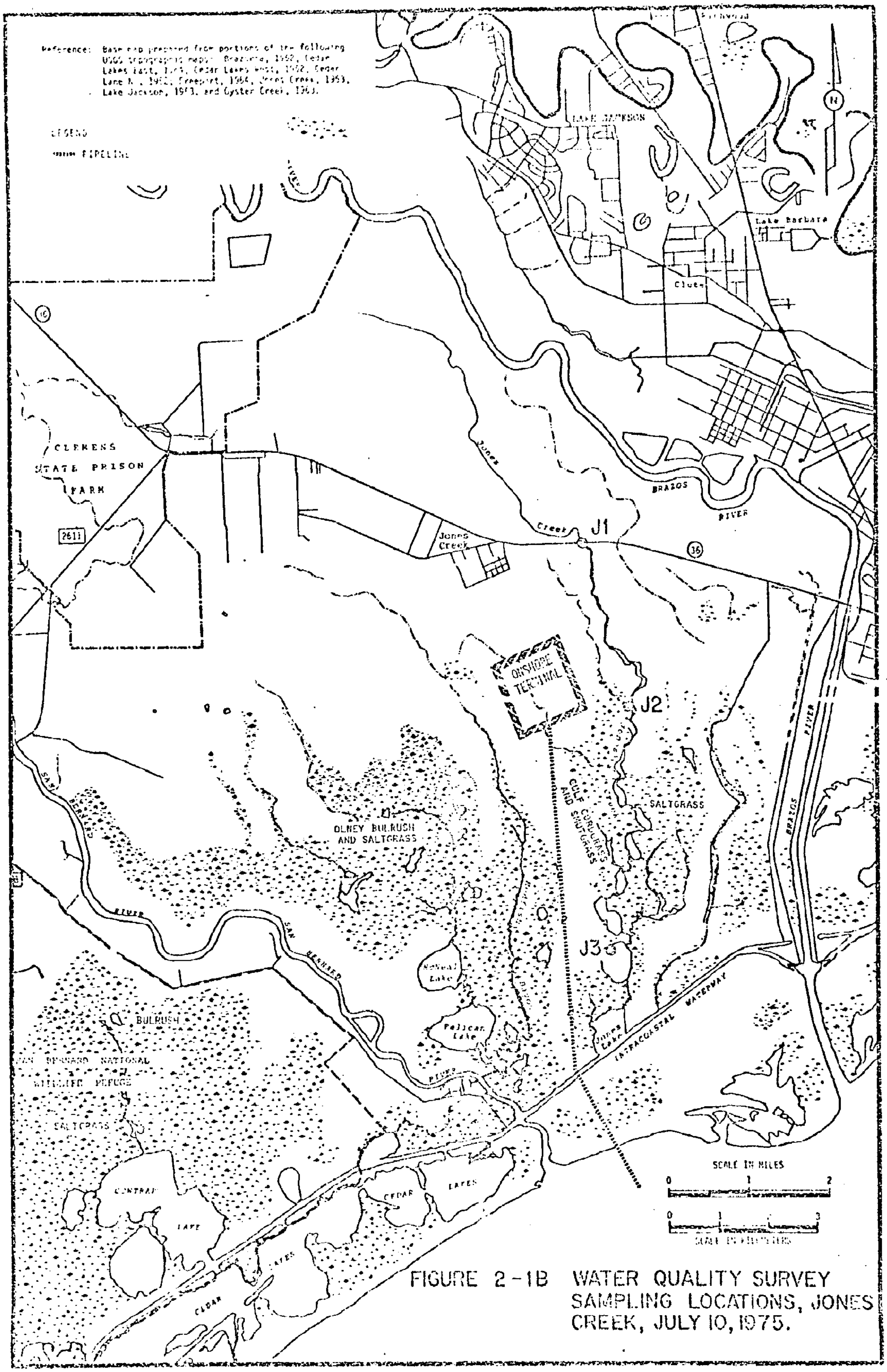


FIGURE 2-1B WATER QUALITY SURVEY SAMPLING LOCATIONS, JONES CREEK, JULY 10, 1975.

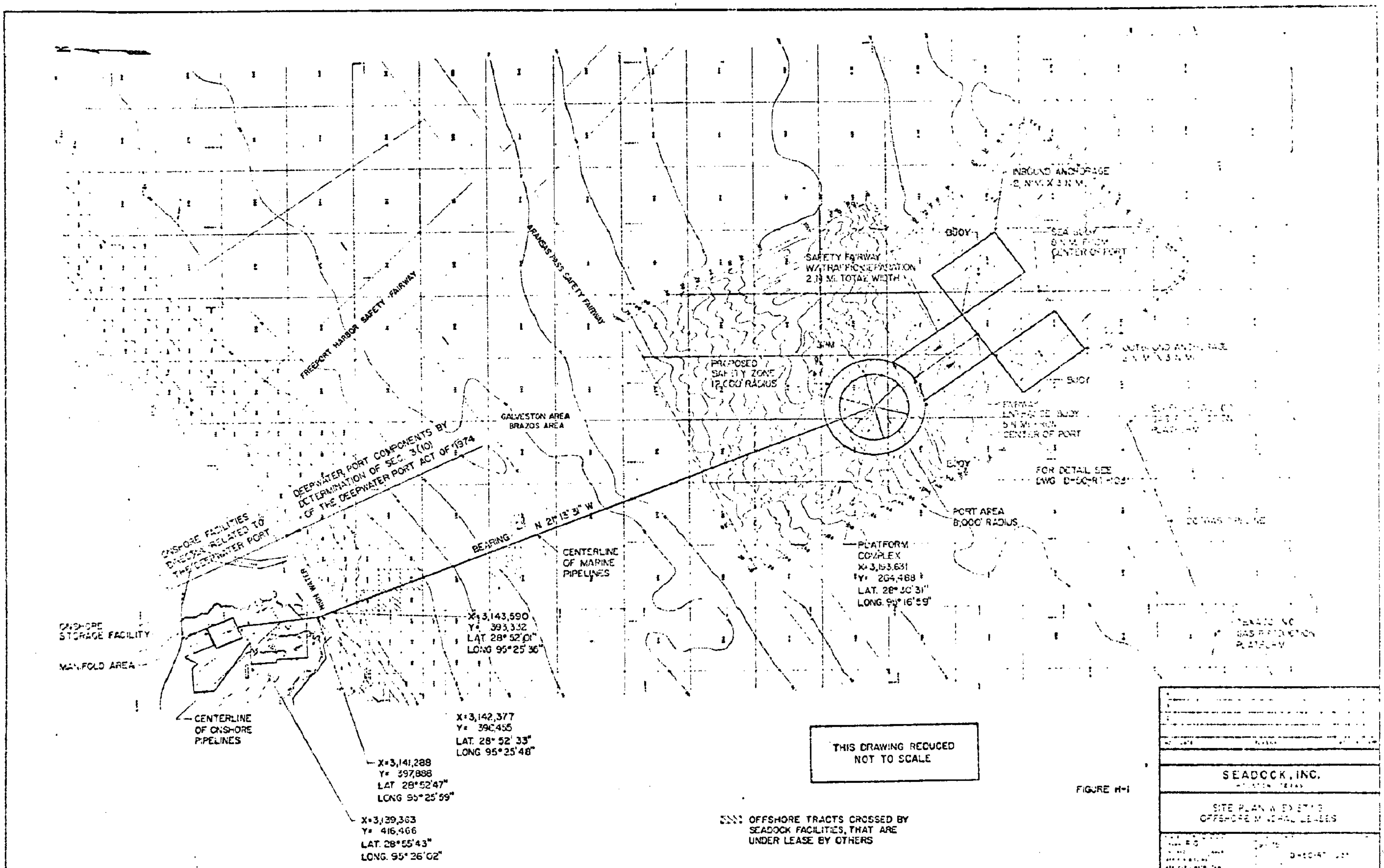

INBOUND ANCHORAGE
SEA BUOY
CENTER OF PORT
BUOY
SAFETY FAIRWAY W/TRAFFIC SEPARATION 2.19 M. TOTAL WIDTH
OUTBOUND ANCHORAGE
PROPOSED SAFETY ZONE 12,000' RADIUS
FAIRWAY ENTRANCE BUOY
CENTER OF PORT
FOR DETAIL SEE
PORT AREA 8,000' RADIUS
PLATFORM COMPLEX
X=3,153,631
Y= 264,488
LAT. 28°30'31"
LONG. 95°16'59"
FREEPORT HARBOR SAFETY FAIRWAY
ARANSAS PASS SAFETY FAIRWAY
GALVESTON AREA
BRAZOS AREA
DEEPWATER PORT COMPONENTS BY DETERMINATION OF SEC. 3(10) OF THE DEEPWATER PORT ACT OF 1974
ONSHORE FACILITIES DIRECTLY RELATED TO THE DEEPWATER PORT
BEARING N 21°13'31" W
CENTERLINE OF MARINE PIPELINES
HIGH WATER
ONSHORE STORAGE FACILITY
MANIFOLD AREA
CENTERLINE OF ONSHORE PIPELINES
X=3,143,590
Y= 393,332
LAT 28°52'01"
LONG 95°25'36"
X=3,142,377
Y= 390,455
LAT. 28°52'33"
LONG 95°25'48"
X=3,141,288
Y= 397,888
LAT 28°52'47"
LONG 95°25'59"
X=3,139,363
Y= 416,466
LAT. 28°55'43"
LONG. 95°26'02"
THIS DRAWING REDUCED NOT TO SCALE
OFFSHORE TRACTS CROSSED BY SEADOCK FACILITIES, THAT ARE UNDER LEASE BY OTHERS
SEADOCK, INC.

FIGURE H-1

APPENDIX B.

FLORIDA ADJACENT COASTAL STATE PETITION

STATE OF FLORIDA

OFFICE OF GOVERNOR REUBIN O'D. ASKEW

February 4, 1976

Rear Admiral R. I. Price
United States Coast Guard
Chief, Office of Marine
Environment and Systems
Room 7302-A Nassif Building
400 Seventh Street Southwest
Washington, D.C. 20590

Dear Admiral Price:

On January 26, 1976 the United States Coast Guard published notice in the Federal Register of two applications for proposed deepwater ports in the Gulf of Mexico. Designation of these applications as "complete" initiated the process for their ultimate acceptance or rejection. The two proposed ports are SEADOCK off Freeport, Texas, and LOOP off the Louisiana coast.

In accordance with Section 9(a)(2) of the Deepwater Port Act of 1974, 33 U.S.C. 1504(c)(1), and 33 CFR 148.217, I am requesting "adjacent coastal state" designation for the State of Florida in both of these applications.

Florida's primary concern relates to tankers in transit off the coast of Florida to and from the proposed deepwater ports. Florida has a lengthy coastline with world-renowned beaches that are a vital part of the major economic activity, tourism. The potential for significant damage to this priceless resource through inadvertent or deliberate oil discharge by tankers poses a danger equal to or greater than the risk to the states that would be directly connected by pipeline to the proposed deepwater ports. Also, oil spills of any magnitude pose a threat to our mangrove and marsh shorelines, coastal fisheries, and estuaries.

Oceanographic and meteorologic conditions are such that oil spilled offshore any part of the Florida coastline could reach shore. Since oil spills from tankers are inevitable given sufficient periods of time, it is obvious that the damage potential to Florida is equal to or greater than that of either Texas or Louisiana, the named adjacent coastal states.

For your information, I have enclosed publications from the Florida Department of Natural Resources concerning commercial fishing and from the Florida Department of Commerce concerning tourism and natural attractions for tourists.

Besides the State's white sandy beaches, sport fishing is a great attraction for tourists and residents. Our mangrove and marshy areas and our estuaries are the nurseries and feeding grounds for most of the marine species of sport and commercial importance. These areas also harbor vast numbers of sea and shore birds that add to the esthetic appeal of our subtropical State.

Oil spills of any origin are not compatible with our fish and wildlife and their habitat or with Florida's deserved reputation for clean water and beaches.

With kind regards,

Sincerely,

Governor

ROA/frs

Enclosure

cc: Honorable William T. Colman, Jr.
Secretary of Transportation
Room 10200 Nassif Building
400 Seventh Street Southwest
Washington, D.C. 20590

APPENDIX C.

SEADOCK TANKER ROUTES

SEADOCK TANKER TRANSITS THROUGH THE STRAITS OF FLORIDA

The SEADOCK applicant has provided revised "supplementary information" dated 2/24/76 which further elaborates on vessel traffic information originally given in Section 5.2 of his Environmental Report dated December 15, 1975 (Supplementary Information). In it he concludes that 10 to 12 percent of the VLCC traffic utilizing the SEADOCK facility will transit Straits of Florida. About 2 percent of this traffic will come in from the north by way of Providence Channel. Another 8 to 10 percent originating from the west coast of Africa will utilize the Old Bahama Channel and will skirt along the north coast of Cuba until sixty miles south of Key West before making a direct run for the SEADOCK facility well clear of the heavily used traffic lanes of the Florida Straits. This is not to say that should a vessel casualty occur for any reason when within 50 miles of Dry Tortugas enroute to the offshore terminal, considerable impact might result to the coast of Florida, given a major oil spill. The remainder of all crude shipments arriving from the Persian Gulf via the Cape of Good Hope together with a portion of the shipments from West Africa will utilize the major shipping route through the Caribbean Sea and Yucatan Channel. The majority of the ballast-laden tankers, however, will exit by way of the Straits of Florida.

Although a good argument is presented for careful routing of vessel traffic so as to minimize opportunities for casualties while transiting the Florida Straits, past practice has shown that the actual mechanics of tanker routing has not been well-controlled but left up to the discretion of each particular shipping company. Also, one should not exclude the heaviest use of Providence Channel for incoming crude oil in the event that the international situation at the time, or simply prudent seamanship, might dictate the exclusion of utilizing the Old Bahama Channel.

Taking into consideration the above factors and using the applicant's estimates of port usage, computations of risk have been based upon four estimates of annual crude laden VLCC transits of the Straits of Florida, as follows: (1) 55, (2) 110, (3) 150, (4) 200.

Only through a positive means of vessel routing, reliable inter-vessel communications, and meaningful identification of VLCC corridors through these heavily travelled waters can risk of environmental damage be minimized.

In arriving at prospective VLCC traffic routing through the Straits of Florida bound for Seadock laden with a certain percentage of foreign crude and with reference to present day usage of this international strait, the following agencies and groups were contacted:

U. S. Coast Guard
Office of Marine Environment and Systems
Deepwater Ports Project - Washington, D.C.

U. S. Coast Guard
Office of Environmental Protection
17th District - Miami, Florida

Military Sealift Command
Tanker Division - Washington, D.C.

U. S. Department of Commerce
Maritime Administration
Office of Port and Intermodel Development
Washington, D.C.

National Petroleum Council *
Washington, D.C.

American Institute of Merchant Shipping
Washington, D.C.

*Reference: Law of the Sea - Particular Aspects Affecting the Petroleum Industry (May 1973)

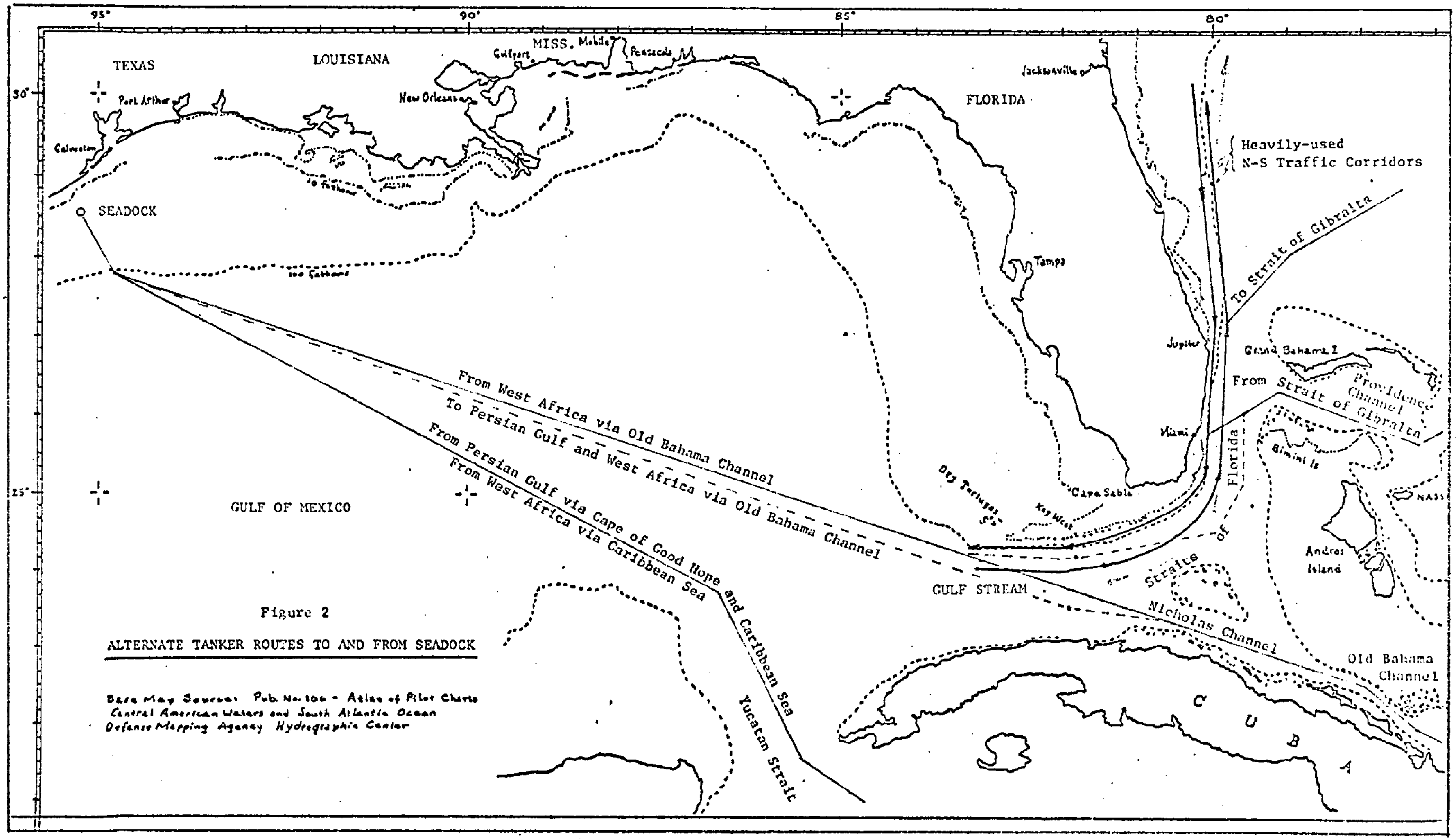


Figure 2

ALTERNATE TANKER ROUTES TO AND FROM SEADOCK

Base Map Sources: Pub. No. 106 - Atlas of Pilot Charts
Central American Waters and South Atlantic Ocean
Defense Mapping Agency Hydrographic Center

APPENDIX D.

SPILL SIZE FREQUENCY

DISTRIBUTION ANALYSIS

SPILL SIZE FREQUENCY DISTRIBUTION ANALYSIS

The frequency distribution of prospective oil spills over a range of sizes as calculated by SEADOCK and LOOP are given in Table D-1. 'The probabilities for the various classes of spill sizes in the two reports have different annual frequencies. For comparison purposes, these probabilities have been adjusted to an annual frequency of one by dividing the annual frequency for each spill size by the annual frequency for a spill of any size. Frequencies for SEADOCK are to be found in Section 5.2.9.2 and for LOOP in Section C.1.7.5 of each application.

The frequency for spills ranging in size from 0 to 5,000 barrels is nearly the same in both reports (SEADOCK is .145 and LOOP is .148). However, these frequencies differ considerably when adjusted.

Both the SEADOCK and LOOP reports reference a Sea Grant study at MIT. Report No. MITSG 74-20 contains the sample data on tanker spills 42,000 gallons and greater. The a priori reasons for use of the gamma distribution and the assumptions necessary are included in the report. The report does not indicate how well the gamma distribution described the data in the sample. The report indicates that the gamma distribution allows a positive probability for an impossible event, a spill greater than the largest vessel's displacement. (It is possible that another function, perhaps the beta distribution which is bound above and below would better fit the data.) The cumulative distribution of the data is shown in Figure D-1, and the cumulative distribution of a gamma variable is shown by the smooth curve. The parameters of the gamma density γ, β have been estimated by the approximate maximum likelihood method. The parameter estimates are indicated on Figure D-1. Figure D-2 is the histogram and estimated density (smooth curve). The χ^2 goodness-of-fit test with ten equally likely intervals has a significance level of $\alpha < .005$ indicating the gamma distribution did not fit the data very well.

The MIT data sample for tanker spills less than 42,000 gallons was based on 1971-1972 U.S. Coast Guard reports. The gamma distribution was assumed to be appropriate for this size spill also. The distribution is extremely skewed and perhaps a multi-model density is necessary. The data is not included in the report so further analysis has not been possible. The sample mean was 318 gallons and the standard deviation was 1.4×10^6 gallons.

The SEADOCK and LOOP reports both mention using a log-normal distribution to estimate the probabilities of extremely large spills. The MIT report does not use this modification. There are two problems with this technique:

(1) The log-normal distribution puts more probability in the tail even though spills above tanker capacities are impossible events.

(2) Determining the spill size beyond which the log-normal distribution will be used is very subjective and the SEADOCK and LOOP reports do not indicate what point was used or how it is to be determined.

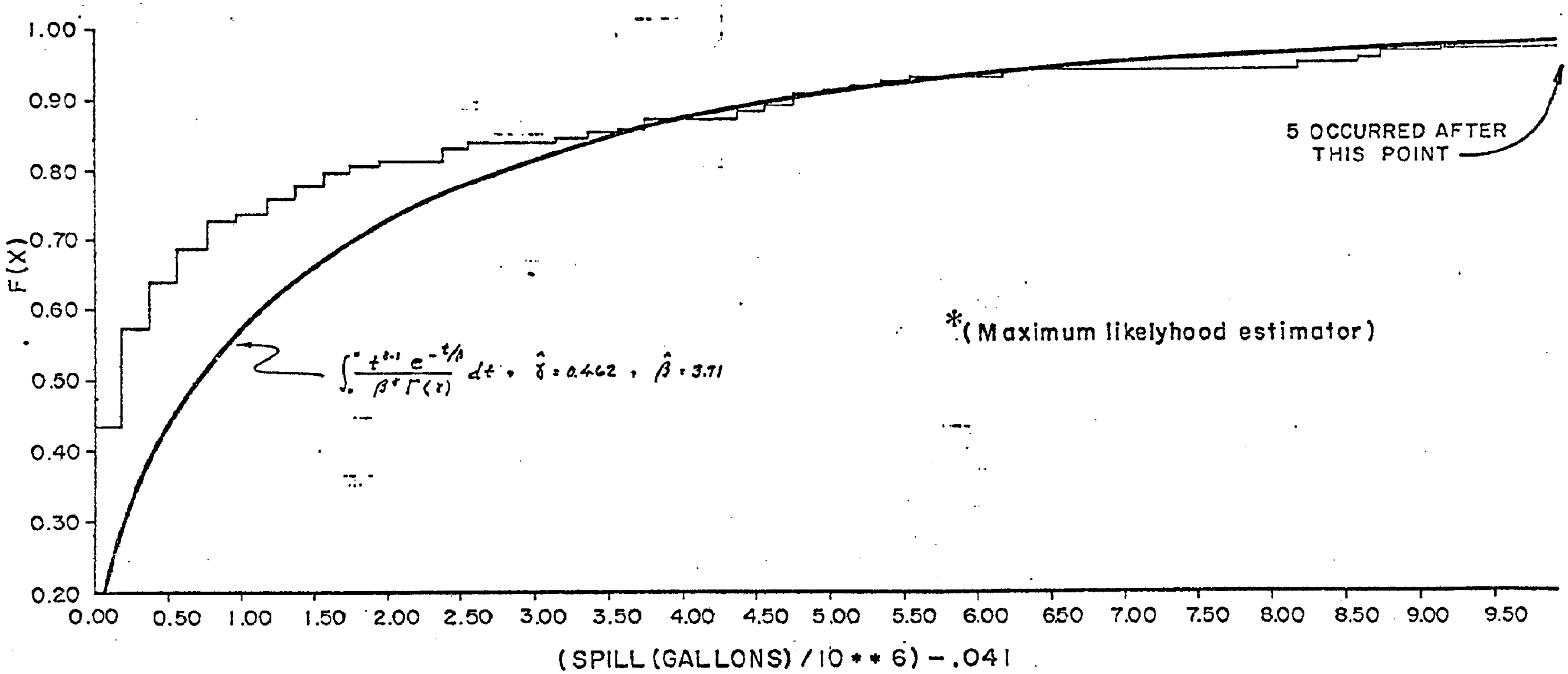
Estimates of the mean and standard deviation of the natural logarithm of the spill size as great as 42,000 gallons are 13.02 and 1.57. Using these parameter estimates, the median spill size is 451,351, the mode is 38,373, and the expected value is 1,547,963.

Another problem which is of interest is how to combine the density of tanker spills less than 42,000 gallons with the density of the larger tanker spills to achieve the most realistic distribution. The SEADOCK and LOOP reports differ considerably in this respect (compare the last 2 columns of Table D-1). The reason for this is that the two densities are estimated from two different data sets. The data sets differ in several ways. They are from different sources, cover different time periods and different geographic locations. They need to be put on a comparable basis to arrive at the distribution over the entire range. The MIT report addresses this question by assuming a Poisson distribution on several different size spills. Utilizing and adjusting the mean number of occurrences for the two spill sizes, above and below 42,000 gallons, during a particular time period, perhaps a year, for each specific location would seem the most reasonable approach. The two empirically determined densities could be implemented to estimate the probabilities within these two spill sizes. The specific technique should be determined and results verified with the available data.

TABLE D-1

	Frequencies from Reports		Adjusted Frequencies	
Size, Barrels	SEADOCK	LOOP	SEADOCK	LOOP
0-200	.026	.008	.1251	.0319
200-500	.024	.015	.1154	.0599
500-1000	.02670	.022	.1284	.0879
1-2M	.03466	.048	.1667	.1917
2-5M	.03400	.0550	.1635	.2196
5-10M	.029470	.0376	.1417	.1502
10-20M	.021270	.0357	.1023	.1426
20-50M	.008310	.0203	.0400	.0811
50-100M	.002480	.0072	.0119	.0288
100-200M	.000747	.0014	.0036	.0056
200-500M	.000147	.00017	.0007	.0007
500-1000M	.000052	.000033	.0003	.0001
1-2MM	.000015	.0000093	.0001	.0000
2-5MM	.000003	.0000022	.0000	.0000
TOTAL	.207904	.2504145	1.0	1.0

FIG. D.1 CUMULATIVE DISTRIBUTION OF MIT OIL SPILL DATA AND CUMULATIVE GAMMA FUNCTION.*



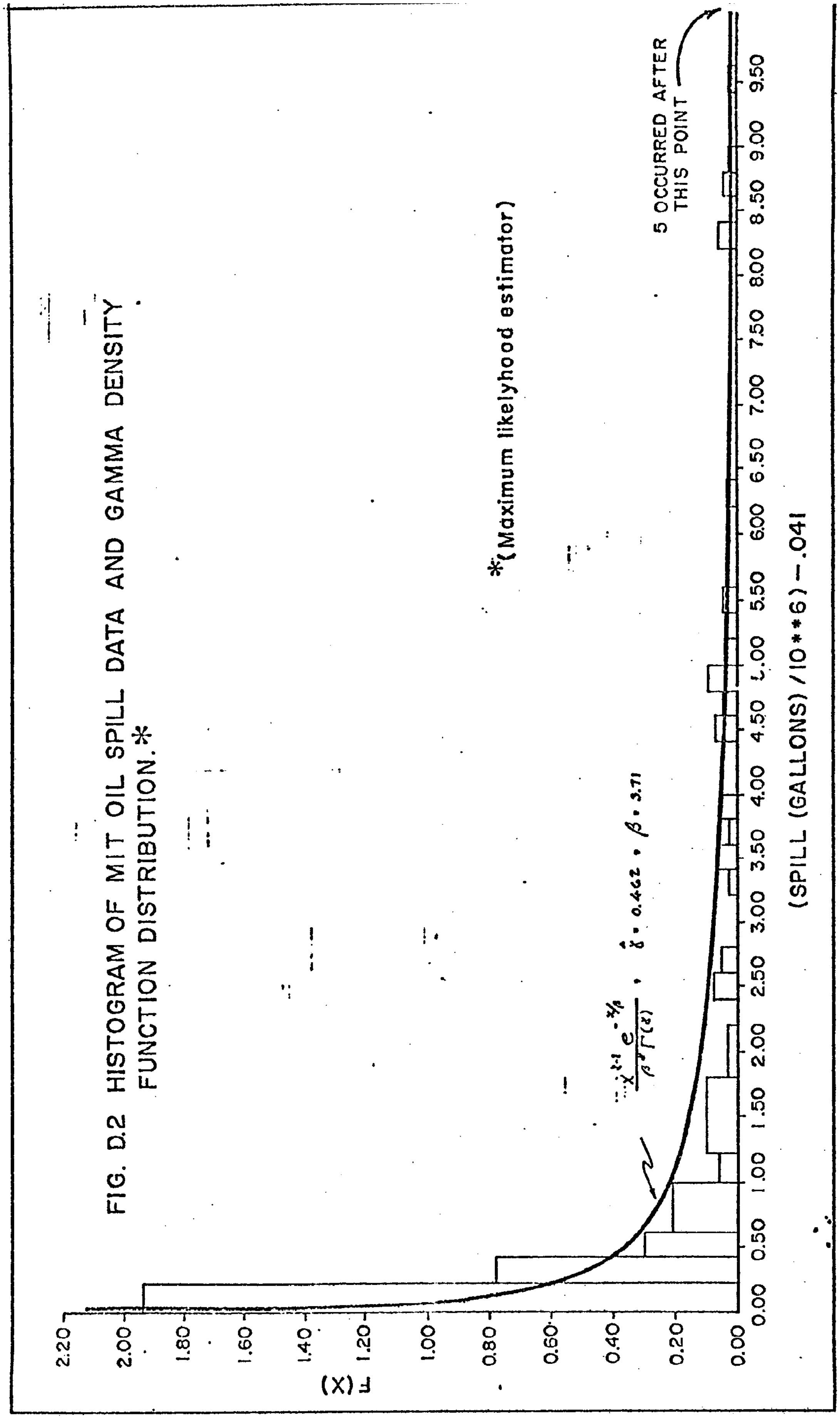


FIG. D.2 HISTOGRAM OF MIT OIL SPILL DATA AND GAMMA DENSITY FUNCTION DISTRIBUTION.*

$\frac{x^{\delta-1} e^{-x/\beta}}{\beta^{\delta}\Gamma(\delta)}$, $\hat{\delta} = 0.462$, $\beta = 3.71$

APPENDIX E.

SEADOCK TRAJECTORY ANALYSIS

SEADOCK TRAJECTORY ANALYSIS

The following material describing the SEADOCK trajectory analysis has been extracted from the applicant's Environmental Report (Chapter 10.6 pgs. 10.6-1 through 10.6-33).

This analysis has been done with reasonable care considering the present state of the art for oil spill trajectory modeling. The approach taken is approximately the same used in the NOAA trajectory analysis.

10.6 PROJECTED MOVEMENT OF OIL SPILLS

The oil spill modeling described in this section was developed to aid the Oil Spill Contingency Plan of SEADOCK. Planning and organizing the contingency program required an estimate of where the slick might go in the event of an oil spill, and how long it would take to get there. This information will indicate which sections of the coast might require protection, and response time available for control at sea.

The movement of oil spilled on the surface of a body of water has been analytically and numerically modeled by several entities. These models, in general, utilize gross approximations for many of the governing physical phenomena. Although refinement of these approximations in many cases is questionable, an attempt has been made during the course of this study to incorporate, in the models developed, each of the forcing functions known to affect oil spill transport.

10.6.1 ANALYTICAL MODELS

Two principal models have been developed and will, henceforth, be referred to as the Slick and the Subsurface Models. The Slick Model is applied to the spillage immediately following the spill and simulates the transport of the oil on the surface until it is either totally decayed, impacts the beach, or else is transported out of the primary region of interest. The Subsurface Model uses the dissolved portion of the total spill quantity as its oil volume. It simulates the undersea transport of this oil either until a concentration of 0.1 ppm of the oil in the water is obtained through diffusion/dispersion, or it impacts the beach, or is transported out of the primary region of interest.

10.6.1.1 Primary Transport Forcing Functions

The transport of both the oil slick and the soluble fractions is dependent on the wind and current data gathered from two sources. The U. S. Weather Bureau supplied the hourly wind time histories as measured in downtown Galveston. SEADOCK made available data on wind, and on surface, mid-depth, and bottom water currents. This material resulted from a data-gathering program at the Buccaneer oil rig approximately 30 miles south of Galveston.

The two above sets of wind data were considered to be necessary to account for the variations in overland and overwater wind patterns as caused by the land-sea interface. It is felt that the accuracy of the Buccaneer wind data is questionable when applied in slick transport equations within five miles of the coast; hence, the use of the Weather Bureau wind data within an area assumed to be affected by the land-sea discontinuity. Further references to these data sets will be as "onshore" and "offshore" winds for the Weather Bureau and Buccanner data, respectively.

The two wind and three current time histories, although complete to a large extent, have time periods during which instrumentation failure occurred.

In order to accomplish continuous simulations of both the oil slick and the soluble fractions, it was necessary to calculate the statistical characteristics of each of the five time histories by month, based on a 17-point compass. These probability density functions were then used in a first-order Markov process to generate statistically valid data for the missing values in the five data sets.

Both of the wind data sets were measured by anemometers placed at about 30 to 33 m (100 to 110 ft). Since the transport equations require wind vectors at a height of 10 m (33 ft), all of the wind data were converted to this altitude through the equation

$$\frac{V}{V_o} = \left(\frac{Z}{Z_o}\right)^{1/7} \qquad (10.6) - 1$$

after Albertson, et al., 1960. The symbology of Equation (10.6) - 1 is as follows: Z is the altitude at which the wind speed is desired; Z_o is the altitude at which the wind speed was measured; V is the desired wind speed; and, V_o is the measured wind speed.

A description of the major aspects of each of the transport models is given below, including certain theories used under various transport conditions.

10.6.1.2 Slick Model

10.6.1.2.1 Areal Geometry

Geometrically, the area of interest is separated into three specific areal extents, as shown in Figure 10.6-1, which are: 1) Gross Area - the area between the Nearshore Boundary, a line parallel to and five statute miles from the coast, and the Out-to-Sea Boundary; 2) Nearshore Area - the area between the Inshore Boundary, a line parallel to and two statute miles from the coast, and the Nearshore Boundary; and, 3) Inshore Area - the area between the coast and the Inshore Boundary. As will be seen later, these areas are differentiated in order to consider the effects of various phonomena known to occur in certain coastal regions.

10.6.1.2.2 Spreading

Upon initiation of the assumed oil spill, several activities of the oil begin occurring simultaneously. The first of these to be considered is the spreading of the oil on the surface. The expressions derived do not consider the effect of wind on the spreading phenomenon. These equations were developed by balancing the various forces acting on the oil slick at early, intermediate, and late times, and then determining experimentally the non-dimensional coefficients. At early times, generally less than one hour, the Gravity-Inertia regime or inertial spread dominates and is described by

$$R = K_i(\Delta g V t^2)^{1/4} \qquad (10.6) - 2$$

where R is the radius of the oil slick, K_i is the non-dimensional coefficient experimentally determined to be 1.14 (Fay, 1971), is the ratio of the absolute difference between the densities of seawater and the oil to that of seawater, g is the force of gravity, V is the original volume of oil spilled, and t is time. When the oil film thickness becomes equal to the viscous layer in the water, then a transition occurs from the Gravity-Inertia regime to the Gravity-Viscous regime. This viscous spreading is described by

$$R = K_v\left(\frac{\Delta g V^2 t^{3/2}}{\nu^{1/2}}\right)^{1/6} \qquad (10.6) - 3$$

where K_v is again the non-dimensional coefficient determined to be about 1.45 (Fay, 1971) and ν is the kinematic viscosity of water. The last phase, the Surface Tension Regime, occurs when the oil film thickness drops below a critical level, which is a function of the net surface tension, the masss densities of the oil and the water, and the force of gravity. The surface tension spread is described by

$$R = K_t\left(\frac{\sigma^2 t^3}{\rho^2 \nu}\right)^{1/4} \qquad (10.6) - 4$$

where K_t was experimentally determined to be 2.05 (Fay, 1971), σ is the surface tension and ρ is the density of water. For large spills on the order of 10,000 tons, inertial and viscous spreading will dominate for about the first week with the surface tension spread then controlling (Fay, 1971).

Although the exact mechanisms that cause the termination of spreading are unknown, the terminal areas of several oil slicks have been observed and used to determined an analytical relationship for the final area of a given oil spill based on the properties of the oil (Fay, 1971). This is described by

$$A_T = K_a\left(\frac{\sigma^2 V^6}{\rho^2 \nu D^3 s^6}\right)^{1/8} \qquad (10.6) - 5$$

where K_a is, as yet, an undetermined constant of order unity, D is the diffusivity, and s is the solubility of the significant oil fractions in the water.

The simulation of the spreading phenomenon in the Slick Model incorporates all of the above formulations with times of transition from one spreading regime to the next, determined by the following:

$$t_{i\to v} = \left(\frac{V}{\Delta g \nu}\right)^{1/3} \left(\frac{K_v}{K_i}\right)^4 \qquad (10.6) - 6$$

$$t_{v\to t} = (\Delta g \nu)^{1/3} \left(\frac{\rho V^{2/3}}{\sigma}\right) \left(\frac{K_v}{K_t}\right)^2 \qquad (10.6) - 7$$

In addition, the area covered by the oil slick is not allowed to exceed A_T; therefore, spreading is terminated at the time.

$$t = \left(\frac{V\rho}{s\sigma}\right)^{1/2} \left(\frac{\nu}{D}\right)^{1/4} \left(\frac{K_a}{\pi K_t^2}\right)^{2/3} \qquad (10.6) - 8$$

All of the variables listed above are assigned specific values in the Slick Model; however, these values may be easily altered by an input data option. The values of the variables used are shown in Table 10.6-1.

10.6.1.2.3 Decay

In addition to the spreading phenomenon, a decaying process on the oil slick begins immediately following the spill. This process is, for ease of description, separated into five principal phases: evaporation, dissolution, emulsification, precipitation, and biodegradation.

Evaporation and dissolution are, in general, the more critical processes of the five listed. As an example, following the "Torrey Canyon" spill, it was found that 25 percent of the oil, by volume, was lost in the first few days after the spill (Smith, 1968). Total depletion of the lighter fractions of the oil can occur in a time span as short as 8 to 12 hours (Krieder, 1971; Kenney, et al., 1969). Thus, these two processes have been accounted for in the Slick Model by using Moore, Dwyer, and Katz's first order model (1972) to approximate the rates of evaporation and dissolution. The basic equation for each fraction of oil is given by

$$\frac{dC}{dt} = (K_e + K_d + K_b)\ C \qquad (10.6) - 9$$

where C is the concentration, and K_e, K_d and K_b are the evaporation, dissolution, and biodegradation coefficients, respectively. The solution to Equation (10.6) - 9 is

$$C = C_o \exp\ (-K_e - K_d - K_b)t \qquad (10.6) - 10$$

where C is the concentration of a particular fraction after some exposure period, t in days, C_o is the initial concentration. Thus, assuming $K_b = 0$ for each fraction, the final solution to Equation (10.6) - 9 is

$$C = C_o \exp(-K_e - K_d)t \qquad (10.6) - 11$$

To facilitate the use of Equation (10.6) - 11, the values for K_e, K_d, and generalized ratios of dissolution to evaporation shown in Table 10.6-2 are utilized. The procedure exercised by the Slick Model is to determine, for each oil fraction individually, the total decayed quantity and then to separate this volume into evaporation and dissolution by using the volumetric ratio of these two processes. Finally, these individual evaporation and dissolution volumes are added for all of the oil fractions to produce the total volume lost due to these decay functions.

Table 10.6-3 shows some typical percent compositions of the eight fractions in several grades of crude oil. Crude B is the one whose characteristics are currently being simulated.

The decay of each fraction is carried out at each time-step during the transport of the oil slick. Since the evaporation rates are functions of the average wind speed, these speeds are averaged over all of the previous steps to generate a value to be used in the next time-step.

The effects of emulsification and precipitation were considered through a one-percent reduction of the volume remaining in the oil slick. These operations are only included when the slick is within the Inshore Area and the offshore wind speed is greater than 32 kms/hr (20 mph); thus, causing turbidity and, consequently, the proper conditions for sinking to occur.

Biodegradation of oil from an oil slick was discussed in Section 3.3.1.2 of Chapter 3. Although it is known that microbial oxidation will occur, particularly after two or three days, no established quantitative data is available for use in the modeling. Further, it is felt that the volumes lost due to this effect would be small enough to disregard in the Slick Model without jeopardizing its validity in predicting the oil spill movement.

10.6.1.2.4 Transport

The actual transport of the oil slick is a function of its position at any given time; that is, whether it is in the Gross, Nearshore, or Inshore Area.

In the Gross Area, the forcing functions on the oil slick are considered to be the offshore wind and surface current vectors. The actual step movement of the slick in this area is given by

$$\Delta\vec{P}_i = 0.03\,\vec{W}_{Fi} + \vec{SC}_{Fi} \qquad (10.6) - 12$$

where $\vec{\Delta P}_i$ is the positional change vector during the i^{th} step, $\vec{W}_{Fi}$ is the offshore wind vector during the i^{th} step, and $\vec{SC}_{Fi}$ is the surface current vector during the i^{th} step.

The size of the time step in the Gross Area is variable, since this is an extremely large area. The initial and minimum time-step is 3 hours, and it increases to 6 hours at the end of 5 days travel time, 12 hours at the end of 10 days travel time, and 24 hours for travel times greater than 20 days. For time-steps greater than three hours, all wind and current vectors are summed to produce the resultant vector during that step.

In the Nearshore Area, the forcing functions are taken to be the onshore and offshore wind vectors and the positionally dependent current vectors. The step movement in this area is described by

$$\vec{\Delta P}_i = 0.03(a\vec{W}_{Ni} + b\vec{W}_{Fi}) + \vec{SC}_{month,\ lat,\ long} \qquad (10.6) - 13$$

where $\vec{W}_{Ni}$ is the onshore wind vector during the i^{th} step, and a and b are the ratios of the distances from the present slick position to the Nearshore and Inshore Boundaries to the total distance between the two boundaries, respectively. The resultant wind vector is generated in this fashion in order to account for the land-sea breeze effect created by the locality of the land mass. It is felt that the use of offshore currents in the Nearshore Area is questionable due to the lack of coastal effects at the current measuring site. Thus, doubly interpolated, positionally dependent current vectors were used from the Central American Waters Current Charts.

The forcing functions in the Inshore Area are considered to be the onshore wind vectors and the longshore current as generated by the offshore wind vectors. This slick movement is given by

$$\vec{\Delta P}_i = 0.03\ \vec{W}_{Ni} + \vec{LC}_i \quad . \qquad (10.6) - 14$$

where $\vec{LC}_i$ is the longshore current vector during the i^{th} step, as determined from the nomograph shown in Figure 10.6-2 (Paulus, 1972). Equation (10.6) - 14 is considered valid as long as the oil slick center of mass is not in contact with the coast. The time steps during transport through both the Nearshore and Inshore Areas are held to three hours in order to force the accounting for the various phenomena known to affect the oil slick while it is in one of these regions.

The transport of the oil slick in the three different areas is schematically diagrammed in Figure 10.6-3.

10.6.1.2.5 Coriolis Effect

The effect of the Coriolis force on the transport of an oil slick has been studied to some extent, but with relatively inconsistent results

(Ekman, 1905; Teeson, et al., 1970). The drift angle of the slick, being that angle between the true direction of movement and the sum of the wind and water current vectors, is caused by the surface shear stress brought about by the wind and the earth's rotation. This angle has been experimentally estimated to be between 5 and 22 degrees to the right for mid-latitudes in the northern hemisphere (Teeson, et al., 1970), as opposed to the theoretical maximum of 45 degrees after Ekman (1905). These experiments were not verified by the "Torrey Canyon" incident, though where the slick apparently drifted dead down wind (Teeson, et al., 1970). However, it is generally agreed that a non-zero drift angle does occur, with its magnitude being the primary question.

In order to consider the Coriolis effect, the Slick Model has the capability of incrementing the transport wind vector by a specified angle. Currently, under this option, the drift angle is 15 degrees. Thus, the slick movement is predicted by the vector sum of the altered wind vector and the water current vector, thereby accounting for the Coriolis-induced transport shift.

10.6.1.2.6 Output of the Slick Model

The output generated by the Slick Model is determined by the user of the model and can be one of two forms. The first form is a complete time history that includes all decay and transport parameters at each time-step. The second form is a summary of each transport simulation where each line contains slick coastal impact parameters for that simulation. Too, the user can choose the option of no printed output, if desired. Examples of the printed output are shown in Figures 10.6-4 through 10.6-7.

In addition to the printed output, the model generates a binary output data file containing all of the pertinent information concerning the oil slick being simulated.

10.6.1.3 Subsurface Model

The Subsurface Model is significantly simpler than the Slick Model since past research has been directed primarily toward the latter.

10.6.1.3.1 Areal Geometry

The areal geometry for the Subsurface Model includes one area between the Nearshore and Out-to-Sea Boundaries. Since this model is to consider the soluble fraction of the oil spilled, a third dimension, that of mixing depth, is included. This depth, generally considered to be from the surface down to the thermocline, has a constant value in the model of 18 m (60 ft). Although this mixing depth can be altered through an input data option, the accurate detection of the thermocline at any given time of the year has not been easily accomplished in the past; thus, reasonableness should be the prime concern for any changes to be made in this depth value.

10.6.1.3.2 Dispersal Volume

The volume of oil to be considered in the Subsurface Model is that which is dissolved at each time-step through the dissolution process in the Slick Model. Preliminary studies have shown that, as with evaporation from the surface slick, the major dissolution of the soluble oil fractions occurs at very early times. Thus, the Subsurface Model has been generated to transport a summed quantity of the amounts dissolved at each time-step, until the contribution to this cumulative dissolved volume by dissolution at the next three time-steps is less than one percent of that already dissolved. It is felt that the maximum subsurface concentrations possible under the given spill conditions will be achieved by this method, and that the concentrations produced by the later dissolutions will be negligible.

10.6.1.3.3 Dispersion Sub-Model

The three-dimensional statistical model proposed by Gifford (1957) and extended by Okubo (1962) is considered to apply to the case of relative diffusion in a homogeneous turbulent field. This model is based on the assumptions that diffusion proceeds independently at different rates in the horizontal and vertical planes, and that the spatial distribution of the diffusing substances is essentially Gaussian in all directions. The last assumption leads to the equation

$$\bar{C}(x,y,z,t) = \frac{M}{\pi\sqrt{2\pi}\,(\bar{\sigma}_x^2\,\bar{\sigma}_y^2\,\bar{\sigma}_z^2)^{1/2}}\exp\left(-\frac{x^2}{2\bar{\sigma}_x^2}-\frac{y^2}{2\bar{\sigma}_y^2}-\frac{z^2}{2\bar{\sigma}_z^2}\right) \qquad (10.6) - 15$$

where $\bar{C}$ is the average concentration at a point x,y,z at time t, M is the amount of diffusing substances initially discharged from an instantaneous point source, and $\bar{\sigma}_x^2$, $\bar{\sigma}_y^2$ and $\bar{\sigma}_z^2$ are the average variances of the concentration distributions in the x, y, and z directions. It is seen that setting x = y = z = 0 in Equation (10.6) - 15 produces an expression for the maximum concentration as a function of time as

$$C_{max}(t) = \frac{M}{\pi\sqrt{2\pi}\,(\bar{\sigma}_x^2\,\bar{\sigma}_y^2\,\bar{\sigma}_z^2)^{1/2}} \qquad (10.6) - 16$$

Since C_{max} is the primary element of interest, Equation (10.6) - 16 is the governing formulation in the dispersion sub-model. Once the computed value for C_{max} becomes less than a specified minimum concentration, currently set as 0.1 ppm, then transport of the soluble oil fractions terminates. (Transport termination also occurs if the submerged oil impacts the Nearshore Boundary or crosses the Out-to-Sea Boundary.)

In the evaluation of Equation (10.6) - 16, estimates of the variances of the concentration distributions in all three principle directions are derived from the "4/3 relationship" shown in Equation (10.6) - 17 (Okubo, 1962),

$$K_{x,y,z} = \frac{\Delta \bar{\sigma}^2_{x,y,z}}{2\Delta t} = K'_{x,y,z} l^{4/3} \qquad (10.6) - 17$$

where $K_{x,y,z}$ are the diffusion coefficients in the x, y, and z directions, $K'_{x,y,z}$ are functions of the rates of energy dissipation, and l is the effective eddy scale of the phenomenon and is proportional to σ.

In order to remain consistent with the Slick Model, it is assumed that horizontal dispersion is equal in all directions, thus $K'_x = K'_y$, $K_x = K_y$ and $\bar{\sigma}^2_x = \bar{\sigma}^2_y$. Also, l initially assumes the value of the slick diameter at the time oil ceases to go into solution and $K'_{x,y}$ are assumed to be 0.001, after Wiegel (1964). At later times, l takes on the computed diameter of the subsurface spreading extent.

Since the eddy scale is unknown for vertical diffusion, it is taken to be 1.0 and k' is assigned the value 0.01, which obviously produces a constant value of K_z equal to 0.01 ft^2/sec. Thus, using the experimentally determined values in Equation (10.6) - 17, new directional variances may be calculated and Equation (10.6) - 16 may be evaluated for an updated C_{max}.

It is assumed that horizontal diffusion will continue until the entire process is terminated. However, vertical diffusion is terminated when the dispersal depth has reached the previously mentioned mixing depth.

10.6.1.3.4 Transport

Transport of the subsurface volume of oil is accomplished through the application of the surface and mid-depth current vectors, the proportion of each being determined by the depth of one standard deviation unit, σ, in the z-direction. Although other phenomena affect this transport process, they have not been adequately described analytically, and thus have been disregarded.

10.6.1.3.5 Output of the Subsurface Model

The output of the Subsurface Model is a printed listing in one of two forms. As in the Slick Model, the first form is a step-by-step tabulation of the transport of the soluble fractions, including subsurface currents, diffusion coefficients, maximum concentration and the dissolved volume's present position. The second output form is again a one-line summary of the transport/diffusion process as determined for the dissolved oil fractions being simulated. Examples of these output forms are shown in Figures 10.6-8 and 10.6-9. An input parameter specifies either no printed output or the form desired.

Also, output is a binary data file containing information pertinent to the transport of each dissolved oil volume.

10.6.1.4 Input Data

The primary input data for both of the transport models are composed of various forms of the wind and current data. These data are presently disk-resident in separate data files, each of which is described below.

WBSHDATA - This file is composed of the primary transport forcing functions used in both the Slick and Subsurface Models. It contains, in the form of three-hour vectors, the following data:

- Onshore winds (U. S. Weather Bureau)
- Offshore winds (SEADOCK, Inc.)
- Surface currents (SEADOCK, Inc.)
- Mid-depth currents (SEADOCK, Inc.)
- Bottom currents (SEADOCK, Inc.)

The wind data is as measured, i.e., no altitude conversions or Coriolis drift angles have been applied. The data missing from the originally received data sets have been generated and are in the files with appropriate indicators to indicate their generation rather than measurement. The time period for which data is available is October, 1971, through August, 1973.

CURRENTS - This file is composed of the surface current data presently in the public domain. The source is the Central American Waters Current Charts. The data is in the form of latitudinally and longitudinally dependent surface current vectors tabulated by month.

10.6.1.5 Scenario of Major Oil Spills

Figures 10.6-10 and 10.6-11 show the transport paths for a typical oil slick under the conditions of no Coriolis force application and a 15 degree Coriolis-induced wind vector shift. Figure 10.6-12 shows the transport path for a typical subsurface plume.

10.6.1.6 Probability of Oil Reaching Coastal Areas

Figures 10.6-13 and 10.6-14 show the probabilities of an oil slick impacting on a given section of the region of interest by month, under the assumptions of no Coriolis force application and a 15 degree Coriolis-induced wind vector shift. Figures 10.6-15 and 10.6-16 present the same type of information for the year 1972.

The method of generation of these plots was to assume an oil spill at a random time each day, and to track its path using the previously derived and assumed equations until it intersected the coast. This is not to imply that there will be an oil spill each day, but is used to show general trends.

Under the assumption of no Coriolis force, there are definite seasonal trends indicated in the figures. If an oil spill was to occur in the winter months (December through February), the coastal impact could be expected between Corpus Christi and Freeport. In the spring (March and April), the slick would reach the beach within 80 miles to the west of Freeport. In the early summer (May and June), coastal impact would be very near Freeport. Late summer slicks (July through September) would impact between 80 km (50 mi) west of Freeport and the Texas-Louisiana border. In the fall (October and November), impact could be expected to occur at, or slightly west of, Freeport.

If the two sets of coastal impact graphs are compared, both with and without the application of the Coriolis force, it can be seen that the impact distributions remain approximately the same. Thus, the primary effect of this 15 degree wind vector shift was to move the impact points about 8 to 24 km (5 to 15 mi) to the east.

Also, it should be noted that, of the 701 simulated oil spills, less than four percent crossed the Out-to-Sea Boundary in the middle of the Gulf. However, about eight percent crossed this boundary on their way to impacting the Louisiana coast east of the primary region of interest in this study. Thus, over 95 percent of the simulated oil slicks reached the beach.

Oil slick travel time statistics are shown on the plots to indicate rough response times for control of the spill at sea.

10.6.1.7 Occurrences of Oil in Offshore Areas

Figures 10.6-17 and 10.6-18 show the numbers of times that one of the 701 simulated oil slicks reached or traversed through any 10-statute mile area in the western Gulf under the assumptions of no Coriolis force application and a 15 degree Coriolis-induced wind vector shift. Figure 10.6-19 shows the same type information for the simulated subsurface plumes. This figure indicates that the diffusion of the dissolved volumes was quick enough to preclude their being transported to within 8 km (5 mi) of the coast before the maximum concentration dropped below 0.1 ppm.

10.6.1.8 References

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TABLE 10.6-1

Typical Oil Slick Spreading Parameters

Variable	Value
g	980.665 cm/sec^2
s	0.001
D	1.0×10^{-5} cm^2/sec
K_a	1.00
K_i	1.14
K_t	2.05
K_v	1.45
ν	0.009825 cm^2/sec
ρ_{oil}	0.85 gm/cm^3
ρ_{water}	1.03 gm/cm^3
σ	30 dynes/cm

TABLE 10.6-2

Approximate Transfer Rates for Eight Oil Fractions[a]
(Moore, Dwyer and Katz, 1972)

Fraction	Description	Evaporation[b] (K_e)	Dissolution (K_d)	Ratio (Diss/Evap)
1	Paraffin C_6-C_{12}	$0.8e^{0.2W}$	0.1	1/60
2	Paraffin C_{13}-C_{22}	0.002	0	0
3	Cycloparaffin C_6-C_{12}	$0.8e^{0.2W}$	0.5	1/12
4	Cycloparaffin C_{13}-C_{23}	0.002	0[c]	0
5	Aromatic (Mono- and di-cyclic) C_6-C_{11}	$0.8e^{0.2W}$	1.0	1/6
6	Aromatic (Poly-cyclic) C_{12}-C_{18}	0.02	0.001	1/20
7	Naphtheno-Aromatic C_9-C_{25}	0.02	0.001[d]	1/20
8	Residual	0	0	0

[a] These values are approximate and are probably all dependent upon temperature and oil film thickness.

[b] W is the wind speed in knots.

[c] Estimated from fraction 2.

[d] Estimated from fraction 6.

