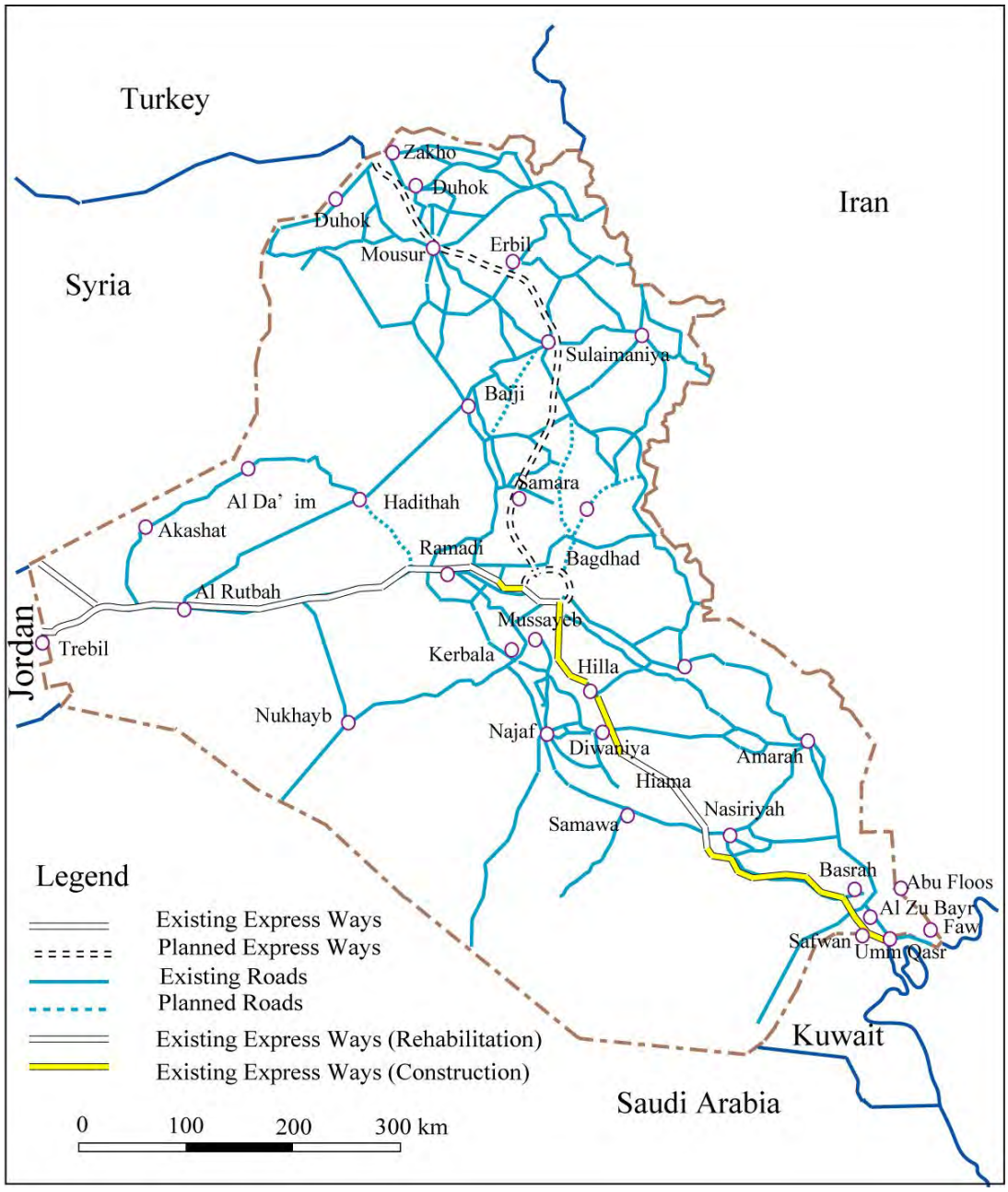
CHAPTER 5

Chapter 5. Long-term Development/Administration Plan for Main Ports and Waterways

5.1 Long-term Development Plan Connecting Main Ports with Hinterland

Figure 5.1-1 shows the existing road network and a part of the road development plan from 2013 to 2017 in Iraq.



Source: Prepared by JICA Study Team based on "Iraq Infrastructure Project Conference 2013"

Figure 5.1-1 Existing Road Network and Development Plan from 2013 to 2017 in Iraq

5.1.1 Review of Existing Road Development Plans

(1) Iraqi Transport Master Plan

The Iraqi Transport Master Plan (ITMP) was produced in 2005 by the Italian Consortium of Iraq (C.I.I.T.I.), in the context of supporting the reconstruction of Iraq, as a joint venture between the Iraqi and Italian Governments, with the aim to identify a plan of infrastructure investments and maintenance operations for road, railway, airport, maritime and fluvial and intermodal facilities.

The long-term development plan of roads mentioned in the above is shown in Table 5.1-1.

Table 5.1-1 Long-term Development Plan of Roads

Year 2010	Year 2015	Year 2020	Year 2035
➢ Rehabilitation of existing roads ➢ Expressway No.1 & FTP (Hilla, Daura-Yousifiya) ➢ National safety and road traffic signs (design) ➢ Road cadastre project	➢ Construction of No.2 ring roads ➢ Construction of No. 4 city diversion ➢ Construction of No. 11 bridge ➢ National safety and road traffic signs (works)	➢ Construction of Baghdad freeway ring road ➢ Construction of Expressway No. 2 ➢ Local improvements of second carriageway	➢ Construction of No. 16 ring road or city diversion ➢ Construction of new connecting road

Source: Prepared by JICA Study Team based on "Iraqi Transport Master Plan (ITMP)"

(2) Iraq Infrastructure Project Conference 2013

The Iraq Infrastructure and Construction Summit 2013 was held in May 2013 in Dubai, with provision of a high-profile platform for analysis and discussion of topics ranging from the latest plans and projects based on airport, railway, road, power, urban development, housing, construction and other major investments. Table 5.1.2 shows road development plans which were highlighted in the conference.

It is noted that Iraq has three main transport corridors: North-South from Turkey; South-North through its port of Um Qasr and East-West through its neighbors' ports on the Mediterranean and Gulf of Aqaba. Other corridors link Iraq with Iran in the East and Saudi Arabia in the South-West. Oil exports pass through oil-only ports such as Basrah. Iraq's transport corridors are inefficient because of institutional weaknesses and infrastructure deficiencies. The traffic along the South-Centre Iraq and East-West Corridors is being served by Expressway No.1 that carries between 15,000 and 30,000 annual average daily traffic units, 40 percent of which is trade traffic. The traffic along the North-South is being served by the road between Ibrahim El-Khalil and Duhok. There are about 3,000 heavy trucks entering Iraq daily from Turkey through Ibrahim El-Khalil border crossing and these trucks currently use the mountain's two-lane, windy and dangerous road through Zakho to reach Duhok and the rest of Iraq.

Table 5.1-2 Road Development Plans highlighted at the Iraq Infrastructure Project Conference 2013

Whole Project	➢ Completion of highways (maintenance/new establishment) 800 km for New and 1,200 km for Maintenance ➢ Development of main roads currently implemented 4,510 km for New and 1,600 km for Maintenance ➢ Maintenance 30 % of the network ➢ Five hundred (500) of bridges ➢ Seven thousand (7,000) km of new roads 800 km for Expressway No.2 and 4,510 km for main roads
Projects for the years 2013-2017	➢ Doura-Yousifiya expressway/Baghdad: 15 km ➢ Rehabilitation of Expressway No. 1 Baghdad-Hilla (R4): 105 km Hila-Diwania (R5): 86 km Abo Ghraib Expressway: 23 km Nasiria-Basrah (R7&R8): 250 km ➢ Expressway No. 2 Baghdad-Samarra: 90 km ➢ Phase 2 on Haji road /Al Najaf: 50 km ➢ Primary roads: 200 km ➢ Rehabilitation: 800 km ➢ Griaat bridge (cable stay bridge) ➢ Hilla bridge in Babylon ➢ Darajy bridge (Samarra) ➢ Replace 9 small bridges in Dewaniya

Source: Prepared by JICA Study Team based on "Iraq Infrastructure Project Conference 2013"

A part of the road development plan from 2013 to 2017 (development projects on Expressway No.1 and No.2) in the above table is shown in Figure 5.1-1.

(3) Transport Corridors Project by the World Bank

The World Bank (WB) is supporting Iraq through the ongoing "Emergency Road Rehabilitation Project (ERRP) and "Transport Corridors Project (TCP)". The objective of ERRP is to improve the condition of the roads by rehabilitating highly damaged segments of the country's highway and rural road network, re-establishing critical river crossings and restoring the capacity to manage and maintain roads. Ultimately, this will contribute to the country's economic and social recovery, and economic development.

The Transport Corridor Project will provide continuity of support with an explicit focus on capacity building of the road agencies and securing immediate gains from investment in road infrastructure. According to the WB's program of support to the road sector in Iraq, the ERRP is financing the rehabilitation of some of the highly damaged Sections of Iraq's highway network and restoring several critical river crossings. The TCP will further finance the safeguarding and development of the road network with a focus on Iraq's main international and regional transport corridor arteries; Expressway No.1 and the North-South transport corridor, that connect its population living in about ten governorates with each other and between the governorates and the major Iraq international gateways. The investments in the road infrastructure will have a major focus on improving road safety, with crash barriers along the median and shoulder of the highway, which should significantly reduce fatal head-on and run-off the road crashes. The two major investments of TCP are part of two international corridors, connecting Iraq to its western, northern and southern neighbours and beyond.

Funding schedule for the Transport Corridor Project is shown in Table 5.1-3.

