The Ports Corporation
The Hashemite Kingdom of Jordan

No. 1

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR OIL SPILL COMBAT IN NORTHERN AQABA GULF
IN
THE HASHEMITE KINGDOM OF JORDAN

JULY, 1995

JAPAN INTERNATIONAL COOPERATION AGENCY
YACHIYO ENGINEERING CO., LTD.
JAPAN OIL ENGINEERING CO., LTD.

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PREFACE

In response to a request from the Government of the Hashemite Kingdom of Jordan, the Government of Japan decided to conduct a basic design study on the Project for Oil Spill Combat in Northern Aqaba Gulf and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Jordan a study team from March 8 to April 6, 1995.

The team held discussions with the officials concerned of the Government of Jordan, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Jordan in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Hashemite Kingdom of Jordan for their close cooperation extended to the teams.

July, 1995

Kimio Fujita
President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

July, 1995

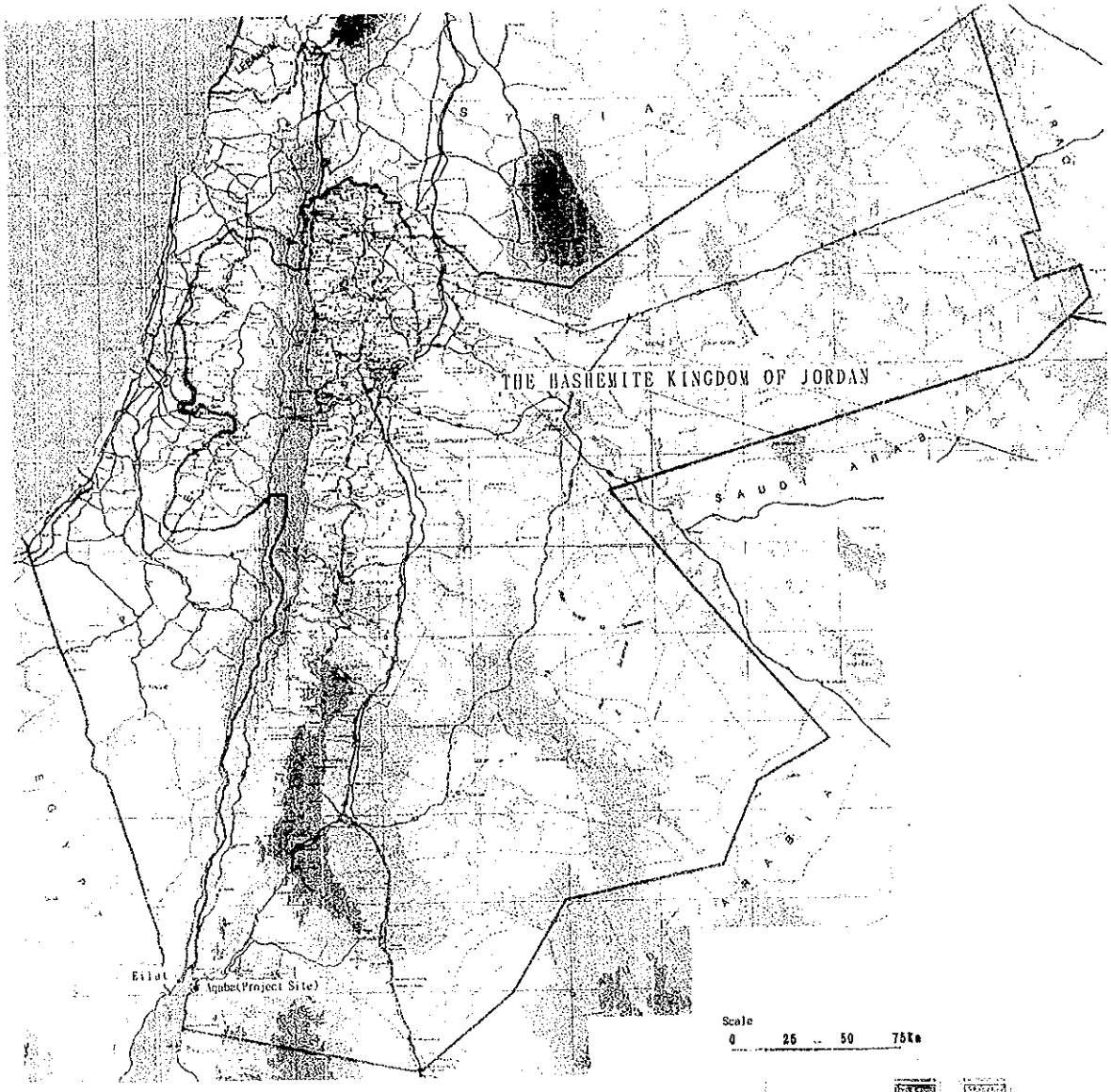
We are pleased to submit to you the basic design study report on the Project for Oil Spill Combat in Northern Aqaba Gulf in the Hashemite Kingdom of Jordan.

This study was conducted by Yachiyo Engineering Co., Ltd. and Japan Oil Engineering Co., Ltd., under a contract to JICA, during the period from March 2, to July 24, 1995. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Jordan and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

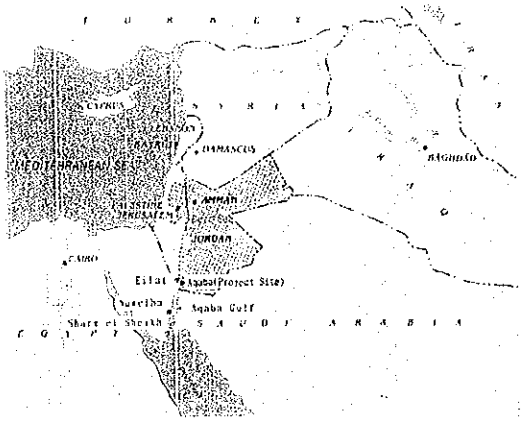
Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

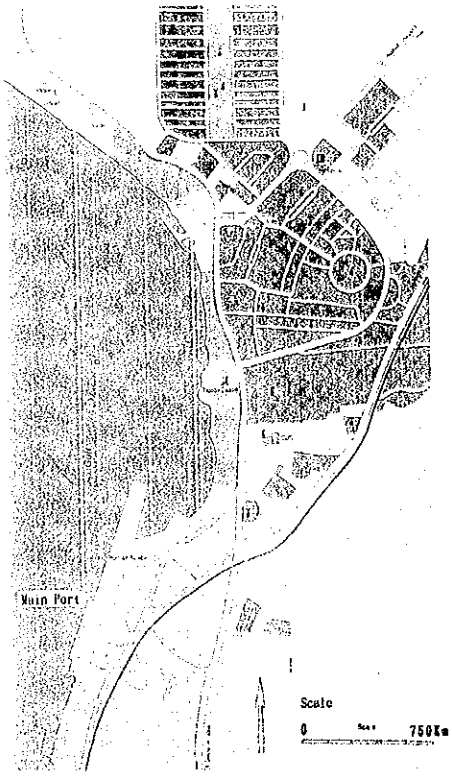
Shuji Sekiguchi
Project manager,
Basic design study team on
the Project for Oil Spill Combat in
Northern Aqaba Gulf
Yachiyo Engineering Co., Ltd.
Japan Oil Engineering Co., Ltd.



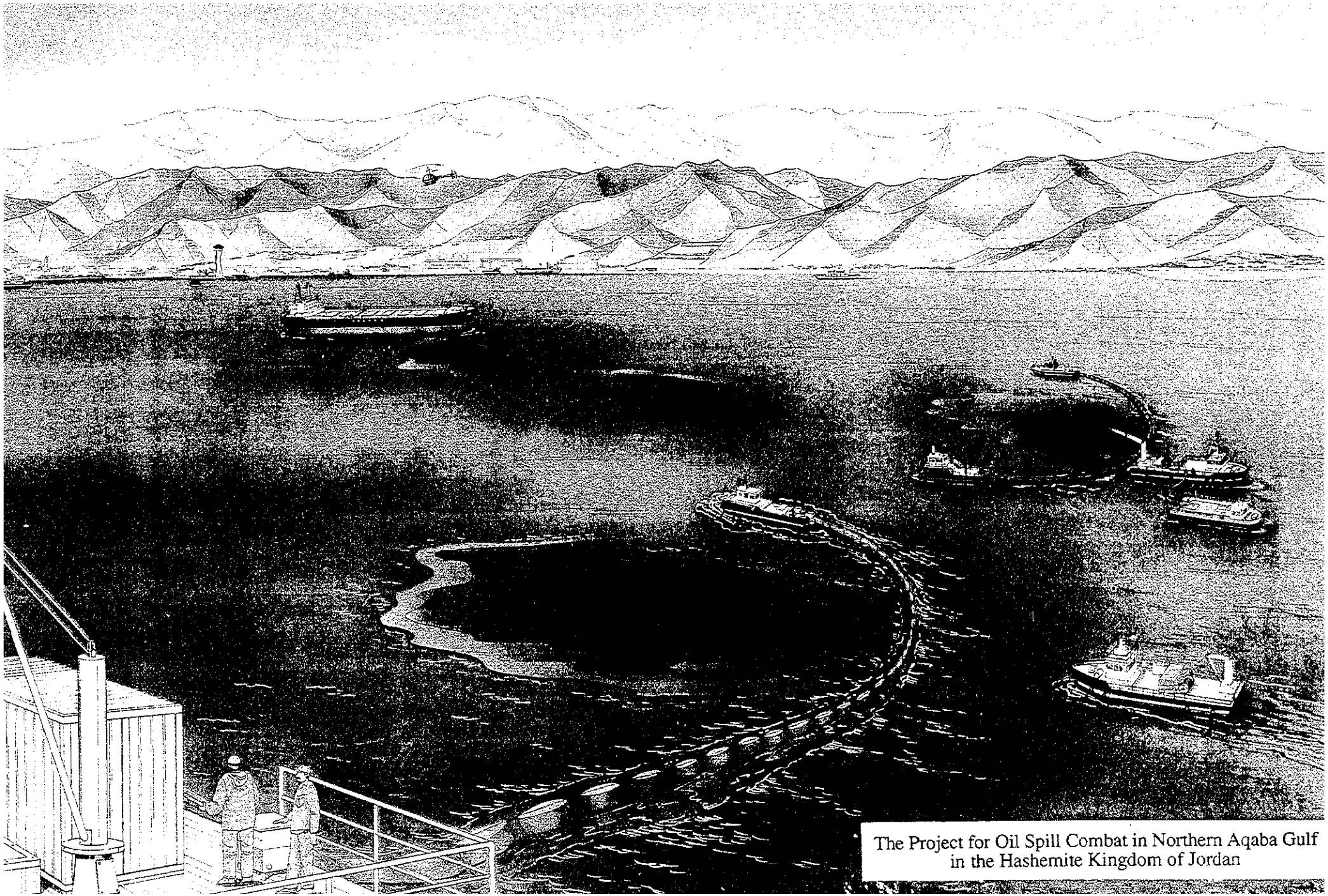
Map of The Hashemite Kingdom of Jordan



Location Map of Jordan



Map of Aqaba City and Main Port



The Project for Oil Spill Combat in Northern Aqaba Gulf
in the Hashemite Kingdom of Jordan

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ABBREVIATIONS

EU	European Union
E/N	Exchange of Notes
GDP	Gross Domestic Product
GNP	Gross National Product
JICA	Japan International Cooperation Agency
JD	Jordan Dinar
PC	The Ports Corporation

CHAPTER 1

BACKGROUND OF THE PROJECT

CHAPTER 1 BACKGROUND OF THE PROJECT

The Gulf of Aqaba is located in the northern part of the Red Sea and forms a narrow water channel of some 180 km in length and some 18 km in width on average, stretching north-south between the Sinai Peninsula and the Arabian Peninsula. Egypt, Israel and the Hashemite Kingdom of Jordan (hereinafter referred to as Jordan) have ports along the coast of the Gulf of Aqaba, all of which act as key bases for economic activities. Aqaba Port in particular plays a crucial role in Jordan's external trade with countries in the region as its only port and is expected to grow to form the base for Jordan's economic development in the coming years. The Gulf of Aqaba is known for its excellent clearness and its resorts attract many tourists. Moreover, it has a unique ecosystem, mainly featuring coral reefs along the coast, boasting biological diversity.

So far, the Gulf of Aqaba has seen few cases of serious damage due to oil pollution caused by navigating vessels or oil spillage. Nevertheless, in view of the necessity to conserve the precious environment and the likelihood of increased economic activities around the Gulf in the future, the cooperation of the countries concerned in the preparation of measures to combat ocean pollution by oil is deemed highly appropriate.

The Working Group on Environment of the Multilateral Middle East Peace Process established in 1992 has taken up this issue and the European Union (EU) has conducted a study for "the Upper Gulf of Aqaba Oil Spill Contingency Project" (hereinafter referred to as EU Project) with the purpose of formulating measures to combat oil contamination with the cooperation of the countries concerned. Having analysed the oil spillage risk and possible recovery methods, etc., the study team of EU Project has proposed the establishment of a cooperation system for three countries (Egypt, Israel and Jordan) with ports facing the Gulf of Aqaba as an urgent project to deal with a medium size oil spillage (upto 200 m^3). The concrete proposals include the introduction of an emergency response centre at a port in each country to store the necessary equipment and materials with appropriate facilities (the details of the equipment and materials required by each centre have also been examined) and the implementation of technical cooperation to develop a cooperation network involving these centres.

At present, only Israel has a facility (at Elat Port) designed to deal with an oil spillage of upto 50-60 m^3. The Working Group has, in principle, agreed to assist Egypt's procurement of the necessary equipment and materials to be stored at Nuweiba Port with EU funding while Israel will finance the procurement of such equipment and materials for Elat Port. In the case of Jordan, Aqaba Port has a certain degree of organization and manpower and some of the

existing facilities can be used. However, the relevant equipment and materials hardly exist. Meanwhile, prior to the formulation of the EU Project, the Government of Jordan has prepared a project to procure the equipment, etc., required to combat oil pollution and has requested the Government of Japan's provision of grant aid for the project for oil spill combat in Northern Aqaba Gulf in Jordan (hereinafter referred to as the Project) on November, 1992.

CHAPTER 2

CONTENTS OF THE PROJECT

CHAPTER 2 CONTENTS OF THE PROJECT

2-1 Objective of the Project

The objective of the Project is the procurement of equipment which is required to establish an oil spill combat capability at Aqaba Port in Jordan within the framework of the Upper Gulf of Aqaba Oil Spill Contingency Project (EU Project) formulated by the Working Group on the Environment of the Multilateral Middle East Peace Process as a measure to combat potential oil spillages by vessels navigating in the northern part of the Gulf of Aqaba in view of the expansion of economic activities and the necessity for environmental conservation in the area.

2-2 Basic Concept of the Project

Aqaba Port in Jordan plays an important role in Jordan's industrial and economic development as the country's only port. It is also endowed with such marine life as coral reef and tourism potential. Due to its geographical importance, the volume of maritime transport is expected to continuously increase in the northern part of the Gulf of Aqaba, necessitating the establishment of a system capable of combating oil spillages to protect shipping activities as well as the natural environment.

The Working Group on the Environment of the Multilateral Middle East Peace Process has decided to facilitate the cooperation of Egypt, Israel and Jordan to introduce measures to both prevent and combat oil spillages in view of the vitalisation of economic activities and conservation of the natural environment with the EU being expected to play a key assistance role and has formulated the Upper Gulf of Aqaba Oil Spill Contingency Project (EU Project) under which each of the three countries will have an Oil Spill Combat Centre of its own. The three countries have already confirmed and agreed to the objective, scale, implementation schedule, equipment to be procured by each country and their specifications and the training programme, etc.

Meanwhile, Jordan made a request for Japan's grant aid for the present Project in November, 1992, prior to the formulation of the EU Project. The original request included a plan to use the equipment to clean the port under ordinary conditions as well as to receive oil discharged from the ships and, therefore, the main item on the list of requested equipment were a self-propelling oil reception vessel and a self-propelling skimmer vessel which are capable of recovering not only spilled oil but also drifting rubbish. Table 2-2-1 shows the list of equipment originally requested by the Government of Jordan.

In comparison, the target of the EU Project is medium-scale oil spillages (upto 200 m^3) and the efficient deployment of many light-weight, small skimmers is planned to deal with various types of spillage incidents in terms of the spillage size and oil properties (particularly those incidents involving high viscosity oil) through the selection of appropriate equipment for each incident.

It was, therefore, necessary for the Study Team to confirm the intentions of the Government of Jordan vis-a-vis the above discrepancy concerning the equipment procurement concept. The Study Team attended the latest meeting of the Steering Committee for the EU Project (Third Meeting held in Eilat on March 14th and 15th, 1995) and was assured that the three countries involved were proceeding with the EU Project in close cooperation. Moreover, at a meeting with the Study Team, the Government of Jordan expressed its hope that the equipment to be procured under the Project would be in line with the EU Project and the revised request was clearly stated in the Minutes of Discussions signed on March 18th, 1995.

The Study Team then confirmed that the range of equipment agreed upon and referred to in the Minutes of Discussions was appropriate to combat an assumed oil spillage of upto 200 m^3 and that a self-propelling skimmer pontoon, the key component of the original request made by the Government of Jordan, was not urgently required as the large-scale operation of recovering drifting rubbish was unrealistic due to the currently small amount of such rubbish. The "Equipment and Materials for Rebuilding of Burges" (item 4.9) which is one of the requested items in the Minutes of Discussions can be utilized for receiving of small scale of the discharged oil from the ships. In short, the suitability of the finally requested equipment to achieve the objective of the Project was confirmed. Furthermore, the Study Team confirmed that the present operation, maintenance and financial capabilities of the project implementation agency (The Ports Corporation with some 2,400 employees as of 1994) would be sufficient to meet the requirements of the Project.

As the expected effects of the Project will not only conform to the framework formulated by the Working Group on the Environment of the Multilateral Middle East Process but will also contribute to Jordan's sustainable industrial and economic development and to conservation of the natural environment, the implementation of the Project with grant aid provided by the Government of Japan is judged to be appropriate.

