Appendix I.4 Present Environmental Conditions of Khasab and Musandam Area

1. Pysico-chemical Environment

1.1 Meteorology

There are two meteorological stations in Musandam, one in Khasab and the other in Diba. In the following sections, the observation data of Khasab is presented as a representative value of Musandam.

(1) Temperature

The hottest period in Khasab is during May to September, with maximum temperature easily exceeding 40℃. Temperature gradually decreases from October, and relatively cool weather continues until April. Temperatures can reach into the lower 10℃ during this period.

AIT.4-1 Monthly Mean Temperature in Khasab from 1999 – 2003 Unit: ℃

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1999	22.1	23.5	24.2	28.9	32.5	34.8	35.1	35.1	32.7	30.8	27.6	23.5	29.2
2000	22.0	22.4	24.7	30.0	32.2	33.2	34.9	34.6	32.8	30.5	26.0	22.3	28.8
2001	19.9	21.5	24.5	28.3	33.2	33.1	35.0	34.5	33.5	30.8	26.5	24.8	28.8
2002	21.9	21.8	25.2	27.9	33.1	34.7	35.2	34.8	33.2	31.1	26.6	23.4	29.1
2003	20.8	22.7	24.8	29.0	32.7	34.0	34.5	34.4	34.2	31.0	26.8	22.7	29.0
Ave.	21.3	22.4	24.7	28.8	32.7	34.0	34.9	34.7	33.3	30.8	26.7	23.3	29.0

Source: MOTC, Directorate General Civil Aviation and Meteorology

(2) Relative Humidity

Khasab remains relatively dry throughout the year. The mean relative humidity fluctuates between 50 to 70%.

AIT.4-2 Monthly Mean Relative Humidity in Khasab from 1998 – 2002 Unit: %

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1998	68	65	63	54	42	58	61	60	65	54	65	62	60
1999	57	67	52	52	53	57	59	61	65	60	59	53	58
2000	61	56	53	54	63	63	60	61	63	62	58	63	60
2001	65	65	69	55	52	66	65	60	65	62	58	67	63
2002	55	60	57	54	51	60	62	65	63	63	56	57	59
Ave.	61	63	59	54	52	61	61	61	64	60	59	60	60

Source: MOTC, Directorate General Civil Aviation and Meteorology

(3) Rainfall

Rainfall is mostly limited during the winter months (November to March). From May to October, rainfall is extremely low if any. Rainfall tends to be variable with each year, with some years exceeding 400 mm and other years reaching to only 20 mm. However, on average Musandam tends to receive more rain than in the other regions.

AIT.4-3 Monthly Mean Rainfall in Khasab from 1999 – 2003 Unit: mm

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1999	29.7	60.4	43.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	0.0	139.6
2000	1.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.4	94.5	110.0
2001	116.3	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	118.3
2002	0.0	19.8	15.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.2	8.1	51.2
2003	12.8	13.6	9.0	36.2	0.0	0.0	0.0	0.0	0.0	0.0	7.6	0.2	79.4
Ave.	32.0	18.8	14.0	7.2	0.0	0.0	0.0	0.0	0.0	0.0	7.2	20.6	99.7

Source: MOTC, Directorate General Civil Aviation and Meteorology

(4) Wind

Wind is relatively calm throughout the year, mostly ranging between 4 to 6 knots. Southeasterly winds are predominant during the winter months (October – March). The winds are more variable during the summer months due to the daily land heating and cooling effect.

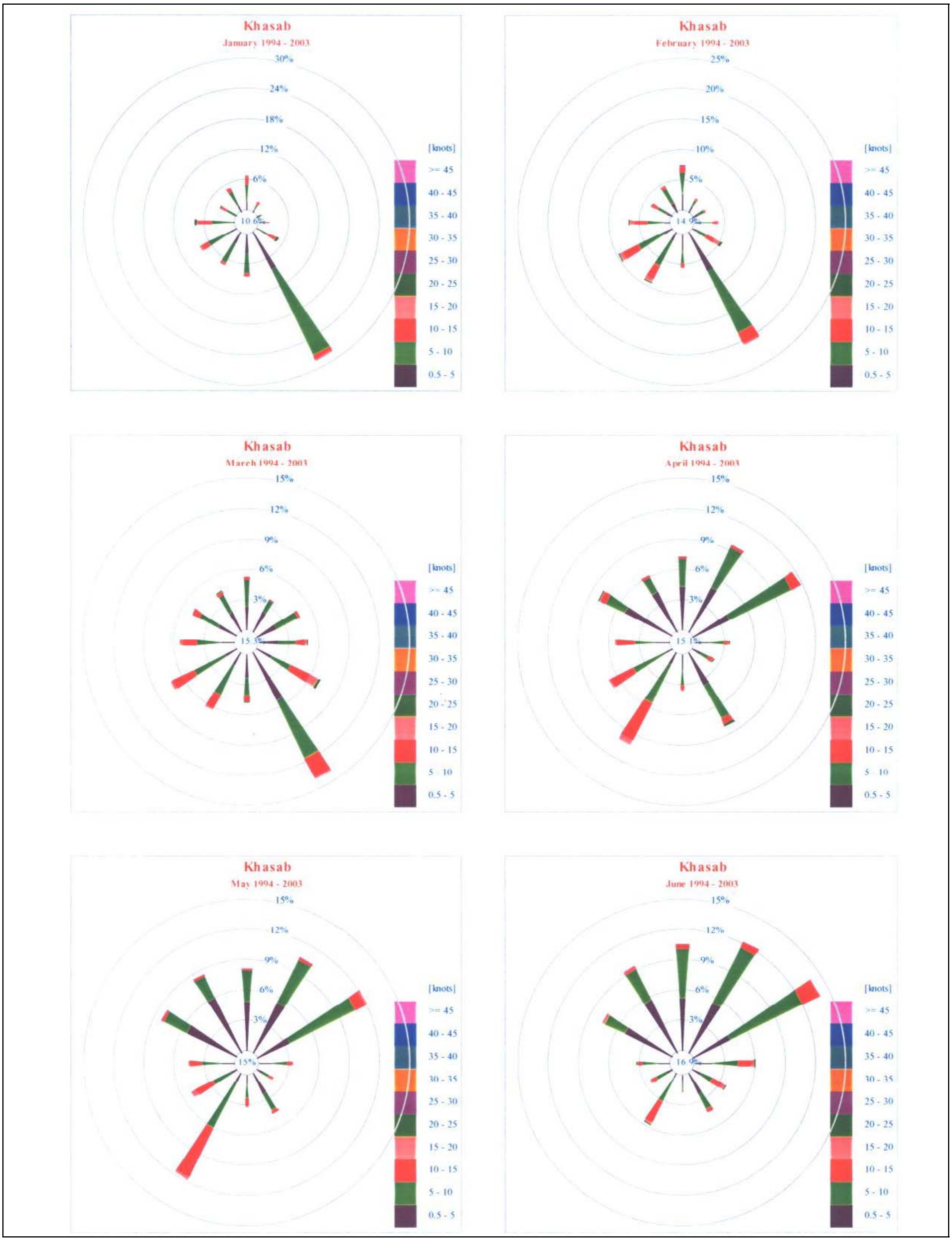
AIT.4-4 Monthly Prevailing Wind Direction and Mean Wind Speed in Khasab from 1998 – 2002 Unit: knots

		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1998	Dir.	150	150	150	060	210	060	120	120	360	150	150	150
	Vel.	05	06	05	04	06	04	05	05	04	04	03	04
1999	Dir.	150	150	150	060	060	030	120	330	120	150	150	150
	Vel.	06	05	03	04	04	05	07	06	06	03	04	05
2000	Dir.	150	150	210	060	030	060	150	030	120	150	150	150
	Vel.	06	06	06	05	05	05	06	07	06	05	06	06
2001	Dir.	150	150	150	060	060	060	360	120	090	150	150	150
	Vel.	06	05	06	05	06	05	06	07	06	04	05	05
2002	Dir.	150	150	150	210	030	360	330	360	360	060	150	150
	Vel.	06	06	05	06	06	05	06	07	06	04	05	05

Source: MOTC, Directorate General Civil Aviation and Meteorology

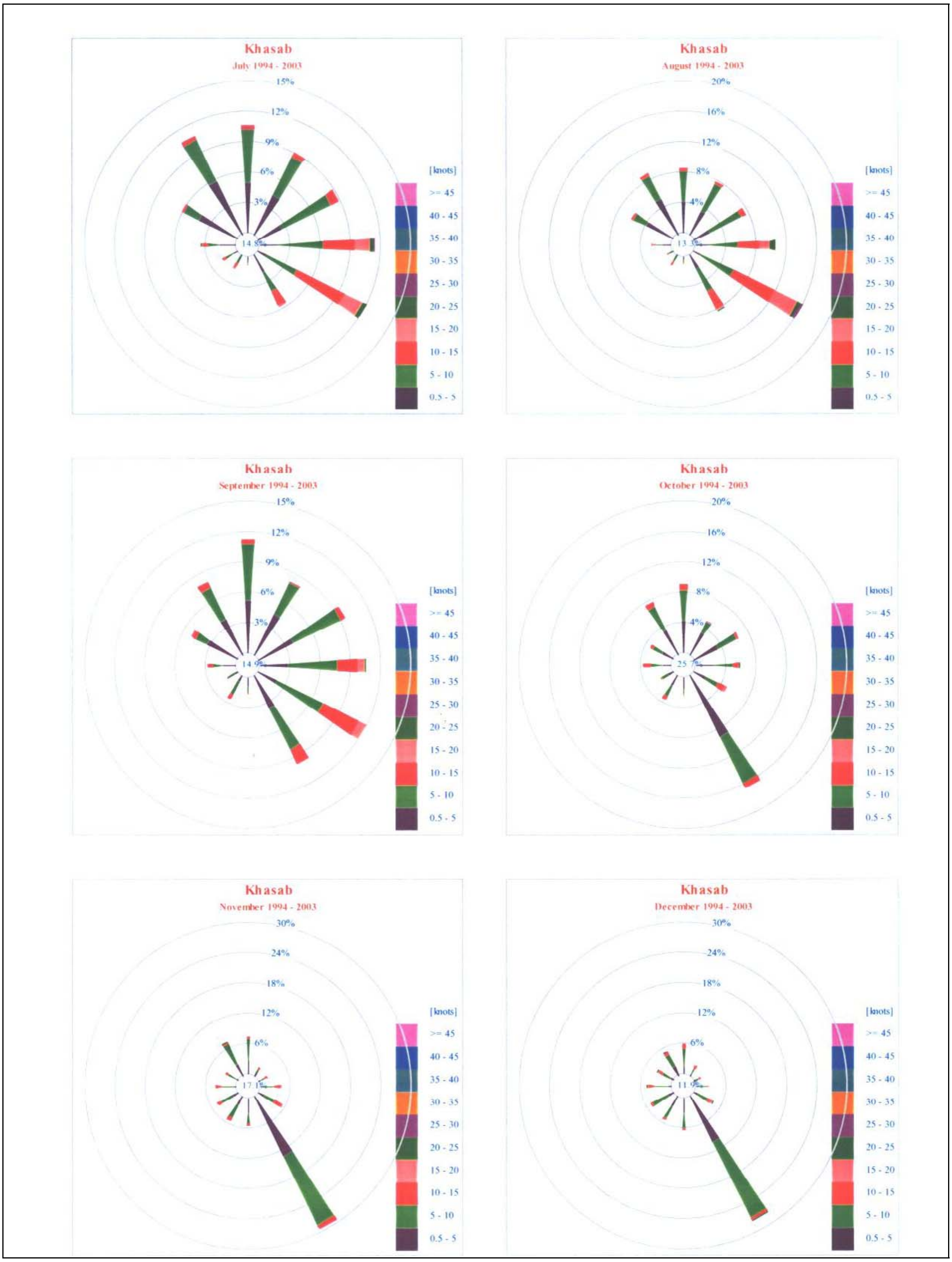
AIF.4-1 shows the monthly wind direction and speed averaged over 1994 - 2003 period.

AIF.4-1 Wind Rose of Khasab Area from January – June (1994 – 2003)



Source: MOTC, Directorate General Civil Aviation and Meteorology

AIF.4-2 Wind Rose of Khasab Area from July – December (1994 – 2003)



Source: MOTC, Directorate General Civil Aviation and Meteorology

1.2 Oceanography

(1) Tide

The following AIT.4-5 shows the mean tidal levels in Khasab. The water level between the west and east coast of Musandam is often different, due to tidal time difference.

AIT.4-5 Mean Tide Levels in Khasab Unit: meters

Lat. N	Long. E	Mean range	Mean sea level	MHHW	MLHW	MHLW	MLLW
26° 12′	56° 14′	1.65	1.55	2.27	2.21	1.12	0.62

Source: Oman Maritime Handbook 2004

(2) Wave

The waters of the Musandam region are mostly calm with very little wave action. The numerous inlets and bays provide protection to the coastline from any swells that may reach from the Gulf of Oman.

(3) Currents

Currents in the Musandam region is mainly driven through tidal movement, and could be quite strong in the Strait of Hormuz, reaching up to 2 m/s (Dobbin, 1992). In contrary, currents in the Khasab area are weak. According to the current measurements made by Techno Consultants in the 1970s at the mouth of the Khasab Bay, no currents exceeded 0.4 m/s and the majority of the measurements were below 0.1 m/s (WS Atkins, 2001).

(4) Littoral Drift

Significant beach erosion occurs along the west coast Musandam, which is partly due to the harbour construction in U.A.E. (Dobbin, 1992). Erosion or accretion in the Musandam Peninsula is less significant due to the relatively stable oceanographic conditions, hard substrate and lack of sediment movement.

1.3 Topography

The Musandam region is comprised of the main land section where the major towns such as Khasab are located, and the Musandam Peninsula, which is connected to the main land through a very narrow isthmus. Most of the Musandam region is comprised of steep rugged mountains, which descends steeply into the coast, creating a fjord like appearance along the coastline, with numerous coves and inlets.

Khasab Port is constructed inside Khasab Bay, which is located on the northwest side of Musandam.

The Bay is u-shaped and has a maximum width of approximately 1km. The east and west side of the Bay is surrounded by steep cliffs. In the hinterland lies the town of Khasab, which is located over a narrow plain that runs in between the rugged mountains. Prior to the construction of the port, the Bay had an extensive tidal flat but this area has now disappeared through landfill.

1.4 Geology

The rocks of Musandam are a thick sequence of Permo-Mesozoic shelf carbonates that have been eroded into high, stark cliffs along promontories of the coast (Dobbin, 1992).

1.5 Hydrology

(1) Wadi Flow

Most of the coastal towns or villages in Musandam are situated on the wadi outlets to the sea. These areas are prone to flash floods due to the generally small and steep catchments. Therefore, some wadis such as Wadi Khasab have flood protection dams to protect the downstream towns from flooding. There are no major wadis in the Musandam Peninsula.

(2) Groundwater

The groundwater storage in the coastal delta is generally limited and is therefore vulnerable to droughts. In some areas, groundwater has been overused for agriculture and has put strain on the water supplies, and has also induced saline intrusion (e.g. municipal wellfield of Daba).

1.6 Water quality

(1) General Conditions

Water quality data from the Musandam region is limited, thus measurements from the Strait of Hormuz are provided for reference. Sea surface temperature in the Strait of Hormuz shows high seasonal fluctuation. Typical sea surface temperatures during winter is between 22 – 25℃. From the onset of the SW monsoon season, water temperature gradually rises, and by May increases to 27 – 28℃. Surface water temperature peaks in August to around 32℃ (Wimpol, 1986).

Generally, the salinity in the Strait of Hormuz is higher in the deep layers (around 39) than in the surface layers, which is due to the intrusion of highly saline and dense water from the Arabian Gulf. The salinity of the surface layer shows some small seasonal fluctuation. Salinity during January – May is around 36.5 – 37. Salinity slightly increases from June onwards to above 37 (Swift & Bower, 2002). Seawater temperatures and salinity in the bays and inlets may have higher fluctuations compared to the Strait of Hormuz, due to its shallowness and semi-enclosed nature.

(2) Status of Water Pollution

The MRMEWR has been conducting regular marine pollution monitoring (Marine Pollution Monitoring Programme (MPMP)) along the coast of Oman since its implementation in 1996. The Programme employs biomonitors such as rock oysters as an indication of the water pollution level.