TABLE 10.6-3

Estimated Percent Composition (by Weight)
and Comparison of Solubilities for Various Petroleum Substances
(Moore, Dwyer, and Katz, 1972)

Fraction	Description	Crude A	Crude B	#2 Fuel Oil	Kerosene	Bunker C
1	Alkanes (C_6-C_{12})	1	10	15	15	0
2	Alkanes (C_{13}-C_{25})	2	7	20	20	1
3	Cyclo-paraffins (C_6-C_{12})	5	15	15	20	0
4	Cyclo-paraffins (C_{13}-C_{25})	5	20	15	20	1
5	Mono- and di-cyclic aromatics (C_6-C_{11})	2	5	15	15	0
6	Polycyclic aromatics (C_{12}-C_{18})	6	3	5	2	1
7	Naphtheno-aromatics (C_9-C_{25})	15	15	15	8	1
8	Residual	65	25	--	--	96
Estimated Maximum % Soluble		10	30	60	65	1
Estimated Maximum % Soluble Aromatic Derivatives		0.1-10	0.1-10	1-30	1-20	0-1

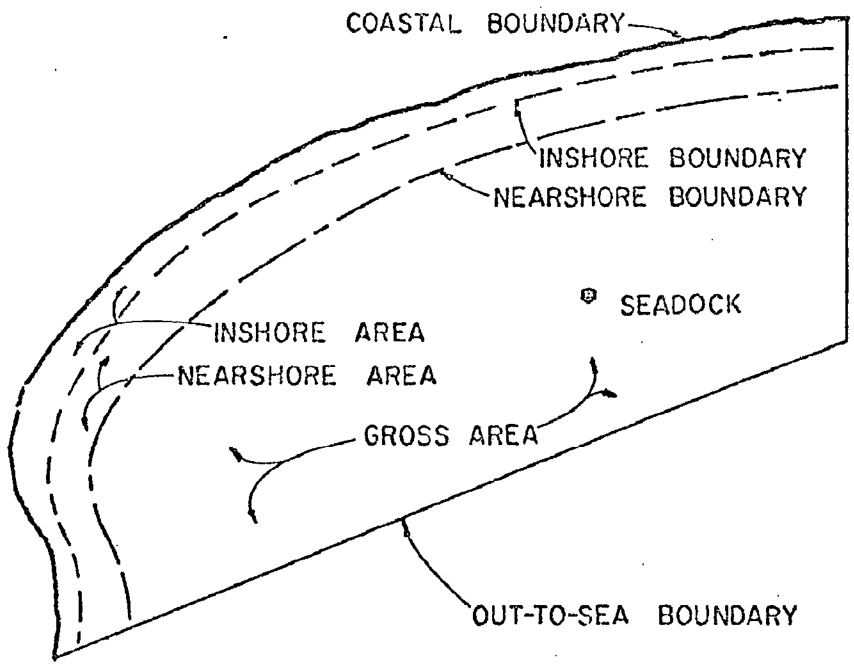

Figure 10.6-1 Geometric Areal Extents.

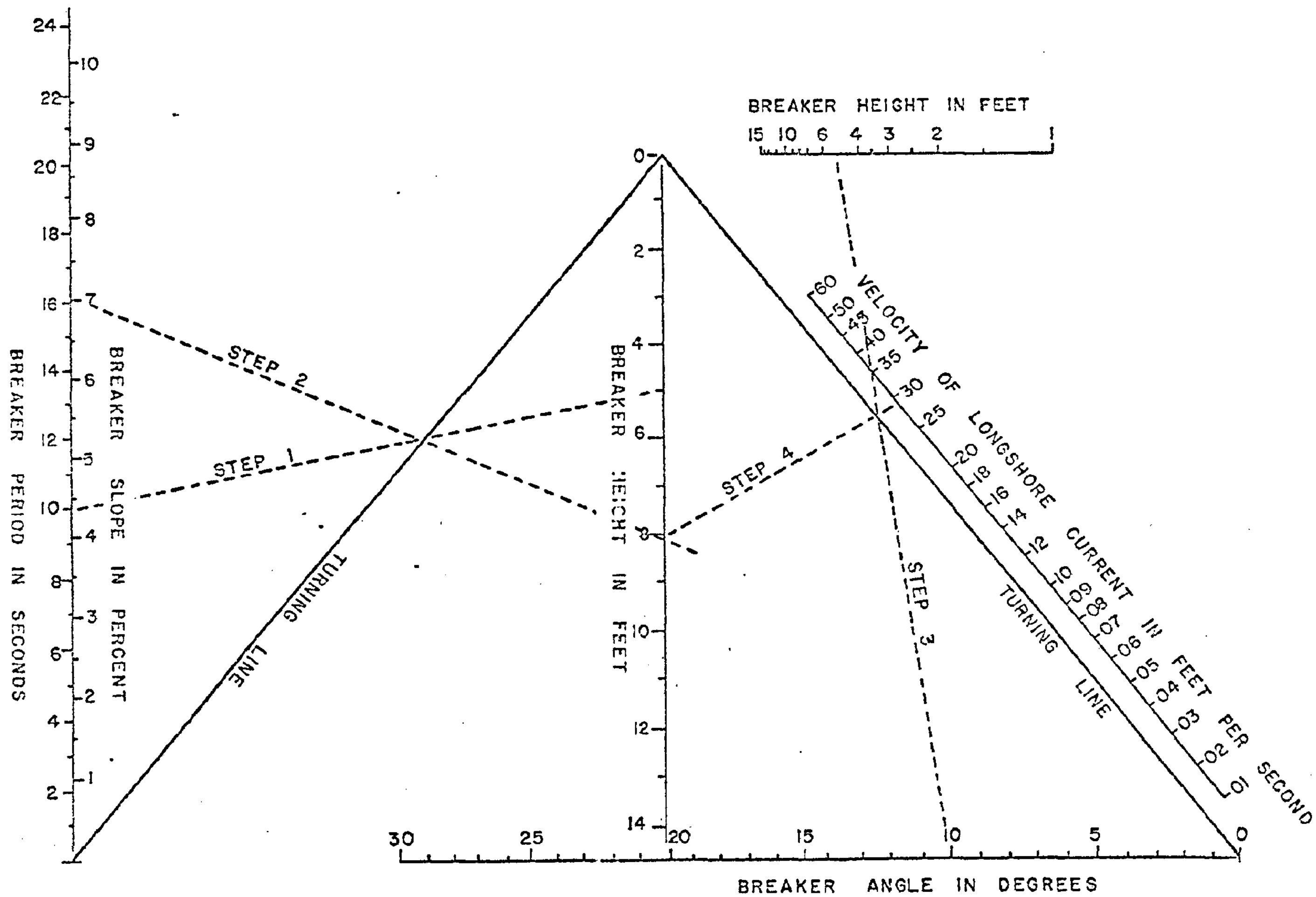

Figure 10.6-2 Longshore Current Nomograph (Paulus, 1972).

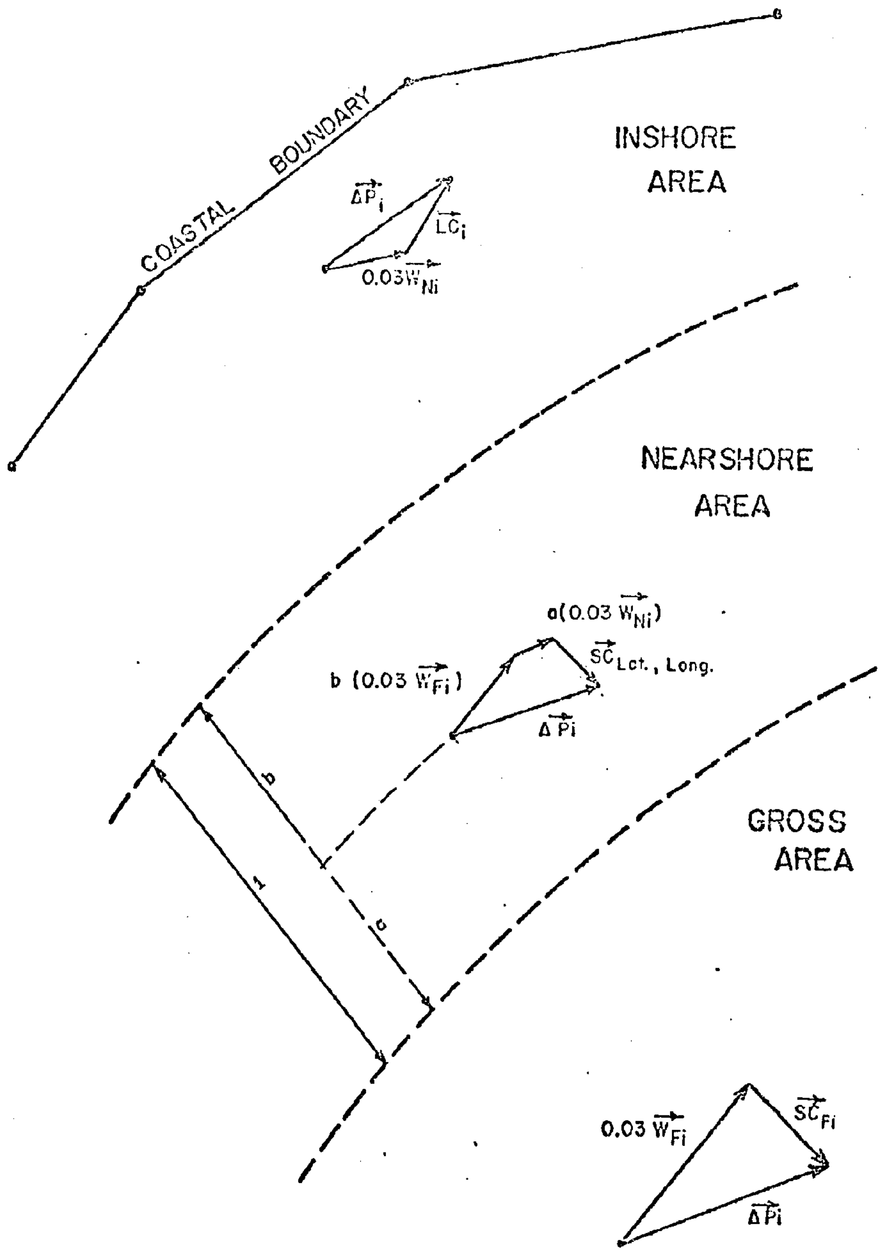

Figure 10.6-3 Oil Slick Transport Vectors by Areal Extent.

OIL SLICK TRANSPORT MODEL

NUMBER OF SLICKS TRANSPORTED - 1

MONTH OF FIRST SLICK - MAR , 1972

* DENSITY		* KINEMATIC	* -------	COEFFICIENTS ------- *		* SPREADING	LAW COEFFICIENTS	*	FINAL
WATER (GM/CM**3)	OIL	VISCOSITY (CM**2/SEC)	SPREADING (DYNE/CM)	DIFFUSIVITY (CM**2/SEC)	SOLUBILITY	INERTIAL	VISCOUS	SF TENSION	AREA
1.010	0.850	0.0098250	30.00	0.000010	0.001000	1.1400	1.4500	2.0500	-1.0000

* --------- INITIAL SLICK CHARACTERISTICS --------- *

INITIAL SLICK VOLUME - 15000.0 TONS

VOLATILE FRACTION	RATE OF EVAPORATION	RATE OF DISSOLUTION	RATE OF DISS / EVAP
10.00	0.80 EXPF(0.20W)	0.1000	0.0166667
7.00	0.00 EXPF(0.0 W)	0.0	0.0
15.00	0.80 EXPF(0.20W)	0.5000	0.0833335
20.00	0.00 EXPF(0.0 W)	0.0	0.0
5.00	0.80 EXPF(0.20W)	1.0000	0.1666670
3.00	0.02 EXPF(0.0 W)	0.0010	0.0500000
15.00	0.02 EXPF(0.0 W)	0.0010	0.0500000
25.00	0.0 EXPF(0.0 W)	0.0	0.0

* ---- SPREADING REGIME DIFFERENTIATION --- *

GRAVITY REGIME (HOURS)	VISCOUS REGIME (HOURS)	SF TENSION REGIME (HOURS)
1.5404	36.0672	206.4501

TERMINAL SPREADING AREA

95.9740 SQ. MILES

Figure 10.6-4 Slick Model Time History Output (No Coriolis Force).

OIL SLICK TRANSPORT MODEL

INITIAL CONDITIONS -
SIMULATED SPILL OCCURRED ON 26 MAR 1972 AT 1500 HOURS.
POSITION IS 28.45 DEGREES LATITUDE,
-95.20 DEGREES LONGITUDE.

		SLICK TRANSPORT PHENOMENA										SLICK CHARACTERISTICS						
		WIND RESULTANTS						CURRENTS				VOLUMES LOST			VOLUME	SLICK	NEW POSITION	
		OFFSHORE		ONSHORE		SLICK WIND		POSITIONAL		LONGSHORE								
DAY	HOUR	DIR (DEG)	SPEED (MPS)	DIR (DEG)	SPEED (MPS)	DIR (DEG)	SPEED (MPS)	DIR (DEG)	SPEED (MPS)	DIR (DEG)	SPEED (MPS)	AIR (TONS)	SOLTN (TONS)	BEACH (TONS)	LEFT (TONS)	AREA (SQ MI)	LATITUDE (DEG)	LONGITUDE (DEG)
0	300	112.5	68.4*			112.5	68.4*	9.6	0.7			4169.9	337.8	0.0	10492.2	2.021	28.4715	-95.2292
0	600	225.0	32.9*			225.0	32.9*	254.2	0.6			8.0	0.4	0.0	10483.8	2.858	28.4793	-95.2267
0	900	180.0	32.9*			180.0	32.9*	280.5	0.6			7.7	0.4	0.0	10475.8	3.501	28.4951	-95.2356
0	1200	135.0	22.8*			135.0	22.8*	334.8	0.5			7.7	0.4	0.0	10467.7	4.042	28.5089	-95.2472
0	1500	112.5	12.7*			112.5	12.7*	307.8	0.3			7.7	0.4	0.0	10459.7	4.519	28.5138	-95.2571
0	1800	135.0	32.9*			135.0	32.9*	260.3	0.6			7.6	0.3	0.0	10451.7	4.951	28.5225	-95.2782
0	2100	135.0	53.2*			135.0	53.2*	325.8	0.4			7.6	0.3	0.0	10443.8	5.348	28.5436	-95.3004
1	0	135.0	32.9*			135.0	32.9*	14.2	1.1			7.6	0.3	0.0	10435.8	5.717	28.5695	-95.3076
1	300	90.0	17.7*			90.0	17.7*	60.8	0.8			7.6	0.3	0.0	10427.8	6.064	28.5738	-95.3055
1	600	135.0	32.9*			135.0	32.9*	79.5	0.7			7.6	0.3	0.0	10419.9	6.392	28.5858	-95.3057
1	900	112.5	27.9*			112.5	27.9*	74.2	0.9			7.6	0.3	0.0	10412.0	6.703	28.5939	-95.3044
1	1200	157.5	53.2*			157.5	53.2*	67.0	0.9			7.5	0.3	0.0	10404.1	7.002	28.6205	-95.3003
1	1500	157.5	27.9*			157.5	27.9*	87.4	1.0			7.5	0.3	0.0	10396.3	7.880	28.6323	-95.2892
1	1800	157.5	58.3*			157.5	58.3*	158.7	0.5			7.5	0.3	0.0	10388.4	8.907	28.6487	-95.2971
1	2100	22.5	93.7*			22.5	93.7*	112.2	0.1			7.5	0.3	0.0	10380.6	9.767	28.6104	-95.3127
2	0	135.0	43.1*			135.0	43.1*	50.5	0.3			7.5	0.3	0.0	10372.8	10.760	28.6265	-95.3236
2	300	112.5	17.7*			112.5	17.7*	73.1	0.6			7.5	0.3	0.0	10365.0	11.784	28.6319	-95.3229
2	600	67.5	78.5*			67.5	78.5*	228.3	0.3			7.4	0.3	0.0	10357.2	12.839	28.6160	-95.3624
2	900	67.5	17.7*			67.5	17.7*	297.6	0.4			7.4	0.3	0.0	10349.4	13.923	28.6158	-95.3766
2	1200	90.0	43.1*			90.0	43.1*	76.1	0.1			7.4	0.3	0.0	10341.7	15.037	28.6160	-95.3[illegible]67
2	1500	112.5	48.1*			112.5	48.1*	235.4	0.3			7.4	0.3	0.0	10334.0	16.179	28.6215	-95.4231
2	1800	90.0	27.9*			90.0	27.9*	222.2	.2			7.4	0.3	0.0	10326.3	17.348	28.6036	-95.4500
2	2100	90.0	22.8*			90.0	22.8*	241.6	1.6			7.4	0.3	0.0	10318.6	18.544	28.5976	-95.4850
3	0	90.0	53.2*			90.0	53.2*	275.0	0.7			7.3	0.3	0.0	10310.9	19.766	28.5984	-95.5224
3	300	112.5	32.9*			112.5	32.9*	277.6	0.4			7.3	0.3	0.0	10303.2	21.015	28.6048	-95.5446
3	600	112.5	43.1*			112.5	43.1*	264.5	0.8			7.3	0.3	0.0	10295.6	22.288	28.6109	-95.5769
3	900	112.5	22.8*			112.5	22.8*	270.2	0.8			7.3	0.3	0.0	10288.0	23.586	28.6147	-95.6011
3	1200	135.0	17.7*			135.0	17.7*	319.7	1.1			7.3	0.3	0.0	10280.4	24.909	28.6325	-95.6192
3	1500	157.5	27.9*			157.5	27.9*	323.2	1.4			7.3	0.3	0.0	10272.8	26.255	28.6604	-95.6388
3	1800	22.5	38.0*			22.5	38.0*	262.3	1.4			7.2	0.3	0.0	10265.2	27.625	28.6425	-95.6680
3	2100	22.5	108.9*			22.5	108.9*	265.7	2.1			7.2	0.3	0.0	10257.7	29.017	28.5965	-95.7238
4	0	22.5	93.7*			22.5	93.7*	270.1	2.1			7.2	0.3	0.0	10250.2	30.432	28.5588	-95.7757
4	300	90.0	17.7*			90.0	17.7*	270.1	2.1			7.2	0.3	0.0	10242.6	31.870	28.5588	-95.8183
4	600	112.5	58.3*			112.5	58.3*	269.0	2.1			7.2	0.3	0.0	10235.1	33.330	28.5678	-95.8806
4	900	135.0	53.2*	N	43.2	121.0	32.5*	243.3	1.1			7.2	0.3	0.0	10227.7	34.811	28.5680	-95.9101
4	1200	157.5	58.3*	NE	35.5	103.2	25.2*	242.9	1.1			7.1	0.3	0.0	10220.2	36.313	28.5642	-95.9330
4	1500	90.0	27.9*	NNE	31.5	34.6	27.5*	242.6	1.1			7.1	0.3	75.9	10136.8	37.837	28.5467	-95.9623
4	1800	112.5	38.0*	NNE	33.1	55.0	25.2*	242.4	1.2			7.1	0.3	0.0	10129.4	39.381	28.5322	-95.9901
4	2100	180.0	53.2*	N	29.9	180.0	2.5*	242.1	1.3			7.1	0.3	0.0	10122.0	40.946	28.5245	-96.0087
5	0	135.0	53.2*	N	30.4	69.4	14.9*	242.0	1.3			7.1	0.3	0.0	10114.6	42.531	28.5133	-96.0345
5	300	135.0	43.1*	NE	24.5	89.2	22.0*	242.0	1.3			7.1	0.3	0.0	10107.2	44.136	28.5042	-96.0642
5	600	135.0	17.7*	NNE	5.7	84.5	5.0*	242.0	1.3			7.0	0.3	73.6	10026.2	45.760	28.4952	-96.0853
5	900	135.0	43.1*	N	9.8	94.6	7.9*	242.0	1.3			7.0	0.3	88.9	9930.0	47.404	28.4867	-96.1077
5	1200	112.5	17.7*	SSE	27.9*	150.8	24.5*	0.0	0.6			7.0	0.3	112.0	9810.6	49.067	28.5042	-96.1137
5	1500	112.5	32.9*	SE	22.8*	135.0	22.8*			238.9	2.5	7.0	0.3	172.8	9630.5	50.749	28.4926	-96.1564

Figure 10.6-4 Slick Model Time Hiscory Output (No Coriolis Force) - (continued).

OIL SLICK TRANSPORT MODEL

INITIAL CONDITIONS -
SIMULATED SPILL OCCURRED ON 26 MAR 1972 AT 1500 HOURS.
POSITION IS 28.45 DEGREES LATITUDE,
-95.20 DEGREES LONGITUDE.

		SLICK TRANSPORT PHENOMENA: WIND RESULTANTS						CURRENTS				SLICK CHARACTERISTICS: VOLUMES LOST					NEW POSITION	
		OFFSHORE		ONSHORE		SLICK WIND		POSITIONAL		LONGSHORE					VOLUME	SLICK		
DAY	HOUR	DIR (DEG)	SPEED (MPS)	DIR (DEG)	SPEED (MPS)	DIR (DEG)	SPEED (MPS)	DIR (DEG)	SPEED (MPS)	DIR (DEG)	SPEED (MPS)	AIR (TONS)	SOLTN (TONS)	BEACH (TONS)	LEFT (TONS)	AREA (SQ MI)	LATITUDE (DEG)	LONGITUDE (DEG)
5	1800	112.5	17.7*	SSE	27.9*	157.5	27.9*			0.0	0.0	7.0	0.3	190.4	9432.9	52.450	28.5037	-96.1618
5	1859	112.5	27.9*	SE	48.1*	135.0	48.1*			233.9	1.0	2.3	0.1	203.0	9227.5	53.014	28.5060	-96.1721

Figure 10.6-4 Slick Model Time History Output (No Coriolis Force) - (continued).

OIL SLICK TRANSPORT MODEL

NUMBER OF SLICKS TRANSPORTED - 31

MONTH OF FIRST SLICK - MAR , 1972

DENSITY WATER (GM/CM**3)	DENSITY OIL (GM/CM**3)	KINEMATIC VISCOSITY (CM**2/SEC)	COEFFICIENTS SPREADING (DYNE/CM)	COEFFICIENTS DIFFUSIVITY (CM**2/SEC)	COEFFICIENTS SOLUBILITY	SPREADING LAW COEFFICIENTS INERTIAL	SPREADING LAW COEFFICIENTS VISCOUS	SPREADING LAW COEFFICIENTS SF TENSION	FINAL AREA
1.030	0.850	0.0098250	30.00	0.000010	0.001000	1.1400	1.4500	2.0550	1.0000

* ---------- INITIAL SLICK CHARACTERISTICS ---------- *

INITIAL SLICK VOLUME - 15000.0 TONS

VOLATILE FRACTION	RATE OF EVAPORATION	RATE OF DISSOLUTION	RATE OF DISS / EVAP
10.00	0.80 EXPF(0.20W)	0.1000	0.0166667
7.00	0.00 EXPF(0.0 W)	0.0	0.0
15.00	0.80 EXPF(0.20W)	0.5000	0.0833335
20.00	0.00 EXPF(0.0 W)	0.0	0.0
5.00	0.20 EXPF(0.20W)	1.0000	0.1666670
3.00	0.02 EXPF(0.0 W)	0.0010	0.0500000
15.00	0.02 EXPF(0.0 W)	0.0010	0.0500000
25.00	0.0 EXPF(0.0 W)	0.0	0.0

* ---- SPREADING REGIME DIFFERENTIATION --- *

GRAVITY REGIME (HOURS)	VISCOUS REGIME (HOURS)	SF TENSION REGIME (HOURS)
1.5409	36.0672	206.4501

TERMINAL SPREADING AREA

95.9740 SQ. MILES

Figure 10.6-5 Slick Model Summary Output (No Coriolis Force).

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OIL SLICK TRANSPORT MODEL

MONTH	DAY	YEAR	HOUR	INITIAL LATITUDE (DEG)	INITIAL LONGITUDE (DEG)	VOLUME (TONS)	DISTANCE TRANSPORTED LATITUDE (MILES)	DISTANCE TRANSPORTED LONGITUDE (MILES)	TIME OF BEACHING (HOURS)	VOLUMES LOST AIR (TONS)	VOLUMES LOST SOLUTION (TONS)	VOLUMES LOST BEACH (TONS)	FINAL COORDINATES LATITUDE (DEG)	FINAL COORDINATES LONGITUDE (DEG)
MAR	1	1972	1500	28.4500	-95.2000	15000.00	63.91	90.58	131.95	4486.37	352.21	651.62	28.2723	-96.5693
MAR	2	1972	600	28.4500	-95.2000	15000.00	53.96	87.72	118.12	4453.95	350.75	539.69	28.2553	-96.5800
MAR	3	1972	1200	28.4500	-95.2000	15000.00	37.98	70.30	81.94	4367.46	346.84	325.56	28.4341	-96.3058
MAR	4	1972	600	28.4500	-95.2000	15000.00	32.41	64.15	81.31	4365.93	346.77	344.25	28.4596	-96.2026
MAR	5	1972	1500	28.4500	-95.2000	15000.00	38.25	72.93	83.41	4371.03	347.00	1071.83	28.3823	-96.3529
MAR	6	1972	0	28.4500	-95.2000	15000.00	45.32	75.14	96.74	4403.12	348.45	1526.78	28.4416	-96.2920
MAR	7	1972	2100	28.4500	-95.2000	15000.00	18.52	38.65	61.21	4316.81	344.54	355.60	28.6728	-95.8017
MAR	8	1972	600	28.4500	-95.2000	15000.00	18.45	41.83	58.31	4309.66	344.21	188.62	28.6690	-95.8096
MAR	9	1972	1200	28.4500	-95.2000	15000.00	32.24	29.16	71.17	4341.25	345.65	198.66	28.9143	-95.5325
MAR	10	1972	0	28.4500	-95.2000	15000.00	39.15	24.38	87.99	4382.09	347.50	433.23	28.9022	-95.2594
MAR	11	1972	300	28.4500	-95.2000	15000.00	161.99	182.40	510.56	5255.16	386.13	1221.71	28.7604	-95.6239
MAR	12	1972	600	28.4500	-95.2000	15000.00	161.81	235.67	619.51	5439.44	393.98	934.22	28.5977	-95.9746
MAR	13	1972	1800	28.4500	-95.2000	15000.00	167.79	245.64	630.33	5457.03	394.72	1265.43	28.5221	-96.1421
MAR	14	1972	1200	28.4500	-95.2000	15000.00	146.05	234.19	567.66	5353.58	390.34	940.35	28.5157	-96.1539
MAR	15	1972	300	28.4500	-95.2000	15000.00	148.19	227.36	554.64	5331.49	389.40	698.73	28.4514	-96.2737
MAR	16	1972	2100	28.4500	-95.2000	15000.00	143.19	213.24	507.87	5250.42	385.92	1252.23	28.4137	-96.3438
MAR	17	1972	0	28.4500	-95.2000	15000.00	133.21	210.68	504.81	5245.03	385.69	1302.97	28.4163	-96.3390
MAR	18	1972	1500	28.4500	-95.2000	15000.00	110.45	138.87	356.29	4967.82	373.65	1529.89	28.2884	-96.5420
MAR	19	1972	300	28.4500	-95.2000	15000.00	109.40	136.72	332.46	4920.43	371.57	1130.33	28.2948	-96.5269
MAR	20	1972	2100	28.4500	-95.2000	15000.00	88.20	117.93	277.92	4808.77	366.63	2138.79	28.3711	-96.3913
MAR	21	1972	600	28.4500	-95.2000	15000.00	88.43	117.02	268.61	4789.24	365.77	2996.50	28.3793	-96.3837
MAR	22	1972	1800	28.4500	-95.2000	15000.00	74.59	97.64	232.27	4711.75	362.32	1457.00	28.5682	-96.0459
MAR	23	1972	2100	28.4500	-95.2000	15000.70	67.61	94.12	206.02	4654.43	359.76	1176.68	28.5712	-96.0387

Figure 10.6-5 Slick Model Summary Output (No Coriolis Force) - (continued).

OIL SLICK TRANSPORT MODEL

SLICK IDENTIFICATION MONTH	DAY	YEAR	HOUR	INITIAL CHARACTERISTICS LATITUDE (DEG)	LONGITUDE (DEG)	VOLUME (TONS)	DISTANCE TRANSPORTED LATITUDE (MILES)	LONGITUDE (MILES)	TIME OF BEACHING (HOURS)	VOLUMES LOST AIR (TONS)	SOLUTION (TONS)	BEACH (TONS)	FINAL COORDINATES LATITUDE (DEG)	LONGITUDE (DEG)
MAR	24	1972	1500	28.4500	-95.2000	15000.00	61.20	79.07	186.71	4611.49	357.84	2241.66	28.5255	-96.1358
MAR	25	1972	1300	28.4500	-95.2000	15000.00	47.94	58.29	160.03	4551.20	355.13	2235.38	28.5515	-96.0863
MAR	26	1972	1500	28.4500	-95.2000	15000.00	41.87	62.94	138.99	4502.75	352.95	916.64	28.5060	-96.1722
MAR	27	1972	900	28.4500	-95.2000	15000.00	38.08	60.07	120.80	4460.25	351.04	501.74	28.5297	-96.1279
MAR	28	1972	900	28.4500	-95.2000	15000.00	33.89	61.45	122.72	4464.77	351.24	783.51	28.4064	-96.2086
MAR	29	1972	600	28.4500	-95.2000	15000.00	51.93	103.35	209.07	4661.16	360.06	1147.04	28.5431	-96.1029
MAR	30	1972	1200	28.4500	-95.2000	15000.00	47.28	106.86	189.82	4618.47	358.15	933.94	28.5321	-96.1233
MAR	31	1972	0	28.4500	-95.2000	15000.00	45.32	87.63	215.05	4674.27	360.65	1183.08	28.6598	-95.8289

Figure 10.6-5 Slick Model Summary Output (No Coriolis Force) - (continued).

OIL SLICK TRANSPORT MODEL

NUMBER OF SLICKS TRANSPORTED - 1

MONTH OF FIRST SLICK - MAR , 1972

* DENSITY WATER (GM/CM**3)	OIL	* KINEMATIC VISCOSITY (CM**2/SEC)	* ------- COEFFICIENTS ------- * SPREADING (DYNE/CM)	DIFFUSIVITY (CM**2/SEC)	SOLUBILITY	* SPREADING LAW COEFFICIENTS * INERTIAL	VISCOUS	SF TENSION	* FINAL AREA
1.030	0.850	0.0098250	30.00	0.000010	0.001000	1.1400	1.4500	2.0500	1.0000

* ---------- INITIAL SLICK CHARACTERISTICS --------- *

INITIAL SLICK VOLUME - 15000.0 TONS

VOLATILE FRACTION	RATE OF EVAPORATION	RATE OF DISSOLUTION	RATE OF DISS / EVAP
10.00	0.80 EXPF(0.[illegible]0W)	0.1000	0.0166667
7.00	0.00 EXPF(0.[illegible])	0.0	0.0
15.00	0.80 EXPF(0.[illegible]0W)	0.5000	0.0333335
20.00	0.00 EXPF(0.0 W)	0.0	0.0
5.00	0.80 EXPF(0.20W)	1.0000	0.1666670
3.00	0.02 EXPF(0.0 W)	0.0010	0.0500000
15.00	0.02 EXPF(0.0 W)	0.0010	0.0500000
25.00	0.0 EXPF(0.0 W)	0.0	0.0

CORIOLIS-INDUCED WIND SHIFT = 15.0 DEGREES.

* ---- SPREADING REGIME DIFFERENTIATION --- *

GRAVITY REGIME (HOURS)	VISCOUS REGIME (HOURS)	SF TENSION REGIME (HOURS)
1.5404	36.0672	206.4501

TERMINAL SPREADING AREA

95.9740 SQ. MILES

Figure 10.6-6 Slick Model Time History Output (Coriolis Force Included).

OIL SLICK TRANSPORT MODEL

INITIAL CONDITIONS -
SIMULATED SPILL OCCURRED ON 26 MAR 1972 AT 1500 HOURS.
POSITION IS 28.45 DEGREES LATITUDE.
-95.20 DEGREES LONGITUDE.

		SLICK TRANSPORT PHENOMENA										SLICK CHARACTERISTICS						
		WIND RESULTANTS						CURRENTS				VOLUMES LOST					NEW POSITION	
		OFFSHORE		ONSHORE		SLICK WIND		POSITIONAL		LONGSHORE					VOLUME	SLICK		
		DIR	SPEED	DIR	SPEED	DIR	SPEED	DIR	SPEED	DIR	SPEED	AIR	SOLTN	BEACH	LEFT	AREA	LATITUDE	LONGITUDE
DAY	HOUR	(DEG)	(MPS)	(DEG)	(MPS)	(DEG)	(MPS)	(DEG)	(MPS)	(DEG)	(MPS)	(TONS)	(TONS)	(TONS)	(TONS)	(SQ MI)	(DEG)	(DEG)
0	300	112.5	68.4*			127.5	68.4*	9.6	0.7			4169.9	337.8	0.0	10492.2	2.021	28.4782	-95.2249
0	600	225.0	32.9*			240.0	32.9*	254.2	0.6			8.0	0.4	0.0	10483.8	2.858	28.4831	-95.2197
0	900	180.0	32.9*			195.0	32.9*	280.5	0.6			7.7	0.4	0.0	10475.8	3.501	28.4983	-95.2244
0	1200	135.0	22.8*			150.0	22.8*	334.0	0.5			7.7	0.4	0.0	10467.7	4.042	28.5137	-95.2336
0	1500	112.5	17.7*			127.5	12.7*	307.8	0.3			7.7	0.4	0.0	10459.7	4.519	28.5199	-95.2427
0	1800	135.0	32.9*			150.0	32.9*	260.3	0.6			7.6	0.3	0.0	10451.7	4.951	28.5303	-95.2605
0	2100	135.0	53.2*			150.0	53.2*	325.0	0.4			7.6	0.3	0.0	10443.8	5.348	28.5555	-95.2772
1	0	135.0	32.9*			150.0	32.9*	14.2	1.1			7.6	0.3	0.0	10435.8	5.717	28.5828	-95.2810
1	300	90.0	17.7*			105.0	17.7*	60.8	0.8			7.6	0.3	0.0	10427.8	6.064	28.5901	-95.2796
1	600	135.0	32.9*			150.0	32.9*	79.5	0.7			7.6	0.3	0.0	10419.9	6.392	28.6043	-95.2754
1	900	112.5	27.9*			127.5	27.9*	74.2	0.9			7.6	0.3	0.0	10412.0	6.703	28.6151	-95.2723
1	1200	157.5	53.2*			172.5	53.2*	67.0	0.9			7.5	0.3	0.0	10404.1	7.002	28.6432	-95.2616
1	1500	157.5	27.9*			172.5	27.9*	87.4	1.0			7.5	0.3	0.0	10396.3	7.380	28.6559	-95.2473
1	1800	157.5	58.3*			172.5	58.3*	158.7	0.5			7.5	0.3	0.0	10388.4	8.807	28.6740	-95.2476
1	2100	22.5	93.7*			37.5	93.7*	112.2	0.1			7.5	0.3	0.0	10380.6	9.767	28.6410	-95.2737
2	0	135.0	43.1*			150.0	43.1*	50.5	0.3			7.5	0.3	0.0	10372.8	10.760	28.6601	-95.2802
2	300	112.5	17.7*			127.5	17.7*	73.1	0.6			7.5	0.3	0.0	10365.0	11.784	28.6672	-95.2782
2	600	67.5	78.5*			82.5	78.5*	228.3	0.3			7.4	0.3	0.0	10357.2	12.839	28.6599	-95.3205
2	900	67.5	17.7*			82.5	17.7*	297.6	0.4			7.4	0.3	0.0	10349.4	13.923	28.6617	-95.3352
2	1200	90.0	43.1*			105.0	43.1*	78.1	0.1			7.4	0.3	0.0	10341.7	15.037	28.6667	-95.3548
2	1500	112.5	40.1*			127.5	48.1*	235.4	0.3			7.4	0.3	0.0	10334.0	16.179	28.6759	-95.3779
2	1800	90.0	27.9*			105.0	27.9*	222.2	1.2			7.4	0.3	0.0	10326.3	17.348	28.6574	-95.4043
2	2100	90.0	22.8*			105.0	22.8*	241.6	1.6			7.4	0.3	0.0	10318.6	18.544	28.6588	-95.4390
3	0	90.0	53.2*			105.0	53.2*	275.0	0.7			7.3	0.3	0.0	10310.9	19.766	28.6656	-95.4755
3	300	112.5	32.9*			127.5	32.9*	277.6	0.4			7.3	0.3	0.0	10303.2	21.015	28.6752	-95.4956
3	600	112.5	43.1*			127.5	43.1*	264.5	0.8			7.3	0.3	0.0	10295.6	22.288	28.6855	-95.5250
3	900	112.5	22.8*			127.5	22.8*	270.2	0.8			7.3	0.3	0.0	10288.0	23.586	28.6916	-95.5478
3	1200	135.0	17.7*			150.0	17.7*	319.7	1.1			7.3	0.3	0.0	10280.4	24.909	28.7106	-95.5641
3	1500	157.5	27.9*			172.5	27.9*	323.2	1.4			7.3	0.3	0.0	10272.8	26.255	28.7394	-95.5802
3	1800	22.5	38.0*	NE	54.0	54.0	47.8*	248.4	0.4			7.2	0.3	53.9	10211.4	27.625	28.7248	-95.6062
3	2100	22.5	108.9*	NE	41.4	46.4	64.9*	247.7	0.5			7.2	0.3	67.5	10136.3	29.017	28.7026	-95.6370
4	0	22.5	93.7*	NE	46.4	45.0	68.7*	247.1	0.6			7.2	0.3	0.0	10120.8	30.432	28.6784	-95.6694
4	300	90.0	17.7*	NE	43.1	79.8	24.4*	246.4	0.6			7.2	0.3	0.0	10121.3	31.870	28.6729	-95.6907
4	600	112.5	58.3*	NNE	39.0	97.2	36.4*	246.0	0.7			7.2	0.3	0.0	10113.8	33.330	28.6710	-95.7184
4	900	135.0	53.2*	N	43.2	38.8	24.2*	245.6	0.7			7.2	0.3	103.2	10003.1	34.811	28.6587	-95.7361
4	1200	157.5	58.3*	NE	35.5	106.8	24.7*	245.3	0.7			7.1	0.3	93.4	9902.2	36.313	28.6573	-95.7583
4	1500	90.0	27.9*	NNE	31.5	42.1	29.7*	244.9	0.7			7.1	0.3	129.9	9764.9	37.837	28.6432	-95.7792
4	1800	112.5	38.0*	NNE	33.1	50.1	20.4*	244.6	0.8			7.1	0.3	122.9	9634.5	39.301	28.6303	-95.8017
4	2100	180.0	53.2*	N	29.9	15.0	14.6*	244.3	0.8			7.1	0.3	121.3	9505.8	40.946	28.6189	-95.8160
5	0	135.0	53.2*	N	30.4	56.9	15.6*	244.1	0.9			7.1	0.3	109.1	9389.3	42.531	28.6096	-95.8354
5	300	135.0	43.1*	NE	24.5	90.8	21.3*	243.8	0.9			7.1	0.3	112.1	9269.8	44.136	28.6039	-95.8595
5	600	135.0	17.7*	NNE	5.7	61.9	4.7*	243.5	1.0			7.0	0.3	133.7	9128.7	45.760	28.5967	-95.8756
5	900	135.0	43.1*	N	9.8	50.4	6.2*	243.3	1.0			7.0	0.3	138.3	8983.1	47.404	28.5885	-95.8925
5	1200	112.5	17.7*	SSE	27.9*	168.8	25.9*	359.7	0.5			7.0	0.3	140.0	8835.8	49.067	28.6065	-95.8951
5	1500	112.5	32.9*	SE	22.8*	150.0	22.0*			245.0	2.9	7.0	0.3	142.8	8685.7	50.749	28.5972	-95.9440

Figure 10.6-6 Slick Model Time History Output (Coriolis Force Included) - (continued).

OIL SLICK TRANSPORT MODEL

INITIAL CONDITIONS -
SIMULATED SPILL OCCURRED ON 26 MAR 1972 AT 1500 HOURS.
POSITION IS 28.45 DEGREES LATITUDE.
-95.20 DEGREES LONGITUDE.

		Slick Transport Phenomena: Wind Resultants — Offshore		Onshore		Slick Wind		Currents — Positional		Longshore		Slick Characteristics: Volumes Lost			Volume	Slick	New Position	
DAY	HOUR	DIR (DEG)	SPEED (MPS)	DIR (DEG)	SPEED (MPS)	DIR (DEG)	SPEED (MPS)	DIR (DEG)	SPEED (MPS)	DIR (DEG)	SPEED (MPS)	AIR (TONS)	SOLTN (TONS)	BEACH (TONS)	LEFT (TONS)	AREA (SQ MI)	LATITUDE (DEG)	LONGITUDE (DEG)
5	1800	112.5	17.7*	SSE	27.9*	172.5	27.9*			0.0	0.0	7.0	0.3	188.3	8490.1	52.450	28.6092	-95.9459
5	1803	112.5	27.9*	SE	48.1*	150.0	48.1*			245.0	1.2	0.1	0.0	135.8	8354.2	52.478	28.6094	-95.9464

Figure 10.6-6 Slick Model Time History Output (Coriolis Force Included) - (continued).

OIL SLICK TRANSPORT MODEL

NUMBER OF SLICKS TRANSPORTED - 31

MONTH OF FIRST SLICK - MAR , 1972

* DENSITY WATER (GM/CM**3)	OIL	* KINEMATIC VISCOSITY (CM**2/SEC)	* ------- COEFFICIENTS SPREADING (DYNE/CM)	DIFFUSIVITY (CM**2/SEC)	SOLUBILITY ------- *	* SPREADING LAW COEFFICIENTS INERTIAL	VISCOUS	SF TENSION *	FINAL AREA
1.030	0.050	0.0098250	30.00	0.000010	0.001000	1.1400	1.4500	2.0500	1.0000

* ---------- INITIAL SLICK CHARACTERISTICS --------- *

INITIAL SLICK VOLUME - 15000.0 TONS

VOLATILE FRACTION	RATE OF EVAPORATION	RATE OF DISSOLUTION	RATE OF DISS / EVAP
10.00	0.80 EXPF(0.20W)	0.1000	0.0166667
7.00	0.00 EXPF(0.0 W)	0.0	0.0
15.00	0.80 EXPF(0.20W)	0.5000	0.0833335
20.00	0.00 EXPF(0.0 W)	0.0	0.0
5.00	0.80 EXPF(0.20W)	1.0000	0.1666670
3.00	0.02 EXPF(0.0 W)	0.0010	0.0500000
15.00	0.02 EXPF(0.0 W)	0.0010	0.0500000
25.00	0.0 EXPF(0.0 W)	0.0	0.0

CORIOLIS-INDUCED WIND SHIFT = 15.0 DEGREES.

* ---- SPREADING REGIME DIFFERENTIATION --- *

GRAVITY REGIME (HOURS)	VISCOUS REGIME (HOURS)	SF TENSION REGIME (HOURS)
1.5404	36.0672	206.4501

TERMINAL SPREADING AREA

95.9740 SQ. MILES

Figure 10.6-7 Slick Model Summary Output (Coriolis Force Included).

OIL SLICK TRANSPORT MODEL

SLICK IDENTIFICATION MONTH	DAY	YEAR	HOUR	INITIAL CHARACTERISTICS LATITUDE (DEG)	LONGITUDE (DEG)	VOLUME (TONS)	DISTANCE TRANSPORTED LATITUDE (MILES)	LONGITUDE (MILES)	TIME OF BEACHING (HOURS)	VOLUMES LOST AIR (TONS)	SOLUTION (TONS)	BEACH (TONS)	FINAL COORDINATES LATITUDE (DEG)	LONGITUDE (DEG)
MAR	1	1972	1500	28.4500	-95.2000	15000.00	63.49	77.31	118.82	4455.59	350.82	411.42	28.3951	-96.3692
MAR	2	1972	600	28.4500	-95.2000	15000.00	57.27	85.11	113.41	4442.82	350.25	551.03	28.2626	-96.5542
MAR	3	1972	1200	28.4500	-95.2000	15000.00	34.31	57.53	73.32	4346.50	345.89	218.29	28.5418	-96.1052
MAR	4	1972	600	28.4500	-95.2000	15000.00	26.60	60.97	77.12	4355.76	346.31	308.99	28.5302	-96.1269
MAR	5	1972	1500	28.4500	-95.2000	15000.00	19.11	40.32	52.24	4294.65	343.53	174.86	28.6471	-95.8555
MAR	6	1972	0	28.4500	-95.2000	15000.00	23.81	34.11	52.00	4294.06	343.50	255.01	28.7232	-95.6958
MAR	7	1972	2100	28.4500	-95.2000	15000.00	19.15	32.86	55.13	4301.81	343.86	247.26	28.7017	-95.7411
MAR	8	1972	600	28.4500	-95.2000	15000.00	20.30	37.91	55.16	4301.89	343.85	170.98	28.7019	-95.7406
MAR	9	1972	1200	28.4500	-95.2000	15000.00	36.6[illegible]	3[illegible].35	75.60	4352.05	346.14	235.70	28.8484	-95.4745
MAR	10	1972	0	28.4500	-95.2000	15000.00	40.7[illegible]	24.04	86.44	4378.34	347.33	330.35	29.0211	-95.2063
MAR	11	1972	300	28.4500	-95.2000	15000.00	163.04	164.04	511.11	5256.13	386.17	1812.79	28.8811	-95.4190
MAR	12	1972	600	28.4500	-95.2000	15000.00	142.73	179.73	480.73	5202.12	383.84	1697.85	28.7104	-95.7227
MAR	13	1972	1800	28.4500	-95.2000	15000.00	139.75	177.67	455.70	5156.72	381.88	945.26	28.6286	-95.8996
MAR	14	1972	1200	28.4500	-95.2000	15000.00	128.80	161.68	428.73	5106.83	379.72	1568.97	28.6337	-95.8873
MAR	15	1972	300	28.4500	-95.2000	15000.00	130.54	158.15	414.27	5079.69	378.54	1675.50	28.5923	-95.9876
MAR	16	1972	2100	28.4500	-95.2000	15000.00	125.07	149.84	372.05	4998.69	375.00	2100.78	28.4585	-96.2605
MAR	17	1972	0	28.4500	-95.2000	15000.00	122.87	147.45	369.14	4993.02	374.75	2110.20	28.4496	-96.2771
MAR	18	1972	1500	28.4500	-95.2000	15000.00	111.13	127.39	331.47	4918.46	371.48	2090.32	28.3025	-96.5086
MAR	19	1972	300	28.4500	-95.2000	15000.00	109.26	123.05	320.64	4896.63	370.52	1644.46	28.3947	-96.3695
MAR	20	1972	2100	28.4500	-95.2000	15000.00	91.61	113.47	278.53	4810.03	366.69	4765.02	28.3981	-96.3564
MAR	21	1972	600	28.4500	-95.2000	15000.00	89.59	111.10	268.40	4788.80	365.75	5451.24	28.4301	-96.3134
MAR	22	1972	1800	28.4500	-95.2000	15000.00	79.32	91.56	231.14	4709.31	362.21	2234.20	28.6023	-95.9634
MAR	23	1972	2100	28.4500	-95.2000	15000.00	72.41	86.79	204.19	4650.38	359.58	2104.75	28.5986	-95.9725

Figure 10.6-7 Slick Model Summary Output (Coriolis Force Included) - (continued).

OIL SLICK TRANSPORT MODEL

SLICK IDENTIFICATION MONTH	DAY	YEAR	HOUR	INITIAL CHARACTERISTICS LATITUDE (DEG)	LONGITUDE (DEG)	VOLUME (TONS)	DISTANCE TRANSPORTED LATITUDE (MILES)	LONGITUDE (MILES)	TIME OF BEACHING (HOURS)	VOLUMES LOST AIR (TONS)	SOLUTION (TONS)	BEACH (TONS)	FINAL COORDINATES LATITUDE (DEG)	LONGITUDE (DEG)
MAR	24	1972	1500	28.4500	-95.2000	15000.00	59.82	68.96	186.18	4610.30	357.79	3350.86	28.5998	-95.9675
MAR	25	1972	1500	28.4500	-95.2000	15000.00	52.26	56.40	159.32	4549.56	355.06	2993.65	28.5369	-96.0008
MAR	26	1972	1500	28.4500	-95.2000	15000.00	41.90	52.06	138.05	4500.57	352.85	1792.22	28.6094	-95.9464
MAR	27	1972	900	28.4500	-95.2000	15000.00	40.10	58.55	120.64	4459.88	351.02	871.55	28.5506	-96.0691
MAR	28	1972	900	28.4500	-95.2000	15000.00	30.47	55.25	97.45	4404.83	348.53	389.80	28.5498	-96.0903
MAR	29	1972	600	28.4500	-95.2000	15000.00	28.06	49.95	84.18	4372.88	347.08	362.37	28.5829	-96.0104
MAR	30	1972	1200	28.4500	-95.2000	15000.00	44.35	79.38	178.74	4593.63	357.04	996.83	28.6872	-95.7715
MAR	31	1972	0	28.4500	-95.2000	15000.00	42.18	75.77	173.99	4582.91	356.56	569.52	28.6892	-95.7673

Figure 10.6-7 Slick Model Summary Output (Coriolis Force Included) - (continued).

SOLUBLE FRACTION TRANSPORT MODEL

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INITIAL CONDITIONS -
     SIMULATED SPILL OF  15000.0 TONS OCCURRED ON 26 MAR  1972 AT 1500 HOURS.
     POSITION IS  28.45 DEGREES LATITUDE,
                 -95.20 DEGREES LONGITUDE.

SOLUBLE FRACTION PARAMETERS -
     HOUR IS  301 (RELATIVE TO SPILL INITIATION).
     POSITION IS  28.47 DEGREES LATITUDE,
                 -95.23 DEGREES LONGITUDE.
     WEIGHT IS     338.9 TONS.
     SLICK AREA IS   2.03 SQUARE MILES.
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		SOLUBLE FRACTION TRANSPORT PHENOMENA						DIFFUSION RESULTS								
		CURRENT RESULTANTS						COEFFICIENTS			SPREADING EXTENTS			MAXIMUM	NEW POSITION	
		SURFACE		MID-DEPTH		TRANSPORT										
		DIR	SPEED	DIR	SPEED	DIR	SPEED	X	Y	Z	X	Y	Z	CONCENTRATION	LATITUDE	LONGITUDE
DAY	HOUR	(DEG)	(MPS)	(DEG)	(MPS)	(DEG)	(MPS)	(FT**2/SEC)			(MI)	(MI)	(FT)	(PPM)	(DEG)	(DEG)
0	601	254.2	0.6	258.1	1.3	255.9	0.7	172.92	172.92	0.01	2.17	2.17	29.39	11.051	28.4699	-95.2413
0	901	280.5	0.6	272.3	1.2	276.1	0.8	258.81	258.81	0.01	2.82	2.82	41.57	4.653	28.4701	-95.2541
0	1201	334.8	0.5	301.9	0.9	316.0	0.7	365.66	365.66	0.01	3.53	3.53	50.91	2.418	28.4771	-95.2617
0	1501	307.5	0.3	236.7	0.9	292.4	0.6	494.26	494.26	0.01	4.31	4.31	58.79	1.404	28.4803	-95.2705
0	1801	260.3	0.6	270.7	1.4	268.0	1.0	645.24	645.24	0.01	5.16	5.16	65.73	0.878	28.4798	-95.2875
0	2101	325.8	0.4	296.4	0.9	304.3	0.6	819.08	819.08	0.01	6.06	6.06	65.73	0.635	28.4850	-95.2961
1	1	14.2	1.1	325.6	0.8	350.8	0.8	1016.18	1016.18	0.01	7.02	7.02	65.73	0.473	28.4971	-95.2983
1	301	60.8	0.8	301.8	0.4	24.6	0.3	1236.85	1236.85	0.01	8.04	8.04	65.73	0.361	28.5010	-95.2962
1	601	79.5	0.7	36.5	0.1	71.9	0.4	1481.38	1481.38	0.01	9.11	9.11	65.73	0.281	28.5027	-95.2904
1	901	74.2	0.9	68.8	0.4	72.4	0.6	1749.97	1749.97	0.01	10.23	10.23	65.73	0.223	28.5053	-95.2808
1	1201	67.0	0.9	42.6	0.4	58.2	0.6	2042.83	2042.83	0.01	11.40	11.40	65.73	0.179	28.5102	-95.2718
1	1501	87.4	1.0	49.3	0.4	75.3	0.6	2360.12	2360.12	0.01	12.62	12.62	65.73	0.147	28.5125	-95.2617
1	1801	158.7	0.5	147.9	0.3	154.4	0.4	2701.98	2701.98	0.01	13.89	13.89	65.73	0.121	28.5075	-95.2590
1	2101	112.2	0.1	255.6	0.3	234.4	0.1	3068.54	3068.54	0.01	15.19	15.19	65.73	0.101	28.5056	-95.2605
2	1	50.5	0.3	315.4	0.4	349.5	0.3	3459.91	3459.91	0.01	16.55	16.55	65.73	0.085	28.5103	-95.2613

Figure 10.6-8 Subsurface Model Time History Output.

SOLUBLE FRACTION TRANSPORT MODEL

* ---- INITIAL OIL SPILL CHARACTERISTICS --- *							* INITIAL SOLUBLE FRACTION PARAMETERS*					* --- SOLUBLE FRACTION TRANSPORT RESULTS --- *					
											SLICK	DISTANCE TRANSPORTED			INITIAL (FINAL)	TERMINAL COORDINATES	
MONTH	DAY	YEAR	HOUR	LATITUDE (DEG)	LONGITUDE (DEG)	WEIGHT (TONS)	HOUR	LATITUDE (DEG)	LONGITUDE (DEG)	WEIGHT (TONS)	AREA (SQ MI)	LAT. (MI)	LONG. (MI)	TIME (HOURS)	CONC. (PPM)	LATITUDE (DEG)	LONGITUDE (DEG)
MAR	1	1972	1500	28.4500	-95.2000	15000.0	329.	28.4598	-95.1919	339.3	2.1546	8.64	13.62	45.48	10.50 (0.10)	28.4995	-95.3976
MAR	2	1972	600	28.4500	-95.2000	15000.0	301	28.4124	-95.2003	338.9	2.0257	8.51	16.22	48.02	11.05 (0.09)	28.4582	-95.4572
MAR	3	1972	1200	28.4500	-95.2000	15000.0	322	28.4653	-95.2486	339.3	2.1182	4.85	12.35	48.37	10.65 (0.08)	28.4357	-95.4435
MAR	4	1972	600	28.4500	-95.2000	15000.0	304	28.4743	-95.2095	339.3	2.0396	4.50	18.29	48.07	11.00 (0.09)	28.4781	-95.5024
MAR	5	1972	1500	28.4500	-95.2000	15000.0	301	28.4363	-95.2431	338.9	2.0257	4.45	18.32	48.02	11.05 (0.09)	28.5010	-95.5387
MAR	6	1972	0	28.4500	-95.2000	15000.0	301	28.4313	-95.2551	338.9	2.0257	4.15	13.34	48.02	11.05 (0.09)	28.4917	-95.4423
MAR	7	1972	2100	28.4500	-95.2000	15000.0	307	28.4754	-95.2121	339.3	2.0530	5.21	27.29	48.12	10.94 (0.09)	28.5511	-95.6614
MAR	8	1972	600	28.4500	-95.2000	15000.0	453	28.4686	-95.2206	339.6	2.5132	4.56	28.11	46.80	9.22 (0.10)	28.5349	-95.6834
MAR	9	1972	1200	28.4500	-95.2000	15000.0	416	28.4720	-95.2536	339.6	2.3428	4.68	13.53	46.27	9.79 (0.10)	28.5393	-95.4763
MAR	10	1972	0	28.4500	-95.2000	15000.0	543	28.4784	-95.2372	340.3	2.7204	8.08	9.89	47.72	8.63 (0.09)	28.5946	-95.3133
MAR	11	1972	300	28.4500	-95.2000	15000.0	746	28.4642	-95.1975	340.7	3.1274	9.66	9.99	49.77	7.66 (0.07)	28.6036	-95.0383
MAR	12	1972	600	28.4500	-95.2000	15000.0	301	28.4427	-95.2227	338.9	2.0257	6.96	7.28	48.02	11.05 (0.09)	28.5401	-95.1129
MAR	13	1972	1800	28.4500	-95.2000	15000.0	520	28.4526	-95.1458	339.6	2.6495	5.40	5.50	47.33	8.01 (0.09)	28.5210	-95.0596
MAR	14	1972	1200	28.4500	-95.2000	15000.0	752	28.4755	-95.1616	341.0	3.1247	5.78	6.40	49.87	7.68 (0.09)	28.5401	-95.0627
MAR	15	1972	300	28.4500	-95.2000	15000.0	701	28.4781	-95.1396	338.2	2.9523	4.41	11.04	49.02	8.00 (0.09)	28.5241	-94.9576
MAR	16	1972	2100	28.4500	-95.2000	15000.0	331	28.4347	-95.1753	339.3	2.1635	7.85	21.52	45.52	10.46 (0.10)	28.4905	-94.8207
MAR	17	1972	0	28.4500	-95.2000	15000.0	308	28.4398	-95.1817	339.3	2.0560	8.61	21.05	48.13	10.92 (0.09)	28.4716	-94.8350
MAR	18	1972	1500	28.4500	-95.2000	15000.0	402	28.4583	-95.2039	339.6	2.2928	7.78	7.08	46.03	9.97 (0.10)	28.5233	-95.2735
MAR	19	1972	300	28.4500	-95.2000	15000.0	302	28.4388	-95.2034	338.9	2.0316	7.42	7.10	48.03	11.02 (0.09)	28.5271	-95.2876
MAR	20	1972	2100	28.4500	-95.2000	15000.0	302	28.4312	-95.1910	338.9	2.0316	4.57	7.04	48.03	11.02 (0.09)	28.4287	-95.2901
MAR	21	1972	600	28.4500	-95.2000	15000.0	333	28.4716	-95.2414	339.6	2.1709	3.63	6.01	45.55	10.44 (0.10)	28.4675	-95.2918
MAR	22	1972	1800	28.4500	-95.2000	15000.0	301	28.4235	-95.2268	338.9	2.0257	4.15	13.86	48.02	11.05 (0.09)	28.4311	-94.9986
MAR	23	1972	2100	28.4500	-95.2000	15000.0	442	28.4566	-95.1732	339.6	2.4791	5.76	16.61	46.70	9.32 (0.10)	28.4882	-94.8996
MAR	24	1972	1500	28.4500	-95.2000	15000.0	302	28.4269	-95.1782	338.9	2.0316	8.53	11.99	49.03	11.02 (0.09)	28.5172	-94.9963
MAR	25	1972	1800	28.4500	-95.2000	15000.0	326	28.4798	-95.2360	339.6	2.1271	7.01	7.66	48.43	10.62 (0.03)	28.5739	-95.2903

Figure 10.6-9 Subsurface Model Summary Output.