The basic concept of the Project, established based on the above-described judgement and findings, is to procure equipment to combat oil spillages in order to establish a reliable oil spill centre function at Aqaba Port, Jordan in conformity with the similar EU Project.

Table 2-2-1 Summary of Equipment Originally Requested by the Government of Jordan

Item	Quantity	Specifications
1. Oil Containment Boom	200m/unit × 5 units	Floating method : air inflated Measurements : minimum freeboard: 400 mm minimum draft: 600 mm Material : highly durable material Weight per unit : 1,500 kg or less
2. Oil Skimmer	1 set	Recovery mechanism : disc-type Recovery rate : 30 tons/hr Drive train : engine-operated hydraulic unit
3. Floating Reception Facility	1 set	Application : reception of oil, oil discharge, oily water mixture, slop and sludge Function : self-propelling with fire-fighting system [Specifications] Speed : approximately 8 knots Storage capacity : 400 m^3 Water tank capacity : 3 m^3 Measurements : 30 m (L) × 7.5 m (W) × 3.0 m (D) Crane mounted : 2.5 tons at 6 m Design standards : Nippon Kaiji Kyokai
4. Skimmer Vessel	1 set	Application : skimming of oil spills, slop, bilge water and drifting rubbish [Specifications] Sweeping width (arm length) : 10 - 15 m Speed : 9 knots Sweeping speed : 1.5 - 2 knots Storage capacity : 35 m^3 Crane mounted : 2 - 5 tons at 5 m Water tank capacity : 1.5 m^3 Design standards : Nippon Kaiji Kyokai Propulsion system : water-jet (pair of schottel drive mechanisms) Auxiliary equipment : generator, compressor and hydraulic pump, etc.
5. Control Equipment	1 set	[Range of Equipment] - Oxygen meter - Explosive meter - Gas detection equipment - Breathing apparatus with mask (fresh air line and compressed air breathing apparatus) - Oil analysis kit - Protective clothing, etc.

Table 2-2-2 Final List of Equipment Requested by the Government of Jordan for the Project

No.	Item	Unit	Quantity
1.	Reduction of Spreading (Booms, etc.)		
1.1	Deflecting Boom, Small	200 m	4
1.2	Deflecting Boom, Medium	200 m	2
1.3	Oil Trawl	pc	1
1.4	Boom Cleaning Unit	pc	1
1.5	Shore Protection Boom	1,000 m	3
1.6	Shore Protection Carpet	200 m	12
1.7	Sorbent Boom/Sorbents	500 m	4
2.	Recovery and Containment (Skimmers, etc.)		
2.1	Skimmer, Medium Viscous Oil, Small (10 m^3/h)	pc	1
2.2	Skimmer, Medium Viscous Oil, Medium (50 m^3/h)	pc	1
2.3	Skimmer, High Viscous Oil (60 m^3/h)	pc	2
2.4	Emergency Off-Loading System	pc	1
2.5	Vacuum Truck	pc	1
2.6	Oil/Water Separator	pc	1
2.7	Demulsifying Unit	pc	1
2.8	Collapsible Floating Tank, Small (10 m^3)	pc	2
2.9	Collapsible Floating Tank, Medium (25 m^3)	pc	2
2.10	Collapsible Floating Tank, Large (100 m^3)	pc	4
2.11	Flexible Tank (10 m^3)	pc	5
3.	Transportation (Vessels)		
3.1	Oil Combat Vessel, Small (10 m)	pc	1
3.2	Oil Combat Vessel, Large (20 m)	pc	1
4.	Miscellaneous		
4.1	VHF Portable Communication Unit	pc	6
4.2	VHF Stationary Communication Unit	pc	1
4.3	VHF Repeater Station	pc	1
4.4	VHF Warning System	pc	1
4.5	Radio Equipment System Test	set	1
4.6	Lighting Equipment	set	1
4.7	Steam Cleaner	pc	1
4.8	Crane for Harbour Tugs	pc	2
4.9	Equipment and Materials for Rebuilding of Barges	pc	2
4.10	Beach Cleaning Tools	set	1
4.11	Personal Safety Equipment and Protective Clothing	set	1

Source: Minutes of Discussions signed on March 18, 1995.

2-3 Basic Design

2-3-1 Design Concept

(1) Natural Conditions

The natural conditions which are likely to affect the selection of equipment to combat oil spillages in the Gulf of Aqaba are wind velocity, wind direction, currents, wave height, temperature, sea water temperature and the existence of marine life, such as bacteria. As the state of spilled oil is largely affected by the sea water temperature and wind velocity, the basic design must take the following points into proper consideration.

1) Types of Oil Used in Gulf of Aqaba

The main types of oil transported or used by vessels navigating in the Gulf of Aqaba are crude oil, heavy bunker oil (equivalent to fuel oil C of the JIS standards), light bunker oil (equivalent to fuel oil A of the JIS standards) and edible oil. Petrol and gas oil used for small boats are also present albeit in minor quantities. The commonly used fuel oils are marine diesel oil (equivalent to fuel oil A) and heavy bunker oil. Although details of the types of oil used by vessels navigating in the Gulf of Aqaba are unavailable, the types of oil in use based on vessel size are roughly estimated in Table 2-3-1.

In the case of vegetable oil, although its damage potential is relatively modest compared to that of mineral oil, the likely damage of its spillage on coral reef is still devastating. The total storage capacity of the vegetable oil tank farm located behind Phosphate Berth A is 11,000 m^3. These tanks are currently protected by an oil containing bank. In the case of crude oil, the Eilat - Ashkelon Pipeline Company (EAPC) operating at Eilat Port, handles several types of crude oil produced in the Gulf of Suez, mainly GOSM and Belayim.

Table 2-3-1 Estimated Use of Fuel Oils by Vessels Navigating in Gulf of Aqaba

Area	Cargo	Maximum Berthing Capacity (dwt) *1	Water Depth (m)	Fuel Oil of Main Engine *2	Remarks
Marina	-	small motorboats, etc.	3 - 5	petrol gas oil	underground fuel tanks in place
[Main Port]					
Berths 1 - 2	general cargo	20,000	10 - 11	HB & LB	
Berths 3 -- 6	general cargo	40,000	10 - 12.5	HB	
Berths 7 - 9	general cargo	(100 - 9,000)	5.8 - 8	HB	
Berth 10	general cargo	(3,000)	5.8	LB	elevated fuel tank in place
Phosphate Berth A	phosphate vegetable oil	(27,500)	11	HB	group of vegetable oil tanks in rear
Phosphate Berth B	phosphate	100,000	15	HB	fuel oil bunkering system in place
[Container Port]					
Mota Floating Berth	grain	40,000	15	HB	
Cement Berth	cement, vegetable oil	120,000	11.8	HB & LB	
Ro-Ro Berth	cars	(25,000)	9	HB	
Container Berth	containers	10,000 -	14 - 20	HB & LB	
Yamuluk Floating Berth	passengers & containers	exclusive berth for service to Nuweiba Port in Egypt	15	LB	
[Industrial Port]					
Oil Jetty	crude oil	300,000	25	HB	for loading of heavy bunkers oil or crude oil
Timber Berth	timber	(5,500)	6.8	LB	
Fertiliser Berth	fertiliser, potassium & sulphur	50,000	9.5-15	HB	

Notes 1) Only the maximum berth capacity is shown based on data supplied by the PC. Those in brackets are estimates based on the water depth.
2) Type of bunker oil: HB (Heavy bunker oil), LB (Light bunker oil)

2) Changes of Properties of Spilled Oil

One of the most important points in preparing the basic design for equipment to remove spilled oil is that the viscosity of spilled oil increases in time due to the emulsion with seawater. The largest contributory factor to this process is said to be drift currents caused by wind. In the Gulf of Aqaba, 50% of the wind has a speed of upto 5 m/sec and some 94% of the wind has a speed of less than 10 m/sec.

Table 2-3-2 and Table 2-3-3 show changes of the properties of GOSM oil produced in the Gulf of Suez due to wind speed and time factors as described in the Project Implementation Report of EU Project (hereinafter referred to as EU

Report). Note that the effect of the oil despersant is rendered smaller when the viscosity is 2,000 centipoise or more. Experiments show that the effect is virtually non-existent with a viscosity of more than 5,000 centipoise. This necessitates the planning of equipment which is capable of dealing with high viscosity oil.

Table 2-3-2 Changes in Water Content (GOSM)

(Unit: %)

Wind Speed	Time Passed					
	15 minutes	3 hours	6 hours	one day	3 days	5 days
10 m/sec	15	73	75	75	75	75
5 m/sec	5	42	57	72	72	72
2 m/sec	2	13	28	55	68	70

Note: Sea surface temperature: 25°C

Table 2-3-3 Changes in Viscosity

(Unit: centipoise)

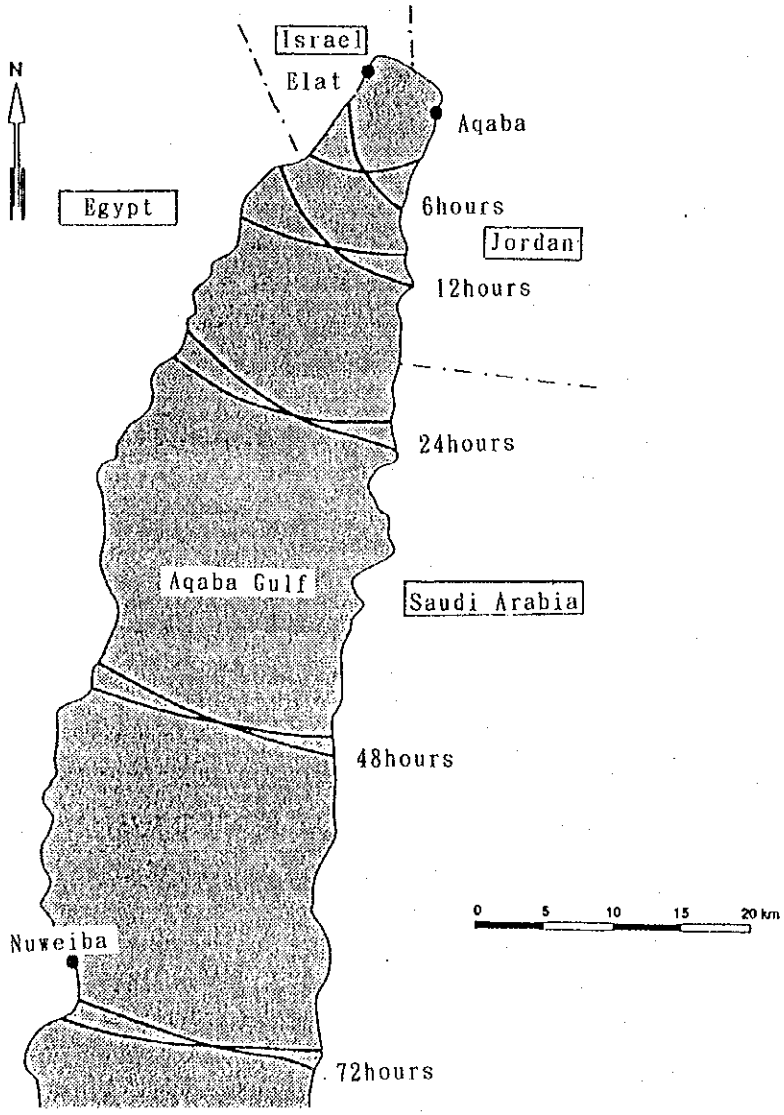
Wind Speed	Time Passed					
	15 minutes	3 hours	6 hours	one day	3 days	5 days
10 m/sec	50	3,000	8,000	10,000	12,000	12,500
5 m/sec	30	300	1,500	6,000	9,000	10,000
2 m/sec	20	85	200	1,500	5,000	6,000

Note: Sea surface temperature: 25°C

3) Forecast of Oil Drift

Supposing that an oil spillage accident occurs near Eilat Port or Aqaba Port. If the wind speed of the northern direction is approximately 10 m/sec, the drift current on the sea surface caused by this wind is generally believed to be 30 cm/sec (excluding the special effects of waves, currents, etc.) which causes drifting of the spilled oil southwards from the northernmost area of the Gulf of Aqaba. (The speed of the drift current is generally said to be 2 - 4% of the wind speed and a 3% level is assumed here.) The travelling distances of this drifting oil within specific time durations are shown in Fig. 2-3-1. It can be seen that it will take some 6 hours for the oil drift to reach the protected coral reef area (area closed to the general public) located to the south of the ferry terminal. The

distribution and specifications of the equipment should, therefore, be determined taking the oil drift forecast described here into consideration.



Source: EU Report: Phase 1 Project Preparation (March, 1994)

Fig. 2-3-1 Illustration of Forecast of Oil Drift (Northern Wind of 10 m/sec)

4) Other Sea and Land Weather Conditions

The Gulf of Aqaba is an inland sea and most waves are lower than 0.5 m. Data on the currents is very scarce as currents are almost non-existent. A wave height

of 0.5 m is adopted as one of the conditions in the selection of such equipment as deflecting boom, skimmer, etc.

(2) Social Conditions

Some 93% of the Jordanian people are Muslims who observe Ramadan, which lasts for approximately one month every year, during which time the daily life is quite different from other times of the year in that meals are not taken during the day-time and special working hours are introduced, etc. In the case of the PC, the Project implementation agency, however, it is engaged in the same port work during Ramadan and, therefore, the Project's operation and maintenance system will not be affected.

(3) Construction Conditions

1) Permission and Approval Relating to Project Implementation

The permission and approval relating to the design, procurement and installation of the equipment to be provided under the Project will be granted by the PC. As the PC has basically agreed to the equipment specifications formulated by the EU Project, no special difficulties are envisaged in regard to the PC granting the said permission and approval.

There is one notable exception to this general picture. With regard to the VHF radio communication equipment which is on the list of requested equipment, multilateral coordination is required for the frequency to be used in order to establish conformity between the EU Project and the present Project. In fact, it has been agreed that the Steering Committee of the EU Project will study the radio equipment specifications of the countries concerned, decide the detailed specifications for the frequency and other items within several months and inform all the countries concerned of its decision. It will, therefore, be necessary to incorporate these detailed specifications for the VHF radio communication equipment to be incorporated in the detailed design stage for the Project.

2) Related Laws and Regulations

As none of the planned equipment on the list is subject to import regulations in Jordan, no specific problems are envisaged in this regard.

3) Level of Local Contractors

The installation of the equipment to be provided under the Project is planned to be conducted by the PC and no local contractors will be involved.

The PC has a shipway with a pulling capacity of upto 360 tons for the smaller repairment of barge hull. The technical ability of the PC is also illustrated by the fact that it conducted the engine repair (upto 1,600 HP) of tug boats at its workshop at Aqaba Port in 1994.

4) Quality and Size of Workforce

Most of the workers employed for port work are Jordanians although there are some foreign workers, e.g., Pakistani, etc. No specific problems are envisaged in regard to the quality and size of the domestic workforce.

5) Quality of Local Equipment and Procurement Problems

None of the equipment planned to be procured under the Project is available in Jordan's domestic market.

6) Infrastructure Level

Port Aqaba has good road access and established basic infrastructure, including electricity, water supply, sewerage, telecommunication services, etc.

(4) Use of Local Contractors and Equipment, etc.

1) Local Contractors

As already described in 2-3-1-(3)-3), local contractors will not be involved in the installation of the equipment and other work related to the Project. However, the use of a local customs house broker is desirable to deal with the equipment import procedure so that the equipment procured under the Project is smoothly imported to Jordan. There are several brokers operating at Aqaba Port and all are well experienced.

2) Feasibility of Local Procurement

None of the equipment to be procured under the Project is available in Jordan. The existing equipment of the PC (fork lifts, cranes, etc.) will be used for the installation and subsequent operation of the procured equipment. The quantity

and capacity of the equipment are deemed sufficient to meet the requirements of the Project.

(5) Maintenance Capability of Implementation Agency

1) Manpower Strength of PC

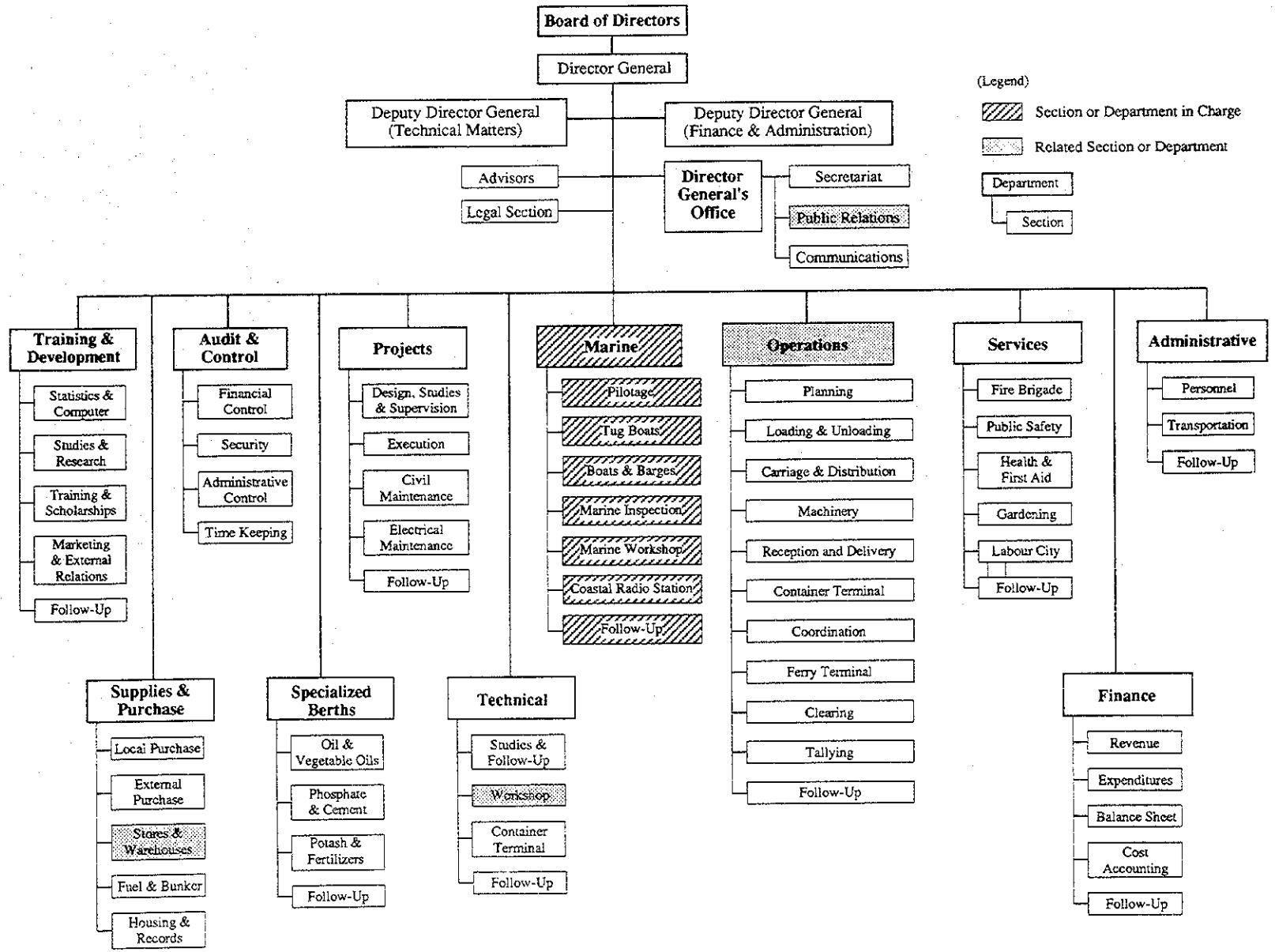
The PC, which is the implementation agency for the Project on the Jordanian side, is a large, independent organization with some 2,400 employees and is responsible for the comprehensive operation, management and development of Aqaba Port, Jordan's only port. The organizational structure of the PC is shown in Fig. 2-3-2 while the manpower strength and work assignments of each Department are described in Table 2-3-4.