The main pollution threat in the Musandam region comes from the illegal discharges of oily ballast wastes by tankers passing into the Arabian Gulf. The following AIT.4-6 and 7 shows the heavy metal and petroleum hydrocarbon concentration recorded in the rock oysters of Khasab.

AIT.4-6 Concentration of Heavy Metals in Rock Oysters Collected in Khasab

Unit: mg/kg dry wt.

	Pb	Cd	Cu	Cr	Ni	Mn	V	Zn
1996/97*1	-	9.15	120	1.11	3.80	-	0.36	-
2001	0.41	9.23	136	-	1.53	14.6	-	593
2002	0.15	14.73	103	1.17	0.81	-	0.78	-
2003	0.10	6.45	83.99	1.26	-	-	<0.2	-
Reference value*2	-	11.68	110.5	0.63	1.16	-	1.8	-

*1: The values are the mean of 5 survey phases

*2: Data from IAEA surveys of the Omani waters from 1983-91

Source 1: Monitoring Pollutants in the Marine Environment, Auscon, 1998

Source 2: MPMP, MRMEWR, 2001-2003

AIT.4-7 Concentration of Petroleum Hydrocarbon in Rock Oysters Collected in Khasab

Unit: mg/kg dry wt.

	Range of total Aliphatics	Range of total Aromatics	Range of total HCs	Mean total HCs
1996/97*1	9.23 – 58.97	7.11 – 70.65	16.35 – 129.62	73.02
2002 Phase 1	-	-	-	10.4
2002 Phase 2	-	-	-	37.1
Ras Al Hadd*2	7.57 – 492.40	16.45 – 246.30	24.02 – 738.70	355.82
IAEA 1991 (KSA)*3	143 – 475	27 – 240	170 – 715	-

*1: Survey during 1996/97 was conducted over 5 phases

*2: Results of Ras Al Hadd during the 1996/97 survey

*3: Data from IAEA surveys of the KSA in 1991

Source 1: Monitoring Pollutants in the Marine Environment, Auscon, 1998

Source 2: MPMP, MRMEWR, 2002

Despite the heavy oil tanker traffic in the Strait of Hormuz, the petroleum hydrocarbon levels in Khasab rock oysters were generally lower than the levels of Al Batinah coast, and significantly lower than in the highly polluted Ras Al Hadd area.

1.7 Sediment Quality

As part of the Marine Pollution Monitoring Programme (MPMP), the intertidal sediments of Khasab has been surveyed in 1996/97, 2001 and 2003. The following AIT.4-8 shows the results of the heavy metal analysis. AIT.4-9 shows the result of petroleum hydrocarbon analysis.

AIT.4-8 Concentration of Heavy Metals in the Intertidal Sediments of Khasab

Unit: mg/kg dry wt.

	Pb	Cd	Cu	Cr	Ni	Mn	V	Zn
1996/97*[1]	-	-	5.08	18	13	-	8.4	-
2001	0.61	0.147	21.8	60.8	46.7	130	5.28	13.3
2003	4.28	0.417	3.57	6.66	3.77	29.92	2.22	11.73
MAFF Action Level*[2]	40	2	40	100	100	-	-	200

*1: Survey during 1996/97 was conducted over 5 phases

*2: Threshold values proposed by the UK Ministry of Agriculture, Fisheries and Food

Source 1: Monitoring Pollutants in the Marine Environment, Auscon, 1998

Source 2: MPMP, MRMEWR, 2001, 2003

The above results indicate that the sediments of Khasab are not contaminated with high levels of heavy metal, which is understandable considering that there are no major land-based inputs of pollutants in the Khasab area at the moment.

AIT.4-9 Concentration of Petroleum Hydrocarbon in the Intertidal Sediments of Khasab

Unit: mg/kg dry wt.

	Grain size (μ m)	Total Aliphatics	Total Aromatics	Total HCs
1996	<250	6.66	0.35	7.01
2002	<250	-	-	2.92
IAEA 1991 (KSA)*	-	13 - 496	6 - 175	19 - 671

*: Data from IAEA surveys of the KSA in 1991

Source 1: Monitoring Pollutants in the Marine Environment, Auscon, 1998

Source 2: MRMEWR

Despite the close proximity to oil tanker traffic, the intertidal petroleum hydrocarbon levels in Khasab are comparable to the other sites in Oman, and are significantly lower than oil contaminated beaches in KSA.

As an alternative indicator of oil pollution, MRMEWR has conducted beach survey of oil residues in 1996/97 and 2002. In the 1996/97 period, the average oil residues found in Khasab were 8 g/m, and 23 g/m in 2002. These values were significantly low compared to the other highly contaminated sites in Oman, such as Khaburah (0 – 10,530 g/m) and Ras Al Hadd (192 – 1,702 g/m).

1.8 Noise and Air Quality

There are no air quality data available for the Musandam area. However, air quality should be relatively good, since there are no major anthropogenic sources of air pollution in the area. However, the activities of the current expansion works, such as quarrying, heavy vehicle movement and concrete batching could temporally be raising the local dust level.

Noise does not seem to be a major problem, due to limited traffic volume and lack of noise generating activities.

1.9 Odor

No significant odor was detected during the field reconnaissance in August 2004.

2 Biological Environment

2.1 Marine Ecosystem

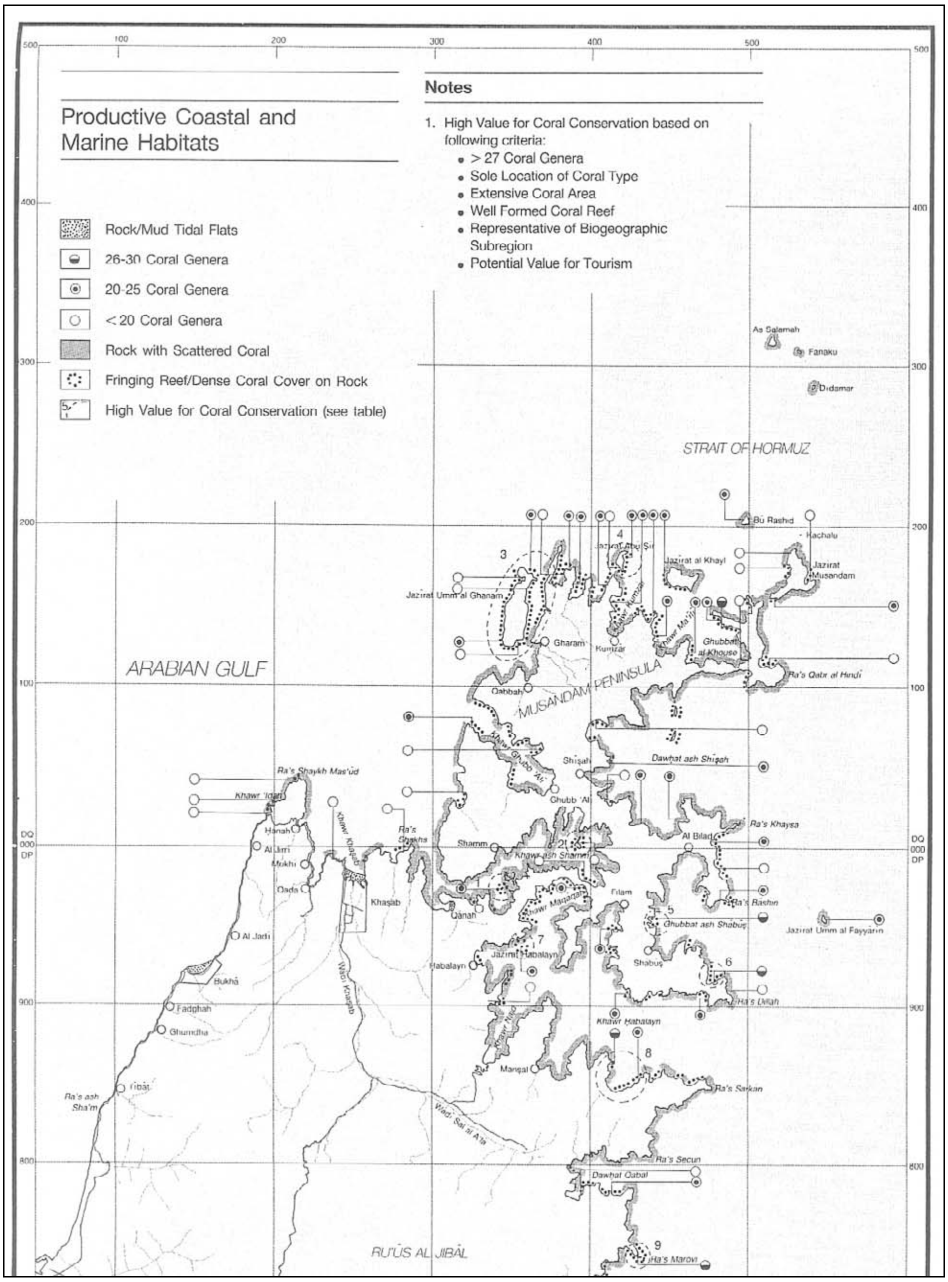
(1) Flora

Prior to the expansion works of the Khasab Port, the subtidal zone of Khasab Bay was densely covered by *Halodule uninervis* and *Halophila ovalis* seagrass species. *Halodule uninervis* were especially abundant, covering an estimated 30% of the subtidal area (WS Atkins, 2001). The seagrass bed in Khasab Bay had an important ecological role, functioning as a nursery ground for juvenile fish species, habitat for various invertebrates, feeding ground for various marine fauna such as green sea turtles and so on. Currently, it is highly unlikely that these seagrass beds remain, due to the landfilling and extensive dredging works inside the Bay.

(2) Fauna

Corals and coral reefs are well developed and widely distributed along the coast of Musandam, playing a vital role in the local ecosystem. Many of these corals have high conservation value for its high species diversity, bio-productivity and tourism value. Some coral species are found only in Musandam. AIF.4-3 shows the distribution of coral and coral reefs in the Musandam region.

AIF.4-3 Distribution of Corals in the Musandam Region



Source: CZMP, IUCN, 1991

Dead or broken corals are common in Musandam, which is partly due to destructive fishing practice and outbreaks of crown of thorns (*Acanthaster planci*) (IUCN, 1991).

Several sea turtle species (e.g. green, hawksbill, loggerhead) are known to habit the waters of Musandam. Generally the area is not suited for nesting due to the lack of sandy beaches. However, there has been some nesting recorded in the small pocket beaches (IUCN, 1991).

2.2 Terrestrial Ecosystem

(1) Flora

Natural terrestrial flora in the area is limited due to the arid climate and rocky substrate. Some *Acacia* sp. grow on the wadi beds.

(2) Fauna

Natural terrestrial fauna is limited in the Khasab area, although in the remote parts of Musandam the Arabian leopard (*Panthera pardus nimr*) and the Arabian Tahr (*Hemitragus jayakari*) are known to exist in low numbers. Both species are classified as “endangered” in the IUCN Red List.

2.3 Nature Reserves

To preserve its unique and beautiful environment, the Musandam Peninsula is proposed as a nature reserve by the MRMEWR.

3 Social Environment

3.1 Demography

According to the Statistical Year Book 2003, the total population in Wilayat Khasab in year 2002 was 20,508, which is approximately 57% of the total population of Musandam Governorate. Approximately 20% are expatriate and the remaining 80% Omanis. Within Wilayat Khasab, most of the population is concentrated in Khasab Town. The remaining population lives in small remote villages that are scattered throughout the area.

3.2 Infrastructure

(1) Access Road

Due to the rugged and mountainous topography, roads are limited in Musandam. Access to the remote villages in Musandam Peninsula is possible only through boats.

(2) Waste Management

Solid waste in the Khasab region is mainly dumped at the Al Saliyan waste disposal site, which is located approximately 10km south of the Khasab Port. The collected waste is then burned often together with hazardous waste.

There is no sewage network in Musandam. Therefore sewage is often collected into a holding tank, then transported and discharged at the above waste disposal site.

(3) Water and Power Supply

Water supplies in the Musandam are drawn almost entirely from wells and boreholes in the coastal alluvium. In Khasab, water is supplied from the municipal wellfield approximately 5km from the coast. There are plans to construct a desalination plant to fulfill increasing demand.

Drinking water is supplied to the remote coastal villages from Khasab or Daba by water supply vessels.

In Musandam, electricity is generated by a diesel power plant. In case of power shortage, electricity is supplied from UAE.

3.3 Livelihood

(1) Fisheries

Fishery in the Musandam region is based solely around the traditional artisanal fishery. The main fishing methods are traps, gill net, hand line, trolling, cast net, beach seine and surrounding net. Fishermen use only small fibre-glass boats or small dhows for fishing. Fishermen from the local fishing villages (listed in Table 10) come to Khasab Port to land their daily catch, which is then auctioned at the quayside. Most of the fish are purchased by Dubai retailers and are transported to the Dubai fish souq. The number of fishermen and fishing boats in the Musandam Governorate and Wilayat Khasab are summarized in the following AIT.4-10.

AIT.4-10 Outline of the Artisanal Fishery in Musandam Governorate and Wilayat Khasab

	Musandam	Wilayat Khasab
Fishing villages near the port[1]	-	Khasab, Qada, Mukhi, Qanah, Shamm, Hanah, Ghab Ali, Al Harf
No. of fishermen (2003)	3,366	2,466
No. of fishing boats (2003)	1,514	1,093

Source 1: MOAF
Source 2: Fisheries statistics 2003, MOAF

Various large and small pelagic fish species, demersal fish species, sharks and rays are caught in the Musandam region. AIT.4-11 shows the annual total landing in the Musandam Governorate from 1999 to 2003 and the major caught species. Species that fetch high prices are grouper, kingfish, large jacks and yellowfin tuna.

AIT.4-11 Annual Total Landing in the Musandam Governorate from 1999 to 2003

Unit: Metric tons

	1999	2000	2001	2002	2003	Major species
Large pelagic	1,459	2,251	2,270	2,001	2,546	Longtail tuna, large jacks, kawakawa, kingfish, queenfish
Small pelagic	1,880	2,179	2,023	1,778	1,694	Sardine, Indian mackerel, small jacks
Demersal	747	832	1,346	1,217	1,396	Emperor, grouper, seabream
Sharks & rays	108	112	212	99	146	-
Crustaceans	1	1	0	0	0	Lobster
Molluscs	8	5	17	21	18	Cuttlefish
Others	0	0	0	9	130	-
Total	4,204	5,380	5,868	5,124 (1,718)*	5,930	

*: The parenthesis shows the total landing in Wilayat Khasab.

Source: Fisheries Statistics Book 2003, MOAF

The eastern side of the new Khasab Port is planned for the local fishing industry. Two floating jetties will be constructed along a 100m quay for fish landing. Currently the port has a fueling facility and an ice plant.

Aquaculture is not conducted in Musandam despite its high potential.

(2) Tourism

The Musandam Peninsula has outstanding tourism values for its unspoilt natural scenery and abundant marine life. Khawr Ash Shamm (large inlet approximately 5km east of Khasab) is a popular destination for cruising, snorkeling and diving. The two islands inside Khawr Ash Shamm are popular diving sites, due to the well-established coral reefs.

The major tourist attraction in Khasab Bay is the Khasab fort, which is located immediately south of the new port.

Despite its high potential for tourism, tourist facilities are still limited in the Musandam Peninsula, having only few hotels. Based on the statistics of Ministry of Tourism, 4,165 people made overnight stays in Musandam in year 2003. There are future plans to expand the tourism sector in Musandam.

3.4 Cultural Assets

A number of archaeological and historical sites are found in Musandam. Archaeological sites include, houses, pre-Islamic tombs, stone structures, shell middens and rock art, some of which date back at least 5,000 years. Historical sites include forts, watchtowers, Islamic cemeteries, mosques and villages (IUCN 1991).

3.5 Land use

The land use adjacent to Khasab Bay consists of residential houses, commercial properties, historic sites (Khasab fort), government buildings and date plantations.

Appendix I.5 Present Environmental Conditions of the Duqm Port Area

1 Pysico-chemical Environment

1.1 Meteorology

Meteorological observation in Duqm has only started from November 2003. Therefore, for the previous years, observation data from Mashirah Island (approximately 120km northeast of Duqm) is provided for reference.