Table 5.1-3 Funding Schedule for the Transport Corridors Project

Section	Length (km)	Budget (million US$)	Financing Source
(Expressway No.1)			
R4/R5/R6	105/78/145	237	Government of Iraq
R7/R8	145/112	265	IB*
R10/R12	128/130	218	IB (Phase 1)
R9/R11/R13	124/137/76	260	IB (Phase 2)
Subtotal	1,180	980	
(North-South Road Corridor)			
No.1 Semel-Batil	15	28	KRG**
No.2 Batil-Girsheen	8	62	KRG
No.3 Girsheen-Suhaila	23		IB (US$58.5 million)
Intersection		87	KRG (US$28.5 million)
No. 4 Suhaila-Ibrahim Al Khalil	14	29	KRG
Subtotal	60	206	
Grand Total	1,240	1,186	

Note: *International bank (IB)
**Kurdistan Regional Government (KRG)
Source: Prepared by Study Team based on the appraisal document "Transport Corridors Project" by WB

The Iraq Transport Corridors Program will be financed by the Government of Iraq (GoI) and the international bank (IB). This Program is estimated to cost about U$1.2 billion and will be implemented over a period of six years. The Program covers about 1,240 km of roads, and involves both new construction and rehabilitation. The TCP will support part of this Program including 257 km of road rehabilitation and 23 km of new construction, and provide technical assistance to build and strengthen institutional capacity, while at the same time providing a platform to further the dialogue on regional integration. The TCP will be financed through an IB loan of U$355 million and KRG contribution of U$30 million. The remainder of the Program will be financed by IB.

5.1.2 Road Development Plan from Ports to the Hinterland

(1) Road Network to Hinterland

As mentioned in Section 5.1.1, the following schemes on the road network to the hinterland are being performed/planned:

Table 5.1-4 Road Development Plans to Hinterland

Project	Performed/Planed by	Execution Period
Expressway No.1 (maintenance: 1,200 km)	NDP 2013-2017 Transport Corridors Project (TCP)	Year 2013-2017
Expressway No.2 (construction: 800 km)	NDP 2013-2017 (Part)	Year 2013-2017
Roads (construction: 4,510 km & maintenance: 1,600 km)	NDP 2013-2017 (Part)	Year 2013-2017
Bridges (construction: 97 & maintenance: 20)	NDP 2013-2017 (Part)	Year 2013-2017
Weight Stations (construction: 75)	NDP 2013-2017 (Part)	Year 2013-2017

Source: JICA Study Team

Besides the above, construction of secondary corridors for single arterial and main highways, transverse roads between governorates, and ring roads which help reduce traffic jams within cities and limit traffic penetration in urban centers, has been planned in the long-term development scheme.

(2) Ports to Existing Expressway

The development concept of the Iraq port system, which was presented in the JCC meeting on the interim report (1), is shown in Table 5.1.5.

Table 5.1-5 Development Concept of the Iraq Port System

Year	A	B	C
UQP is overflowed sometimes between 2022-2027.			
2015	Minimum investment on UQP/KZP	Limited Development on UQP/KZP to ensure enough capacity until AFGP will start operation	Stage 1 Development on UQP/KZP
2020	Al Faw Grand Port Development (Stage 1)		Stage 2 Development on UQP/KZP
2025	Al Faw Grand Port Development (Phase 2)	Mother/feeder ship operation for AFGP and feeder ship operation for UQP/KZP	Stage 3 Development on UQP/KZP
2030			
2035	Full Development on Al Faw Grand Port	Full Development on Al Faw Grand Port	Full Development on UQP/KZP

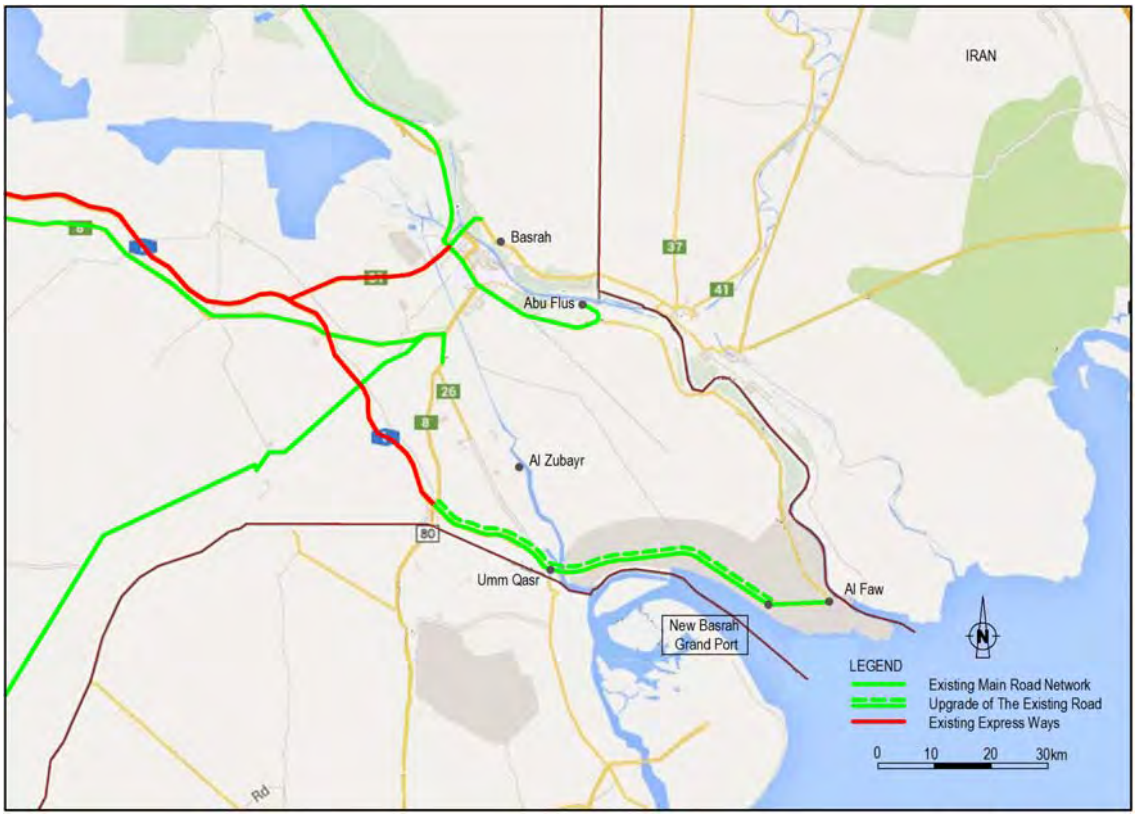
Source: JICA Study Team

It is noted that the land connections (roads and/or railways) from ports to the hinterland should be strengthened as port development will be accelerated.

Each concept foreseen, based on the feasibility study report by the C.I.I.T.I:

- Concept A: Land connections should be strengthened. The existing road between the new port and the existing expressway to Baghdad, about 90 km long will be provided by two lanes per direction, 3.75 m wide emergency lane, and geometrical characteristics adapted for a design speed of 110 km/h.
- Concept B: The characteristics (pavement, safety) of the existing double lane road connections should be improved, from the Umm Qasr port to the existing expressway to Baghdad, to allow the additional (heavy, commercial) traffic induced by the strengthening of the port until the new port will open. After that the new road should be constructed between the new port and Umm Qasr port.
- Concept C: The characteristics (pavement, safety) of the existing double lane road connections should be improved, from the Umm Qasr port to the existing expressway to Baghdad, to allow the additional (heavy, commercial) traffic induced by the strengthening of the port.

Figure 5.1.1 shows the development plan of roads from ports to the existing highway. According to the "Port Master Plan Report" by C.I.I.T.I, the Al Faw Grand Port (AFGP) will be connected to the existing road network by a dedicated road. The newly proposed road linking AFGP with the existing road network will be designed entirely of new track, through the desert and the flood area with difficult water-soil conditions. The road connection is defined by the assumption that the roads have to cut the flood area in the shortest possible distance, due to very bad geological and hydro geological conditions prevailing in the area, and the threat of damage caused by movements of the bay waters.



Source: Prepared by JICA Study Team based on the Data of Presentation materials in the Seminar "Iraq Infrastructure 2013", GCPI

Figure 5.1-2 Development Plan of Roads from Ports to the Existing Highway

5.1.3 Problems and Challenges of Road Development

According to the appraisal document for Transport Corridors Project by the World Bank, the following issues are pointed out for the road development in the sector:

- The poor state of the road network in Iraq brings a cost increase of trade and commerce caused by a disturbance of the international/domestic movement of goods and services. It is estimated that 60 % of the 48,000 km of expressways, primary and secondary roads in Iraq are in poor condition.
- Iraq has one of the highest road accident fatality rates in the world which means poor road safety performance.
- A deficiency of funding is a key issue in the road sector of Iraq. Therefore, support for financing is needed for investments in road infrastructure.
- The Ministry of Construction and Housing (MOCH) has two agencies; the State Commission for Roads and Bridges in Baghdad and the General Directorate for Roads and Bridges, which are responsible for road infrastructure construction, maintenance and rehabilitation. These agencies have a lack of human resources to manage the road network effectively.
- Weak contracting and consulting industries in the road sector bring poor quality of road construction and project implementation. The absence of international contractors / consultants, due to security problems, is one of the big reasons for poor performance in the sector.