Table 2-3-4 Manpower Strength and Work Assignments of PC by Department (as of February, 1994)

Department	Staff	Workers	Sub-Total *	Work Assignments
Director General's Office	55	4	59	Coordination of general affairs relating to the Director General; control of telephone exchange, public relations and incoming/outgoing mail
Legal Division	6	0	6	Preparation of draft contracts and agreements; participation in investigations concerning accidents and fires; study of staff and department development and qualification methods
Training and Development Department	28	6	34	Preparation of statistics and study improvement regarding the activities of the PC; enforcement of worker training; collection of information concerning marine affairs; promotion of port services and publishing of brochures
Supply and Purchase Department	77	8	65	Purchasing, storage and delivery of spare parts for machinery, stationary, furniture and fuel
Audit and Control Department	102	44	146	Auditing of revenue and expenditure; inspection of activities and quality and productivity of administration; control of gates and issue of port entry permits; control and administration of working hours of all employees

Department	Staff	Workers	Sub-Total *	Work Assignments
Specialised Berths Department	170	237	407	Operation of phosphate exporting and management of Main Port facilities; management of Industrial Port facilities for such cargo as oil products (for export/import), fertiliser, potash, cement (for export), vegetable oil, sulphur and ammonium (for import)
Projects Department	146	48	194	Design, ordering and maintenance of port facilities
Technical Department	263	128	391	Requesting of machine, equipment and spare part purchasing to Supply Department; maintenance and repair of machinery and equipment, scrapping of unusable machinery and equipment; provision of technical educational training for workers
Marine Department	232	200	432	Inspection of ships; monitoring and prevention of marine pollution; operation and maintenance of pilot boats, tug boats, lighters and barges
Operations Department	1,017	436	1,453	Operation of cargo handling; holding of berth allocation meetings; coordination of cargo handling operation with other departments; control of cargo storage and ship movement
Services Department	174	85	259	Management and operation of the Fire Brigade, Clinic and worker accommodation; storage of dangerous cargo and supervision of labour safety
Finance Department	95	3	98	Collection of revenue and payment of expenses; preparation of balance sheets and profit/loss statements, etc. and preparation of budget; analysis of productivity and economic affairs
Administration Department	83	1,277	161	Administration of personnel affairs; transportation of workers and their school-age children
Total	2,448	1,277	3,725	

Note : The sub-total figures do not include daily employed labourers.
Source : The Ports Corporation



Source: The Ports Corporation

Fig. 2-3-2 Organizational Structure of the Ports Corporation

The department which will play a key role in the Project will be the Marine Department, the manpower strength of which is more than 200. As described in Table 2-3-5, the Marine Department is capable of conducting all maritime work, ranging from the operation of pilot boats, tug boats, etc. to the repair of ships and equipment. In addition, it has radio communication capability. When dealing with an oil spillage incident after the equipment provided under the Project becomes operational, the Marine Department may find it necessary to request the cooperation of and manpower reinforcement by other related departments. In this regard, the Marine Department has strategic status to easily initiate communication with or to issue instructions/requests to other departments and is deemed to be the most appropriate department to bear responsibility for the Project.

Table 2-3-5 Manpower of Marine Department by Section
(as of February, 1994)

Section	Manpower
Pilotage	62
Tug Boats	43
Boats and Lighters	58
Marine Inspection	12
Marine Workshop	23
Radio Coastal Station	25
Follow-Up	9
Total	232

Source: The Ports Corporation

The staff members of the Marine Department currently work on a 24 hour basis and the existing emergency communication system using portable radio equipment illustrates the Marine Department's readiness to take up the new job of combating oil spillages using the new equipment. Fig. 2-3-3 shows the organizational structure of the Marine Inspection Section, which will be the key section to implement the Project, and the present work assignments of its units.

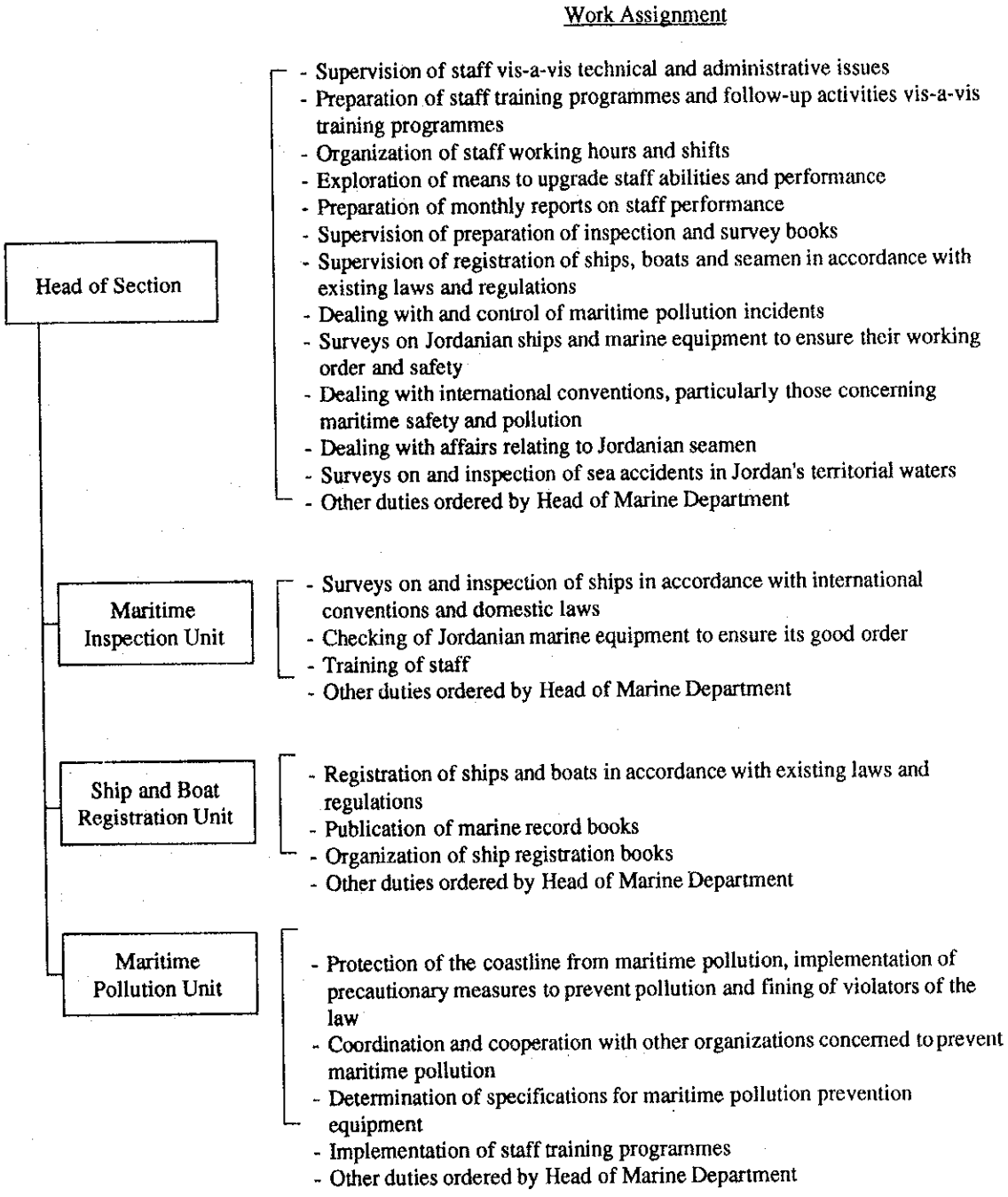


Fig. 2-3-3 Organizational Structure and Work Assignments of Marine Inspection Section

As shown in Fig. 2-3-3, the work assignments of the Marine Inspection Section include the monitoring and prevention of maritime pollution which is conducted by the Maritime Pollution Unit. At present, the Unit has only one maritime

pollution expert and its manpower strength is not sufficient to conduct full-scale pollution control activities in the future. Nevertheless, it can be safely argued that the Marine Inspection Section has the minimum manpower strength required for the implementation of the Project.

Having examined the existing manpower strength and organization of the PC, it is judged that the PC has the necessary organization and staff to act as the implementation agency for the Project.

2) Current Legal Arrangements Relating to Oil Pollution

There is no basic environmental law in Jordan which comprehensively covers all aspects of environmental issues, including a national environment strategy, consolidation of related organizations, environmental standards, environment-related permits and licensing system, obligation on the part of violators of the environment to compensate for damage, fines and punishments for such violators and an environmental assessment system. However, a parliamentary debate is currently in progress with a view to legislating national environment policies prepared in 1991, mainly by the Department of Local Government and the Environment, as an environment law.

Maritime oil pollution in Jordan is dealt with by the Instruction for Assessment of Pollution Damage Caused by Ships (1988) which was enforced based on the Ships Law (Law No. 51 of 1961). The Instruction stipulate the level of fines and compensation depending on the scale of pollution and type of pollutant, be it oil, chemical substances, solid waste or waste water. Table 3-2-6 shows the level of penalty and compensation in the case of oil pollution. Penalty is paid to the Treasury while compensation is paid to the PC.

Table 2-3-6 Penalty and Compensation for Damage Due to Oil Pollution

(Unit: Jordanian Dinar)

Scale of Spillage (Area)	Category	Light bunker oil	Heavy bunker oil	Crude Oil
Less than 100 m^2	Penalty	1,000	1,000 - 2,000	1,000 - 2,000
	Compensation	1.0/m^2	5.0/m^2	5.0/m^2
100 m^2 or more but less than 500 m^2	Penalty	1,000 - 1,000	2,000 - 4,000	2,000 - 4,000
	Compensation	0.8/m^2	4.5/m^2	4.5/m^2
500 m^2 or more but less than 1,000 m^2	Penalty	2,000 - 2,500	4,000 - 7,000	4,000 - 7,000
	Compensation	0.6/m^2	4.0/m^2	4.0/m^2
1,000 m^2 or more but less than 5,000 m^2	Penalty	2,500 - 5,000	7,000 - 10,000	7,000 - 10,000
	Compensation	0.4/m^2	2.5/m^2	2.5/m^2
5,000 m^2 or more but less than 25,000 m^2	Penalty	5,000 - 7,000	7,000 - 10,000	7,000 - 10,000
	Compensation	0.3/m^2	2.0/m^2	2.0/m^2
25,000 m^2 or more but less than 100,000 m^2	Penalty	7,000 - 10,000	7,000 - 10,000	7,000 - 10,000
	Compensation	0.2/m^2	2.0/m^2	2.0/m^2
100,000 m^2 or more but less than 500,000 m^2	Penalty	7,000 - 10,000	10,000	10,000
	Compensation	0.1/m^2	1.5/m^2	1.5/m^2
500,000 m^2 or more	Penalty	10,000	10,000	10,000
	Compensation	In accordance with international convention		

Original Notes : 1) The actual cost will be calculated and charged for oil recovery.
2) The figures for the heaviest oil will be used in the case of oil pollution involving different types of oil.
3) The compensation figures in the table do not include compensation claims for damage to industrial and tourism facilities.

Source : Attached Table A, Instruction for Assessment of Pollution Damage Caused by Ships (1988)

A move to revise the penalty and compensation levels is currently underway on the grounds that the present levels are ridiculously low in view of the need to prevent oil pollution and the severe implications of an oil spill vis-a-vis the environment and tourism in the area. According to the draft revision prepared by the PC and submitted to the Department of Transport for review, the penalty and compensation levels are almost quadrupled.

In Jordan, the responsibility for recovering spilled oil falls on the party responsible for the oil spillage. As such a party usually lacks the ability to recover the oil, the Instruction states that the PC shall conduct the work on behalf of the responsible party and shall charge the responsible party the actual recovery cost in addition to the compensation.

In the case of recent oil spillage incidents at Aqaba Port, the penalty and compensation were calculated based on the estimated oil spillage area by the Marine Inspection Section and then charged to the party responsible for the oil spillage through litigation in ordinary court filed by the Legal Division of the PC. In contrast, the recovery cost was not charged simply because the PC cannot conduct proper recovery due to the lack of the necessary equipment.

With regard to oil terminal and similar facilities, while there is no legal obligation to install oil spillage prevention equipment, the PC is said to include conditions regarding the compulsory installation of an oil spillage prevention system and equipment in its agreements concerning the construction of facilities from which oil spillage at the Aqaba Port may occur.

There are international conventions regarding the prevention and notification of and measures to combat maritime pollution, including oil spillages, due to its international implications. The most important international convention is the Protocol of 1978 relating to the Convention for the Preservation of Pollution from Ships, 1973 (MAPOL 73/78). Following ratification by the neighbouring countries (Israel on August 31st, 1983 and Egypt on August 7th, 1986), Jordan signed the Protocol for ratification on December 31st, 1994. The structure of the MAPOL 73/78 is as follows.

① Main Text : General provisions on obligations, scope of application and violations, etc.
Protocol I : Rules on the Notification of Accidents Involving Harmful Substances
Protocol II : Rules on Arbitration to Solve Disputes
② Annex I : Rules on Oil
③ Annex II : Rules on Harmful Bulk Liquids
④ Annex III : Rules on Harmful Liquids Stored and Transported in Containers, etc. (enforced on July 1st, 1992)
⑤ Annex IV : Rules on Waste Water (not yet affective)
⑥ Annex V : Rules on Solid Waste (enforced on December 31st, 1988)

The Government of Jordan signed the Main Text, Annex I and Annex II in December, 1994 with a view to their ratification. As the Protocols come into force three months after the deposit of the ratification, Jordan is now preparing to enforce the ratified parts of the Protocol.

The above review of the domestic and international legal provisions indicates that Jordan has the basic legal framework to prevent as well as combat oil spillages. These legal provisions, however, are not accompanied by concrete activities due to the lack of the necessary equipment, etc. to enforce them.

(6) Scope and Level of Facilities and Equipment

There is no universal equipment capable of preventing or combating oil spillages which can occur under vastly different circumstances. The equipment specifications substantially vary, depending on the priority. In the case of a skimmer for example, the specifications are dominated by emphasis on its ability to either deal with high viscosity oil or to resist high waves. The specifications for a deflecting boom are similarly determined by emphasis on either reliability, i.e. strength, or operability, i.e. light-weight and speedy expansion, or emphasis on either coastline protection or the recovery of spilled oil. The sea and land weather conditions at the location of use also affect the desirable specifications.

All of these considerations illustrate the importance of taking Jordan's natural conditions and technical level into consideration in the selection of equipment for the Project. In addition, the framework referred to in the EU Project, for which agreement has been reached by the three countries concerned, should also be taken into consideration. The items relating to the scope and level of the facilities and equipment planned under the Project are explained below.

1) Assumed Volume of Oil Spillage into Gulf of Aqaba

The maximum volume is assumed to be 200 m^3 (medium-scale spillage) of oil which will be spilled in case fuel bunkering or crude offloading. In addition, the navigating vessels accident also be taken into consideration when selection of oil combat materials and equipment.

2) Location of Oil Spillage

The original oil spillage location is assumed to be near the crude oil jetty at Eilat Port in Israel or Aqaba Port in Jordan in the Northern Gulf of Aqaba.

3) Damaged Sea Area and Damaged Sites

The prevailing winds in the subject sea area are northerly, northwesterly and northeasterly winds. If an oil spillage incident occurs in the Northern Gulf of Aqaba, the spilled oil is likely to drift towards Jordan, causing extensive

damage to Jordan's long coastline. This likelihood must be taken into consideration when deciding the specifications and quantities of the equipment to be provided.

4) Relationship with Equipment Deployed in Israel and Egypt

The EU Project report envisages the functional divisions and quantities of equipment to be deployed in Jordan, Israel and Egypt based on the assumptions made in 1) through 3) above. The present Project should respect the master plan and equipment should be selected which allows Jordan to engage in joint operations with Israel and Egypt.