(1) Temperature

The air temperature in Duqm does not follow a conventional seasonal pattern due to the effects of the SW monsoon. Although temperature gradually increases from April, it drops back to near winter levels from July to September. This is due to the upwelling of deep cool water offshore of the Arabian Sea, which is triggered by the intensification of the SW monsoon winds in July – September.

AIT.5-1 Monthly Mean Temperature in Mashirah Island and Duqm from 1999 – 2004

Unit: ℃

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1999	23.4	24.1	25.7	28.9	29.9	28.6	26.8	25.2	26.5	28.3	26.2	24.4	26.5
2000	23.4	23.4	25.3	28.7	30.8	29.0	26.3	26.2	26.8	28.2	27.0	23.9	26.6
2001	22.4	22.8	25.7	28.4	30.2	28.9	26.9	26.6	27.1	28	26.4	25.1	26.5
2002	23.4	23	26.2	28.7	30.5	29.5	26.7	25.4	26.4	28.5	26.6	24.4	26.6
Ave.	23.2	23.3	25.7	28.7	30.4	29	26.7	25.9	26.7	28.3	26.6	24.5	26.5
2003 - 2004*	22.0	22.6	25.4	30.7	31.5	32.0	28.2	26.6	-	-	25.8	22.8	-

*: Observation data of Duqm

Source: MOTC, Directorate General Civil Aviation and Meteorology

(2) Relative Humidity

Relative humidity increases during the SW monsoon season due to the inflow of moist cold air from the Arabian Sea. Maximum relative humidity can reach to or near 100% during the SW monsoon.

AIT.5-2 Monthly Mean Relative Humidity in Mashirah Island and Duqm from 1999 – 2004

Unit: %

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1999	66	75	66	67	71	77	79	83	77	73	71	67	73
2000	64	61	59	71	69	77	78	80	75	72	70	69	70
2001	63	68	66	65	71	77	77	81	76	69	65	69	71
2002	59	62	69	63	70	75	77	78	79	64	67	63	69
Ave.	63.0	66.5	65.0	66.5	70.3	76.5	77.8	80.5	76.8	69.5	68.3	67.0	70.8
2003 – 2004*	68	57	57	57	56	62	70	70	-	-	67	67	-

*: Observation data of Duqm

Source: MOTC, Directorate General Civil Aviation and Meteorology

(3) Rainfall

Rainfall is extremely scarce in Mashirah Island except when a tropical storm passes over the region, which is relatively frequent compared to the other regions of Oman.

AIT.5-3 Monthly Mean Rainfall in Mashirah Island and Duqm from 1999 – 2004

Unit: mm

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1999	0.0	11.3	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.1
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1
2001	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	2.4	5.6
Ave.	0.3	2.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.6	6.3
2003 – 2004*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0	-

*: Observation data of Duqm

Source: MOTC, Directorate General Civil Aviation and Meteorology

(4) Wind

The wind direction is generally from the northeast during the winter months and then shifts to the south to southwest in the summer months. Wind is relatively strong during the peak SW monsoon season, constantly blowing at a strength between 8 – 10 m/s.

AIT.5-4 Monthly Prevailing Wind Direction and Mean Wind Speed in Mashirah Island and Duqm from 1999 – 2004

Unit: knots

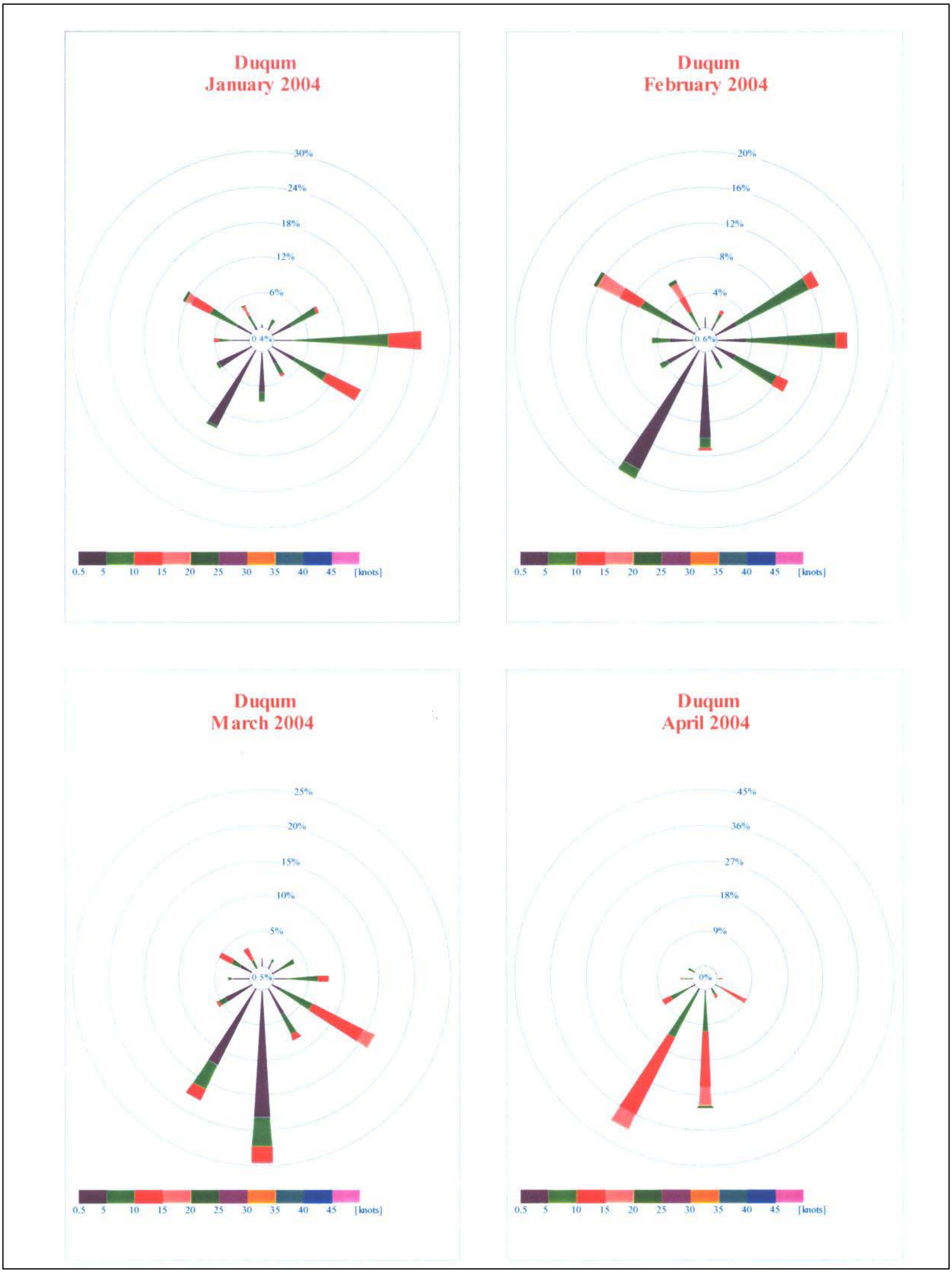
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1999	Dir.	090	120	150	240	210	210	210	210	240	060	090	060
	Vel.	07	06	07	08	11	16	16	15	08	06	05	09
2000	Dir.	090	090	150	240	240	210	210	210	210	150	160	060
	Vel.	08	09	09	11	11	15	16	15	12	08	10	09
2001	Dir.	090	090	210	210	240	210	210	210	210	240	090	090
	Vel.	09	09	09	11	15	16	16	12	12	08	07	08
2002	Dir.	090	090	150	240	210	210	210	210	210	150	090	090
	Vel.	09	09	09	09	13	14	20	15	11	08	08	09
2003 – 2004*	Dir.	90	210	180	180	180	180	180	180	-	-	60	60
	Vel.	06	06	06	10	12	11	19	19	-	-	06	05

*: Observation data of Duqm

Source: MOTC, Directorate General Civil Aviation and Meteorology

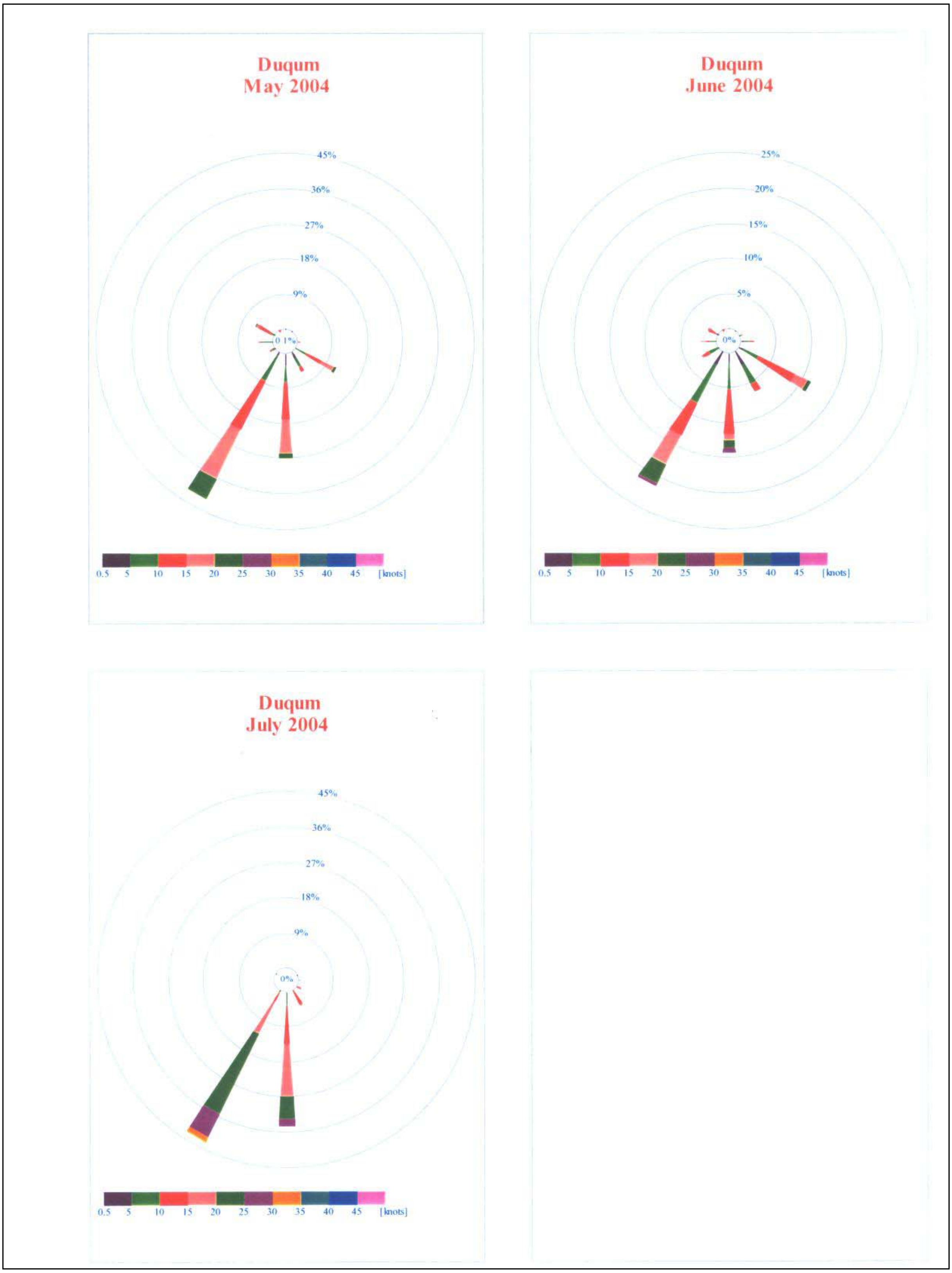
AIF.5-1 shows the monthly wind direction and speed in 2003 and 2004.

AIF.5-1 Wind Rose of Duqm Area from January – April (2004)



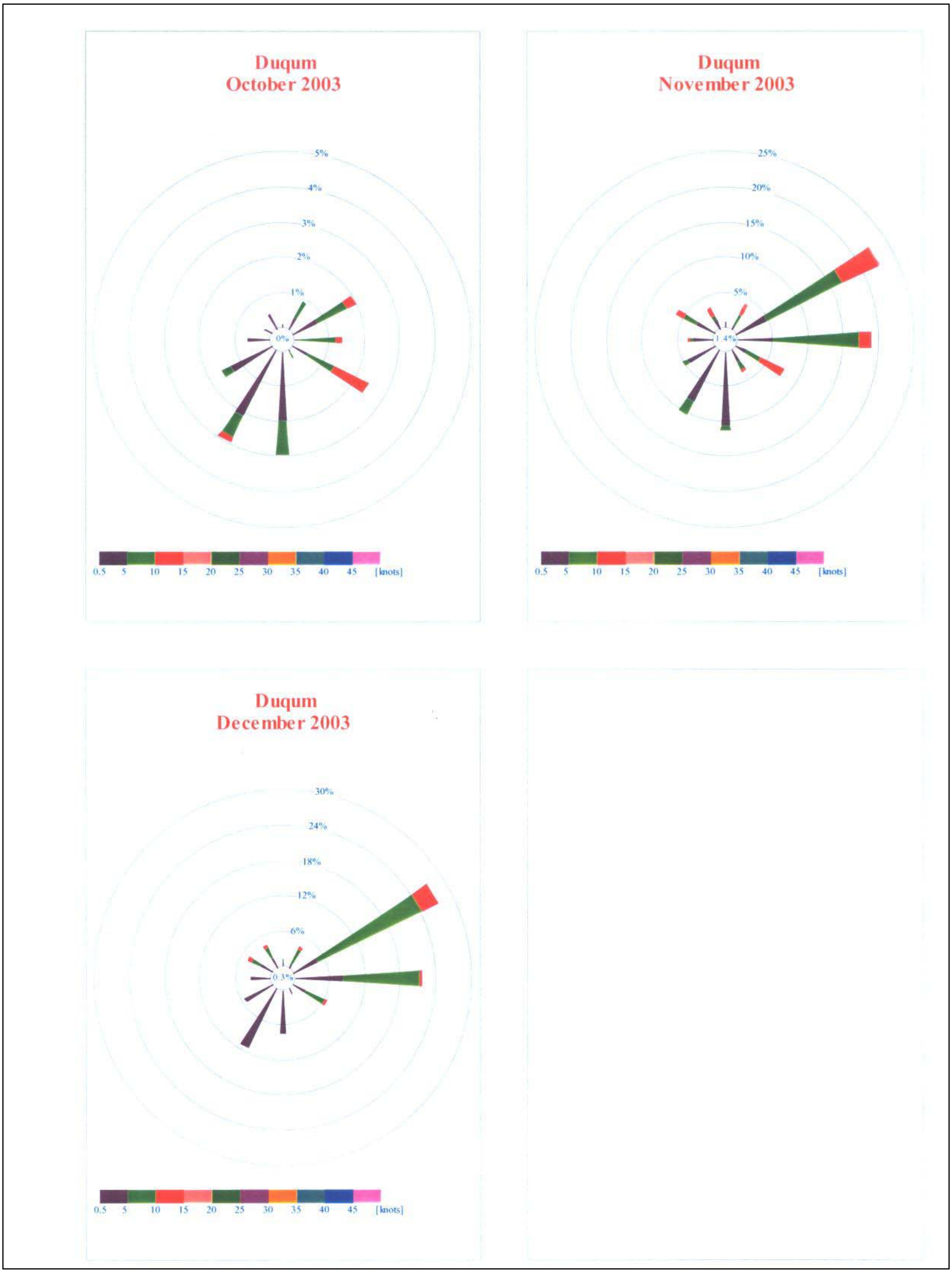
Source: MOTC, Directorate General Civil Aviation and Meteorology

AIF.5-2 Wind Rose of Duqm Area from May – July (2004)



Source: MOTC, Directorate General Civil Aviation and Meteorology

AIF.5-3 Wind Rose of Duqm Area from October – December (2003)



Source: MOTC, Directorate General Civil Aviation and Meteorology

(5) Tropical Cyclones

Tropical cyclones originating in the Indian Ocean enter the Arabian Sea quite frequently. Approximately 10 tropical cyclones have passed near or crossed the area between Ras Madraka and Mashirah Island in the last 30 years, with some storms causing intense rainfall (e.g. 431mm in Mashirah 1977).

1.2 Oceanography

(1) Tide

In the Duqm area, spring tides tend to be semi-diurnal and diurnal during neap tides.