Apart from the above issues, one of the most important issues from a technical point of view is the construction method to use for road crossings of a river (Khor Al Zubayr Channel). In general, the following methods will be considered: (1) a bored tunnel beneath the water being crossed, (2) an immersed tube tunnel and (3) a bridge. Of these methods an immersed tube tunnel

should be recommended. An immersed tube is a kind of underwater tunnel composed of segments, constructed elsewhere and floated to the tunnel site to be sunk into place and linked together. Immersed tubes are often used in conjunction with other types of tunnel at their ends, such as a cut and cover or bored tunnel, which is usually necessary to continue the tunnel from near the water edge to the entrance at the land surface.

The main advantage of an immersed tube is that they can be considerably more cost effective than other methods, i.e. a bored tunnel or a bridge.

(Advantages)

- Speed of construction
- Minimal disruption to a shipping route in the river
- Safety of construction because of work in a dry dock
- Flexibility of profile

(Disadvantages)

- Immersed tube tunnels are often partly exposed on the river, risking a sunken ship/anchor strike
- Direct contact with water necessitates careful waterproofing design around the joints
- The segmental approach requires careful design of the connections

5.2 Development Outline of Main Ports and Waterways

5.2.1 Preliminary Development Plans of Main Ports

(1) Concept of long-term development plans

As the development concepts are considered for the development of the existing ports, in preparation of the long-term development plan, it is important to ensure the cargo handling capacity of ports to cope with the increasing cargo volumes, and to avoid over-investment by keeping a balance between the investments on the existing ports and AFGP.

Three development concepts are taken into considerations to select the best alternative.

Concept A: The minimum investment

The investment is limited to the maintenance and repair of the existing port facilities to sustain the existing capacity. The concept allows those cargoes overflowed form Iraqi ports to be imported via ports in nearby countries such as Kuwait, Jordan, Syria and others until AFGP starts operation.

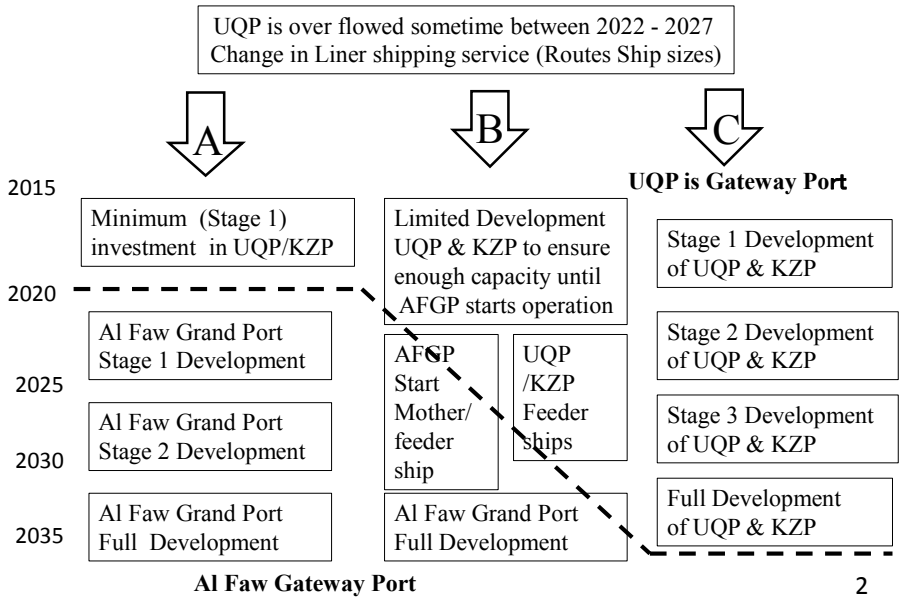
Concept B: The capacity of the existing ports is strengthened while AFGP is constructed

Until AFGP starts operation, the investment on the existing ports is also done to increase their capacity to cope with the increasing cargo traffic demand. AFGP will be developed in stages to complement the shortage of the capacity of the existing ports.

Concept C: the capacity of the existing ports should be expanded as much as possible

All the unused water lines within the basin of UQP are developed to wharves and the capacity should be maximized by installing heavy equipment. This concept will ease the tight schedule of the AFGP development project. It also reduces the amount of annual investment for AFGP, access roads and railways

These three concepts can be figuratively illustrated as shown in Figure 5.2.1. Attempt of Concept A is to open AFGP as soon as possible, and Concept C is intended to delay the opening of AFGP as much as possible Concept B is an intermediate of Plan A and Plan C, and is intended to develop AFGP in accordance with the moderate construction schedule, while the capacity of UQP is also expanded up to the extent that private operators have proposed to GCPI.



Source: JICA Study Team

Figure 5.2-1 Alternative concepts of long-term development of Iraqi ports

Table 5.2-1 Comparison of advantages and disadvantages of the alternative development

Alternative concept	Advantage	Disadvantage
1) The minimum investment	Investment can be concentrated on AFGP to open the port as soon as possible. Redundancy of the investments can be avoided.	A shortage of the capacity of the existing ports would occur if the opening of AFGP is delayed and overflowed container cargoes have to be transported via ports of adjacent foreign countries. Additional land transportation costs are required for longer hauling distance. Large size container ships cannot dock at Iraqi ports until AFGP starts operation.
2) Both the capacity strengthening of UQP and the development of AFGP are implemented simultaneously	It is attractive for private operators to invest in the capacity strengthening for the scale of investment is moderate. The investment by the private sector can be effectively utilized even after the opening of AFGP. Staged expansion of the capacity of the existing ports is possible in accordance with the increase of cargo volumes. The timing of the opening of AFGP is adjustable to the demand of deep water container terminals for Panamax and Post Panamax size container ships.	Investments on the existing ports and on AFGP should be done simultaneously. The schedule of the development of the existing and the new port should be carefully balanced.

3) Maximize the capacities of the existing ports	This concept is the most attractive for private operators because they are able to elaborate their business plan over the long period of time to ensure the profit in return to their investment: the stages investment is possible for the private operators in accordance with the growth of cargo volumes instead of large amount of investment at a time. The annual public investment amount can be optimized by providing longer construction period for AFGP project and the investment can be well balanced over transport sub-sectors: ports, roads, and railways.	It is difficult to expect that the private sector invest large scale investment required for the capacity expansion of the existing ports and therefore public investment is also needed to encourage the private investments. Public investment is required for the deepening and widening of waterways and basins for the passage and docking of large container ship at the existing ports. There is such a risk that the investment on the existing ports and the waterways become underused after the opening of AFGP.

Source: JICA Study Team

The construction of AGP has been started and the east and the west breakwaters are about to be completed. It was announced by the Iraqi government that the first stage of AFGP Project will be completed and the port will start operation in 2018. However, it is an anxiety of those who are concerned with the port and shipping businesses that the AFGP project will fail to be completed because of the huge amount of investment needed, not only on the port itself but also on access roads and railways to the port.

Therefore, due to the uncertainty of the implementation plan of AFGP, and the magnitudes of the risk, the three development concepts are evaluated and compared for selection of the most appropriate concept.

(2) Risks and Opportunities

RISK:
A risk that is contained in the development concept of the whole Iraqi port system and that the shortage of the port capacity would obstruct the trade of Iraq.

OPPORTUNTY:
Opportunities that would be brought by the investment.

The risks and opportunities have been evaluated as shown in Table 5.2-2 and Table 5.2-3, respectively. It is assessed that the simultaneous development of the existing ports and AFGP, i.e., Concept B, is the most appropriate, because the risks are intermediate and the opportunity of encouraging private sector investment is larger than the other concepts.

Table 5.2-2 Magnitude of the risk of port capacity shortage

Development Concept	Risks		
	Delay of Opening of AFGP	Shortage of private investment amount	Over investment on the port facilities
1) Concept A	Large	Small	Small
2) Concept B	Intermediate	Intermediate	intermediate
3) Concept C	Small	Large	Large

Source: JICA Study Team

Table 5.2-3 Magnitude of the opportunities brought by the investments

Development Concept	Opportunities		
	Attraction for port cargoes	Promotion of employment larger ships	Encouragement of private investment
1) Concept A	Small	Large	Small
2) Concept B	Intermediate	Intermediate	Large
3) Concept C	Large	Small	Intermediate

Source: JICA Study Team

(3) The assumptions employed in the preparation of long-term development plans

The following assumptions have been employed in the process of elaborating the Long-term Development Plan of the Iraqi port system:

1) Utilization of berths in UQP and KZP

a) UQP South Port: Berth No. 1 will be used by the Navy in the coming decades

b) UQP South Port: GCPI will develop Berths No. 2 through No. 8 as an integrated terminal that handles dry cargoes, including dry bulk and container cargoes in accordance with investment proposals by private operators.

c) UQP South Port: Berths No. 10 and 11will be remain as a dry bulk terminal operated by MOI.

d) UQP North Port: Berth No. 21 through 24 will be jointly developed by a private operator and GCPI for the handling of container and general cargoes, including cargoes brought in RoRo vessels.

e) UQP North Port: Berths No. 25 through 27 will be developed jointly by a private operator and GCPI as a container terminal.

f) KZP: The private operators that are currently operating respective berths will continue their businesses under current concession contract.

g) KZP: Zones where liquid and dry cargoes are handled will be more strictly delineated in the long-term. Berth No. 4 and the south area of it will be used for liquid bulk cargoes, while Berth No. 5 and the northern area of it will be used for dry cargo handling.

2) Movements of private operators

a) UQP: Gulftainer will keep operating ICT

b) KZP: Mar-log will operate Berths No. 6, 7 and 8 at KZP for the handling of general and container cargoes in accordance with renewed concession contract.

c) KZP: Berths No. 9 and 10 will be used by a private company for dry bulk operation for the export of iron ore under the concession contract.

d) KZP: It was agreed by GCPI and MOO that Berth No. 1 through No. 4 will be used for liquid bulk.