- Jordan (Aqaba) : Medium-scale oil spillage recovery function and long coastline protection function
- Israel (Eilat) : Medium-scale oil spillage recovery function through reinforcement of existing equipment
- Egypt (Nuweiba) : Small-scale oil spillage recovery function and supporting function for Jordanian and/or Israeli operations

5) Unification of Equipment Specifications

A large-scale oil spillage incident will necessitate joint oil recovery by the three countries. The unification of the equipment specifications as much as possible is, therefore, necessary to improve the workability, maneuverability, interchangeability and maintainability of the equipment. The basic equipment specifications will be those confirmed by the Study Team through consultations with the consultants of EU Project.

- Workability : Common specifications for the major connecting parts of the equipment will make joint operations easier to launch
- Maneuverability : Common specifications to allow storage of the equipment in standard containers to facilitate transportation of the equipment by land, air or sea
- Interchangeability : A high level of interchangeability of the equipment specifications will facilitate mutual support at the time of an emergency

A high level of interchangeability is also desirable for the spare parts held by each country to facilitate mutual support.

6) Protection of Tourism Resources and Marine Life

A mechanical oil recovery method will be used instead of a chemical method. Maximum care should be paid to the recovery of oil from the coastline.

7) Treatment of Recovered Oil

The PC plans to treat the oil recovered from an oil spillage incident by transferring it to calling vessels equipped with a waste oil tank as is currently the case or by mixing it with tar for road paving in the spillage quantity is small. In the case of a large spillage, the Jordan Petroleum Refinery Co., Ltd., the only oil refining company in Jordan, will be required to separate the oil from water. The same principles will apply for recovered oil after the commencement of operation involving equipment procured under the Project.

(7) Project Period

In principle, the Project (from initial contract to delivery of equipment) will be completed within a single fiscal year in accordance with Japan's grant aid system.

Given the close relationship between the Project and the EU Project, the effects of the Project will be maximised by arranging the project implementation schedule as closely as possible to the equipment procurement schedule for the EU Project.

2-3-2 Basic Design

(1) Outline of Equipment to be Provided

The equipment to be provided under the Project is classified below based on the respective purposes of use. Table 2-3-7 summarises the specifications for the equipment.

1) Equipment for Reduction of Spreading of Spilled Oil

This equipment will be used to reduce of spreading or gathering of drifting spilled oil on the sea surface following an oil spillage incident. In general, the equipment is called a deflecting boom and the selection of deflecting booms in the basic design took their wave resistance, workability, operability and maneuverability into consideration to suit the natural conditions in the Northern Gulf of Aqaba. The length and quantity of the equipment have been carefully examined in view of responding to oil spillages of various scales upto 200 m^3.

2) Equipment for Recovery and Containment of Spilled Oil

① Oil Recovery System

A mobile oil recovery system (skimmer equipment) instead of a special oil recovery self-propeller vessel is planned as this can be very flexibly used on a jetty or a vessel. Three types of oil mechanism are planned to deal with different viscosities of spilled oil and to provide different recovery capacities.

- Small Skimmer (low to medium viscosity oil)
- Medium Skimmer (low to medium viscosity oil)
- Medium Skimmer (high viscosity oil)

In addition, an emergency off-loading system is planned to recover the fuel remaining in the fuel tank at the time of an oil spillage incident involving a vessel at sea. A vacuum truck will also be provided to recover spilled oil from the contaminated coastline.

② Demulsifying Unit

When spilled oil drifts at sea for a long time, it changes to emulsion oil. Even if it is recovered by a skimmer for high viscosity oil, transportation to a waste oil disposal site poses a difficult problem due to the fact that high viscosity emulsion oil cannot be handle with by the existing tank lorries or commonly used centrifugal pumps.

According to the PC's Director General, although the PC lacks waste oil disposal facilities, PC agrees that such facilities should be installed in the future. However, Jordan Petroleum Refinery Co., Ltd. has a 30 m^3 waste oil tank (slop oil tank) and an oily waste water treatment unit (API separator: 50 m^3/hr) at its Aqaba oil storage tank farm to deal with waste oil and slop tank cleaning water. It plans to establish a new fuel tank farm by the end of 1996 at the Industrial Port which will be equipped with a 100 m^3 slop tank and two oily waste water treatment units (50 m^3/hr × 2). Through the combined use of these facilities and the demulsifying unit to be provided under the Project, the rough separation of spilled emulsion oil can be conducted. Therefore, until PC's own facility installed, it is planned to transport the recovered oil and waste oil from these waste oil tanks by lorry to a refinery located at Zarqa, a city located to the north of Amman, for

final treatment. Jordan Petroleum Refinery Co., Ltd. is ready to accept this arrangement. Considering the above situations, it will be necessary to provide a demulsifying unit to be provided under the Project on land or at sea near Aqaba. The planned mechanism of the demulsifying unit is to inject an emulsion breaker to separate water from the emulsion oil.

③ Recovered Oil Storage System

The recovered oil storage capacity is planned to deal with wide-ranging oil spillage incidents, from small spillages to spillages of upto 200 m^3. The following types of tanks of varying storage capacities are planned to achieve a high degree of workability.

Name	Capacity	Location of Use
- Rebuilding of Existing Barges (equipped with new tanks)	50 $m^3 \times 4$	sea
- Small Collapsible Floating Tank	10 $m^3 \times 1$	land/sea
- Medium Collapsible Floating Tank	25 $m^3 \times 2$	sea
- Large Collapsible Floating Tank	100 $m^3 \times 4$	sea
- Small Flexible Tank	10 $m^3 \times 5$	land/sea

The remodelled tanks of the existing barges will mainly be used to store oil recovered at sea and collapsible floating tanks of different sizes (small to medium) will also be deployed to tackle scattered oil spillages. On land, flexible tanks will mainly be used.

3) Transportation Equipment for Oil Spillage Combat Equipment

In order to minimise the damage caused by an oil spillage, efficient recovery is required, including the swift transportation of booms and skimmers to the spillage site. As the existing vessels of the PC cannot guarantee such efficient recovery, the provision of two self-propelling oil combat vessels is planned. The propulsion system of these vessels will be the water jet propulsion system to avoid agitation of the drifting spilled oil.

4) Miscellaneous Equipment

In addition to the equipment referred to in 1), 2) and 3) above, the following equipment is required.

- VHF portable communication units	:	for the issue and relay of instructions, etc. at the time of an oil spillage incident
- Lighting equipment	:	for night work
- Steam cleaner	:	for the removal of oil from equipment
- Beach cleaning tools	:	for the cleaning of beaches, etc.
- Personal safety equipment and protective clothing	:	for the protection of those people engaged in oil collection and cleaning work

The actual oil recovery/removal work will be conducted with an efficient combination and operation of the equipment mentioned in 1), 2), 3) and 4) above. Table 2-3-8 shows the planned operation of the supplied equipment for oil spillages of different scales.

5) Spare Parts

As the planned equipment is for emergency use, its usage will differ from that which is used daily. The quantity of spare parts must be decided in view of the estimated frequency of use and degree of importance of each type of equipment. The provision of two years' supply of spare parts is planned for the driving unit (engine and hydraulic mechanism, etc.) to extend the booms and the driving unit (pump, hydraulic mechanism and engine, etc.) of the skimmers and cleaner, etc. Similarly, two years' supply of spare parts will be provided for the oil combat vessels and VHF equipment, both of which are expected to be in constant use, to ensure the efficient operation of the oil spillage combat system at Aqaba Port.

Main spare parts to be provided are as follows:

- Handling Equipment for Deflecting Boom:
  Piston Ring, Gasket, Mechanical Seal for Lubrication Oil, Bolts and Nuts, Filter for Oil Pressure Mechanism, etc.
- Skimmers and Boom Cleaning Units:
  Piston Ring, Gasket, Mechanical Seal for Pump, Bolts and Nuts, Filter for Oil Pressure Mechanism, etc.
- Oil Combat Vessels:
  Piston Ring, Gasket, Mechanical Seal for Pump, Bolts and Nuts, Filter for Oil Pressure Mechanism, Fuse, Lamp, etc.
- VHF Communication Unit:
  Fuse, Lamp, etc.

Table 2-3-7 Outline of Equipment to be Provided

(1/2)

Item	Specifications	Unit	Quantity
1. Reduction of Spreading			
1.1 Deflecting Boom, Small	Wave resistance : upto 1.0 m Floating method : air inflated Measurements : freeboard: 300-400 mm draft: 400-600 mm Unit connection : ASTM D962-86	200 m	4
1.2 Deflecting Boom, Medium	Wave resistance : upto 1.5 m Floating method : air inflated Measurements : freeboard: 400 - 600 mm draft: 500 - 750 mm Unit connection : ASTM D962-86	200 m	2
1.3 Oil Trawl	Measurements : freeboard: 500 - 750 mm draft: 750 mm (min.) Trawling width : 24 - 28 m Connection : ASTM D962-86 to be connected to deflecting booms	set	1
1.4 Boom Cleaning Unit	Subject booms : those in 1.1 and 1.2 above Cleaning capacity : 60 m in length per hour Power source : hydraulic unit to drive the winding drum for booms or hydraulic unit of a skimmer	pc	1
1.5 Shore Protection Boom	Measurements : freeboard: 300 mm (min.) draft: 300 mm (min.) Connection : ASTM D962-86 at 500 m intervals	1,000 m	3
1.6 Shore Protection Carpet	Measurements : 4 - 5 m (W), 10 - 20 m (L) Material : bio-degradable treated natural fibre	200 m	12
1.7 Sorbent Boom/Sorbents	Minimum absorption capacity (gas oil) : 0.75 ℓ of oil per litre	500 m	4
2. Recovery and Containment			
2.1 Skimmer, Medium Viscous Oil, Small ($10 m^3$/hr class)	Recovery mechanism : adhesion (MOP) type Recovery rate : 8 - 12 m^3/hr	set	1
2.2 Skimmer, Medium Viscous Oil, Medium ($50 m^3$/hr class)	Recovery mechanism : disc type Recovery rate : 50 - 60 m^3/hr	set	1
2.3 Skimmer, High Viscous Oil ($60 m^3$/hr class)	Recovery mechanism : weir-type and screw pump Recovery rate : 60 - 100 m^3/hr	set	2
2.4 Emergency Off-Loading System	Pumping capacity : 350 m^3/hr × 6 kg/cm^2 Pump type : centrifugal, submerged	set	1
2.5 Vacuum Truck	Mounted tank capacity : approximately 13 m^3 Suction rate : 1,500 m^3/hr	pc	1
2.6 Oil/Water Separator	Separation rate : approx. 50 m^3/hr	pc	1
2.7 Demulsifying Unit	Emulsion oil treatment capacity : upto 80 m^3/hr	pc	1
2.8 Collapsible Floating Tank, Small	Oil storage capacity : 10-15 m^3	pc	2
2.9 Collapsible Floating Tank, Medium	Oil storage capacity : 25-30 m^3	pc	2
2.10 Collapsible Floating Tank, Large	Oil storage capacity : 100 m^3	pc	4
2.11 Flexible Tank	Oil storage capacity : 10 - 15 m^3	pc	5

Item	Specifications	Unit	Quantity
3. Transportation			
3.1 Oil Combat Vessel, Small (10 m class)	Main particulars : overall length : approx. 10m moulded width: approx. 4m moulded depth: approx. 0.9m Maximum speed : 25 knots or more Crane capacity : rated lifting capacity: 0.6 tons Deck workspace : approx. 30 m^2	pc	1
3.2 Oil Combat Vessel, Large (20 m class)	Main particulars : overall length: approx. 21m moulded width: approx. 7 m moulded depth: approx. 1.6 m Maximum speed : 20 knots or more Oil tank capacity : approx. 45 m^3 with heater Crane capacity : rated lifting capacity: 1.5 tons Deck workspace : approx. 55 m^2 Fire-fighting capacity : 4,000 ℓ /min	pc	1
4. Miscellaneous			
4.1 VHF Portable Communication Unit	To be used for the transmission of instructions, information and other communication purposes between the Centre and combat teams and between different Centres	pc	6
4.2 VHF Stationary Communication Unit	As above	pc	1
	As above	pc	1
4.3 VHF Repeater Station	As above	pc	1
4.4 VHF Warning System			
4.5 Radio Equipment System Test	As above	set	1
4.6 Lighting Equipment	Source : sodium lamp (1.2 kW)	set	1
4.7 Steam Cleaner	Hot water pressure : 120 kg/cm^2 Water flow rate : 100 litres/min or more	pc	1
4.8 Crane for Harbour Tugs	Crane capacity : rated lifting capacity: 2 tons working radius: 6.5 m	pc	2
4.9 Equipment and Materials for Rebuilding of Barges	[Recovered Oil Tank Specifications] Capacity : 50 m^3 (× 4 tanks) Accessories : electric heater (20 kW × 2) insulation material hoses and cables [Pump Unit] Capacity : approx. 10 m^3/hr Pressure : approx. 5 kg/cm^2 Power : electricity	set	2
4.10 Beach Cleaning Tools	Cleaning tools for beaches and coastlines	set	1
4.11 Personal Safety Equipment and Protective Clothing	Oil-resistant boots and oil-resistant working clothes, gloves, etc.	set	1

Table 2-3-8 Outline of Oil Combat Equipment Operation Plan

Scale of Oil Spillage	Equipment Category					Oil Treatment Method
	1. Reduction of Spreading	2. Recovery and Containment	3. Transportation	4. Miscellaneous		
				Communication, etc.	Cleaning, etc.	
1. Ground Spillage-Tank Rupture	• Protection by existing dike for oil tanks	• Recovery by vacuum trucks (2.5)	• Transportation by existing lorries or transfer to existing tanks			• Same as the present methods: either entrusting to calling vessels equipped with a waste oil tank or mixing with tar for road paving.
2. Sea Spillage ① Small Spillage at Jetty (less than 2 m^3)	• Contained by deflecting booms (1.1)	• Recovery by small skimmer (2.1) and/or sorbent boom/sorbents (1.7) from jetty or combat vessel	• Land transportation by existing lorries; at sea, first transported by large vessel (3.2) and then by lorries	• Dispatch of equipment to the site instructed on receipt of an accident report through the VHF unit (4.1)	• The following cleaning equipment and tools are used as part of the oil combat operation - Boom cleaning unit (1.4) - Vacuum truck for coastal cleaning (2.5) - Steam cleaner (4.7) - Beach cleaning tools (4.10) - Safety equipment and protective clothing (4.11)	As above
② Small Spillage at Sea (2 - 10 m^3)	• Contained by deflecting booms (1.1); larger booms (1.2) are used when the weather conditions at sea are severe	• Use of suitable skimmer (2.1, 2.2 or 2.3) and sorbent boom/sorbents (1.7) depending on the spillage size and weather conditions, etc.	• Use of suitable combat vessel (3.1 and 3.2) and existing support boats (4.8, 4.9) to conduct the following work - Transportation of boom container - Inflation of booms - Towing of booms - Transportation and installation of skimmer - Transportation of other equipment - Oil recovery work - Transfer and transportation of recovered oil to the port	• Use of VHF units (4.2) for communication between the Centre and the operation site		As above
③ Medium Spillage at Sea (10 - 30 m^3)	• Same operation details as ② above except the use of the oil trawl (1.3) if applicable	• Use of emergency off-loading system (2.4) to extract remaining fuel oil from the fuel tank in the case of a ship accident		• Use of VHF units when communication and request for assistance of other countries are required		• Reclaimed at the refinery or burnt; in the case of high viscosity oil, the following facilities are used due to the impossibility of its transportation to the refinery by lorry - Oil/water separator (2.6) - Demulsifying unit (2.7) - Existing API separator and slop tank
④ Large Spillage at Sea (30 - 200 m^3) (spilled oil is likely to become high viscosity oil)	• Use of the following equipment if there is a high risk of the coastline (beaches) being contaminated - Shore protection boom (1.5) - Shore protection carpet (1.6) - Sorbent boom/sorbents (1.7)	• Use of the following storage facilities depending on the quality of the oil to be recovered and the site conditions - Floating tanks (2.8, 2.9 and 2.10) - Flexible tank (2.11) - Improved tanks on existing barges (4.9)		• Use of lighting equipment (4.6) for the night work		

Note: The figures in brackets denote the equipment code in Table 2-3-7.

(2) Outline of Equipment Specifications

The equipment specifications are given in Tables 2-3-9/12 for the different equipment categories.

Table 2-3-9 Equipment for Reduction of Spreading
Table 2-3-10 Equipment for Recover and Containment
Table 2-3-11 Equipment for Transporation
Table 2-3-12 Miscellaneous Equipment

Table 2-3-9 Equipment for Reduction of Spreading

(1/2)

Equipment	Quantity	Specifications	Reasons for Selection
1.1 Deflecting Boom, Small	200 m × 4	1. Wave Height : upto 1.0 m 2. Buoyancy : air inflated 3. Measurements : freeboard: 300 - 400 mm draft : 400 - 600 mm 4. Connection : ASTM D962-86 5. Materials : neoprene or similar 6. Buoyancy-Weight Ratio : min. 16:1 7. Deployment Time : less than 10 minutes per 200 m in length 8. Storage : each unit to be stored with the winding drum of the container	• The inflatable boom can be stored in a relatively small container, allowing great flexibility for land and sea transportation. • The unit length of 200 m allows flexible selection of the total length and the system is capable of combating a wide range of oil spillage incidents. • As the prevailing wave height in the Gulf of Aqaba is 1 m or less, a boom capable of operating under a wave height of upto 1.0 m is selected. Standard specifications for the connecting parts are adopted for all three countries.
1.2 Deflecting Boom, Medium	200 m × 2	1. Wave Height : upto 1.5 m 2. Buoyancy : air inflated 3. Measurements : freeboard: 400 - 600 mm draft : 500 - 750 mm 4. Connection : ASTM D962-86 5. Materials : neoprene or similar 6. Buoyancy-Weight Ratio : min. 15:1 7. Deployment Time : less than 10 minutes per 200 m in length 8. Storage : each unit to be stored with the winding drum of the container	• The boom characteristics are the same as those in 1.1. • The provision of booms capable of containing spilled oil under a wave height of upto 1.5 m is believed necessary as such a wave height has been recorded in the past.
1.3 Oil Trawl	1	1. Measurements : freeboard : 500 - 750 m min. draft: 750 mm 2. Opening : 24 - 28 m 3. Connection : ASTM D962-86 4. Deployment Time : less than 20 minutes 5. Storage : to be stored in a container of specified measurements	• The most common method of recovering a large amount of spilled oil at sea is to connect deflecting oil booms to a length of 200 m or 400 m to be towed by two vessels. • The efficient recovery of the gathered oil by a skimmer requires an increased thickness of oil inside the boom(s). • The oil trawl operates in a V shape once deployed with a wide opening and narrow bottom to increase the oil thickness for efficient skimming. • Deployment along a single combat vessel to collect a small quantity of spilled oil is possible.