AIT.5-5 Mean Tide Levels in Duqm

Unit: meters

Lat. N	Long. E	Mean range	Mean Sea Level	MHHW	MLHW	MHLW	MLLW
20° 10′	57° 49′	1.6	1.71	2.36	2.29	1.48	0.70

Note: The levels are of Sirab, approximately 60km north of Duqm

Source: Oman Maritime Handbook 2004, Royal Navy of Oman

(2) Wave

Along the Arabian Sea coast, wave action is most intense during the SW monsoon season due to the strong winds (>15m/sec) blowing between the Indian Ocean and the Asian continent. The dominant swell direction during SW monsoon season is from the south. Since the proposed Duqm port site faces into the northeast to east direction, the southern swell does not hit the coast directly but is refracted into the area, which first breaks at the head of Ras Duqm. By the time the southern swell reaches the Duqm area, swell energy is significantly reduced. Therefore, in comparison to the south facing high energy Arabian Sea coastline, the coast of the Duqm area is characterized as a low to moderate energy coast.

(3) Current

Surface current measurements were made approximately 70km south east of Duqm by Wimpol (1986). Current was strongest during the peak SW monsoon season, reaching to around 0.4 m/s. For the majority of the year the prevailing current direction was towards the northeast, except from November to January where the prevailing direction was southwest. Close to the coast, the oceanic currents are weaker and tidal currents are more apparent. The nearshore currents generally flow in the northern direction at speed of about 0.25 m/s (Posford Haskoning, 2002).

(4) Littoral Drift

The sediments of the sandy / silty beach north of Ras Duqm is assumed to be supplied by the soft cliffs south of Ras Duqm, which are eroded by heavy wave action. The suspended sediments are generally transported north towards the beach north of Ras Duqm. The coarse sediments tend to settle relatively near Ras Duqm, whereas the finer sediments tend to be carried further north by currents and settle in more sheltered areas of the coast. The estimated longshore net northerly sediment (sand) transport rate is assumed to be around 900,000 m^3/yr (Dobbin 1992).

(5) Upwelling

The oceanography of the Duqm area is strongly influenced by the two monsoon seasons. The most significant factor is the upwelling of deep water in the Arabian Sea during the SW monsoon season. The onset of the upwelling starts around the end of May and continues until September. The upwelling brings nutrient rich cool deep water to the surface and turns the Arabian Sea into a highly productive environment.

1.3 Topography

The proposed site for the new port lies over a shallow sandy bay of approximately 2km width. The bay is enclosed by rocky headlands in the north and the south. The beach area south of the bay is narrow and is backed by steep cliffs, which gradually slopes down to the low-lying central part of the bay. The central part of the bay is backed by extensive areas of sabkha (saline mud flat). The small headland north of the bay separates the bay from the much larger bay to the north (Ghubbat Quawayrat).

1.4 Geology

According to the Geological Map Sheet NE40-03/07, 1992 Duqm and Madraca (scale, 1:250,000), the western coast of the port area is composed of Quaternary Sub-Recent to Recent sabkhah deposits (Q*by*-*z*). The eastern coast of the port area is indicated as “beach sand, recent coastal dunes and aeolian sand venner”(Q*mz*). The information from the Geological Map implies that the substrate of the port area is relatively soft, loose and unstable, which was also reconfirmed during the field reconnaissance in July 2004.

In the hinterland of the port area including the Ras Duqm headland, lies the Tertiary, Duqm Formation, which is composed of “interbedded green marl, thin-bedded laminated gypsum and calcarenitic limestone; grey palustrine limestone and conglomerate at base”(EO*du*). In the eastern headland lies the Tertiary, Aydim Formation, which is composed of “reefal limestone with abundant corals and brecciated limestone”.

1.5 Hydrology

(1) Wadi flow

There are no wadi outfall near the Duqm area.

(2) Groundwater

The main groundwater recharge in the Al Wusta region is through the mountain ranges of northern and southern Oman. However, by the time the groundwater reaches the region, the groundwater becomes brackish to saline. The groundwater salinity in the Duqm area ranges between 14 – 33 ppt. The water table varies between 0.5 – 1.0m below the surface (OISC 2001).

1.6 Seawater Quality

(1) General Conditions

Sea surface temperature is coolest in the summer months (around 23℃) due to the upwelling of cold deep water in the SW monsoon season. Sea surface temperature gradually increases after the end of the upwelling season (around 26℃), then falls down again with the peak of the winter season. Sea surface temperature reaches its highest (around 28℃) prior to the onset of the SW monsoon season (Wimpol 1986). There is little seasonal variation in salinity in the northern Arabian Sea, which is around 36 throughout the year.

(2) Status of Water Pollution

Rock oysters are sometimes used to indicate the water quality of the coastal area. The following AIT.5-6 shows the heavy metal concentrations in the rock oysters collected in Mashirah Island and Duqm.

AIT.5-6 Concentration of Heavy Metals in Rock Oysters of Mashirah Island

Unit: mg/kg dry wt.

	Pb	Cd	Cu	Cr	Ni	Mn	V	Zn
1996/97*[1]	-	22.67	112	2.05	2.48	-	0.33	-
2001*[2]	0.29	14.92	77.2	-	1.18	19.0	-	302
2002	0.04	12.65	115	0.44	0.62	5.31	0.39	412
Reference value*[3]	-	11.68	110.5	0.63	1.16	-	1.8	-

*1: The values are the mean of 5 survey phases

*2: The values are of Duqm

*3: Data from IAEA surveys of the Omani waters from 1983-91

Source 1: Monitoring Pollutants in the Marine Environment, Auscon, 1998

Source 2: MPMP, MRMEWR, 2001-2002

AIT.5-7 shows the petroleum hydrocarbon concentration in the rock oysters collected in Mashirah Island.

AIT.5-7 Concentration of Petroleum Hydrocarbon in Rock Oysters of Mashirah Island

Unit: mg/kg dry wt.

	Range of total Aliphatics	Range of total Aromatics	Range of total HCs	Mean total HCs
1996/97*1	9.52 – 120.10	10.51 – 40.70	24.71 – 160.80	68.18
2002 Phase 1	-	-	-	2.79
2002 Phase 2	-	-	-	62.4
Ras Al Hadd*2	7.57 – 492.40	16.45 – 246.30	24.02 – 738.70	355.82
IAEA 1991 (KSA)*3	143 – 475	27 – 240	170 – 715	-

*1: Survey during 1996/97 was conducted over 5 phases

*2: Results of Ras Al Hadd during the 1996/97 survey

*3: Survey results of IAEA in KSA in 1991

Source 1: Monitoring Pollutants in the Marine Environment, Auscon, 1998

Source 2: MPMP, MRMEWR, 2002

1.7 Bottom Sediment Quality

Sediment quality data from the Duqm area is limited, thus data from Mashirah Island is provided for reference. The following AIT.5-8 shows the results of the heavy metal analysis. AIT.5-9 shows the result of petroleum hydrocarbon analysis. The data are presented in terms of the aliphatic (n-alkane) component and the polycyclic aromatic fraction (PAHs).

AIT.5-8 Concentration of Heavy Metal in the Intertidal Sediments of Mashirah Island and Duqm

Unit: mg/kg dry wt.

	Pb	Cd	Cu	Cr	Ni	Mn	V	Fe	Co	Zn
1996/97*1	-	-	13.6	53	51	-	19.7	-	-	-
2001*2	1.22	1.29	9.24	80.6	40.4	284	5.65	-	-	-
2002	1.84	0.117	6.43	365	92.1	78.79	78.2	8,857	5.56	44.65
MAFF Action Level*3	40	2	40	100	100	-	-	-	-	200

*1: The values are the mean of 5 survey phases

*2: The values are of Duqm

*3: Threshold values proposed by the UK Ministry of Agriculture, Fisheries and Food

Source 1: Monitoring Pollutants in the Marine Environment, Auscon, 1998

Source 2: MPMP, MRMEWR, 2001/02

Heavy metals did not show any elevated levels in the intertidal sediments of Mashirah Island or Duqm, which could partly be attributed to the lack of industrial activities. High chromium levels were detected in Mashirah Island in 2002, though the reasons are unknown.

AIT.5-9 Concentration of Petroleum Hydrocarbon in the Intertidal Sediments of Mashirah Island

Unit: mg/kg dry wt.

	Grain size (μ m)	Total Aliphatics	Total Aromatics	Total HCs
1996	<125	12.48	8.05	20.54
2002 phase I	<125	-	-	4.5
2002 phase II	<125	-	-	10.6
IAEA 1991 (KSA)*	-	13 - 496	6 - 175	19 - 671

*: Data from IAEA surveys of the KSA in 1991

Source 1: Monitoring Pollutants in the Marine Environment, Auscon, 1998

Source 2: MPMP, MRMEWR, 2002

As an alternative indicator of oil pollution, MRMEWR has also conducted beach survey of oil residues in 1996 and 2002. Over 5 survey phases in the 1996/97 period, the average amount of oil residues in Mashirah Island were 105 g/m, which significantly decreased to 1.6 g/m in 2002.

1.8 Noise and Air Quality

The current air quality in the Duqm area should be good, due to lack of traffic, industrial activities and small population.

1.9 Odor

No significant odor was detected during the field reconnaissance in July 2004. Odor from the fish processing factory could be significant during its operation months.

2 Biological Environment

2.1 Marine Ecosystem

(1) Flora

Information on marine flora in the Duqm Port area is scarce and should be surveyed in the future.

(2) Fauna

The biodiversity and productivity of the region is high, due to the high levels of nutrients from upwelling.

Regular observations of the vulnerable humpback whale (*Megaptera novaeanglie*) and Indo-Pacific humpback dolphin (*Sousa chinensis*) have been made offshore of Duqm. The humpback whale is thought to breed in the shallow waters offshore of Duqm. The Indo-Pacific humpback dolphins are known to feed in very shallow waters.

2.2 Terrestrial Ecosystem

(1) Flora

Vegetation is restricted to halophytes (plants adapted to saline substrates) due to the highly saline soil conditions. Halophytes are mainly found growing along the edge of the sabkha.

(2) Fauna

The Duqm area is sited as an Important Bird Area by Birdlife International due to its international importance as staging and feeding ground for over-wintering and migratory birds. It is also an important habitat for shorebirds, gulls and turns. The majority of the over-wintering and migratory birds pass through Duqm between the end of September and mid May.

The following wild mammal species are reported to occur in the Duqm area (AIT.5-10) (Posford Haskoning, 2002). Gazelles and foxes are sometimes seen in the port area.

AIT.5-10 Mammalian Species in the Duqm Area

Species name	Common name	Status in IUCN Red List
Gazella subgutturosa	Reem Gazelle	Near Threatened
Gazella gazella	Arabian Gazelle	Vulnerable
Capra nubiana	Nubian Ibex	Endangered
Vulpes sp.	Fox	-
Lepus capensis	Hare	-

2.3 Nature Reserve

“The Arabian Oryx Sanctuary” lies 60 km west to the Duqm port, which was designated as a nature reserve by RD4/94. The Sanctuary was also designated as an UNESCO World Heritage Site in 1994. The total area of the Sanctuary is 24,785 km^2. The Sanctuary contains many important geological and archaeological features and also outstanding scenic and wilderness values.

Although the port area lies outside the Sanctuary buffer zone, further studies are proposed along the Duqm coast for the possibility of future designation.

3 Socio-economic Environment

3.1 Demography

According to the Statistical Year Book 2003, the total population in Wilayat Duqm in year 2002 was 4,308, which is approximately 20% of the total population of Al-Wusta Region. Approximately 16% are expatriate and the remaining 84% Omanis.

Many of the local residents are bedwins (nomads). They make seasonal migrations between Duqm and the inland towns.

3.2 Infrastructure

(1) Access Road

The proposed Duqm port site is located approximately 8km east from Duqm town, the administrative center of the Wilayat Duqm. The port site is currently accessible only through an unpaved road. This access road will be paved and expanded in the future.

(2) Waste Management

The closest waste disposal site near the proposed Duqm port is MRMEWR owned Ras Al Duqm waste disposal site. Solid waste and sewage generated from Duqm port will probably be dumped here.

(3) Water and Power Supply

Water to the Duqm town is supplied through a small capacity desalination plant. Power is supplied through a small capacity diesel plant. The capacity of the water and power supply facilities must be significantly improved to serve the future demands.

3.3 Livelihood

The majority of the local residents depend on fishing for their livelihood. Other residents work for the Government and the trading sector. Agriculture is not conducted due to unsuitable soil conditions (Posford Haskoning 2002).

(1) Fisheries

Fishing is the primary source of income for the local residents of Duqm, especially during the NE monsoon season. Local fishermen tend to avoid fishing in the peak SW monsoon season (June –

August) due to severe sea conditions. Instead they move to the inland towns to seek for another job such as date farming or just simply rest. Many small fishing boats were seen docked on the shore of the proposed Duqm Port and in the adjacent Ghubbat Quwayrat Bay during the field reconnaissance in August 2004.

There is a fish processing factory in the proposed port area, but only operates during the winter months when fishing is more active. The following AIT.5-11 shows the fishing villages that are located near the proposed port, and the number of fishermen and fishing boats in the Al Wusta Region and in the Wilayat Duqm for year 2003.

AIT.5-11 Outline of the Artisanal Fishery in Al Wusta Regiona and Wilayat Duqm

	Al Wusta Region	Wilayat Duqm
Fishing villages near the port[1]	-	Ras Duqm, Ras Madrakah, Ras Markhaz, Nafun, Ash Shuayr, Haitam, Khalaf, Deethab
No. of fishermen (2003)[2]	3,269	922
No. of fishing boats (2003)[2]	1,509	439

Source 1: MOAF
Source 2: Fisheries Statistics Book 2003, MOAF

The main fishing method used in the Duqm area is handline, trolling and gillnet. AIT.5-12 shows the annual total landing in the Al Wusta Region from 1999 to 2003 and the major caught species. In contrary to the Gulf of Oman area, the majority of the landings in the Al Wusta Region are composed of demersal species. The most valuable species are shrimps and lobsters.

AIT.5-12 Annual Total Landing in the Al Wusta Region from 1999 to 2003

Unit: Metric tons

	1999	2000	2001	2002	2003	Major species
Large pelagic	2,437	1,230	2,226	1,392	1,979	Kingfish. yellowfin & longtail tuna, barracuda, queenfish
Small pelagic	1,450	573	1,594	3,936	3,689	Sardine, Indian mackerel, mullets
Demersal	7,953	8,271	6,784	8,412	5,918	Croaker, seabream, emperor, grouper, catfish
Sharks & rays	681	347	476	346	1,765	-
Crustaceans	370	674	699	675	662	Lobster, shrimp
Molluscs	3,014	323	2,215	2,199	1,783	Cuttlefish
Others	0	107	528	43	992	-
Total	15,905	11,524	14,522	17,004 (7,544)	16,778	

*: The parenthesis shows the total landing in Wilayat Duqm

Source: Fisheries Statistics Book 2003, MOAF

A pilot study facility for a shrimp farm was constructed by Oman International Shrimp Company (OISC), located about 10km north of the proposed Duqm Port in Ghubbat Quwayrat Bay. However, the project is currently cancelled due to the proposed Duqm Port. It was planned to operate during the months of February to November each year.

(2) Tourism

Attracted by the unspoilt natural environment, the coast of Duqm is occasionally visited for camping, swimming, bird watching, fossil hunting and so on. However, at the moment there are no tourist facilities in Duqm.

3.4 Cultural Assets

There are no known archaeological or historical heritage sites near the Duqm port area.

3.5 Land Use

Although the Duqm area is scarcely populated and undeveloped at the moment, a master plan study of the Duqm area will be implemented in the near future by the Government.

Appendix I.6 Present Environmental Conditions of Shinas Port Area

1 Pysico-chemical Environment

1.1 Meteorology

Currently there is no meteorological station in the Shinas area. The conditions are probably similar to Sohar due to its close proximity and similar geographical location, thus please refer to Sohar (Appendix III-3) for meteorological information.

1.2 Oceanography

Oceanographic information of Shinas is very limited. The conditions are probably similar to Sohar due to its close proximity and similar geographical location, thus please refer to Sohar (Appendix III-3) for information on tide, wave and current.