SOLUBLE FRACTION TRANSPORT MODEL

* ---- INITIAL OIL SPILL CHARACTERISTICS --- *							* INITIAL SOLUBLE FRACTION PARAMETERS *					* --- SOLUBLE FRACTION TRANSPORT RESULTS --- *					
											SLICK	DISTANCE TRANSPORTED			INITIAL (FINAL)	TERMINAL COORDINATES	
MONTH	DAY	YEAR	HOUR	LATITUDE (DEG)	LONGITUDE (DEG)	WEIGHT (TONS)	HOUR	LATITUDE (DEG)	LONGITUDE (DEG)	WEIGHT (TONS)	AREA (SQ MI)	LAT. (MI)	LONG. (MI)	TIME (HOURS)	CONC. (PPM)	LATITUDE (DEG)	LONGITUDE (DEG)
MAR	26	1972	1500	28.4500	-95.2000	15000.0	301	28.4715	-95.2293	338.9	2.0257	3.93	6.72	48.02	11.05 (0.09)	28.5103	-95.2613
MAR	27	1972	900	28.4500	-95.2000	15000.0	322	28.4728	-95.2223	340.0	2.0980	4.41	4.43	48.37	10.76 (0.08)	28.5016	-95.2019
MAR	28	1972	900	28.4500	-95.2000	15000.0	301	28.4116	-95.2157	338.9	2.0257	5.16	10.32	48.02	11.05 (0.09)	28.4381	-95.3737
MAR	29	1972	600	28.4500	-95.2000	15000.0	533	28.4327	-95.2568	340.3	2.6541	4.16	21.69	47.55	8.81 (0.09)	28.4671	-95.6138
MAR	30	1972	1200	28.4500	-95.2000	15000.0	301	28.4126	-95.2523	338.9	2.0257	5.18	14.55	48.02	11.05 (0.09)	28.3914	-95.4782
MAR	31	1972	0	28.4500	-95.2000	15000.0	302	28.4803	-95.2329	338.9	2.0316	5.06	6.72	48.03	11.02 (0.09)	28.4437	-95.3196

Figure 10.6-9 Subsurface Model Summary Output - (continued).

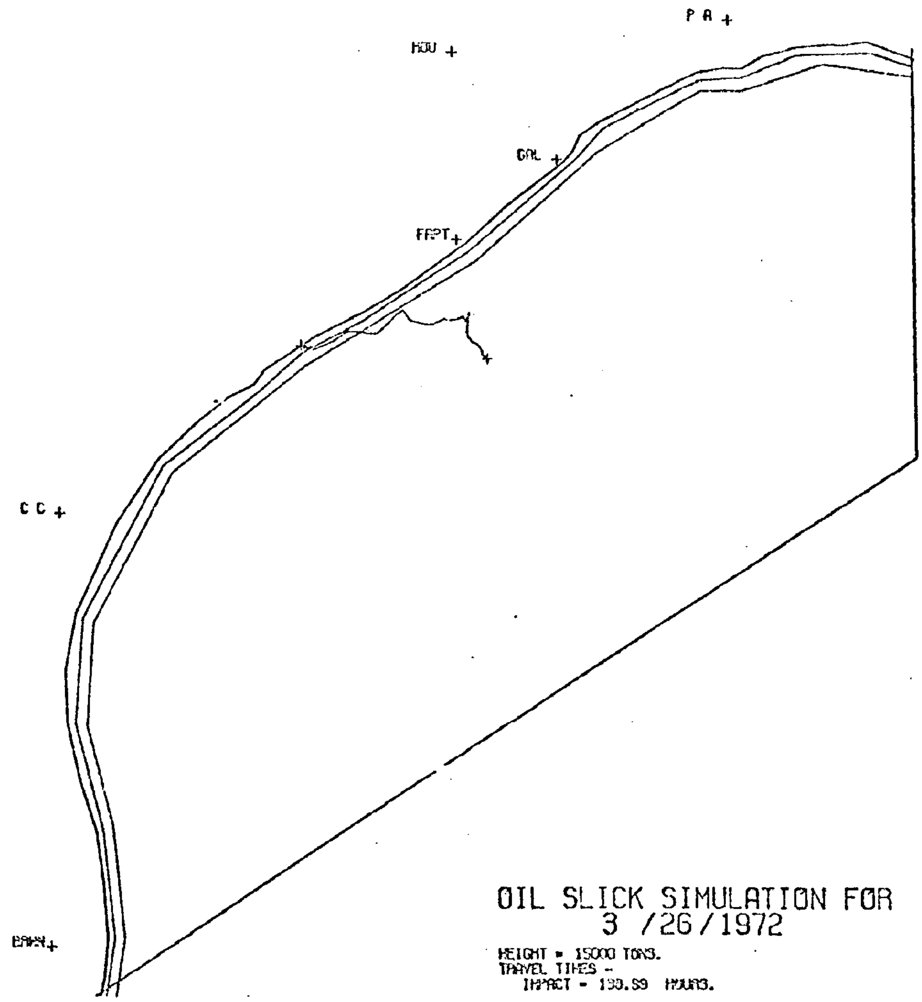


Figure 10.6-10 Typical Oil Slick Transport Path (No Coriolis Force).

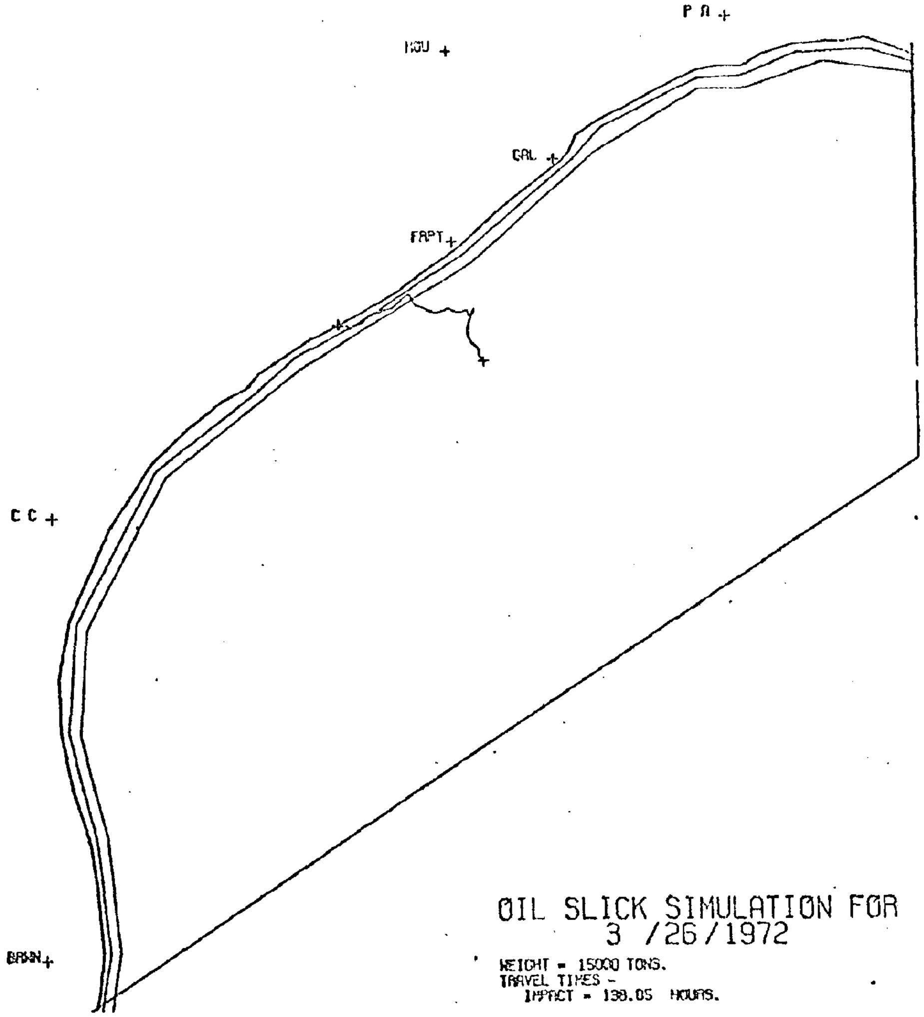


Figure 10.6-11 Typical Oil Slick Transport Path (Coriolis Force Included).

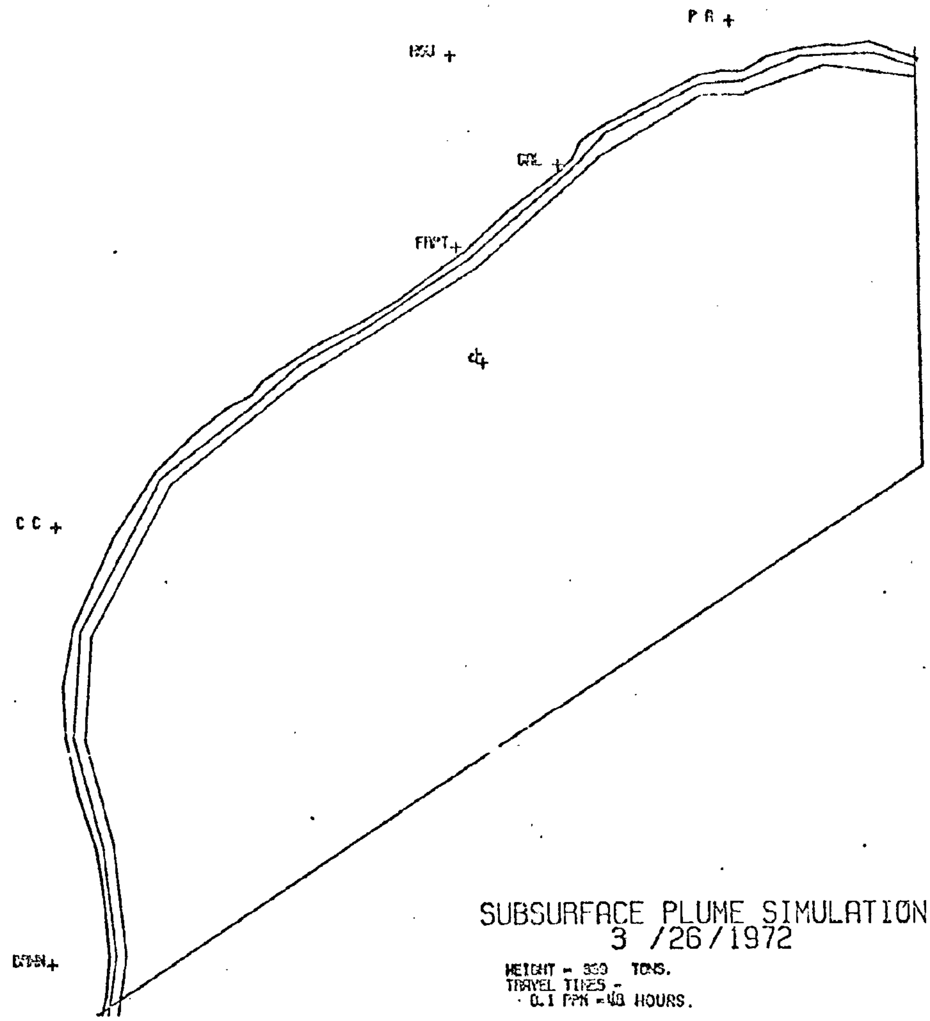
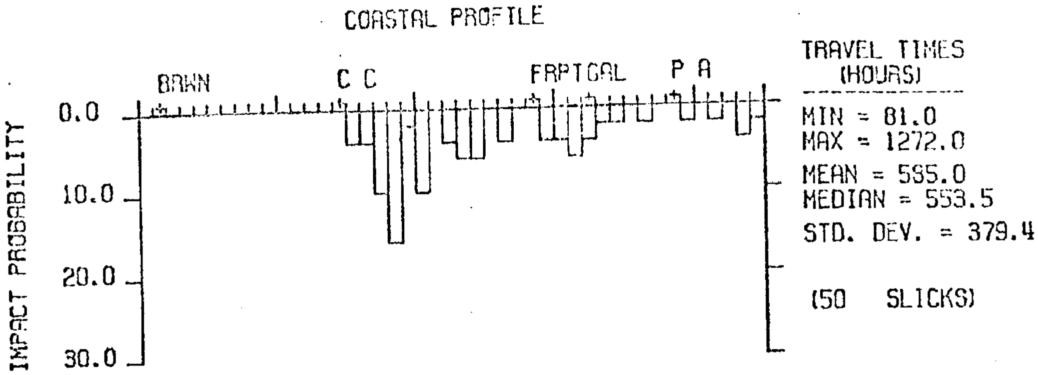
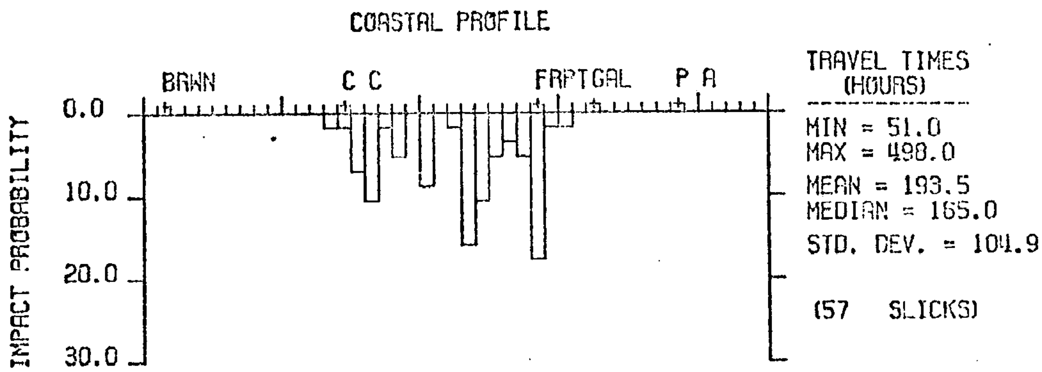


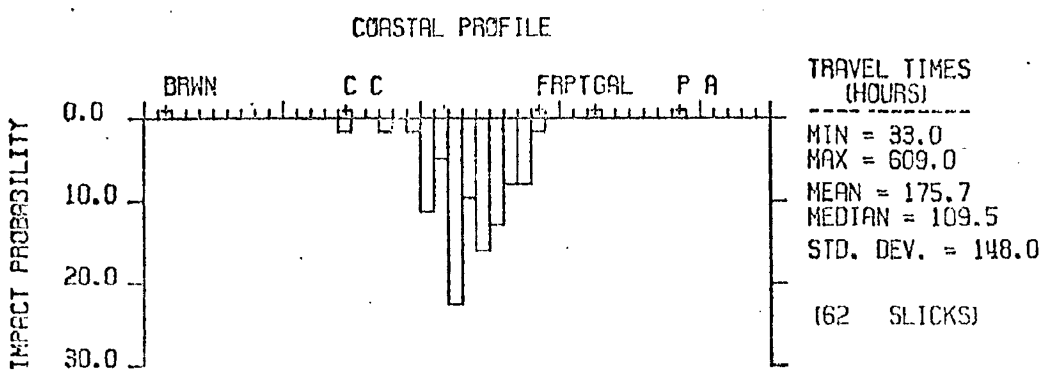
Figure 10.6-12 Typical Subsurface Plume Transport Path.



a.) Month of January

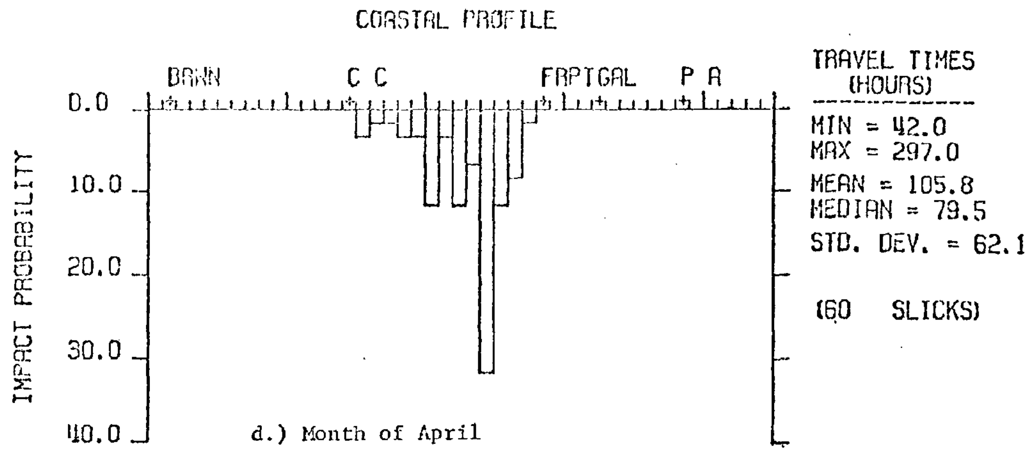


b.) Month of February

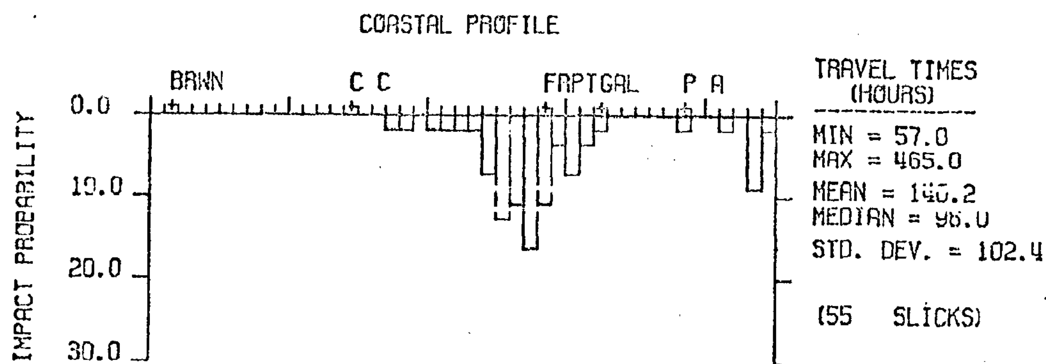


c.) Month of March

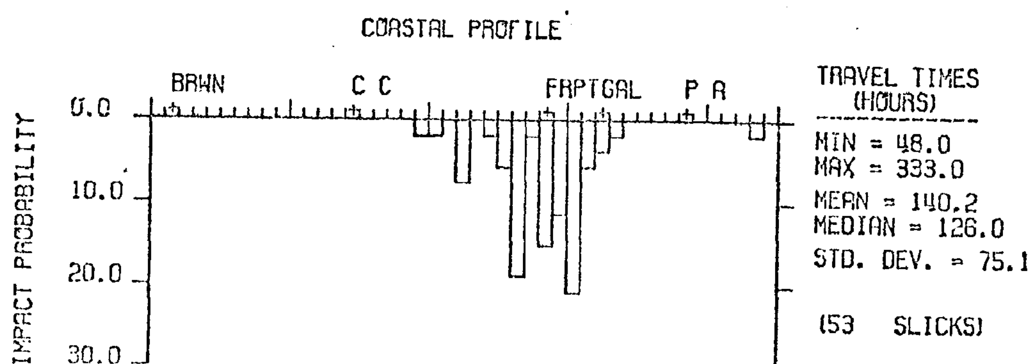
Figure 10.6-13 Oil Slick Monthly Coastal Impact Probabilities (No Coriolis Force).



d.) Month of April

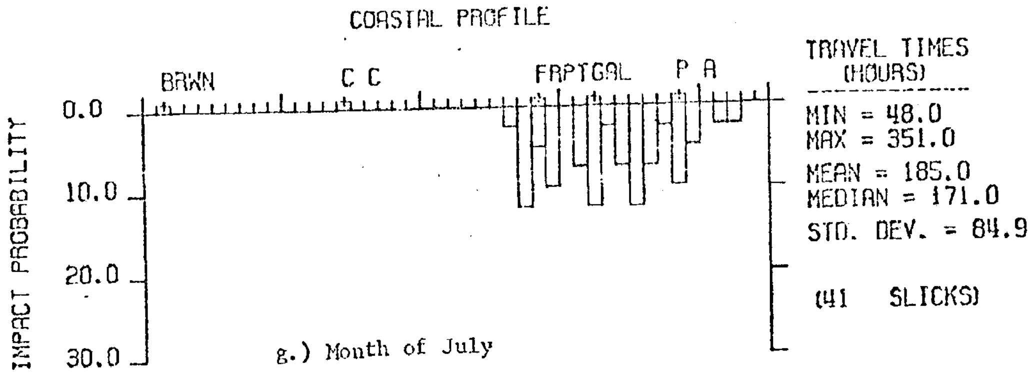


e.) Month of May

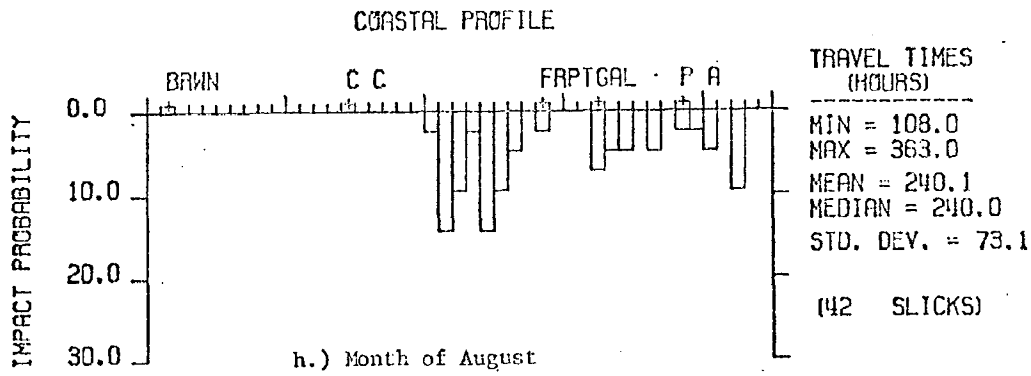


f.) Month of June

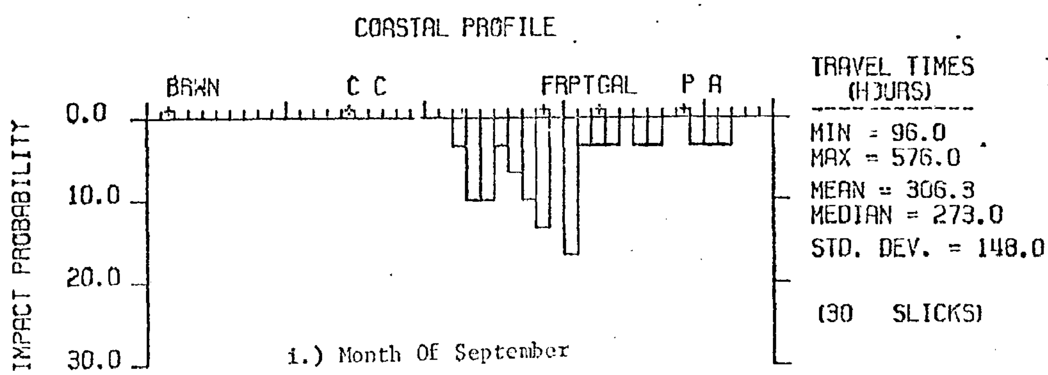
Figure 10.6-13 Oil Slick Monthly Coastal Impact Probabilities (No Coriolis Force) - (continued).



g.) Month of July

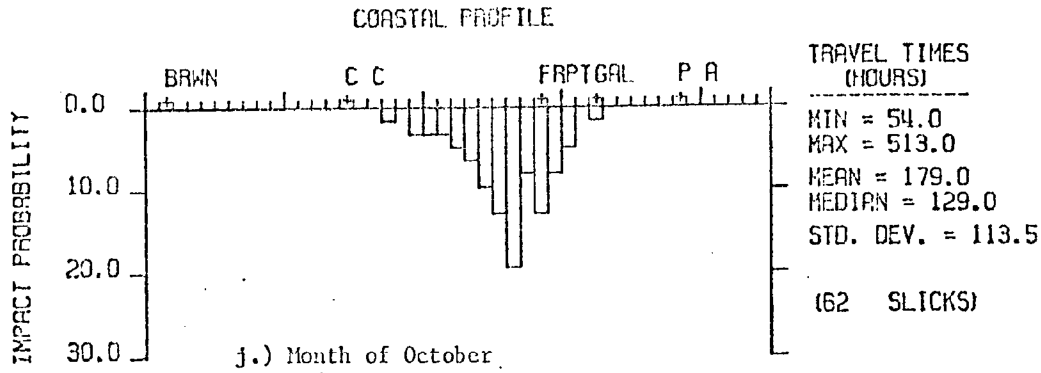


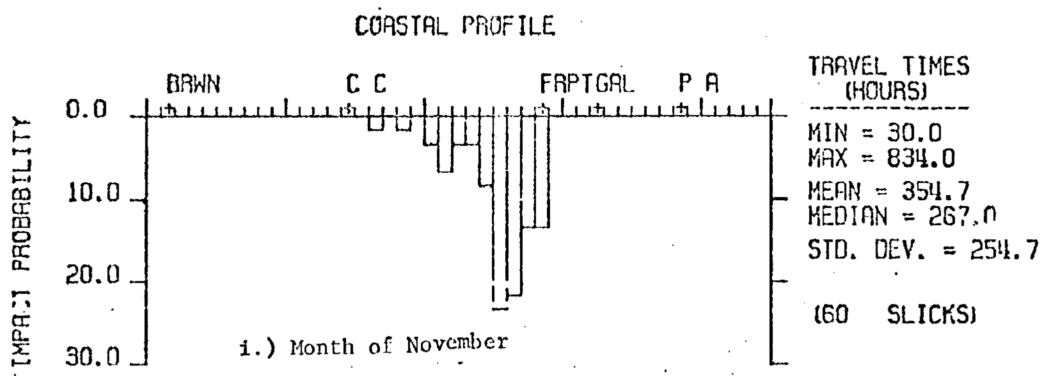
h.) Month of August



i.) Month Of September

Figure 10.6-13 Oil Slick Monthly Coastal Impact Probabilities (No Coriolis Force) - (continued).





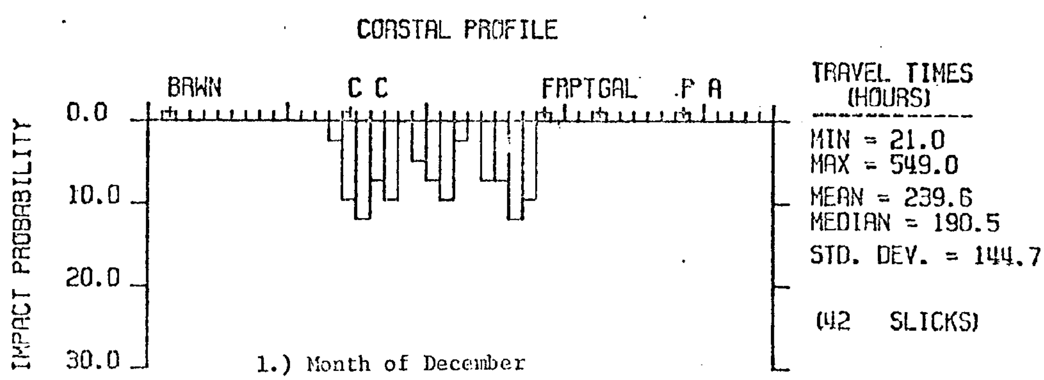
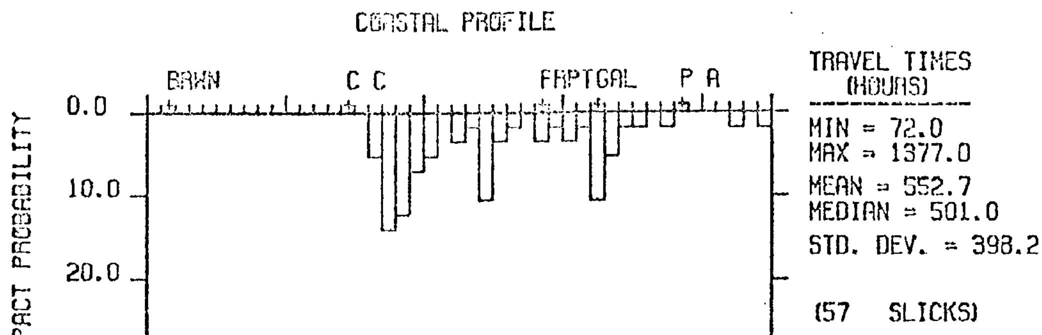
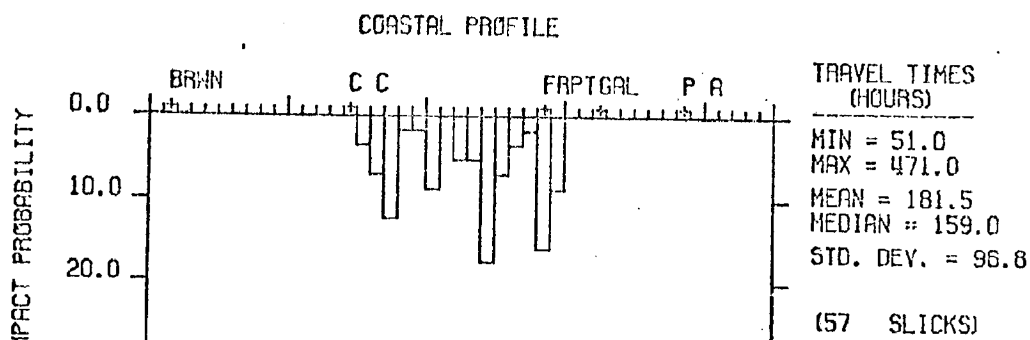


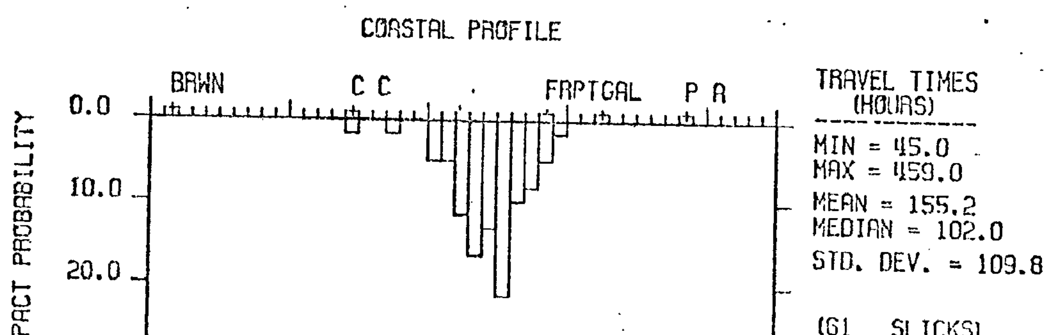
Figure 10.6-13 Oil Slick Monthly Coastal Impact Probabilities (No Coriolis Force) - (continued).



a.) Month of January

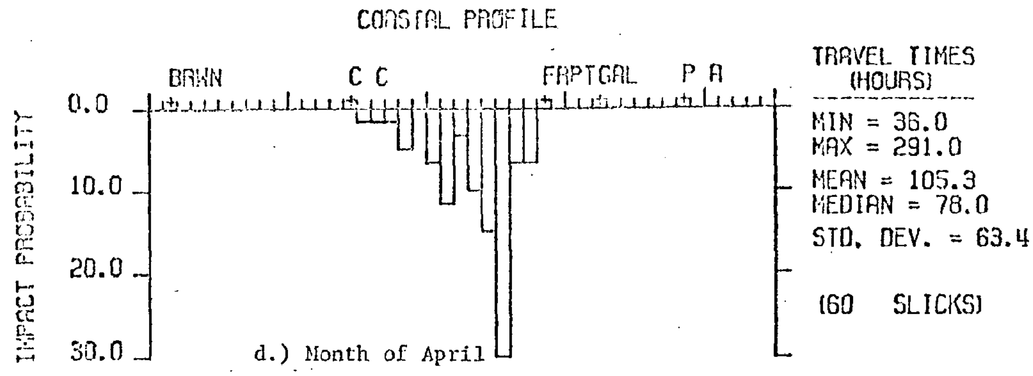


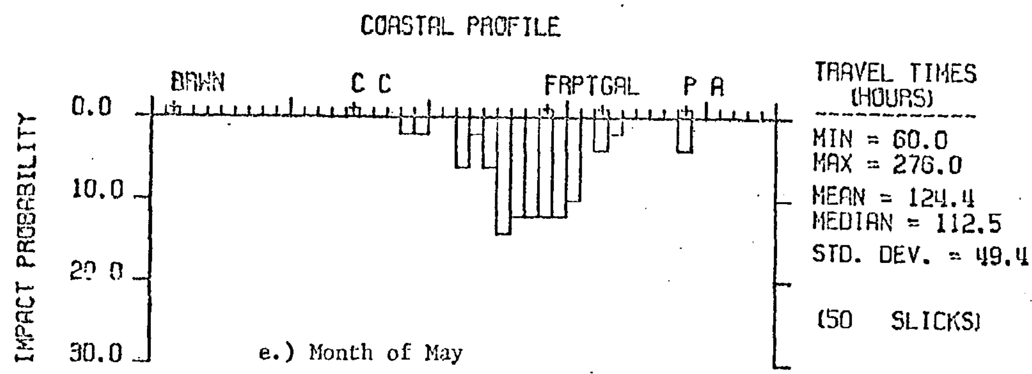
b.) Month of February



c.) Month of March

Figure 10.6-14 Oil Slick Monthly Coastal Impact Probabilities (Coriolis Force Included).





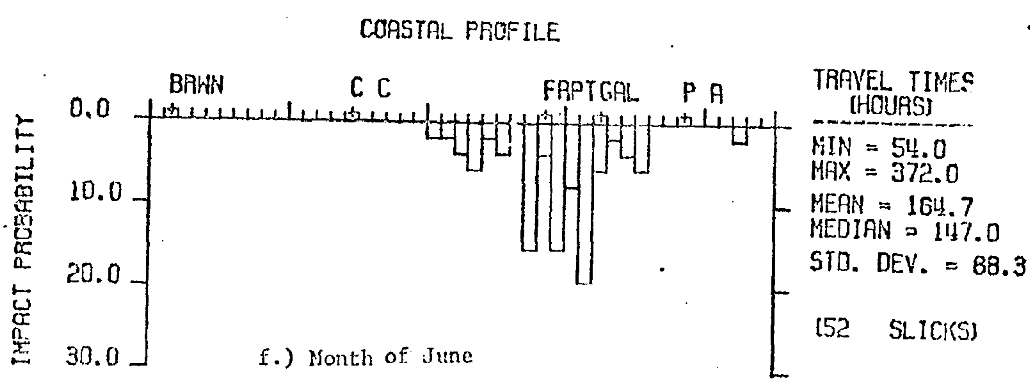
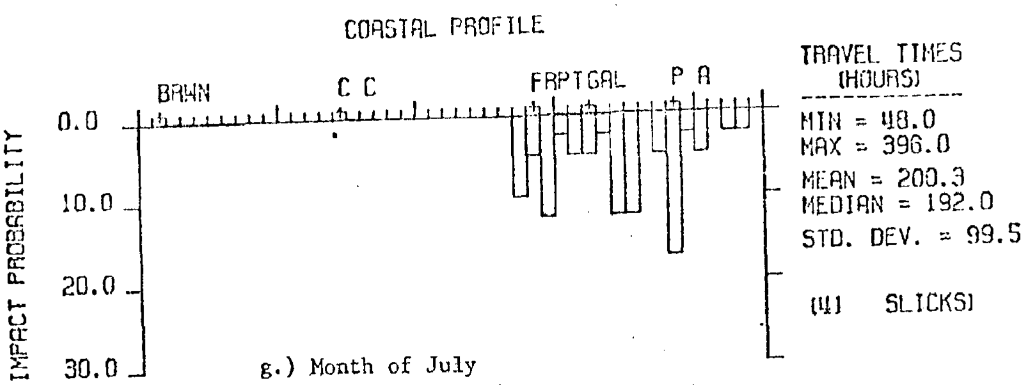
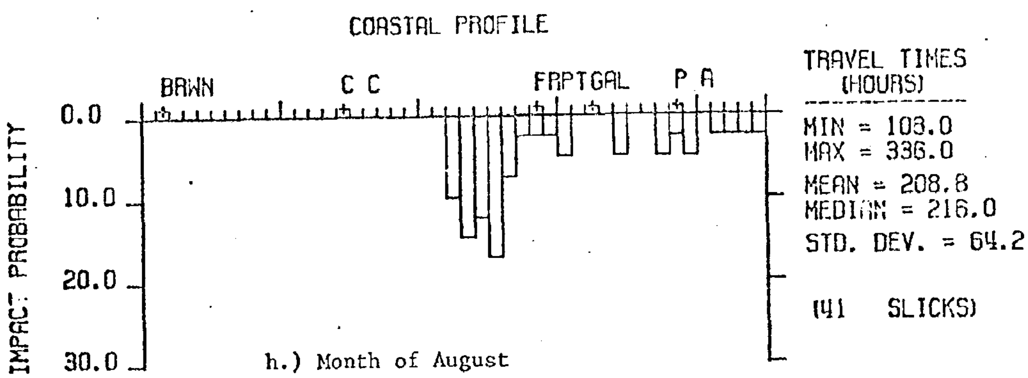


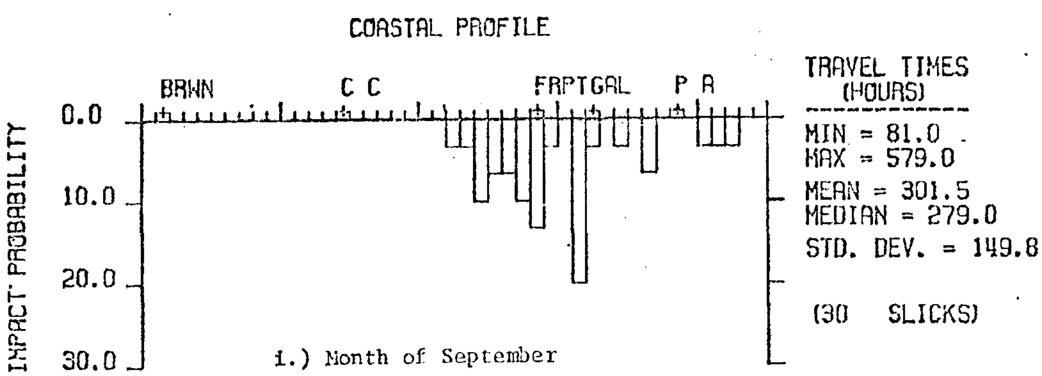
Figure 10.6-14 Oil Slick Monthly Coastal Impact Probabilities (Coriolis Force Included).



g.) Month of July



h.) Month of August



i.) Month of September

Figure 10.6-14 Oil Slick Monthly Coastal Impact Probabilities (Coriolis Force Included).

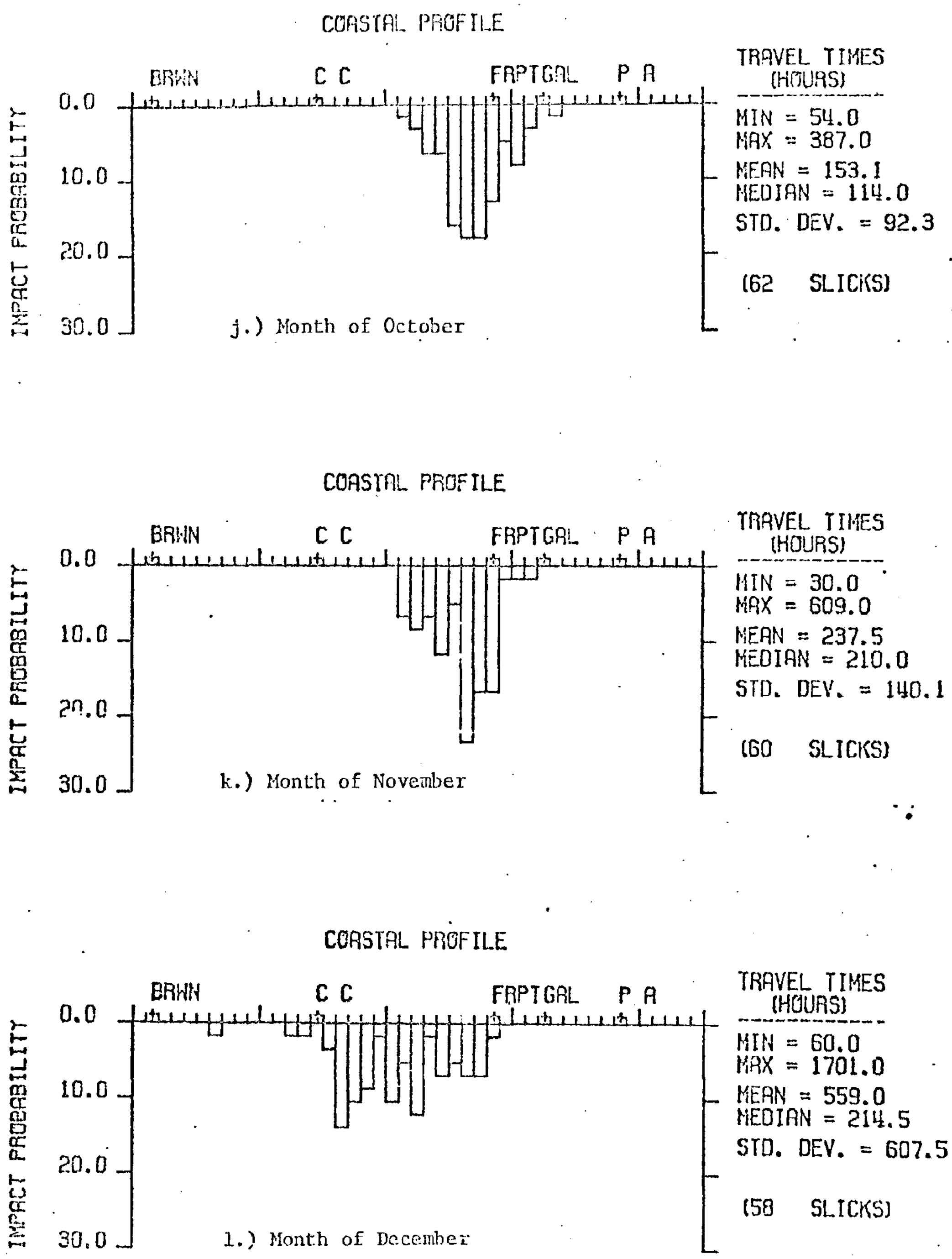


Figure 10.6-14 Oil Slick Monthly Coastal Impact Probabilities (Coriolis Force Included).

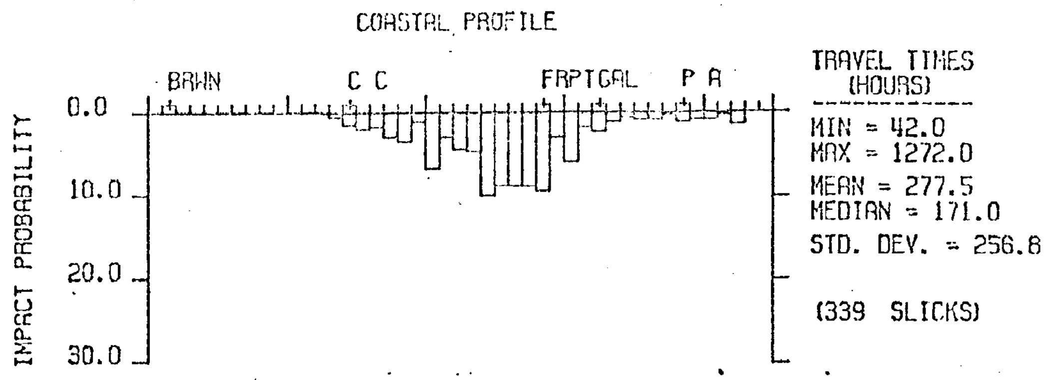


Figure 10.6-15 Oil Slick Coastal Impact Probabilities for the Year 1972 (No Coriolis Force).

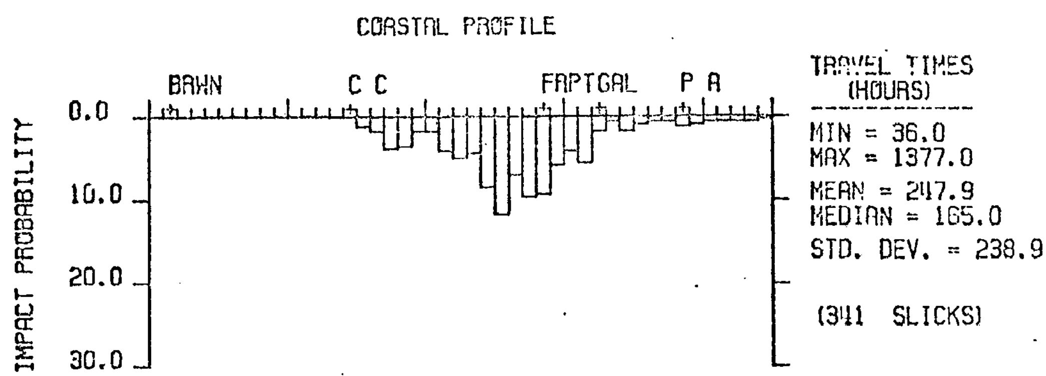
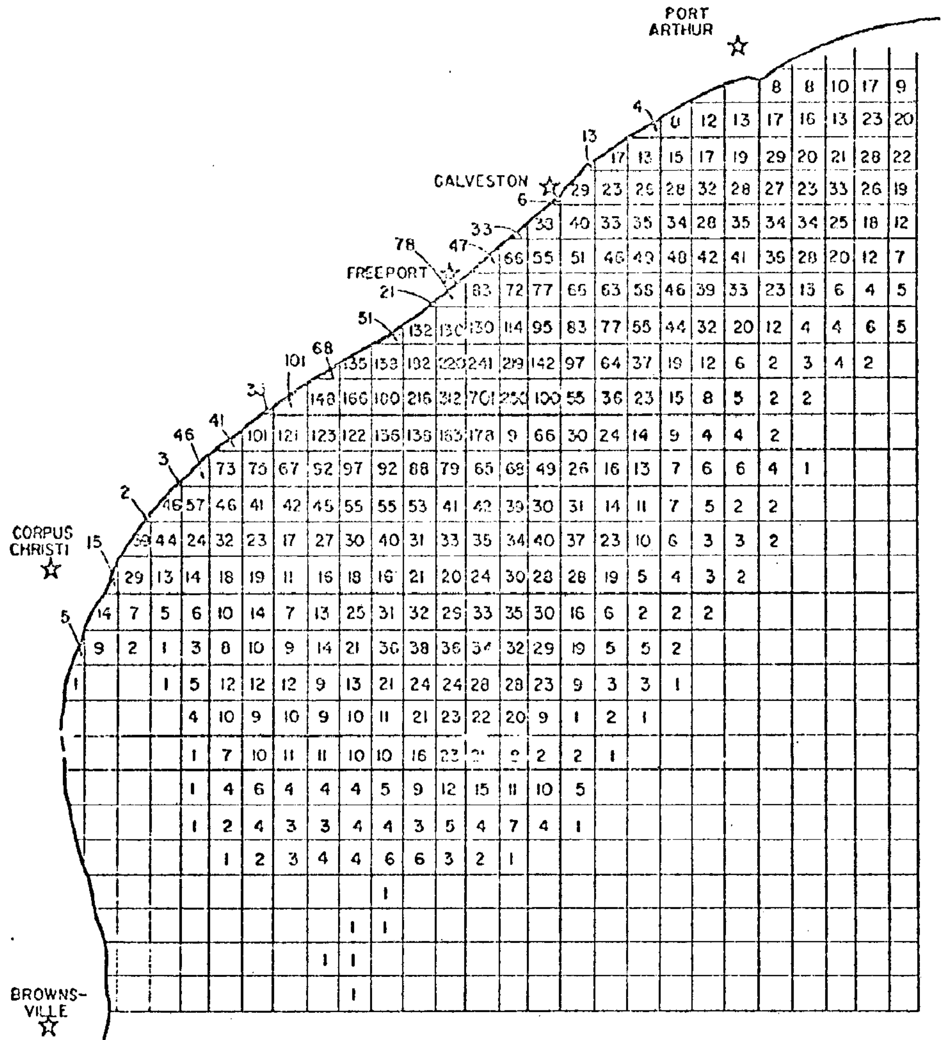


Figure 10.6-16 Oil Slick Coastal Impact Probabilities for the Year 1972 (Coriolis Force Included).



NOTE: A TOTAL OF 701 HYPOTHETICAL OIL SPILLS SIMULATED

Figure 10.6-17 Oil Slick Occurrences in the Offshore Area (No Coriolis Force).

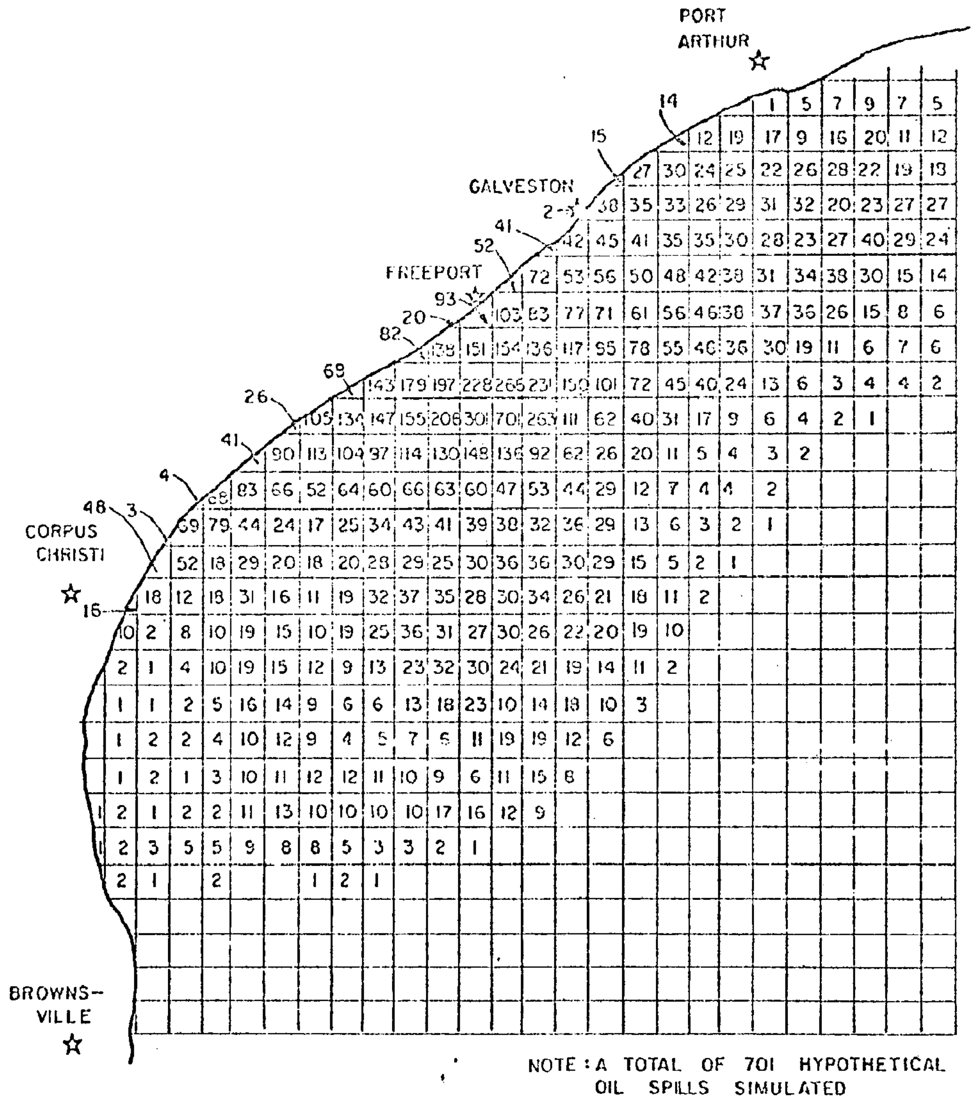


Figure 10.6-18 Oil Slick Occurrences in the Offshore Area (Coriolis Force Included).