Equipment	Quantity	Specifications		Reasons for Selection
1.4 Boom Cleaning Unit	1	1. Subject Booms 2. Capacity 3. Power Source 4. Storage	: those in 1.1 and 1.2 above : 60 m in length per hour : hydraulic unit to drive the winding drum for the booms or hydraulic unit of the skimmer : to be stored in the container	• It is necessary the clean the booms using the specially designed cleaning unit after recovery operation to ensure efficient operation in the future, to prevent secondary pollution of the sea and to ensure the long working life of the booms.
1.5 Shore Protection Boom	1,000 m × 3	1. Measurements 2. Buoyancy-Weight Ratio 3. Connection 4. Deployment Time 5. Accessories 6. Storage	: freeboard: 300 mm (min.) draft : 300 mm (min.) : min. 20:1 : ASTM D962-86 at 500 m intervals : maximum 2 hours per 1,000m in length : - rubber boat with outboard engine for boom deployment - tools and rope, etc. for boom deployment : to be stored in the special container together with all accessories	• The equipment is capable of providing the urgent protection of tourist beaches and coral reefs along the coast of the Gulf of Aqaba as it is located at a distance of some 10 - 15 km from the Main Port. • Containers storing a single unit each are deployed at the subject sites for a quick response.
1.6 Shore Protection Carpet	200 m × 12	1. Measurements 2. Deployment Time 3. Storage	: width : 4 - 5 m length: 10 - 20 m : less than 15 minutes per 200 m in length : to be stored in the drum	• The oil spillage incident in the Gulf of Alaska in 1990 made all countries aware of the need for coastline protection, leading to the development of this type of carpet. This will be essential in the battle to protect beaches from spilled oil.
1.7 Sorbent Boom/Sorbents	1. Boom: 500 m × 4 or 2. Sorbents: 1 m^2 × 2,000	1. Materials 2. Efficiency (gas oil) 3. Floatability 4. Measurements 5. Deployment Time (boom) 6. Storage	: bio-degradable treated natural fibre (cellular) : larger than 0.75 litres of oil per litre : 98% or more for at least 10 days : freeboard: approx. 20 cm draft : no specific requirement : upto 300 m per hour : to be stored as a unit of 50 m	• When the chemical method is not used, the skimmer finds it difficult to conduct efficient oil recovery to deal with a thin oil layer or a small quantity of spilled oil. These sorbent booms and sorbents are easy to use for this purpose. • Treated natural fibre products are selected due to the lower likelihood of their causing secondary contamination after being sunk in the seabed. High floatability is also emphasised in the selection process.

Table 2-3-10 Equipment for Recover and Containment

(1/3)

Equipment	Quantity	Specifications	Reasons for Selection
2.1 Skimmer, Medium Viscous Oil, Small	1	1. Principle : adhesion belt type 2. Mechanism : oil adhering to the belt-shaped band (oil mop) to be squeezed out 3. Capacity : 8 - 12 m^3/hr 4. Oil Viscosity : 1 - 5,000 mPas 5. Efficiency : free water content of upto 10% in the recovered oil 6. Power/Power Source : hydraulic unit driven by the engine 7. Storage : to be stored in a transportable single unit container	• The small skimmer is required to have a high degree of maneuverability and workability to operate in complicated topography or limited space. • The equipment in question is used worldwide as it meets the above requirements. • It is suitable for oil recovery in small confined areas in the Gulf of Aqaba.
2.2 Skimmer, Medium Viscous Oil, Medium	1	1. Principle : adhesion disc type 2. Mechanism : oil to be skimmed by the rotating metal/plastic adhesion disc for scraping off 3. Capacity : 50 - 60 m^3/hr 4. Oil Viscosity : 1 - 5,000 mPas 5. Efficiency : free water content of upto 10% in the recovered oil 6. Power/Power Source : hydraulic unit driven by the engine 7. Storage : to be stored in a transportable single unit container	• This equipment with a relatively large capacity is widely used to skim medium viscosity oil and is selected for the Project to deal with medium-scale oil spillage incidents in the port area.
2.3 Skimmer, High Viscosity Oil	2	1. Principle : weir type 2. Mechanism : incoming oil over the weir to be transferred by the screw pump 3. Floating Skimmerhead : with adjustable weir height for different types of oil 4. Capacity : 60 - 100 m^3/hr 5. Efficiency : free water content of upto 20% in the recovered oil 6. Power/Power Source : hydraulic unit driven by the engine 7. Storage : to be stored in a transportable single unit container	• This is a recently developed product to combat emulsion oil as oil drifting for a long time takes on a tar-like appearance (called "mousse"), gaining high viscosity. • It is practically impossible to recover this oil using conventional skimmers. Making the best use of the relatively low wave height in the Gulf of Aqaba, a free-floating skimmerhead equipped with an height-adjustable weir is planned together with a screw pump capable of dealing with high viscosity oil. Two units are planned to ensure efficient operation in view of the assumed maximum spillage of 200 m^3.

Equipment	Quantity	Specifications	Reasons for Selection
2.4 Emergency Off-Loading System	1	1. Pumping Capacity : 350 m^3/hr × 6 kg/cm^2 2. Pump Type : centrifugal, submerged pump 3. Power Source : hydraulic motor driven by the diesel engine 4. Engine Capacity : 120 kW 5. Storage : pump and its accessories, etc. to be stored in an aluminium container of the specified size	• Most ships navigating in the Gulf of Aqaba call at Aqaba Port and this equipment is essential for oil spillage incidents involving fuel tank ruptune of large ships.
2.5 Vacuum Truck	1	1. Tank Capacity : approx. 13 m^3 2. Suction Capacity : 1,500 m^3/hr 3. Safety Standards : European ADR Regulations 4. General Design : operable on sandy or rocky shores	• Vacuum trucks have been found to be useful to combat ground oil spillage incidents and to clean coastal areas.
2.6 Oil/Water Separator	1	1. Capacity : approx. 50 m^3/hr 2. Efficiency : oil content of less than 100 ppm in the discharged water 3. Separation System : coalescence type 4. Accessories : - flow meter - sampling unit - controller and operation panel - hoses	• For the recycling of oil from emulsion oil, this unit should be used to calculate the exact flow in combination with the demulsifying unit (2.7).
2.7 Demulsifying Unit	1	1. Capacity : 80 m^3/hr (min.) 2. Dosage System : 0 - 1,000 ppm of emulsion throughout 3. Flow Control : fully automatic system with a mass-flow meter	• This is to be used in combination with the oil/water separator (2.6).
2.8 Collapsible Floating Tank, Small	2	1. Storage Capacity : 10 - 15 m^3 2. Life : 10 years (min.) 3. Buoyancy : floating when empty, without air filling 4. Strength for Towing : resistant to a towing speed of 5 knots when fully loaded	• A number of floating tanks will be required to combat an oil spillage incident at sea. • As this light-weight floating tank is collapsible, it does not require a large storage space, meeting all the requirements for this type of floating tank.

Equipment	Quantity	Specifications	Reasons for Selection
2.9 Collapsible Floating Tank, Medium	2	1. Storage Capacity : 25 -30 m^3 2. Life : 10 years (min.) 3. Buoyancy : floating when empty, without air filling 4. Strength for Towing : resistant to a towing speed of 5 knots when fully loaded	• A number of floating tanks will be required to combat an oil spillage incident at sea. • As this light-weight floating tank is collapsible, it does not require a large storage space, meeting all the requirements for this type of floating tank.
2.10 Collapsible Floating Tank, Large	4	1. Storage Capacity : 100 m^3 2. Life : 10 years (min.) 3. Buoyancy : floating when empty, without air filling 4. Strength for Towing : resistant to a towing speed of 5 knots when fully loaded	• A number of floating tanks will be required to combat an oil spillage incident at sea. • As this light-weight floating tank is collapsible, it does not require a large storage space, meeting all the requirements for this type of floating tank.
2.11 Flexible Tank	5	1. Storage Capacity : 10 - 15 m^3 2. Full Measurements : diameter: 3.0 - 3.6 m height : 1.5 - 1.7 m 3. Measurements for Storage : 2.0 × 0.5 × 0.5 m 4. Assembly Time : 15 minutes (min.)	• The flexible tank which can be easily assembled on site is particularly useful when a tank is required to store recovered oil in a small space where an ordinary tank system cannot be used either on land or at sea. Its light weight gives the additional advantage of easy transportation.

Table 2-3-11 Equipment for Transportation

(1/2)

Equipment	Quantity	Specifications	Reasons for Selection
3.1 Small Oil Combat Vessel	1	1. Main Particulars : overall length : approx. 10 m moulded width: approx. 4 m moulded depth : approx. 0.9 m 2. Maximum Speed : 25 knots or more (with normal sea and Beaufort wind scale of 2 or less) 3. Propulsion : jet stream 4. Hull Materials : aluminium, reinforced fibre plastic, or steel 5. Crane Capacity : rated lifting capacity: 1.5 tons working radius: 360° × 3.5 m power source: hydraulic 6. Deck Workspace : approx. 30 m^2 7. Towing Capacity : min. 15 KN 8. Design Standards : safety regulations of the DNV for a ship of upto 15 m in overall length or equivalent standards	• The rear deck space of the vessels owned by the Marine Department of the PC is rather small as these vessels are generally used for loading and unloading at the port. An oil combat vessel operating at sea is required to have the following features. ① larger workspace ② self-propelling, high speed operation ③ crane-mounted ④ towing capacity • In view of the above requirements, a new combat vessel is provided and the existing vessels used for supporting work.
3.2 Large Oil Combat Vessel	1	1. Main Particulars : overall length : approx. 21 m moulded width: approx. 7 m moulded depth : approx. 1.6 m 2. Maximum Speed : 20 knots or more (with normal sea and Beaufort wind scale of 2 or less) 3. Propulsion : jet stream 4. Hull Materials : aluminium, reinforced fibre plastic, or steel 5. Recovered Oil Tank Capacity : approx. 45 m^3 with heater 6. Crane Capacity : rated lifting capacity: 1.5 m working radius : 9.5 m power source: hydraulic 7. Deck Workspace : approx. 55 m^2 8. Fire-Fighting Capacity : 4,000 litres/min 9. Towing Capacity : 30 KN or more 10. Design Standards : safety regulations of the DNV for a ship of upto 15 m in overall length or equivalent standards	• An additional oil combat vessel which is similar to that of 3.1 in terms of specifications but which has a much larger size is required to combat a large oil spillage incident of upto 200 m^3. It should be equipped with a recovered oil storage tank of at least some 50 m^3. • A fire-fighting function is added to make the vessel a multi-purpose vessel capable of fighting the fires of small vessels or berths.

Table 2-3-12 Miscellaneous Equipment

(1/2)

Equipment	Quantity	Specifications	Reasons for Selection
4.1 - 4.5 VHF Communication Equipment	1 set	4.1: portable VHF unit × 6 4.2: stationary VHF unit × 1 4.3: VHF repeater station × 1 4.4: VHF warning system × 1 4.5: Testing equipment for the above × 1	• The efficient recovery of spilled oil cannot be achieved simply by the use of recovery equipment. Efficient and effective communication is required to convey instructions to and information between the Centre and operation sites, combat vessels and other countries affected by the spillage. • While Aqaba Port does have a VHF radio communication system, an exclusive channel operated by the Centre will be essential for centralised control to combat an assumed oil spillage of 200 m^3.
4.6 Lighting Equipment	1 set	1. Source : sodium lamp (approx. 1.2 kW) 2. Lighting Mast : 4 m or higher, free-standing 3. 1 set consists of 2 lamps and2 masts	• Lighting equipment is particularly required to ensure the safety of night work.
4.7 Steam Cleaner	1 set	1. Hot Water Pressure : 120 kg/cm^2 2. Water Flow Rate : 100 litres/min or more 3. Water Temperature : 60℃ or higher 4. Power Source : engine	• The steam cleaner is provided to clean oil-stained equipment and berths, etc.
4.8 Crane for Harbour Tugs	2 sets	1. Capacity : rated lifting capacity: 2 tons working radius : 6.5 m power source : hydraulic	• The ship crane is to be mounted to two of the most powerful tug boats owned by the PC to support oil combat operations. The main tasks will be to place the skimmer on the sea and to lift the booms, etc.
4.9 Equipment and Materials for Rebuilding of Barges	2 sets (Tank unit 4 sets, Pump unit 1 set)	1. Recovered Oil Tank Unit : capacity: 50 m^3 quantity: 2 accessories - electric heater (20 kW × 2) - insulation materials - hoses and cables 2. Pump Unit : capacity: 10 m^3/hr quantity: 1 pressure: approx. 5 kg/cm^2 power source: electricity (to be supplied from the existing panelboard at the No. 8 berth of the Main Port 3. All the above electrical units should be flame-proof	• The transportation of the oil recovered from the sea requires a special barge (to be towed) and the tank on the barge must be equipped with a heater to deal with high viscosity oil. This oil tank is to be mounted on the two barges (No.36 and No.37) owned by the Marine Department of the PC and one pump unit is to be installed to transfer the oil from the tank. Remodelling of the barges themselves is unnecessary as the tank and pump are designed as independent units.

Equipment	Quantity	Specifications	Reasons for Selection
4.10 Beach Cleaning Tools	1 set (for 24 workers)	Cleaning tools for oil-contaminated beaches and coastline	• These are necessary to ensure personal safety and efficiency during cleaning work.
4.11 Personal Safety Equipment and Protective Clothing	1 set (for 24 workers)	1. Helmets 2. Oil-Resistant Boots 3. Oil-Resistant Working Clothes 4. Oil-Resistant Gloves, etc.	• These are necessary to ensure personal safety and efficiency during cleaning work.

(3) Verification of Main Equipment Quantities

Of the planned equipment, that which will be most frequently used will be deflecting booms (Nos. 1-1 and 1-2 in Table 2-3-7) and oil skimmers (Nos. 2-1, 2-2 and 2-3 in Table 2-3-7). The required numbers of these equipment are verified below.

1) Deflecting Booms

Oil spilled at sea spreads over a wide area in accordance with time. In general, there is no regular pattern of this dispersion as it is affected by the wind velocity, current strength and oil viscosity. Verification of the required equipment quantity here is, therefore, theoretical based on the assumption that the sea is calm enough not to change the properties of the spilled oil.

① Radius of Oil Dispersion

The estimated radius of oil dispersion is shown in Tables 2-3-13 and 2-3-14.

Table 2-3-13 Estimated Radius of Dispersion of Heavy Fuel Oil

(Oil Type: C Heavy Fuel Oil, Viscosity: 450 centipoise)

Time Passed Spillage Size	Radius After One Hour (m)	Radius After 2 Hours (m)	Radius After 3 Hours (m)	Radius After 4 Hours (m)
1 m³	7.0	7.6	8.0	8.3
10 m³	16.6	18.1	19.1	19.8
30 m³	25.1	27.4	28.8	29.9
50 m³	30.4	33.2	34.9	36.2
100 m³	39.4	43.0	45.2	46.9
200 m³	53.5	55.2	58.0	60.2
300 m³	59.5	64.9	68.3	70.8

Source: The Japan Association for Preventing Marine Accidents

Table 2-3-14 Estimated Radius of Dispersion of Crude Oil

(Oil Type: Iranian Heavy Crude Oil, Viscosity: 8.7 centipoise)

Time Passed Spillage Size	Radius After One Hour (m)	Radius After 2 Hours (m)	Radius After 3 Hours (m)	Radius After 4 Hours (m)
1 m³	12.5	13.7	14.4	14.9
10 m³	29.7	32.4	34.1	35.3
30 m³	44.8	48.9	51.4	53.3
50 m³	54.3	59.2	62.3	64.6
100 m³	70.4	76.8	80.8	83.8
200 m³	91.5	99.8	105.0	108.9
300 m³	106.3	116.0	122.0	126.5

Source: The Japan Association for Preventing Marine Accidents

② Estimation of Minimum Requirement for Deflecting Boom Length

(a) Oil Spillage (Heavy Fuel Oil) of Less Than 10 m^3

An oil spillage incident involving less than 10 m^3 of oil is considered the most typical oil spillage at Aqaba Port. Assuming sea weather conditions of a wave height of not more than 1 m and 3 hours required to transport the equipment and deploy the boom, the dispersion radius will be approximately 20 m according to Table 2-3-13. The boom length required to surround the dispersed oil is approximately 126 m (20 m × 2 × 3.14). As the single unit length of the boom to be deployed with a wave height of 1 m or less (Equipment No. 1.1) is 200 m, the deployment of just one unit should be sufficient.

(b) Oil Spillage (Heavy Fuel Oil) of 200 m^3

The maximum oil spillage assumed by the Project is 200 m^3. Given the same conditions employed in (a) above (a wave height of 1.0 m or less and the elapse of 3 hours before boom deployment), the minimum boom length is in theory approximately 365 m (58 m × 2 × 3.14), requiring two units (total length of 400 m) (Equipment No. 1.1). When a much higher wave height and stronger wind are involved, the oil does not radially disperse evenly. In addition, some oil can escape under the skirt of the boom. Booms capable of operating under such conditions are, therefore, required. This is the main reason why two boom units (400 m in total = 200 m/unit × 2) operable upto a wave height of 1.5 m (Equipment No. 1.2) should be provided.

An actual spillage situation is, in fact, much more complex than the theoretical model. Spilled oil tends to be thicker on the leeward side, making its escape under the deployed boom highly likely, in turn necessitating the dual or even triple deployment of booms. Given the fairly constant wind direction at Aqaba Port (north wind), an additional two boom units (total length of 400 m) are required for dual boom deployment. The total requirement for small deflecting booms (upto a wave height of 1.0 m) is 4 units. When the sea conditions are so bad that the spilled oil is divided into sections, it will be necessary to request that neighbouring countries (Israel and/or Egypt) mobilise their units to encircle the drifting oil or to deploy triple lines of booms.