3) New berth construction and revision of the use of the existing berths

a) UQP South Port: Berth No. 9, which is currently used for the mooring of a power plant barge. When the power plant barge is no longer necessary, it will be removed.

b) KZP: Berth No. 11 owned by the NAVY and currently used for the mooring of a power barge will be returned to the NAVY when the power plant barge is no longer needed.

c) Status of berth utilization in the coming years

d) Taking into consideration the assumptions described above, it is assumed that berth

utilization of UQP and KZP will be expected as shown in Table 5.2-4.

(4) Status of berth utilization in the coming years

Taking into consideration the assumptions described above, it is assumed that berth utilization of UQP and KZP will be expected as shown in Table 5.2-4.

Table 5.2-4 Status of berth utilization at UQP and KZP (current and in 2035)

UQP			2014						2035				
Berth No.	Structure	Length (m)	Commodity	Operator	Container	Dry Bulk	Gen. Cargo	RoRo	Commodity	Container	Dry Bulk	Gen. Cargo	RoRo
South													
1	Wharf		Navy						Navy				
2	Wharf	200	Dry Bulk			1			Dry Bulk		1		
3	Wharf	200	Wheat			1			Wheat		1		
4	Wharf	200	Container		1				Container	1			
5	Wharf	250	Container		1				Container	1			
6	Wharf	213	Container		1				Container	1			
7	Wharf	213	Container		1				Container	1			
8	Wharf	213	Container		1				Container	1			
9	Pier		Power Berge						Power Berg				
10	Pier	385	Dry Bulk	MOT		1			Dry Bulk		1		
11	Wharf	190	Dry Bulk	MOI		1			Dry Bulk		1		
ICT	Wharf	375	Container	Gulf tainer	1				Container	1			
North													
12	Wharf	200	General Cargo				1		General Cargo			1	
13	Wharf	200	General Cargo				1		General Cargo			1	
14	Wharf	200	General Cargo				1		General Cargo			1	
15	Wharf	200	General Cargo				1		General Cargo			1	
16	Wharf	200	General Cargo				1		General Cargo			1	
17	Wharf	200	General Cargo				1		General Cargo			1	
18	Wharf	200	General Cargo				1		General Cargo			1	
19	Wharf	200	General				1		General			1	
20	Wharf	250	Container	GCPI	1			1	Container	1			
21	Wharf	200		GCPI									
22	Wharf	200		Alloreen					G. Cargo/RoRo			1	
23	Wharf	200		Alloreen					G. Cargo/RoRo				
24	Wharf	200		Alloreen					Container	1			
25	Wharf	200		ICTSI					Container	1			
26	Wharf	200		ICTSI					Container	1			
27	Wharf	200		ICTSI					Container				
			Total Berths		7	4	8	1	Total Berths	10	4	9	0

KZP			2014						2025/2035				
Berth No.	Structure	Length (m)			Container	Dry Bulk	GC	Liquid		Container	Dry Bulk	GC	Liquid
1	Pier		Oil						Oil	MOO			1
	New berth	250							Oil	GCPI			
	New berth	87											1
2	Pier	180	Oil			1			Oil	MOO			1
3	Pier	180	Oil			1			Oil	MOO			1
4	Pier	180	Oil			1			Oil	MOO			1
Service	Pier	200	Work Vessels										
5	Pier	365	General Cargo	GCPI			1		General Cargo	GCPI		1	
6	Pier	365	General Cargo	Marlog			1		General Cargo	Marlog		1	
7	Pier	260	General Cargo	Marlog			1		General Cargo	Marlog		1	
8	Pier	250	General Cargo	Marlog				1	General Cargo	Marlog		1	
9	Wharf	250	Dry Bulk	MOO		1			Dry Bulk		1		
10	Wharf	300	Dry Bulk	MOO		1		1	Dry Bulk		1		
11	Pier		Power Barge						General Cargo			1	
12	Pier								General Cargo			1	
13	Pier								Navy				
			Total number of berths		0	5	3	2	Total Berths	0	2	6	5
Source: JICA Study Team			UQP+KZP Total		7	9	11	3	UQP+KZP	10	6	15	5

On the basis of berth utilization at the two port shown in Table 5.2-4, the numbers of berths at UQP and KZP in 2035 available for container, dry bulk, general, and liquid bulk cargoes are estimated as shown in Table 5.2-5.

Table 5.2-5 Available number of berths for Long-term Development Plans

Unit: berth

Name of Port	Type of cargo			
	Containers	Dry Bulk	Geneeral Cargo	Liquid Bulk
UQP	10	4	9	0
KZP	0	2	6	5
UQP／KZP合計	10	6	15	5
Abu Flus	2	0	1	0
Al Maqil	2	0	11	0

Source: JICA Study Team

(5) Required scales of port facilities

1) Container berths

a) Demand forecast of container cargoes

The container cargo traffic demand is presented in Section 4.3. The port statistics of GCPI show that containers were handled at UQP, KZP and Abu Flus Port up to 2013. A private container terminal was opened at Al Maqil Port in 2013, and in 2014 it is expected that containers will also be handled at Al Maqil Port.

Thus, in the coming years, it is foreseen that container cargoes are handled at all the four existing ports. The shares of container volume handled among UQP, KZP and Abu Fuls port have been approximately 89%, 1% and 10%, respectively, in the past years. Of course the share will keep changing in the coming years, but for planning purposes it is assumed that the share among the three ports will remain unchanged over the coming decades, and that Abu Flus and Al Maqil Ports will supplement each other to handle 10% of the total container cargo volume. Thus, the container cargo volumes are estimated as shown in Table 5.2-6. Incidentally, the container cargo volumes allotted to UQP in 2025 and 2035 include the container cargo volumes that may be handled at AFGP.

Table 5.2-6 Forecast of container cargo volumes handled at the existing ports

Unit: 1,000 TEU

	Share	2012	2015			2025			2035		
			Low	Middle	High	Low	Middle	High	Low	Middle	High
Demand	100%	589	866	966	1,070	2,090	2,908	3,928	3,106	4,718	6,942
UQP (AFGP)	89%	524	771	860	952	1,860	2,588	3,496	2,764	4,199	6,178
KZP	1%	6	9	10	11	21	29	39	31	47	69
Abu Flus/Al Maquil	10%	59	87	97	107	209	291	393	311	472	694

Source: JICA Study Team

b) Selection of types of container handling equipment at the wharves and the alternative plans for the development of UQP

It has been assessed that the capacity of UQP is about 1.0 million TEU with no capacity expansion measures. To cope with the increase in container cargo traffic, GCPI has been working jointly with private companies to expand container handling capacity at UQP, in particular Berths No. 2 through No. 8, and Berths No. 22 through 27. The development plans are about to be implemented and, therefore, it is assumed that these plans will be realized in a few years. The berth utilization presented in Table 5.2-4 was prepared based on the assumption that these GCPI-Private sector joint development plans will be implemented as proposed.

The capacity of container terminals is limited not only by the productivity in ship-shore operation, but also by the capacity of container yards. Regarding the total capacity of the Iraqi Port system, including existing and AFGP in the long-term development plans described hereunder, it is assumed that the container yards are large enough so that no restriction will occur due to the capacity of the container yards.

As discussed in Section 3.8.1, the container handling productivity at the berths is different depending on the type of cranes: Mobile crane, Quay gantry crane or ship gears. While mobile cranes may be operated on the existing wharf with minor repairs, quay gantry cranes require full repair or reconstruction of the wharves to strengthen the wharf structure to support the heavy equipment.

In addition, it is easier for mobile cranes than quay gantry cranes to relocate from UQP to AFGP when the latter is opened.

Therefore, it seems to be reasonable to assume that, when gantry cranes are introduced for the capacity expansion at the proposed berths in UQP, these upgraded container berths will keep operating even after the start of operation of AFGP.

The capacity expansion plan of GCPI relies on private investment under concession contracts. The introduction of quay gantry cranes require larger amounts of investment by private companies, and, therefore, the concession period should be long enough, probably not shorter than 25 years, for the operator to recover its investment.

Thus, there are two options of the capacity expansion of the container terminals of UQP:

i) Option 1 (Gantry crane installation)

At UQP Berth No 4 through No. 8, and Berths No. 25 through No. 27 will be developed to permanent container terminals and two units of quay gantry cranes will be installed at each berth to maximize the capacity of these berths. In addition two units of mobile cranes will be installed at Berth No. 23 and No. 24.

ii) Option 2 (Mobile crane installation)

At UQP, Berth No. 4 through No. 8 will be equipped with mobile cranes (2 units per berth), for ship-wharf operation, after minor repair work to the existing wharf structure. A new container terminal will be constructed at Berth No. 23 and No. 24 with 2 units of mobile cranes.

For both options, ICT and Berth No. 20 will remain as container terminals.

c) The productivity of container berths

The capacity of a container berth varies depending on the type of equipment. The annual container volumes handled at a berth are shown in Table 5.2-7 for three types of equipment. These capacities are based on the analysis described in Section 4.7.2.

Table 5.2-7 Annual capacity of container handling per berth by type of equipment

Equipment	Unit	Capacity (1,000TEU/Year)
Ship Gear	2	88
Mobile Crane	2 3	177 265
Gantry Crane	2 3	260 390
ICT No. 20 & 21 Gantry Crane Mobile Crane	 2 2	 310

Source: JICA Study Team

d) The capacity of the existing four ports and berth requirement at AFGP

The result of the berth capacity estimation at each port is shown in Table 5.2-8.