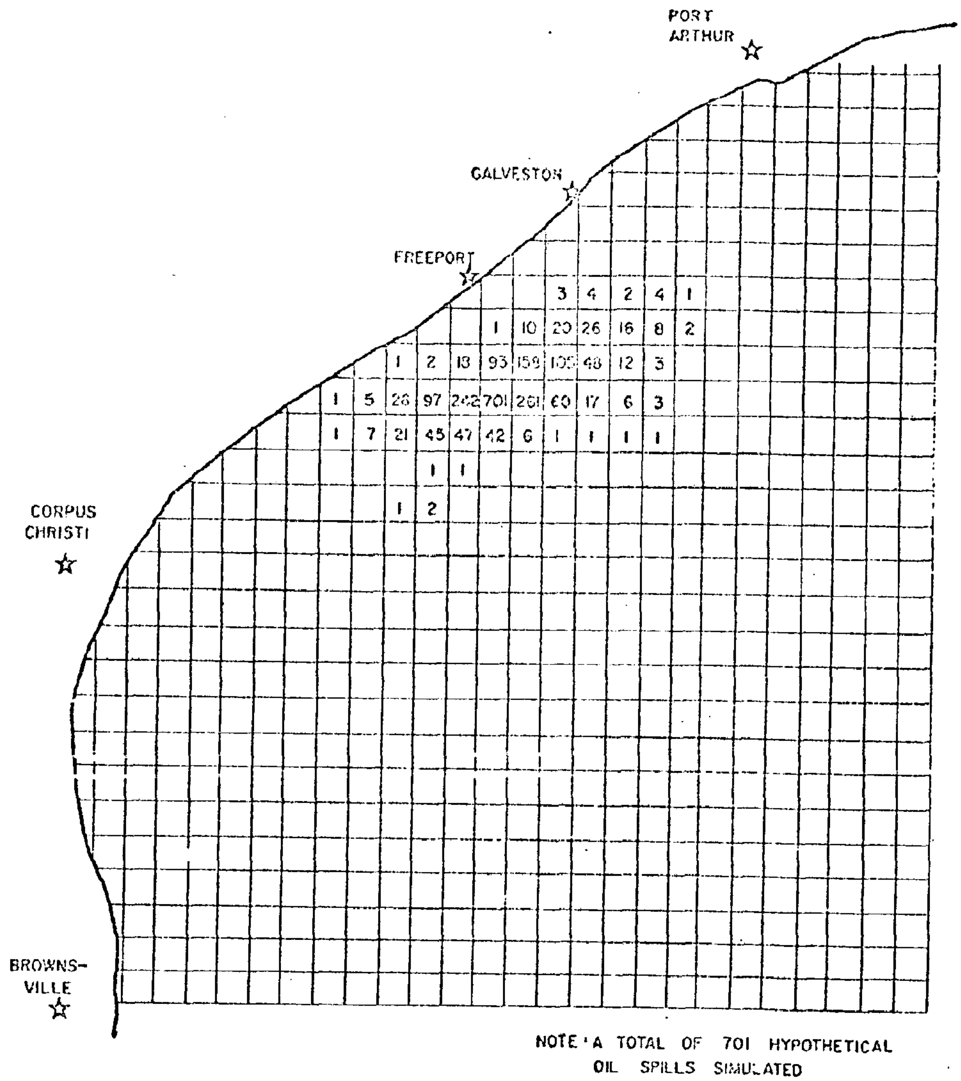


Figure 10.6-19 Subsurface Plume Occurrences in the Offshore Area.

APPENDIX F.

NOAA TRAJECTORY ANALYSIS

NOAA TRAJECTORY ANALYSIS

INTRODUCTION

An analytical technique has been developed to determine the extent of coastal impact from an offshore oil spill. The oil spill model employed uses a statistical summarization of oil spill trajectories computed from a climatological data base of wind and surface currents. The following appendix summarizes these analysis techniques.

Oil spill trajectories were initiated at various offshore locations from which oil spills might be expected. Such locations included the deepwater port site, intersections of offshore tanker routes with customary shipping lanes, and critical points along various prospective tanker routes adjacent to U.S. coastal waters.

BACKGROUND INFORMATION

An oil spill occurring at a proposed deepwater port site can be advected by wind and local currents. The purpose of this section is to determine which nearshore locations will be most affected by such an event. Accordingly, calculations will be made, based on a simple oil spill trajectory model, of the risk of shoreside exposure.

The twentieth century has seen a marked advance in the sciences of meteorology and oceanography. Notwithstanding, it is clear that there is no universally accepted theory concerning the movement of the water surface (i.e., surface currents) available. To complicate the problem to an even greater extent, even if such a theory existed, there is little understanding of how wind-waves passing under oil, the wind blowing over it and water motions just below the oil combine to move a slick.

In 1905, Ekman presented a rather simple theory that proved to be the forerunner to future contributions dealing with the problem of wind-generated currents. Ekman assumed homogeneous water on a flat rotating sea of infinite depth with constant wind and viscosity coefficient. The model predicted surface currents deflected 45° to the right (in the northern hemisphere) of the wind with greater deflection and exponential decay of current with depth. Using these theoretical results, he further predicted a "wind-factor" (i.e., the ratio of surface drift current, W_e, to wind speed, U_o) of

$$\frac{W_e}{U_o} \approx \frac{0.127}{\sqrt{\sin\phi}}$$

which is a function of the geographic latitude, ϕ.

Therefore, at latitude 40° N he predicted a surface wind drift current of 1.5% of the wind speed directed 45° to the right of the wind. In shallow water, Ekman's theory gives a deflection angle of less than 45°.

A number of investigators have attempted to measure this wind factor. A summary of the more recognized efforts were presented in James (1966).* The range of values indicated a factor from about 1 to 4.5% with a characteristic deflection angle of 20° from the wind.

In addition to the wind's direct effect on surface water movements (i.e., wind drift), wind also drives surface wind-waves. These waves result in a wave induced drift current (i.e., Stokes drift) that is directed approximately downwind and may be additive to the wind drift current. James implies that a "wave-factor" may be approximated by

$$\frac{W_w}{U_o} = 0.007$$

where W_w is a wave-induced (Stokes) type surface drift current.

In addition to the above-mentioned factors, Smith (1974) has measured a leeway effect for oil slicks. Leeway is defined as the motion of an oil slick relative to the water a few centimeters below the sea surface. He indicated that this effect acts downwind and may be predicted by the simple linear relationship

$$W_D = 0.0179\ U_o - 0.0196$$

for the range of wind 5-25 knots.

The combined wind effect may also be estimated by equating the stress in the air to the stress in the water:

$$\tau_a \simeq \tau_w$$

$$\rho_a \cdot U_o^2 \simeq \rho_w \cdot W_o^2$$

but $$\frac{\rho_a}{\rho_w} = \frac{\text{air density}}{\text{water density}} \simeq 1/900$$

thus $$\frac{W_o}{U_o} \text{ is about } 3\%$$

The exact manner in which wind-drift, wave-current and leeway combine to move the centroid of a slick has not been resolved. In the absence of more definitive information, letting $W_o = 0.031\ U_o$, represents a reasonable basis for estimating total wind induced surface drift under the combined effect of wind-drift, wave-drift and leeway. It is also concluded that the drift deflection angle,

- * (see Fig. F.1)

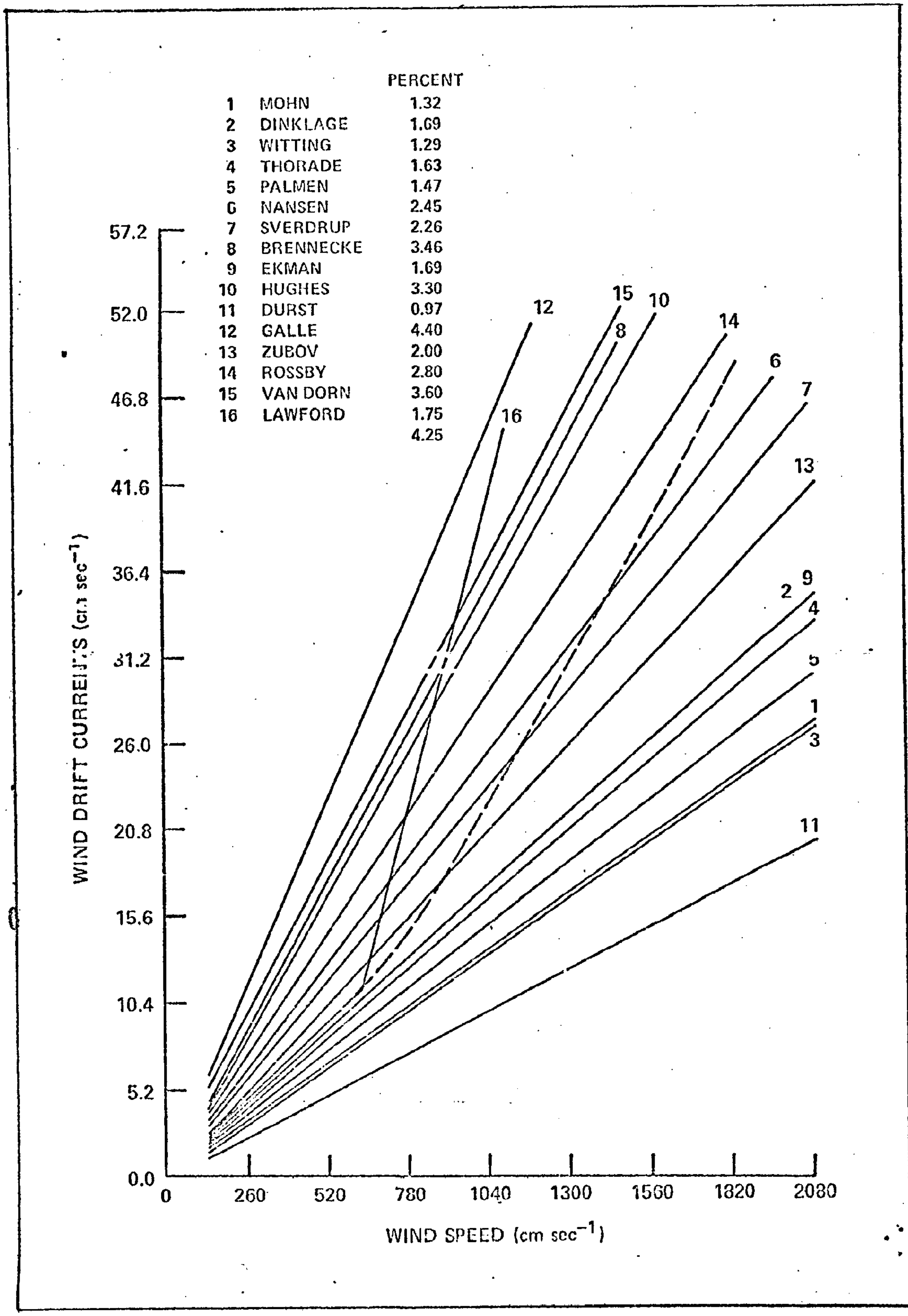
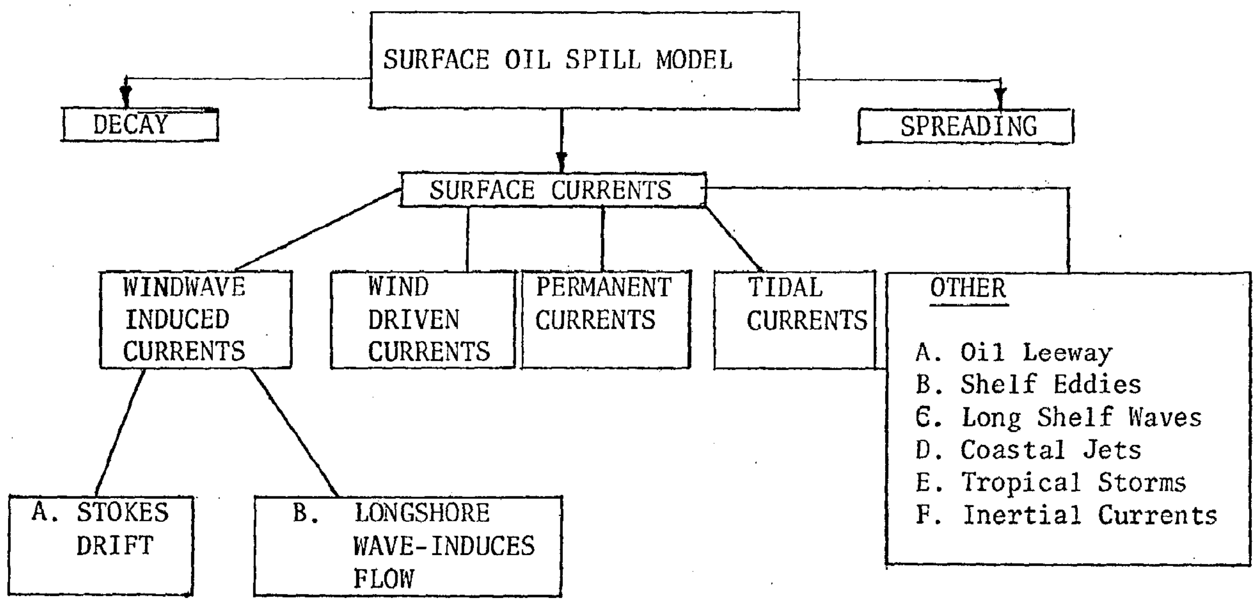


Fig. F.1 Various Calculations of Wind Factor (After James, 1966) a direct result of the Coriolis force, can be assumed to be 15°. These conclusions agree with the laboratory experiments on wind driven currents conducted by Wu (1968) and the observations of oil slick movements given by Smith (1968).

Besides wind-driven currents, a forecast technique for spill trajectories might consider a prediction of the effects of tidal currents, geostropic currents, Kelvin shelf waves, inertial currents and the effect of river flow. In the diagram below, some idea is given of the various processes that one might include in an oil spill model.



There is little possibility of modeling these combined effects. Let us reduce the problem to a more manageable level of difficulty by the following argument.

A major driving mechanism for surface currents (neglecting tides) on shorter time periods than weeks is the local wind. In this analysis, short term changes in surface cu rrent are assumed to be wind-driven. Tidal currents, shelf waves, inertial currents and river flow will not be included. A permanent current is added to the wind-driven current vector to estimate surface currents. No attempt is made to remove the mean wind-drift currents from the permanent current.

TRAJECTORY MODEL

The surface transport of the center of gravity of the oil slick occurs in time steps according to

$$\vec{W_o} = 0.031\ \vec{U}_{o+15} + \vec{PC}$$

where $\vec{U}_{o+15}$ is the surface drift vector taken adjusted 15° to the right of the wind direction and $\vec{U_o}$ is a wind vector from a relatively long (8-10 year) wind record taken at a nearby meteorological station. $\vec{PC}$ is a permanent current vector taken from the best available source for the site under consideration. A hypothetical path of transport for oil is generated by computing subsequent transport from each third hourly observation. After each three-hour step, the geographical position of the hypothetical oil mass is computed and compared to coastal beach locations. When the oil position and beach location coincide, an impact event is assumed. Upon assumed impact, the wind record used in these computations is advanced 72 hours and a new spill event is considered. If no beach impact is found within a modeling time of 1200 hours, the oil mass is assumed to be degraded and a spill scenario is terminated- Estimates of the direct wind driven sea surface current are modeled from historical records of wind observations from coastal observation sites. It is particularly desirable to use the records of sequential observation rather than summarized data because the use of actual observation sequences preserves the inherent persistence in serial data record. Simulation of observation sequence from summarized (wind rose) data would be possible if the serial correlation function of the original sequence was known.

Fay (1971) has developed an analysis for the spreading of a one-dimensional axi-symmetric oil slick as a function of time. He did not consider the effect of wind, waves, or ocean diffusion. After about one hour, a balance between gravity and viscous forces dominate the spreading and the slick radius, R, is related to the time after the spill begins, t, by

$$R = G\left|\left(\frac{\rho_w-\rho_o}{\rho_w}\right) g\,\frac{V^2 t^{3/2}}{K^{1/2}}\right|^{1/6}$$

where ρ_w is the water density, ρ_o is the oil density, g is the acceleration of gravity, V is the volume of oil, G= 1.45 and K is the kinematic viscosity of water.

A final spreading phase occurs when the oil thickness drops below a critical level, which in turn is a function of the net surface tension, σ, the mass densities of the oil and water, and the force of gravity. This, so-called, surface-tension spread is given as

$$R = S\left[\frac{\sigma^2 t^3}{\rho_w K}\right]^{1/4}$$

where S = 2.05

The time at which the transition from gravity/viscous to surface-tension/viscous spread occurs, T, can be found by equating the spill radii from the above equations and solving for T as

$$T = \left[\frac{G}{S}\right]^2 \frac{\rho_w}{\sigma} V^{2/3} \left[\left(\frac{\rho_w - \rho_o}{\rho_w}\right) g K\right]^{1/3}$$

For large spills, on the order of 10,000 tons and larger, gravity spreading will dominate for about the first week with the surface tension spread then controlling spill growth.

Williams et. al. (1975) have developed a simple technique to account for the processes that would reduce the concentration of a spill after it had occurred (Fig. F.2). The five principle components are evaporation, dissolution, emulsification, precipitation and biodegradiation; the most critical of these are the first two. Accordingly, slick concentration, C, would theoretically decay with respect to these two processes as

$$C = C_o e^{-(K_e + K_d)t_D}$$

where C_o is the initial concentration at the time of the spill, K_e and K_d are the evaporation and dissolution coefficients, respectively, and t_D is decay time in days. In this analysis, no attempt is made to account for emulsification, precipitation and biodegradiation.

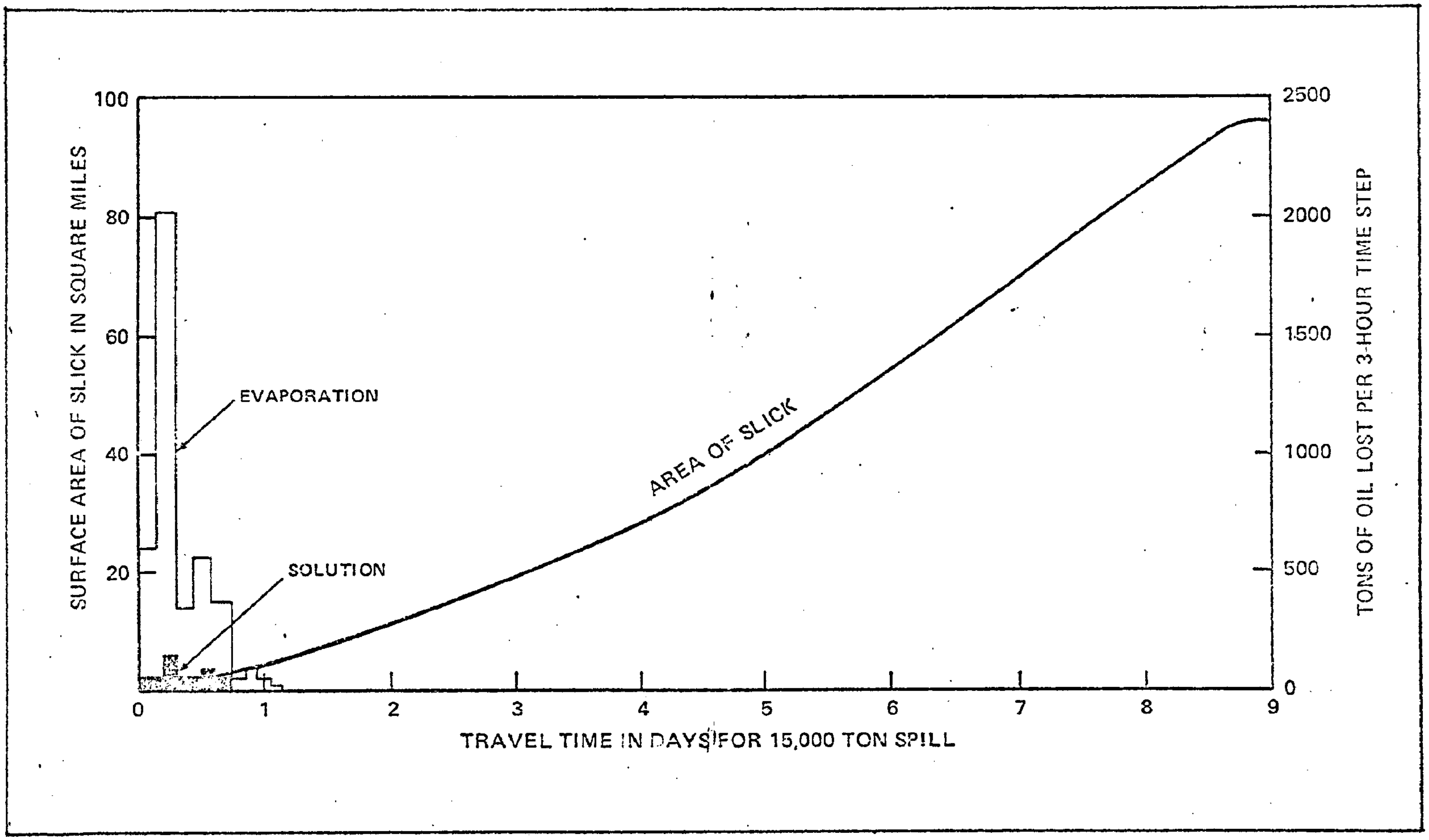


Fig. F.2 Time History for Spreading Evaporation and Dissolution (After Williams, et al, 1974)

PERMANENT CURRENT INPUT TO MODEL

In coastal regions, surface current patterns are complex both in space and time. Available measurements averaged over periods of weeks or greater generally indicate a residual drift after tides are removed. This non-tidal semi-permanent surface drift is equivalent to values given on regional current atlases. Such data must necessarily include mean wind-drift currents superimposed on mean baroclinic currents related to the density field. Other factors such as river outflow currents may also complicate the picture.

Coast of Texas - Gulf of Mexico

The permanent flow in the region near the proposed deepwater port site off Freeport, Texas, was discussed in the license application submitted by the Seadock, Inc. Some of the conclusions given were as follows:

(1) Water flows west from the Mississippi Delta area towards a zone of convergence off the Texas coast (which is near southern Texas in winter, shifting to the Corpus Christi-Freeport area in early summer).

(2) The movement of this convergence conforms with the wind pattern shift (which changes from southeast in summer to northeast in winter).

A sketch of current patterns given in the Seadock report indicates that a shift in current direction off Freeport, Texas occurs in June and July. (Fig. F.3) A table listing mean currents by month for the Galveston area is also presented in the report. The currents were taken from Central American Waters Current Charts, a set of data collected and tabulated by month. The current speeds given are in the range 0.2 and 0.4 knots and set toward the west except from April to June when a reversal is indicated. These values are based mainly on ship drift and include wind effects.

Coast of Florida - Straits of Florida

The permanent current pattern observed off the southern and eastern Florida coast is generally the well-defined Florida current, the extension of which is termed the Gulf Stream. The swift flow in the Gulf Stream/Florida Current system prevails throughout the year with minor meanders in direction and slight seasonal variations of speed. Mean speed of the current system is about two knots with a maximum speed at the core of up to five knots.

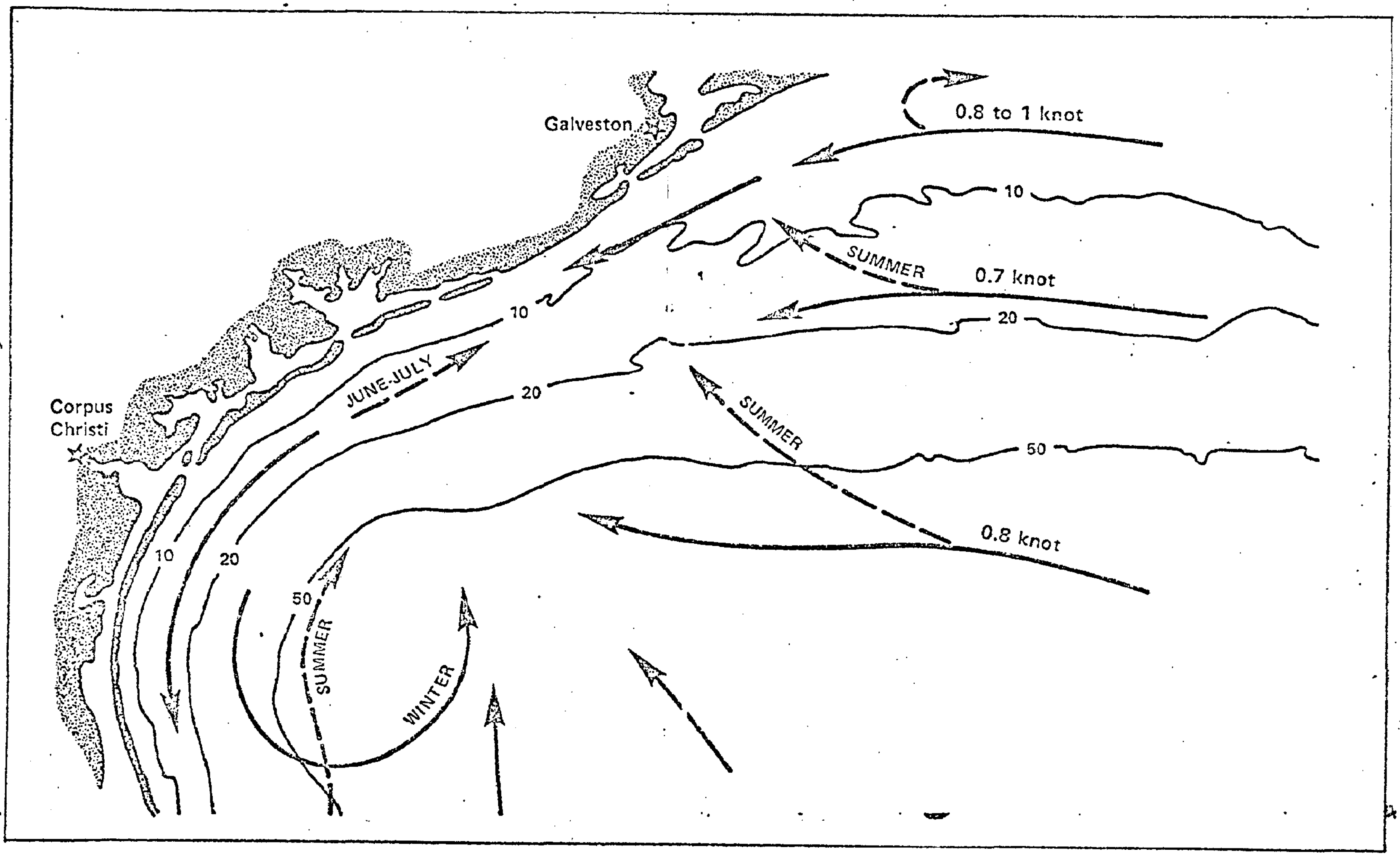


Fig. F.3 Currents off the Texas Coast (After Corps of Engineers, 1973)

The origin of the Gulf Stream can be traced to the Yucatan Strait where a well-defined current enters the Gulf of Mexico. The position of this strong current between Yucatan Strait and the Straits of Florida is variable, ranging from close inshore off northwestern Cuba to a "loop" penetrating over 300 miled northward into the Gulf. This part of the flow is termed the Loop Current from which an occasional detached eddy has been observed. After entering the Straits of Florida between Cuba and the Florida Keys, the current becomes less unstable. The major variations of the current from off Key West to off Little Bahama Bank appears to be a meandering of the axis of the flow within the relatively narrow Straits of Florida. The current in the Straits and north is referred to as the Florida Current. After emerging from the Straits of Florida, the current is joined by the Antilles Current which moves northwesterly along the open ocean side of the West Indies. The combination of these currents produces the extension of the Florida current characterized by slightly reduced velocities and a greater meandering tendency. As the flow continues northward, then northeastward (paralleling approximately the general trend of the 100 fathom isobath as far as far as Cape Hatteras), meandering does not generally exceed the stream width about 90 km.

The following information concerning the Florida Current is extracted directly from the U.S. Coast Pilot No. 4, Cape Henry to Key West (1975), a guide to mariners (Chapter 3., pgs. 66-67).

"Throughout the whole stretch from the Florida Keys to past Cape Hatteras the stream flows with considerable velocity. Characteristic average surface speed is on the order of 2.5 knots, increasing to about 4 knots, off Cape Florida where the cross sectional area of the channel is least. These values are for the axis of the stream where the current is maximum, the speed of the stream decreasing gradually from the axis as the edges of the stream are approached. The speed of the current varies with an annual cycle, tending to be greatest in July, and least in November throughout this region. Both the speed and position of the axis of the stream fluctuate also from day to day, hence description of both position and speed are averages.

Crossing the stream at Jupiter or Fowey Rocks, an average allowance of 2.5 knots in a northerly direction should be made for the current.

Crossing the stream from Habana, a fair allowance for the average current between 100-fathom curves is 1 knot in an east-northeasterly direction.

A vessel bound from Cape Hatteras to Habana, or the Gulf ports, crosses the stream off Cape Hatteras. A fair allowance to make in crossing the stream is 1 to 1.5 knots in a northeasterly direction for a distance of 40 miles from the 100-fathom curve----"

"The lateral boundaries of the current within the Straits are fairly well fixed, but as the stream leaves the Straits its eastern boundry becomes somewhat vague. On the western side the limits can be defined approximately since the waters of the stream differ in color, temperature, salinity, and flow from the inshore coastal waters. On the east, however, the Antilles Current combines with the Gulf Stream so that its waters here merge gradually with the waters of the open Atlantic. Observations of the National Ocean Survey indicate that, in general, the average position of the inner edge of the Gulf Stream as far as Cape Hatteras lies inside the 50-fathom curve.

At the western end of the Straits of Florida the limits of the Gulf Stream are not well defined. Between Fowey Rocks and Jupiter Inlet the inner edge lies very close to the shoreline.

Along the Florida Reefs between Alligator Reef and Dry Tortugas the distance of the northerly edge of the Gulf Stream from the edge of the reefs gradually increases toward the westward. Off Alligator Reef it is quite close inshore, while off Rebecca Shoal and Dry Tortugas it is possibly 15 to 20 miles south of the 100-fathom curve. Between the reefs and the northern edge of the Gulf Stream the currents are ordinarily tidal and are subject at all times to considerable modification by local winds and barometric conditions. This neutral zone varies in both length and breadth; it may extend along the reefs a greater or less distance than stated, and its width varies as the northern edge of the Gulf Stream approaches or recedes from the reefs."

The values used for the permanent current input for modeling purposes was extracted from the Atlantic Coastal Currents Chart. In actual oil spills, it is clear that knowledge of the exact position of the variable loop current (possibly through remote sensing techniques) is essential to accurately predict oil spill advection.

For this climatological analysis, atlas currents may be considered as a first order approximation to actual conditions.

Although our oil spill trajectory procedures are quite idealized, we have combined the two most probable types of currents (local permanent currents and wind-driven currents) in a first order manner. Neglected are such potentially important factors as coastal spin-off eddies and tidal currents. These transport mechanisms, it might be argued, are oscillatory in nature and thus do not produce a net drift. In reality, this may not necessarily be the case. Non-linear interation between permanent flow, wind-driven currents, eddies and tidal currents may indeed produce unmodeled transport. One must also realize that even if a system is completely oscillatory (in the onshore/offshore dirctions), onshore oil transport has the probability of "sticking" to beaches. One might assume that neglecting oscillatory currents underestimates actual impact by some undeterminable amount.

Calculation of oil spill trajectories were undertaken at probable spill sites near the Florida coast. These calculations were subjectively combined with the above mentioned considerations. A conclusion was reached that about 50% of the offshore spills impact the shoreline with average impact times on the order of 2 to 4 days depending on spill site.

Gulf of Mexico

The surface circulation of the eastern Gulf of Mexico is dominated by the LOOP current. This current flows through the Yucatan Straits from the western Cayman Sea. The path and intensity of the LOOP current changes both seasonally and on an annual basis. The annual cycle, proposed by Leipper (1970), is composed of a spring intrus ion of the current into the Gulf. Maximum penetration occurs in the summer. During this time-frame, separation of an anticyclonic eddy from the main flow is a characteristic feature. During the fall, the system recedes, with a minimum penetration occuring in the winter. (Fig. F.4 and F.5). Typically, the highest velocities are found to the left of the current's center facing downstream. The width of the current is approximately 100 km in the Yucatan Strait. As the current flow turns anticyclonically, it slows down and spreads out to about 150 km (Chew, 1974). As the current continues its turn south, its width again decreases reaching a minimum in the Straits of Florida of about 75 km.

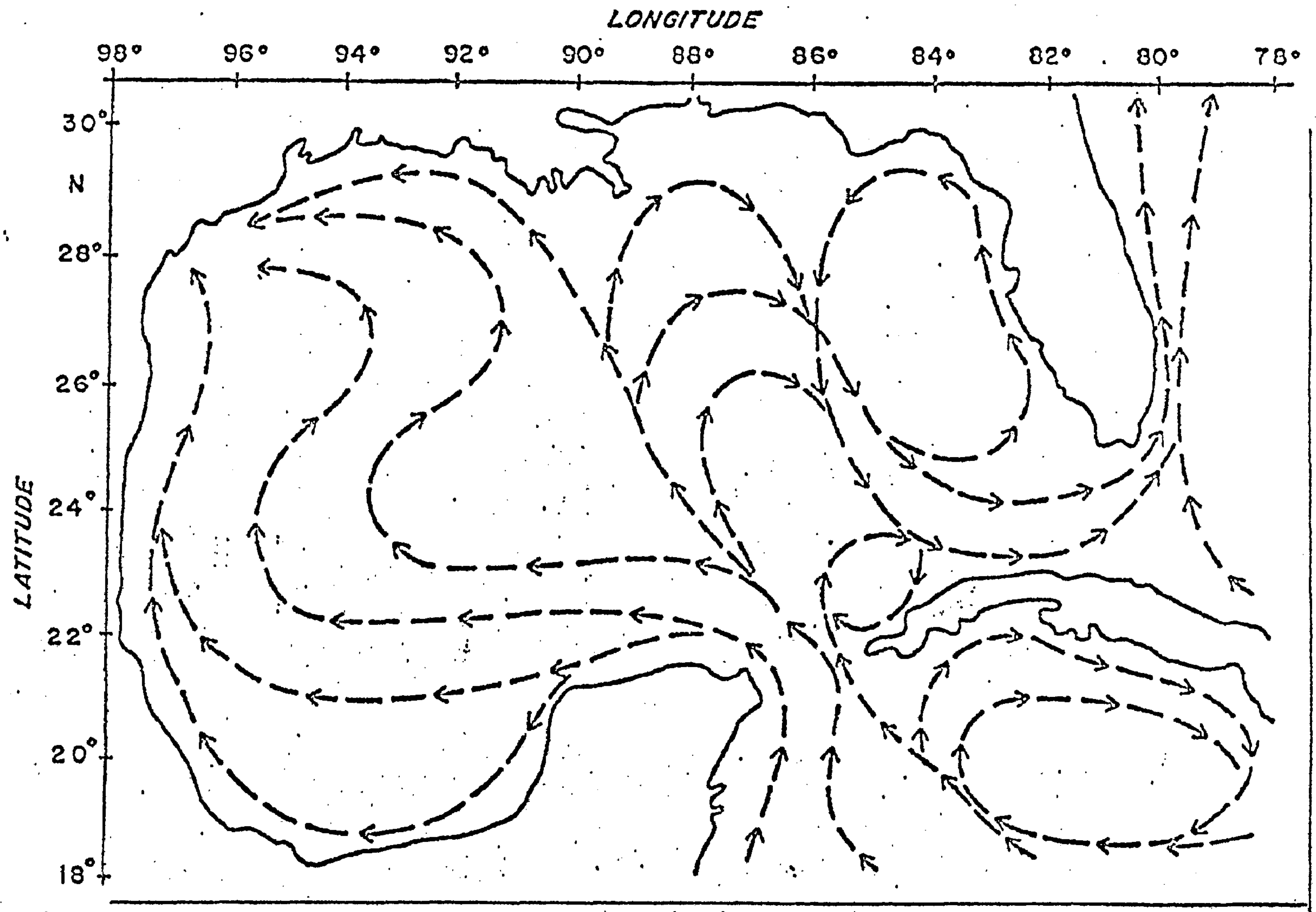


Fig. F.4 Idealized Surface Currents - Gulf of Mexico, June (After Leipper)

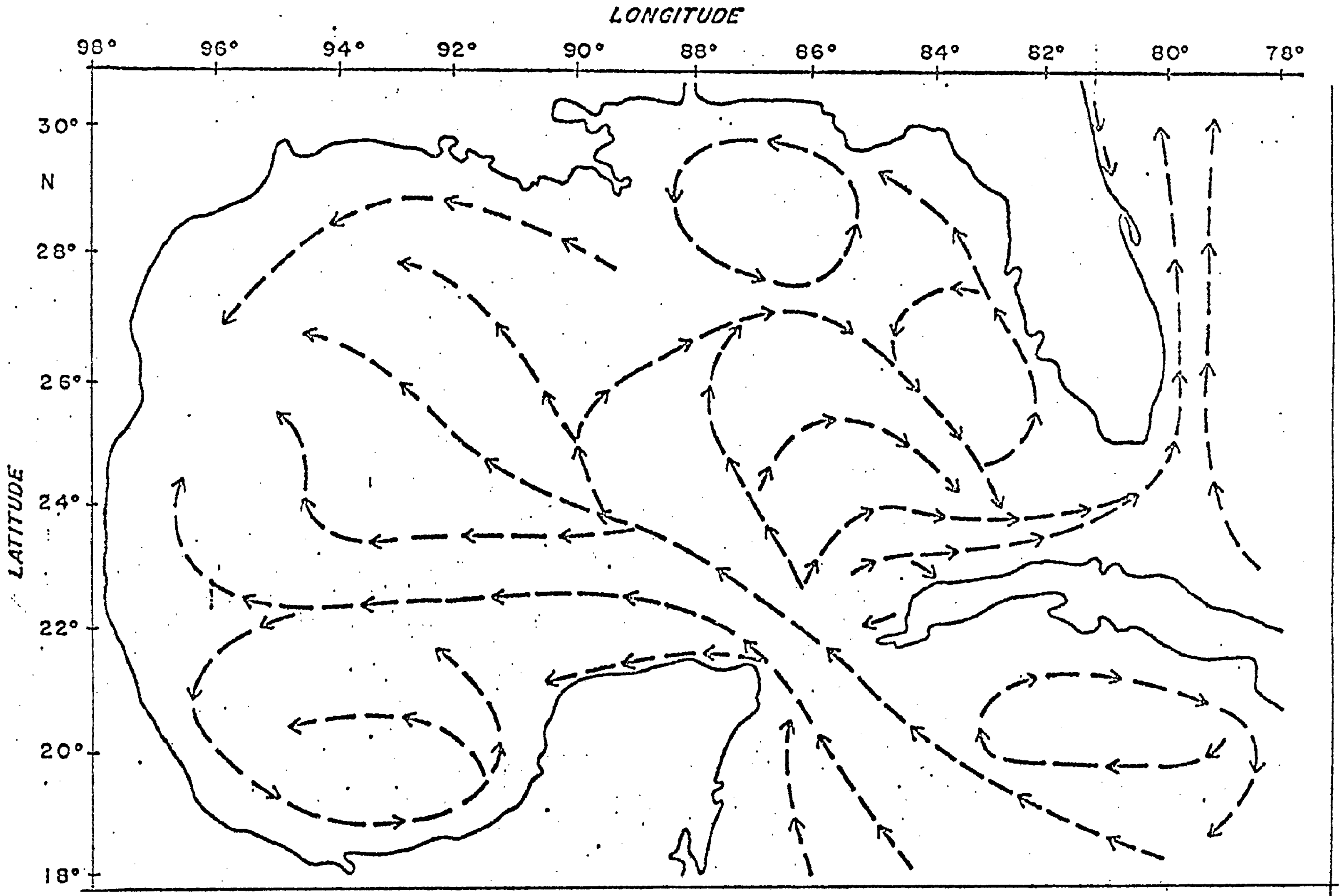


Fig. F.5 Idealized Surface Currents - Gulf of Mexico, December (After Leipper)

RESULTS OF NOAA TRAJECTORY ANALYSIS

The method employed in the modeling process was to assume that an oil spill occured at a random time. A given meteorological record that might be expected to give representative wind conditions for the spill site was obtained from the National Climatic Center at Ashville, North Carolina. The meteorological records obtained were:

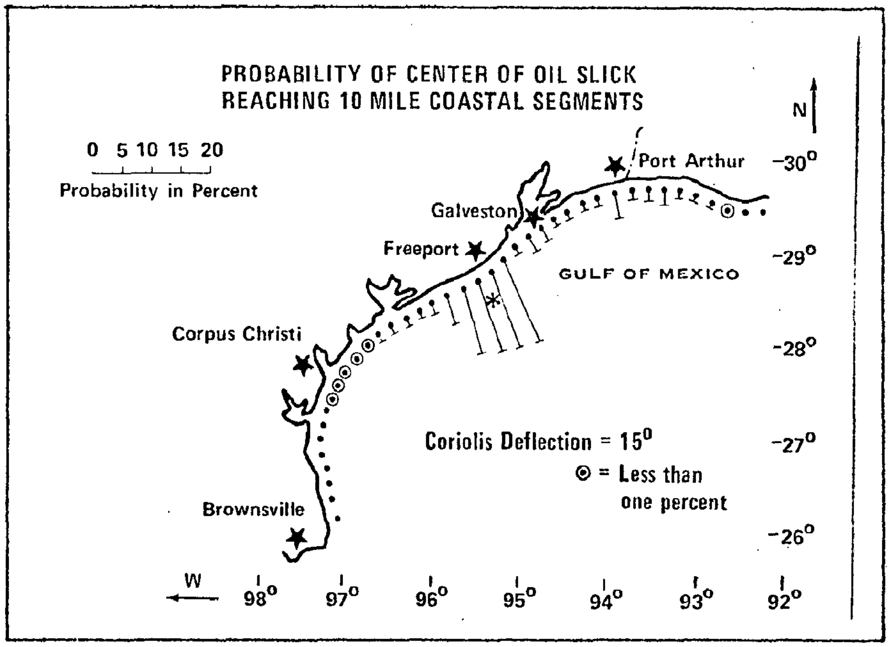
Galveston, Texas	New Orleans, Louisiana
Palacios, Texas	Biloxi, Mississippi
Freeport, Texas	Ft. Myers, Florida
Port Arthur, Texas	Key West, Florida
Burrwood, Louisiana	Miami, Florida
	Havana, Cuba

In addition to these records, the meteorological and oceanographic record for the NOAA Environmental Data Buoy "EB10" (located at approximately 27° 30', 88°W)was obtained from the National Oceanographic Data Center in Washington, D.C.

Hypothetical oil spills were tracked using the model previously discussed for the LOOP and Seadock sites. Various other offshore oil spill along the Florida coast and in the Gulf of Mexico were also tracked. The results of these calculations are summarized into diagrams indicating probability in a 10-mile coastal segment (Figs. F.6-F.10).

In addition to the scenarios depicted in the following diagrams, spill sites at the center of the Straits of Yacatan (22 N,86 W) and at 26 N,88 W were tracked. The result of the calculations was no coastal impact within the 1200 hour running time of the computer program.

Index to Diagrams



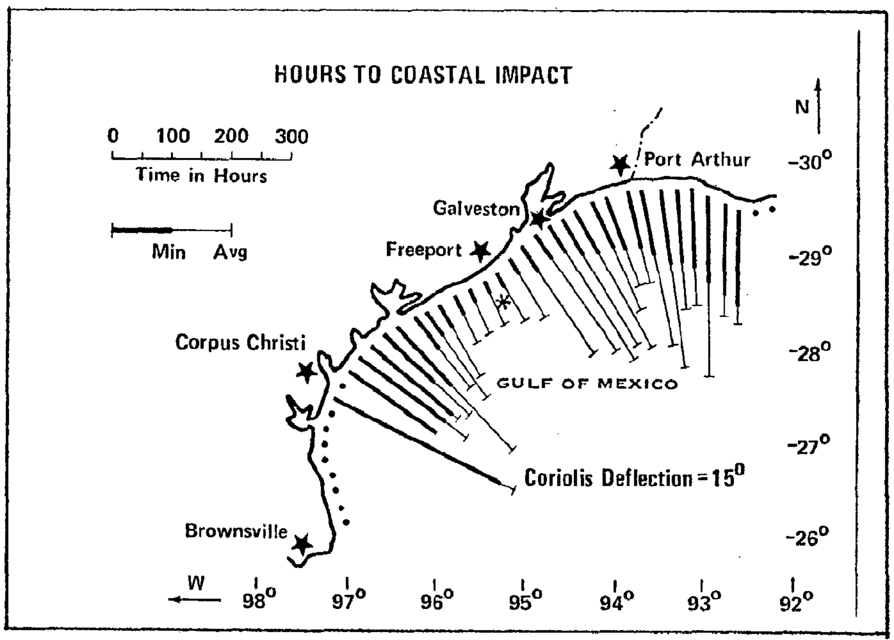
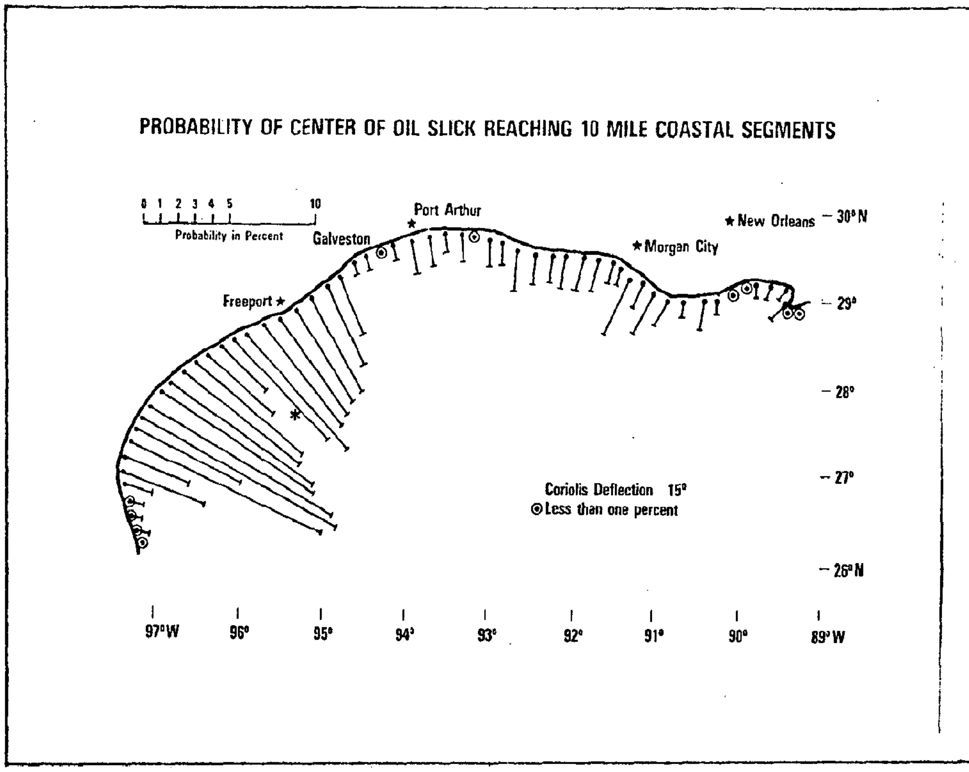


Fig. F.6 Spill at Port Site



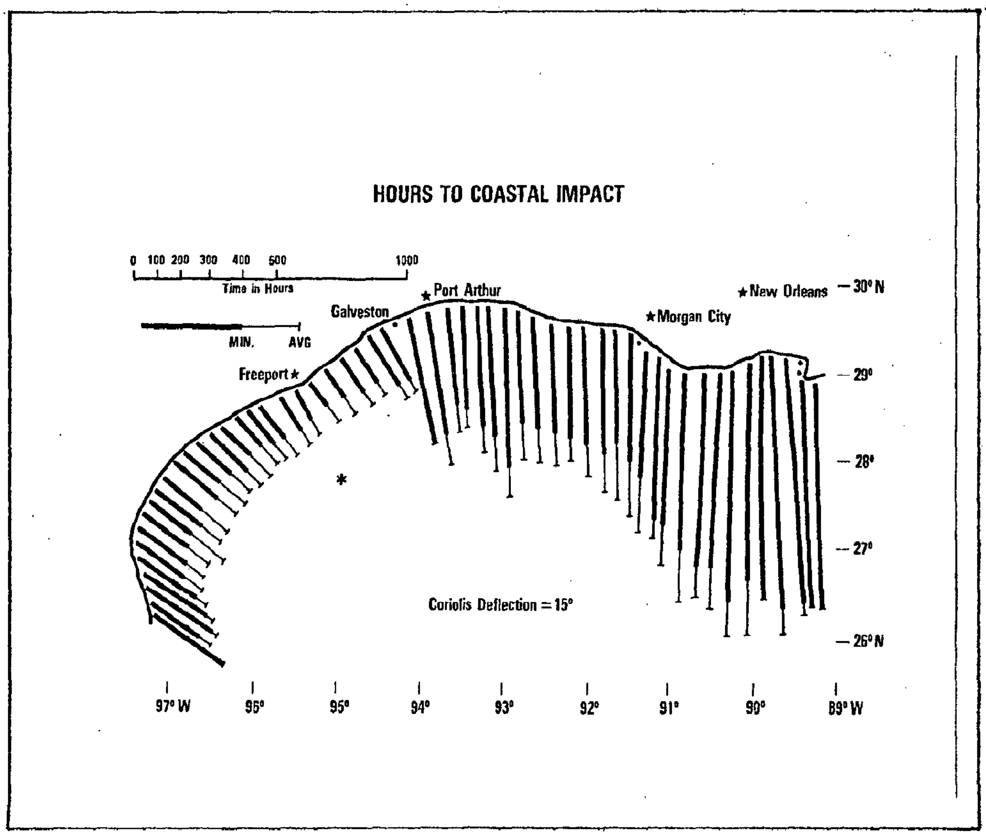


Fig. F.7 Spill Offshore Texas

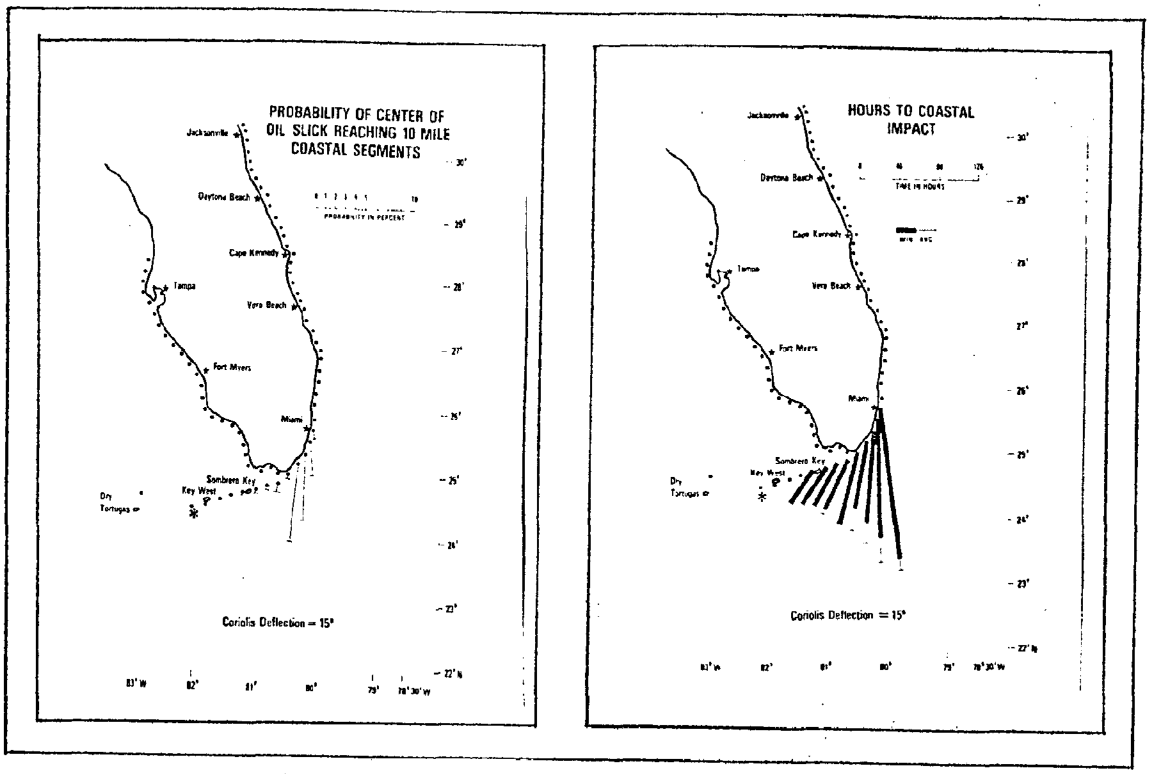


Fig. F.8 Spill off Key West

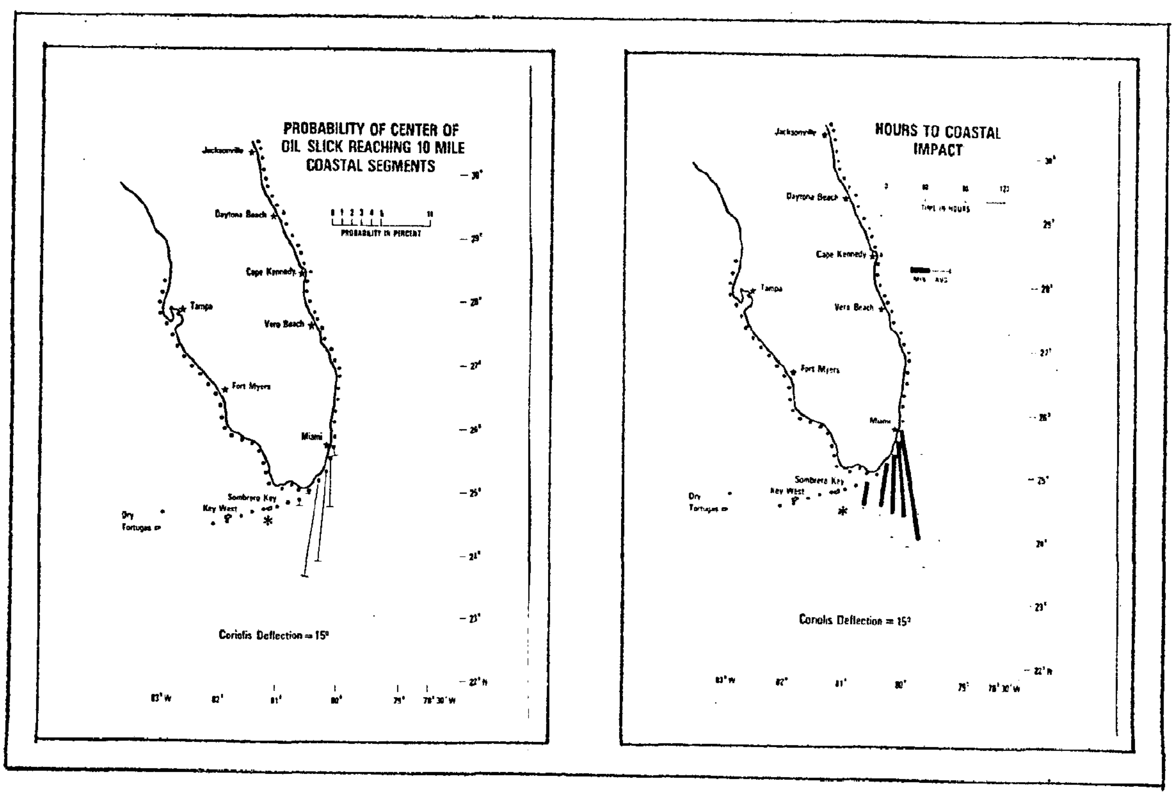
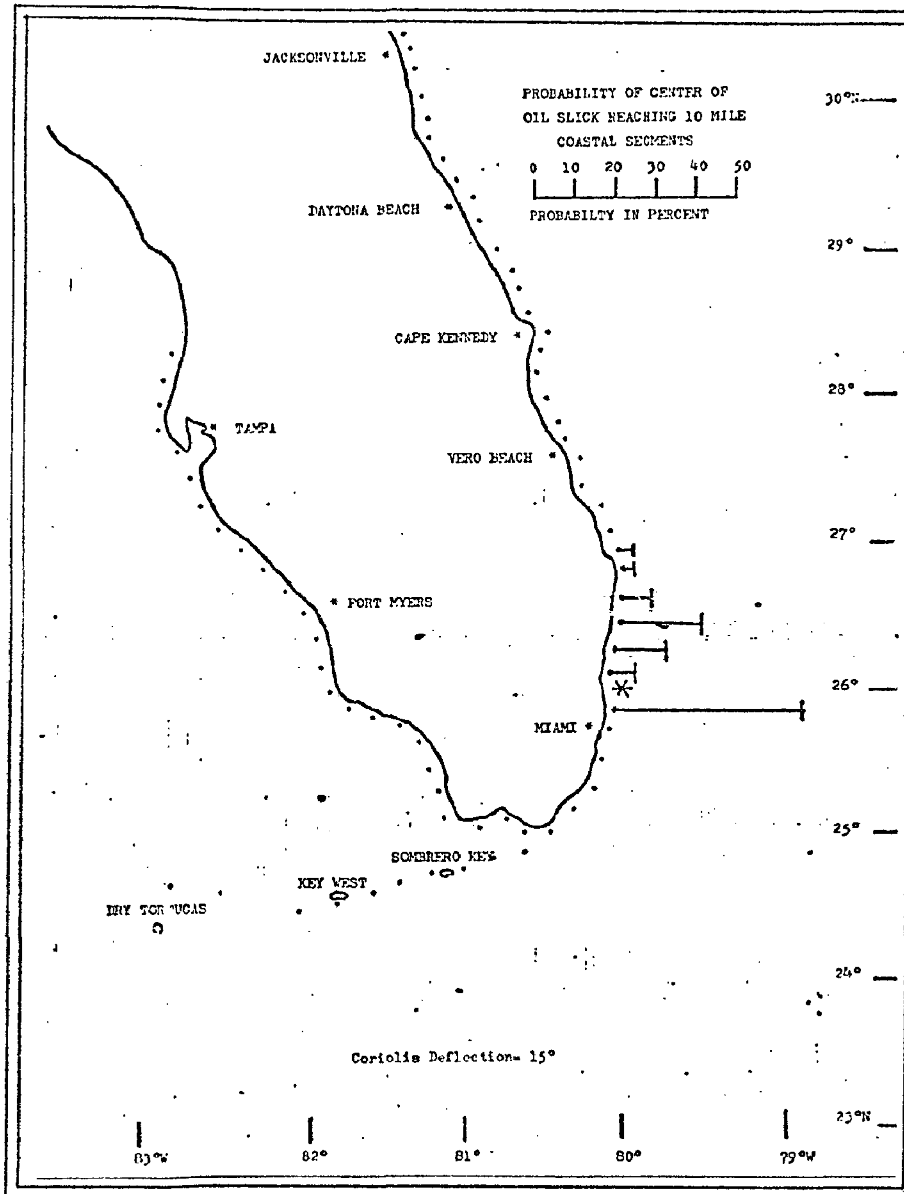


Fig. F.9 Spill off Florida Keys



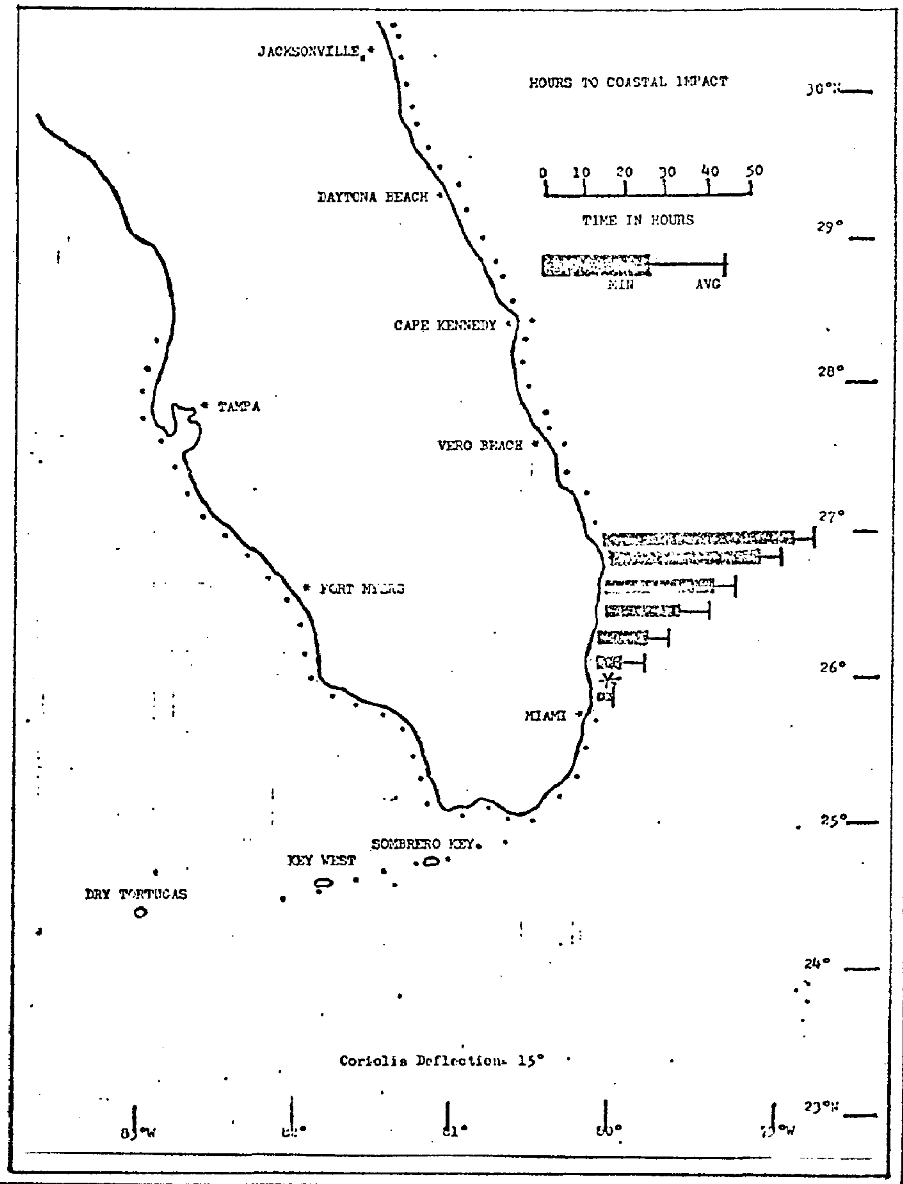


Fig. F.10 Spill off Miami

COMPUTER PROGRAM DOCUMENTATION

The computer programs which are utilized in the operation of the oil advection model are written in Fortran. A diagram of operations procedures is given in Fig. F.11.