(c) Oil Spillage (Crude Oil) of 200 m^3 at Port Eilat

While Aqaba Port is not involved in the loading and unloading of crude oil, an oil spillage incident may occur at the oil jetty of Eilat Port as has happened in the past.

Assuming that the rate of spilled oil dispersion is the same as in case (b) above, the radius of dispersion after 3 hours will be approximately 105 m (Table 2-3-14), necessitating the deployment of some 660 m long booms to encircle the area of dispersion. This means that at least 4 units of small booms (Equipment No. 1.1) should be available for single line deployment. The dual or triple line deployment of booms will require the assistance of other countries.

2) Skimmers

As already described in 2.3.1-(1)-2), spilled oil absorbs sea water over time and its viscosity substantially increases with a high water ratio, becoming so-called emulsion oil. The main factor in acceleration of this process is said to be the drift current caused by wind. Tables 2-3-2 and 2-3-3 give the actual test results for this change of the oil properties in relation to time.

① Specifications and Number of Skimmers

The viscosity data for crude oil given in Table 2-3-3 indicate widely varying water content and viscosity of crude oil depending on the wind velocity. In order to deal with this diversity, skimmers capable of tacking medium to high viscosity oil are required.

(a) Oil Spillage of Less than 10 m^3

In the case of a small spillage (less than 10 m^3) of medium viscosity fuel oil, the small skimmer for medium viscosity oil (10 m^3/hr class) to be provided under the Project (Equipment No. 2.1) can recover the oil in 4 hours based on the following conditions.

[Assumed Conditions]

- Wind Velocity : not more than 5 m/sec
- Time Elapsed Since Spillage : upto 3 hours
- Water Content : upto 50%
- Skimmer Efficiency : 50%

[Recovery Time]

$$\text{Recovery Time (hours)} = \frac{\text{quantity of original spillage } (m^3) + \text{water quantity } (m^3)}{\text{nominal capacity } (m^3/hr) \times \text{recovery efficiency } (\%)}$$

$$= \frac{10m^3 + 10m^3}{10m^3/hr \times 0.5}$$

$$= 4$$

(b) Oil Spillage of 200 m^3

In the case of a high viscosity oil spillage, the water content and viscosity of the oil substantially change after 3 hours have elapsed under a wind velocity of 10 m/sec as shown in Tables 3-3-2 and 3-3-3. It takes approximately 3 hours before oil recovery operation commences at sea (2 hours to reach the spillage site and one hour to deploy the boom). With the deployment of 2 oil skimmers for high viscosity oil (60 m^3/hr: Equipment No. 2.3 and another unit of a neighbouring country), spilled high viscosity oil of 200 m^3 can, in theory, be recovered in 9.1 hours.

[Assumed Conditions]

- Wind Velocity : 10 m/sec
- Time Elapsed Since Spillage : 3 hours
- Water Content : 73%
- Skimmer Efficiency : 50%

[Recovery Time]

$$\text{Recovery Time (hours)} = \frac{\text{quantity of original spillage } (m^3) + \text{water quantity } (m^3)}{\text{nominal capacity } (m^3/hr) \times \text{recovery efficiency } (\%) \times \text{no.}}$$

$$= \frac{200m^3 + 346m^3}{60m^3/hr \times 0.5 \times 2}$$

$$= 9.1$$

The continuous recovery of spilled oil of 200 m^3 is not a practical assumption as there are time losses caused by night work, changing over of the storage tanks and relocation of the skimmers, etc. Taking this extra time into consideration, a realistic time scale to complete the recovery of 200 m^3 of spilled oil is one day or one and a half days.

(4) Basic Design Drawings

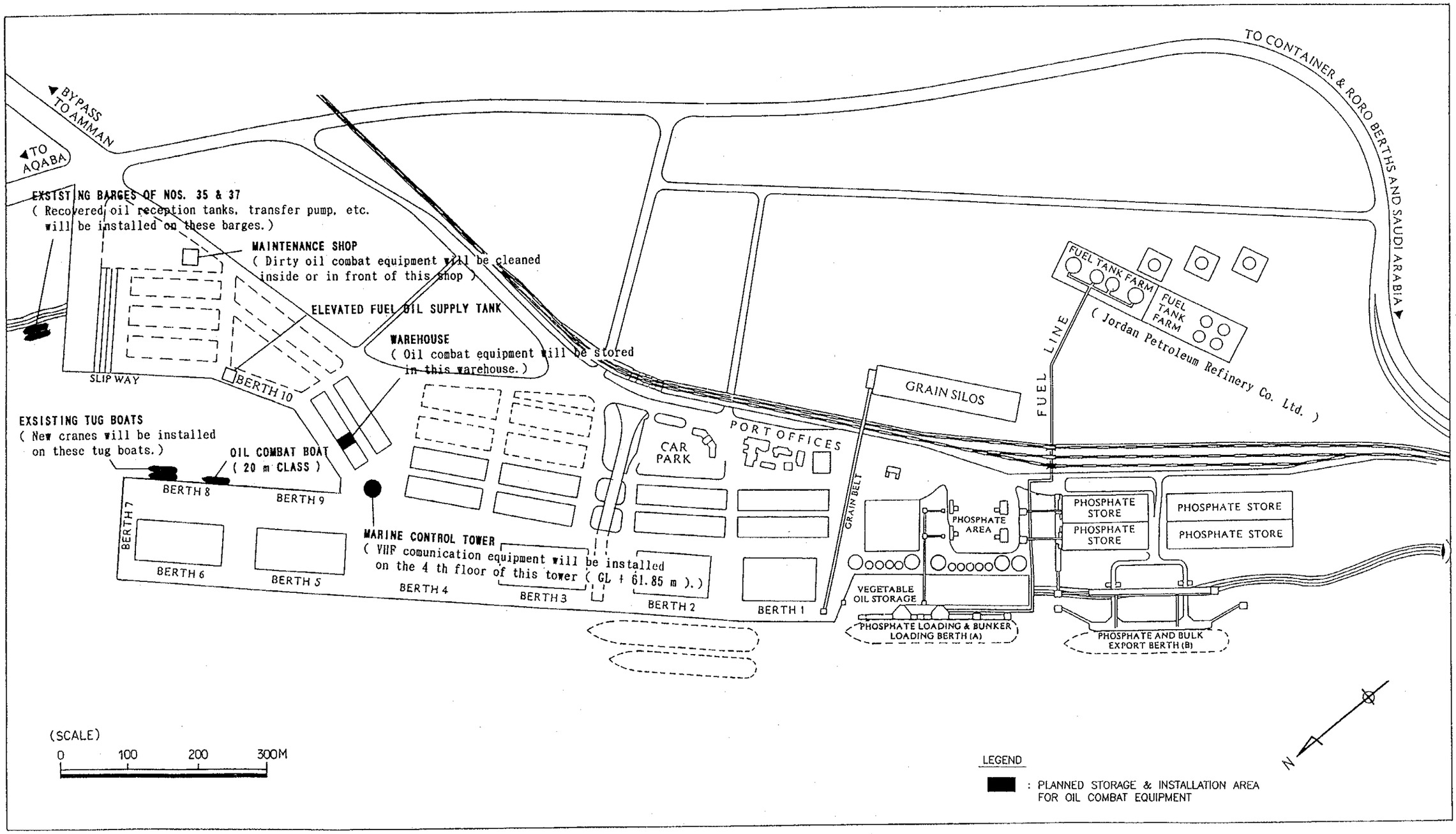
The following basic design drawings are included in this report.

Drawing G-1: Plot Plan of Aqaba Main Port Facilities
Indicating the locations of oil combat equipment which will be stored or installed.

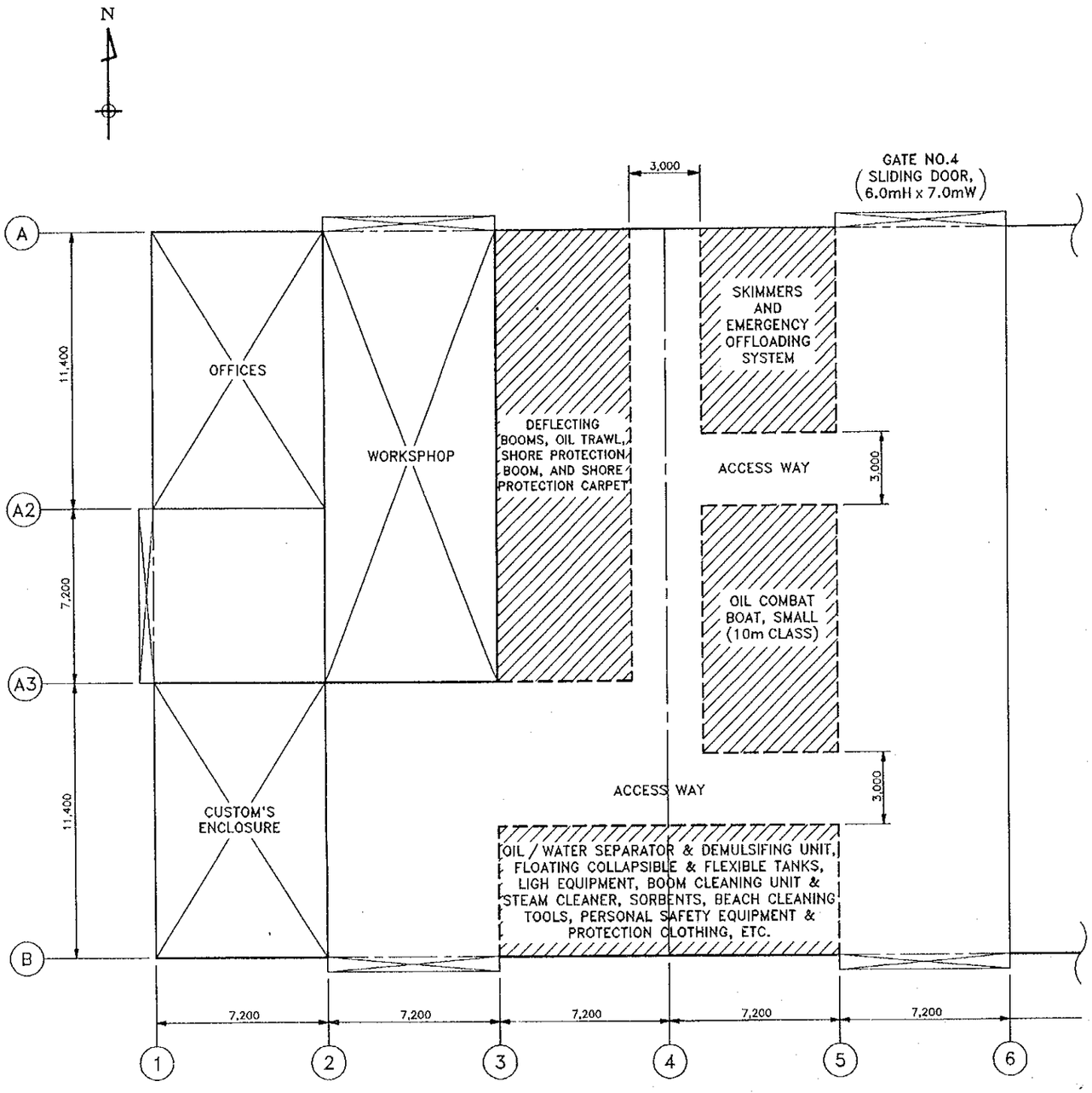
Drawing G-2: Warehouse and Layout of Oil Combat Equipment
Indicating the layout for the oil combat equipment which will be stored in the warehouse.

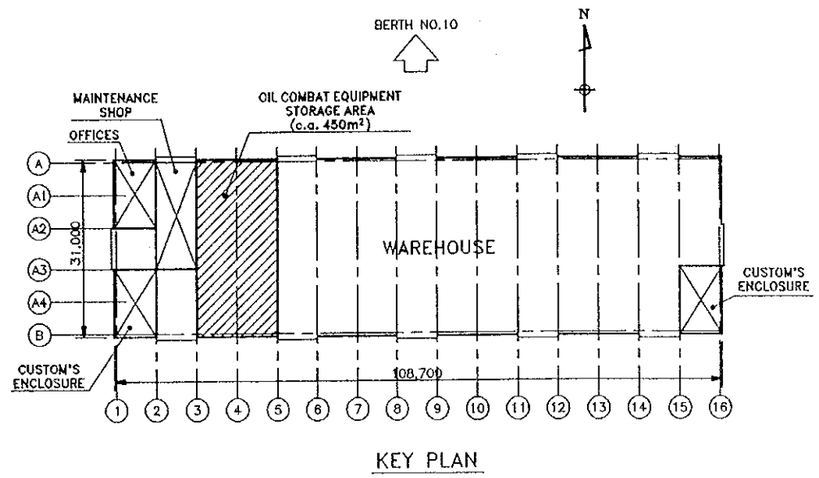
Drawing E-1: Location of New Crane on Existing Tug Boats
Indicating the location of new crane which will be mounted on the existing tug boats of Amman and Al-Aqaba.

Drawing E-2: Recovered Oil Reception Tanks and Transfer Pump
For the recovered oil reception tanks and transfer pump which will be mounted on the existing barges of Nos.35 & 37, indicating their arrangement and the details of recovered oil reception tanks.



DRAWING NO. G-1 : PLOT PLAN OF AQUABA MAIN PORT FACILITIES





KEY PLAN

NOTES :

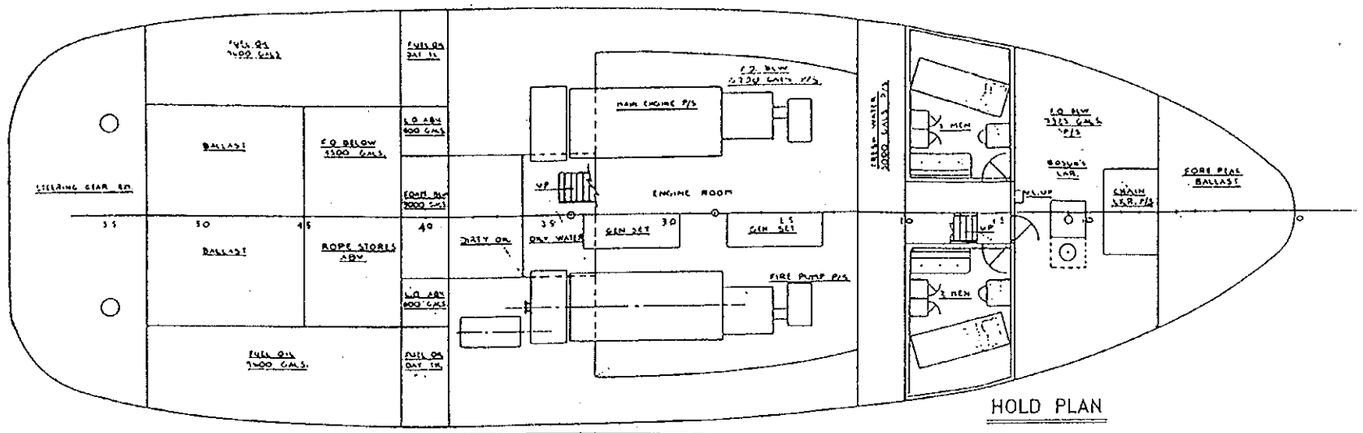
1) OIL COMBAT BOAT, LARGE (20m CLASS) WILL BE MOORED AT A QUAY.
2) VACUUM TRUCK WILL BE STORED OUTDOORS NEAR THIS WAREHOUSE..
3) THE UNIT ON THIS DRAWING IS MILIMETER (mm), IF STATED OTHERWISE.