Table 5.2-8 Estimate of berth capacity at each port

Unit: 1,000 TEU

Port/Berth	2025						2035					
	Low		Middle		High		Low		Middle		High	
	Opt.1	Opt.2	Opt.1	Opt.2	Opt.1	Opt.2	Opt.1	Opt.2	Opt.1	Opt.2	Opt.1	Opt.2
UQP												
No. 2												
No. 3												
No. 4	260	177	260	177	260	177	260		260		260	
No. 5	260	177	260	177	260	177	260		260		260	
No. 6	260	177	260	177	260	177	260		260		260	
No. 7	260	177	260	177	260	177	260		260		260	
No. 8	260	177	260	177	260	177	260		260		260	
ICT	310	310	310	310	310	310	310	310	310	310	310	310
No. 12*		177		177		177	177					
No. 13*		88				177						
No. 14												
No. 20/21	208	208	310	208	310	208	310	208	310	208	310	208
No. 22/23/24		177	177	177	177	177	177	177	177	177	177	
No.25/26/27**			260		260		260		260		260	
			260		260		260		260		260	
Sub Total	1,818	1845	2,617	1757	2,617	1,934	2,794	695	2,617	695	2,617	518
Al Faw	**0**	**0**	**0**	**800**	**1,200**	**1,600**	**0**	**2,000**	**1,600**	**3,600**	**4,000**	**5,600**
Grand Total	1,818	1,845	2,617	2,557	3,817	3,534	2,794	2,695	4,217	4,295	6,617	6,118

KZP (Ship G.)*	80	80	80	80	80	80	80	80	80	80	80	80
Abu Flus												
No. 3	88	88	177	177	177	177	88	88	260	260	260	260
No. 2	88	88		88	88	88	88	88	88	88	260	260
Al Maqil												
No. 12	88	88	88	88	88	88	88	88	88	88	88	88
No. 13			88		88	88	88	88	88	88	88	88
KZP,Abu Flus Maqil Total	344	344	433	433	521	521	432	432	604	604	776	776
Grand Total	2,162	2,189	3,050	2,990	4,338	4,055	3,226	3,127	4,821	4,899	7,393	6,894
Demand	2,090		2,908		3,928		3,106		4,718		6,942	

* Handled at General Cargo Berth

Source: JICA Study Team

It is observed in Table 5.2-9 that capacity expansion plan Option 1 provides enough capacity to handle all the estimated volumes of containers in 2025 without opening AFGP, for the case of Low and Middle economic growth scenarios, while Option 2 requires AFGP to have a container terminal with a capacity of 800,000 TEU in 2025 for the case of middle growth scenario. It should be noted that, when Option 2 is chosen for the middle growth scenario, the container cargo volume will exceed the expanded capacity of the existing port, which is estimated to be 1,632,000 TEU, in 2020 and, thus, AFGP should be operational earlier than 2025.

For the case of high growth scenario, AFGP is required to have a capacity of 1.2 million to 1.6 million TEU's.

As explained in Section 3.8.1, the capacity of container berths at UQP is limited by the capacity of the yards since containers remain in the container yards for about 15 days on average. For the purpose of planning, it is assumed that average dwell time at UQP should be shortened to 10 days, and that AFGP yard space is large enough. The required number of berths is estimated as shown in Table 5.2-9.

Table 5.2-9 Required number of container berths at AFGP and UQP

Port	2025						2035					
	Low		Middle		High		Low		Middle		High	
	Opt.1	Opt.2	Opt.1	Opt.2	Opt.1	Opt.2	Opt.1	Opt.2	Opt.1	Opt.2	Opt.1	Opt.2
Al Faw 350 m Berth	0	0	0	2	3	4	0	5	4	9	10	14
UQP Container Berths	10	9	10	8	10	8	10	3	10	3	10	2

Source: JICA Study Team

2) Conventional cargoes

a) Allotment of commodities and volumes to the existing ports

In accordance with the roles and functions of the existing ports discussed in Section 4.6.1 and the trend of the commodity share observed in the statistics of the four ports, the share among the ports is assumed as shown in Table 5.2-10.

It should be noted that sugar is handled at UQP only, but is imported in the forms of dry bulk and general cargo, i.e., bagged cargo. The volumes of respective types are assumed to be the same. Likewise, cement is imported at KZP and Al Maqil Port and cement unloaded at KZP is dry bulk while that unloaded at Al Maqil Port is general cargo, i.e., bagged cargo and the volumes handled at the two ports are equal, as observed in 2013.

Table 5.2-10 Allotment of commodities and volume share among the four existing ports

Unit: %

Commodity/Port	UQP	KZP	Abu Flus	Al Maqil
Containers	90	0	10	0
Grain (Wheat)	100	0	0	0
Rice	100	0	0	0
Sugar (Dry Bulk) Sugar (Bagged Cargo)	50 50	0	0	0
Cement	0	50	0	50
Steel & Piles	50	50	0	0
Dates	0	100	0	0
Other Conventional	75	5	5	15

Source: JICA Study Team

b) Cargo handling productivity

The criteria of cargo handling productivity has been prepared for various commodities on the basis of the average and the maximum productivity observed at the existing ports in 2013 and those achieved in Aqaba port. The cargo handling productivity has been determined as listed in Table 5.2-11 for the purpose of berth allocation in 2025 and 2035. It is expected that the productivity of cargo handling will be improved by introducing appropriate cargo handling equipment.

Table 5.2-11 Cargo handling productivities (handling volumes per day per berth)

Unit：ton/day/Berth

Commodity	2012 (Actual)		Plan	
	Average	Max	2025	2035
Wheat	4,725	8,500	8,000	8,000
Rice	3,124	5,250	4,000	4,000
Sugar(Bulk)	1,918	3,333	4,000	4,000
Sugar(GC)	1,918	3,333	2,000	2,000
Cement(KZP)	734	1,429	3,000	5,000
Cement (Al Maqil)	569	1,173	700	1,500
Steel Plate/Pipe	3,557	4,088	3,000	5,000
General Cargo(UQP)	827	4,852	1,500	2,000
General Cargo(Al Maqil)	384	843	800	800
Dates	107	222	700	700
Vehicle(Units/day)	3,225	3,225	4,000	4,000
Fuel Oil(Import)	2,000	3,400	4,000	4,000
Fuel Oil(Export)	2,000	3,400	8,000	8,000

Source: JICA Study Team

c) Size of ship

Taking into account the sizes of ships that are currently calling on Iraqi ports and that are deployed in the Arabian Gulf, ship design sizes are chosen for respective commodities in 2025, 2035 and later years. Table 5.2-12 shows the estimated sizes of ships calling on UQP and KZP. It is expected that the sizes of container ships tend to become larger even in feeder shipping routes in the Arabian Gulf. It is likely that Panamax size container ships will be calling on Iraqi ports. In order to accept Panamax size container ships at UQP, the waterways as well as basins should be deepened. Thus, to avoid the redundancy of investment, large container ships having DWT of 50,000 tons or larger will be accepted at AFGP only in accordance with the Development Concept B.

Table 5.2-12 Design ships

Ship Type	DWT (Max.)	Load/Ship (ton or TEU)	Length (m)	Beam (m)	Ful-load Draft (m) ref	Calling port		
						2025	2035	2035 -
(UQP)								
1. Container	41,771	3,000 TEU	199	32.2	12	UQP/Al Faw		
Panamax Containership	52,000	4,000 TEU	274	32.3	12.7	na	Al Faw	
Post Panamx	60,000	4,700 TEU	294	35.9	13.4	na		
2. General Cargo	40,000	40,000	198	30.7	11.5	UQP		
3. RO/RO(Car Carrier)	40,000	8,000 Units	208	32.3	9.7	UQP		
Pure Car Carrier	19,000	6,000 Units	158	24.4	7.9	UQP		
4. PCTV	30,000					UQP		
5. Bulk Carrier(Wheat)	82,769	75,000	229	32.0	14	na		Al Faw
Panamax Bulker	70,000	70,000	233	32.3	13.8	na	Al Faw	
Handysize Bulkers	45,000	45,000	205	31.2	11.9	UQP		
(KZP)								
1. Tanker	83,651	80,000	228	32.2	14	na		Al Faw
LPG Tanker 25,000 DWT	25,000	25,000	192	29.4	11.5	KZP		
LPG Tanker 50,000 DWT	50,000	50,000	204	34.0	12.0	na	Al Faw	
2. General Cargo	30,000	30,000	182	28.3	10.5	KZP		

Source: JICA Study Team

d) Estimation of Required port facilities

i) Calculation of annual operation days required for each commodity

Annual cargo volumes estimated in 2025 and 2035 of each commodity are converted to the total days required for handling the commodity by dividing the former by the handling productivity of the commodity, which is given in the column of "Plan" in Table 5.2-10. Table 5.2-13 shows the days to be spent for the handling of each commodity.

Table 5.2-13 Days required for handling each commodity

Cargo Type	Commodity	2012	Estimated volume (1,000 t)			Cargo ton/ship	Total work days required (Days)			
			2015	2025	2035		2012	2015	2025	2035
Bulk	Wheat	2,644	2,244	1,152	1,707	50,000	560	475	144	213
GC	Rice (Baged cargo)	1,093	1,211	1,416	1,531	33,000	350	388	354	383
Bulk	Sugar	495	516	753	1,033	12,500	258	269	188	258
GC	Sugar	247	257	376	516	10,000	129	134	188	258
Bulk	Cement(KZP)	794	550	900	1,300	8,000	1,082	749	300	260
GC	Cement (Al Maqil)	794	550	900	1,300	1,500	1,395	967	1,286	867
GC	Steel/Pipe	734	550	840	1,080	8,000	206	155	280	216
GC	Others(UQP,KZP)	738	702	758	1,012	3,000	892	849	505	506
GC	Others(Ab Flus, Al Maqil)	184	176	189	253	800	480	457	237	316
GC	Dates	83	106	0	0	800	776	991	0	0
Vehicle	Vehicle(1000 Units)	70	93	570	686	4,000	22	29	143	172
Liquid	Fuel Oil(Import)	2,732	4,510	0	0	20,000	1,366	2,255	0.0	0.0
Liquid	Fuel Oil(Export)	366	600	7,820	7,050	20,000	183	300	978	881

Source: JICA Study Team

ii) Calculation of number of berths required for each commodity by port

It is assumed that total working days are 363 taking into consideration two holidays. i.e. New Year's Day and another holiday, and that days when ships can be moored at wharves are 65% of the total working days. After deducting the time needed for docking at and leaving berths and suspension of cargo operation due to the weather and delays of work for other reasons leaves 236 days.