Input to the program are files of historical wind records from either a disk storage or tape files. Geographis coordinates defining the beach or impact meridian is input from cards. These coordinates define and orient beach and coastal water areas (10 x 10 miles) in which the impact of oil will be considered. Results of modeling will be couched in terms of the frequency oil is expected to enter each of the 10 x 10 mile areas.

Availablilty of data on the quasi-permanent ocean currents varies from one proposed port site to another. Use of the current data in the oil advection model required wide variation in programming for operations at the different sites. Current data were selected from the computer data files in operations on a basis of the geographic location of the hypothetical oil mass or on the month from which the historical wind records were taken.

Computational procedures in the model permitted the computation of about 123 hypothetical oil movement paths from each spill site per year of historical wind record. About 40 minutes of Central Processing Unit Time (IBM 360/195) was required to run the oil advection model with 10 years of historical wind record.

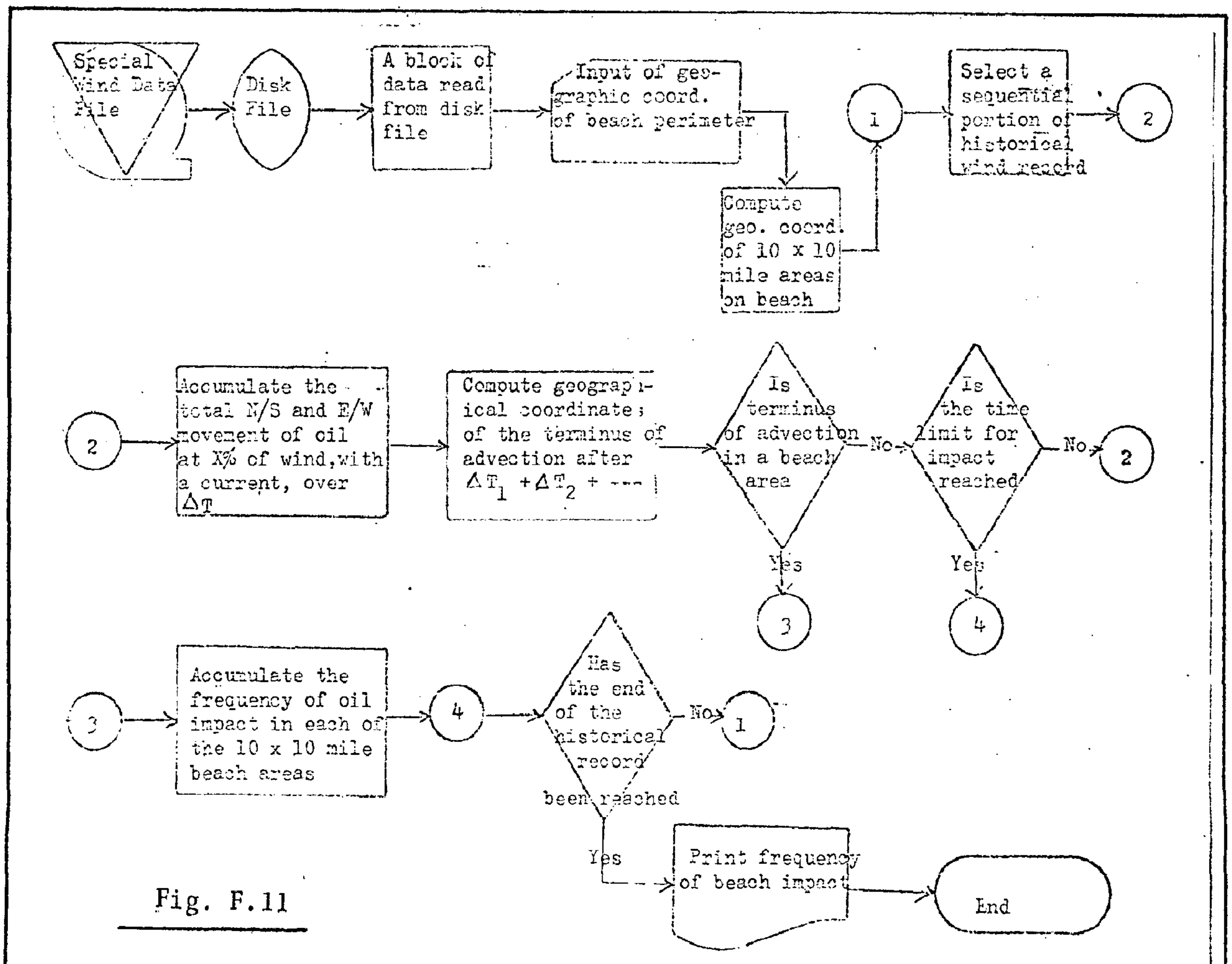


Fig. F.11

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APPENDIX G.

STRANDING ANALYSIS

STRANDING ANALYSIS

The following pages present results of stranding analyses for both the SEADOCK site off Texas and the Florida situation:

- Texas:
  - A description of the SEADOCK stranding analysis technique from the SEADOCK Environmental Analysis (EA), pages 5.5-11 to 5.5-13
  - Tabular results from the SEADOCK EA, pages 5.5-16 to 5.5-46
  - NOAA stranding analysis for a catastrophic spill at the offshore fairway intersection.
- Florida:
  - Tabular results of stranding assuming 25% spill decay for four levels of tanker exposure--low (.15 and .30 exposure years); medium (.41 exposure years); and high (.55 exposure years).
  - Tabular results assuming no spill decay for .30, .41, and .55 exposure years.

This distribution assumes that about 25 percent of all oil spilled is evaporated or dissolved in the water and that about an additional 20 percent of the small spills (less than 1,000 bbl) is lost to recovery by dispersion fine enough to preclude stranding. However, some of it may eventually turn up as tar balls. The same eventual fate - natural paths of degradation - would apply to oil escaping into the open Gulf.

The expectation of loss to the marine environment (including the atmosphere) due to processing the oil through SEADOCK would be approximately 1,357 bbl annually or just under 1 bbl per 1 MMbpd of the oil handled. Of the 1,169 bbl expectation spilled in the terminal, about the same fraction would be evaporated and some would soak into the upper soil layers to undergo eventual natural degradation. The remainder would be recovered.

5.5.7 COMPUTATION METHODOLOGY FOR STRANDING EXPECTATION

Tables 5.5-4 through 5.5-39 exhibit the separate components of the expectation. The procedure involves the following distribution factors:

a) probability that the trajectory will intercept a given coast sector in a given month (Section 10.6);

b) the distribution of spill sizes;

c) the distribution of significant wave heights (which does not add to 100 percent because the fraction of time SEADOCK is estimated to be shut in by bad weather is deleted from the available time);

d) the annual frequency of a given spill size (the annual frequency must be divided by 12 to obtain the applicable rate for one month);

e) an averaging factor to compensate for computing spill effects from the largest amount in each spill size group;

f) spill transit time group distributions to determine potential recovery time, estimated from the maximum, minimum, mean, median, and standard deviation of the transit times of the individual trajectories (Section 10.4) and a description of the shape of the spectrum of transit times for each month, supplied by Texas A&M, to distinguish differences in the time groups applicable to the geographic sectors.

g) the amount of oil which is left in slick in each category at the time of stranding; and,

h) the annual expectation of stranded oil from each category.

The procedure is equivalent to computing the following amount:

> Given that a certain size spill will touch the shore zone in t hours when the weather is of a certain class, how much oil is still in the slick at the time of stranding? The product of that amount and the joint probability of all of the above items a) through g) is the expectation for the given case. The total expectation of spill volume reaching the shore zone is the summation of all possible cases.

The amount of oil considered for pickup is not quite all of the projected marine spillage. The frequencies selected for the small spills have the effect of clipping off the bottom of the distribution. The expectation of oil considered spilled for computational purposes is (4 MMbpd case):

Tankers	1474 bbl annual
SPM	180 bbl annual
Platforms	560 bbl annual
Pipelines	62 bbl annual
TOTAL	2276 bbl annual

The remainder of the projected marine oil spillage of 3,516 bbl annually, all in small spills, is considered to be contained in the boom deployable at the site, or to be totally dispersed by rough weather.

The calculation method as exhibited appears to imply that if a spill occurs, in a given class of weather, then that weather class will persist for the whole period of travel time. In actuality, all types of weather may apply to a given spill, and it has been assumed that the time apportionment may be interchanged in the calculation. For good weather, cleanup can usually be completed before stranding. The time difference between end of this hypothetical cleanup and the stranding is effectively discarded by the calculation. In real spills, where some of the cleanup is delayed by bad weather, the remaining time would be utilized in skimming. Consequently, the error introduced by assuming interchangability of wave classes is towards overprediction of the oil stranding.

The assumption that night cleanup is as effective as day cleanup, implicit in the calculation since no special allowance was assumed for night periods, tends towards underprediction of oil stranding. However, in the early stages of large spills, which is the most important period for achieving efficient recovery, night skimming is nearly as effective as daylight efforts. In the later stages of slick dispersion, slick patches are harder to locate at night.

As an example of the computation, consider Table 5.5-8, Freeport Sector in April, 50 - 25 Mbbl spill, "C" weather, medium time group (70 hour average):

> The amount of oil unrecovered in 70 hours would be 12,400 bbl, interpolated from Table 5.5-2. The joint probabilities are:

1)	probability of hitting Freeport sector in that month	.884
2)	probability of wave state "C"	.06
3)	annual frequency of 50 - 25 Mbbl spill, divided by 12 to obtain an average monthly rate	.0069 ÷ 12
4)	averaging factor (25 + 50)/ 2 ÷ 50	.75
5)	fraction of spills averaging 70 hours	.25
	JOINT ANNUAL PROBABILITY PRODUCT	5.7×10^{-6}

Thus, the annual expectancy is 12,400 bbl x $5.7 \times 10^{-6} = 7.09 \times 10^{-2}$ bbl.

The necessary unit for adding up the contributions of the various cases is a millibarrel, or about 5.3 ounces of oil - literally by the teacup. The pattern of the tables indicates that the most likely expectation of spillage reaching the shore zone results from spills of around 25 Mbbl in bad weather. The contribution of spills around this size to the stranding expectation is on the order of 2 to 2.5 times that for spills around 100 Mbbl.

The last spill size group is the contribution from the site sources other than tankers. These contribute about 35 percent of the oil involved in the calculation, but make up roughly 1 to 2 percent of the stranding expectation. Clearly, tanker spills dominate the oil spill risk.

TABLE 5.5-2

MARINE SPILLAGE CLEANUP
(3 Skimmers)

			TANKER SPILLS						
			120,000 bbl	100,000 bbl	75,000 bbl	50,000 bbl	25,000 bbl	5,000[b] bbl	5,000[c] bbl
A.	Wave State (0-4 ft)	0 hrs	120,000	100,000	75,000	50,000	25,000	5,000	5,000
		4 hrs[a]	115,200	96,000	72,000	48,000	24,000	4,800	4,800
		10 hrs	74,000	56,000	34,000	14,000	(5 hrs)0	0	350
		30 hrs	(26 hrs)0	(22 hrs)0	(17 hrs)0	(13 hrs)0			350
B.	Wave State (4-6 ft)	0 hrs	120,000	100,000	75,000	50,000	25,000	5,000	5,000
		4 hrs[a]	115,200	96,000	72,000	48,000	24,000	4,800	4,800
		10 hrs	91,000	73,000	51,000	28,000	6,000	0	2,400
		30 hrs	43,000	27,000	7,000	(23 hrs)0	(14 hrs)0		350
		50 hrs	7,000	(45 hrs)0	(34 hrs)0				350
		100 hrs	(55 hrs)0						350
		200 hrs							350
		300 hrs							350
C.	Wave State (6-8 ft)	0 hrs	120,000	100,000	75,000	50,000	25,000	5,000	5,000
		4 hrs[a]	115,200	96,000	72,000	48,000	24,000	4,800	4,800
		10 hrs	105,000	87,000	64,000	42,000	19,000	3,400	4,000
		30 hrs	86,000	70,000	50,000	30,000	10,000	400	800
		50 hrs	74,000	59,000	41,000	16,000	4,000	0	600
		100 hrs	58,000	49,000	29,000	7,000	1,800		400
		200 hrs	48,000	41,000	23,000	2,400	1,000		400
		300 hrs	44,000	38,000	21,000	900	400		400
D.	8 Feet and Over - No cleaning								

[a] Start of cleanup.

[b] One skimmer with barriers.

[c] One skimmer without barriers.

TABLE 5.5-3

EXPECTATION OF OIL REACHING SHORELINE
(in barrels)

	GALVESTON		FREEPORT		CORPUS CHRISTI		
	Total Expec- tation	Weathered Oil	Total Expec- tation	Weathered Oil	Total Expec- tation	Weathered Oil	TOTAL
January	1.6	0.9	4.1	2.1	2.8	1.5	8.5
February	0.0	0.0	7.4	1.4	4.4	3.4	11.8
March	0.0	0.0	10.3	0.0	0.5	0.2	10.8
April	0.0	0.0	7.5	0.0	0.8	0.2	8.3
May	0.3	0.0	4.7	0.0	0.3	0.1	5.3
June	0.3	0.0	2.3	0.0	0.1	0.0	2.7
July	0.3	0.0	0.3	0.0	0.0	0.0	0.6
August	0.1	0.0	0.3	0.1	0.0	0.0	0.4
September	1.1	0.5	3.4	1.7	0.0	0.0	4.5
October	0.3	0.1	6.4	1.3	0.2	0.1	6.9
November	0.0	0.0	6.0	2.8	0.3	0.3	6.3
December	0.0	0.0	4.5	0.0	4.7	2.3	9.2
TOTAL	4.0	1.5	57.2	9.4	14.1	8.1	75.3

TABLE 5.5-4

INDEX FOR EXPECTATION TABLES

	Freeport Sector	Galveston Sector	Corpus Christi Sector
January	5.5-5	5.5-17	5.5-24
February	5.5-6	a	5.5-25
March	5.5-7	a	5.5-26
April	5.5-8	a	5.5-27
May	5.5-9	5.5-18	5.5-28
June	5.5-10	5.5-19	5.5-29
July	5.5-11	5.5-20	a
August	5.5-12	5.5-21	a
September	5.5-13	5.5-22	a
October	5.5-14	5.5-23	5.5-30
November	5.5-15	a	5.5-31
December	5.5-16	a	5.5-32

[a] Indicates that there is negligible or no expectation of marine oil spillage stranding for the Galveston or Corpus Christi sectors for the referenced month.

TABLE 5.5-5

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- JANUARY, FREEPORT SECTOR -
(monthly sector arrival probability - 46.7%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 20% - 80 hours, Spill Size at Shore	20% - 80 hours, Annual Expectation	26% - 120 hours, Spill Size at Shore	26% - 120 hours, Annual Expectation	54% - 300 hours +, Spill Size at Shore	54% - 300 hours +, Annual Expectation
120-100	A	.59	13.2 E-4	.917	0	0	0	0	0	0
	B	.22	13.2 E-4	.917	0	0	0	0	0	0
	C	.08	13.2 E-4	.917	64,400	4.9 E-2	56,000	5.5 E-2	44,000	9.0 E-2
	D	.07	13.2 E-4	.917	99,000	6.6 E-2	96,000	8.3 E-2	96,000	17.2 E-2
100-75	A	.59	12.4 E-4	.875	0	0	0	0	0	0
	B	.22	12.4 E-4	.875	0	0	0	0	0	0
	C	.08	12.4 E-4	.875	53,000	3.6 E-2	47,400	4.2 E-2	38,000	7.0 E-2
	D	.07	12.4 E-4	.875	82,500	5.1 E-2	80,000	6.1 E-2	80,000	12.6 E-2
75-50	A	.59	12.4 E-4	.833	0	0	0	0	0	0
	B	.22	12.4 E-4	.833	0	0	0	0	0	0
	C	.08	12.4 E-4	.833	33,300	2.2 E-2	27,800	2.3 E-2	21,000	3.6 E-2
	D	.07	12.4 E-4	.833	62,300	3.5 E-2	60,000	4.4 E-2	60,000	9.1 E-2
50-25	A	.59	6.9 E-3	.75	0	0	0	0	0	0
	B	.22	6.9 E-3	.75	0	0	0	0	0	0
	C	.08	6.9 E-3	.75	10,600	3.4 E-2	6,080	2.5 E-2	900	0.8 E-2
	D	.07	6.9 E-3	.75	41,250	11.5 E-2	40,500	14.6 E-2	40,000	30.2 E-2
25-5	A	.59	52.2 E-3	.60	0	0	0	0	0	0
	B	.22	52.2 E-3	.60	0	0	0	0	0	0
	C	.08	52.2 E-3	.60	2,680	5.25 E-2	1,640	4.2 E-2	400	2.1 E-2
	D	.07	52.2 E-3	.60	21,000	35.8 E-2	20,000	44.3 E-2	20,000	92.1 E-2
5-0	A	.59	145.0 E-3	.30	0	0	0	0	0	0
	B	.22	145.0 E-3	.30	0	0	0	0	0	0
	C	.08	145.0 E-3	.30	0	0	0	0	0	0
	D	.07	145.0 E-3	.30	4,100	9.7 E-2	4,000	12.3 E-2	4,000	25.6 E-2
5-0[c]	A	.59	10.0 E-3	.30	350	0.5 E-2	350	0.6 E-2	350	1.3 E-2
	B	.22	10.0 E-3	.30	350	0.2 E-2	350	0.2 E-2	350	0.5 E-2
	C	.08	10.0 E-3	.30	480	0.1 E-2	400	0.1 E-2	400	0.2 E-2
	D	.07	10.0 E-3	.30	4,100	0.7 E-2	4,000	0.9 E-2	4,000	1.8 E-2
TOTAL						93.1 E-2		110.5 E-2		211.0 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-6

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- FEBRUARY, FREEPORT SECTOR -
(monthly sector arrival probability - 59.7%)

					SPILL TRAVEL TIME GROUPS IN BARRELS					
					21% - 40 hours		57% - 120 hours		22% - 210 hours +	
Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	Spill Size at Shore	Annual Expectation	Spill Size at Shore	Annual Expectation	Spill Size at Shore	Annual Expectation
120-100	A	.50	13.2 E-4	.917	0	0	0	0	0	0
	B	.26	13.2 E-4	.917	25,000	8.2 E-2	0	0	0	0
	C	.09	13.2 E-4	.917	80,000	9.1 E-2	56,000	17.2 E-2	47,600	5.7 E-2
	D	.09	13.2 E-4	.917	104,400	11.8 E-2	96,000	29.5 E-2	96,000	11.4 E-2
100-75	A	.50	12.4 E-4	.875	0	0	0	0	0	0
	B	.26	12.4 E-4	.875	9,000	2.6 E-2	0	0	0	0
	C	.09	12.4 E-4	.875	64,500	6.6 E-2	47,400	13.2 E-2	40,700	4.4 E-2
	D	.09	12.4 E-4	.875	87,000	8.9 E-2	80,000	22.2 E-2	80,000	8.6 E-2
75-50	A	.50	12.4 E-4	.833	0	0	0	0	0	0
	B	.26	12.4 E-4	.833	0	0	0	0	0	0
	C	.09	12.4 E-4	.833	45,500	4.4 E-2	27,800	7.3 E-2	22,800	2.3 E-2
	D	.09	12.4 E-4	.833	65,300	6.3 E-2	60,000	15.8 E-2	60,300	6.1 E-2
50-25	A	.50	6.9 E-3	.75	0	0	0	0	0	0
	B	.26	6.9 E-3	.75	0	0	0	0	0	0
	C	.09	6.9 E-3	.75	23,000	11.1 E-2	6,080	8.0 E-2	2,250	1.1 E-2
	D	.09	6.9 E-3	.75	43,500	21.4 E-2	40,000	53.3 E-2	40,500	20.6 E-2
25-5	A	.50	52.2 E-3	.60	0	0	0	0	0	0
	B	.26	52.2 E-3	.60	0	0	0	0	0	0
	C	.09	52.2 E-3	.60	7,000	20.6 E-2	1,640	13.1 E-2	940	2.9 E-2
	D	.09	52.2 E-3	.60	21,800	64.3 E-2	20,000	160.0 E-2	20,800	61.5 E-2
5-0	A	.50	145.0 E-3	.30	0	0	0	0	0	0
	B	.26	145.0 E-3	.30	0	0	0	0	0	0
	C	.09	145.0 E-3	.30	200	0.8 E-2	0	0	0	0
	D	.09	145.0 E-3	.30	4,400	18.0 E-2	4,000	44.5 E-2	4,000	17.2 E-2
5-0[c]	A	.50	10.0 E-3	.30	350	0.55 E-2	350	1.5 E-2	350	0.6 E-2
	B	.26	10.0 E-3	.30	350	0.3 E-2	350	0.8 E-2	350	0.3 E-2
	C	.09	10.0 E-3	.30	700	0.2 E-2	400	0.3 E-2	400	0.1 E-2
	D	.09	10.0 E-3	.30	4,400	12.3 E-2	4,000	3.0 E-2	4,000	1.2 E-2
TOTAL						207.5 E-2		386.7 E-2		144.3 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, Pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-7

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- MARCH, FREEPORT SECTOR -
(monthly sector arrival probability - 93.7%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 52% - 30 hours: Spill Size at Shore	52% - 30 hours: Annual Expectation	48% - 80 hours: Spill Size at Shore	48% - 80 hours: Annual Expectation	0%: Spill Size at Shore	0%: Annual Expectation
120-100	A	.64	13.2 E-4	.917	0	0	0	0	0	0
	B	.21	13.2 E-4	.917	43,000	44.3 E-2	0	0	0	0
	C	.07	13.2 E-4	.917	86,000	29.5 E-2	64,400	20.4 E-2	0	0
	D	.06	13.2 E-4	.917	108,000	32.0 E-2	99,000	27.1 E-2	0	0
100-75	A	.64	12.4 E-4	.875	0	0	0	0	0	0
	B	.21	12.4 E-4	.875	27,000	25.0 E-2	0	0	0	0
	C	.07	12.4 E-4	.875	70,000	21.5 E-2	53,000	15.0 E-2	0	0
	D	.06	12.4 E-4	.875	90,000	23.9 E-2	83,000	20.3 E-2	0	0
75-50	A	.64	12.4 E-4	.833	0	0	0	0	0	0
	B	.21	12.4 E-4	.833	[illegible],[illegible]00	6.15 E-2	0	0	0	0
	C	.07	12.4 E-4	.833	50,000	14.6 E-2	33,800	9.1 E-2	0	0
	D	.06	12.4 E-4	.833	67,[illegible]00	17.[illegible] E-2	62,000	14.5 E-2	0	0
50-25	A	.64	6.9 E-3	.75	0	0	0	0	0	0
	B	.21	6.9 E-3	.75	0	0	0	0	0	0
	C	.07	6.9 E-3	.75	30,000	43.7 E-2	10,600	14.2 E-2	0	0
	D	.06	6.9 E-3	.75	45,000	56.2 E-2	41,300	47.6 E-2	0	0
25-5	A	.64	52.2 E-3	.60	0	0	0	0	0	0
	B	.21	52.2 E-3	.60	0	0	0	0	0	0
	C	.07	52.2 E-3	.60	10,000	88.9 E-2	2,680	22.0 E-2	0	0
	D	.06	52.2 E-3	.60	22,500	172.0 E-2	20,600	145.4 E-2	0	0
5-0	A	.64	145.0 E-3	.30	0	0	0	0	0	0
	B	.21	145.0 E-3	.30	0	0	0	0	0	0
	C	.07	145.0 E-3	.30	400	4.95 E-2	0	0	0	0
	D	.06	145.0 E-3	.30	4,500	47.7 E-2	4,100	40.1 E-2	0	0
5-0[c]	A	.64	10.0 E-3	.30	350	2.7 E-2	350	2.5 E-2	0	0
	B	.21	10.0 E-3	.30	350	0.9 E-2	350	0.8 E-2	0	0
	C	.07	10.0 E-3	.30	600	0.7 E-2	480	0.4 E-2	0	0
	D	.06	10.0 E-3	.30	4,500	3.3 E-2	4,100	2.8 E-2	0	0
TOTAL						660.5 E-2		368.0 E-2		

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-8

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- APRIL, FREEPORT SECTOR -
(monthly sector arrival probability - 88.4%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 50% - 40 hours: Spill Size at Shore	50% - 40 hours: Annual Expectation	25% - 70 hours: Spill Size at Shore	25% - 70 hours: Annual Expectation	25% - 140 hours +: Spill Size at Shore	25% - 140 hours +: Annual Expectation
120-100	A	.64	13.2 E-4	.917	0	0	0	0	0	0
	B	.22	13.2 E-4	.917	25,000	24.5 E-2	0	0	0	0
	C	.06	13.2 E-4	.917	80,000	21.6 E-2	67,600	9.1 E-2	54,000	7.3 E-2
	D	.05	13.2 E-4	.917	104,400	23.2 E-2	99,600	11.0 E-2	96,000	10.7 E-2
100-75	A	.64	12.4 E-4	.875	0	0	0	0	0	0
	B	.22	12.4 E-4	.875	9,000	7.9 E-2	0	0	0	0
	C	.06	12.4 E-4	.875	64,500	15.5 E-2	55,000	6.6 E-2	45,800	5.5 E-2
	D	.05	12.4 E-4	.875	87,000	17.4 E-2	83,000	8.3 E-2	80,000	8.0 E-2
75-50	A	.64	12.4 E-4	.833	0	0	0	0	0	0
	B	.22	12.4 E-4	.833	0	0	0	0	0	0
	C	.06	12.4 E-4	.833	45,500	10.5 E-2	36,200	4.2 E-2	26,600	3.1 E-2
	D	.05	12.4 E-4	.833	65,300	12.4 E-2	62,300	5.9 E-2	60,000	5.7 E-2
50-25	A	.64	6.9 E-3	.75	0	0	0	0	0	0
	B	.22	6.9 E-3	.75	0	0	0	0	0	0
	C	.06	6.9 E-3	.75	23,000	26.45 E-2	12,400	7.1 E-2	5,160	3.0 E-2
	D	.05	6.9 E-3	.75	43,500	40.8 E-2	41,500	19.5 E-2	40,000	18.8 E-2
25-5	A	.64	52.2 E-3	.60	0	0	0	0	0	0
	B	.22	52.2 E-3	.60	0	0	0	0	0	0
	C	.06	52.2 E-3	.60	7,000	48.3 E-2	3,120	10.8 E-2	1,480	5.4 E-2
	D	.05	52.2 E-3	.60	21,800	126.0 E-2	20,800	60.1 E-2	20,000	57.8 E-2
5-0	A	.64	145.0 E-3	.30	0	0	0	0	0	0
	B	.22	145.0 E-3	.30	0	0	0	0	0	0
	C	.06	145.0 E-3	.30	200	1.9 E-2	0	0	0	0
	D	.05	145.0 E-3	.30	4,400	35.2 E-2	4,200	16.8 E-2	4,000	16.0 E-2
5-0[c]	A	.64	10.0 E-3	.30	350	2.5 E-2	350	1.2 E-2	350	1.2 E-2
	B	.22	10.0 E-3	.30	350	0.9 E-2	350	0.4 E-2	350	0.4 E-2
	C	.06	10.0 E-3	.30	700	0.5 E-2	520	0.2 E-2	400	0.1 E-2
	D	.05	10.0 E-3	.30	4,400	2.5 E-2	4,200	1.2 E-2	4,000	1.1 E-2
TOTAL						418.1 E-2		162.4 E-2		144.1 E-2

[a] Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b] Monthly probability assigned 1/12 of annual rate.

[c] Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-9

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- MAY, FREEPORT SECTOR -
(monthly sector arrival probability - 88.8%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 58% - 60 hours: Spill Size at Shore	58% - 60 hours: Annual Expectation	42% - 150 hours: Spill Size at Shore	42% - 150 hours: Annual Expectation	0%: Spill Size at Shore	0%: Annual Expectation
120-100	A	.71	13.2 E-4	.917	0	0	0	0	0	0
	B	.17	13.2 E-4	.917	0	0	0	0	0	0
	C	.06	13.2 E-4	.917	70,800	22.2 E-2	53,000	12.0 E-2	0	0
	D	.04	13.2 E-4	.917	90,000	18.8 E-2	84,000	12.7 E-2	0	0
100-75	A	.71	12.4 E-4	.875	0	0	0	0	0	0
	B	.17	12.4 E-4	.875	0	0	0	0	0	0
	C	.06	12.4 E-4	.875	57,000	15.9 E-2	45,000	9.1 E-2	0	0
	D	.04	12.4 E-4	.875	75,000	13.9 E-2	70,000	9.4 E-2	0	0
75-50	A	.71	12.4 E-4	.833	0	0	0	0	0	0
	B	.17	12.4 E-4	.833	0	0	0	0	0	0
	C	.06	12.4 E-4	.833	38,600	10.3 E-2	26,000	5.0 E-2	0	0
	D	.04	12.4 E-4	.833	56,300	10.0 E-2	52,500	6.8 E-2	0	0
50-25	A	.71	6.9 E-3	.75	0	0	0	0	0	0
	B	.17	6.9 E-3	.75	0	0	0	0	0	0
	C	.06	6.9 E-3	.75	14,200	1.9 E-2	4,700	4.5 E-2	0	0
	D	.04	6.9 E-3	.75	37,500	33.4 E-2	35,000	22.6 E-2	0	0
25-5	A	.71	52.2 E-3	.60	0	0	0	0	0	0
	B	.17	52.2 E-3	.60	0	0	0	0	0	0
	C	.06	52.2 E-3	.60	3,560	28.7 E-2	1,400	8.2 E-2	0	0
	D	.04	52.2 E-3	.60	18,800	101.1 E-2	17,500	68.1 E-2	0	0
5-0	A	.71	145.0 E-3	.30	0	0	0	0	0	0
	B	.17	145.0 E-3	.30	0	0	0	0	0	0
	C	.06	145.0 E-3	.30	0	0	0	0	0	0
	D	.04	145.0 E-3	.30	3,800	28.4 E-2	3,500	18.9 E-2	0	0
5-0[c]	A	.71	10.0 E-3	.30	350	3.2 E-2	350	2.3 E-2	0	0
	B	.17	10.0 E-3	.30	350	0.8 E-2	350	0.6 E-2	0	0
	C	.06	10.0 E-3	.30	560	0.4 E-2	400	0.2 E-2	0	0
	D	.04	10.0 E-3	.30	3,800	1.4 E-2	3,500	1.3 E-2	0	0
TOTAL						290.4 E-2		181.7 E-2		

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-10

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- JUNE, FREEPORT SECTOR -
(monthly sector arrival probability - 85.4%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 25% - 60 hours, Spill Size at Shore	25% - 60 hours, Annual Expectation	40% - 100 hours, Spill Size at Shore	40% - 100 hours, Annual Expectation	35% - 150 +, Spill Size at Shore	35% - 150 +, Annual Expectation
120-100	A	.83	13.2 E-4	.917	0	0	0	0	0	0
	B	.12	13.2 E-4	.917	0	0	0	0	0	0
	C	.02	13.2 E-4	.917	70,800	3.0 E-2	58,000	3.9 E-2	53,000	3.15 E-2
	D	.02	13.2 E-4	.917	90,000	3.9 E-2	85,800	6.0 E-2	84,000	5.1 E-2
100-75	A	.83	12.4 E-4	.875	0	0	0	0	0	0
	B	.12	12.4 E-4	.875	0	0	0	0	0	0
	C	.02	12.4 E-4	.875	57,000	2.1 E-2	49,000	2.9 E-2	45,000	2.4 E-2
	D	.02	12.4 E-4	.875	75,000	2.9 E-2	71,500	8.2 E-2	70,000	3.8 E-2
75-50	A	.83	12.4 E-4	.833	0	0	0	0	0	0
	B	.12	12.4 E-4	.833	0	0	0	0	0	0
	C	.02	12.4 E-4	.833	38,600	1.4 E-2	29,000	1.7 E-2	26,000	1.4 E-2
	D	.02	12.4 E-4	.833	56,300	2.1 E-2	53,600	3.1 E-2	52,500	3.0 E-2
50-25	A	.83	6.9 E-3	.75	0	0	0	0	0	0
	B	.12	6.9 E-3	.75	0	0	0	0	0	0
	C	.02	6.9 E-3	.75	14,200	2.5 E-2	7,000	2.0 E-2	4,700	1.15 E-2
	D	.02	6.9 E-3	.75	37,500	6.9 E-2	35,800	10.5 E-2	35,000	9.0 E-2
25-5	A	.83	52.2 E-3	.60	0	0	0	0	0	0
	B	.12	52.2 E-3	.60	0	0	0	0	0	0
	C	.02	52.2 E-3	.60	3,560	4.0 E-2	1,800	3.2 E-2	1,400	2.2 E-2
	D	.02	52.2 E-3	.60	18,800	21.0 E-2	17,900	32.0 E-2	17,500	27.4 E-2
5-0	A	.83	145.0 E-3	.30	0	0	0	0	0	0
	B	.12	145.0 E-3	.30	0	0	0	0	0	0
	C	.02	145.0 E-3	.30	0	0	0	0	0	0
	D	.02	145.0 E-3	.30	3,800	23.6 E-2	3,600	8.9 E-2	3,500	7.6 E-2
5-0[c]	A	.83	10.0 E-3	.30	350	1.55 E-2	350	2.5 E-2	350	2.2 E-2
	B	.12	10.0 E-3	.30	350	0.2 E-2	350	0.4 E-2	350	0.3 E-2
	C	.02	10.0 E-3	.30	560	0.1 E-2	400	0.1 E-2	400	0.1 E-2
	D	.02	10.0 E-3	.30	3,800	0.4 E-2	3,600	0.6 E-2	3,500	0.5 E-2
TOTAL						75.7 E-2		86.0 E-2		69.4 E-2

[a] Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b] Monthly probability assigned 1/12 of annual rate.

[c] Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-11

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
-JULY, FREEPORT SECTOR -
(monthly sector arrival probability - 42.7%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 50% - 90 hours: Spill Size at Shore	50% - 90 hours: Annual Expectation	50% - 180 hours: Spill Size at Shore	50% - 180 hours: Annual Expectation	0%: Spill Size at Shore	0%: Annual Expectation
120-100	A	.89	13.2 E-4	.917	0	0	0	0	0	0
	B	.08	13.2 E-4	.917	0	0	0	0	0	0
	C	.03	13.2 E-4	.917	61,200	4.0 E-2	50,000	3.25 E-2	0	0
	D	0	13.2 E-4	.917	86,400	0	84,000	0	0	0
100-75	A	.89	12.4 E-4	.875	0	0	0	0	0	0
	B	.08	12.4 E-4	.875	0	0	0	0	0	0
	C	.03	12.4 E-4	.875	51,000	3.1 E-2	42,600	2.6 E-2	0	0
	D	0	12.4 E-4	.875	72,000	0	70,000	0	0	0
75-50	A	.89	12.4 E-4	.833	0	0	0	0	0	0
	B	.08	12.4 E-4	.833	0	0	0	0	0	0
	C	.03	12.4 E-4	.833	3[illegible],[illegible]00	1.7 E-2	24,200	1.3 E-2	0	0
	D	0	12.4 E-4	.833	54,000	0	52,500	0	0	0
50-25	A	.89	6.9 E-3	.75	0	0	0	0	0	0
	B	.08	6.9 E-3	.75	0	0	0	0	0	0
	C	.03	6.9 E-3	.75	8,800	2.4 E-2	3,320	0.9 E-2	0	0
	D	0	6.9 E-3	.75	36,000	0	35,000	0	0	0
25-5	A	.89	52.2 E-3	.60	0	0	0	0	0	0
	B	.08	52.2 E-3	.60	0	0	0	0	0	0
	C	.03	52.2 E-3	.60	2,240	3.7 E-2	1,160	1.9 E-2	0	0
	D	0	52.2 E-3	.60	18,000	0	17,500	0	0	0
5-0	A	.89	145.0 E-3	.30	0	0	0	0	0	0
	B	.08	145.0 E-3	.30	0	0	0	0	0	0
	C	.03	145.0 E-3	.30	0	0	0	0	0	0
	D	0	145.0 E-3	.30	3,600	0	3,500	0	0	0
5-0[c]	A	.89	10.0 E-3	.30	350	1.7 E-2	350	1.7 E-2	0	0
	B	.08	10.0 E-3	.30	350	0.15 E-2	350	0.15 E-2	0	0
	C	.03	10.0 E-3	.30	440	0.1 E-2	400	0.1 E-2	0	0
	D	0	10.0 E-3	.30	3,600	0	3,500	0	0	0
TOTAL						16.9 E-2		12. E-2		

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-12

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- AUGUST, FREEPORT SECTOR -
(monthly sector arrival probability - 74.2%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 0% Spill Size at Shore	0% Annual Expectation	50% - 150 hours Spill Size at Shore	50% - 150 hours Annual Expectation	50% - 300 hours + Spill Size at Shore	50% - 300 hours + Annual Expectation
120-100	A	.90	13.2 E-4	.917	0	0	0	0	0	0
	B	.08	13.2 E-4	.917	0	0	0	0	0	0
	C	.02	13.2 E-4	.917	0	0	53,000	4.0 E-2	44,000	3.3 E-2
	D	0	13.2 E-4	.917	0	0	84,000	0	84,000	0
100-75	A	.90	12.4 E-4	.875	0	0	0	0	0	0
	B	.08	12.4 E-4	.875	0	0	0	0	0	0
	C	.02	12.4 E-4	.875	0	0	45,000	2.9 E-2	38,000	2.5 E-2
	D	0	12.4 E-4	.875	0	0	70,000	0	70,000	0
75-50	A	.90	12.4 E-4	.833	0	0	0	0	0	0
	B	.08	12.4 E-4	.833	0	0	0	0	0	0
	C	.02	12.4 E-4	.833	0	0	26,000	1.7 E-2	21,000	1.4 E-2
	D	0	12.4 E-4	.833	0	0	52,500	0	52,500	0
50-25	A	.90	6.9 E-3	.75	0	0	0	0	0	0
	B	.08	6.9 E-3	.75	0	0	0	0	0	0
	C	.02	6.9 E-3	.75	0	0	4,700	1.5 E-2	900	0.3 E-2
	D	0	6.9 E-3	.75	0	0	35,000	0	35,000	0
25-5	A	.90	52.2 E-3	.60	0	0	0	0	0	0
	B	.08	52.2 E-3	.60	0	0	0	0	0	0
	C	.02	52.2 E-3	.60	0	0	1,400	2.7 E-2	400	0.8 E-2
	D	0	52.2 E-3	.60	0	0	17,500	0	17,500	0
5-0	A	.90	145.0 E-3	.30	0	0	0	0	0	0
	B	.08	145.0 E-3	.30	0	0	0	0	0	0
	C	.02	145.0 E-3	.30	0	0	0	0	0	0
	D	0	145.0 E-3	.30	0	0	3,500	0	3,500	0
5-0[c]	A	.90	10.0 E-3	.30	0	0	350	2.9 E-2	350	2.9 E-2
	B	.08	10.0 E-3	.30	0	0	350	0.3 E-2	350	0.3 E-2
	C	.02	10.0 E-3	.30	0	0	400	0.1 E-2	400	0.1 E-2
	D	0	10.0 E-3	.30	0	0	3,500	0	3,500	0
TOTAL								16.1 E-2		11.6 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-13

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- SEPTEMBER, FREEPORT SECTOR -
(monthly sector arrival probability - 76.7%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS					
					0%		50% - 180 hours		50% - 360 hours -	
					Spill Size at Shore	Annual Expectation	Spill Size at Shore	Annual Expectation	Spill Size at Shore	Annual Expectation
120-100	A	.68	13.2 E-4	.917	0	0	0	0	0	0
	B	.18	13.2 E-4	.917	0	0	0	0	0	0
	C	.06	13.2 E-4	.917	0	0	50,000	11.5 E-2	44,000	10.1 E-2
	D	.04	13.2 E-4	.917	0	0	84,000	13.0 E-2	84,000	13.0 E-2
100-75	A	.68	12.4 E-4	.875	0	0	0	0	0	0
	B	.18	12.4 E-4	.875	0	0	0	0	0	0
	C	.06	12.4 E-4	.875	0	0	42,600	8.9 E-2	38,000	8.0 E-2
	D	.04	12.4 E-4	.875	0	0	70,000	9.6 E-2	70,000	9.6 E-2
75-50	A	.68	12.4 E-4	.833	0	0	0	0	0	0
	B	.18	12.4 E-4	.833	0	0	0-	0	0	0
	C	.06	12.4 E-4	.833	0	0	24,200	4.8 E-2	21,000	4.2 E-2
	D	.04	12.4 E-4	.833	0	0	52,500	7.0 E-2	52,500	7.0 E-2
50-25	A	.68	6.9 E-3	.75	0	0	0	0	0	0
	B	.18	6.9 E-3	.75	0	0	0	0	0	0
	C	.06	6.9 E-3	.75	0	0	3,320	3.3 E-2	900	0.9 E-2
	D	.04	6.9 E-3	.75	0	0	35,000	22.75 E-2	35,000	22.75 E-2
25-5	A	.68	52.2 E-3	.60	0	0	0	0	0	0
	B	.18	52.2 E-3	.60	0	0	0	0	0	0
	C	.06	52.2 E-3	.60	0	0	1,160	7.0 E-2	400	2.4 E-2
	D	.04	52.2 E-3	.60	0	0	17,500	70.0 E-2	17,500	70.0 E-2
5-0	A	.68	145.0 E-3	.30	0	0	0	0	0	0
	B	.18	145.0 E-3	.30	0	0	0	0	0	0
	C	.06	145.0 E-3	.30	0	0	0	0	0	0
	D	.04	145.0 E-3	.30	0	0	3,500	19.4 E-2	3,500	19.4 E-2
5-0[c]	A	.68	10.0 E-3	.30	0	0	350	2.3 E-2	350	2.3 E-2
	B	.18	10.0 E-3	.30	0	0	350	0.6 E-2	350	0.6 E-2
	C	.06	10.0 E-3	.30	0	0	400	0.2 E-2	400	0.2 E-2
	D	.04	10.0 E-3	.30	0	0	3,500	1.3 E-2	3,500	1.3 E-2
TOTAL								171.4 E-2		171.8 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-14

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- OCTOBER, FREEPORT SECTOR -
(monthly sector arrival probability - 91.8%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 35% - 75 hours: Spill Size at Shore	35% - 75 hours: Annual Expectation	43% - 140 hours: Spill Size at Shore	43% - 140 hours: Annual Expectation	22% - 300 hours: Spill Size at Shore	22% - 300 hours: Annual Expectation
120-100	A	.66	13.2 E-4	.917	0	0	0	0	0	0
	B	.19	13.2 E-4	.917	0	0	0	0	0	0
	C	.06	13.2 E-4	.917	66,000	12.9 E-2	54,000	13.0 E-2	44,000	5.4 E-2
	D	.06	13.2 E-4	.917	88,200	17.1 E-2	84,000	20.0 E-2	84,000	10.2 E-2
100-75	A	.66	12.4 E-4	.875	0	0	0	0	0	0
	B	.19	12.4 E-4	.875	0	0	0	0	0	0
	C	.06	12.4 E-4	.875	54,000	9.45 E-2	45,800	9.8 E-2	38,000	4.2 E-2
	D	.06	12.4 E-4	.875	73,500	12.9 E-2	70,000	15.0 E-2	70,000	7.7 E-2
75-50	A	.66	12.4 E-4	.833	0	0	0	0	0	0
	B	.19	12.4 E-4	.833	0	0	0	0	0	0
	C	.06	12.4 E-4	.833	35,000	5.8 E-2	26,600	5.4 E-2	21,000	2.2 E-2
	D	.06	12.4 E-4	.833	55,125	9.1 E-2	52,500	10.7 E-2	52,500	5.5 E-2
50-25	A	.66	6.9 E-3	.75	0	0	0	0	0	0
	B	.19	6.9 E-3	.75	0	0	0	0	0	0
	C	.06	6.9 E-3	.75	11,300	9.7 E-2	5,160	5.3 E-2	900	0.5 E-2
	D	.06	6.9 E-3	.75	36,750	30.9 E-2	35,000	36.1 E-2	35,000	18.5 E-2
25-5	A	.66	52.2 E-3	.60	0	0	0	0	0	0
	B	.19	52.2 E-3	.60	0	0	0	0	0	0
	C	.06	52.2 E-3	.60	2,900	14.6 E-2	1,480	9.2 E-2	400	1.3 E-2
	D	.06	52.2 E-3	.60	18,375	92.6 E-2	17,500	108.4 E-2	17,500	55.4 E-2
5-0	A	.66	145.0 E-3	.30	0	0	0	0	0	0
	B	.19	145.0 E-3	.30	0	0	0	0	0	0
	C	.06	145.0 E-3	.30	0	0	0	0	0	0
	D	.06	145.0 E-3	.30	3,675	25.6 E-2	3,500	30.0 E-2	3,500	15.3 E-2
5-0[c]	A	.66	10.0 E-3	.30	350	1.85 E-2	350	2.3 E-2	350	1.2 E-2
	B	.19	10.0 E-3	.30	350	0.5 E-2	350	0.7 E-2	350	0.3 E-2
	C	.06	10.0 E-3	.30	500	0.2 E-2	400	0.2 E-2	400	0.1 E-2
	D	.06	10.0 E-3	.30	3,675	1.8 E-2	3,500	2.1 E-2	3,500	1.1 E-2
TOTAL						245.0 E-2		268.2 E-2		128.9 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-15

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- NOVEMBER, FREEPORT SECTOR -
(monthly sector arrival probability - 95.0%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 50% - 100 hours, Spill Size at Shore	50% - 100 hours, Annual Expectation	0%, Spill Size at Shore	0%, Annual Expectation	50% - 300 hours +, Spill Size at Shore	50% - 300 hours +, Annual Expectation
120-100	A	.61	13.2 E-4	.917	0	0	0	0	0	0
	B	.26	13.2 E-4	.917	0	0	0	0	0	0
	C	.05	13.2 E-4	.917	58,000	13.9 E-2	0	0	44,000	10.6 E-2
	D	.05	13.2 E-4	.917	97,800	23.5 E-2	0	0	96,000	23.1 E-2
100-75	A	.61	12.4 E-4	.875	0	0	0	0	0	0
	B	.26	12.4 E-4	.875	0	0	0	0	0	0
	C	.05	12.4 E-4	.875	49,000	10.5 E-2	0	0	38,000	8.2 E-2
	D	.05	12.4 E-4	.875	81,500	17.6 E-2	0	0	80,000	17.3 E-2
75-50	A	.61	12.4 E-4	.833	0	0	0	0	0	0
	B	.26	12.4 E-4	.833	0	0	0	0	0	0
	C	.05	12.4 E-4	.833	29,000	5.9 E-2	0	0	21,000	4.3 E-2
	D	.05	12.4 E-4	.833	61,100	12.4 E-2	0	0	60,000	12.2 E-2
50-25	A	.61	6.9 E-3	.75	0	0	0	0	0	0
	B	.26	6.9 E-3	.75	0	0	0	0	0	0
	C	.05	6.9 E-3	.75	7,000	7.0 E-2	0	0	900	0.9 E-2
	D	.05	6.9 E-3	.75	40,800	42.1 E-2	0	0	40,000	41.3 E-2
25-5	A	.61	52.2 E-3	.60	0	0	0	0	0	0
	B	.26	52.2 E-3	.60	0	0	0	0	0	0
	C	.05	52.2 E-3	.60	1,800	11.2 E-2	0	0	400	2.5 E-2
	D	.05	52.2 E-3	.60	20,400	126.2 E-2	0	0	20,000	123.8 E-2
5-0	A	.61	145.0 E-3	.30	0	0	0	0	0	0
	B	.26	145.0 E-3	.30	0	0	0	0	0	0
	C	.05	145.0 E-3	.30	0	0	0	0	0	0
	D	.05	145.0 E-3	.30	4,100	35.2 E-2	0	0	4,000	34.4 E-2
5-0[c]	A	.61	10.0 E-3	.30	350	2.5 E-2	0	0	350	2.5 E-2
	B	.26	10.0 E-3	.30	350	1.1 E-2	0	0	350	1.1 E-2
	C	.05	10.0 E-3	.30	400	0.2 E-2	0	0	400	0.2 E-2
	D	.05	10.0 E-3	.30	4,100	2.4 E-2	0	0	4,000	2.4 E-2
TOTAL						311.7 E-2				284.8 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-16

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- DECEMBER, FREEPORT SECTOR -
(monthly sector arrival probability - 49.3%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 50% - 90 hours Spill Size at Shore	50% - 90 hours Annual Expectation	0% Spill Size at Shore	0% Annual Expectation	50% - 250 hours + Spill Size at Shore	50% - 250 hours + Annual Expectation
120-100	A	.61	13.2 E-4	.917	0	0	0	0	0	0
	B	.22	13.2 E-4	.917	0	0	0	0	0	0
	C	.08	13.2 E-4	.917	61,200	12.2 E-2	0	0	46,000	9.2 E-2
	D	.07	13.2 E-4	.917	98,400	17.2 E-2	0	0	95,000	16.8 E-2
100-75	A	.61	12.4 E-4	.875	0	0	0	0	0	0
	B	.22	12.4 E-4	.875	0	0	0	0	0	0
	C	.08	12.4 E-4	.875	51,000	9.2 E-2	0	0	39,500	7.1 E-2
	D	.07	12.4 E-4	.875	82,000	12.8 E-2	0	0	80,000	12.4 E-2
75-50	A	.61	12.4 E-4	.833	0	0	0	0	0	0
	B	.22	12.4 E-4	.833	0	0	0	0	0	0
	C	.08	12.4 E-4	.833	31,400	5.3 E-2	0	0	22,000	3.7 E-2
	D	.07	12.4 E-4	.833	61,500	9.1 E-2	0	0	60,000	8.9 E-2
50-25	A	.61	6.9 E-3	.75	0	0	0	0	0	0
	B	.22	6.9 E-3	.75	0	0	0	0	0	0
	C	.08	6.9 E-3	.75	8,800	7.5 E-2	0	0	1,650	1.4 E-2
	D	.07	6.9 E-3	.75	41,000	30.3 E-2	0	0	40,000	29.6 E-2
25-5	A	.61	52.2 E-3	.60	0	0	0	0	0	0
	B	.22	52.2 E-3	.60	0	0	0	0	0	0
	C	.08	52.2 E-3	.60	2,240	11.5 E-2	0	0	700	3.6 E-2
	D	.07	52.2 E-3	.60	20,500	92.5 E-2	0	0	20,000	90.2 E-2
5-0	A	.61	145.0 E-3	.30	0	0	0	0	0	0
	B	.22	145.0 E-3	.30	0	0	0	0	0	0
	C	.08	145.0 E-3	.30	0	0	0	0	0	0
	D	.07	145.0 E-3	.30	4,100	25.7 E-2	0	0	4,000	25.1 E-2
5-0[c]	A	.61	10.0 E-3	.30	350	1.3 E-2	0	0	350	1.3 E-2
	B	.22	10.0 E-3	.30	350	0.5 E-2	0	0	350	0.5 E-2
	C	.03	10.0 E-3	.30	440	0.2 E-2	0	0	400	0.2 E-2
	D	.07	10.0 E-3	.30	4,100	1.8 E-2	0	0	4,000	1.7 E-2
TOTAL						234.1 E-2				211.7 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-17