(1) Littoral Drift

Beach erosion and accretion is an ongoing problem around the Shinas Port. The net sediment transport is towards the northwest. The sediment transport rate along the Shinas coast is estimated to be around 77,000 m^3/year (Dobbin, 1992).

1.3 Topography

Shinas Port is located over a long stretch of shallow coastline that runs in the southeast to northwest direction. The Port is backed by a narrow tidal lagoon (Khawr Shinas), which becomes inundated during high tide. A single road bridges the Port to the hinterland residential area.

1.4 Geology

The geology of the Shinas Port area is very similar to Sohar (refer to Annex III-3).

1.5 Hydrology

(1) Wadi Flow

There are three wadis that could possibly have a flooding effect on the Shinas Port. They are Wadi Hatta, Wadi Fayd and Wadi Bidah.

(2) Groundwater

Please refer to Annex III-3.

1.6 Water Quality

Water quality data was not available. The data of Sohar should provide reference values for Shinas (Appendix III-3).

1.7 Sediment Quality

Sediment quality data in the Shinas area is limited to oil pollution related parameters. In 1996, MRMEWR conducted a brief survey of petroleum hydrocarbon concentration in the intertidal sediments of Shinas. The results are summarized in the following AIT.6-1.

AIT.6-1 Concentration of Petroleum Hydrocarbon in the Intertidal Sediments of Shinas

Unit: mg/kg dry wt.

	Grain size (μ m)	Total Aliphatics	Total Aromatics	Total HCs
1996	<125	8.22	1.36	9.58
IAEA 1991 (KSA)*	-	13 - 496	6 - 175	19 - 671

*: Data of IAEA survey in KSA in 1991

Source: Monitoring Pollutants in the Marine Environment, Auscon, 1998

Petroleum hydrocarbon concentration were significantly low compared to highly contaminated sites such as KSA, but at an average level in Oman.

As an alternative indicator of oil pollution, MRMEWR also conducted beach survey of oil residues in 1996. The average amount of oil residues found in the Shinas area was 220 g/m. This value is relatively low within Oman but is considerably high compared to non-Gulf countries such as Australia (0 – 5.5 g/m).

1.8 Noise and Air Quality

There are no major noise or air pollutant sources in the Shinas area.

1.9 Odor

No significant odor was detected during the field reconnaissance in August 2004.

2 Biological Environment

2.1 Marine Ecosystem

The marine environment of Shinas should be similar to Sohar. Thus please refer to Sohar (Appendix III-3).

2.2 Terrestrial Ecosystem

Mangrove forest of approximately 53 ha grows along the southern edge of Khawr Shinas. A mangrove transplantation project by MRMEWR is ongoing in the northern arm of the khawr.

3 Social Environment

3.1 Demography

According to the Statistical Year Book 2003, the total population in Wilayat Shinas in year 2002 was 54,890, which is approximately 8% of the total population of Al Batinah Region. Approximately 15% are expatriate and the remaining 85% Omanis.

3.2 Infrastructure

(1) Access Road

The access road from the port to the Batinah highway, runs through the residential area.

(2) Waste Management

Solid waste generated from Shinas port is dumped at the MRMEWR owned Shinas main waste disposal site. Sewage is collected to a holding tank, then transported and discharged at the above waste disposal site.

(3) Water and Power Supply

The Shinas area relies on groundwater for water supply.

Power in the north of Oman is supplied through a network of 4 gas / diesel power stations that are located in Barka, Manaha (near Nizwa), Al Kamil (near Sur) and Al Ghubrah. These power stations are designed to supplement each other in case of power shortage.

3.3 Livelihood

(1) Fisheries

Prior to the handover to the MOTC in 2001, Shinas Port belonged to the Ministry of Agriculture and Fishery. Now half of the area is allocated for commercial uses and the other half for fisheries. Currently the port has a fuel station, ice plant, fish processing factory, workshop and a new wholesale and retail fish market.

The following AIT.6-2 shows the fishing villages that are located near the port, and the number of fishermen and fishing boats in the Al Batinah Region and in the Wilayat Shinas for year 2003.

AIT.6-2 Outline of the Artisanal Fishery in Al Batinah Region and Wilayat Shinas

	Al Batinah Region	Wilayat Shinas
Fishing villages near the port[1]	-	Al Widyat, Al Aqur, Al Sayfiyah, Al Bulaydah, Sur Al Balush, Sur Al Mazari
No. of fishermen (2003)[2]	10,298	1,699
No. of fishing boats (2003)[2]	4,753	839

Source 1: MOAF
Source 2: Fisheries Statistics Book 2003, MOAF

Fishing is based on traditional artisanal fishery. The employed fishing methods and main target species are probably similar to the Sohar area, due to its close proximity and similar fishing environment.

(2) Tourism

Establishment of a tourist complex (hotels, restaurant, shopping mall) is planned in the area south of Khawr Shinas by the Ministry of Tourism.

3.4 Cultural Assets

To be completed.

3.5 Land Use

A residential and agriculture area lies between the port area and the Batinah Highway.

APPENDIX Ⅱ

Technology to Induce Coral Settlement on Breakwater

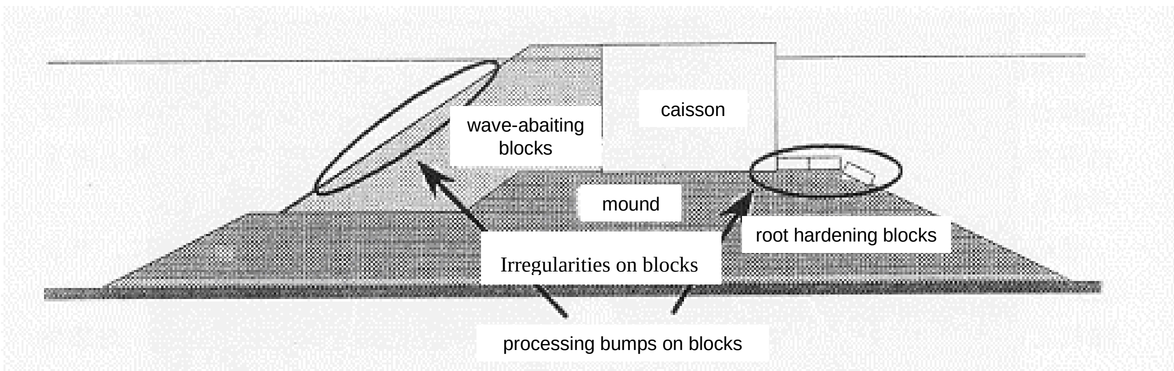
Appendix II

(Excerpt from: Nature Conservation Bureau, Ministry of the Environment, Japan (2004), Manual for restoration and remediation of coral reefs, chapter 3-2, 29-33pp)

3-2 Manufacture and placement of artificial substrates for coral settlement

This is a method that makes irregularities of approximately 1 to 3 cm on the surface of marine structures, such as breakwaters to facilitate the settlement of juvenile corals. It is expected that the turbulence of microscale flows produced by the complex shape of the substrate surface can make the larvae stay on the surface with a higher possibility of settlement when they come near. It is also estimated that the surface irregularities can reduce the danger of predation and scraping fishes and sea-urchins after the settlement. Since many of the marine structures are made of concrete, it is easy to make irregularities on the surface when manufacturing them. The irregularities can be made on the wave-dissipating blocks that are placed in front of breakwaters and foot protection blocks that are placed behind the structures (Fig. 3-12).

Fig. 3-12 Breakwater Areas with Irregularities for Coral Substrates



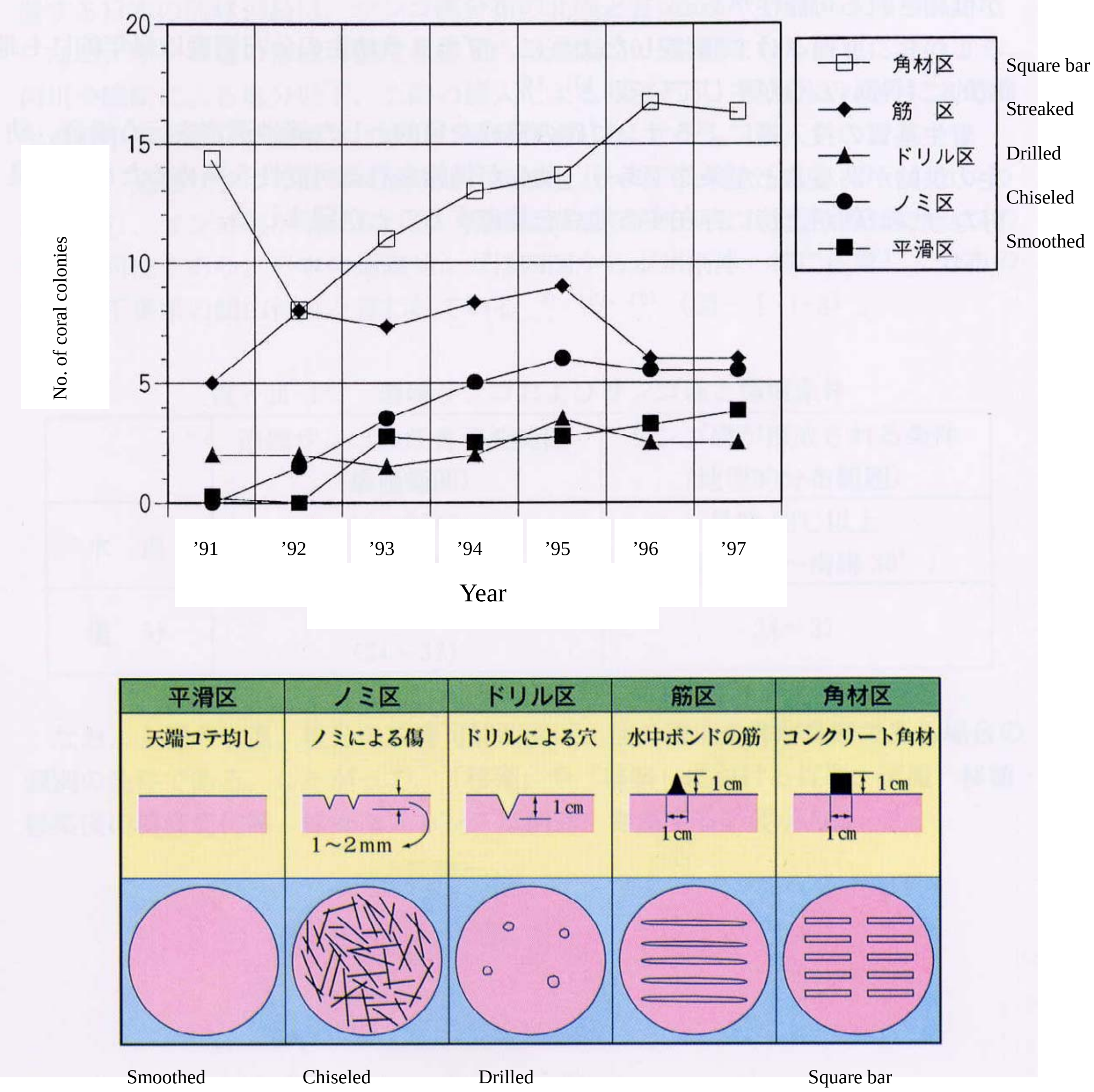
(Harbor & Marine Environment Laboratory 1999)

For making the irregularities on the blocks, the following methods have been considered (Harbor & Marine Environment Laboratory 1999):

a) Chiseled: The concrete mould of the block form is made irregular by using chiseled interior forms.
b) Drilled: Holes are made with a drill bit on the block after manufacture.
c) Streaked: Concrete is sprayed on the block surface to form the irregularities.
d) Square bar: Adhesive or bolts are used to fasten secondary products such as square bar, plates, or concrete cement on the block surface to form the irregularities.

According to research relating coral settlement success to various process to manufacture blocks with requisite irregularities (Harbor & Marine Environment Laboratory 1999), there is an indication that the use of forms which have been affixed secondary products that produce a high degree of roughness can produce more coral colonies (Fig. 3-13). As for the inclination of the substrate, there was a an indication that both the coral coverage and the number of colonies are larger on the horizontal surface or 45 degree surface than on the vertical surface at the depth of around 2 m, but no such difference was recognized at the depth of around 10 m.

Fig. 3-13 State of Settlement of Corals at the Processed Areas of Substrate



Smoothed (control)	Chiseled (Grooves made with a chisel)	Drilled (Holes made with a drill bit)		Square bar (concrete square bars are affixed)

(Harbor & Marine Environment Laboratory 1999)

The only possible waters for the placing substrates are environments that the corals can readily inhabit. Though it seems that any current coral area allows settlement corals, the settlement of larvae cannot be expected in the areas where the transparency is low and the sediments are significant. They may die out due to the luck of enough lighting or covering sediments even after the settlement. As a result of experimental settlement of *Acropora tenuis* and *Heliopora coerulea* larvae under suspended red soil or sediments, both species showed reduction of the settlement rate and secretion of mucus (Harii et al. 2002). As a red soil contamination guideline for maintaining the coral communities healthy, Omija et al. (2003) defined the annual maximum permissible value of SPSS (Content of suspendible particles in seabed sediment) as 30 kg/cm^3.

Yamamoto et al. (2002) researched the coral coverage and habitat environment on the artificial structures in Naha Harbor, and classified areas unsuitable for the growth of coral and those that allow growth. As a result, they identified suitable environmental conditions for the growth of corals, on which numerical data are shown in Table 3-1.

Table 3-1 Environmental Conditions Suitable for Growth of Coral Communities in Naha Harbor (Yamamoto et al. 2002)

Environmental item	Mean value ±sd
Wave height in front of breakwater (m)	8.4±3.4
Salinity	34.7±0.1
Transparency (m)	13.7±3.5
SS(mg/l)	1.2±0.5
COD (mg/l)	0.8±0.1
TN (mg/l)	0.15±0.04
TP (mg/l)	0.012±0.005

Heeger & Sotto (2000), who studied coral transplantation, after the following set of the suitable environmental conditions for transplantation without indicating the relevant species (Table 3-2).

Table 3-2 Suitable Environmental Conditions for Transplantation (Heeger & Sotto 2000)

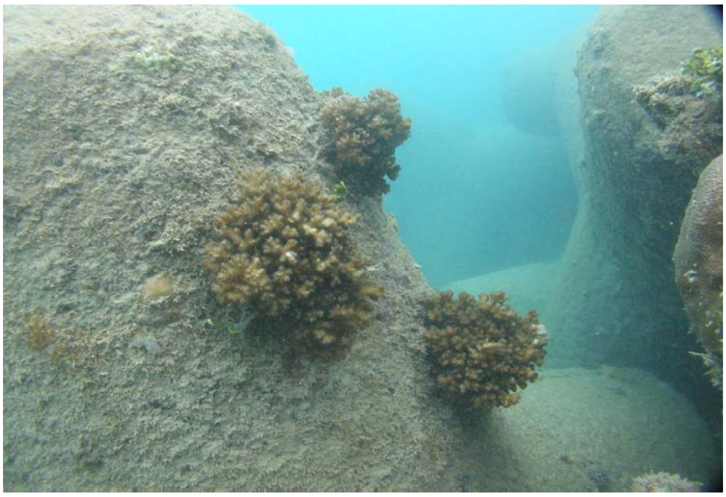
Environmental item	Optimal value	Remarks
Water temperature	22℃-30℃ (25℃ is desirable)	
Salinity	32 to 36	Free from effects of rivers
Transparency	12ｍ or more	
Tidal current	1ｍ/s or less	
Depth	6 to 12ｍ	Shallower areas are easily affected by drift sand.
Sediment	Sand or algae community dotted with coral communities	

Since coral eggs and larvae drift for about five days near the surface, they are affected much by the wind, which varies according to the weather conditions at the time. Therefore, the situation of coral recruitment for resettlement at a given place generally varies from year to year (Marine Parks Center of Japan 1995). But, macroscopically, there may exist some places with a repeatedly high possibility of retention of larvae, caused by middle scale turbulence and counterflow produced by the bottom topography and constant flow of current. The frequency of the recruitment may be high in such places.

The depth for this purpose can be determined by noting to the depth of water peripheral to areas that corals inhabit. The coral inhabitable depth varied depending on species, but in many cases can be from the low tide level down to 30m as far as the transparency is good (Fig. 3-14).