The required number of berths is calculated dividing the required days shown in Table 5.2-13 for the handling of respective commodities by 236 days, which is the total workable days of a berth. The results are given in Table 5.2-14.

Table 5.2-14 Calculation of required berth number of by commodity

Cargo Type	Commodity	Berths Required		2025					2035				
		2025	2035	UQP	KZP	Abu Flus	Al Maqil	Total	UQP	KZP	Abu Flus	Al Maqil	Total
Bulk	Wheat	0.6	0.9	0.6				0.6	0.9				0.9
GC	Rice (Baged cargo)	1.5	1.6	1.5				1.5	1.6				1.6
Bulk	Sugar	0.8	1.1	0.8				0.8	1.1				1.1
GC	Sugar	0.8	1.1	0.8				0.8	1.1				1.1
Bulk	Cement(KZP)	1.3	1.1		1.3			1.3		1.1			1.1
GC	Cement (Al Maqil)	5.4	3.7				5.4	5.4				3.7	3.7
GC	Steel/Pipe	1.2	0.9	0.6	0.6			1.2	0.5	0.4			0.9
GC	Others(UQP,KZP)	2.1	2.1	1.1	1.0			2.1	1.1	1.0			2.1
GC	Others(Ab Flus, Al Maqil)	1.0	1.3			0.5	0.5	1.0			0.6	0.7	1.3
GC	Dates	0.0	0.0		0.0			0.0		0.0			0.0
Vehicle	Vehicle	0.6	0.7	0.6				0.6	0.7				0.7
Liquid	Fuel Oil(Import)	0.0	0.0		0.0			0.0		0.0			0.0
Liquid	Fuel Oil(Export)	4.1	3.7		4.1			4.1		3.7			3.7
Total number of required berths		19.5	18.4	6.0	7.0	0.5	6.0	19.5	7.0	6.3	0.6	4.4	18.4
	Dry Bulk			1.4	0.0	0.0	0.0	1.4	2.0	0.0	0.0	0.0	2.0
	General Cargo			4.0	2.9	0.5	6.0	13.3	4.3	2.6	0.6	4.4	11.9
	RoRo			0.6	0.0	0.0	0.0	0.6	0.7	0.0	0.0	0.0	0.7
	Liquid Bulok				4.1			4.1		3.7			3.7
	Dates				0.0			0.0		0.0			0.0

Source: JICA Study Team

The required numbers of berths are summed up by cargo type and by port, and compared with the number of available berths in 2025 and 2035 at each port for the respective cargo types (see Table 5.2-15). It is observed in Table 5.2-15 that the number of berths available for dry bulk and general cargoes in the existing ports is larger than the required number of berths for both dry bulk and general cargoes. Thus, it is recognized that capacity of the existing port can be enhanced to handle all the conventional dry cargoes in 2035 without additional berths, provided the cargo handling productivity is improved up to those values shown in Table 5.2-11.

Table 5.2-15 Required and available numbers of berths for dry bulk and general cargoes

Unit: Berths

Poprt	Type of Berth	2025		2035	
		Required	Available	Required	Available
UQP	Dry Bulk	1.4	4	2.0	4
	General Cargo	4.0	9	4.3	9
KZP	Dry Bulk	2.0	2*	2.0	2*
	General Cargo	2.9	5**	2.6	4***
	Liquid Bulk	4.1	4	3.7	5
Abu Flus	Dry Bulk	0.0	0	0.0	0
	General Cargo	1.0	2	0.6	2
Al Maquil	Dry Bulk	0.0	0	0.0	0
	General Cargo	5.0	5****	4.4	5****

Note: * Excluding berth for sponge iron and oil
** Include 1 berth to be constructed by Phase II of the Port Sector Rehabilitation Project
*** One general cargo berth will be converted to an oil berth
Source: JICA Study Team

Incidentally, without improvement in the productivity of unloading cargoes, in particular, cement and liquid bulk, and if the productivity observed in 2012 will remain unchanged, the number of berths shown in Table 5.2-16 will be required in 2025 and in 2035. The Table indicates that dry bulk and liquid bulk will overflow at KZP in 2035. It is also observed in the table that Al Maqil port will be overflowed by general cargoes (bagged cement), (see the figures in bold).

Table 5.2-16 Required berth number without improvement of cargo handling productivities

Unit: Berth

Port	Type of Cargo	2025		2035	
		Required	Available	Required	Available
UQP	Dry Bulk	2.7	4	3.8	4
	General Cargo	5.1	9	6.4	9
KZP	Dry Bulk	2	2*	2	2*
	General Cargo	**7.6**	**5**	**10.7**	**4**
	Liquid Bulk	**16.6**	**4**	**14.9**	**5**
Abu Flus	Dry Bulk	0	0	0	0
	General Cargo	1	2	1.4	2
Al Maquil	Dry Bulk	0	0	0	0
	General Cargo	**8.7**	**5**	**11.1**	**5**

Note: * Excluding berths for Spomge iron and oil
** Berth No. 8-12
Source: JICA Study Team

The required number of berths with the improved productivity for conventional cargoes are also calculated for the low and high growth scenarios. The results are shown in Table 5.2-17. It is seen in the Table that, for the high growth scenario, additional berths are needed in KZP for general cargoes and Liquid bulk cargoes, and that Al Maqil Port also requires additional berths for general cargoes.

Table 5.2-17 Required berth number for the cases of low and high growth scenarios (with improved productivities)

Port	Type of Berth	Low Growth Scenario				High Growth Scenerio			
		2025		2035		2025		2035	
		Required	Available	Required	Available	Required	Available	Required	Available
UQP	Dry Bulk	1.4	4	2.0	4	1.9	4	2.5	4
	General Cargo	3.6	9	3.9	9	6.6	9	5.7	9
KZP	Dry Bulk	2.0	2*	2.0	2*	2.0	2*	2.0	2*
	General Cargo	1.3	5**	1.0	4***	5.0	5**	4.9	4***
	Liquid Bulk	1.3	4	1.3	5***	**12.8**	**4**	**12.8**	**5*****
Abu Flus	Dry Bulk	0	0	0	0	0	0	0	0
	General Cargo	0.6	2	0.4	2	1.4	2	2.0	2
Al Maqil	Dry Bulk	0	0	0	0	0	0	0	0
	General Cargo	0.3	5****	0.4	5****	**12.0**	**5****	**9.5**	**5****

Note * Excluding berths for Spomge iron and oil
** Including 1 berth to be constructed by Phase II of the Port Sector Rehabilitaiton Project
*** 1 General Cargo berth will be converted to an oil berth
**** Bertn No. 8-12

Source: JICA Study Team

iii) Estimation of number of calling ships for conventional cargoes

With the assumption of the ship sizes for respective commodities as indicated in Table 5.2-12, the cargo volume brought by a ship is estimated for each commodity with an assumption that all the ships call on Iraqi ports with full load. The estimate results of calling ships for respective commodities under the Middle Growth Scenario are shown in Table 5.2-18.

The number of ships that pass Khawr Ab-Alah Waterway is the sum of the calling ships on UQP and KZP. In 2035, a total of 1,370 ships will call on UQP or KZP, and thus double 1,370, i.e., 2,740 ships will pass through Khawr Ab-Alah Waterway. The total number of ships passing through Shatle al Arab waterway including calling ships is estimated to be 2,370 (=1,183 x 2) ships.

Table 5.2-18 Number of calling ships (middle growth scenario)

Cargo Type	Commodity	2012	Estimated volume (1,000 t)			Cargo ton/ship	Ship calls			
			2015	2025	2035		2012	2015	2025	2035
Bulk	Wheat	2,644	2,244	1,152	1,707	50,000	52.9	44.9	23.0	34.1
GC	Rice (Baged cargo)	1,093	1,211	1,416	1,531	33,000	33	36.7	42.9	46.4
Bulk	Sugar	495	516	753	1,033	12,500	40	41.2	60.2	82.7
GC	Sugar	247	257	376	516	10,000	25	25.7	37.6	51.6
Bulk	Cement(KZP)	794	550	900	1,300	8,000	99	68.8	112.5	162.5
GC	Cement (Al Maqil)	794	550	900	1,300	1,500	529	366.7	600.0	866.7
GC	Steel/Pipe	734	550	840	1,080	8,000	92	68.8	105.0	135.0
GC	Others(UQP,KZP)	738	702	758	1,012	3,000	246	234.1	252.5	337.3
GC	Others(Ab Flus, Al Maqil)	184	176	189	253	800	231	219.5	236.8	316.3
GC	Dates	83	106	0	0	800	104	132.5	0.0	0.0
Vehicle	Vehicle(1000 Units)	70	93	570	686	4,000	17	23.3	142.5	171.5
Liquid	Fuel Oil(Import)	2,732	4,510	0	0	20,000	137	226	0	0
Liquid	Fuel Oil(Export)	366	600	7,820	7,050	20,000	18	30	391	353
			Tital ship calls			UQP	444	426	596	770
						KZP	315	373	572	604
						Abu Flus	58	55	59	79
						Al Maqil	702	531	778	1,104
						Ocean Going Ship	1,519	1,385	2,004	2,557
						Small ship (KZP)	104	133	0	0

Source: JICA Study Team

The number of calling ships is estimated for the cases of Low and High Growth Scenarios. The results are shown in Table 5.2-19 and Table 5.2-20, respectively.