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- JANUARY, GALVESTON SECTOR -
(monthly sector arrival probability - 18.8%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 20% - 120 hours, Spill Size at Shore	20% - 120 hours, Annual Expectation	26% - 180 hours, Spill Size at Shore	26% - 180 hours, Annual Expectation	54% - 300 hours +, Spill Size at Shore	54% - 300 hours +, Annual Expectation
120-100	A	.59	13.2 E-4	.917	0	0	0	0	0	0
	B	.22	13.2 E-4	.917	0	0	0	0	0	0
	C	.08	13.2 E-4	.917	56,000	1.7 E-2	50,000	1.95 E-2	44,000	3.6 E-2
	D	.07	13.2 E-4	.917	96,000	2.5 E-2	96,000	3.3 E-2	96,000	6.9 E-2
100-75	A	.59	12.4 E-4	.875	0	0	0	0	0	0
	B	.22	12.4 E-4	.875	0	0	0	0	0	0
	C	.08	12.4 E-4	.875	47,400	1.3 E-2	42,600	1.55 E-2	38,000	2.9 E-2
	D	.07	12.4 E-4	.875	80,000	1.9 E-2	80,000	2.5 E-2	80,000	5.2 E-2
75-50	A	.59	12.4 E-4	.833	0	0	0	0	0	0
	B	.22	12.4 E-4	.833	0	0	0	0	0	0
	C	.08	12.4 E-4	.833	27,800	0.7 E-2	24,200	0.8 E-2	21,000	1.5 E-2
	D	.07	12.4 E-4	.833	60,000	1.4 E-2	60,000	1.8 E-2	60,000	3.7 E-2
50-25	A	.59	6.9 E-3	.75	0	0	0	0	0	0
	B	.22	6.9 E-3	.75	0	0	0	0	0	0
	C	.08	6.9 E-3	.75	6,080	0.7 E-2	3,320	0.5 E-2	900	0.3 E-2
	D	.07	6.9 E-3	.75	40,000	4.6 E-2	40,000	6.0 E-2	40,000	12.4 E-2
25-5	A	.59	52.2 E-3	.60	0	0	0	0	0	0
	B	.22	52.2 E-3	.60	0	0	0	0	0	0
	C	.08	52.2 E-3	.60	1,640	1.3 E-2	1,160	1.2 E-2	400	0.8 E-2
	D	.07	52.2 E-3	.60	20,000	13.7 E-2	20,000	17.9 E-2	20,000	37.1 E-2
5-0	A	.59	145.0 E-3	.30	0	0	0	0	0	0
	B	.22	145.0 E-3	.30	0	0	0	0	0	0
	C	.08	145.0 E-3	.30	0	0	0	0	0	0
	D	.07	145.0 E-3	.30	4,000	3.8 E-2	4,000	5.0 E-2	4,000	10.3 E-2
5-0[c]	A	.59	10.0 E-3	.30	350	0.2 E-2	350	0.3 E-2	350	0.5 E-2
	B	.22	10.0 E-3	.30	350	0.1 E-2	350	0.1 E-2	350	0.2 E-2
	C	.08	10.0 E-3	.30	400	0.0 E-2	400	0.0 E-2	400	0.1 E-2
	D	.07	10.0 E-3	.30	4,000	0.3 E-2	4,000	0.3 E-2	4,000	0.7 E-2
TOTAL						34.2 E-2		43.3 E-2		86.2 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-18

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- MAY, GALVESTON SECTOR -
(monthly sector arrival probability - 5.6%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 58% - 120 hours Spill Size at Shore	58% - 120 hours Annual Expectation	42% - 200 hours Spill Size at Shore	42% - 200 hours Annual Expectation	0% Spill Size at Shore	0% Annual Expectation
120-100	A	.71	13.2 E-4	.917	0	0	0	0	0	0
	B	.17	13.2 E-4	.917	0	0	0	0	0	0
	C	.06	13.2 E-4	.917	56,000	1.1 E-2	48,000	0.7 E-2	0	0
	D	.04	13.2 E-4	.917	84,000	1.1 E-2	84,000	0.8 E-2	0	0
100-75	A	.71	12.4 E-4	.875	0	0	0	0	0	0
	B	.17	12.4 E-4	.875	0	0	0	0	0	0
	C	.06	12.4 E-4	.875	47,400	0.8 E-2	41,000	0.5 E-2	0	0
	D	.04	12.4 E-4	.875	70,000	0.8 E-2	70,000	0.6 E-2	0	0
75-50	A	.71	12.4 E-4	.833	0	0	0	0	0	0
	B	.17	12.4 E-4	.833	0	0	0	0	0	0
	C	.06	12.4 E-4	.833	27,800	0.5 E-2	23,000	0.3 E-2	0	0
	D	.04	12.4 E-4	.833	52,500	0.6 E-2	52,500	0.4 E-2	0	0
50-25	A	.71	6.9 E-3	.75	0	0	0	0	0	0
	B	.17	6.9 E-3	.75	0	0	0	0	0	0
	C	.06	6.9 E-3	.75	6,080	0.5 E-2	2,400	0.1 E-2	0	0
	D	.04	6.9 E-3	.75	35,000	1.9 E-2	35,000	1.4 E-2	0	0
25-5	A	.71	52.2 E-3	.60	0	0	0	0	0	0
	B	.17	52.2 E-3	.60	0	0	0	0	0	0
	C	.06	52.2 E-3	.60	1,640	0.8 E-2	1,000	0.4 E-2	0	0
	D	.04	52.2 E-3	.60	17,500	5.6 E-2	17,500	4.3 E-2	0	0
5-0	A	.71	145.0 E-3	.30	0	0	0	0	0	0
	B	.17	145.0 E-3	.30	0	0	0	0	0	0
	C	.06	145.0 E-3	.30	0	0	0	0	0	0
	D	.04	145.0 E-3	.30	3,500	1.7 E-2	3,500	1.2 E-2	0	0
5-0[c]	A	.71	10.0 E-3	.30	350	0.2 E-2	350	0.15 E-2	0	0
	B	.17	10.0 E-3	.30	350	0.05 E-2	350	0	0	0
	C	.06	10.0 E-3	.30	400	0	400	0	0	0
	D	.04	10.0 E-3	.30	3,500	0.1 E-2	3,500	0.1 E-2	0	0
TOTAL						15.8 E-2		11.0 E-2		

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-19

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- JUNE, GALVESTON SECTOR -
(monthly sector arrival probability - 12.8%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 25% - 70 hours, Spill Size at Shore	25% - 70 hours, Annual Expectation	40% - 120 hours, Spill Size at Shore	40% - 120 hours, Annual Expectation	35% - 220 hours, Spill Size at Shore	35% - 220 hours, Annual Expectation
120-100	A	.83	13.2 E-4	.917	0	0	0	0	0	0
	B	.12	13.2 E-4	.917	0	0	0	0	0	0
	C	.02	13.2 E-4	.917	67,600	0.4 E-2	56,000	0.6 E-2	47,200	0.4 E-2
	D	.02	13.2 E-4	.917	88,800	.6 E-2	84,000	.9 E-2	84,000	0.7 E-2
100-75	A	.83	12.4 E-4	.875	0	0	0	0	0	0
	B	.12	12.4 E-4	.875	0	0	0	0	0	0
	C	.02	12.4 E-4	.875	55,000	0.3 E-2	47,400	0.4 E-2	40,400	0.5 E-2
	D	.02	12.4 E-4	.875	74,000	0.4 E-2	70,000	0.7 E-2	70,000	0.6 E-2
75-50	A	.83	12.4 E-4	.833	0	0	0	0	0	0
	B	.12	12.4 E-4	.833	0	0	0	0	0	0
	C	.02	12.4 E-4	.833	36,200	0.2 E-2	27,800	0.2 E-2	22,600	0.2 E-2
	D	.02	12.4 E-4	.833	54,800	0.3 E-2	57,500	0.5 E-2	57,500	0.4 E-2
50-25	A	.83	6.9 E-3	.75	0	0	0	0	0	0
	B	.12	6.9 E-3	.75	0	0	0	0	0	0
	C	.02	6.9 E-3	.75	12,400	0.3 E-2	6,080	0.3 E-2	2,100	0.1 E-2
	D	.02	6.9 E-3	.75	37,000	1.0 E-2	35,000	1.6 E-2	35,000	1.4 E-2
25-5	A	.83	52.2 E-3	.60	0	0	0	0	0	0
	B	.12	52.2 E-3	.60	0	0	0	0	0	0
	C	.02	52.2 E-3	.60	3,120	0.5 E-2	1,640	0.4 E-2	880	0.2 E-2
	D	.02	52.2 E-3	.60	18,500	3.1 E-2	17,500	4.7 E-2	17,500	4.1 E-2
5-0	A	.83	145.0 E-3	.30	0	0	0	0	0	0
	B	.12	145.0 E-3	.30	0	0	0	0	0	0
	C	.02	145.0 E-3	.30	0	0	0	0	0	0
	D	.02	145.0 E-3	.30	3,700	0.9 E-2	3,500	1.3 E-2	3,500	1.1 E-2
5-0[c]	A	.83	10.0 E-3	.30	350	0.2 E-2	350	0.4 E-2	350	0.3 E-2
	B	.12	10.0 E-3	.30	350	0	350	0.05 E-2	350	0.05 E-2
	C	.02	10.0 E-3	.30	520	0	400	0	400	0
	D	.02	10.0 E-3	.30	3,700	0.1 E-2	3,500	0.1 E-2	3,500	0.1 E-2
TOTAL						8.3 E-2		12.2 E-2		9.8 E-2

[a] Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b] Monthly probability assigned 1/12 of annual rate.

[c] Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-20

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- JULY, GALVESTON SECTOR -
(monthly sector arrival probability - 57.3%)

					SPILL TRAVEL TIME GROUPS IN BARRELS					
					50% - 110 hours		50% - 240 hours		0%	
Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency	Averaging Factor	Spill Size at Shore	Annual Expectation	Spill Size at Shore	Annual Expectation	Spill Size at Shore	Annual Expectation
120-100	A	.89	13.2 E-4	.917	0	0	0	0	0	0
	B	.08	13.2 E-4	.917	0	0	0	0	0	0
	C	.03	13.2 E-4	.917	57,000	4.8 E-2	46,400	3.9 E-2	0	0
	D	0	13.2 E-4	.917	84,600	0	84,000	0	0	0
100-75	A	.89	12.4 E-4	.875	0	0	0	0	0	0
	B	.08	12.4 E-4	.875	0	0	0	0	0	0
	C	.03	12.4 E-4	.875	48,200	3.9 E-2	39,800	3.2 E-2	0	0
	D	0	12.4 E-4	.875	70,500	0	70,000	0	0	0
75-50	A	.89	12.4 E-4	.833	0	0	0	0	0	0
	B	.08	12.4 E-4	.833	0	0	0	0	0	0
	C	.03	12.4 E-4	.833	28,400	2.1 E-2	22,200	1.7 E-2	0	0
	D	0	12.4 E-4	.833	52,900	0	52,500	0	0	0
50-25	A	.89	6.9 E-3	.75	0	0	0	0	0	0
	B	.08	6.9 E-3	.75	0	0	0	0	0	0
	C	.03	6.9 E-3	.75	6,540	2.4 E-2	1,800	0.7 E-2	0	0
	D	0	6.9 E-3	.75	35,300	0	35,000	0	0	0
25-5	A	.89	52.2 E-3	.60	0	0	0	0	0	0
	B	.08	52.2 E-3	.60	0	0	0	0	0	0
	C	.03	52.2 E-3	.60	1,720	3.9 E-2	760	1.7 E-2	0	0
	D	0	52.2 E-3	.60	17,600	0	17,500	0	0	0
5-0	A	.89	145.0 E-3	.30	0	0	0	0	0	0
	B	.08	145.0 E-3	.30	0	0	0	0	0	0
	C	.03	145.0 E-3	.30	0	0	0	0	0	0
	D	0	145.0 E-3	.30	3,500	0	3,500	0	0	0
5-0[c]	A	.89	10.0 E-3	.30	350	2.2 E-2	350	2.2 E-2	0	0
	B	.08	10.0 E-3	.30	350	0.2 E-2	350	0.2 E-2	0	0
	C	.03	10.0 E-3	.30	400	0.1 E-2	400	0.1 E-2	0	0
	D	0	10.0 E-3	.30	3,500	0	3,500	0	0	0
TOTAL						19.6 E-2		13.7 E-2		

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 4-9 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-21

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- AUGUST, GALVESTON SECTOR -
(monthly sector arrival probability - 25.8%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 0%: Spill Size at Shore	0%: Annual Expectation	50% - 150 hours: Spill Size at Shore	50% - 150 hours: Annual Expectation	50% - 300 hours +: Spill Size at Shore	50% - 300 hours +: Annual Expectation
120-100	A	.90	13.2 E-4	.917	0	0	0	0	0	0
	B	.08	13.2 E-4	.917	0	0	0	0	0	0
	C	.02	13.2 E-4	.917	0	0	53,000	1.4 E-2	44,000	1.1 E-2
	D		13.2 E-4	.917	0	0	84,000	0	84,000	0
100-75	A	.90	12.4 E-4	.875	0	0	0	0	0	0
	B	.08	12.4 E-4	.875	0	0	0	0	0	0
	C	.02	12.4 E-4	.875	0	0	45,000	1.1 E-2	38,000	0.9 E-2
	D	0	12.4 E-4	.875	0	0	70,000	0	70,000	0
75-50	A	.90	12.4 E-4	.833	0	0	0	0	0	0
	B	.08	12.4 E-4	.833	0	0	0	0	0	0
	C	.02	12.4 E-4	.833	0	0	26,000	0.6 E-2	21,000	0.5 E-2
	D	0	12.4 E-4	.833	0	0	52,500	0	52,500	0
50-25	A	.90	6.9 E-3	.75	0	0	0	0	0	0
	B	.08	6.9 E-3	.75	0	0	0	0	0	0
	C	.02	6.9 E-3	.75	0	0	4,700	0.5 E-2	900	0.1 E-2
	D	0	6.9 E-3	.75	0	0	35,000	0	35,000	0
25-5	A	.90	52.2 E-3	.60	0	0	0	0	0	0
	B	.08	52.2 E-3	.60	0	0	0	0	0	0
	C	.02	52.2 E-3	.60	0	0	1,400	0.9 E-2	400	0.3 E-2
	D	0	52.2 E-3	.60	0	0	17,500	0	17,500	0
5-0	A	.90	145.0 E-3	.30	0	0	0	0	0	0
	B	.08	145.0 E-3	.30	0	0	0	0	0	0
	C	.02	145.0 E-3	.30	0	0	0	0	0	0
	D	0	145.0 E-3	.30	0	0	3,500	0	3,500	0
5-0[c]	A	.90	10.0 E-3	.30	0	0	350	1.0 E-2	350	1.0 E-2
	B	.08	10.0 E-3	.30	0	0	350	0.1 E-2	350	0.1 E-2
	C	.02	10.0 E-3	.30	0	0	400	0	400	0
	D	0	10.0 E-3	.30	0	0	3,500	0	3,500	0
TOTAL								5.6 E-2		4.0 E-2

[a] Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b] Monthly probability assigned 1/12 of annual rate.

[c] Platform, pipeline, and SPM spill greater than 1,000 bbl.

TABLE 5.5-22

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- SEPTEMBER, GALVESTON SECTOR -
(monthly sector arrival probability - 23.3%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 0% Spill Size at Shore	0% Annual Expectation	50% - 180 hours Spill Size at Shore	50% - 180 hours Annual Expectation	50% - 300 hours + Spill Size at Shore	50% - 300 hours + Annual Expectation
120-100	A	.68	13.2 E-4	.917	0	0	0	0	0	0
	B	.18	13.2 E-4	.917	0	0	0	0	0	0
	C	.06	13.2 E-4	.917	0	0	50,000	3.5 E-2	44,000	3.1 E-2
	D	.04	13.2 E-4	.917	0	0	84,000	4.0 E-2	84,000	4.0 E-2
100-75	A	.68	12.4 E-4	.875	0	0	0	0	0	0
	B	.18	12.4 E-4	.875	0	0	0	0	0	0
	C	.06	12.4 E-4	.875	0	0	42,600	2.8 E-2	38,000	2.5 E-2
	D	.04	12.4 E-4	.875	0	0	70,000	3.0 E-2	70,000	3.0 E-2
75-50	A	.68	12.4 E-4	.833	0	0	0	0	0	0
	B	.18	12.4 E-4	.833	0	0	0	0	0	0
	C	.06	12.4 E-4	.833	0	0	24,200	1.45 E-2	21,000	1.3 E-2
	D	.04	12.4 E-4	.833	0	0	52,500	2.1 E-2	52,500	2.1 E-2
50-25	A	.68	6.9 E-3	.75	0	0	0	0	0	0
	B	.18	6.9 E-3	.75	0	0	0	0	0	0
	C	.06	6.9 E-3	.75	0	0	3,320	1.0 E-2	900	0.3 E-2
	D	.04	6.9 E-3	.75	0	0	35,000	7.0 E-2	35,000	7.0 E-2
25-5	A	.68	52.2 E-3	.60	0	0	0	0	0	0
	B	.18	52.2 E-3	.60	0	0	0	0	0	0
	C	.06	52.2 E-3	.60	0	0	1,160	2.1 E-2	400	0.7 E-2
	D	.04	52.2 E-3	.60	0	0	17,500	21.4 E-2	17,500	21.4 E-2
5-0	A	.68	145.0 E-3	.30	0	0	0	0	0	0
	B	.18	145.0 E-3	.30	0	0	0	0	0	0
	C	.05	145.0 E-3	.30	0	0	0	0	0	0
	D	.04	145.0 E-3	.30	0	0	3,500	5.95 E-2	3,500	5.95 E-2
5-0[c]	A	.68	10.0 E-3	.30	0	0	350	0.7 E-2	350	0.7 E-2
	B	.18	10.0 E-3	.30	0	0	350	0.2 E-2	350	0.2 E-2
	C	.06	10.0 E-3	.30	0	0	400	0.1 E-2	400	0.1 E-2
	D	.04	10.0 E-3	.30	0	0	3,500	0.4 E-2	3,500	0.4 E-2
TOTAL								55.4 E-2		52.4 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-23

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- OCTOBER, GALVESTON SECTOR -
(monthly sector arrival probability - 4.9%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 35% - 100 hours		43% - 190 hours		22% - 300 hours +	
					Spill Size at Shore	Annual Expectation	Spill Size at Shore	Annual Expectation	Spill Size at Shore	Annual Expectation
120-100	A	.66	13.2 E-4	.917	0	0	0	0	0	0
	B	.19	13.2 E-4	.917	0	0	0	0	0	0
	C	.06	13.2 E-4	.917	58,000	0.6 E-2	49,000	0.6 E-2	44,000	0.3 E-2
	D	.06	13.2 E-4	.917	85,800	0.9 E-2	84,000	1.1 E-2	84,000	0.5 E-2
100-75	A	.66	12.4 E-4	.875	0	0	0	0	0	0
	B	.19	12.4 E-4	.875	0	0	0	0	0	0
	C	.06	12.4 E-4	.875	49,000	0.5 E-2	41,800	0.5 E-2	38,000	0.2 E-2
	D	.06	12.4 E-4	.875	71,500	0.7 E-2	70,000	0.8 E-2	70,000	0.4 E-2
75-50	A	.66	12.4 E-4	.833	0	0	0	0	0	0
	B	.19	12.4 E-4	.833	0	0	0	0	0	0
	C	.06	12.4 E-4	.833	29,000	0.25 E-2	23,600	0.25 E-2	21,000	0.1 E-2
	D	.06	12.4 E-4	.833	53,625	0.5 E-2	52,500	0.6 E-2	52,500	0.3 E-2
50-25	A	.66	6.9 E-3	.75	0	0	0	0	0	0
	B	.19	6.9 E-3	.75	0	0	0	0	0	0
	C	.06	6.9 E-3	.75	7,000	0.3 E-2	2,860	0.2 E-2	900	0
	D	.06	6.9 E-3	.75	35,750	1.6 E-2	35,000	1.9 E-2	35,000	1.0 E-2
25-5	A	.66	52.2 E-3	.60	0	0	0	0	0	0
	B	.19	52.2 E-3	.60	0	0	0	0	0	0
	C	.06	52.2 E-3	.60	1,800	0.5 E-2	1,080	0.4 E-2	400	0.1 E-2
	D	.06	52.2 E-3	.60	17,875	4.8 E-2	17,500	5.8 E-2	17,500	2.95 E-2
5-0	A	.66	145.0 E-3	.30	0	0	0	0	0	0
	B	.19	145.0 E-3	.30	0	0	0	0	0	0
	C	.06	145.0 E-3	.30	0	0	0	0	0	0
	D	.06	145.0 E-3	.30	3,575	1.3 E-2	3,500	1.6 E-2	3,500	0.8 E-2
5-0[c]	A	.66	10.0 E-3	.30	350	0.1 E-2	350	0.1 E-2	350	0.1 E-2
	B	.19	10.0 E-3	.30	350	0	350	0	350	0
	C	.06	10.0 E-3	.30	400	0	400	0	400	0
	D	.06	10.0 E-3	.30	3,375	0.1 E-2	3,500	0.1 E-2	3,500	0.1 E-2
TOTAL						12.2 E-2		14.0 E-2		6.9 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-24

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- JANUARY, CORPUS CHRISTI SECTOR -
(monthly sector arrival probability - 34.5%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 20% - 150 hours: Spill Size at Shore	20% - 150 hours: Annual Expectation	26% - 220 hours: Spill Size at Shore	26% - 220 hours: Annual Expectation	54% - 300 hours +: Spill Size at Shore	54% - 300 hours +: Annual Expectation
120-100	A	.59	13.2 E-4	.917	0	0	0	0	0	0
	B	.22	13.2 E-4	.917	0	0	0	0	0	0
	C	.08	13.2 E-4	.917	53,000	3.0 E-2	47,200	3.4 E-2	44,000	6.7 E-2
	D	.07	13.2 E-4	.917	96,000	4.6 E-2	96,000	6.0 E-2	96,000	12.5 E-2
100-75	A	.59	12.4 E-4	.875	0	0	0	0	0	0
	B	.22	12.4 E-4	.875	0	0	0	0	0	0
	C	.08	12.4 E-4	.875	45,000	2.25 E-2	40,400	2.6 E-2	38,000	5.1 E-2
	D	.07	12.4 E-4	.875	80,000	3.5 E-2	80,000	4.5 E-2	80,000	9.3 E-2
75-50	A	.59	12.4 E-4	.833	0	0	0	0	0	0
	B	.22	12.4 E-4	.833	0	0	0	0	0	0
	C	.08	12.4 E-4	.833	26,000	1.25 E-2	22,600	1.4 E-2	21,000	2.7 E-2
	D	.07	12.4 E-4	.833	60,000	2.5 E-2	60,000	3.3 E-2	60,000	6.8 E-2
50-25	A	.59	6.9 E-3	.75	0	0	0	0	0	0
	B	.22	6.9 E-3	.75	0	0	0	0	0	0
	C	.08	6.9 E-3	.75	4,700	1.1 E-2	2,100	0.66 E-2	900	0.6 E-2
	D	.07	6.9 E-3	.75	40,000	8.1 E-2	40,000	10.6 E-2	40,000	22.0 E-2
25-5	A	.59	52.2 E-3	.60	0	0	0	0	0	0
	B	.22	52.2 E-3	.60	0	0	0	0	0	0
	C	.08	52.2 E-3	.60	1,400	2.0 E-2	880	1.65 E-2	400	1.6 E-2
	D	.07	52.2 E-3	.60	20,000	25.2 E-2	20,000	32.8 E-2	20,000	58.0 E-2
5-0	A	.59	145.0 E-3	.30	0	0	0	0	0	0
	B	.22	145.0 E-3	.30	0	0	0	0	0	0
	C	.08	145.0 E-3	.30	0	0	0	0	0	0
	D	.07	145.0 E-3	.30	4,000	7.0 E-2	4,000	9.1 E-2	4,000	19.0 E-2
5-0[c]	A	.59	10.0 E-3	.30	350	0.4 E-2	350	0.5 E-2	350	1.0 E-2
	B	.22	10.0 E-3	.30	350	0.1 E-2	350	0.2 E-2	350	0.4 E-2
	C	.08	10.0 E-3	.30	400	0.1 E-2	400	0.1 E-2	400	0.2 E-2
	D	.07	10.0 E-3	.30	4,000	0.5 E-2	4,000	0.6 E-2	4,000	1.2 E-2
TOTAL						55.4 E-2		77.5 E-2		147.1 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-25

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- FEBRUARY, CORPUS CHRISTI SECTOR -
(monthly sector arrival probability - 40.3%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 21% - 110 hours, Spill Size at Shore	21% - 110 hours, Annual Expectation	79% - 300 hours +, Spill Size at Shore	79% - 300 hours +, Annual Expectation	0%, Spill Size at Shore	0%, Annual Expectation
120-100	A	.50	13.2 E-4	.917	0	0	0	0	0	0
	B	.26	13.2 E-4	.917	0	0	0	0	0	0
	C	.09	13.2 E-4	.917	57,000	4.4 E-2	44,000	12.9 E-2	0	0
	D	.09	13.2 E-4	.917	96,600	7.4 E-2	96,000	27.8 E-2	0	0
100-75	A	.50	12.4 E-4	.875	0	0	0	0	0	0
	B	.26	12.4 E-4	.875	0	0	0	0	0	0
	C	.09	12.4 E-4	.875	48,200	3.3 E-2	38,000	9.9 E-2	0	0
	D	.09	12.4 E-4	.875	80,500	5.6 E-2	80,000	20.9 E-2	0	0
75-50	A	.50	12.4 E-4	.833	0	0	0	0	0	0
	B	.26	12.4 E-4	.833	0	0	0	0	0	0
	C	.09	12.4 E-4	.833	28,400	1.8 E-2	21,000	5.1 E-2	0	0
	D	.09	12.4 E-4	.833	60,400	4.0 E-2	60,000	14.8 E-2	0	0
50-25	A	.50	6.9 E-3	.75	0	0	0	0	0	0
	B	.26	6.9 E-3	.75	0	0	0	0	0	0
	C	.09	6.9 E-3	.75	6,540	2.2 E-2	900	1.1 E-2	0	0
	D	.09	6.9 E-3	.75	40,300	13.2 E-2	40,000	49.3 E-2	0	0
25-5	A	.50	52.2 E-3	.60	0	0	0	0	0	0
	B	.26	52.2 E-3	.60	0	0	0	0	0	0
	C	.09	52.2 E-3	.60	1,720	3.4 E-2	400	3.0 E-2	0	0
	D	.09	52.2 E-3	.60	20,100	40.0 E-2	20,000	149.8 E-2	0	0
5-0	A	.50	145.0 E-3	.30	0	0	0	0	0	0
	B	.26	145.0 E-3	.30	0	0	0	0	0	0
	C	.09	145.0 E-3	.30	0	0	0	0	0	0
	D	.09	145.0 E-3	.30	4,000	11.0 E-2	4,000	41.5 E-2	0	0
5-0[c]	A	.50	10.0 E-3	.30	350	0.4 E-2	350	1.4 E-2	0	0
	B	.26	10.0 E-3	.30	350	0.2 E-2	350	0.7 E-2	0	0
	C	.09	10.0 E-3	.30	400	0.1 E-2	400	0.3 E-2	0	0
	D	.09	10.0 E-3	.30	4,000	0.8 E-2	4,000	2.8 E-2	0	0
TOTAL						94.4 E-2		341.3 E-2		

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-26

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- MARCH, CORPUS CHRISTI SECTOR -
(monthly sector arrival probability - 6.3%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 0% Spill Size at Shore	0% Annual Expectation	52% - 130 hours Spill Size at Shore	52% - 130 hours Annual Expectation	48% - 280 hours + Spill Size at Shore	48% - 280 hours + Annual Expectation
120-100	A	.64	13.2 E-4	.917	0	0	0	0	0	0
	B	.21	13.2 E-4	.917	0	0	0	0	0	0
	C	.07	13.2 E-4	.917	0	0	55,000	1.1 E-2	44,800	0.9 E-2
	D	.06	13.2 E-4	.917	0	0	96,000	1.9 E-2	96,000	1.7 E-2
100-75	A	.64	12.4 E-4	.875	0	0	0	0	0	0
	B	.21	12.4 E-4	.875	0	0	0	0	0	0
	C	.07	12.4 E-4	.875	0	0	46,600	1.0 E-2	38,600	0.7 E-2
	D	.06	12.4 E-4	.875	0	0	80,000	1.6 E-2	80,000	1.4 E-2
75-50	A	.64	12.4 E-4	.833	0	0	0	0	0	0
	B	.21	12.4 E-4	.833	0	0	0	0	0	0
	C	.07	12.4 E-4	.833	0	0	27,200	0.6 E-2	21,400	0.4 E-2
	D	.06	12.4 E-4	.833	0	0	60,000	0.9 E-2	60,000	0.9 E-2
50-25	A	.64	6.9 E-3	.75	0	0	0	0	0	0
	B	.21	6.9 E-3	.75	0	0	0	0	0	0
	C	.07	6.9 E-3	.75	0	0	5,620	0.6 E-2	1,200	0.1 E-2
	D	.06	6.9 E-3	.75	0	0	40,000	3.4 E-2	40,000	3.2 E-2
25-5	A	.64	52.2 E-3	.60	0	0	0	0	0	0
	B	.21	52.2 E-3	.60	0	0	0	0	0	0
	C	.07	52.2 E-3	.60	0	0	1,560	1.0 E-2	520	0.3 E-2
	D	.06	52.2 E-3	.60	0	0	20,000	10.1 E-2	20,000	9.4 E-2
5-0	A	.64	145.0 E-3	.30	0	0	0	0	0	0
	B	.21	145.0 E-3	.30	0	0	0	0	0	0
	C	.07	145.0 E-3	.30	0	0	0	0	0	0
	D	.06	145.0 E-3	.30	0	0	4,000	2.8 E-2	4,000	2.6 E-2
5-0[c]	A	.64	10.0 E-3	.30	0	0	350	0.2 E-2	350	0.2 E-2
	B	.21	10.0 E-3	.30	0	0	350	0.1 E-2	350	0.1 E-2
	C	.07	10.0 E-3	.30	0	0	400	0	400	0
	D	.06	10.0 E-3	.30	0	0	4,000	0.2 E-2	4,000	0.2 E-2
TOTAL								24.6 E-2		22.1 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-27

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- APRIL, CORPUS CHRISTI SECTOR -
(monthly sector arrival probability - 11.6%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 50% - 70 hours: Spill Size at Shore	50% - 70 hours: Annual Expectation	25% - 200 hours: Spill Size at Shore	25% - 200 hours: Annual Expectation	25% - 300 hours: Spill Size at Shore	25% - 300 hours: Annual Expectation
120-100	A	.64	13.2 E-4	.917	0	0	0	0	0	0
	B	.22	13.2 E-4	.917	0	0	0	0	0	0
	C	.06	13.2 E-4	.917	67,600	2.4 E-2	48,000	0.8 E-2	44,000	0.8 E-2
	D	.05	13.2 E-4	.917	99,600	2.8 E-2	96,000	2.7 E-2	96,000	1.4 E-2
100-75	A	.64	12.4 E-4	.875	0	0	0	0	0	0
	B	.22	12.4 E-4	.875	0	0	0	0	0	0
	C	.06	12.4 E-4	.875	55,000	1.65 E-2	41,000	0.6 E-2	38,000	0.6 E-2
	D	.05	12.4 E-4	.875	83,000	2.1 E-2	80,000	1.0 E-2	80,000	1.0 E-2
75-50	A	.64	12.4 E-4	.833	0	0	0	0	0	0
	B	.22	12.4 E-4	.833	0	0	0	0	0	0
	C	.06	12.4 E-4	.833	36,200	1.1 E-2	23,000	0.3 E-2	21,000	0.3 E-2
	D	.05	12.4 E-4	.833	62,300	1.6 E-2	60,000	0.8 E-2	60,000	[illegible] E-2
50-25	A	.64	6.9 E-3	.75	0	0	0	0	0	0
	B	.22	6.9 E-3	.75	0	0	0	0	0	0
	C	.06	6.9 E-3	.75	12,400	1.9 E-2	2,400	0.2 E-2	900	0.1 E-2
	D	.05	6.9 E-3	.75	41,500	5.2 E-2	40,000	2.5 E-2	40,000	2.5 E-2
25-5	A	.64	52.2 E-3	.60	0	0	0	0	0	0
	B	.22	52.2 E-3	.60	0	0	0	0	0	0
	C	.06	52.2 E-3	.60	3,120	2.8 E-2	1,000	0.45 E-2	400	0.2 E-2
	D	.05	52.2 E-3	.60	20,800	15.6 E-2	20,000	7.5 E-2	20,000	7.5 E-2
5-0	A	.64	145.0 E-3	.30	0	0	0	0	0	0
	B	.22	145.0 E-3	.30	0	0	0	0	0	0
	C	.06	145.0 E-3	.30	0	0	0	0	0	0
	D	.05	145.0 E-3	.30	4,200	4.5 E-2	4,000	2.1 E-2	4,000	2.1 E-2
5-0[c]	A	.64	10.0 E-3	.30	350	0.3 E-2	350	0.2 E-2	350	0.2 E-2
	B	.22	10.0 E-3	.30	350	0.1 E-2	350	0.1 E-2	350	0.1 E-2
	C	.06	10.0 E-3	.30	520	0	400	0	400	0
	D	.05	10.0 E-3	.30	4,200	0.3 E-2	4,000	0.2 E-2	4,000	0.1 E-2
TOTAL						42.4 E-2		19.5 E-2		17.7 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-28

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- MAY, CORPUS CHRISTI SECTOR -
(monthly sector arrival probability - 5.6%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 0% Spill Size at Shore	0% Annual Expectation	58% - 105 hours Spill Size at Shore	58% - 105 hours Annual Expectation	42% - 300 hours + Spill Size at Shore	42% - 300 hours + Annual Expectation
120-100	A	.71	13.2 E-4	.917	0	0	0	0	0	0
	B	.17	13.2 E-4	.917	0	0	0	0	0	0
	C	.06	13.2 E-4	.917	0	0	57,500	1.1 E-2	44,000	0.6 E-2
	D	.04	13.2 E-4	.917	0	0	85,200	1.1 E-2	84,000	0.8 E-2
100-75	A	.71	12.4 E-4	.875	0	0	0	0	0	0
	B	.17	12.4 E-4	.875	0	0	0	0	0	0
	C	.06	12.4 E-4	.875	0	0	48,500	0.8 E-2	38,000	0.5 E-2
	D	.04	12.4 E-4	.875	0	0	71,000	0.8 E-2	70,000	0.6 E-2
75-50	A	.71	12.4 E-4	.833	0	0	0	0	0	0
	B	.17	12.4 E-4	.833	0	0	0	0	0	0
	C	.06	12.4 E-4	.833	0	0	28,700	0.5 E-2	21,000	0.3 E-2
	D	.04	12.4 E-4	.833	0	0	53,300	0.6 E-2	52,500	0.4 E-2
50-25	A	.71	6.9 E-3	.75	0	0	0	0	0	0
	B	.17	6.9 E-3	.75	0	0	0	0	0	0
	C	.06	6.9 E-3	.75	0	0	6,770	0.55 E-2	900	0.05 E-2
	D	.04	6.9 E-3	.75	0	0	35,500	1.9 E-2	35,000	1.4 E-2
25-5	A	.71	52.2 E-3	.60	0	0	0	0	0	0
	B	.17	52.2 E-3	.60	0	0	0	0	0	0
	C	.06	52.2 E-3	.60	0	0	1,760	0.9 E-2	400	0.15 E-2
	D	.04	52.2 E-3	.60	0	0	17,800	6.1 E-2	17,500	4.3 E-2
5-0	A	.71	145.0 E-3	.30	0	0	0	0	0	0
	B	.17	145.0 E-3	.30	0	0	0	0	0	0
	C	.06	145.0 E-3	.30	0	0	0	0	0	0
	D	.04	145.0 E-3	.30	0	0	3,600	1.7 E-2	3,500	1.2 E-2
5-0[c]	A	.71	10.0 E-3	.30	0	0	350	0.2 E-2	350	0.15 E-2
	B	.17	10.0 E-3	.30	0	0	350	0.05 E-2	350	0
	C	.06	10.0 E-3	.30	0	0	400	0	400	0
	D	.04	10.0 E-3	.30	0	0	3,600	0.1 E-2	3,500	0.1 E-2
TOTAL								16.5 E-2		10.7 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-29

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- JUNE, CORPUS CHRISTI SECTOR -
(monthly sector arrival probability - 1.8%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 25% - 80 hours Spill Size at Shore	25% - 80 hours Annual Expectation	40% - 180 hours Spill Size at Shore	40% - 180 hours Annual Expectation	35% - 300 hours + Spill Size at Shore	35% - 300 hours + Annual Expectation
120-100	A	.83	13.2 E-4	.917	0	0	0	0	0	0
	B	.12	13.2 E-4	.917	0	0	0	0	0	0
	C	.02	13.2 E-4	.917	64,400	0.1 E-2	50,000	0.1 E-2	44,000	0.1 E-2
	D	.02	13.2 E-4	.917	87,600	0.1 E-2	84,000	0.1 E-2	84,000	0.1 E-2
100-75	A	.83	12.4 E-4	.875	0	0	0	0	0	0
	B	.12	12.4 E-4	.875	0	0	0	0	0	0
	C	.02	12.4 E-4	.875	53,000	0	42,600	0.1 E-2	38,000	0
	D	.02	12.4 E-4	.875	73,000	0.1 E-2	70,000	0.1 E-2	70,000	0.1 E-2
75-50	A	.83	12.4 E-4	.833	0	0	0	0	0	0
	B	.12	12.4 E-4	.833	0	0	0	0	0	0
	C	.02	12.4 E-4	.833	33,800	0	24,200	0	21,000	0
	D	.02	12.4 E-4	.833	54,800	0	52,500	0.1 E-2	52,500	0.1 E-2
50-25	A	.83	6.9 E-3	.75	0	0	0	0	0	0
	B	.12	6.9 E-3	.75	0	0	0	0	0	0
	C	.02	6.9 E-3	.75	10,600	0	3,320	0	900	0
	D	.02	6.9 E-3	.75	36,500	0.9 E-2	35,000	0.2 E-2	35,000	0.2 E-2
25-5	A	.83	52.2 E-3	.60	0	0	0	0	0	0
	B	.12	52.2 E-3	.60	0	0	0	0	0	0
	C	.02	52.2 E-3	.60	2,680	0.1 E-2	1,160	0	400	0
	D	.02	52.2 E-3	.60	18,300	0.4 E-2	17,500	0.7 E-2	17,500	0.6 E-2
5-0	A	.83	145.0 E-3	.30	0	0	0	0	0	0
	B	.12	145.0 E-3	.30	0	0	0	0	0	0
	C	.02	145.0 E-3	.30	0	0	0	0	0	0
	D	.02	145.0 E-3	.30	37,000	0.1 E-2	3,500	0.2 E-2	3,500	0.2 E-2
5-0[c]	A	.83	10.0 E-3	.30	350	0	350	0.05 E-2	350	0.05 E-2
	B	.12	10.0 E-3	.30	350	0	350	0	350	0
	C	.02	10.0 E-3	.30	480	0	400	0	400	0
	D	.02	10.0 E-3	.30	3,700	0	3,500	0	3,500	0
TOTAL						1.8 E-2		1.7 E-2		1.5 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-30

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- OCTOBER, CORPUS CHRISTI SECTOR -
(monthly sector arrival probability - 3.3%)

					SPILL TRAVEL TIME GROUPS IN BARRELS					
					0%		35% - 190 hours		65% - 300 hours +	
Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	Spill Size at Shore	Annual Expectation	Spill Size at Shore	Annual Expectation	Spill Size at Shore	Annual Expectation
120-100	A	.66	13.2 E-4	.917	0	0	0	0	0	0
	B	.19	13.2 E-4	.917	0	0	0	0	0	0
	C	.06	13.2 E-4	.917	0	0	49,000	0.3 E-2	44,000	0.6 E-2
	D	.06	13.2 E-4	.917	0	0	84,000	0.6 E-2	84,000	1.1 E-2
100-75	A	.66	12.4 E-4	.875	0	0	0	0	0	0
	B	.19	12.4 E-4	.875	0	0	0	0	0	0
	C	.06	12.4 E-4	.875	0	0	41,800	0.3 E-2	38,000	0.4 E-2
	D	.06	12.4 E-4	.875	0	0	70,000	0.4 E-2	70,000	0.8 E-2
75-50	A	.66	12.4 E-4	.833	0	0	0	0	0	0
	B	.19	12.4 E-4	.833	0	0	0	0	0	0
	C	.06	12.4 E-4	.833	0	0	23,600	0.1 E-2	21,000	0.2 E-2
	D	.06	12.4 E-4	.833	0	0	52,500	0.3 E-2	52,500	0.6 E-2
50-25	A	.66	6.9 E-3	.75	0	0	0	0	0	0
	B	.19	6.9 E-3	.75	0	0	0	0	0	0
	C	.06	6.9 E-3	.75	0	0	2,860	0.1 E-2	900	0.05 E-2
	D	.06	6.9 E-3	.75	0	0	35,000	1.0 E-2	35,000	1.9 E-2
25-5	A	.66	52.2 E-3	.60	0	0	0	0	0	0
	B	.19	52.2 E-3	.60	0	0	0	0	0	0
	C	.06	52.2 E-3	.60	0	0	1,080	0.2 E-2	400	0.1 E-2
	D	.06	52.2 E-3	.60	0	0	17,500	3.2 E-2	17,500	5.9 E-2
5-0	A	.66	145.0 E-3	.30	0	0	0	0	0	0
	B	.19	145.0 E-3	.30	0	0	0	0	0	0
	C	.06	145.0 E-3	.30	0	0	0	0	0	0
	D	.06	145.0 E-3	.30	0	0	3,500	0.9 E-2	3,500	1.6 E-2
5-0[c]	A	.66	10.0 E-3	.30	0	0	350	0.1 E-2	350	0.1 E-2
	B	.19	10.0 E-3	.30	0	0	350	0	350	0
	C	.06	10.0 E-3	.30	0	0	400	0	400	0
	D	.06	10.0 E-3	.30	0	0	3,500	0.1 E-2	3,500	0.1 E-2
TOTAL								7.6 E-2		13.5 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-31

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- NOVEMBER, CORPUS CHRISTI SECTOR -
(monthly sector arrival probability - 5.0%)

Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	SPILL TRAVEL TIME GROUPS IN BARRELS: 10% - 140 hours, Spill Size at Shore	10% - 140 hours, Annual Expectation	0%, Spill Size at Shore	0%, Annual Expectation	90% - 300 hours +, Spill Size at Shore	90% - 300 hours +, Annual Expectation
120-100	A	.61	13.2 E-4	.917	0	0	0	0	0	0
	B	.26	13.2 E-4	.917	0	0	0	0	0	0
	C	.05	13.2 E-4	.917	54,000	0.1 E-2	0	0	44,000	1.0 E-2
	D	.05	13.2 E-4	.917	96,000	0.3 E-2	0	0	96,000	2.2 E-2
100-75	A	.61	12.4 E-4	.875	0	0	0	0	0	0
	B	.26	12.4 E-4	.875	0	0	0	0	0	0
	C	.05	12.4 E-4	.875	45,800	0.1 E-2	0	0	38,000	0.8 E-2
	D	.05	12.4 E-4	.875	80,000	0.2 E-2	0	0	80,000	1.6 E-2
75-50	A	.61	12.4 E-4	.833	0	0	0	0	0	0
	B	.26	12.4 E-4	.833	0	0	0	0	0	0
	C	.05	12.4 E-4	.833	26,600	0.1 E-2	0	0	21,000	0.4 E-2
	D	.05	12.4 E-4	.833	60,000	0.1 E-2	0	0	60,000	1.1 E-2
50-25	A	.61	6.9 E-3	.75	0	0	0	0	0	0
	B	.26	6.9 E-3	.75	0	0	0	0	0	0
	C	.05	6.9 E-3	.75	5,160	0.1 E-2	0	0	900	0.1 E-2
	D	.05	6.9 E-3	.75	40,000	0.4 E-2	0	0	40,000	3.8 E-2
25-5	A	.61	52.2 E-3	.60	0	0	0	0	0	0
	B	.26	52.2 E-3	.60	0	0	0	0	0	0
	C	.05	52.2 E-3	.60	1,480	0.1 E-2	0	0	400	0.2 E-2
	D	.05	52.2 E-3	.60	20,000	1.3 E-2	0	0	20,000	11.7 E-2
5-0	A	.61	145.0 E-3	.30	0	0	0	0	0	0
	B	.26	145.0 E-3	.30	0	0	0	0	0	0
	C	.05	145.0 E-3	.30	0	0	0	0	0	0
	D	.05	145.0 E-3	.30	4,000	0.4 E-2	0	0	4,000	3.4 E-2
5-0[c]	A	.61	10.0 E-3	.30	350	0	0	0	350	0.2 E-2
	B	.26	10.0 E-3	.30	350	0	0	0	350	0.1 E-2
	C	.05	10.0 E-3	.30	400	0	0	0	400	0
	D	.05	10.0 E-3	.30	4,000	0	0	0	4,000	0.3 E-2
TOTAL						3.2 E-2				26.9 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TABLE 5.5-32

EXPECTATION OF MARINE OIL SPILLAGE STRANDING
- DECEMBER, CORPUS CHRISTI SECTOR -
(monthly sector arrival probability - 50.7%)

					SPILL TRAVEL TIME GROUPS IN BARRELS					
					50% - 120 hours		0%		50% - 300 hours +	
Spill Size (1000 bbl)	Wave Class[a]	Wave Class Factor	Annual Frequency[b]	Averaging Factor	Spill Size at Shore	Annual Expectation	Spill Size at Shore	Annual Expectation	Spill Size at Shore	Annual Expectation
120-100	A	.61	13.2 E-4	.917	0	0	0	0	0	0
	B	.22	13.2 E-4	.917	0	0	0	0	0	0
	C	.08	13.2 E-4	.917	56,000	11.5 E-2	0	0	44,000	9.0 E-2
	D	.07	13.2 E-4	.917	96,000	17.2 E-2	0	0	96,000	17.2 E-2
100-75	A	.61	12.4 E-4	.875	0	0	0	0	0	0
	B	.22	12.4 E-4	.875	0	0	0	0	0	0
	C	.08	12.4 E-4	.875	47,400	8.8 E-2	0	0	38,000	7.0 E-2
	D	.07	12.4 E-4	.875	80,000	12.8 E-2	0	0	80,000	12.8 E-2
75-50	A	.61	12.4 E-4	.833	0	0	0	0	0	0
	B	.22	12.4 E-4	.833	0	0	0	0	0	0
	C	.08	12.4 E-4	.833	27,800	4.9 E-2	0	0	21,000	3.7 E-2
	D	.07	12.4 E-4	.833	60,000	9.1 E-2	0	0	60,000	9.1 E-2
50-25	A	.61	6.9 E-3	.75	0	0	0	0	0	0
	B	.22	6.9 E-3	.75	0	0	0	0	0	0
	C	.08	6.9 E-3	.75	6,080	5.2 E-2	0	0	900	0.8 E-2
	D	.07	6.9 E-3	.75	40,000	31.1 E-2	0	0	40,000	31.1 E-2
25-5	A	.61	52.2 E-3	.60	0	0	0	0	0	0
	B	.22	52.2 E-3	.60	0	0	0	0	0	0
	C	.08	52.2 E-3	.60	1,640	8.7 E-2	0	0	400	2.1 E-2
	D	.07	52.2 E-3	.60	20,000	92.6 E-2	0	0	20,000	92.6 E-2
5-0	A	.61	145.0 E-3	.30	0	0	0	0	0	0
	B	.22	145.0 E-3	.30	0	0	0	0	0	0
	C	.08	145.0 E-3	.30	0	0	0	0	0	0
	D	.07	145.0 E-3	.30	4,000	25.7 E-2	0	0	4,000	25.7 E-2
5-0[c]	A	.61	10.0 E-3	.30	350	1.35 E-2	0	0	350	1.35 E-2
	B	.22	10.0 E-3	.30	350	0.5 E-2	0	0	350	0.5 E-2
	C	.08	10.0 E-3	.30	400	0.2 E-2	0	0	400	0.2 E-2
	D	.07	10.0 E-3	.30	4,000	1.8 E-2	0	0	4,000	1.8 E-2
TOTAL						243.6 E-2				227.2 E-2

[a]Wave class significant height: A - 0-4 ft
B - 4-6 ft
C - 6-8 ft
D - >8 ft

[b]Monthly probability assigned 1/12 of annual rate.

[c]Platform, pipeline, and SPM spills greater than 1,000 bbl.

TEXAS OFFSHORE CATASTROPHIC SPILL

CLEAN UP

Period	3 Skimmers	Amount
5-10 hours	6000 bbl/hr	30,000
10-50 hours	3600 bbl/hr	144,000
50-100 hours	2700 bbl/hr	135,000
100-200 hours	900 bbl/hr	90,000
200-300 hours	300 bbl/hr	30,000
		429,000

Spill Class	Frequency	Start	Unrec.	Expected
120-200	6.0E-4	110,000	0	
200-500	1.5E-4	350,000	0	
$500-1x40^6$	5.2E-5	750,000	250,000	13
$1x10^6 - 2x10^6$	1.5E-5	1,500,000	1,000,000	15
				28 bbls

FLORIDA STRANDING ANALYSIS

Exposure: Low - 25% Oil Spill Decay

Spill/Class (bbls)	Spill Frequency	Oil at Stranding	Expected Annual Average Oil at Stranding
120,000-100,000	.75 E-4	82,500	6.18
100,000- 75,000	.70E-4	65,265	4.57
75,000-50,000	.70E-4	50,625	3.54
50,000-25,000	3.9 E-4	28,125	10.96
25,000-5,000	3.0 E-3	11,250	33.75
5,000-0	8.2E-3	1,875	15.38
[Catastrophic Spills]			
120,000-200,000	3.4E-5	120,000	4.08
200,000-500-000	8.5E-6	262,500	2.23
500,000-$1x10^6$	2.9E-6	562,500	1.63
$1x10^6$ - $2x10^6$	8.5E-7	1,125,000	.96
			83.28

Impact time = 50%= 41.64

EXPOSURE: LOW - 25% oil spill decay

FLORIDA STRANDING ANALYSIS

Spill/Class (bbls)	Spill Frequency	Oil at Stranding	Expected Annual Average Oil at Stranding
120,000-100,000	15E-4	82,500	12.38
100,000- 75,000	1.4E-4	65,265	9.19
75,000-50,000	1.4E-4	50,625	8.09
50,000-25,000	8.0E-4	28,125	22.50
25.000-5,000	6.1E-3	11,250	68.63
5,000-0	1.7E-2	1,875	31.88
[Catastrophic Spills]			
120,000-200,000	6.9E-5	120,000	82.52
200,000-500-000	1.7E-5	262,500	4.46
500,000-1x10^6	6.0E-6	562,500	3.38
1x10^6 - 2x10^6	1.7E-6	1,125,000	1.91
			169.67
		Impact time = 50% =	84.8

EXPOSURE: MEDIUM - 25% oil spill decay

FLORIDA STRANDING ANALYSIS

Spill/Class (bbls)	Spill Frequency	Oil at Stranding	Expected Annual Average Oil at Stranding
120,000-100,000	2.1E-4	82,500	17.33
100,000- 75,000	1.9E-4	65,625	12.47
75,000-50,000	1.9E-4	50,625	9.62
50,000-25,000	1.1E-3	28,125	30.94
25,000-5,000	8.2E-3	11,250	92.25
5,000-0	2.3E-2	1,875	43.13
[Catastrophic Spills]			
120,000-200,000	9.4E-5	120,000	11.28
200,000-500-000	2.4E-5	262,500	6.30
500,000-$1x10^6$	8.1E-6	562,500	4.56
$1x10^6$ - $2x10^6$	2.3E-6	1,125,000	2.59
			230.47
		Impact time = 50% =	115.24

EXPOSURE: HIGH - 25% oil spill decay

FLORIDA STRANDING ANALYSIS

Spill/Class (bbls)	Spill Frequency	Oil at Stranding	Expected Annual Average Oil at Stranding
120,000-100,000	2.8E-4	82,500	23.10
100,000- 75,000	2.6E-4	65,625	17.06
75,000-50,000	2.6E-4	50,625	13.16
50,000-25,000	1.4E-3	28,125	39.38
25,000-5,000	1.1E-2	11,250	123.75
5,000-0	3.1E-2	1,875	58.13
[Catastrophic Spills]			
120,000-200,000	1.3E-4	120,000	15.60
200,000-500-000	3.1E-5	262,500	8.14
500,000-$1x10^6$	1.1E-5	562,500	6.19
$1x10^6$ - $2x10^6$	3.2E-6	1,125,000	3.60
			308.11
		Impact time = 50% =	154.0

EXPOSURE: LOW

FLORIDA STRANDING ANALYSIS

Spill/Class (bbls)	Spill Frequency	Oil at Stranding	Expected Annual Average Oil at Stranding
120,000-100,000	1.5E-4	110,000	16.84
100,000- 75,000	1.4E-4	87,500	12.58
75,000-50,000	1.4E-4	67,500	9.71
50,000-25,000	8.0E-4	37,500	30.01
25,000-5,000	6.1E-3	15,000	90.82
5,000-0	1.7E-2	2,500	42.05
[Catastrophic Spills]			
120,000-200,000	6.9E-5	160,000	11.13
200,000-500-000	1.7E-5	350,000	6.09
500.000-$1x10^6$	6.0E-6	750,000	4.52
$1x10^6$ - $2x10^6$	1.7E-6	1,500,000	2.61
			226.35
		Impact time = 50% =	113.18

EXPOSURE: MEDIUM

FLORIDA STRANDING ANALYSIS

Spill/Class (bbls)	Spill Frequency	Oil at Stranding	Expected Annual Average Oil at Stranding
120,000-100,000	2.1E-4	110,000	22.79
100,000- 75,000	1.9E-4	87,500	17.03
75,000-50,000	1.9E-4	67,500	13.14
50,000-25,000	1.1E-3	37,500	40.8
25,000-5,000	8.2E-3	15,000	122.93
5,000-0	2.3E-2	2,500	56.91
[Catastrophic Spills]			
120,000-200,000	9.4E-5	160,000	15.07
200,000-500-000	2.4E-5	350,000	8.24
500,000-$1x10^6$	8.1E-6	750,000	6.12
$1x10^6$ - $2x10^6$	2.3E-6	1,500,000	3.53
			306.56
		Impact time = 50% =	153.56

EXPOSURE: HIGH

FLORIDA STRANDING ANALYSIS

Spill/Class (bbls)	Spill Frequency	Oil at Stranding	Expected Annual Average Oil at Stranding
120,000-100,000	2.8E-4	110,000	30.78
100,000- 75,000	2.6E-4	87,500	23.00
75,000-50,000	2.6E-4	67,500	17.55
50,000-25,000	1.4E-3	37,500	54.8
25,000-5,000	1.1E-2	15,000	165.99
5,000-0	3.1E-2	2,500	76.85
[Catastrophic Spills]			
120,000-200,000	1.3E-4	160,000	20.35
200,000-500-000	3.1E-5	350,000	11.13
$500,000-1x10^6$	1.1E-5	750,000	8.27
$1x10^6 - 2x10^6$	3.2E-6	1,500,000	4.77
			413.49
		Impact time = 50% =	206.8

APPENDIX H.