Manufactured structures must be placed in the sea before the coral spawning, as a matter of course, which varies according to place and from year to year. In Okinawa's coral reef areas, the spawning begins in May, in the years that water temperature is higher range, and usually in July or August in Honshu and Kyushu areas. The time of placement of structures should be determined by taking into consideration the period needed to adapt the concrete for the seawater, and in addition, strategies to prevent algae attaching to the substrate and disturbing the coral settlement, or even can covering the substrate. However, it may be acceptable that the substrates are covered with some crustose red algae because some of them encourage recruitment of coral larvae. As a result of experimental settlement of *Acropora hyacinthus* and *A. tenuis* larvae on artificial substrates (unglazed tiles) that were submerged in the sea for three weeks, six months and one year respectively, it is reported that the submergence longer the more settled larvae. Larvae settled on the coralline algae that covered the substrates, which itself had varied lengths of time to become established (Taniguchi 2002). However, if the algae other than the coralline algae and/or sea squirts, sea sponge, Bryozoa or other competing sessile animals cover the substrates, they must be removed.

Fig. 3-14. *Pocillopora damicornis* on Breakwater Wave-dissipating Blocks (Ishigaki Harbor)



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(Fujiwara S)

APPENDIX Ⅲ

Salalah Container Vessel Movement & Berthed

AIIIT 1 Salalah Container Vessel Movement

Vessel Name	L/D	Last port	Next port	Schedule	Arrived date	Agent
GRASMER MAERSK	292/12	JEDDAH	PELEPAS	10.08.04/0200		MAERSK
KHALEE EXPRESS	159/8.5	MUSCAT	COLOMBO	10.08.04/PM	14.08.04/1120	MERIDIAN
MAERSK VERONA	184/10	MOMBASA	MOMBASA	11.08.04/0100	15.08.04/0050	MAERSK
SAFMARIN COTONOU	182/10	MOMBASA	DARESALEM	11.08.04/1000	15.08.04/1225	MAERSK
MAERSK ARIZONA	239/10.1	PORT QASIM	PORT QASIM	11.08.04/2300	13.08.04/1815	MAERSK
MAERSK TOKYO	270/11.5	MUMBAI	SUEZ	11.08.04/2300		MAERSK
NORD BEACH	156/8.11	DUBAI	REUNION	12.08.04/0001	19.08.04/S112	MAERSK
MAERSK MALACCA	294/12	JEDDAH	JEBEL ALI	12.08.04/0600		MAERSK
ORION	178/8	PORT ELIZAB	JEBELALI	12.08.04/2200	15.08.04/1040	MAERSK
SEALAND MICHIGAN	304/13	JEDDAH	PELEPAS	12.08.04/0200	12.08.04/0755	MAERSK
APL INDIA	277/12	BREMERHAVI	SINGAPORE	13.08.04/0900	13.08.04/0722	GAC
MAERSK AVON	155/8	DIBOUTI	MADRAS	13.08.04/1100	DELAYED	MAERSK
APL DAIJAN	207/11	AINSKHNA	FUJAIRAH	13.08.04/1200		GAC
SEALAND ATLANTIC	289.5/12	MUSCAT	JEDDAH	13.08.04/1400	14.08.04/0700	MAERSK
MSK ATLANTIC	155/7.5	JEDDAH	TBA	14.08.04/0500	15.08.04/S053	MAERSK
SAF. PAKISTAN	168/9	PORT QASIM	KARACHI	14.08.04/0600	22.08.04/0230	MAERSK
MAERSK ABERDEEN	155/9.5	MADRAS	ADEN	14.08.04/0600	21.08.04/0600	MAERSK
APL PUSAN	208/11	SINGAPORE	JEDDAH	14.08.04/1300	14.08.04/0945	GAC
MSK VERONA	184/10	MOMBASA	MOMBASA	14.08.04/1800	15.08.04/0050	MAERSK
SAF HIMALAYA	304/13	PELEPASS	SUEZ	15.08.04/0900	15.08.04/0940	MAERSK
MSK VENISPILS	175/11	COLOMBO	TBA	15.08.04/1100	DELAYED	MAERSK
MAERSK AVON	155/8	DIBOUTI	MADRAS	15.08.04/0830		MAERSK
MIBERRICUM	179.6/9.45	TBA	TBA	15.08.04/1700	DELAYED6	MAERSK
TIGER OCEAN	120/4.25	MUMBAI	JUBELALI	15.08.04/1800	16.08.04/0352	GAC
CORNELIA MSK	347/13.5	JEDDAH	TBA	16.08.04/0300		MAERSK
MAERSK GEORGIA	292/12	TBA	TBA	16.08.04/0800	16.08.04/1135	MAERSK
CAPE SPEAR	157/8.5	HODEDAH	ADEN	17.08.04/0600	19.08.04/0200	GAC
QC WISDOM	138/7	MUSCAT	JEBEL ALI	17.08.04/0700	18.08.04/1848	GAC
MSK ARIZONA	240/11.5	PORT QASIM	PORT QASIM	17.08.04/TBA	25.08.04/0730	MAERSK
NORDSTAR	184/7.5	MOMBASA	MOMBASA	17.08.04/0800	23.08.04/1315	MAERSK
COLOMBO	119.32/6	TBA	TBA	18.08.04/AM	21.08.04/2114	KANOO
AUCANIA	195.6/11	MUMBAI	SUEZ	18.08.04/2300	19.08.04/S131	MAERSK
APL DENMARK	277.3/13.2	BREMERHAVI	SINGAPORE	19.08.04/0700	19.08.04/1235	GAC
GLASGOW MSK	292/12	SUEZ	PELEPAS	19.08.04/1100		MAERSK
MAERSK MISOURI	292/11	JEDDAH	JEBEL ALI	19.08.04/2300	20.08.04/0705	MAERSK
APL VENEZUELA	220/9.8	SUKHNA	FUJAIRAH	20.08.04/1000	20.08.04/0945	GAC
SEALAND QUALITY	290/11	MUSCAT	JEDDAH	20.08.04/1400	21.08.04/0830	MAERSK
MAERSK ANTWERP	155/8	COLOMBO	MADRAS	21.08.04/0600	25.08.04/0845	MAERSK
APL JEDDAH	207.4/11.2	SINGAPORE	JEDDAH	21.08.04/0900	21.08.04/0804	GAC
APL PEARL	275/13.25	SINGAPORE	ZEEBURGGE	21.08.04/2000	21.08.04/1540	GAC
PHOENIX	157/7.6	PORT LOUIS	REUNION	22.08.04/0800	22.08.04/0940	MAERSK
SUSAN MAERSK	347/13	JEDDAH	KELANG	23.08.04/0300	22.08.04/2230	MAERSK
SEALAND NEWYORK	304/13	PELEPASS	SUEZ	22.08.04/1900	22.08.04/1400	MAERSK
MAERSK MALACCA	294/12	MUMBAI	SUEZ	23.08.04/TBA	25.08.04/0625	MAERSK
MARSK DUNDEE	292/13.5	JEDDAH	PELEPAS	23.08.04/2330	24.08.04/1245	MAERSK
CAPE SPEAR	157/8.5	HODEDAH	ADEN	25.08.04/1000		GAC
MSK ATLANTIC	155/7.5	DIBOUTI	DIBOUTI	25.08.04/1300	22.08.04/2230	MAERSK
ORION	178/11.5	JEBEL ALI	DURBAN	25.08.04/2130		MAERSK
ORANJE	177.6/11	DURBAN	KOCHIN	25.08.04/2200	26.08.04/1345	MAERSK
MAERSK TOLEDO	270/11	MUMBAI	SUEZ	25.08.04/2300	26.08.04/S175	MAERSK
MAERSK CAROLINA	292/12	JEDDAH	JUBEL ALI	26.08.04/0630	27.08.04/S024	MAERSK
NORDSUN	156.7/8	DURBAN	REUNION	26.08.04/1400	27.08.04/S161	MAERSK
CAPE BYRON	140/8.5	VICTORIA	DARESALEM	26.08.04/1700	27.08.04/1830	MAERSK
APL GERMANY	280/13.25	BREMERHAVI	SINGAPORE	27.08.04/0700	27.08.04/0705	GAC
FABIAN SCHULTE	168/10	COLOMBO	COLOMBO	27.08.04/0900	28.08.04/0225	MAERSK
SEALAND VALLE	292/11	MUSCAT	JEDDAH	27.08.04/1400		MAERSK
MARSK VINUS	175/11	COLOMBO	PIPAVE	27.08.04/1500	28.08.04/2204	MAERSK
APL PUSAN	208/9.5	SUKHUNA	FUJAIRAH	27.08.04/1500	27.08.04/1115	GAC
MAERSK DARWIN	294/11	SUEZ	JUBELALI	28.08.04/1000	29.08.04/s125(	MAERSK
MARE IBERICUM		QASIM	COCHIN	29.08.04/1200		MAERSK
SINE MAERSK	347/11.5	JEDDAH	PORT KELAN(	29.08.04/1800	29.08.04/1900	MAERSK
MAERSK KALAMATA	304/12	COLOMBO	SUEZ	30.08.04/0500	30.08.04/0655	MAERSK
MSK MISSOURI	290/12	MUMBAI	SUEZ	30.08.04/0600	29.08.04/2300	MAERSK
SAFMARIN PAKISTAN	168/10.3	PIPAVE	COLOMBO	30.08.04/1400	28RESKE	MAERSK
SAFMARIN AMAZON		JEBEL ALI	DURBAN	30.08.04/2130		MAERSK
MSK ATLANTIC		DJIBOUTI	DIBOUTI	31.08.04/1800	02.09.04/S023	MAERSK
KNUD MAERSK		JEDDAH	PELEPAS	31.08.04/0700		MAERSK
LTC CALVIN TITUS		COLOMBO	JEDDAH	01.09.04/1500		GAC
MAERSK TRIESTE	270/12.5	MUMBAI	SUEZ	01.09.04/2300	01.09.04/1950	MAERSK
TIGER OCEAN	120.6/6	MUMBAI	JEBEL ALI	02.09.04/0300	02.09.04/1830	GAC
MAERSK DUBLIN	292/12.5	JEDDAH	JEBEL ALI	02.09.04/1400	03.09.04/0855	MAERSK
QC WISDOM	138.3/TBA	MUSKAT	JUBEL ALI	02.09.04/1800	02.09.04/1040	GAC
MSK ARIZONA	240/11.5	PORT QASIM	PORT QASIM	02.09.04/1600	02.09.04/0920	MAERSK
MAERSK AVON	155/8	ADEN	HODEIDAH	02.09.04/2000	05.09.04/0610	MAERSK
MAERSK RENNIS	133/6	DURBAN	REUNION	02.09.04/2100	03.09.04/0400	MAERSK
APL JEDDAH	107.4/11	SUKHNA	FUJAIRAH	03.09.04/0200	03.09.04/0120	GAC
MAERSK PITSBURG	196/11	JEBEL ALI	TUTICOLIN	03.09.04/0900	05.09.04/0010	MAERSK
MAERSK VERONA	184/9	MOMBASA	MOMBASA	03.09.04/1300	08.09.04/2000	MAERSK
SEALAND PERFORMANCE	290/11	MUSKAT	JEDDAH	03.09.04/1400	03.09.04/1445	MAERSK
ORANGE	177.6/10.5	QASIM	KARACHI	03.09.04/1500	05.09.04/0420	MAERSK
CAPE SPEAR	157/TBA	HODEIDAH	ADEN	03.09.04/1800	12.09.04/0340	GAC
APL IRIS	272/13.25	SINGAPORE	ZEEBRUGGE	03.09.04/2100	04.09.04/0845	GAC
APL IRELAND	265.7/11	BREMERHAVI	SINGAPORE	04.09.04/0800	04.09.04/0250	GAC
MARIT MAERSK	294/12	SUEZ	JEBEL ALI	04.09.04/1000	04.09.04/1400	MAERSK
ENGIADINA	222/12	SINGAPORE	JEDDAH	04.09.04/1300	04.09.04/1650	MAERSK
MAERSK ABERDEEN	155/8	MADRAS	MADRAS	04.09.04/1500	07.09.04/1645	MAERSK
MAERSK KOLKATA	304/13	PEREPAS	SUEZ	05.09.04/2359	06.09.04/0035	MAERSK
COLOMBINE MARSK	347/13.5	JEDDAH	PORT KELAN(	06.09.04/0300	07.09.04/0060	MAERSK
MAERSK CAROLINA	292/12	MUMBAI	SUEZ	06.09.04/0600	07.09.04/1100	MAERSK
SAFMARIN ANTWARP	304/13	JEDDAH	PELEPAS	08.09.04/0200	07.09.04/0205	MAERSK
MSK ARIZONA	240/11.5	PORT QASIM	PORT QASIM	09.09.04/0700	09.09.04/1430	MAERSK
SAFMARINE PAKISTAN	168/9.2	PIPAVE	COCHIN	09.09.04/0700	09.09.04/0835	MAERSK
MAERSK ANTWERP	155/8	COLOMBO	MADRAS	08.09.04/1830		MAERSK
MAERSK DUISBURG	292/13.5	MUMBAI	SUEZ	08.09.04/2300		MAERSK
MAERSK VIRGINIA	292/12.5	JEDDAH	JEBEL ALI	08.09.04/2300		MAERSK
COLOMBO		MUMBAI	JEBEL ALI	08.09.04/2200		KANOO
FABIAN SCHULTE	168/10	COLOMBO	COLOMBO	09.09.04/1800	11.09.04/S105	MAERSK
APL IVORY	260/11	TBA	TBA	09.09.04/2000		GAC
APL SPAIN		BREMERHAEI	SINGAPORE	10.09.04/0300	10.09.04/S210	GAC
NORDSTAR	184/7.5	MOMBASA	MOMBASA	10.09.04/0400	4RESKE	MAERSK
QC WISDOM	138.3/TBA	MUSKAT	JUBEL ALI	10.09.04/0900	18.09.04/0700	GAC
SEALAND COMMITMENT	289/12	MUSKAT	JEDDAH	10.09.04/1400		MAERSK
MAERSK VINUS	175/11	COLOMBO	PIPAVE	10.09.04/1500	19.09.04/1000	MAERSK
APL CHILE		SINGAPORE	JEDDAH	11.09.04/0200	11.09.04/S111	GAC
MAERSK AVON	155/8	ADEN	DJIBOUTI	11.09.04/0600	14.09.04/1045	MAERSK
SAFMARINE COTONOU	182/7.5	MOMBASA	DARESALEM	11.09.04/0800	11.09.04/2150	MAERSK
MAERSK MERLION	294/12	SUEZ	JEBEL ALI	11.09.04/1700		MAERSK
CAPE SPEAR	157/8.5	HODEDAH	ADEN	11.09.04/2000	12.09.04/0340	GAC
PLUTO	194/10	JEBEL ALI	DURBAN	11.09.04/2130	14.09.04/0945	MAERSK
SEALAND MICHGAN	304/13	PEREPAS	SUEZ	12.09.04/2359	14.09.04/S053	MAERSK
SOFIE MAERSK	347/13	JEDDAH	KELANG	13.09.04/0300	14.09.04/S045	MAERSK
CAPE BYRON	140/6	VICTORIA	DARESALEM	13.09.04/0500		MAERSK
ORANJE	177.6/10.5	QASIM	KARACHI	13.09.04/0600	7RESKE	MAERSK
MAERSK DUBLIN	292/12	MUMBAI	SUEZ	13.09.04/0600	14.09.04/0740	MAERSK
SAFMARINE HIMALAYA	304/13	JEDDAH	PELEPAS	13.09.04/1900	14.09.04/0700	MAERSK
APL ORCHID	161/10	MUMBAI	JEBEL ALI	16.09.04/0200		MAERSK
ORANGE	177.6/9	QASIM	KARACHI	16.09.04/0400	ADVANCE	MAERSK
MAERSK ATLANTIC	155/8.5	ADEN	DJIBOUTI	16.09.04/0700	23.09.04/1535	MAERSK
APL CORAL	275/13	BREMERHAVI	SINGAPORE	17.09.04/0200		MAERSK
MAERSK TOYAMA	256/11	MUMBAI	SUEZ	16.09.04/1100		MAERSK
GREENWICH MAERSK	292/12	JEDDAH	JEBEL ALI	16.09.04/2000		MAERSK
QC WISDOM	138.3/TBA	MUSKAT	JUBEL ALI	17.09.04/0100	18.09.04/0700	MAERSK
SEALAND ATLANTIC	304/13	MUSKAT	JEDDAH	17.09.04/1400	17.09.04/1040	MAERSK
ENGIADINA	222/12	AINSKHNA	FUJAIRAH	17.09.04/1800	17.09.04/0805	ALFAYHA
APL VENEZUELA	220/8.8	SINGAPORE	JEDDAH	18.09.04/0200		GAC
APL CYPRINE	275/12	BINGAPORE	ZEEBURGGE	18.09.04/0030		GAC