Table 5.2-19 Number of ship calls (Low Growth Scenario)

Unit: Ship

Port	2012	2015	2025	2035
UQP	444	313	473	645
KZP	315	60	332	430
Abu Flus	58	34	37	48
Al Maqil	702	103	112	143
Ocean Going Ship	1,519	510	954	1,265
Small Ship (KZP)	246	147	159	203

Source: JICA Study Team

Table 5.2-20 Number of ship calls (High Growth Scenario)

Unit: Ship

Port	2012	2015	2025	2035
UQP	672	983	1,085	1,336
KZP	685	1,250	2,642	3,062
Abu Flus	26	33	0	0
Al Maqil	170	168	105	135
Ocean Going Ship	1,553	2,434	3,832	4,533
Small Ship (KZP)	231	309	413	505

Source: JICA Study Team

3) Required scales of port facilities

Summing up the discussions of the required berths for the container cargoes and the conventional cargoes, Table 5.2-21 through Table 5.2-24 have been prepared to explain the utilization of each berth of the existing ports.

Table 5.2-21 Berth utilization at UQP

UQP			2025						2035					
Berth No.	Structure	Length	Low		Middle		High		Low		Middle		High	
			Opt.1	Opt.2	Opt.1	Opt.2	Opt.1	Opt.2	Opt.1	Opt.2	Opt.1	Opt.2	Opt.1	Opt.2
South														
1	Wharf													
2	Wharf	200	DB	DB	DB	DB	DB	DB	DB	DB	DB	DB	DB	DB
3	Wharf	200	DB	DB	DB	DB	DB	DB	DB	DB	DB	DB	DB	DB
4	Wharf	200	**GCO2**	MCO2	**GCO2**	MCO2	**GCO2**	MCO2	**GCO2**	GC	**GCO2**	GC	**GCO2**	GC
5	Wharf	250	**GCO2**	MCO2	**GCO2**	MCO2	**GCO2**	MCO2	**GCO2**	GC	**GCO2**	GC	**GCO2**	GC
6	Wharf	213	**GCO2**	MCO2	**GCO2**	MCO2	**GCO2**	MCO2	**GCO2**	GC	**GCO2**	GC	**GCO2**	GC
7	Wharf	213	**GCO2**	MCO2	**GCO2**	MCO2	**GCO2**	MCO2	**GCO2**	GC	**GCO2**	GC	**GCO2**	GC
8	Wharf	213	**GCO2**	MCO2	**GCO2**	MCO2	**GCO2**	MCO2	**GCO2**	GC	**GCO2**	GC	**GCO2**	GC
9	Pier		Removed						Removed					
10	Pier	385	DB	DB	DB	DB	DB	DB	DB	DB	DB	DB	DB	DB
11	Wharf	190	DB	DB	DB	DB	DB	DB	DB	DB	DB	DB	DB	DB
ICT	Wharf	375	**GCO2+** MCO2	**GCO2+** MCO2	**GCO2+** MCO2	**GCO2+** MCO2	**GCO2+** MCO2	**GCO2+** MCO2	**GCO2+** MCO2	**GCO2+** MCO2	**GCO2+** MCO2	**GCO2+** MCO2	**GCO2+** MCO2	**GCO2+** MCO2
North														
12	Wharf	200	GC	MCO2	GC	MCO2	GC	MCO2	MCO2	GC	GC	GC	GC	GC
13	Wharf	200	GC	SCO	GC	GC	GC	MCO2	GC	GC	GC	GC	GC	GC
14	Wharf	200	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC
15	Wharf	200	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC
16	Wharf	200	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC
17	Wharf	200	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC
18	Wharf	200	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC
19	Wharf	200	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC
20/21	Wharf	300	**GCO2**	**GCO2**	**GCO2+** MCO2	**GCO2**	**GCO2+** MCO2	**GCO2**	**GCO2+** MCO2	**GCO2**	**GCO2+** MCO2	**GCO2**	**GCO2+** MCO2	**GCO2**
22/23/24	Wharf	350	GC*	GC*	GC*	GC*	GC*	GC*	GC*	GC*	GC*	GC*	GC*	GC*
	Wharf	200	GC	MCO2	MCO2	MCO2	MCO2	MCO2	MCO2	MCO2	MCO2	MCO2	MCO2	GC
25/26/27	Wharf	250			**GCO2**		**GCO2**				GCO2		GCO2	
	Wharf	250			**GCO2**		**GCO2**				GCO2		GCO2	
Al Faw 350 m Berth			**0**	**0**	**0**	**2**	**3**	**4**	**0**	**5**	**4**	**9**	**10**	**14**
UQP Container Berths			10	8	10	8	10	8	8	3	10	3	9	2
UQP Dry Bulk Berth			4	4	4	4	4	4	4		4	4	4	4
UQP GCerl cargo Berth			9	8	9	7	9	7	9		9	9	9	9

Container Berth	SCO:	No Crane , Ship Gears
	MCO2:	With 2 Units of Mobile Crane
	GCO2:	With 2 Units of Gantry Crane
	GCO2:	With 2 Units of Gantry Crane + 2 Units of Mobile Crane
	GCO2+MCO2:	With 2 Ganyrt Crane and 2 Mobile Cranes
Dry Bulk Berth		DB
GCeral Cargo Berth		GC
Include RoRo Berth		GC*

Source: JICA Study Team

Table 5.2-22 Berth utilization of KZP

KZP				2025			2035		
Berth No.	Structure	Length (m)	2014	Low	Middle	High	Low	Middle	High
					Op.1b	Op. 1	MC	Op.1b	Op. 1
1	Pier			LB	LB	LB	LB	LB	LB
	New berth	250		GC	GC	GC	LB	LB	LB
	New berth	87							
2	Pier	180	DB	LB	LB	LB	LB	LB	LB
3	Pier	180	DB	LB	LB	LB	LB	LB	LB
4	Pier	180	DB	LB	LB	LB	LB	LB	LB
	Pier			Service Berth					
5	Pier	370	GC	GC	GC	GC	GC	GC	GC
6	Pier	370		GC	GC	GC	GC	GC	GC
7	Wharf	250	GC	GC	GC	GC	GC	GC	GC
8	Wharf	250	GC	GC	GC	GC	GC	GC	GC
9	Wharf	560	LB	DB	DB	DB	DB	DB	DB
10	Pier		DB	DB	DB	DB	DB	DB	DB
11	Pier							GC	GC
12	Pier							GC	GC
13	Pier						Navy	Navy	Navy
CO:	Container Berths			0	0	0	0	0	0
DB:	Dry Bulk Berth			2	2	2	2	2	2
GC:	GCerl cargo Berth			5	5	5	4	6	6
LB:	Liquid Bulk Berth			4	4	4	5	5	5

Source: JICA Study Team

Table 5.2-23 Berth utilization Abu Flus Port

Abu Flus			2014	2025				2035				
Berth No.	Structure	Length		Low	Middle		High	Low	Middel		High	
No. 1	Wharf		GC	GC	GC	GC	GC	GC	GC	GC	GC	GC
No.2	Wharf		GC	SCO	GC	GC	SCO	SCO	SCO	SCO	**GCO2**	**GCO2**
No.3	Wharf		SCO	SCO	MCO2	MCO2	MCO2	SCO	**GCO2**	**GCO2**	**GCO2**	**GCO2**
	Container Berths		1	2	1	1	2	2	2	2	2	2
	General cargo Berth		2	1	2	2	1	1	1	1	1	1

SCO: Containeer berth without Crane (Ship Gear)

MCO2: Container Berth with 2 units of Mobile Crane

Source: JICA Study Team

Table 5.2-24 Berth utilization of Al Maqil Port

Al Maqil			2025/2035	Al Maqil			2025/2035
Berth No.	Structure	Length	Low/Middle/High	Berth No.	Structure	Length	Low/Middle/High
No. 1				No. 8	Wharf		GC
No. 2	Wharf		GC	No. 9	Wharf		GC
No. 3	Wharf		GC	No. 10	Wharf		GC
No. 4	Wharf		GC	No. 11	Wharf		GC
No. 5	Wharf		GC	No. 12	Wharf		GC
No. 6	Wharf		GC	No. 13	Wharf		CO
No. 7	Wharf		GC	No. 14	Wharf		CO
				Container Berths			2
				GCerl cargo Berths			11