RECREATIONAL RESOURCES

RECREATIONAL RESOURCES

I. Basis for Quanitative Estimates of Vulnerable Recreation Activities

Recreational user days and value estimates have been derived from several sources. These estimates are subject to variation depending upon the source, the methods used in deriving the estimates, and the time and place in which they were made. There is at the present time, no standard methodology widely accepted among experts in the recreation establishment for quantitively evaluating use values for the activities of interest here. However, NOAA feels that the recreational values presented in the text of this report are representative of the best estimates available.

The following sources provided estimates on the economic values of the indicated user day activities:

- Boating Day Values

  (A) Per trip or marginal costs per day, exclusive of amortised capital investment in vessels, maintenance, insurance and berthing costs were estimated for Dade County Florida by Dr. Bruce Austin, Assistant Professor, Rosenstiel School of Marine and Atmospheric Sciences, University of Miami, Miami, Florida. Dr. Austin found the average value to be approximately $20,00 per boating day.

  (B) Thomas Brown, Cornell University, in a personal communication, estimated the value of a boating day to be $11.59 based upon a recent study of Long Island Sound boating recreation. This value represents expenditures on fuel, berthing and maintenance, but not capital expenditures for the purchase of vessels.

  (C) A mean value of $15.80 was taken from the above two user day estimates as a reasonable proxy (shadow price) for the value of a boating day.

- Fishing Day Values

  (A) One estimate of $20.00 per fisherman day was provided by Dr. William Brown in a personal communication, March 1976. This value is the result of a recent study currently pending publication from the Oregon Agricultural Experiment Station, entitled: "Improved Economic

Evaluation of Commercially and Sport Caught Salmon and Steelhead of the Columbia River," by Brown, Larson, Johnston, and Whale, 1976. This value is derived from actual dollar expenditures of fishermen as solicited in personal interviews. With few studies estimating sport fishing user day values having been made, it was decided that this study, though for a different region of the U.S., could be applied as a reasonable estimate of Gulf Coast fishing day values.

(B) A similar estimate of $22.16 per day was made in a recent study by Donnie L. Daniel, entitled: "A Survey of Sport Fishing Related Expenditures In a Selected Portion of the Mississippi Gulf Coast," University of Southern Mississippi, Bureau of Business Research, School of Business Administration, Hattiesburg, Mississippi, 1974.

(C) A mean value of $21.58 was taken from the above two user day estimates as a reasonable proxy (shadow price) for the value of a sport fishing day.

•Beach Day Values

(A) In a recent study by Kenneth E. McConnell, entitled: "Congestion and Willingness to Pay: A Study of Beach Use," University of Rhode Island, Kingston, Rhode Island, 1976; the author estimated the value of a beach day to be worth $4.00 to the overall beach user.

(B) In a study by Walter J. Mead and Philip E. Sorenson, entitled: "The Economic Cost of the Santa Barbara Oil Spill,: University of California, December 1970, the authors estimated the value of a beach day to be $3.50

(C) A mean value of $3.75 was taken from the above user day estimates as a reasonalbe proxy (shadow price) for the value of a beach day.

The following sources provided estimates of actual user day participation in areas of concern along the Texas, Louisiana, and Florida Coast:

(A) Center for Wetland Resources, Louisiana Superport Studies, Louisiana State University, Baton Rouge, Louisiana, 1973.

(B) Louisiana Parks and Recreation Commission, Baton Rouge, Louisiana.

(C) Texas Parks and Wildlife Commission, Texas Outlook Recreation Plan, Austin, Texas, 1974.

(D) Florida Bureau of Natural Resources, Division of Parks and Recreation and the State of Florida Division of Tourism.

II. Florida's Interest In Gaining Adjacent Coastal State Status Based Upon Recreational Considerations

The following is taken verbatim from a report given to NOAA by the Florida Department of Natural Resources, Division of Recreation and Parks documenting recreational activity in Florida's Coastal Zone. In it will be found user day estimates for four planning regions in Florida. However, the area of concern is region X only, the boundaries of which approximate almost precisely the "Coastal Impact Area" (Figure 3) as determined in NOAA's spill trajectory analysis.

Florida Department of Natural Resources
Division of Recreation and Parks

(4)

FLORIDA'S INTEREST IN GAINING ADJACENT COASTAL STATE STATUS BASED UPON RECREATIONAL CONSIDERATIONS

Coastal recreation is very important in Florida, not only economically but for the mental and physical well-being of the residents and millions of tourists who annually flock to the beaches and other attractions. This is especially true of the coastal area between Tampa Bay and Daytona Beach as this is where the majority of Florida's residents reside and tourists visit.

In order to demonstrate the recreational importance of this 17-county area, this analysis consists of three parts. The first is the demand (projected to 1990) for selected coastal activities such as beach activities, sport fishing, boating and visiting archaeological and historic sites. The second section pertains to the supply necessary to satisfy the demand detailed in the first section. It consists of the tabulation of designated recreational beaches as well as general discussions on the extent and vulnerability of natural areas and archaeological and historic sites in the coastal zone. Documentation makes up the 3rd section. Source materials are provided, including the draft of the 1976 State Comprehensive Outdoor Recreation Plan, maps inventorying the recreation areas in the 17-county area and the Florida Environmentally Endangered Land Plan.

I. DEMAND[1)]

Beach Activities

Regions		VI	VIII	IX	X	Total
Thousands of	-1975	30,319	31,444	42,579	100,389	204,731
User-Occasions[2)]	-1980	33,927	35,237	47,943	112,189	229,296
	-1985	37,663	39,152	53,427	124,440	254,682
	-1990	41,575	43,260	59,218	137,244	281,297

Saltwater Sport Fishing

Regions		VI	VIII	IX	X	Total
Thousands of	-1975	5,922	12,830	12,230	24,399	55,381
User-Occasions	-1980	6,675	14,506	13,776	27,611	62,568
	-1985	7,443	16,206	15,356	30,864	69,869
	-1990	8,255	18,009	17,024	34,320	77,608

Saltwater Power Boating

Regions		VI	VIII	IX	X	Total
Thousands of	-1975	1,242	3,913	8,366	24,209	37,730
User-Occasions	-1980	1,409	4,425	9,515	27,302	42,651
	-1985	1,577	4,944	10,667	30,455	47,643
	-1990	1,757	5,495	11,899	33,790	52,941

Saltwater-Sailing[3)]

Regions		VI	VIII	IX	X	Total
Thousands of	-1975	209	3,713	1,701	4,024	9,674
User-Occasions	-1980	238	4,229	1,938	4,433	10,838
	-1985	267	4,746	2,176	4,874	12,063
	-1990	298	5,299	2,430	5,324	13,351

Visiting Archaeological and Historic Sites[4)]

Regions		VI	VIII	IX	X	Total
Thousands of	-1975	3,949	1,293	2,181	3,767	11,190
User-Occasions	-1980	4,334	1,428	2,412	4,164	12,338
	-1985	4,752	1,572	2,658	4,588	13,570
	-1990	5,176	1,720	2,911	5,022	14,829

NOTES

1) Source for all demand figures is the enclosed preliminary draft of the 1976 Florida Comprehensive Outdoor Recreation Plan. (P. 105 for Beach Activities; P. 106 for Saltwater Sport Fishing; P. 109 for Saltwater Power Boating; P. 128 for Saltwater Sailing and P. 118 for Visiting Archaeological and Historic Sites.) The text in this draft has been altered in the as-yet-to-be completed final draft which is tentatively scheduled to be presented to the Governor and Cabinet on March 9, 1976 for adoption as the

official State Outdoor Recreation Plan. The statistics, however, shouldn't be altered at all and are applicable for this analysis.

2) A user-occasion = one instance of participation in a single outdoor recreation activity by one person.

3) Other saltwater boating activites that have a high degree of participation but cannot be separated from freshwater activities include water skiing and other boating. Additionally, saltwater ramp usage contributes a great deal of boating boating activities but the statistics aren't included here as many are already included within the fishing category. Among these three activities, additional millions of user-occasions contribute to Florida's overall saltwater recreation picture.

4) These demand figures are total demand for the entire four regions. Obviously, some of the archaeological and historic sites are inland and would be unaffected by an oil spill or some similar disaster; but it is not possible to separate the demand for coastal sites from that for inland sites.

III. TEXAS RECREATIONAL USER-DAY ESTIMATES

The following represent user-day estimates for recreational activities taking place in the projected "Coastal Impact Area" of the Texas coast (as determined in the NOAA trajectory analysis).

TEXAS RECREATION USER-DAYS FOR SELECTED ACTIVITIES, BY COUNTY, 1975

County	Activities		
	Beach	Boating	Sportfishing
Jefferson	240,000	317,000	298,000
Chambers	154,200	242,361	475,000
Galveston	5,747,000	1,708,000	4,579,000
Brazoria	1,851,000	568,000	1,313,000
Matagorda	163,500	80,000	728,000
Calhoun	141,000	289,000	393,000
Total	8,296,700	3,204,361	7,786,000

User-days estimates for the six-county coastal region were obtained from the Texas Outdoor Recreation Plan, Texas Parks and Wildlife Department, Comprehensive Planning Branch. The boating activity includes water skiing. Beach activity includes surfing. County totals include activities taking place in both rural and urban localities and of out-of-State use.

APPENDIX I.

ANNUAL SUMMARY OF COMMERCIAL FISH LANDINGS

(1974)

CURRENT FISHERIES STATISTICS NO. 6719

Florida Landings, Annual Summary 1974

In cooperation with the Florida Department of Natural Resources, Tallahassee, Florida 32301

FLORIDA LANDINGS, ANNUAL SUMMARY, 1974

Commercial landings of fish and shellfish at ports along Florida's 1,200 mile coastline during 1974 were 174.2 million pounds, worth $68.1 million at dockside. Compared to 1973 the volume increased by 6 percent and the value increased by 9 percent. The increase in volume was due mainly to improved landings of king mackerel and blue crabs. The increase in value was a result of price increases of many species and heavier landings. In quantity, black mullet and menhaden were the leading finfish; shrimp continued to be the leading shellfish in both volume and dockside value.

SHRIMP. Landings of shrimp were 32.5 million pounds (heads-on weight)–11 percent more than 1973. The dockside value of shrimp was $24.7 million–15 percent lower than in 1973. The average dockside price of 26/30 count shrimp began the year at $2.04 per pound (heads-off) and declined erratically until September when 26/30 count were only $1.18. A slight recovery occurred during the last 3 months when 26/30 count shrimp climbed to an average of $1.23 per pound to the fishermen.

The Tortugas grounds yielded 16.7 million pounds or 51 percent of the total shrimp landings in Florida during 1974. Landings of shrimp on the East Coast of Florida were 4.0 million pounds, an increase of 30 percent over 1973. Landings of rock shrimp increased substantially on both coasts. East Coast landings were 506,000 pounds in 1974 (heads-on), compared to only 296,000 pounds in 1973. West Coast landings were 2,305,000 pounds in 1974, compared to 900,000 pounds in 1973.

FINFISH. Total landings of finfish were 106.5 million pounds, valued at $23.4 million, an increase of 1.1 million pounds and $3.8 million over 1973. The 6-million-pound drop in menhaden was compensated by a substantial increase in landings of king mackerel combined with an upturn in production of major species such as grouper, red snapper, pompano, and spotted trout. Black mullet production declined from the 29.3 million pounds in 1973 to 27.9 million pounds in 1974. The dockside average price for all species combined (except menhaden) was 24.5 cents per pound in 1974, compared to 22.0 cents per pound in 1973.

January 16, 1976 Washington, D.C.

noaa NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION / NATIONAL MARINE FISHERIES SERVICE

FLORIDA LANDINGS, ANNUAL SUMMARY, 1974 - Continued

SPINY LOBSTER. Total landings of spiny lobsters were 10.9 million pounds worth $13.4 million at dockside. Landings were down 0.3 million pounds from 1973, but the value increased by $1.7 million. Production improved in the Florida Keys, but was more than offset by lower catches from waters off the Bahamas.

CRABS. Landings of blue crabs were 17.6 million pounds–30 percent higher than in 1973. Dockside value of the crabs was $2.2 million, a $0.5-million increase. Average price to the fishermen for live crabs was 12 cents per pound.

Landings of stone crabs were 2.6 million pounds worth $1.9 million at the dock. This compares to 2.1 million pounds valued at $1.4 million in 1973. In 1974 the average price paid to the fishermen was 73 cents per pound, compared to 68 cents per pound the previous year.

OYSTERS. Oyster landings yielded 2.8 million pounds of meats with a dockside value of $1.6 million, a 0.3-million-pound increase in volume and a slight increase in total value. Shellstock continued to be shipped into Florida from neighboring States for shucking owing to scarcity of locally produced oysters. The average price to the fishermen was 58 cents per pound of shucked meats.

SCALLOPS. Production of calico scallops was 1.1 million pounds of meats in 1974 valued at $0.6 million to the fishermen. This substantial increase over the 1,600 pounds harvested in 1973 is the record for landings since the commercial fishery began in 1967.

MISCELLANEOUS. The fishing fleet began the year combatting the fuel crisis. At some ports, vessels lost considerable time waiting for fuel deliveries. Most of the problems with fuel supply had been eliminated by April.

BY J. ERNEST SNELL
SUPERVISORY FISHERY REPORTING SPECIALIST
MIAMI, FLORIDA

FLORIDA LANDINGS BY DISTRICTS, 1974

SPECIES	1974 EAST COAST		1974 WEST COAST		1974 TOTAL		1973 TOTAL	
FISH	POUNDS	DOLLARS	POUNDS	DOLLARS	POUNDS	DOLLARS	POUNDS	DOLLARS
ALEWIVES			178,735	11,003	178,735	11,003	168,286	9,176
AMBERJACK	35,139	3,717	57,536	4,393	92,675	8,110	75,121	6,032
ANGELFISH	4,631	451	6,483	523	11,114	974	14,951	1,344
BALLYHOO	177,655	41,648	214,066	41,716	391,721	83,364	440,608	78,428
BARRACUDA	272	3	12		284	3	270	23
BLUE RUNNER OR HARDTAIL	77,340	6,073	658,634	59,366	735,974	65,439	1,484,140	95,923
BLUEFISH	1,272,483	214,488	500,964	54,542	1,773,447	269,030	2,075,438	280,323
BONITO	5,394	381	98,769	7,625	104,163	8,006	101,956	5,658
CATFISH, FRESH (1)	1,713,187	447,769	20,300	7,230	1,733,487	454,999	1,749,538	405,689
CATFISH, SALT	59,962	3,202	102,779	7,528	162,741	10,730	113,068	8,406
CIGARFISH	50		724,863	110,313	724,913	110,313	519,199	79,463
COBIA	11,610	1,898	88,978	9,866	100,588	11,764	87,542	9,818
CREVALLE (JACKS)	121,211	6,353	2,088,434	136,873	2,209,645	143,226	2,542,143	143,002
CROAKER	65,137	14,150	1,878,023	273,657	1,943,160	287,807	2,460,495	373,829
DOLPHIN	15,313	4,524	69,947	16,937	85,260	21,461	87,869	19,571
DRUM, BLACK	92,348	11,491	59,854	6,377	152,202	17,868	182,533	21,993
DRUM, RED	137,318	38,075	1,190,435	258,864	1,327,753	296,939	1,120,618	237,751
EELS	313,597	84,641	5,671	1,417	319,268	86,058	81,847	16,279
FLOUNDERS	210,935	59,064	226,337	66,041	437,272	125,105	452,878	138,286
GOATFISH	62,864	21,961	1,404	774	64,268	22,735	84,213	25,562
GROUPERS AND SCAMP	590,069	246,094	6,110,158	2,106,493	6,700,227	2,352,587	5,536,709	1,702,117
GRUNTS	29,359	3,864	258,364	53,306	287,723	57,170	303,015	57,827
HERRING, THREAD	36,234		731,543	34,980	767,777	34,980	952,372	43,246
HOGFISH	4,310	1,925	12,124	3,492	16,434	5,417	18,090	5,565
JEWFISH	46,380	13,380	160,766	17,737	207,146	31,117	177,139	20,099
KING MACKEREL	4,267,520	1,677,730	6,133,635	1,594,149	10,401,155	3,271,879	5,928,846	2,134,712
KING WHITING	962,425	161,437	153,452	12,308	1,115,877	173,745	1,387,142	251,162
MENHADEN	12,636,900	400,759	702,238	59,291	13,339,138	460,050	19,263,217	627,856
MISCELLANEOUS	82	20			82	20		
MULLET, BLACK	2,763,709	281,233	25,119,353	3,153,211	27,883,062	3,434,444	29,279,198	3,215,967
MULLET, SILVER	579,102	44,579	606,862	93,411	1,185,964	137,990	806,436	103,458
PERMIT	5,487	1,078	53,061	11,245	58,548	12,323	74,354	14,067
PIGFISH	14,774	671	12,944	1,694	27,718	2,365	26,333	2,032
POMPANO	227,964	265,243	1,204,373	1,537,270	1,432,337	1,802,513	1,251,722	1,484,407
SAND PERCH (MOJARRA)	172,457	17,737	128,074	17,245	300,531	34,982	361,285	40,935
SCUP	75,735	21,649	79,356	16,589	155,091	38,238	155,720	38,035
SEA BASS	95,097	29,191	50,585	7,031	145,682	36,222	181,658	44,583
SEA TROUT, GRAY	128,936	25,346	10,422	3,825	139,358	29,171	206,532	40,094
SEA TROUT, SPOT	658,539	266,691	2,260,502	884,002	2,919,041	1,150,693	2,892,115	1,104,504
SEA TROUT, WHITE	2,234	696	224,125	34,083	226,359	34,779	225,721	21,764
SHAD	99,968	23,514	12,325	369	112,293	23,883	99,006	27,553
SHARKS	1,535	70	25,081	1,282	26,616	1,352	338,818	16,416
SHEEPSHEAD	302,447	44,370	284,600	32,154	587,047	76,524	618,552	79,330
SNAPPER, LANE	13,817	4,546	18,914	7,362	32,731	11,908	35,701	11,700
SNAPPER, MANGROVE	131,719	71,472	586,847	205,541	718,566	277,013	672,407	244,140
SNAPPER, MUTTON	201,767	152,491	256,983	119,378	458,750	271,869	548,324	342,492
SNAPPER, RED	557,498	388,843	4,611,420	3,587,445	5,168,918	3,976,288	4,088,416	3,093,133
SNAPPER, VERMILLION	101,407	75,966	177,585	106,474	278,992	182,440	200,872	171,952
SNAPPER, YELLOWTAIL	104,776	69,933	937,865	577,335	1,042,641	647,268	942,730	581,220
SPANISH MACKEREL	2,346,277	459,015	8,265,746	1,443,827	10,612,023	1,902,842	9,397,233	1,536,601
SPANISH SARDINES	2,229		786,090	59,108	788,319	59,108	154,075	9,246
SPOT	1,747,835	259,351	143,999	13,767	1,891,834	273,118	1,104,028	169,913
STURGEON			4,224	401	4,224	401	8,387	1,087
SWORDFISH			49,806	85,860	49,806	85,860		
TENPOUNDER (LADYFISH)	1,746		1,968,879	87,245	1,970,625	87,245	1,526,093	76,833
TILAPIA (NILE PERCH)	1,200	360	10,674	1,662	11,874	2,022		
TILEFISH	87,425	31,288	14,895	4,908	102,320	36,196	48,082	16,997
TRIGGER FISH	17,593	3,028	53,816	5,869	71,409	8,897	62,992	6,921
TRIPLETAIL	1,255	168	1,255	63	2,510	231	3,927	407
WAHOO	745	185	125	42	870	227		
WARSAW	60,099	18,008	118,491	25,126	178,590	43,134	177,170	35,665
1-UNCLASSIFIED - FOOD	266,711	31,067	1,500,761	199,521	1,767,472	230,588	1,544,812	182,798
2-UNCLASSIFIED - MISC.	175,692	5,149	629,562	33,838	805,254	38,987	875,776	43,527
TOTAL FISH.	33,897,500	6,058,036	72,644,104	17,314,984	106,541,604	23,373,020	105,377,918	19,556,917
SHELLFISH ET AL.								
CLAMS HARD	94,130	94,258			94,130	94,258	139,103	101,257
CLAMS, SUNRAY VENUS			7,387	2,127	7,387	2,127	244,034	33,310
CONCH							52	26
CRABS, BLUE; HARD	7,471,709	917,099	10,133,727	1,280,450	17,605,436	2,197,549	13,511,913	1,678,901
CRABS, BLUE; SOFT	135	16	146	153	281	169		
CRABS, STONE	66,766	50,990	2,523,864	1,848,623	2,590,630	1,899,613	2,087,766	1,425,464
LOBSTER, SPANISH	8,768	10,529	1,826	1,705	10,594	12,234	5,409	3,770
LOBSTER, SPINY (CRAWFISH)	4,138,511	5,057,163	6,735,578	8,325,016	10,874,089	13,382,179	11,171,708	11,661,141
OYSTERS	97,724	85,523	2,653,661	1,523,716	2,751,385	1,609,239	2,531,325	1,592,967
SCALLOPS, BAY	56,960	31,328	16,284	18,426	73,244	49,754	52,999	62,698
SCALLOPS, CALICO	1,074,354	587,799			1,074,354	587,799	1,624	2,055
SHRIMP, EAST COAST	3,991,507	3,291,864	4,643	4,250	3,996,150	3,296,114	3,069,611	3,662,011
SHRIMP, CAMPECHE			3,169,454	1,752,011	3,169,454	1,752,011	2,242,716	2,001,158
SHRIMP, CARIBBEAN							1,384	2,145
SHRIMP, CENTRAL WEST COAST			1,797,686	1,405,603	1,797,686	1,405,603	897,058	4,712,780
SHRIMP, TORTUGAS			16,682,250	12,745,249	16,682,250	12,745,249	16,916,812	14,043,258
SHRIMP, UPPER WEST COAST			6,808,365	5,538,336	6,808,365	5,538,336	6,070,016	4,679,586
SPONGES, GRASS	3,720	9,095	1,179	3,875	4,899	12,970	7,503	16,870
SPONGES, SHEEPSWOOL	4,715	30,439	6,576	69,074	11,291	99,513	9,047	76,812
SPONGES, YELLOW	3,662	9,303	2,036	8,113	5,698	17,416	5,431	15,216
SQUID	22,442	1,672	46,966	9,311	69,408	10,983	42,134	6,477
TURTLE, GREEN	9,154	1,478	17,512	4,368	26,666	5,846	34,398	9,045
TURTLE, LOGGERHEAD	7,605	1,094			7,605	1,094	42,630	4,777
TOTAL SHELLFISH ET AL.	17,051,862	10,179,650	50,609,140	34,540,406	67,661,002	44,720,056	59,084,673	42,938,657
GRAND TOTAL	50,949,362	16,237,686	123,253,244	51,855,390	174,202,606	68,093,076	164,462,591	62,495,574

(1) THE PRODUCTION OF FRESHWATER CATFISH REPRESENTS THAT PORTION HANDLED BY DEALERS OF MARINE SPECIES.

NOTE:--DATA ON LANDINGS OF FRESHWATER CATFISH, SOFT-SHELL TURTLES, AND TILAPIA (ALSO KNOWN AS NILE PERCH OR PERCH IN FLORIDA) NOT HANDLED BY MARINE DEALERS ARE AS FOLLOWS: FRESHWATER CATFISH-8,924,900 POUNDS VALUED AT $2,561,446; SOFT-SHELL TURTLES, 123,000 POUNDS VALUED AT $18,450; AND TILAPIA 828,000 POUNDS VALUED AT $99,360.

(2) ROCK SHRIMP TOTALS THAT ARE INCLUDED IN SHRIMP STATISTICS WITHIN THIS PUBLICATION ARE: EAST COAST--505,841 POUNDS (HEADS ON), VALUED AT $172,241 AND WEST COAST--2,305,133 POUNDS (HEADS ON), VALUED AT $828,000.

THE EAST COAST IS DEFINED AS THOSE COUNTIES BORDERING THE ATLANTIC OCEAN FROM NASSAU COUNTY SOUTH THROUGH DADE COUNTY. THE WEST COAST IS DEFINED AS THOSE COUNTIES BORDERING THE GULF OF MEXICO FROM MONROE COUNTY NORTH THROUGH ESCAMBIA COUNTY. THE 1974 DATA INCLUDE REVISIONS SINCE PUBLICATION OF MONTHLY BULLETINS. ALL SPECIES ARE SHOWN IN WEIGHT AS LANDED, EXCEPT UNIVALVE AND BIVALVE MOLLUSKS, WHICH ARE REPORTED IN POUNDS OF MEATS. WEIGHT OF SCALLOP MEATS IF WEIGHT OF SHELL-CLOSING MUSCLE. VALUE OF LANDINGS REPRESENTS THE AMOUNT RECEIVED FOR THE CATCH DELIVERED TO THE DOCK. WEIGHT OF SPONGES IS CLEANED (DRY) WEIGHT

FLORIDA LANDINGS BY MONTHS, 1974

SPECIES	JANUARY EAST COAST	JANUARY WEST COAST	JANUARY TOTAL	FEBRUARY EAST COAST	FEBRUARY WEST COAST	FEBRUARY TOTAL	MARCH EAST COAST	MARCH WEST COAST	MARCH TOTAL
	POUNDS								
FISH									
ALEWIVES									
AMBERJACK	2,755	7,494	10,249	1,992	4,823	6,815	7,660	7,334	14,994
ANGELFISH	186	211	397	887	514	1,401	228	944	1,172
BALLYHOO	64,286	72,873	137,159	30,714	26,965	57,679	22,858	20,370	43,228
BARRACUDA									
BLUE RUNNER OR HARDTAIL	10,754	782	11,536	1,390	985	2,375	6,102	722	6,824
BLUEFISH	188,986	42,588	231,574	190,919	30,593	221,512	330,340	43,891	374,231
BONITO	496	1,100	1,596	38	63	101	220	7,662	7,882
CATFISH, FRESH (1)	281,773	1,338	283,111	190,402	226	190,628	338,104	1,374	339,478
CATFISH, SALT	6,548	76	6,624	2,653	144	2,797	10,368	12,998	23,366
CIGARFISH		1,800	1,800					752	752
COBIA	1,851	4,182	6,033	777	5,034	5,811	2,962	14,569	17,531
CREVALLE (JACKS)	5,917	73,317	79,234	4,753	41,078	45,831	30,314	132,521	162,835
CROAKER	3,935	140,823	144,758	4,280	139,005	143,285	5,514	204,618	210,132
DOLPHIN	131	1,236	1,367	465	2,215	2,680	1,518	5,746	7,264
DRUM, BLACK	15,937	10,065	26,002	5,283	8,923	14,206	23,252	5,016	28,268
DRUM, RED	27,064	110,124	137,188	11,823	86,157	97,980	31,508	230,637	262,145
EELS	12,584		12,584	1,532		1,532	1,850		1,850
FLOUNDERS	4,882	21,923	26,805	5,370	17,414	22,784	30,618	23,972	54,590
GOATFISH	3,240		3,240	5,367		5,367	9,578		9,578
GROUPERS AND SCAMP	34,977	465,747	500,724	68,384	309,838	378,222	120,719	1,044,029	1,164,748
GRUNTS	4,030	43,946	47,976	2,043	24,722	26,765	4,362	65,418	69,780
HERRING, THREAD									
HOGFISH	233	1,700	1,933	475	1,443	1,918	2,012	2,566	4,578
JEWFISH	183	13,907	14,090	520	9,185	9,705	5,284	21,370	26,654
KING MACKEREL	1,208,012	481,308	1,689,320	624,457	902,388	1,526,845	594,181	4,161,083	4,755,264
KING WHITING	101,371	14,888	116,259	107,774	16,049	123,823	250,194	21,438	271,632
MENHADEN	77,055	1,811	78,866	102,314	53	102,367	164,444	10,287	174,731
MISCELLANEOUS							82		82
MULLET, BLACK	218,120	4,472,912	4,691,032	143,449	1,079,518	1,222,967	308,946	1,496,807	1,805,753
MULLET, SILVER	9,402	49,603	59,005	6,612	33,908	40,520	44,800	58,442	103,242
PERMIT	411	4,984	5,395	473	922	1,395	290	968	1,258
PIGFISH	469	547	1,016	210	80	290	6,054	438	6,492
POMPANO	63,189	50,001	113,190	11,850	50,971	62,821	16,750	148,946	165,696
SAND PERCH (MOJARRA)	15,853	2,157	18,010	9,967	3,774	13,741	8,172	9,154	17,326
SCUP	3,873	7,637	11,510	6,193	4,021	10,214	14,520	9,288	23,808
SEA BASS	6,701	17,182	23,883	3,653	3,191	6,844	21,664	12,204	33,868
SEA TROUT, GRAY	21,012	183	21,195	16,703		16,703	22,214	12	22,226
SEA TROUT, SPOT	59,004	307,637	366,641	57,341	168,611	225,952	94,501	329,439	423,940
SEA TROUT, WHITE		20,668	20,668		13,206	13,206		7,041	7,041
SHAD	45,877		45,877	25,592		25,592	27,540		27,540
SHARKS		3,702	3,702		3,596	3,596		7,252	7,252
SHEEPSHEAD	23,532	42,941	66,473	18,162	27,483	45,645	32,886	43,538	76,424
SNAPPER, LANE	3,728	749	4,477	1,002	767	1,769	3,160	952	4,112
SNAPPER, MANGROVE	7,090	53,143	60,233	8,002	41,864	49,866	12,910	87,276	100,186
SNAPPER, MUTTON	37,576	17,160	54,736	6,772	13,629	20,401	17,516	26,891	44,407
SNAPPER, RED	40,617	438,049	478,666	25,550	334,888	360,438	62,385	471,005	533,390
SNAPPER, VERMILLION	5,373	15,991	21,364	2,811	6,419	9,230	9,251	4,084	13,335
SNAPPER, YELLOWTAIL	6,183	76,921	83,104	2,047	64,320	66,367	12,784	144,261	157,045
SPANISH MACKEREL	480,893	2,752,857	3,233,750	250,510	1,101,249	1,351,759	643,634	2,131,835	2,775,469
SPANISH SARDINES									
SPOT	38,234	6,652	44,886	41,228	6,573	47,801	90,649	8,714	99,363
STURGEON		419	419		952	952		975	975
SWORDFISH								49,686	49,686
TENPOUNDER (LADYFISH)		1,548	1,548		1,848	1,848		75,397	75,397
TILAPIA (NILE PERCH)		817	817					2,052	2,052
TILEFISH	1,678	818	2,496	3,597	860	4,457	12,500	748	13,248
TRIGGER FISH	921	4,422	5,343	883	1,884	2,767	4,632	3,746	8,378
TRIPLETAIL	182		182	83		83	94		94
WAHOO									
WARSAW	1,546	11,389	12,935	3,737	23,127	26,864	19,278	13,862	33,140
1-UNCLASSIFIED - FOOD	38,872	130,607	169,479	15,348	107,796	123,144	26,402	251,897	278,299
2-UNCLASSIFIED - MISC.	9,280	50,436	59,716	15,474	43,115	58,589	23,738	47,228	70,966
TOTAL FISH.	3,196,802	10,055,371	13,252,173	2,041,861	4,766,389	6,808,250	3,531,542	11,483,455	15,014,997
SHELLFISH ET AL.									
CLAMS HARD	8,595		8,595	5,118		5,118	9,828		9,828
CLAMS, SUNRAY VENUS					4,473	4,473			
CONCH									
CRABS, BLUE: HARD	535,439	661,997	1,197,436	550,993	686,442	1,237,435	980,726	1,103,517	2,084,243
CRABS, BLUE: SOFT								100	100
CRABS, STONE	7,912	287,981	295,893	5,820	377,668	383,488	9,548	684,685	694,233
LOBSTER, SPANISH					55	55		85	85
LOBSTER, SPINY (CRAWFISH)	266,557	259,325	525,882	250,674	184,216	434,890	657,348	319,846	977,194
OYSTERS	16,862	490,863	507,725	11,091	361,671	372,762	25,242	347,612	372,854
SCALLOPS, BAY									
SCALLOPS, CALICO	38,856		38,856	93,320		93,320	254,224		254,224
SHRIMP, EAST COAST	302,727	1,565	304,292	130,775		130,775	90,295		90,295
SHRIMP, CAMPECHE		473,858	473,858		634,001	634,001		548,412	548,412
SHRIMP, CARIBBEAN									
SHRIMP, CENTRAL WEST COAST		42,215	42,215		85,419	85,419		150,341	150,341
SHRIMP, TORTUGAS		3,449,423	3,449,423		1,558,454	1,558,454		1,536,143	1,536,143
SHRIMP, UPPER WEST COAST		203,546	203,546		280,461	280,461		465,522	465,522
SPONGES, GRASS	323	49	372	225	68	293	284	43	327
SPONGES, SHEEPSWOOL	127	464	591	166	304	470	372	682	1,054
SPONGES, YELLOW	285	75	360	260	9	269	335	66	401
SQUID	1,529	661	2,190	899	2,787	3,686	416	3,068	3,484
TURTLE, GREEN	392	8,970	9,362	488	7,907	8,395	1,806		1,806
TURTLE, LOGGERHEAD	1,828		1,828	2,960		2,960	1,696		1,696
TOTAL SHELLFISH ET AL.	1,181,432	5,880,992	7,062,424	1,052,789	4,183,935	5,236,724	2,032,120	5,160,122	7,192,242
GRAND TOTAL	4,378,234	15,936,363	20,314,597	3,094,650	8,950,324	12,044,974	5,563,662	16,643,577	22,207,239

SEE FOOTNOTES ON PAGE 3.

(CONTINUED ON NEXT PAGE)

FLORIDA LANDINGS BY MONTHS, 1974

SPECIES	APRIL			MAY			JUNE		
	EAST COAST	WEST COAST	TOTAL	EAST COAST	WEST COAST	TOTAL	EAST COAST	WEST COAST	TOTAL
	POUNDS								
FISH									
ALEWIVES		85,075	85,075		62,097	62,097			
AMBERJACK	4,072	3,381	7,453	4,573	5,965	10,538	2,435	4,289	6,724
ANGELFISH	97	212	309	75	504	579	431	352	783
BALLYHOO	5,000	5,792	10,792	3,857	6,729	10,586	2,000	25,710	27,710
BARRACUDA				18	12	30	38		38
BLUE RUNNER OR HARDTAIL	10,332	13,982	24,314	2,035	343,907	345,942	3,211	117,628	120,839
BLUEFISH	147,048	71,793	218,841	117,005	24,273	141,278	8,103	19,012	27,115
BONITO	1,184		1,184	96	12,975	13,071	23	4,602	4,625
CATFISH,FRESH (1)	104,362	3,262	107,624	132,199	1,574	133,773	88,523	2,052	90,575
CATFISH,SALT	13,149	53,896	67,045	4,227	7,370	11,597	2,000	1,312	3,312
CIGARFISH		66,759	66,759		45,390	45,390		376,139	376,139
COBIA	813	9,652	10,465	1,081	3,409	4,490	616	3,434	4,050
CREVALLE (JACKS)	19,994	240,754	260,748	4,433	213,654	218,087	3,365	73,903	77,268
CROAKER	2,756	89,512	92,268	5,187	144,771	149,958	4,215	134,676	138,891
DOLPHIN	922	7,300	8,222	2,775	7,007	9,782	3,174	26,641	29,815
DRUM, BLACK	2,866	2,053	4,919	9,600	3,431	13,031	1,656	775	2,431
DRUM, RED	7,459	58,845	66,304	6,402	75,152	81,554	5,267	54,973	60,240
EELS	1,497		1,497	35		35			
FLOUNDERS	3,820	17,639	21,459	6,944	15,080	22,024	5,822	23,874	29,696
GOATFISH	4,977		4,977	8,423	1,139	9,562	3,238		3,238
GROUPERS AND SCAMP	51,268	495,690	546,958	59,146	661,306	720,452	70,351	653,754	724,105
GRUNTS	2,190	18,580	20,770	1,522	20,143	21,665	1,062	18,560	19,622
HERRING, THREAD		16,098	16,098		7,575	7,575		108,622	108,622
HOGFISH	246	781	1,027	235	958	1,193	277	589	866
JEWFISH	3,006	13,910	16,916	2,576	17,269	19,845	2,134	16,938	19,072
KING MACKEREL	81,097	96,564	177,661	207,738	56,325	264,063	84,510	58,688	143,198
KING WHITING	36,537	19,307	55,844	63,024	11,616	74,640	49,537	11,104	60,641
MENHADEN	2,463,835	24,351	2,488,186	2,408,601	57,367	2,465,968	78,108	144,881	222,989
MISCELLANEOUS									
MULLET, BLACK	172,316	704,531	876,847	179,148	828,804	1,007,952	196,688	909,671	1,106,359
MULLET, SILVER	20,075	33,329	53,404	8,665	38,093	46,758	26,839	41,000	67,839
PERMIT	157	575	732	298	652	950	787	3,123	3,910
PIGFISH	104	501	605	150	1,619	1,769	1,321	667	1,988
POMPANO	11,792	77,618	89,410	15,037	111,840	126,877	10,642	80,067	90,709
SAND PERCH (MOJARRA)	10,665	18,753	29,418	16,211	29,171	45,382	20,233	24,153	44,386
SCUP	5,172	3,045	8,217	8,184	9,200	17,384	6,199	8,407	14,606
SEA BASS	4,684	2,636	7,320	12,307	2,597	14,904	5,453	1,367	6,820
SEA TROUT, GRAY	8,863		8,863	10,020		10,020	3,659	138	3,797
SEA TROUT, SPOT	44,896	115,242	160,138	57,761	140,322	198,083	40,230	126,618	166,848
SEA TROUT, WHITE		6,972	6,972		7,739	7,739		13,027	13,027
SHAD									
SHARKS	392	65	457		2,108	2,108		89	89
SHEEPSHEAD	21,927	13,167	35,094	16,025	13,438	29,463	13,516	12,520	26,036
SNAPPER, LANE	442	216	658	1,024	158	1,182	2,823	590	3,413
SNAPPER, MANGROVE	5,410	36,187	41,597	6,661	54,279	60,940	16,008	55,730	71,738
SNAPPER, MUTTON	7,513	16,737	24,250	18,763	40,961	59,724	25,687	42,855	68,542
SNAPPER, RED	30,520	239,030	269,550	60,337	424,015	484,352	60,276	427,840	488,116
SNAPPER, VERMILLION	11,268	10,587	21,855	9,008	15,670	24,678	7,640	9,398	17,038
SNAPPER, YELLOWTAIL	4,377	61,209	65,586	17,357	145,945	163,302	26,824	213,967	240,791
SPANISH MACKEREL	212,836	194,755	407,591	58,966	74,261	133,227	14,282	42,271	56,553
SPANISH SARDINES		24,850	24,850		10,584	10,584		302,998	302,998
SPOT	71,798	11,075	82,873	116,150	8,195	124,345	164,777	14,957	179,734
STURGEON		236	236		230	230			
SWORDFISH									
TENPOUNDER (LADYFISH)		154,857	154,857		500,562	500,562		108,162	108,162
TILAPIA (NILE PERCH)		4,169	4,169						
TILEFISH	2,313	1,142	3,455	4,240	2,665	6,905	7,246	1,294	8,540
TRIGGER FISH	1,060	2,852	3,912	2,069	7,881	9,950	1,607	4,012	5,619
TRIPLETAIL	131		131	95		95	103		103
WAHOO				71	56	127	82		82
WARSAW	4,282	5,664	9,946	8,683	8,360	17,043	5,843	5,960	11,803
1-UNCLASSIFIED - FOOD	18,973	85,690	104,663	17,589	130,187	147,776	25,097	115,442	140,539
2-UNCLASSIFIED - MISC.	14,635	30,041	44,676	7,718	36,492	44,210	4,060	87,551	91,611
TOTAL FISH.	3,655,128	3,270,919	6,926,047	3,704,344	4,453,082	8,157,426	1,108,018	4,536,382	5,644,400
SHELLFISH ET AL.									
CLAMS HARD	7,063		7,063	4,493		4,493	7,243		7,243
CLAMS, SUNRAY VENUS									
CONCH									
CRABS, BLUE; HARD	617,932	983,212	1,601,144	669,381	1,123,860	1,793,241	759,178	892,205	1,651,383
CRABS, BLUE; SOFT		10	10						
CRABS, STONE	10,158	268,542	278,700	3,884	107,803	111,687		6,644	6,644
LOBSTER, SPANISH		503	503		242	242		193	193
LOBSTER, SPINY (CRAWFISH)	185,625	113,538	299,163	171,335	132,913	304,248	245,661	116,913	362,574
OYSTERS	6,626	312,649	319,275	1,702	118,495	120,197	1,190		1,190
SCALLOPS, BAY				56,960		56,960		2,732	2,732
SCALLOPS, CALICO	87,336		87,336	116,912		116,912	153,456		153,456
SHRIMP, EAST COAST	62,437		62,437	190,442		190,442	252,479		252,479
SHRIMP, CAMPECHE		347,552	347,552		256,208	256,208		91,179	91,179
SHRIMP, CARIBBEAN									
SHRIMP, CENTRAL WEST COAST		121,685	121,685		162,824	162,824		234,810	234,810
SHRIMP, TORTUGAS		1,220,633	1,220,633		1,149,475	1,149,475		866,831	866,831
SHRIMP, UPPER WEST COAST		732,359	732,359		653,435	653,435		628,771	628,771
SPONGES, GRASS	390	41	431	454	37	491	489		489
SPONGES, SHEEPSWOOL	445	481	926	748	1,195	1,943	992	800	1,792
SPONGES, YELLOW	418	93	511	313	187	500	367	460	827
SQUID	169	8,896	9,065	696	4,720	5,416	1,973	4,841	6,814
TURTLE, GREEN	6,468		6,468						
TURTLE, LOGGERHEAD	1,121		1,121						
TOTAL SHELLFISH ET AL.	986,188	4,110,194	5,096,382	1,217,320	3,711,394	4,928,714	1,423,028	2,846,379	4,269,407
GRAND TOTAL	4,641,316	7,381,113	12,022,429	4,921,664	8,164,476	13,086,140	2,531,046	7,382,761	9,913,807

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FLORIDA LANDINGS BY MONTHS, 1974

SPECIES	JULY			AUGUST			SEPTEMBER		
	EAST COAST	WEST COAST	TOTAL	EAST COAST	WEST COAST	TOTAL	EAST COAST	WEST COAST	TOTAL
	POUNDS								
FISH									
ALEWIVES					28,810	28,810			
AMBERJACK	2,411	7,587	9,998	1,927	4,737	6,664	1,790	1,268	3,058
ANGELFISH	313	612	925	624	478	1,102	995	1,405	2,400
BALLYHOO	1,285	579	1,864	1,657	4,740	6,397	2,571	5,063	7,634
BARRACUDA							80		80
BLUE RUNNER OR HARDTAIL	865	116,573	117,438	3,303	22,505	25,808	6,689	26,640	33,329
BLUEFISH	6,042	14,283	20,325	9,363	24,248	33,611	37,110	58,245	95,355
BONITO	570	56,752	57,322	1,234	14,290	15,524	1,232	450	1,682
CATFISH, FRESH (1)	109,541	1,640	111,181	86,577	1,070	87,647	107,165	2,261	109,426
CATFISH, SALT	1,820	2,324	4,144	3,580	2,448	6,028	3,069	1,098	4,167
CIGARFISH		144,367	144,367		61,640	61,640		995	995
COBIA	231	6,505	6,736	449	9,410	9,859	483	8,281	8,764
CREVALLE (JACKS)	4,916	65,614	70,530	7,028	135,767	142,795	8,299	227,376	235,675
CROAKER	4,985	194,767	199,752	15,643	249,034	264,677	10,280	171,950	182,230
DOLPHIN	2,501	4,547	7,048	919	7,311	8,230	1,022	5,110	6,132
DRUM, BLACK	3,243	5,204	8,447	1,933	750	2,683	5,805	2,942	8,747
DRUM, RED	5,455	58,681	64,136	4,566	98,114	102,680	10,116	123,412	133,528
EELS				1,050		1,050	1,550		1,550
FLOUNDERS	4,924	19,651	24,575	8,912	11,997	20,909	24,469	19,102	43,571
GOATFISH	2,508	265	2,773	2,273		2,273	7,184		7,184
GROUPERS AND SCAMP	48,522	568,113	616,635	51,070	440,088	491,158	23,325	379,634	402,959
GRUNTS	446	10,419	10,865	461	10,779	11,240	2,169	6,085	8,254
HERRING, THREAD	29,439	269,401	298,840	1,630	180,007	181,637	5,165	16,265	21,430
HOGFISH	233	556	789	24	342	366	50	446	496
JEWFISH	11,441	16,985	28,426	11,074	13,449	24,523	8,478	5,600	14,078
KING MACKEREL	151,695	31,362	183,057	184,756	36,418	221,174	137,105	33,443	170,548
KING WHITING	53,591	9,309	62,900	42,289	4,474	46,763	19,412	5,850	25,262
MENHADEN	3,369,127	223,323	3,592,450	2,468,656	92,766	2,561,422	755,445	128,872	884,317
MISCELLANEOUS									
MULLET, BLACK	202,903	1,406,775	1,609,678	215,212	1,772,741	1,987,953	292,717	1,838,724	2,131,441
MULLET, SILVER	67,441	101,286	168,727	60,235	55,392	115,627	254,277	58,985	313,262
PERMIT	92	7,522	7,614	491	933	1,424	663	3,560	4,223
PIGFISH	3,313	1,190	4,503	180	145	325	525	963	1,488
POMPANO	10,344	85,202	95,546	9,514	140,246	149,760	4,981	111,482	116,463
SAND PERCH (MOJARRA)	18,132	7,246	25,378	21,381	5,342	26,723	17,550	6,374	23,924
SCUP	6,058	8,865	14,923	9,391	9,066	18,457	2,811	4,196	7,007
SEA BASS	6,279	673	6,952	5,341	320	5,661	4,143	327	4,470
SEA TROUT, GRAY	5,502	1,349	6,851	2,917	1,025	3,942	2,569	206	2,775
SEA TROUT, SPOT	48,547	111,947	160,494	65,163	136,727	201,890	45,577	122,188	167,765
SEA TROUT, WHITE	1,733	31,080	32,813		27,026	27,026		13,743	13,743
SHAD	100		100		12,325	12,325			
SHARKS	300	235	535					69	69
SHEEPSHEAD	10,747	11,415	22,162	21,282	14,404	35,686	36,987	16,743	53,730
SNAPPER, LANE	50	32	82	47	9,740	9,787	30	734	764
SNAPPER, MANGROVE	18,990	111,449	130,439	15,528	38,360	53,888	13,128	30,903	44,031
SNAPPER, MUTTON	15,964	14,268	30,232	16,486	25,665	42,151	11,180	12,363	23,543
SNAPPER, RED	62,175	392,200	454,375	64,270	473,616	537,886	31,522	269,709	301,231
SNAPPER, VERMILLION	5,446	22,017	27,463	11,997	15,018	27,015	8,518	11,229	19,747
SNAPPER, YELLOWTAIL	16,855	85,041	101,896	6,433	37,128	43,561	2,584	25,336	27,920
SPANISH MACKEREL	15,964	61,244	77,208	30,164	61,428	91,592	45,308	80,141	125,449
SPANISH SARDINES		236,851	236,851		70,280	70,280		560	560
SPOT	126,583	31,488	158,071	245,390	6,176	251,566	247,155	14,374	261,529
STURGEON									
SWORDFISH		120	120						
TENPOUNDER (LADYFISH)	1,227	34,510	35,737	500	58,840	59,340	19	253,846	253,865
TILAPIA (NILE PERCH)	1,200	162	1,362		110	110		368	368
TILEFISH	1,096	506	1,602	4,434	2,241	6,675	5,126	2,031	7,157
TRIGGER FISH	740	5,244	5,984	1,981	5,169	7,150	201	4,202	4,403
TRIPLETAIL	30	5	35	156		156	3	1,242	1,245
WAHOO	81		81	204	34	238	87	35	122
WARSAW	4,727	5,917	10,644	4,680	8,813	13,493	1,464	5,777	7,241
1-UNCLASSIFIED - FOOD	14,645	70,440	85,085	15,537	93,849	109,386	18,759	108,077	126,836
2-UNCLASSIFIED - MISC.	16,699	62,856	79,555	21,577	66,021	87,598	3,133	74,267	77,400
TOTAL FISH.	4,500,067	4,738,554	9,238,621	3,761,489	4,603,852	8,365,341	2,232,075	4,304,547	6,536,622
SHELLFISH ET AL.									
CLAMS HARD	1,370		1,370	168		168	19,609		19,609
CLAMS, SUNRAY VENUS								2,914	2,914
CONCH									
CRABS, BLUE; HARD	1,239,510	976,472	2,215,982	740,965	983,025	1,723,990	361,278	767,549	1,128,827
CRABS, BLUE; SOFT								36	36
CRABS, STONE					802	802	1,056	43,412	44,468
LOBSTER, SPANISH		20	20						
LOBSTER, SPINY (CRAWFISH)	270,287	48,675	318,962	523,746	1,706,642	2,230,388	385,064	864,153	1,249,217
OYSTERS	887		887	800		800	877	183,698	184,575
SCALLOPS, BAY		9,644	9,644		2,596	2,596		1,312	1,312
SCALLOPS, CALICO	123,400		123,400	100,648		100,648	27,424		27,424
SHRIMP, EAST COAST	657,484		657,484	388,326		388,326	459,571		459,571
SHRIMP, CAMPECHE		41,236	41,236						
SHRIMP, CARIBBEAN									
SHRIMP, CENTRAL WEST COAST		551,382	551,382		185,356	185,356		33,597	33,597
SHRIMP, TORTUGAS		538,137	538,137		447,753	447,753		488,863	488,863
SHRIMP, UPPER WEST COAST		814,515	814,515		518,803	518,803		489,675	489,675
SPONGES, GRASS	417	24	441	276	102	378	143	119	262
SPONGES, SHEEPSWOOL	531	604	1,135	348	341	689	215	628	843
SPONGES, YELLOW	682	225	907	164	51	215	171	460	631
SQUID	5,952	4,586	10,538	2,718	4,971	7,689	713	3,206	3,919
TURTLE, GREEN		35	35						
TURTLE, LOGGERHEAD									
TOTAL SHELLFISH ET AL.	2,300,520	2,985,555	5,286,075	1,758,159	3,850,442	5,608,601	1,256,121	2,879,622	4,135,743
GRAND TOTAL	6,800,587	7,724,109	14,524,696	5,519,648	8,454,294	13,973,942	3,488,196	7,184,169	10,672,365

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NOAA--S/T 76-2065

FLORIDA LANDINGS BY COUNTIES, 1974

SPECIES	FRANKLIN	GULF	BAY	WALTON	OKALOOSA	SANTA ROSA	ESCAMBIA
FISH	POUNDS	POUNDS	POUNDS	POUNDS	POUNDS	POUNDS	POUNDS
ALEWIVES	175	590	29,182				
AMBERJACK	600		15,302		12,944		6,012
ANGELFISH		35			8	24	2,972
BALLYHOO			1,903				
BARRACUDA					12		
BLUE RUNNER OR HARDTAIL	57	158,050	386,759		80,019	78	9,354
BLUEFISH	1,757	53,062	110,221	92	82,288	454	55,516
BONITO		77,467	11,227				
CATFISH: FRESH-WATER(1)	3,488	4,444	5,440		300	1,398	225
SEA	1,430	48,041	1,260	133	27,114	429	13,746
CIGARFISH	752	182,406	228,174		274,900	75	38,556
COBIA	83		7,997		3,481		1,493
CREVALLE (JACKS)	4,508	250,017	405,208		112,456		12,411
CROAKER	10,728	72,172	120,690	5,930	107,917	116,467	1,404,042
DOLPHIN			607		192		
DRUM: BLACK	2,704	4,154	7,240		1,608		4,907
RED	28,022	9,799	3,749	92	4,996	1,042	15,304
EELS							
FLOUNDERS	55,022	8,035	16,126	306	9,352	649	37,387
GOATFISH							
GROUPERS AND SCAMP	252,134	57,800	347,655	60	53,231		70,482
GRUNTS	25	50	700		44		
HERRING, THREAD		503,341	217,674				
HOGFISH							
JEWFISH	145		79		840		146
KING MACKEREL		806	57,437		14,034		818
KING WHITING	106,207	12,836	5,322		786		5,280
MENHADEN	68,828	353,281	110,800		1,452		500
MISCELLANEOUS							
MULLET: BLACK	645,144	375,308	415,107	64,972	289,081	111,355	858,743
SILVER			5,131	150		625	
PERMIT							
PIGFISH		1,110			100		2,551
POMPANO	302	5,916	3,297		6,919	85	7,926
SAND PERCH (MOJARRA)							
SCUP	8,536	878	13,948		3,861		22,021
SEA BASS							
SEA TROUT: GRAY							
SPOTTED	75,586	40,119	106,946	7,818	21,731	16,697	83,407
WHITE	815	16	7,238		1,504	8,801	179,064
SHAD			12,325				
SHARKS							
SHEEPSHEAD	2,707	2,755	6,780	589	4,457	2,067	34,293
SNAPPER: LANE			575				
MANGROVE	1,443	175	4,196		80		3,302
MUTTON							
RED	116,036	40,748	1,887,040	150	331,466		542,612
VERMILION	319	865	77,077		9,094		86,257
YELLOWTAIL			510				
SPANISH MACKEREL	5,198	241,307	174,973		37,029	2,286	258,333
SPANISH SARDINES	1,924	358,241	224,728		150,665		50,532
SPOT	18,869	27,548	9,040		683	2,181	32,466
STURGEON			115			288	3,821
SWORDFISH			48,752				
TENPOUNDER (LADYFISH)	182	1,127,865	512,590		136,771	20,075	34,883
TILAPIA (NILE PERCH)							
TILEFISH							
TRIGGER FISH	17		13,289		13,203		24,061
TRIPLETAIL	36						5
WAHOO							
WARSAW		673	27,393		8,153		17,136
UNCLASSIFIED: FOR FOOD					20	16	2,589
FOR MISC.	79	20,525	31,555				1,309
TOTAL FISH	1,413,858	4,040,435	5,673,357	80,292	1,802,791	285,092	3,925,362
SHELLFISH ET AL.							
CLAMS: HARD							
SUNRAY VENUS	4,068					405	
CONCH							
CRABS, BLUE, HARD	1,443,753	163	77,911	37,745	3,275	15,733	20,818
SOFT							
STONE	1,528				710		
SPANISH	1,106	30					
LOBSTER: SPINY							
OYSTERS	2,453,995	7,644	70,436	7,780	578	27,862	36,536
SCALLOPS: BAY		7,479	8,749				
CALICO							
SHRIMP(HEADS-ON): EAST COAST							
CAMPECHE	778,160		158,519				30,646
CARIBBEAN							
CENTRAL WEST COAST	38,513		9,082				3,954
TORTUGAS	108,202	17,055	125,673				6,038
UPPER WEST COAST	3,038,728	731,707	1,397,571		298,812		944,009
TOTAL SHRIMP	3,963,603	748,762	1,690,845		298,812		984,647
SPONGES: GRASS							
SHEEPSWOOL							
YELLOW							
SQUID	5,595	331	4,980		232		13,691
TURTLES: GREEN							35
LOGGERHEAD							
TOTAL SHELLFISH ET AL.	7,873,648	764,429	1,852,921	45,525	303,607	44,000	1,055,727
GRAND TOTAL	9,287,506	4,804,864	7,526,278	125,817	2,106,398	329,092	4,981,089

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C. F. S. NO. 6719

FLORIDA LANDINGS BY MONTHS, 1974

SPECIES	OCTOBER EAST COAST	OCTOBER WEST COAST	OCTOBER TOTAL	NOVEMBER EAST COAST	NOVEMBER WEST COAST	NOVEMBER TOTAL	DECEMBER EAST COAST	DECEMBER WEST COAST	DECEMBER TOTAL
	POUNDS								
FISH									
ALEWIVES		2,578	2,578		175	175			
AMBERJACK	350	1,516	1,866	1,089	6,174	7,263	4,085	2,968	7,053
ANGELFISH	322	127	449	282	598	880	191	526	717
BALLYHOO	15,714	19,282	34,996	8,571	12,206	20,777	19,142	13,757	32,899
BARRACUDA				136		136			
BLUE RUNNER OR HARDTAIL	3,861	14,262	18,123	11,812	648	12,460	16,986		16,986
BLUEFISH	15,159	40,980	56,139	62,645	91,276	153,921	159,763	39,782	199,545
BONITO		855	855	149		149	152	20	172
CATFISH, FRESH (1)	77,194	3,378	80,572	94,392	1,721	96,113	102,955	404	103,359
CATFISH, SALT	5,015	806	5,821	4,195	20,089	24,284	3,338	218	3,556
CIGARFISH		18,845	18,845	50	8,176	8,226			
COBIA	321	7,144	7,465	440	8,814	9,254	1,586	8,544	10,130
CREVALLE (JACKS)	7,610	582,263	589,873	13,680	214,650	228,330	10,902	87,537	98,439
CROAKER	4,575	139,838	144,413	2,649	130,909	133,558	1,118	138,120	139,238
DOLPHIN	865	478	1,343	374	622	996	647	1,734	2,381
DRUM, BLACK	7,526	11,704	19,230	6,751	4,061	10,812	8,496	4,930	13,426
DRUM, RED	9,270	97,218	106,488	8,071	97,059	105,130	10,317	100,063	110,380
EELS	67,623		67,623	88,009	5,671	93,680	137,867		137,867
FLOUNDERS	40,704	24,571	65,275	50,285	17,042	67,327	24,185	14,072	38,257
GOATFISH	4,445		4,445	7,451		7,451	4,180		4,180
GROUPERS AND SCAMP	16,511	309,546	326,057	19,825	408,089	427,914	25,971	374,324	400,295
GRUNTS	5,613	9,256	14,869	3,143	16,032	19,175	2,318	14,424	16,742
HERRING, THREAD		105,325	105,325		28,250	28,250			
HOGFISH	315	1,044	1,359	200	619	819	10	1,080	1,090
JEWFISH	415	8,437	8,852	205	13,001	13,206	1,064	10,715	11,779
KING MACKEREL	24,416	59,307	83,723	127,264	36,213	163,477	842,289	180,536	1,022,825
KING WHITING	53,628	14,007	67,635	107,308	12,578	119,886	77,760	12,832	90,592
MENHADEN	273,153	15,017	288,170	410,252	3,510	413,762	65,910		65,910
MISCELLANEOUS									
MULLET, BLACK	267,671	2,556,114	2,823,785	258,187	4,700,036	4,958,223	308,352	3,352,720	3,661,072
MULLET, SILVER	32,900	105,714	138,614	34,700	4,435	39,135	13,156	26,675	39,831
PERMIT	414	11,059	11,473	749	10,298	11,047	662	8,465	9,127
PIGFISH	566	4,021	4,587	745	1,999	2,744	1,137	774	1,911
POMPANO	7,406	97,935	105,341	9,527	127,629	137,156	56,932	122,436	179,368
SAND PERCH (MOJARRA)	16,442	11,085	27,527	13,483	8,478	21,961	4,368	2,387	6,755
SCUP	3,537	3,876	7,413	2,402	7,423	9,825	7,395	4,332	11,727
SEA BASS	3,382	2,519	5,901	14,465	3,573	18,038	7,025	3,996	11,021
SEA TROUT, GRAY	6,421	4,317	10,738	3,500	3,126	6,626	25,556	66	25,622
SEA TROUT, SPOT	36,341	191,714	228,055	52,695	219,504	272,199	56,483	290,553	347,036
SEA TROUT, WHITE	19	12,988	13,007	465	37,874	38,339	17	32,761	32,778
SHAD							859		859
SHARKS		90	90	480	368	848	363	7,507	7,870
SHEEPSHEAD	35,013	24,558	59,571	39,943	23,605	63,548	32,427	40,788	73,215
SNAPPER, LANE	73	118	191	549	4,663	5,212	889	195	1,084
SNAPPER, MANGROVE	9,068	30,864	39,932	14,091	32,242	46,333	4,833	14,550	19,383
SNAPPER, MUTTON	19,475	14,516	33,991	9,181	13,875	23,056	15,654	18,063	33,717
SNAPPER, RED	38,024	417,330	455,354	35,850	345,340	381,190	45,972	378,398	424,370
SNAPPER, VERMILLION	15,620	22,834	38,454	3,644	22,367	26,011	10,831	21,971	32,802
SNAPPER, YELLOWTAIL	4,586	28,538	33,124	2,550	24,392	26,942	2,196	30,807	33,003
SPANISH MACKEREL	52,855	351,926	404,781	131,912	393,015	524,927	408,953	1,020,764	1,429,717
SPANISH SARDINES		91,337	91,337		48,630	48,630	2,229		2,229
SPOT	322,597	21,945	344,542	264,846	12,292	277,138	18,428	1,558	19,986
STURGEON									
SWORDFISH		812	812		600	600			
TENPOUNDER (LADYFISH)		673,037	673,037		104,272	104,272		2,000	2,000
TILAPIA (NILE PERCH)		666	666		530	530		1,800	1,800
TILEFISH	11,940	1,107	13,047	28,544	802	29,346	4,711	681	5,392
TRIGGER FISH	846	6,086	6,932	505	5,387	5,892	2,148	2,931	5,079
TRIPLETAIL		8	8	38		38	340		340
WAHOO	42		42	116		116	62		62
WARSAW	1,407	4,893	6,300	2,929	16,698	19,627	1,523	8,031	9,554
1-UNCLASSIFIED - FOOD	19,921	141,131	161,052	29,391	131,729	161,120	26,177	133,916	160,093
2-UNCLASSIFIED - MISC.	8,066	41,636	49,702	38,898	45,122	84,020	12,414	44,797	57,211
TOTAL FISH.	1,549,237	6,362,558	7,911,795	2,023,613	7,488,487	9,512,100	2,593,324	6,580,508	9,173,832
SHELLFISH ET AL.									
CLAMS HARD	8,178		8,178	17,463		17,463	5,002		5,002
CLAMS, SUNRAY VENUS									
CONCH									
CRABS, BLUE; HARD	430,061	739,734	1,169,795	341,304	564,244	905,548	244,942	651,470	896,412
CRABS, BLUE; SOFT							135		135
CRABS, STONE	10,901	130,495	141,396	8,344	257,171	265,515	9,143	358,661	367,804
LOBSTER, SPANISH		38	38	92		92	8,676	690	9,366
LOBSTER, SPINY (CRAWFISH)	439,979	1,492,501	1,932,480	355,337	505,822	861,159	386,898	991,034	1,377,932
OYSTERS	4,008	259,311	263,319	12,696	242,217	254,913	15,743	337,145	352,888
SCALLOPS, BAY									
SCALLOPS, CALICO	12,568		12,568	50,544		50,544	15,666		15,666
SHRIMP, EAST COAST	501,852	1,715	503,567	458,344	1,363	459,707	496,775		496,775
SHRIMP, CAMPECHE		50,128	50,128		348,234	348,234		378,646	378,646
SHRIMP, CARIBBEAN									
SHRIMP, CENTRAL WEST COAST		65,255	65,255		81,657	81,657		83,145	83,145
SHRIMP, TORTUGAS		921,744	921,744		2,273,013	2,273,013		2,231,781	2,231,781
SHRIMP, UPPER WEST COAST		722,317	722,317		825,151	825,151		473,810	473,810
SPONGES, GRASS	178	124	302	113	98	211	428	474	902
SPONGES, SHEEPSWOOL	260	407	667	90	137	227	421	533	954
SPONGES, YELLOW	273	147	420	132	52	184	262	211	473
SQUID	1,684	2,035	3,719	3,314	2,808	6,122	2,379	4,387	6,766
TURTLE, GREEN					600	600			
TURTLE, LOGGERHEAD									
TOTAL SHELLFISH ET AL.	1,409,942	4,385,951	5,795,893	1,247,773	5,102,567	6,350,340	1,186,470	5,511,987	6,698,457
GRAND TOTAL	2,959,179	10,748,509	13,707,688	3,271,386	12,591,054	15,862,440	3,779,794	12,092,495	15,872,289

SEE FOOTNOTES ON PAGE 3.