Vessel Name	L/D	Last port	Next port	Schedule	Arrived date	Agent
KAREN MAERSK	318/13	SUEZ	JEBEL ALI	18.09.04/1000		MAERSK
MAERSK ABERDEEN	155/9.5	MADRAS	MADRAS	18.09.04/1930		MAERSK
MAERSK ARIZONA	239/10	QASIM	QASIM	18.09.04/0700	24.09.04/0430	MAERSK
SOVEREIGN MAERSK	347/13	JEDDAH	KELANG	20.09.04/0300	20.09.04/0425	MAERSK
MAERSK VIRGINIA	292/12	MUMBAI	SUEZ	20.09.04/0600	19.09.04/2300	MAERSK
MAERSK VILNUS	175/11	PIPAVE	PIPAVE	20.09.04/1100	18RESKE	MAERSK
SEALAND ILLINOIS	304/12	PELEPAS	SUEZ	20.09.04/1600		MAERSK
SIRIUS	178/8.9	JEBEL ALI	DURBAN	20.09.04/1900	20.09.04/0100	MAERSK
MAERSK VERONA	184/10.5	MOMBASA	MOMBASA	21.09.04/1200	05.10.04/0820	MAERSK
SEALAND NEWYORK	304/13.2	JEDDAH	PELEPAS	21.09.04/1600		MAERSK
MAERSK ABERDEEN	155/9.5	MADRAS	MADRAS	21.09.04/1800		MAERSK
MAERSK ATLANTIC	155/8	DIBOUTI	DIBOUTI	22.09.04/1600	23.09.04/1535	MAERSK
CAPE ARACO	239/12	QASIM	QASIM	22.09.04/0800		GAC
SAFMARINE PAKISTAN	168/10	COLOMBO	COLOMBO	22.09.04/1300	01.10.04/0620	MAERSK
PHEONIX	157/8	DURBAN	REUNION	22.09.04/2000	25.09.04/1100	MAERSK
CLIPPER	156.7/7.8	MUMBAI	JEBEL ALI	22.09.04/0645		GAC
ORANGE	177/8	QASIM	KARACHI	22.09.04/1200		MAERSK
MSK TOKYO	270/11	MUMBAI	SUEZ	23.09.04/1000	23.09.04/0330	MAERSK
MSK GEORGIA	292/12	JEDDAH	JEBEL ALI	22.09.04/2300		MAERSK
APL AGATE	275/12.7	BREMERHAVI	SINGAPORE	23.09.04/0800	23.09.04/1410	GAC
QC WISDOM	138.3/8	DJIBOUTI	JEBEL ALI	23.09.04/2200	24.09.04/0700	GAC
MSK ARIZONA	239/12	QASIM	QASIM	23.09.04/2359	24.09.04/0430	MAERSK
QUALITY	289.5/12	MUSCAT	JEDDAH	24.09.04/1400	24.09.04/1015	MAERSK
FAB SCHULTE	168/8	COLOMBO	PIPAVE	24.09.04/1700	27.09.04/S0120	MAERSK
ERIC GIBSON	198.8/11	MUSCAT	SINGAPORE	24.09.04/1800		GAC
APL LOLITE	272/11.8	SINGAPORE	ZEEBURUGE	24.09.04/1900		GAC
APL CHILE	260/12	AQABA	FUJAIRAH	24.09.04/2100	25.09.04/1535	GAC
CAPE SPEAR	152/8.4	HODEIDAH	DJIBOUTI	24.09.04/2300	19RESKE	GAC
APL PUSAN	208/9	SINGAPORE	JEDDAH	25.09.04/0200		GAC
MARCHEN MAERSK	292/12	SUEZ	JEBEL ALI	25.09.04/1000	25.09.04/0905	MAERSK
MSK ANTWERP	155/7.5	COLOMBO	MADRAS	25.09.04/1900	27.09.04/S0420	MAERSK
ORANGE	177/8	QASIM	MADRAS	25.09.04/2000		MAERSK
NORDSTAR	184/10	MOMBASA	MOMBASA	26.09.04/0500		MAERSK
KNUD MAERSK	155/7.5	COLOMBO	MADRAS	26.09.04/0600	27.09.04/0300	MAERSK
CLIFFORD MAERSK	347/13	JEDDAH	KELANG	27.09.04/0800	26.09.04/2210	MAERSK
GREENWICH MAERSK	292/12.5	MUMBAI	SUEZ	27.09.04/0600	27.09.04/0545	MAERSK
NORDSUN	156.7/9.5	DURBAN	REUNION	27.09.04/1100		MAERSK
PEGASUS	194/11	JEBEL ALI	DURBAN	27.09.04/2130		MAERSK
MAERSK KALAMATA	304/12	JEDDAH	PELEPUS	28.09.04/0700		MAERSK
SAFMARINE COTONOU	182/9	MOMBASA	DARESSALEN	28.09.04/2359		MAERSK
MALACCA	294/11	JEDDAH	JEBEL ALI	29.09.04/2300		MAERSK
ALICANIA	195.6/11	MUMBAI	SUEZ	29.09.04/2300		MAERSK
APL ORCHID	161/	MUMBAI	JEBEL ALI	30.09.04/0200		GAC
APL HONGKONG	155/	BREMERHAVI	SINGAPORE	30.09.04/0900	02.10.04/0700	GAC
MSK AVON	155/9.5	ADEN	DJIBOUTI	30.09.04/TBA		MAERSK
SAFMARINE PAKISTAN	168/10.8	PIPAVAV	PIPAVAV	30.09.04/TBA		MAERSK
RENNES	133/5.3	DURBAN	REUNION	30.09.04/TBA	02.10.04/0050	MAERSK
ARIZONA	239/12	QASIM	QASIM	30.09.04/TBA		MAERSK
QC WISDOM	147/TBA	MUSCAT	JEBEL ALI	01.10.04/0030.		GAC
ORANGE	177/8	QASIM	KARACHI	01.10.04/0300		MAERSK
APL VENEZUELA	220/TBA	SUKHNA	FUJAIRAH	01.10.04/TBA		GAC
CAPE BYRON	139.9/7.6	VICTORIA	DARESSALEN	01.10.04/TBA		MAERSK
SL. VALLE	261/11.6	MUSCAT	JEDDAH	01.10.04/TBA	01.10.04/1315	MAERSK
APL IVORY	262/TBA	SINGAPORE	JEDDAH	02.10.04/0200		GAC
GRAS MAERSK	292/13.5	SUEZ	JEBEL ALI	02.10.04/TBA	02.10.04/1013	GAC
MSK VILNUS	175/10.9	COLOMBO	COLOMBO	02.10.04/TBA	02.10.04/1530	MAERSK
SALLY MAERSK	347/14.5	JEDDAH	KELANG	02.10.04/PM	02.10.04/1013	MAERSK
MSK GEORGIA	292/13.5	MUMBAI	SUEZ	02.10.04/PM	03.10.04/1430	MAERSK
SAFMARINE ANTWERP	304/14	PELEPAS	SUEZ	03.10.04/PM		MAERSK
ABERDEEN	155/9	COLOMBO	MADRAS	04.10./18:30		MAERSK
MSK VALPARAISO	194/11	JEBEL ALI	DURBAN	04.10.04/2130		MAERSK
MSK KOLKOTTA	304/13.8	JEDDAH	PELEPUS	05.10.04/0700		MAERSK
MAERSK VERONA	157/10.6	MOMBASA	M0MBASA	05.10.04/1000		MAERSK
MARCHEN MSK	294/13.5	MUMBAI	SUEZ	06.10.04/2300		MAERSK
MSK MISSOURI	292/13.5	JEDDAH	JEBEL ALI	06.10.04/2300		MAERSK
APL PUSAN	208/9.5	SUKHUNA	ADEN	06.10.04/0200		GAC
CLIPPER	156.7/8.5	MUMBAI	JEBEL ALI	06.10.04/0945		GAC
MSK ATLANTIC	155/9.5	ADEN	DJIBOUTI	07.10.04/2100		MAERSK
MSK ARIZONA	239/12	QASIM	QASIM	07.10.04/TBA		MAERSK
QC WISDOM	138/9.5	MUSCAT	JEBEL ALI	08.10.04/0100		GAC
APL INDIA	277.3/12	BREMERHAVI	SINGAPORE	08.10.04/0900		GAC
APL PEARL	275.2/11	SINGAPORE	JEBEL ALI	08.10.10/2100		GAC
PERFORMANCE	289/11.6	MUSCAT	JEDDAH	08.10.04/TBA		MAERSK
FAB SCHULTE	168/8	COLOMBO	PIPAVE	08.10.04/TBA		MAERSK
APL SHANGHAI	220.5/11.6	SINGAPORE	JEDDAH	08.10.04/TBA		GAC
ORANGE	177/8	QASIM	KARACHI	09.10.04/1000		MAERSK
SAFMARINE PAKISTAN	168/10.8	PIPAVAV	COLOMBO	09.10.04/1600		MAERSK
MSK ANTWERP	155/9.5	COLOMBO	MADRAS	09.10.04/1930		MAERSK
CAPE SPEAR	157.5/8.5	HODEIDAH	ADEN	09.10.04/2300		GAC
SL. WASHINGTON	303.8/14	SUEZ	JEBEL ALI	10.10.04/TBA		MAERSK
SVEND MAERSK	347/13	JEDDAH	KELANG	11.10.04/0300		MAERSK
MAERSK MALACCA	294/12	MUMBAI	SUEZ	11.10.04/0600		MAERSK
SEALAND MICHIGAN	304/12.7	JEDDAH	PELEPUS	11.10.04/1900		MAERSK
MAERSK ITAJAI	194/10	JEBEL ALI	DURBAN	11.10.04/2130		MAERSK
NORDSTAR	184/10	MOMBASA	MOMBASA	12.10.04/1000		MAERSK
MAERSK TRIESTE	270/13	MUMBAI	SUEZ	13.10.04/2300		MAERSK
MAERSK CAROLINA	292/12	JEDDAH	JEBEL ALI	13.10.04/2300		MAERSK
APL ORCHID	161/10	MUMBAI	JEBEL ALI	14.10.04/0300		GAC
MSK AVON	155/7	ADEN	DJIBOUTI	14.10.04/2300		MAERSK
MSK ARIZONA	239/10	QASIM	QASIM	14.10.04/2300		MAERSK
SAFMARINE COTONOU	182/9	MOMBASA	DARESSALEN	15.10.04/0800	12delayed	MAERSK
APL DENMARK	277.3/12	BREMERHAVI	SINGAPORE	15.10.04/0700	15.10.04/0720	GAC
APL IVORY	260/11.5	SCKNA	FUJAIRAH	15.10.04/1200		GAC
SAFMARINE COMITTMENT	289/11.5	MUSKAT	JEDDAH	15.10.04/1400	15.10.04/1310	MAERSK
MAERSK VILNIUS	174/10.2	COLOMBO	PIPAV	15.10.04/1700		MAERSK
QC WISDOM	138/9.5	MUSCAT	JEBEL ALI	15.10.04/2300		GAC
ORANGE	177/8	QASIM	KARACHI	16.10.04/1000	23.10.04/1455	MAERSK
MARSK DUNDEE	292/12	JEDDAH	PELEPAS	16.10.04/1000		MAERSK
FAB SCHULTE	168/11	COLOMBO	PIPAVE	16.10.04/1600		MAERSK
GIBSON	198.8/10	SHARJAH	SINGAPORE	17.10.04/0300		GAC
SEALAND NEWYORK	304/13	JEDDAH	PELEPAS	17.1004/1900		MAERSK
CARSTEN MAERSK	347/13	JEDDAH	KELANG	18.10.04/0300		MAERSK
MAERSK MISSOURI	292/12	MUMBAI	SUEZ	18.10.04/0600	18.10.04/0135	MAERSK
SEALAND ILLINOIS	304/12	JEDDAH	PELEPAS	18.10.04/1900		MAERSK
ORION	178/11	JEBEL ALI	DURBAN	18.10.04/2130		MAERSK
VERONA	157/10	MOMBASA	MOMBASA	19.10.04/0800		MAERSK
NORDSKY		JEBEL ALI	REUNION	19.10.04/1000		MAERSK
PHEONIX	157/8	VICTORIA	TBA	19.10.04/1100		MAERSK
RINKENS	167.2/9	SUEZ	DARESSALEN	19.10.04/1100		MAERSK
APL TULIP	161.9/9.7	MUMBAI	JEBEL ALI	19.10.04/2100		GAC
MSK DUISBURG	292/12	MUMBAI	SUEZ	20.10.04/1600		GAC
CMACGM VERDI	277.4/13.5	KELANG	SUEZ	20.10.04/1200		ALFAYHA
ABERDEEN	155/10	COLOMBO	MADRAS	21.10.04/1500		MAERSK
CONSTELATION	182.3/10	TBA	DARESSALEN	21.10.04/1000		MAERSK
CAPE SPEAR	157.5/8.5	HODEIDAH	DJIBOUTI	21.10.04/0500		GAC
SHANGHAI	220/11	SUKHNA	FUJAILAH	22.10.04/0800		GAC
MSK ARIZONA	239/11	QASIM	QASIM	21.10.04/2200		MAERSK
APL GERMANY	280/13	BREMERHAVI	SINGAPORE	22.10.04/0800		GAC
SEALAND ATLANTIC	289.5/10.5	MUSKAT	JEDDAH	22.10.04/1400		MAERSK
MAERSK DUBLIN	292/12	JEDDAH	JEBEL ALI	22.10.04/2300	20DELAYED	MAERSK
SAFMARINE PAKISTAN	168/8.5	COLOMBO	PIPAVAV	22.10.04/1700		MAERSK
APL IRIS	272/11.2	SIGAPORE	ZEBRUGGE	22.10.04/1800		GAC
QC WISDOM	138/8.5	MUSKAT	JEBEL ALI	23.10.04/0600	23.10.04/1355	GAC
MSK KALAMATA	304/11.7	PELEPAS	SUEZ	24.10.04/0030	24.10.04/1140	MAERSK
MSK ATLANTIC	155/8	ADEN	HODEIDAH	24.10.04/1300	21DELAYED	MAERSK
SAFMARINE AMAZON		JEBEL ALI	DURBAN	24.10.04/1100		MAERSK