LEGENDS :

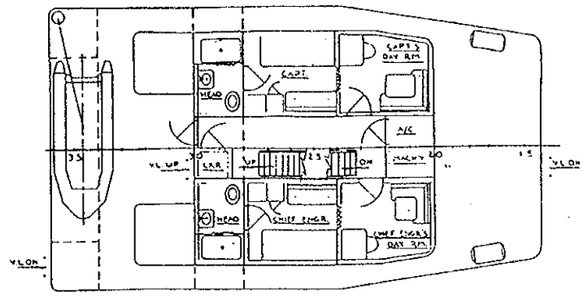
▨ : PLANNED STORAGE AREA FOR OIL COMBAT EQUIPMENT

(SCALE)
0 5 10 M

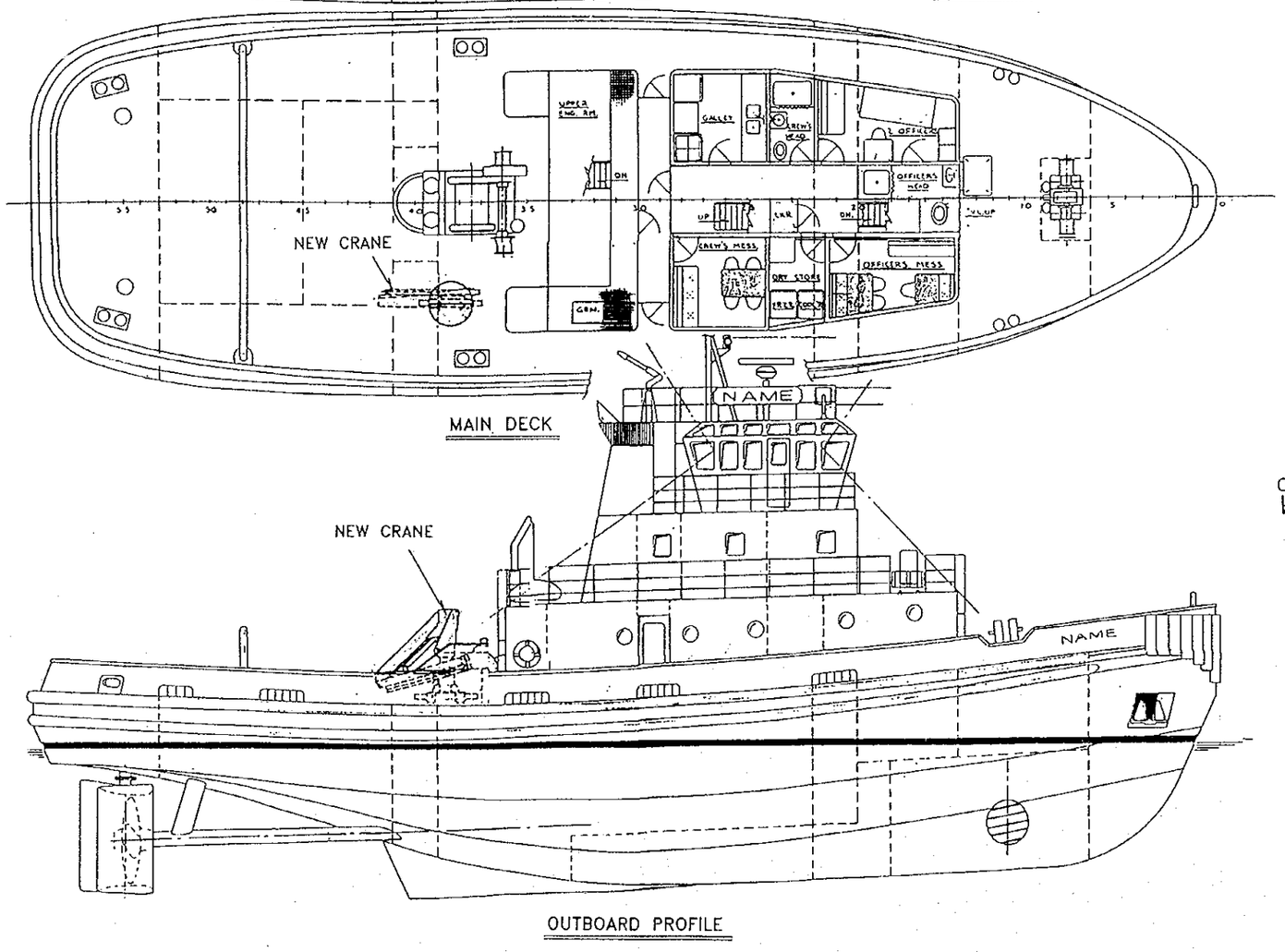
DRAWING NO. G-2 : WAREHOUSE AND LAYOUT OF OIL COMBAT EQUIPMENT



HOLD PLAN

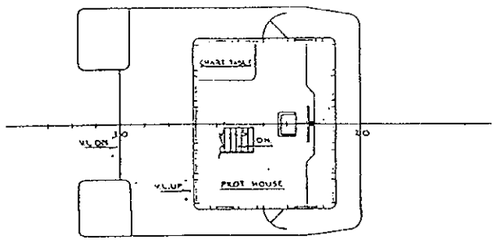


BOAT DECK (01 LVL.)



MAIN DECK

OUTBOARD PROFILE



BRIDGE (02 LVL.)

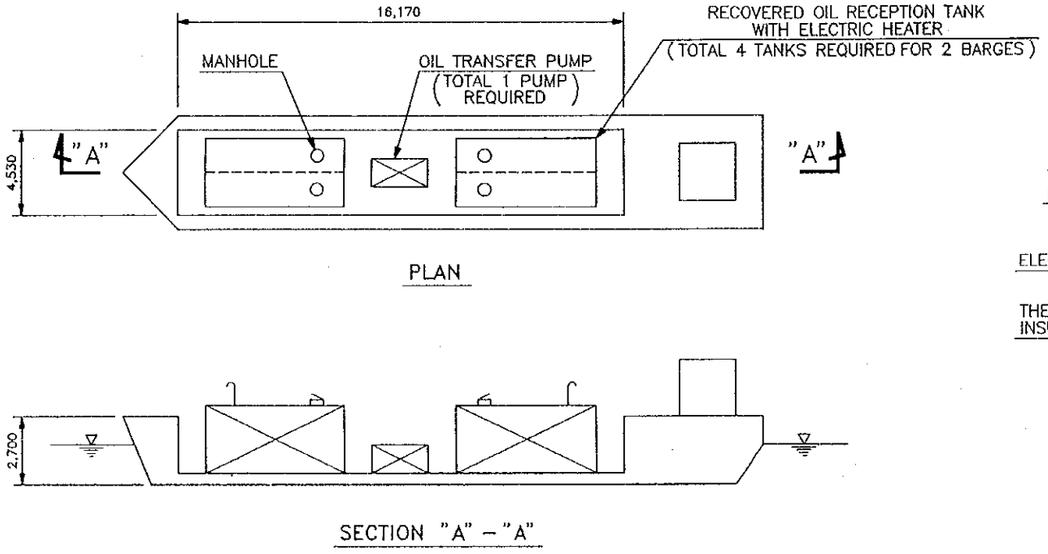
0 5M 10M

NOTE : IN THIS PROJECT, CRANES WILL BE SUPPLIED, BUT THIER INSTALLATION IS JORDAN'S SCOPE OF WORKS.

CHARACTERISTICS

LENGTH O.A. (MLD)	106'-6"
LENGTH @ 13'-6" W.L.	103'-8"
BEAM (MLD)	34'-0"
DEPTH (MLD)	16'-0"
DESIGN DRAFT	13'-6"
FUEL OIL CAP.	50,750 GALS.
FRESH WATER CAP.	10,000 GALS.
FOAM CAP.	3,000 GALS.
LUBE OIL CAP.	1,600 GALS.
TUG BOAT NAME	AMMAN & AL-AQUABA.

DRAWING NO. E-1 : LOCATION OF NEW CRANE ON EXSISTING HABOUR TUGS

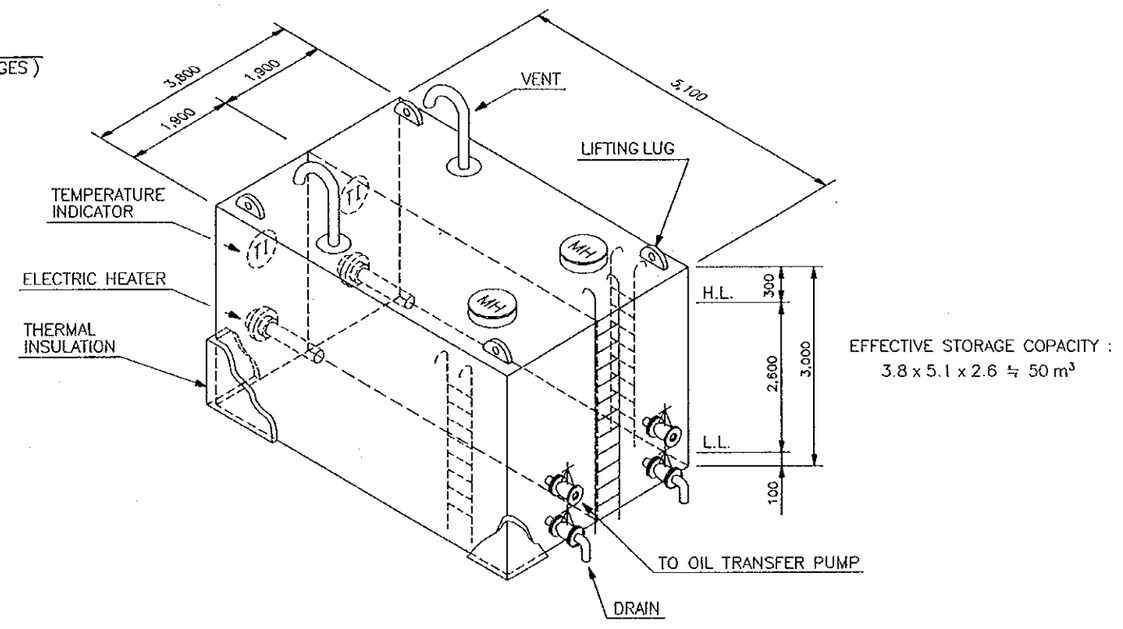


PLAN

SECTION "A" – "A"

KEY PLAN

(UNIT : mm)



EFFECTIVE STORAGE COPACITY :
$3.8 \times 5.1 \times 2.6 \fallingdotseq 50\ m^3$

DETAILS
FOR
RECOVERED OIL RECEPTION TANK

(UNIT : mm)

REMARKS :

IN THIS PROJECT, RECOVERED OIL TANKS, TRANSFER PUMP, ETC. WILL BE SUPPLIED, BUT INITALLATION OF THESE EQUPMENT IS JORDAN'S SCOPE OF WORKS.

DRAWING NO. E-2 : RECOVERED OIL RECEPTION TANKS WITH ELECTRIC HEATERS AND TRANSFER PUMP ON EXISTING BARGES (NOS. 35 & 37)

CHAPTER 3

IMPLEMENTATION PLAN

CHAPTER 3 IMPLEMENTATION PLAN

3-1 Implementation Plan

3-1-1 Implementation Concept

The Project will be implemented within the framework of the grant aid system of the Government of Japan. The Project will formally commence with the signing of the E/N upon approval by the Governments of Jordan and Japan. The Government of Jordan will subsequently select a consultant (Japanese corporation) to conduct the detailed design work. With the completion of the detailed design documents, the equipment supplier (a Japanese corporation responsible for equipment supply) who is the successful bidder will conduct the supply of the equipment. The basic issues and implementation conditions of the project implementation process are described below.

(1) Project Implementation Agency

The agency responsible for the Project on the Jordanian side will be the Ports Corporation (PC) which will ensure the smooth implementation of the Project by the leadership of the Marine Department under the control of its Director General. The Government of Jordan will be required to appoint a person responsible for the Project to maintain close communication and to consult with the Japanese consultant and equipment supplier for the smooth progress of the Project throughout all its stages.

(2) Consultant

A Japanese consultant will be selected by the Government of Jordan to conclude a design and supervision agreement with a view to procuring the envisaged equipment and materials with Japanese grant aid. The consultant will conduct the detailed design for and supervision of the procurement of such equipment and materials. The consultant will also prepare the tender documents and will conduct the tender procedure on behalf of the implementation agency.

(3) Equipment Supplier

A Japanese company, selected through the open tender process pursuant to the grant aid system of the Government of Japan, will conduct the procurement and supply of the envisaged equipment and materials. The selected equipment supplier must pay proper attention to maintaining post-Project communication links with the Jordanian

side as the supply of spare parts and after-care for equipment breakdowns, etc. will be required in the post-Project years.

(4) Necessity to Dispatch Engineers

The transfer of operating and maintenance technologies for the equipment to be provided under the Project which will be done at the time of delivery of equipment at Aqaba Port will require specially trained engineers who are familiar with the equipment specifications and functions. As the recruitment of such engineers in Jordan is currently difficult, it will be necessary to request the equipment manufacturers to dispatch engineers conversant with the operation and maintenance of the equipment in question to Jordan to train local engineers.

3-1-2 Implementation Conditions

There are several points to note relating to the manufacture, transportation and delivery of the equipment under the Project.

(1) It is expected that the envisaged equipment will be procured not only in Japan but also from many third countries, resulting in a large number of supplier countries and manufacturers. This will necessitate careful checking at the time of approving the equipment design drawings and specifications of their conformity with the design standards, criteria and technical specifications specified in the tender documents.

(2) Because of the expected multiplicity of manufacturers, the on-site inspection of the equipment prior to its shipment will be conducted at a number of sites on different dates. It will be the responsibility of the equipment supplier to coordinate the inspection sites and dates for the convenience of the consultant to attend the inspection. The inspection at factories should be efficiently conducted and the transportation plan should ensure the well-timed delivery of the equipment to avoid any undesirable congestion of the equipment delivery to Jordan.

(3) Special care should be paid in regard to the safe transportation and delivery of the equipment to avoid damage to the existing facilities and third parties working at Aqaba Port.

(4) The method of site testing following the equipment delivery to Aqaba Port should be carefully planned in terms of the testing site and testing hours in order to avoid any disruption of the normal operation of the port.

(5) The Government of Jordan should secure sufficient manpower and equipment required to conduct the site testing of the delivered equipment while ensuring that the allocation of manpower and equipment for this purposes does not disrupt the normal operation of the port.

3-1-3 Scope of Works

The Government of Japan and the Government of Jordan will be responsible for the following work under the Project.

(1) Work to be Undertaken by the Government of Japan

Procurement and delivery of equipment and materials to combat oil spillages.

(2) Work to be Undertaken by the Government of Jordan

Installation work for the following equipment which will be supplied under the Project.

1) Crane for the existing harbour tugs
2) Recovered oil tank unit for re-building of barges
3) VHF communication equipment

3-1-4 Consultant Supervision

In view of the Project's implementation as a grant aid project of the Government of Japan, the selected consultant should conduct the detailed design and work supervision for the Project with proper attention to the following requirements.

- Proper understanding of the background of the project implementation plan
- Proper understanding of the contents of the Basic Design Report
- Proper understanding of the Japan's grant aid system
- Proper understanding of the contents of the Exchange of Notes (E/N) signed by the Government of Japan and the Government of Jordan
- Conformity of the contents of the planned technical cooperation of the EU

Taking the above requirements into consideration, the necessary work during the detailed design and work supervision stages is outlined below together with some specific points to note.

(1) Scope of Work

After the signing of the E/N, the consultant will conclude a consultancy agreement with the Government of Jordan to conduct the following work as defined in the E/N.

1) Detailed Design

- Detailed design work and preparation of the tender documents
- Securing of official approval of the tender documents by the Government of Jordan
- Tender process, evaluation and reporting of the tender results and witnessing of the equipment procurement agreement
- Confirmation of the scope of work for the Government of Jordan

2) Work Supervision

- Issue of the notice to proceed with procurement
- Preparation of a report on the commencement of the procurement procedure
- Consultation with all related parties prior to the commencement of procurement
- Securing of approval of the planned schedule and organization of schedule control meetings
- Approval of the equipment manufacture and specifications
- Witnessing of the factory inspection of the materials and equipment and issue of necessary instructions relating to equipment manufacture
- Witnessing of the site testing of the equipment and issue of necessary instructions
- Preparation of regular work progress reports (monthly)
- Preparation of the project completion report and implementation of the project completion procedure

(2) Points to Note

1) Detailed Design

① Reconfirmation of Equipment Procurement Conditions

The consultant will check the need to change any of the equipment procurement conditions identified at the basic design stage. At this stage, it is essential to review the conformity of the equipment, much of which will be procured from third countries, with the requirements referred to in the basic design and the E/N.

② Preparation and Explanation of Tender Specifications

The consultant must hold thorough discussions with the Government of Jordan during the field survey for the detailed design to ensure that the tender documents, including the detailed design drawings and equipment specifications, conform to the planned EU project and constitute owner's specifications suitable for an equipment procurement project using Japan's grant aid. Moreover, the consultant must obtain the Government of Jordan's approval of these documents.

2) Work Supervision

① Schedule Control

The envisaged project implementation schedule at this time is shown in Fig. 3-1-1. As the Project will be financed by Japan's grant aid, the implementation schedule to be prepared as part of the detailed design must taking the working mechanism of such grant aid into consideration to ensure smooth project implementation in accordance with the schedule. In view of the fact that the work schedule will be significantly affected by the delivery timing of the equipment to be procured in third countries, the consultant is required to enforce strict control of the timing of manufacture, factory inspection, transportation and provisional inspection acceptance, etc.

② Quality Control

It is likely that the equipment procurement under the Project will involve multiple countries and, therefore, the quality control principles and standards will almost certainly vary from one country to another. Under these circumstances, the consultant must carefully inspect the equipment manufacture specifications for comparison with the specifications given in the detailed design and, if necessary, must approve the specifications for the proposed equipment to be procured in order to ensure satisfactory equipment quality so that the original purposes of the equipment design and specifications are not compromised.

③ Supervision

As the Project is an equipment procurement project, it will be unnecessary to dispatch a full-time supervisor to the project site during the project

implementation period. However, it will be necessary to dispatch staff to the project site to conduct the following inspections.

- Factory inspection prior to shipment (at the factories of manufacturers)
- Delivery inspection of the equipment at Aqaba Port

3-1-5 Procurement Plan

The selection of the equipment to be procured and supplied to Jordan under the Project (see 2-3-2) is based on the precondition that the equipment conforms to the objectives, scope and contents of the EU project as agreed by the three parties concerned, i.e. Jordan, Egypt and Israel. Consequently, the technical specifications of the equipment to be procured and supplied to Jordan have been determined to allow use of the equipment by Jordanian organizations participating in the tripartite joint exercises envisaged by the training programme for the EU project.

Of the selected equipment to be supplied, it appears desirable to purchase some equipment, including oil trawl, small skimmers for medium viscous oil, etc., from third countries as these are rarely manufactured in Japan due to the different ideas of placing booms of Japan and the European countries and also because of the low level of need for such equipment. None of the equipment will be procured in Jordan as it is not locally manufactured.

Based on this understanding, the following sources of equipment supply are planned for the Project.

Table 3-1-1 Material and Equipment Source

Equipment Category	Supply Source	
	Japan	Third Country
Reduction of Oil Spreading	—	- Deflecting Boom, Small (upto a wave height of 1.0 m) - Deflecting Boom, Medium (upto a wave height of 1.5 m) - Oil Trawl - Boom Cleaning Unit - Shore Protection Boom - Shore Protection Carpet - Sorbent Boom/Sorbents
Recovery and Containment	- Large Floating Collapsible Tank (100 m^3)	- Small Skimmer for Medium Viscous Oil (10 m^3/hr) - Medium Skimmer for Medium Viscous Oil (50 m^3/hr) - Skimmer for High Viscous Oil (60m^3/hr) - Emergency Off-Loading System - Vacuum Truck - Oil/Water Separator - Demulsifying Unit - Small Floating Collapsible Tank (10 m^3) - Medium Floating Collapsible Tank (25 m^3) - Flexible Tank (10 m^3)
Transportation	---	- Small Oil Combat Vessel (10 m) - Large Oil Combat Vessel (20 m)
Miscellaneous	- Recovered oil tank unit for Rebuilding of Barges	- VHF Portable Communication Equipment - VHF Stationary Communication Equipment - VHF Repeater Station - VHF Warning System - Lighting Equipment - Steam Cleaner - Crane for Harbour Tugs - Beach Cleaning Tools - Personal Safety Equipment and Protective Clothing

3-1-6 Implementation Schedule

If the Project is implemented with grant aid provided by the Government of Japan, it will require three stages to complete after the signing of the E/N by the two countries, i.e. ① preparation of the detailed design documents, ② tender and equipment procurement contract and ③ equipment manufacturing and delivery. These three stages are outlined below while the project implementation schedule is shown in Fig. 3-1-1.