CONVERSION FACTORS USED IN PREPARING THIS REPORT

SPECIES	DATA COLLECTED AS	CONVERTED TO AND PUBLISHED IN POUNDS AS	BY MULTIPLYING BY
CLAMS	GALLONS	MEATS	8.75
DO.	U.S. BUSHELS	DO	*
OYSTERS	GALLONS	DO	8.75
DO.	U.S. BUSHELS	DO	*
SCALLOPS, CALICO	GALLONS	DO	8
DO.	U.S. BUSHELS	DO	*
CRABS:			
BLUE	ROUND WEIGHT	ROUND WEIGHT	1
STONE	DO	DO	1
DO.	CLAWS	DO	2
SHRIMP:			
BROWN	POUNDS OF TAILS	DO	1.61
PINK	DO	DO	1.6
ROCK	DO	DO	1.67
ROYAL RED	DO	DO	1.8
SEA BOBS	DO	DO	1.53
WHITE	DO	DO	1.54
SPINY LOBSTER	ROUND WEIGHT	DO	1
DO.	TAIL WEIGHT	DO	3
SPONGES:			
GLOVE:			
DIVING	PIECES	CLEANED (DRY) WEIGHT	.05
HOOKING	DO	DO	.045
GRASS:			
DIVING	DO	DO	.055
HOOKING	DO	DO	.071
SHEEPSWOOL:			
DIVING	DO	DO	.091
HOOKING	DO	DO	.062
YELLOW:			
DIVING	DO	DO	.071
HOOKING	DO	DO	.071

*CONVERSION FACTOR IS NOT CONSTANT AND IS BASED ON REPORTS OF PRODUCING FIRMS.

FLORIDA LANDINGS BY COUNTIES, 1974

SPECIES	NASSAU	DUVAL	PUTNAM	ST JOHNS	VOLUSIA	BREVARD	INDIAN RIVER	ST LUCIE
FISH	POUNDS	POUNDS	POUNDS	POUNDS	POUNDS	POUNDS	POUNDS	POUNDS
ALEWIVES								
AMBERJACK		2,712		22	71	6,302	2,169	18,913
ANGELFISH		77			820	1,628	136	892
BALLYHOO								
BARRACUDA								
BLUE RUNNER OR HARDTAIL		119			10,250	1,176	4,029	21,865
BLUEFISH		90,750		841	89,551	112,463	127,318	320,065
BONITO						2,952	103	756
CATFISH: FRESH-WATER(1)	5,664	11,977	1,690,895			4,536		
SEA		399			57,317			
CIGARFISH								
COBIA		299		139	1,255	2,801	1,552	2,597
CREVALLE (JACKS)		25,342			33,923	5,784	600	18,110
CROAKER		17,860		576		2,943	4,629	11,669
DOLPHIN		474		367	339	2,608	681	7,218
DRUM: BLACK	6,699	22,249		275	13,810	15,833	5,063	5,927
RED	1,818	52,277	718	22	51,452	20,807	5,357	1,769
EELS		100	313,212					285
FLOUNDERS	8,470	53,315		28,745	28,111	46,598	723	11,819
GOATFISH						8,544	431	436
GROUPERS AND SCAMP	6,196	61,444		18,285	68,496	111,709	33,907	108,657
GRUNTS		77		95		4,605	24	363
HERRING, THREAD								
HOGFISH						342	63	
JEWFISH		87		77	112	17,916	691	12,316
KING MACKEREL	606	16,536		586	28,740	783,609	1,470,421	1,160,070
KING WHITING	64,439	452,350		113,187	98,068	151,552	10,845	16,293
MENHADEN	11,562,357	1,275			54,447	351,817	662,745	3,120
MISCELLANEOUS					82			
MULLET: BLACK	23,594	153,968	12,000	55	901,369	837,275	364,943	160,288
SILVER		634	274		6,360	312,662	3,470	67,876
PERMIT		165			530	801	607	1,542
PIGFISH		21			300	1,458	719	1,991
POMPANO	477	1,029		165	17,023	37,658	41,778	36,882
SAND PERCH (MOJARRA)		100		700	425	404		16,443
SCUP	143	50,664		13,486	6,823	1,913	942	140
SEA BASS	2,580	17,689		9,541	23,433	26,292	7,728	2,950
SEA TROUT: GRAY	594	36,743		1,036	3,534	10,239	20,173	37,503
SPOTTED	4,597	77,556		1,824	258,812	115,855	70,810	77,316
WHITE		1,683					36	465
SHAD		84,071	14,769	1,028				
SHARKS				843		92		
SHEEPSHEAD	3,188	26,646		1,554	42,824	61,945	8,971	17,478
SNAPPER: LANE						4	42	1,223
MANGROVE		6,673		4,263	12,975	10,598	8,471	34,292
MUTTON		85,190		1,930	27	33,186	5,445	808
RED	4,865	112,625		51,235	70,434	119,677	29,459	23,058
VERMILION		66,641		18,772	7,937	1,190	410	2,972
YELLOWTAIL						2,313	98	1,309
SPANISH MACKEREL	1,184	5,781		2,583	94,004	184,174	126,419	777,749
SPANISH SARDINES								
SPOT	3,945	63,194		269	82,603	334,075	596,065	382,358
STURGEON								
SWORDFISH								
TENPOUNDER (LADYFISH)		1,217				10		
TILAPIA (NILE PERCH)					1,200			
TILEFISH				552	3,057	8,342	2,656	60,953
TRIGGER FISH	366	6,145		1,584	4,240	1,991	2,582	
TRIPLETAIL		90				80	40	78
WAHOO						46	79	360
WARSAW		3,139		1,052	314	14,030	1,979	24,794
UNCLASSIFIED: FOR FOOD	445	13,355	1,150	610	62,343	47,162	22,323	50,389
FOR MISC.	6,815	17,556		1,200	496	76,431		216
TOTAL FISH	11,709,042	1,642,284	2,033,018	277,499	2,137,907	3,896,428	3,647,732	3,504,513
SHELLFISH ET AL.								
CLAMS: HARD				1,679	4,994	85,524	1,935	
SUNRAY VENUS								
CONCH								
CRABS: BLUE: HARD	871,784	181,896	1,762,387	692,787	189,380	3,195,874	537,108	9,226
SOFT			135					
STONE					15	6,639		
SPANISH								
LOBSTER: SPINY						15	586	609
OYSTERS	2,875	19,027		47,429	1,916	21,539	4,938	
SCALLOPS: BAY						56,960		
CALICO						1,074,354		
SHRIMP(HEADS-ON): EAST COAST	695,548	1,554,911		502,692	393,929	844,427		
CAMPECHE								
CARIBBEAN								
CENTRAL WEST COAST								
TORTUGAS								
UPPER WEST COAST								
TOTAL SHRIMP	695,548	1,554,911		502,692	393,929	844,427		
SPONGES: GRASS								
SHEEPSWOOL								
YELLOW								
SQUID	227			1,204	13,616	7,395		
TURTLES: GREEN						9,154		
LOGGERHEAD		2,664				4,941		
TOTAL SHELLFISH ET AL.	1,570,434	1,758,488	1,762,522	1,245,791	603,850	5,306,822	544,565	9,835
GRAND TOTAL	13,279,476	3,400,772	3,795,540	1,523,290	2,741,757	9,203,250	4,192,297	3,514,348

SEE FOOTNOTES ON PAGE 3.

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FLORIDA LANDINGS BY COUNTIES, 1974

SPECIES	MARTIN	PALM BEACH	BROWARD	DADE	MONROE	COLLIER	LEE	CHARLOTTE
FISH	POUNDS	POUNDS	POUNDS	POUNDS	POUNDS	POUNDS	POUNDS	POUNDS
ALEWIVES								
AMBERJACK	712	3,636		602	12,889	80		
ANGELFISH	933	145				226	75	
BALLYHOO		86		177,569	212,163			
BARRACUDA		216		56				
BLUE RUNNER OR HARDTAIL	18,288	15,928		5,685	3,512	617	13,723	80
BLUEFISH	365,472	159,866		6,157	33,565	14,344	44,940	35,869
BONITO	1,195	398			103	5,614	4,358	
CATFISH: FRESH-WATER(1)		115						136
SEA	2,070	176						
CIGARFISH		50						
COBIA	1,329	779		929	11,956	2,621	59,845	
CREVALLE (JACKS)	28,766	7,525		1,161	1,953	87,833	289,624	178,082
CROAKER	22,653	4,708		99				
DOLPHIN	304	1,269		2,053	68,536			
DRUM: BLACK	16,762	4,662		1,068		2,217	298	4,223
RED	1,125	1,921		52	58	14,333	492,933	115,284
EELS							5,671	
FLOUNDERS	970	32,148		36	3	1	74,125	4,121
GOATFISH	44,075	9,378			265			
GROUPERS AND SCAMP	16,891	30,686		133,798	667,716	116,737	819,632	14,232
GRUNTS	6,502	404		17,289	24,748	230		
HERRING, THREAD	36,234				9,938	590		
HOGFISH		240		3,665	10,382		23	
JEWFISH	7,043	7,065		1,073	23,785	2,749	119,335	1,008
KING MACKEREL	22,636	686,876		97,440	2,400,546	2,665,103	915,087	
KING WHITING	47,738	6,622		1,331	34		2,614	4,800
MENHADEN		1,139					20,080	
MISCELLANEOUS								
MULLET: BLACK	268,564	41,238		415		3,236,315	5,913,523	2,853,364
SILVER	29,760	46,476		111,590	481,934	43,359	21,247	
PERMIT	1,234	608			430	4,209	24,427	
PIGFISH	417	9,097		771				
POMPANO	67,522	18,485		6,945	75,645	150,350	746,815	46,619
SAND PERCH (MOJARRA)	137,433	16,952					21,671	58,834
SCUP	20	369		1,235	428	207	2,783	687
SEA BASS	2,290	2,594						
SEA TROUT: GRAY	10,285	8,829			350	216	2,142	253
SPOTTED	20,765	28,221		2,783	34,370	47,511	1,025,230	153,520
WHITE		50				1,420	12,062	6,422
SHAD		100						
SHARKS		600			13,785	2,374	8,846	28
SHEEPSHEAD	124,177	14,844		820		480	59,343	72,548
SNAPPER: LANE	3,148	2,926		6,474	4,181		13,862	40
MANGROVE	6,753	33,936		13,758	295,921	4,788	225,867	6,876
MUTTON	811	36,137		38,233	192,885	171	58,082	
RED	1,678	4,051		140,416	25,723	2,184	220,132	915
VERMILION	88	1,042		2,355	1,400			
YELLOWTAIL	12,731	22,357		65,968	798,565		138,083	
SPANISH MACKEREL	495,272	352,762		306,349	5,223,441	1,033,040	845,378	102,539
SPANISH SARDINES	2,229							
SPOT	118,999	166,305		22			51	1,297
STURGEON								
SWORDFISH					256			
TENPOUNDER (LADYFISH)		519				3,025		
TILAPIA (NILE PERCH)								
TILEFISH	8,655	2,526		684	14,393			
TRIGGER FISH		695			867			
TRIPLETAIL	939	28					1,214	
WAHOO	24	57		179	125			
WARSAW	10,296	100		4,395	10,678		417	112
UNCLASSIFIED: FOR FOOD	20,792	31,668		16,474	183,911	109,339	818,985	28,960
FOR MISC.	72,878	100			29,090	48,448	30,052	
TOTAL FISH	2,059,458	1,819,690		1,169,929	10,870,530	7,600,731	13,052,575	3,690,849
SHELLFISH ET AL.								
CLAMS: HARD								
SUNRAY VENUS								
CONCH								
CRABS: BLUE: HARD	25,630	827		4,820	45	4,447		328,261
SOFT								36
STONE	1,333	3,998		54,781	855,344	1,145,933	196,526	68,839
SPANISH				8,768	690			
LOBSTER: SPINY	3,125	188,721	25,518	3,919,937	6,606,127	116,059	9,120	4,161
OYSTERS								
SCALLOPS: BAY								
CALICO								
SHRIMP(HEADS-ON): EAST COAST					4,564		79	
CAMPECHE					335,419		1,014,699	
CARIBBEAN								
CENTRAL WEST COAST					17,100		328,249	10,658
TORTUGAS					10,814,888	15,422	4,407,779	199,653
UPPER WEST COAST					58,577		53,931	251
TOTAL SHRIMP					11,230,548	15,422	5,804,737	210,562
SPONGES: GRASS				3,720	1,071			
SHEEPSWOOL				4,715	4,261			
YELLOW				3,662	844			
SQUID					4,668		16,752	7
TURTLES: GREEN					17,477			
LOGGERHEAD								
TOTAL SHELLFISH ET AL.	30,088	193,546	25,518	4,000,403	18,721,075	1,281,861	6,027,135	611,866
GRAND TOTAL	2,089,546	2,013,236	25,518	5,170,332	29,591,605	8,882,592	19,079,710	4,302,715

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(CONTINUED ON NEXT PAGE)

FLORIDA LANDINGS BY COUNTIES, 1974

SPECIES	SARASOTA	MANATEE	HILLSBOROUGH	PINELLAS	PASCO-CITRUS	LEVY	DIXIE-TAYLOR	WAKULLA
FISH	POUNDS	POUNDS	POUNDS	POUNDS	POUNDS	POUNDS	POUNDS	POUNDS
ALEWIVES								148,788
AMBERJACK	472		996	7,628			613	
ANGELFISH	252	1,585	124	370	812			
BALLYHOO								
BARRACUDA								
BLUE RUNNER OR HARDTAIL		2,123		5	1,747		710	1,800
BLUEFISH	23,691	25,161		6,658	4,823	537	6,605	1,381
BONITO								
CATFISH: FRESH-WATER(1)		243	1,383	3,189			54	
SEA			9,183				1,443	
CIGARFISH								
COBIA	50	338		987	92		35	
CREVALLE (JACKS)	31,994	236,175	6,582	87,677	148,536	7,131	17,218	211,029
CROAKER		18,746		30			1,406	19,895
DOLPHIN				612				
DRUM: BLACK	2,181	11,004	6,164	1,624	773	2,068	616	8,073
RED	23,675	209,663	8,119	32,021	77,707	44,297	48,837	60,404
EELS								
FLOUNDERS	158	1,425	4,688	3,381	377	486	3,908	6,787
GOATFISH		1,139						
GROUPERS AND SCAMP	111,824	746,038	111,479	2,630,547	72,171	7,157	883	30,380
GRUNTS		9,650	57	119,832	93,697	4,715	297	4,319
HERRING, THREAD								
HOGFISH				1,719				
JEWFISH	400	195		9,884	2,200			
KING MACKEREL	19,042	12,467	1,645	40,943	4,151	212	1,346	
KING WHITING		2,543	2,053	6,800	3,223		174	780
MENHADEN		265		33	1,179	4,000	3,655	138,165
MISCELLANEOUS								
MULLET: BLACK	387,754	2,607,572	1,969,053	1,573,883	1,613,094	600,496	724,754	879,835
SILVER	2,337	15,874	2,600	11,029	19,925		1,151	1,500
PERMIT	3,923	14,449		3,450	1,923	250		
PIGFISH				263			8,640	280
POMPANO	32,321	60,355	1,452	39,933	7,468	3,498	14,442	1,030
SAND PERCH (MOJARRA)	10,342	7,469	23,066	2,878	3,685		129	
SCUP		10,740	25	13,901	1,341			
SEA BASS			7	32,061	14,378	685	3,109	345
SEA TROUT: GRAY					7,291			170
SPOTTED	23,568	134,038	23,483	60,460	119,942	34,273	133,508	118,295
WHITE		2,874		3,448	18	75	368	
SHAD								
SHARKS					48			
SHEEPSHEAD	14,148	4,859	5,073	36,478	12,901	5,396	10,184	9,542
SNAPPER: LANE				16				240
MANGROVE	2,249	2,774	141	36,691	2,344			
MUTTON	94	1,129		4,329	81	212		
RED	44,812	394,756	78,300	896,608	14,024	36	710	15,168
VERMILION		2,196		377				
YELLOWTAIL	16	124		567				
SPANISH MACKEREL	64,867	129,133		97,328	23,644	5,555	6,577	15,118
SPANISH SARDINES								
SPOT	602	20,889	2,028	4,295	594	6,032	3,247	14,177
STURGEON								
SWORDFISH		798						
TENPOUNDER (LADYFISH)	878	3,116		3,675				125,819
TILAPIA (NILE PERCH)			60	5,628	4,986			
TILEFISH		293		209				
TRIGGER FISH				1,479				
TRIPLETAIL								
WAHOO								
WARSAW		46,601		7,213	115			
UNCLASSIFIED: FOR FOOD	11,970	217,252	8,758	46,715	25,816	18,389	26,653	1,388
FOR MISC		2,300	595	113	78,325	28,237	134,539	224,395
TOTAL FISH	813,620	4,958,351	2,267,114	5,836,967	2,363,431	773,837	1,155,809	2,039,103
SHELLFISH ET AL.								
CLAMS: HARD								
SUNRAY VENUS								2,914
CONCH								
CRABS, BLUE, HARD		20,972	34,784	5,350	1,682,929	713,179	1,871,739	3,872,623
SOFT			30					80
STONE	280	2,340		23,791	61,336	88,570	65,277	13,390
SPANISH								
LOBSTER: SPINY				111				
OYSTERS				50		22,899	7,347	18,514
SCALLOPS: BAY					56			
CALICO								
SHRIMP(HEADS-ON):EAST COAST								
CAMPECHE			703,443	148,568				
CARIBBEAN								
CENTRAL WEST COAST		41,202	793,190	486,841	68,897			
TORTUGAS		1,595	617,541	365,924	2,480			
UPPER WEST COAST		16,879	136,927	105,960	3,504	131		21,378
TOTAL SHRIMP		59,676	2,251,101	1,107,293	74,881	131		21,378
SPONGES: GRASS				108				
SHEEPSWOOL				2,315				
YELLOW				1,192				
SQUID			710					
TURTLES: GREEN								
LOGGERHEAD								
TOTAL SHELLFISH ET AL.	280	82,988	2,286,625	1,140,210	1,819,202	824,779	1,944,363	3,928,899
GRAND TOTAL	813,900	5,041,339	6,553,739	6,977,177	4,182,633	1,598,616	3,100,172	5,968,002

SEE FOOTNOTES ON PAGE 3.

(CONTINUED ON NEXT PAGE)

CURRENT FISHERIES STATISTICS NO. 6723

Texas Landings, Annual Summary 1974

In cooperation with the TEXAS PARKS AND WILDLIFE DEPARTMENT, AUSTIN, TEXAS

TEXAS LANDINGS, ANNUAL SUMMARY, 1974

Commercial landings of marine fish and shellfish were 94.0 million pounds, valued at $71.8 million–down 4.3 million pounds in volume and $21.5 million in value compared with 1973. The shrimp and oyster fisheries were responsible for the 1974 decrease.

SHRIMP. Shrimp trawlers unloading at commercial facilities in Texas made 67,073 trips into bay waters and 33,394 trips into Gulf waters, and unloaded 78.7 million pounds of shrimp (heads-on weight) with a value of $67.7 million to fishermen and/or vessel owners. Compared with 1973 this was a decrease of 4 percent in volume and 22 percent in value. Brown and pink shrimp accounted for 76 percent of the total volume; white shrimp, 22 percent; and seabobs and rock shrimp, 2 percent.

Landings include 52.0 million pounds of shrimp from adjacent Gulf waters; 12.9 million pounds from waters off Mexico; and 8.0 million pounds from waters off Louisiana.

The dockside value of headless shrimp averaged $1.37 per pound–32 cents per pound below 1973. Exvessel prices ranged from $1.59 per pound in ports with long-range vessels working throughout the year, to $1.12 per pound in ports with a large bay fleet. The price paid for good-guality shrimp is usually consistent for a given size along the entire coast.

VESSELS. Vessel construction dropped sharply in 1974. About 55 new large trawlers entered the shrimp fishery compared with 91 in 1973. Nine vessels were lost at sea, and 70 to 80 vessels were sold to foreign flag interests or transferred to other domestic fisheries.

OYSTERS. About 62,600 barrels of oysters were harvested commercially yielding 1.2 million pounds of meats valued at $1.1 million. This was 47 percent below the volume and 38 percent below the value of landings in 1973. The decline was due largely to heavy mortalities from freshwater kill in fall 1973 and spring 1974.

Out-of-State vessels that usually operate oyster dredges in Galveston Bay did not work the spring or fall season.

December 9, 1975 Washington, D.C.

noaa NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION / NATIONAL MARINE FISHERIES SERVICE

TEXAS LANDINGS, ANNUAL SUMMARY, 1974 - Continued

BLUE CRABS. Commercial crab landings of 6.1 million pounds, valued at $0.8 million were 12 percent below the volume, but almost unchanged in value from the 1973 level. The exvessel price averaged 14 cents per pound for live crabs, compared with 12 cents in 1973. Select male crabs were flown to East Coast markets throughout the year.

FINFISH. Commercial landings of edible finfish were 7.5 million pounds, valued at $2.1 million. This was 10 percent above the volume and 11 percent above the value of 1973 landings. The 1974 increase was in black and red drum and flounders.

Commercial landings of fish and shellfish do not include the ever-increasing volume of fishery products, both fresh and frozen, sold by bait camps, roadside markets, and door-to-door enterprises.

ORMAN H. FARLEY
SUPERVISORY FISHERY REPORTING
SPECIALIST
GALVESTON, TEXAS

TEXAS LANDINGS, CATCH BY WATERS, 1974

SPECIES	GULF OF MEXICO		SABINE LAKE		GALVESTON AND TRINITY BAYS	
FISH	POUNDS	DOLLARS	POUNDS	DOLLARS	POUNDS	DOLLARS
CABIO (LING)	20,000	2,993	-	-	-	-
CROAKER	95,300	5,856	-	-	28,900	2,840
DRUM:						
BLACK	67,300	8,091	-	-	27,600	3,720
RED (REDFISH)	140,700	45,050	-	-	34,900	10,792
FLOUNDERS	319,500	87,293	-	-	20,100	6,710
GROUPER	85,000	10,950	-	-	-	-
KING WHITING	125,800	12,678	-	-	6,100	566
MULLET	82,800	4,924	-	-	24,500	1,464
POMPANO	4,400	2,393	-	-	-	-
SEA CATFISH	14,400	1,707	-	-	33,200	1,828
SEA TROUT:						
SPOTTED	284,400	91,526	-	-	272,900	87,689
WHITE	-	-	-	-	1,000	146
SHEEPSHEAD	73,700	7,549	-	-	28,500	3,283
SNAPPER, RED	742,900	415,792	-	-	-	-
UNCLASSIFIED:						
FOR FOOD	99,000	8,716	-	-	41,800	3,525
FOR BAIT, REDUCTION, AND ANIMAL FOOD	130,900	6,452	-	-	60,400	3,019
TOTAL FISH	2,286,100	711,970	-	-	579,900	125,582
SHELLFISH						
CRABS, BLUE	39,900	3,475	560,800	77,090	1,983,000	273,301
OYSTER MEATS	-	-	-	-	836,800	753,292
SHRIMP (HEADS-ON):						
BROWN AND PINK	57,194,700	50,641,037	-	-	1,422,600	378,773
WHITE	12,066,200	12,216,269	-	-	2,392,400	1,432,538
OTHER	1,437,400	335,493	-	-	-	-
SQUID	10,400	1,735	-	-	3,700	792
TOTAL SHELLFISH	70,748,600	53,198,009	560,800	77,090	6,638,500	2,838,696
GRAND TOTAL	73,034,700	53,909,979	560,800	77,090	7,218,400	2,964,278

SPECIES	MATAGORDA, EAST MATAGORDA AND LAVACO BAYS		SAN ANTONIO, MESQUITE, ESPIRITU SANTO BAYS, AND GREEN LAKE		ARANSAS AND COPANA BAYS	
FISH	POUNDS	DOLLARS	POUNDS	DOLLARS	POUNDS	DOLLARS
CROAKER	1,100	133	300	45	5,600	291
DRUM:						
BLACK	14,700	2,101	109,700	15,720	118,400	16,674
RED (REDFISH)	52,500	17,685	168,600	58,288	244,000	79,488
FLOUNDERS	22,800	8,788	27,600	11,190	43,600	13,863
KING WHITING	-	-	-	-	100	3
MULLET	600	115	-	-	3,500	210
POMPANO	-	-	-	-	300	147
SEA CATFISH	-	-	2,900	443	8,100	1,266
SEA TROUT, SPOTTED	130,100	44,390	103,800	37,185	202,500	66,588
SHEEPSHEAD	5,700	801	9,000	1,109	52,300	2,730
UNCLASSIFIED, FOR BAIT, REDUCTION, AND ANIMAL FOOD	-	-	109,400	8,299	11,200	607
TOTAL FISH	227,500	74,013	531,300	132,279	689,600	181,867
SHELLFISH						
CRABS, BLUE	959,300	132,032	1,124,300	152,447	1,079,300	147,628
OYSTER MEATS	197,100	157,815	196,600	189,627	9,900	11,295
SHRIMP (HEADS-ON):						
BROWN AND PINK	469,800	117,479	67,100	16,322	210,900	53,874
WHITE	1,418,700	1,121,585	815,300	474,806	706,300	540,552
SQUID	800	149	-	-	-	-
TOTAL SHELLFISH	3,045,700	1,529,060	2,203,300	833,202	2,006,400	753,349
GRAND TOTAL	3,273,200	1,603,073	2,734,600	965,481	2,696,000	935,216

SEE NOTE ON PAGE 4.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Washington, D.C. 20235

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TEXAS LANDINGS BY MONTHS, 1974 - Continued

SPECIES	JULY		AUGUST		SEPTEMBER	
FISH	POUNDS	DOLLARS	POUNDS	DOLLARS	POUNDS	DOLLARS
CABIO (LING).	6,000	1,110	5,900	853	4,900	611
CROAKER	13,700	1,248	10,100	780	24,700	1,781
DRUM:						
BLACK	95,800	19,614	128,700	28,681	63,400	14,775
RED (REDFISH)	119,600	43,068	143,300	52,723	176,200	57,334
FLOUNDERS	44,000	14,150	40,700	12,662	45,100	15,272
GROUPER	6,300	724	7,000	1,026	5,300	755
KING WHITING.	6,000	611	15,000	1,839	14,900	1,434
MULLET.	1,100	199	11,300	839	6,100	544
POMPANO	300	111	500	212	500	203
SEA CATFISH	11,800	787	22,700	1,367	7,600	685
SEA TROUT:						
SPOTTED	206,100	73,746	153,300	54,623	155,300	58,737
WHITE	100	4	-	-	300	45
SHEEPSHEAD.	15,700	1,202	23,700	2,088	19,000	1,671
SNAPPER, RED.	66,700	41,898	74,200	40,741	56,900	31,927
UNCLASSIFIED:						
FOR FOOD.	3,900	402	26,900	2,183	8,300	794
FOR BAIT, REDUCTION AND ANIMAL FOOD.	61,100	3,065	8,400	419	18,300	927
TOTAL FISH.	657,200	201,939	671,700	201,036	606,800	197,495
SHELLFISH						
CRABS, BLUE	713,200	96,949	681,400	92,580	468,400	65,272
OYSTER MEATS.	27,000	37,080	35,400	48,600	22,300	30,600
SHRIMP (HEADS-ON):						
BROWN AND PINK.	10,867,000	6,940,690	12,504,500	8,522,805	8,002,400	6,722,622
WHITE	961,100	1,471,506	1,301,600	1,187,903	1,907,200	1,574,779
OTHER	3,000	1,485	2,600	1,178	-	-
SQUID	1,100	210	1,200	191	800	131
TOTAL SHELLFISH . . .	12,572,400	8,547,920	14,526,700	9,853,257	10,401,100	8,393,504
GRAND TOTAL	13,229,600	8,749,859	15,198,400	10,054,293	11,007,900	8,590,999

SPECIES	OCTOBER		NOVEMBER		DECEMBER	
FISH	POUNDS	DOLLARS	POUNDS	DOLLARS	POUNDS	DOLLARS
CABIO (LING).	1,500	185	-	-	-	-
CROAKER	65,600	3,583	27,100	1,486	5,800	252
DRUM:						
BLACK	66,900	13,698	85,500	10,308	134,700	17,132
RED (REDFISH)	189,700	73,242	167,000	47,164	188,000	42,816
FLOUNDERS	80,700	26,850	74,900	20,955	46,500	10,550
GROUPER	7,400	1,107	7,000	961	7,100	957
KING WHITING.	19,800	1,948	13,800	1,203	8,400	725
MULLET.	17,100	1,217	13,800	811	6,900	268
POMPANO	500	220	200	102	1,000	485
SEA CATFISH	8,300	1,005	2,500	310	2,200	216
SEA TROUT:						
SPOTTED	160,000	59,226	114,300	32,508	125,300	30,416
WHITE	400	67	-	-	-	-
SHEEPSHEAD.	21,100	1,505	21,800	1,377	55,400	3,016
SNAPPER, RED.	67,400	35,337	47,600	29,299	88,500	52,912
UNCLASSIFIED:						
FOR FOOD.	17,100	1,507	9,700	1,011	6,600	525
FOR BAIT, REDUCTION AND ANIMAL FOOD.	6,300	315	21,500	1,072	2,300	110
TOTAL FISH.	729,800	221,012	606,800	148,567	578,700	160,386
SHELLFISH						
CRABS, BLUE	548,500	83,168	390,600	58,975	248,200	39,477
OYSTER MEATS.	35,800	40,852	301,000	236,725	311,200	246,882
SHRIMP (HEADS-ON):						
BROWN AND PINK.	5,926,200	6,038,344	4,255,100	3,835,545	3,204,300	2,880,617
WHITE	2,825,400	2,481,550	2,947,000	1,833,961	1,368,400	743,606
OTHER	82,000	7,490	50,000	4,005	180,000	23,006
SQUID	400	106	400	99	400	67
TOTAL SHELLFISH . . .	9,418,300	8,651,510	7,944,700	5,969,310	5,312,500	3,933,655
GRAND TOTAL	10,148,100	8,872,522	8,551,500	6,117,877	5,991,200	4,094,035

NOTE:--DATA INCLUDE REVISIONS SINCE THE PUBLICATION OF MONTHLY BULLETINS. OYSTERS ARE SHOWN IN WEIGHT OF MEATS (8.75 POUNDS PER GALLON). ALL OTHER SPECIES ARE REPORTED IN ROUND WEIGHT. THE WEIGHT OF HEADS-ON SHRIMP WAS DETERMINED BY MULTIPLYING HEADS-OFF WEIGHT BY THE FOLLOWING FACTORS: BROWN, 1.61; PINK, 1.60; WHITE, 1.54; ROYAL RED, 1.80; AND SEA BOBS, 1.53. DATA DO NOT INCLUDE LANDINGS OF FRESHWATER FISH TAKEN COMMERCIALLY IN THE COASTAL DISTRICTS.

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

NOAA--S/T 76-2029

TEXAS LANDINGS, CATCH BY WATER, 1974 - Continued

SPECIES	CORPUS CHRISTI AND NUECCES BAYS		BAFFIN BAY AND UPPER LAGUNA MADRE		CENTRAL AND LOWER LAGUNA MADRE	
FISH	POUNDS	DOLLARS	POUNDS	DOLLARS	POUNDS	DOLLARS
CROAKER	12,300	727	3,000	155	25,500	1,277
DRUM:						
BLACK	201,100	34,893	498,000	101,182	320,000	39,015
RED (REDFISH)	214,100	74,168	398,700	134,351	668,000	194,272
FLOUNDERS	37,800	11,182	9,300	3,221	26,400	6,834
KING WHITING	-	-	-	-	1,600	244
MULLET	1,100	105	400	29	300	28
POMPANO	500	225	2,100	946	4,800	2,157
SEA CATFISH	10,000	1,180	4,600	337	4,400	652
SEA TROUT, SPOTTED	178,100	60,563	331,500	112,920	492,800	144,263
SHEEPSHEAD	91,300	4,979	81,500	4,426	27,800	1,620
UNCLASSIFIED, FOR FOOD	-	-	600	44	-	-
TOTAL FISH	746,300	188,022	1,329,700	357,611	1,571,600	390,362
SHELLFISH						
CRABS, BLUE	326,300	44,339	2,000	277	12,700	1,778
OYSTER MEATS	-	-	-	-	3,300	3,755
SHRIMP (HEADS-ON):						
BROWN AND PINK	154,900	41,852	-	-	-	-
WHITE	320,300	308,486	-	-	-	-
TOTAL SHELLFISH	801,500	394,677	2,000	277	16,000	5,533
GRAND TOTAL	1,547,800	582,699	1,331,700	357,888	1,587,600	395,895

SPECIES	TOTAL			
	1973		1974	
FISH	POUNDS	DOLLARS	POUNDS	DOLLARS
CABIO (LING)	16,000	2,436	20,000	2,993
CROAKER	122,500	8,859	172,000	11,324
DRUM:				
BLACK	1,207,900	154,350	1,356,800	221,396
RED (REDFISH)	1,677,500	539,316	1,921,500	614,094
FLOUNDERS	341,900	105,275	507,100	149,081
GROUPER	100,300	14,498	85,000	10,950
KING WHITING	90,400	9,451	133,600	13,491
MULLET	158,000	8,432	113,200	6,875
POMPANO	2,100	912	12,100	5,868
SEA CATFISH	67,500	8,539	77,600	7,413
SEA TROUT:				
SPOTTED	1,968,900	645,900	1,996,100	645,124
WHITE	6,400	831	1,000	146
SHEEPSHEAD	269,400	24,500	369,800	26,497
SNAPPER, RED	781,400	401,532	742,900	415,792
UNCLASSIFIED:				
FOR FOOD	132,100	10,617	141,400	12,285
FOR BAIT, REDUCTION, AND ANIMAL FOOD	330,700	20,399	311,900	18,377
TOTAL FISH	7,273,000	1,955,847	7,962,000	2,161,706
SHELLFISH				
CRABS, BLUE	6,881,100	830,440	6,087,600	832,367
OYSTER MEATS	2,348,000	1,812,554	1,243,700	1,115,784
SHRIMP (HEADS-ON):				
BROWN AND PINK	57,669,800	63,571,837	59,520,000	51,249,337
WHITE	23,015,200	23,034,619	17,719,200	16,094,236
OTHER	1,035,300	272,999	1,437,400	335,493
SQUID	5,400	783	14,900	2,676
TOTAL SHELLFISH	90,954,800	89,523,232	86,022,800	69,629,893
GRAND TOTAL	98,227,800	91,479,079	93,984,800	71,791,599

NOTE:--DATA DO NOT INCLUDE LANDINGS OF FRESHWATER SPECIES TAKEN COMMERCIALLY IN THE COASTAL DISTRICTS. SEE NOTE ON PAGE 6.

TEXAS LANDINGS BY MONTHS, 1974

SPECIES	JANUARY		FEBRUARY		MARCH	
FISH	POUNDS	DOLLARS	POUNDS	DOLLARS	POUNDS	DOLLARS
CABIO (LING)	100	10	200	21	-	-
CROAKER	1,300	67	5,500	430	1,800	104
DRUM:						
BLACK	183,000	22,742	95,700	11,477	182,100	26,176
RED (REDFISH)	223,100	60,616	141,000	41,216	236,100	70,394
FLOUNDERS	25,000	6,965	12,800	3,280	22,600	5,693
GROUPER	4,500	533	5,500	714	12,500	1,563
KING WHITING	9,200	680	2,200	204	6,800	683
MULLET	16,800	850	12,300	641	26,600	1,354
POMPANO	900	396	900	407	2,400	1,079
SEA CATFISH	3,200	454	1,300	167	6,000	945
SEA TROUT:						
SPOTTED	150,800	42,317	155,300	45,297	202,700	60,990
WHITE	100	15	-	-	-	-
SHEEPSHEAD	42,000	3,009	44,900	2,997	49,400	3,678
SNAPPER, RED	67,800	34,280	77,000	40,953	42,500	23,663
UNCLASSIFIED:						
FOR FOOD	9,900	667	16,700	1,141	16,400	1,183
FOR BAIT, REDUCTION, AND ANIMAL FOOD	18,400	774	48,000	3,840	16,700	1,308
TOTAL FISH	756,100	174,375	619,300	152,785	824,600	198,813
SHELLFISH						
CRABS, BLUE	258,300	30,960	413,600	49,302	281,300	33,666
OYSTER MEATS	204,500	165,567	55,600	54,192	131,000	130,144
SHRIMP (HEADS-ON):						
BROWN AND PINK	2,647,800	4,051,349	2,189,100	2,934,401	1,645,300	2,133,611
WHITE	1,029,500	710,142	1,045,300	620,761	805,300	704,435
OTHER	475,100	126,357	585,400	156,601	39,600	8,669
SQUID	1,000	127	900	207	3,500	694
TOTAL SHELLFISH	4,616,200	5,084,502	4,289,900	3,815,464	2,906,000	3,011,219
GRAND TOTAL	5,372,300	5,258,877	4,909,200	3,968,249	3,730,600	3,210,032

SPECIES	APRIL		MAY		JUNE	
FISH	POUNDS	DOLLARS	POUNDS	DOLLARS	POUNDS	DOLLARS
CABIO (LING)	-	-	200	21	1,200	182
CROAKER	4,100	375	5,400	524	6,900	694
DRUM:						
BLACK	150,400	25,338	78,800	14,494	91,800	16,961
RED (REDFISH)	159,300	52,747	89,900	30,490	88,300	32,284
FLOUNDERS	29,600	8,538	40,700	11,453	44,500	12,703
GROUPER	10,400	1,232	4,300	503	7,700	875
KING WHITING	7,500	852	17,400	1,927	12,600	1,385
MULLET	500	34	300	59	400	59
POMPANO	1,600	709	200	112	3,100	1,832
SEA CATFISH	7,600	898	3,300	441	1,000	138
SEA TROUT:						
SPOTTED	205,300	64,841	162,100	52,783	206,600	69,640
WHITE	-	-	-	-	100	15
SHEEPSHEAD	32,300	2,661	27,100	2,068	17,400	1,225
SNAPPER, RED	46,700	25,625	47,700	23,785	59,900	35,372
UNCLASSIFIED:						
FOR FOOD	17,800	1,754	3,600	665	4,500	453
FOR BAIT, REDUCTION, AND ANIMAL FOOD	21,800	1,502	51,400	2,578	37,700	2,477
TOTAL FISH	694,900	187,106	532,400	141,903	583,700	176,295
SHELLFISH						
CRABS, BLUE	442,400	55,775	815,000	109,886	826,700	116,257
OYSTER MEATS	101,700	102,192	5,800	5,976	12,400	16,974
SHRIMP (HEADS-ON):						
BROWN AND PINK	1,380,200	1,788,566	2,666,000	2,329,188	4,232,100	3,071,599
WHITE	805,500	874,206	1,821,900	2,492,060	900,400	1,399,327
OTHER	5,900	1,400	9,300	4,577	4,500	725
SQUID	1,800	302	400	87	3,000	455
TOTAL SHELLFISH	2,737,500	2,822,441	5,318,400	4,941,774	5,979,100	4,605,337
GRAND TOTAL	3,432,400	3,009,547	5,850,800	5,083,677	6,562,800	4,781,632

SEE NOTE ON PAGE 6.

APPENDIX J.

ENDANGERED SPECIES

ENDANGERED SPECIES

The following endangered species occupy sections of the Florida and Texas coasts that are vulnerable to damage by spilled oil.

1. Red Wolf

The entire remaining population of pure-bred red wolves (i.e., not hybridized with coyotes), estimated to be 300 individuals, occurs in marshes and coastal prairies of Brazoria, Galveston, Chambers and Jefferson Counties, Texas, and probably Cameron Parish, Louisiana. Their principal food appears to be nutria, with rabbits, muskrats, and other medium-sized vertebrates also taken. No major problems should occur to this species with an oil spill, but habitat alteration from pipelines, etc., could have a harmful effect upon the species.

2. Brown Pelican

Of the estimated 23,000 Eastern brown pelicans surviving in the U.S.A., approximately 6,100 pairs breed in nesting colonies on the Florida Coast from Cape Canaveral to Seahorse Key. The total population of pelicans in this area, counting immatures, may number 17,000 birds. Small colonies with continued heavy mortality from pesticides have been reintroduced onto the Louisiana Coast (now about 200 birds), and less than 50 birds with low reproductive success are hanging on in Texas in the Aransas and Corpus Christi areas.

Pelican nesting colonies always occur on coastal islands, nests being built on ground or on tops of mangroves. Nesting season usually begins in March, and young are fledged in May-July.

After nesting season and throughout the winter, pelicans disperse from nesting colonies and may be seen all along Gulf Coast from Florida to Mobile Bay. They roost on mudflats, mangroves, etc., on island or on shore.

Principal food appears to be menhaden, threadfin herring, mullet, and other non-commercial species.

Pelicans would be highly vulnerable to oil spills at all seasons of the year, since they feed exclusively in coastal waters and roost and nest on low islands often barely above high tide levels.

3. Leatherback Turtles

A small breeding population of this worldwide species still nests on the east coast of Florida, with only 25 nests/year. This species could be eliminated from U.S. with a major oil spill coating beach nesting areas.

4. Florida Manatee

The estimated 1,000+ manatees in the U.S. have a distribution pattern dependant on both seasonal climatic changes and short-term weather fluctuations. In the spring and summer they are distributed primarily from South Georgia to the Swanee River, with occasional stragglers wandering as far north as Cape Hatteras and as far west as Padre Island, Texas. Within the coastal areas of concern, estimated summer numbers are as follows:

Cape Canaveral to Naples	-450
Naples to Destin Dome	-350
Destin Dome to Alabama line	-occasional stragglers
Alabama line to Brownsville	-occasional stragglers

During the winter, the manatee range contracts sharply, as the animals concentrate in southern Florida. Estimated winter distribution in coastal areas of concern are as follows:

Naples to Destin Dome (actually only to the Swanee River Mouth) - 400

During the winter cold spells (temperature less than 10-15°C), manatees congregate at specific refugia near natural warm springs, power plant discharges, etc. Coastal warm water refugia, with numbers of manatees commonly seen, include:

Cape Canaveral to Naples	-600
Naples to Destin Dome (actually only to Swanee River Mouth)	-400

Manatee utilization of habitats appears to be closely related to the availability of seagrasses, their primary food source in coastal environments. Species grazed include Thalassia testudium, Syringoduim filiforme, Diplanthera wrightii, and Ruppia maritima. Manatees tend to concentrate where these seagrasses are abundant, and long coastal stretches lacking these may form a significant barrier to dispersion.

This species could be significantly affected by a major oil spill in Southern Florida.

5. American Alligator

Approximately 750,000 alligators occur in the U.S. An overall estimate for the number of these inhabiting coastal areas within the area of concern is not available, but the number is considerable.

State	Total Numbers
Louisiana	201,000
Florida	408,000
Mississippi	5,000
Alabama	13,000
Texas	27,000

Although it is difficult to predict damage to this species from a major oil spill, habitat modifications in coastal wetlands resulting from an oil spill could be harmful to alligator populations.

6. Southern Bald Eagle

Florida supports the largest nesting population of Southern Bald Eagles in the U.S., at least 274 breeding pairs. In northern and Atlantic Florida, these nesting pairs are concentrated along the St. John River and other inland areas; to the south and west, however, most nests are located along the coast. A few additional nests are scattered along other parts of the Gulf Coast. The distance that eagles forage away from their nests is unknown. When fish are plentiful, they may confine most feeding to an area of a few square miles, However, given the large size and food requirements of adults and the very large foraging areas sometimes observed for smaller raptors, it is quite possible that under certain circumstances eagles might forage 25 or even 50 miles away from their nests. This species could be heavily damaged by a spill in southern Florida, or by a spill along the Louisiana coast.

7. American crocodile

All of the 200-300 remaining American crocodiles, of which less than ten are breeding females, occur in or around Florida Bay and adjacent parts of the Florida Keys and the Everglades. Adult crocidiles are much more tolerant of salt water than American alligators and primarily frequent brackish to saline environments. Few data are available on food habits. This species could be eliminated by a major spill in the Florida Keys or Florida Bay.

8. Key Deer

This species, smallest of the white-tailed deer, is primarily found in the lower Florida Keys, Monroe County, Florida. The present population of approximately 700 animals is significantly affected by development, hurricanes and fire. Road kills have also become a problem. The following keys are occupied by the key deer: Big Pine, Big Torch, Little Pine, Howe, No Name, Middle Torch, Cudjoe, Johnson, Knock-em-down, Sugarloaf, Summarland, Grassy, Water, Racoon, and Annette. The deer freely swim between them. The chief habitats of the key deer are hammocks and pinelands, with open landscapes preferred. Availability of freshwater is an important factor affecting the distribution of this animal. This species could be directly affected by an oil spill as they swim between keys, and would be seriously effected if its freshwater supplies were contaminated by oil.

9. Key Largo Woodrat

This small rodent is found only in the climax hammock vegetation on the northern portion of Key Largo, Monroe County, Florida. This is the only species of wood rat in South Florida. The species builds a very large stick nest on the ground which is reused and added to by successive generations. Two litters per year averaging two young per litter are produced by mature females. The major threat is habitat destruction by private and commercial development. Approximately, 700 to 800 individuals comprise the total population. The species would probably not be directly impacted from an oil spill, unless its water supplies were contaminated by oil, but heavy traffic from a major clean-up operation could harm the population.

10. Key Largo Deer Mouse

This small rodent is found only in the clima hammock vegetation on the northern portion of Key Largo, Monroe County, Florida. Two to three litters per year averaging four young per litter are produced. No estimate of population numbers is available. The major threat to the species is habitat destruction by private and commercial development. The mice would not be directly impacted from an oil spill, but heavy traffic from a major clean up operation could harm them.

11. Whooping Crane

The entire natural breeding population of whooping cranes (now up to more than 50 birds) winters at Aransas National Wildlife Refuge and adjacent parts of Matagorda and St. Joseph Islands. The birds arrive in November and leave in April. While at the wintering grounds, they feed heavily on blue crabs and other shore invertebrates, often within sight of the heavy oil tanker traffic moving along the intra-coastal waterway. When invertebrates are scarce, they may temporarily move inland to seek grain or freshwater invertebrates, but these are not preferred food.

Proposed critical habitat for the whooping crane includes Aransas National Wildlife Refuge and adjacent parts of San Antonia Bay, Espiritu Santo Bay, Matagorda Island, St. Joseph Island, Aransas Bay and Lamar Peninsula.

This species could be eliminated with a major oil spill occurring in the above critical habitat.

APPENDIX K.

NON-RISK IMPACTS

SUMMARY OF NON-RISK IMPACT TO TEXAS FORM THE PROPOSED SEADOCK DEEPWATER PORT

Construction Impacts

Onshore construction impacts will be limited to roughly 900 acres of natural habitats and pasturelands that will be devoted to the onshore oil terminal and underground pipelines leading to the terminal . Although the area will be dramatically altered during construction, the overall regional environmental effects of doing so will be minimal and generally not detrimental to the health of local ecological systems. The onshore environmental impacts will be most noticeable during the one to six years necessary to complete the onshore facilities,and will consist primarily of destruction of relatively small sections of natural habitats during construction activities. Certain limited areas outside the immediate vicinity of the construction sites will be used for dredge spoil disposal but the overall environmental effects of that activity are also expected to be minor. The dredge spoils will be rapidly colonized by natural elements of the regional biota. The source will be true of areas devoted to underground pipelines.

Offshore construction impacts will consist primarily of disruptions of the sea floor during installation of platforms, mooring buoys and submarine pipelines leading to onshore facilities. The environmental effects of these activities will include temporary destructions of small sections of the demersal habitat, and increases in turbidity in the water column in construction areas. These will be short term effects, however, that will end with termination of construction.

The disturbed sections of the ocean floor will be recolonized immediately by the local beuthic fanna. The overall effects of the offshore construction upon both the demersal and pelagic biota of the construction area will be insignificant and probably not measurable. Effects of construction upon ambient water quality conditions will be minor and will cease with completion of the offshore facility.

Operation and Maintainance Impacts

The environmental effects of operating the SEADOCK facilities should be minimal. Wastewaters generated on platforms in the docking area will be discharged into the ocean in an ecologically harmless fashion. Solid wastes will be transported ashore for appropriate treatment and disposal. Waste materials generated at the onshore facility will also be treated and disposed in a manner meeting EPA waste disposal standards, hence will not cause ecological problems. It will be possible to maintain the facilities with virtually no adverse effects upon surrounding environmental systems.