AIIIT 2 Salalah Container Vessel Berthed

Berth No.	Arrived date	Vessel Name	L/D	Last port	Next port	Schedule
2	08.08.04/S0940	SEALAND COM	289/12	MUSKAT	JEDDAH	MAERSK
1	08.08.04/1825	MSK ATLANTIC	155/9.5	COCHIN	JEDDAH	MAERSK
2	08.08.04/1055	QC WISDOM	147/76.8	DJIBOUTI	JEBEL ALI	GAC
3	08.08.04/S1230	MAERSK RENN	133/6	DURBAN	REUNION	MAERSK
3	08.08.04/1410	MSK KOLKATA	304/14	JEDDAH	PORT KELAN	MAERSK
4	08.08.04/S1455	APL VENEZUEL	220/9.8	SUKHNA	FUJAIRAH	GAC
1	09.08.04/1606	Greenwich MSK	292/13.5	MUNBAI	SUEZ	MAERSK
4	09.08.04/0035	SAF. ANTWERP	304/11	PELEPAS	SUEZ	MAERSK
1	12.08.04/0755	SEALAND MICH	304/13	JEDDAH	PELEPAS	MAERSK
2	12.08.04/1515	FABIAN SCHUL	168/10	DJIBOUTI	MADRAS	MAERSK
3	12.08.04/1825	MSK ANTWERP	155/9.2	PIPAVE	PIPAVE	MAERSK
4	13.08.04/0722	APL INDIA	277/13.25	BREMERHAVI	SINGAPORE	GAC
1	13.08.04/1815	MAERSK ARIZC	239/10.1	PORT QASIM	PORT QASIM	MAERSK
2	14.08.04/0700	SEALAND ATLA	289.5/12	MUSCAT	JEDDAH	MAERSK
4	14.08.04/1120	KHALEE EXPRE	158/9.2	MUSCAT	TUTICORIN	MERIDIAN
4	14.08.04/0945	APL PUSAN	208/10.4	SINGAPORE	JEDDAH	GAC
4	15.08.04/0050	MSK VERONA	184/10	MOMBASA	MOMBASA	MAERSK
2	15.08.04/S0535	MSK ATLANTIC	155/7.5	JEDDAH	TBA	MAERSK
1	15.08.04/0635	MSK ARIZONA	240/11.5	PORT QASIM	PORT QASIM	MAERSK
	15.08.04/0940	SAF HIMALAYA	304/13	PEREPAS	SUEZ	MAERSK
	15.08.04/1040	ORION	178/8	PORT ELIZAB	JEBELALI	MAERSK
30/4(6DAYS	15.08.04/1225	SAF COTONOU	182/8	MOMBASA	DARESALEM	MAERSK
	16.08.04/1135	MAERSK GEOR	292/12	MUMBAI	SUEZ	MAERSK
	16.08.04/0352	TIGER OCEAN	120/4.25	MUMBAI	JUBELALI	GAC
	18.08.04/0050	MSK VENISPILS	175/11	COLOMBO	DURBAN	MAERSK
	18.08.04/1848	QC WISDOM	138/7	MUSCAT	JEBEL ALI	GAC
	19.08.04/0200	CAPE SPEAR	157/8.5	HODEDAH	ADEN	GAC
2	19.08.04/S0100	SEALAND ILLINOIS				MAERSK
1	19.08.04/S1120	NORD BEACH	156/8.11	DUBAI	REUNION	MAERSK
3	19.08.04/S1315	AUCANIA	195.6/11	MUMBAI	SUEZ	MAERSK
	19.08.04/1235	APL DENMARK	277.3/13.2	BREMERHAVI	SINGAPORE	GAC
3	19.08.04/2230	MSK VERONA	184/10	MOMBASA	MOMBASA	MAERSK
2	20.08.04/0705	MAERSK MISOU	292/11	JEDDAH	JEBEL ALI	MAERSK
1	20.08.04/0945	APL VENEZUEL	220/9.8	AIN SUKHNA	FUJAIRAH	GAC
2	21.08.04/0235	MARE IBERICUI	179.6/9.45	MUSCAT	KARACHI	MAERSK
3	21.08.04/0600	MSK ABERDEEI	155/9.5	MADRAS	ADEN	MAERSK
4	21.08.04/0830	SEALAND QUAI	290/11	MASCAT	JEDDAH	MAERSK
1	21.08.04/1540	APL PEARL	275/13.25	SINGAPORE	ZEEBURGGE	GAC
2	21.08.04/2114	COLOMBO	119.32/6	TBA	TBA	KANOO
1	21.08.04/0804	APL JEDDAH	207.4/11.2	SINGAPORE	JEDDAH	GAC
	22.08.04/0230	SAF PAKISTAN	168/9	PORT QASIM	KARACHI	MAERSK
	22.08.04/0940	PHOENIX	157/7.6	PORT LOUIS	REUNION	MAERSK
	22.08.04/1400	SEALAND NEW	304/13	PELEPASS	SUEZ	MAERSK
1	22.08.04/2230	SUSAN MAERS	347/13	JEDDAH	KELANG	MAERSK
2	22.08.04/2230	MSK ATLANTIC	155/7.5	JEDDAH	ADEN	MAERSK
3	23.08.04/1315	NORDSTAR	184/7.5	MOMBASA	MOMBASA	MAERSK
4	24.08.04/1245	MARSK DUNDE	292/13.5	JEDDAH	PELEPAS	MAERSK
	25.08.04/0845	MAERSK ANTW	155/8	COLOMBO	MADRAS	MAERSK
1	25.08.04/0625	MAERSK MALA	294/12	MUMBAI	SUEZ	MAERSK
2	25.08.04/0730	MSK ARIZONA	240/11.5	PORT QASIM	PORT QASIM	MAERSK
4	26.08.04/S1750	MAERSK TOLEI	270/11	MUMBAI	SUEZ	MAERSK
	26.08.04/1345	ORANJE	177.6/11	DURBAN	KOCHIN	MAERSK
3	27.08.04/S0240	MAERSK CARO	292/12	JEDDAH	JUBEL ALI	MAERSK
1	27.08.04/S1610	NORDSUN	156.7/8	DURBAN	REUNION	MAERSK
	27.08.04/0705	APL GERMANY	280/13.25	BREMERHAVI	SINGAPORE	GAC
1	27.08.04/1115	APL PUSAN	208/9.5	SUKHUNA	FUJAIRAH	MAERSK
1	27.08.04/1830	CAPE BYRON	140/8.5	VICTORIA	DARESALEM	MAERSK
2	28.08.04/0225	FABIAN SCHUL	168/10	COLOMBO	COLOMBO	MAERSK
30	28.08.04/0735	LIDAN	88.2/5.4	MUKALIAH	MUKALIAH	SSMS
	28.08.04/2204	MARSK VINUS	175/11	COLOMBO	PIPAVE	MAERSK
1	29.08.04/s1250	MAERSK DARW	294/11	SUEZ	JUBELALI	MAERSK
1	29.08.04/1900	SINE MAERSK	347/11.5	JEDDAH	PORT KELAN	MAERSK
4	29.08.04/2300	MSK MISSOURI	290/12	MUMBAI	SUEZ	MAERSK
3	30.08.04/0655	MAERSK KALAI	304/12	COLOMBO	SUEZ	MAERSK
1	01.09.04/1950	MAERSK TRIES	270/12.5	MUMBAI	SUEZ	MAERSK
	02.09.04/0920	MSK ARIZONA	240/11.5	PORT QASIM	PORT QASIM	MAERSK
	02.09.04/1040	QC WISDOM	138.3/TBA	MUSKAT	JUBEL ALI	GAC
1	02.09.04/1830	TIGER OCEAN	120.6/6	MUMBAI	JEBEL ALI	GAC
2	02.09.04/S0230	MSK ATLANTIC		DJIBOUTI	DJIBOUTI	MAERSK
2	03.09.04/0120	APL JEDDAH	107.4/11	SUKHNA	FUJAIRAH	GAC
1	03.09.04/0400	MAERSK RENN	133/6	DURBAN	REUNION	MAERSK
3	03.09.04/0855	MAERSK DUBLI	292/12.5	JEDDAH	JEBEL ALI	MAERSK
4	03.09.04/1445	SEALAND PERF	290/11	MUSKAT	JEDDAH	MAERSK
2	04.09.04/0250	APL IRELAND	265.7/11	BREMERHAVI	SINGAPORE	GAC
3	04.09.04/0845	APL IRIS	272/13.25	SINGAPORE	ZEEBRUGGE	GAC
1	04.09.04/0945	CAPE SPEAR	157/TBA	HODEIDAH	ADEN	GAC
3	04.09.04/1650	ENGIADINA	222/12	SINGAPORE	JEDDAH	FAYHA
4	04.09.04/1400	MARIT MAERSK	294/12	SUEZ	JEBEL ALI	MAERSK
	05.09.04/0010	MAERSK PITSB	196/11	JEBEL ALI	TUTICOLIN	MAERSK
	05.09.04/0420	ORANGE	177.6/10.5	QASIM	KARACHI	MAERSK
	05.09.04/0610	MAERSK AVON	155/8	ADEN	HODEIDAH	MAERSK
4	06.09.04/0035	MAERSK KOLK	304/13	PEREPAS	SUEZ	MAERSK
2	07.09.04/0060	COLOMBINE M	347/13.5	JEDDAH	PORT KELAN	MAERSK
1	07.09.04/1100	MAERSK CARO	292/12	MUMBAI	SUEZ	MAERSK
	07.09.04/1645	MAERSK ABERI	155/8	MADRAS	MADRAS	MAERSK
	07.09.04/0205	SAFMARIN ANT	304/13	JEDDAH	PELEPAS	MAERSK
31	08.09.04/2000	MAERSK VERO	184/9	MOMBASA	MOMBASA	MAERSK
3	09.09.04/1430	MSK ARIZONA	240/11.5	PORT QASIM	PORT QASIM	MAERSK
4	09.09.04/0835	SAFMARINE PA	168/9.2	PIPAVE	COCHIN	MAERSK
1	10.09.04/S2105	APL SPAIN		BREMERHAEI	SINGAPORE	GAC
4	10.09.04/2335	NORDSTAR	184/7.5	MOMBASA	MOMBASA	MAERSK
3	11.09.04/S0920	QC WISDOM	138.3/TBA	MUSKAT	JUBEL ALI	GAC
2	11.09.04/S1050	FABIAN SCHUL	168/10	COLOMBO	COLOMBO	MAERSK
1	11.09.04/S1110	APL CHILE		SINGAPORE	JEDDAH	GAC
3	11.09.04/2150	SAFMARINE CC	182/7.5	MOMBASA	DARESALEM	MAERSK

Berth No.	Arrived date	Vessel Name	L/D	Last port	Next port	Schedule
1	12.09.04/0340	CAPE SPEAR	157/8.5	HODEDAH	ADEN	MAERSK
1	14.09.04/S053	SEALAND MIC	304/13	PEREPAS	SUEZ	MAERSK
3	14.09.04/S045	SOFIE MAERS	347/13	JEDDAH	KELANG	MAERSK
1	14.09.04/0700	SAFMARINE I	304/13	JEDDAH	PELEPAS	MAERSK
3	14.09.04/0740	MAERSK DUB	292/12	MUMBAI	SUEZ	MAERSK
2	14.09.04/1045	MAERSK AVO	155/8	ADEN	JIBOUCHI	MAERSK
3	14.09.04/0945	PLUTO	194/10	JEBEL ALI	DURBAN	MAERSK
	17.09.04/0530	MAERSK ARIZ	239/10	QASIM	QASIM	MAERSK
1	17.09.04/0805	ENGIADINA	222/12	AINSKHNA	FUJAIRAH	MAERSK
2	17.09.04/1040	SEALAND ATI	304/13	MUSKAT	JEDDAH	MAERSK
4	18.09.04/0700	QC WISDOM	138.3/TBA	MUSKAT	JUBEL ALI	GAC
2	19.09.04/1000	MAERSK VILN	175/11	PIPAVE	PIPAVE	MAERSK
2	19.09.04/2300	MAERSK VIRC	292/12	MUMBAI	SUEZ	MAERSK
4	20.09.04/0100	SIRIUS	178/8.9	JEBEL ALI	DURBAN	MAERSK
1	20.09.04/0425	SOVEREIGN I	347/13	JEDDAH	KELANG	MAERSK
3	23.09.04/1535	MAERSK ATL	155/8	DIBOUTI	DIBOUTI	MAERSK
1	23.09.04/1410	APL AGATE	275/12.7	BREMERHAVI	SINGAPORE	GAC
2	23.09.04/0330	MSK TOKYO	270/11	MUMBAI	SUEZ	MAERSK
3	23.09.04/0830	MSK GEORGI	292/12	JEDDAH	JEBEL ALI	MAERSK
2	24.09.04/0700	QC WISDOM	138.3/8	DJIBOUTI	JEBEL ALI	GAC
3	24.09.04/0430	MSK ARIZON	239/12	QASIM	QASIM	MAERSK
4	24.09.04/1015	QUALITY	289.5/12	MUSCAT	JEDDAH	MAERSK
2	25.09.04/1535	APL CHILE	260/12	AQABA	FUJAIRAH	GAC
3	25.09.04/1100	PHEONIX	157/8	DURBAN	REUNION	MAERSK
4	25.09.04/0905	MARCHEN M	292/12	SUEZ	JEBEL ALI	MAERSK
	26.09.04/2210	CLIFFORD M	347/13	JEDDAH	KELANG	MAERSK
1	27.09.04/S012	FAB SCHULTE	168/8	COLOMBO	PIPAVE	MAERSK
4	27.09.04/S042	MSK ANTWEF	155/7.5	COLOMBO	MADRAS	MAERSK
	27.09.04/0300	KNUD MAERS	155/7.5	COLOMBO	MADRAS	MAERSK
	27.09.04/0545	GREENWICH	292/12.5	MUMBAI	SUEZ	MAERSK
1	01.10.04/0750	CAPE BYRON	139.9/7.6	VICTORIA	DARESSALEN	MAERSK
2	01.10.04/1130	ARIZONA	239/12	QASIM	QASIM	MAERSK
3	01.10.04/0620	SAFMARINE F	168/10.8	PIPAVAV	PIPAVAV	MAERSK
4	01.10.04/1315	SL. VALLE	261/11.6	MUSCAT	JEDDAH	MAERSK
1	02.10.04/0700	APL HONGKC	155/	BREMERHAVI	SINGAPORE	GAC
1	02.10.04/0050	RENNES	133/5.3	DURBAN	REUNION	MAERSK
3	02.10.04/1530	MSK VILNUS	175/10.9	COLOMBO	COLOMBO	MAERSK
4	02.10.04/1013	GRAS MAERS	292/13.5	SUEZ	JEBEL ALI	MAERSK
1	03.10.04/1430	MSK GEORGI	292/13.5	MUMBAI	SUEZ	MAERSK
2	04.10.04/0805	SALLY MAERS	347/14.5	JEDDAH	KELANG	MAERSK
4	04.10.04/0640	CAPE SPEAR	157.5/8.5	HODEIDAH	ADEN	GAC
3	05.10.04/0820	MAERSK VER	157/10.6	MOMBASA	M0MBASA	MAERSK
4	05.10.04/0310	MSK VALPAR	194/11	JEBEL ALI	DURBAN	MAERSK
3	09.10.04/0525	SAFMARINE F	168/10.8	PIPAVAV	COLOMBO	MAERSK
1	09.10.04/1130	FAB SCHULTE	168/8	COLOMBO	PIPAV	MAERSK
4	09.10.04/0000	PERFORMAN	289/11.6	MUSCAT	JEDDAH	MAERSK
4	11.10.04/S032	NORDBEACH				MAERSK
3	11.10.04/0135	SVEND MAER	347/13	JEDDAH	KELANG	MAERSK
4	11.10.04/1045	MAERSK MAL	294/12	MUMBAI	SUEZ	MAERSK
1	11.10.04/S171	SAFMARINE I	304/13	JEDDAH	PELEPAS	MAERSK
1	15.10.04/0720	APL DENMAR	277.3/12	BREMERHAVI	SINGAPORE	MAERSK
2	15.10.04/0250	MSK ARIZON	239/10	QASIM	QASIM	GAC
3	15.10.04/1405	MAERSK VILN	174/10.2	COLOMBO	PIPAV	MAERSK
4	15.10.04/1310	SAFMARINE (	289/11.5	MUSKAT	JEDDAH	MAERSK
1	18.1004/1145	TIGER OCEAI	120.8/4.2	FUJAIRAH	JEDDAH	GAC
2	18.10.04/1400	VERONA	157/10	MOMBASA	MOMBASA	MAERSK
3	18.10.04/0420	CARSTEN MA	347/12.2	JEDDAH	KELANG	MAERSK
4	18.10.04/0135	MAERSK MIS	292/12.1	MUMBAI	SUEZ	MAERSK
1	21.10.04/1140	RINKENS	167.2/9	SUEZ	DARESSALEN	MAERSK
2	21.10.04/1230	CAPE SPEAR	157.5/8.5	HODEIDAH	DJIBOUTI	
	22.10.04/1355	SAFMARINE F	168/8.5	COLOMBO	PIPAVAV	MAERSK
	23.10.04/1355	QC WISDOM	138/8.5	MUSKAT	JEBEL ALI	GAC
	23.10.04/1455	ORANGE	177/8	QASIM	KARACHI	MAERSK
1	24.10.04/1525	MSK ATLANTI	155/8	ADEN	HODEIDAH	MAERSK
4	24.10.04/1140	MSK KALAMA	304/11.7	PELEPAS	SUEZ	MAERSK

Number of vessels called Salalah according to the regions of their O/D

	Number of call to & from	India	Main route	Africa	Gulf
Total call	126	38	42	23	23
Percent	100	30	33	18	18

Number of vessels by their aggents/Operators

	Maersk/Seal	APL/GAC	Others
Number	96	24	4
Percentage	77	19	3

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