(1) Detailed Design

A Japanese consultant will conclude a consultancy agreement with the Government of Jordan immediately after the signing of the E/N and will commence the detailed design work. The tender documents (specifications and detailed design drawings) will then be prepared based on the results of the basic design and detailed design. Intensive consultations will take place with Jordanian government organizations and the EU consultant at both the beginning and end of the detailed design stage. The tender process will commence with the approval of the tender documents at the last consultation meeting. This detailed design stage is expected to take about 2 months to complete.

(2) Tender and Signing of Contract

On behalf of the Government of Jordan, the consultant will conduct the tender announcement, acceptance and examination of declarations of intention to bid, briefing and distribution of the tender documents. Following a specified period of tender preparation, the consultant will invite tenders and will assess the bids as soon as the bids and related documents are submitted to facilitate the signing of a contract between the Government of Jordan and a Japanese contractor (equipment supplier). All related parties will attend the opening of the tenders. The lowest bidder whose bid is deemed to be appropriate will be accepted as the successful bidder and will enter into a contract with the Government of Jordan. This stage, from the commencement of the tender process to the contract signing, is expected to take another about 1.5 months to complete.

(3) Equipment Procurement

After the signing of the equipment procurement contract, the procurement process will commence with the approval of the Government of Japan. Given the scope of the Project and the range of equipment to be procured, the entire process of procuring the planned equipment is expected to take approximately 10 months provided that no unanticipated problem in procurement arises and with the smooth progress of the preparatory work on the part of the Government of Jordan, including the preparation of the existing warehouse for storage of the equipment.

At this stage, the consultant will hold meetings with the contractor (equipment supplier) prior to the commencement of the procurement work and will instruct and supervise the contractor to ensure the smooth transportation, factory inspection and

delivery inspection of the equipment procured by the contractor so that the entire procurement process is completed within the period specified in the E/N.

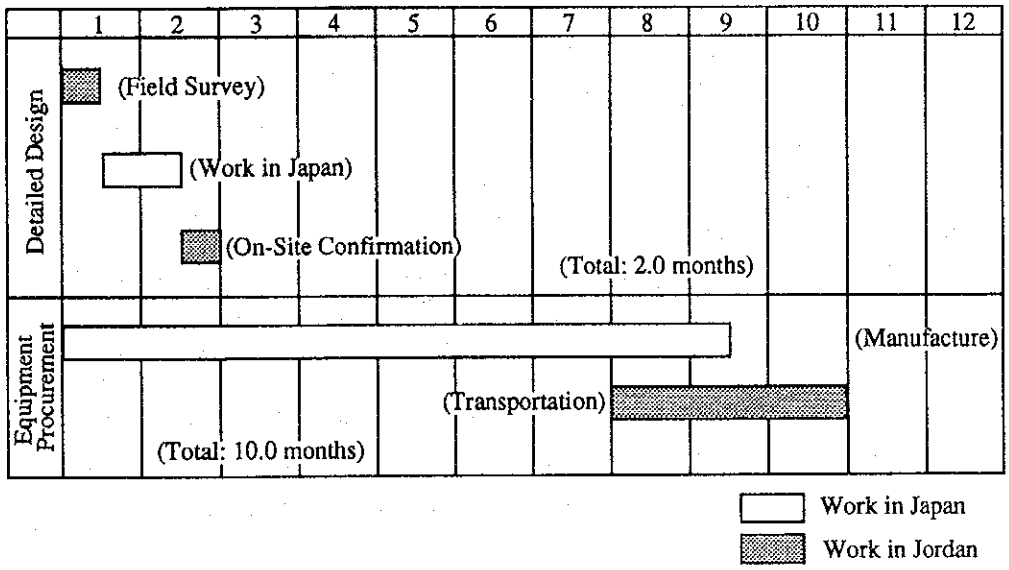


Fig. 3-1-1 Project Implementation Schedule

3-1-7 Obligations of Recipient Country

Necessary measures to be taken by the Government of Jordan in case that Japan's Grant Aid is extended are as follows:

(1) To secure and clear the site for the Project prior to the commencement of the works to be done under the Grant Aid Program, including liaison office, warehouse, stockyard, etc., if necessary.

(2) To provide following facilities and activities at the Project site when necessary.

1) Warehouse and stockyard for the equipment and materials to be supplied under the Project, prior to the delivery of the equipment

2) Installation of the equipment to be supplied under the Project

(3) To bear advising commission of Authorization to Pay (A/P) and payment commission to a Japanese foreign exchange bank for the banking services based on the Banking Arrangement (B/A).

(4) To ensure prompt unloading, tax exemption, customs clearance at port of disembarkation in Jordan and prompt internal transportation of the products purchased under the Grant.

(5) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such as may be necessary for their entry to Jordan and stay therein for the execution of the Project.

(6) To exempt Japanese nationals engaged in the Project from customs duties, internal taxes and other fiscal levies which may be imposed in Jordan with respect to the supply of the products and services under the verified contract.

(7) To provide necessary permissions, licenses and other authorizations for carrying out the Project.

(8) To bear all the expenses, other than those covered by the Grant, necessary for the procurement of equipment.

(9) To provide necessary data and information.

(10) To take necessary actions to expedite the approval for executions of the Project by the authorities concerned in Jordan.

(11) To witness and confirm by the authorities concerned when site tests are carried out at the time of delivery in Aqaba, if necessary.

(12) To ensure that the products purchased under the Grant be maintained and used property and effectively for the Project.

(13) To secure electricity and water supply to the site when the site testing of the delivered equipment will be conducted.

3-2 Operation and Maintenance Plan

As described in 2-3-1-(5)-2), Jordan has a system of calculating the real cost of spilled oil recovery and demanding payment by those responsible for such spillage. Consequently, the new cost to be borne by the PC following the installation of the new equipment under the Project will be reasonably limited to those expenses for regular operation and maintenance work.

Although operation work can be conducted by the present manpower level of the PC, in order to maintain proper function of the equipment, three (3) new staff will be required for the maintenance of the equipment. Therefore, it appears reasonable to say that the operation and maintenance relating to the new equipment will consist of the following.

(1) Maintenance Staff (3 person)

2 Engineer	JD 12,000/year (JD 6,000 × 2)
1 Store keeper	JD 3,600/year
Total	JD 15,600/year

(2) Regular Checks and Periodic Inspection of Equipment, Excepting Oil Combat Vessels

Regular checks and periodic inspections must be conducted in accordance with the maintenance arrangements shown in Table 3-3-1 and the annual fuel consumption for these purposes is estimated to be some 1,000 ℓ , costing approximately JD 360 (¥50,000) (JD 0.36/ℓ × 1,000 ℓ).

(3) Regular Checks and Periodic Inspection of Oil Combat Vessels

Based on the maintenance arrangements shown in Table 3-3-1, it is estimated that the annual fuel consumption and other expendable items will cost approximately JD 3,600 (¥500,000).

(4) Disaster Prevention Exercise Cost

Assuming one annual tripartite exercise and another annual exercise by the Jordanian staff alone, the estimated cost is approximately JD 2,200 (¥310,000), of which the major expenditure item is the fuel cost for the participating vessels based on 6 hours operation/vessel.

The total annual maintenance cost will be approximately JD 22,000 (¥3,100,000). There will also be the cost of the periodic inspection of the oil combat vessels which is required by law and the amount of which will depend on the vessel size. This legal inspection cost is estimated to be approximately JD 15,000 - JD 20,000 (¥2 - 3 million) for a 10 year period. In short, all the above costs do not appear to constitute a major financial constraint for the PC in view of its current budget size.

Table 3-3-1 Check/Inspection List for Planned Equipment

No.	Item	Check/Inspection Frequency		
		Monthly	Every 6 Months	Annually
1.	**Reduction of Spreading (Booms, etc.)**			
1.1	Deflecting Boom, Small	○	○	○
1.2	Deflecting Boom, Medium	○	○	○
1.3	Oil Trawl	○	○	○
1.4	Boom Cleaning Unit	–	–	○
1.5	Shore Protection Boom	○	○	○
1.6	Shore Protection Carpet	–	–	–
1.7	Sorbent Boom/Sorbents	–	–	–
2.	**Recovery and Containment (Skimmers, etc.)**			
2.1	Skimmer, Medium Viscous Oil, Small (10 m^3/h)	○	○	○
2.2	Skimmer, Medium Viscous Oil, Medium (50 m^3/h)	○	○	○
2.3	Skimmer, High Viscous Oil (60 m^3/h)	○	○	○
2.4	Emergency Off-Loading System	–	○	○
2.5	Vacuum Truck	○	○	○
2.6	Oil/Water Separator	–	○	○
2.7	Demulsifying Unit	–	○	○
2.8	Collapsible Floating Tank, Small (10 m^3)	–	–	○
2.9	Collapsible Floating Tank, Medium (25 m^3)	–	–	○
2.10	Collapsible Floating Tank, Large (100 m^3)	–	–	○
2.11	Flexible Tank (10 cum)	–	–	○
3.	**Transportation (Vessels)**			
3.1	Oil Combat Vessel, Small (10 m)	–	–	○
3.2	Oil Combat Vessel, Large (20 m)	○	○	○
4.	**Miscellaneous**			
4.1	VHF Portable Communication Equipment	○	○	○
4.2	VHF Stationary Communication Equipment	○	○	○
4.3	VHF Repeater Station	○	○	○
4.4	VHF Warning System	○	○	○
4.5	Light Equipment	–	○	○
4.6	Steam Cleaner	–	○	○
4.7	Crane for Harbour Tugs	–	○	○
4.8	Recovered oil tank unit for Rebuilding of Barges	–	○	○
4.9	Beach Cleaning Tools	–	–	○
4.10	Personal Safety Equipment and Protective Clothing	–	–	○

Note) Monthly Check : check of the proper functions of the rotating mechanism of the engine andhydraulic pump, etc.
Six Monthly Check : operational check at sea (can be conducted as part of an exercise.)
Annual Inspection : overhauling, if necessary.

CHAPTER 4

PROJECT EVALUATION AND RECOMMENDATION

CHAPTER 4 PROJECT EVALUATION AND RECOMMENDATION

4-1 Project Effect

Aqaba Port is the only port in Jordan and is rich in marine life and tourism resources, such as coral reef, as described in 2-2, playing an important role in the development of Jordanian industries as well as its economy.

Although no serious oil spillage by navigating vessels has been reported in the Northern Gulf of Aqaba, the establishment of a system to combat oil spillages is urgently required in view of the increasing economic activities in the area and the critical need for environmental conservation. It is against this background that the Working Group on the Environment of the Multilateral Middle East Peace Process decided to implement the Upper Gulf Aqaba Oil Spill Contingency Project and formulated the project framework relating to the scope of equipment required to combat oil spillages of a target scale (upto 200 m^3). With the strenuous efforts and commitment of all the countries concerned, it was agreed to establish local Oil Spill Centres at Nuweiba Port (Egypt), Eilat Port (Israel) and Aqaba Port (Jordan).

While Egypt will receive EU assistance, Israel plans to procure the necessary equipment using its own funds. In the case of Jordan, the government lists protection of the natural environment as one of its priority targets in the 3rd 5-Year National Plan (1993 - 1997) and has been trying to introduce concrete measures to prevent environmental pollution along the coastline of the Gulf of Aqaba. Due to the severe financial situation of Jordan, however, it will be extremely difficult for the Government of Jordan to provide the necessary funds to procure the equipment envisaged by the Working Group on the Environment to combat oil spillages.

The present Project is designed to procure that equipment which is essential to establish an appropriate Oil Spill Centre at Aqaba Port and is appropriate vis-a-vis the above-mentioned objective of the National Plan. Moreover, it conforms to the policies and measures encouraged by the Working Group on the Environment of the Multilateral Middle East Peace Process.

The operation and maintenance of the equipment to be supplied under the Project will be the responsibility of the PC which has sufficient manpower and facilities to conduct the required work in a proper manner. The measures to combat oil spillages using the

equipment in question will conform to the environmental standards adopted by Jordan and will not create any new environmental problems.

All the above findings and arguments suggest that the Project to be implemented with Japan's grant aid is highly significant and the Project should be considered highly appropriate for such assistance. The implementation of the Project is expected to achieve a number of benefits as described below.

Current Conditions and Problems	Improvement Measures Under the Project	Positive Improvement Effects of the Project
Aqaba Port has no existing facilities to combat oil spillages, causing concern in regard to the adverse impacts of an oil spillage incident on the natural environment, including marine life, and tourism resources.	Equipment to combat oil spillages will be supplied at Aqaba Port.	The oil spillage combat function to deal with medium-scale spillages (200 m^3) will be established to minimise adverse impacts on the natural environment.
As Aqaba Port is Jordan's only port, its current inability to deal with oil spillages may hinder the industrial and economic development of Jordan.	As above.	The establishment of an oil spillage combat capability is expected to protect the sole marine tourism resources in Jordan and to secure continuous revenue from tourism.
The lack of a coordinated oil spillage combat system among neighbouring countries along the coast of the Gulf of Aqaba causes concern in regard to the adverse impacts of an oil spillage incident on the region's economic growth and environment.	The equipment to be selected and procured will conform to that to be supplied under the Upper Gulf of Aqaba Oil Spill Contingency Project prepared by the Working Group on the Environment of the Middle East Peace Process and agreed upon by the countries concerned (Jordan, Egypt and Israel).	The establishment of an oil spillage combat capability at Aqaba Port will enable the full-scale implementation of joint ocean pollution prevention measures by the three countries as envisaged by the Working Group on the Environment.

4-2 Recommendation

(1) The Government of Jordan is required to conduct a long-term study and assessment of maritime pollution and the environmental impacts of such pollution, to identify sources of pollution and to develop measures to reduce the discharge of pollutants in view of preventing in advance any further aggravation and adopting long-term environmental conservation measures.

(2) Treatment of Recovered Oil

The PC should consult with the Jordan Petroleum Refinery Co., Ltd. to establish a concrete method for commissioned waste oil treatment so that the oil recovered by the equipment provided under the Project can be promptly and appropriately processed with no environmental problems.

(3) Use of Dispersants

At the meeting of the Steering Committee of the EU Project in Eilat on March 14th and 15th, 1995, it was confirmed that no dispersants should be used without the full agreement of the three countries. It was further agreed that discussions on the use of dispersants would continue and that a conclusion would be reached in the future, taking the self-purification capability of the Gulf of Aqaba from the biological point of view and other relevant conditions into consideration.

In view of the above agreement, it is recommended that the Government of Jordan examine the possible need to install and operate a spraying system and storage tank for dispersants in consultation with the countries concerned, particularly Egypt and Israel.

(4) Operation of Supplied Equipment

It is planned that those responsible for combating oil spillages in the three countries will organize joint training sessions and mock exercises with the funding of the EU. In order to make such joint efforts thoroughly effective, it will be important for the PC to review the operation and maintenance system of the equipment it owns and to make all staff members familiar with the operation of the equipment.

(5) Necessity to Introduce Measures to Cover a Wide Area

There are regional treaties in many parts of the world today to combat large-scale oil spillages. Those near the Gulf of Aqaba include the Red Sea/Gulf of Aden Treaty (involving Palestine, Saudi Arabia, Sudan and Yemen) orchestrated by the ALECSO and the Mediterranean Treaty involving Egypt, Israel and other countries, orchestrated in 1978 by the Mediterranean Region Action Planning and Coordinating Bureau of the UNEP.

In addition, an Oil Spill Centre is under construction at the Egyptian port of Sharm el Sheikh at the mouth of the Gulf of Aqaba with EU funding. It is recommended that the Government of Jordan maintain close contact with those organizations responsible for regional efforts to combat oil spillages and consider mutual cooperation vis-a-vis

lending or borrowing equipment to firmly establish a joint system which is capable of combating large-scale oil spillages in the future.

APPENDICES

APPENDIX 1

MEMBER LIST OF THE SURVEY TEAM

MEMBER LIST OF THE SURVEY TEAM (BASIC DESIGN STUDY)

Name	Assignment	Position
Mr. Shigeru Okamoto	Leader	Deputy Director of Study Review and Coordination Division Grant Aid Study and Design Department, JICA
Mr. Hiroyuki Kinomoto	Project Coordinator	First Basic Design Study Division Grant Aid Study and Design Department, JICA
Mr. Shuji Sekiguchi	Chief Consultant/Oil Spill Combat Planner	Yachiyo Engineering Co., Ltd.
Mr. Makoto Fuyumuro	Equipment Planner I	Japan Oil Engineering Co., Ltd.
Mr. Yoshikazu Tsukidate	Equipment Planner II	Japan Oil Engineering Co., Ltd.
Mr. Naoki Hara	Operation and Maintenance Planner	Yachiyo Engineering Co., Ltd.
Mr. Masatsugu Komiya	Procurement Planner/Cost Estimator	Yachiyo Engineering Co., Ltd.

MEMBER LIST OF THE SURVEY TEAM (DRAFT FINAL EXPLANATION TEAM)

Name	Assignment	Position
Mr. Hiroyuki Kinomoto	Leader	First Basic Design Study Division Grant Aid Study and Design Department, JICA
Mr. Shuji Sekiguchi	Chief Consultant/Oil Spill Combat Planner	Yachiyo Engineering Co., Ltd.
Mr. Makoto Fuyumuro	Equipment Planner I	Japan Oil Engineering Co., Ltd.
Mr. Masatsugu Komiya	Procurement Planner/Cost Estimator	Yachiyo Engineering Co., Ltd.