Source: JICA Study Team

(6) Preliminary facility Layout for Long-term Development Plan

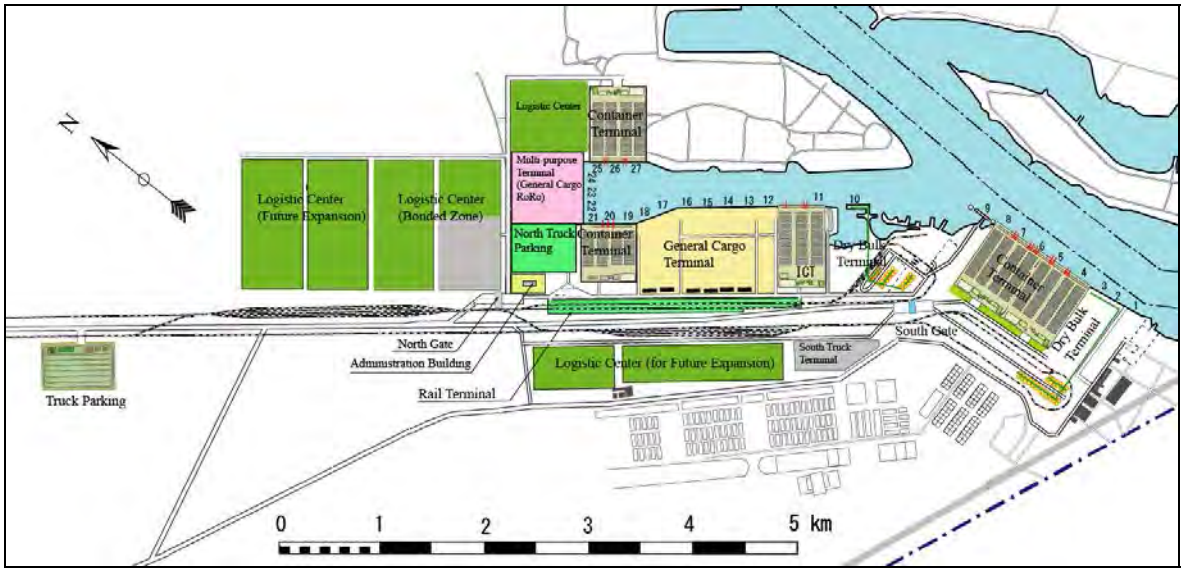
On the basis of the berth utilization indicated in Table 5.2-21 through Table 5.2-24. Preliminary facility layout plans have been prepared for each port.

1) Preliminary facility layout of the Long-term development plan of UQP

The facility layout for the long-term development plan of UQP has been elaborated on the basis of the capacity enhancement measures that GCPI plans to implement jointly at South and North Ports, with private operators under concession contracts such as container wharves and RoRo wharves. In the course of the preparation, emphasis was given to the following items from the view point of ensuring yard space and smooth traffic flow within the port area:

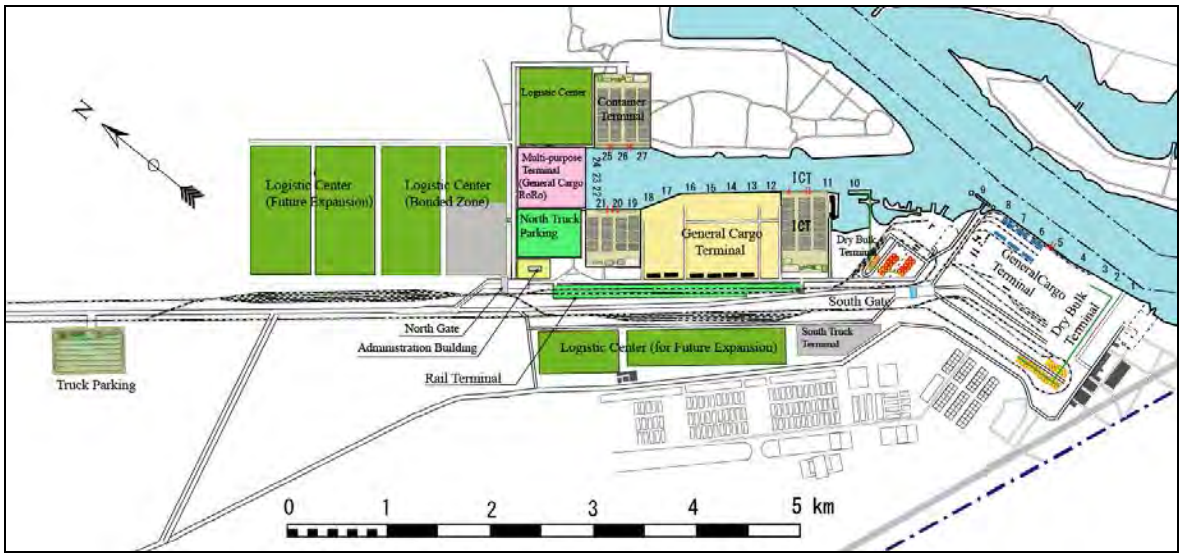
- Separation of traffic between South and North Ports,
- Construction of road network within the port area for smooth traffic flow: one-way operation on aprons of the general cargo wharves for instance,
- Rearrangement of railway network in the port area,
- Removal of underused sheds on the general cargo wharves,
- Relocation of administration building to outside the port restricted area to reduce traffic volume within the port area,
- Construction of truck parking area within and outside of port area to avoid parking along the roads,
- Go-around alignment of rail tracks to facilitate train operation and to reduce the suspension of road traffic flow due to train marshalling operations,
- Provision of land areas for logistic centres for the reduction of dwell time within the on-dock storage yards and to facilitate cargo handling operation at the wharves.

The preliminary facility layout plans are drawn for the Long-term Development Plan and the Alternative Plan in Figure 5.2-2 and Figure 5.2-3, respectively.



Source: JICA Study Team

Figure 5.2-2 Preliminary layout plan of Long-term Development Plan of UQP



Source: JICA Study Team

Figure 5.2-3 Preliminary facility layout of Alternative Plan

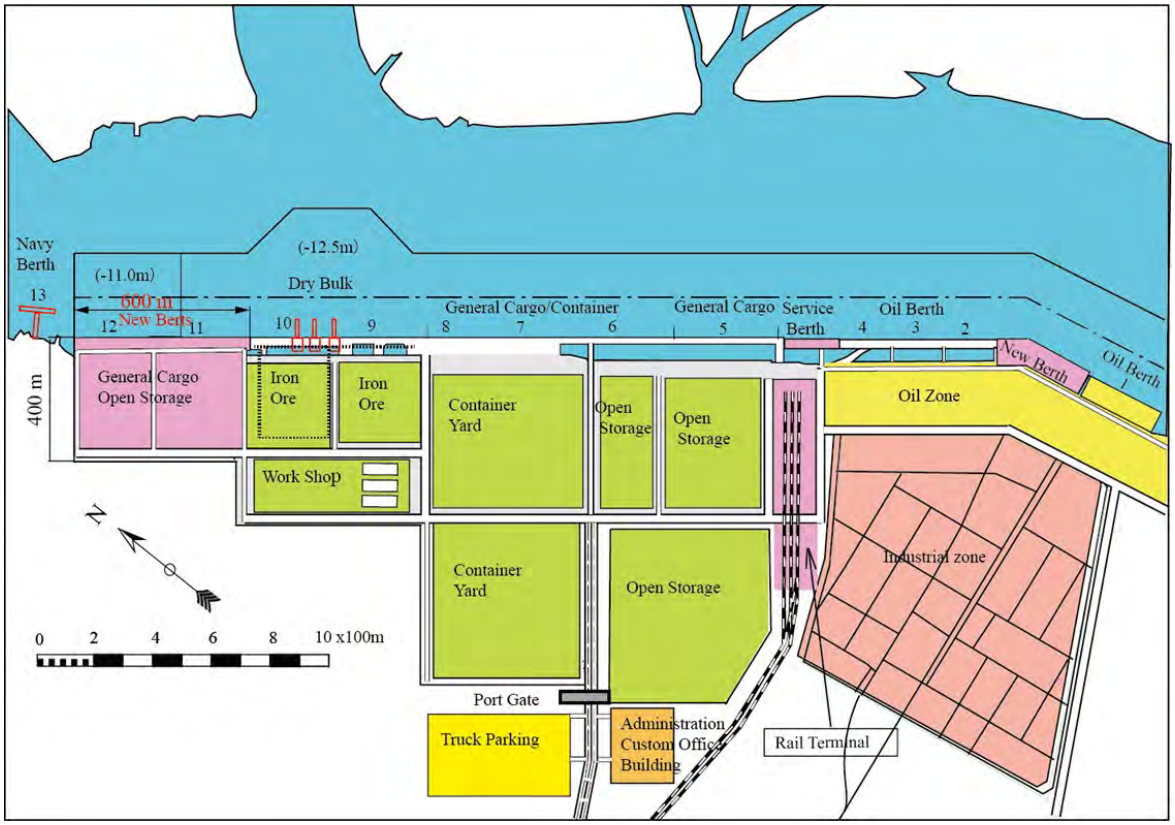
2) Preliminary facility layout of the Long-term development plan of KZP

At KZP, dry cargo and liquid cargoes are handled at the same wharves, and, therefore, pipelines are installed at the dry cargo wharves. This situation is not only inconvenient for dry cargo operations but is also not safe. KZP Office of GCPI has an intension to separate the zones for dry cargoes and liquid cargoes. So far, dry cargo operation that had been done on berths No. 2, 3 and 4 was transferred to No. 6, 7, and 8, while liquid cargo operation, which used to be done on berths No. 9 and No. 10 will be transferred in accordance with the plan of KZP Office to use the southern area for petroleum products and the northern area for dry cargoes.

So far, most of the wharves of KZP are exclusively used by private operators (dry cargoes) and MOO (Liquid bulk cargoes) and Berth No. 5 is the only berth that GCPI operates itself for public users. Thus it is foreseen that KZP will encounter difficulties to provide good services to new port users because of a lack of available berths. Thus, along with the GCPI's plan, the construction of general cargo wharves No. 11 and No. 12 in the northern area is proposed in the layout of the long-term development plan, for the exchange of the new wharves that are to be constructed between Berth No. 1 and No. 2 under the "Urgent Rehabilitation Project Phase II".

As proposed for UQP, the following items are proposed for KZP (see Figure 5.2.4):

- Relocation of administration building to outside of restricted area,.
- Provision of truck parking area outside of port area, and
- Pavement of storage yards.



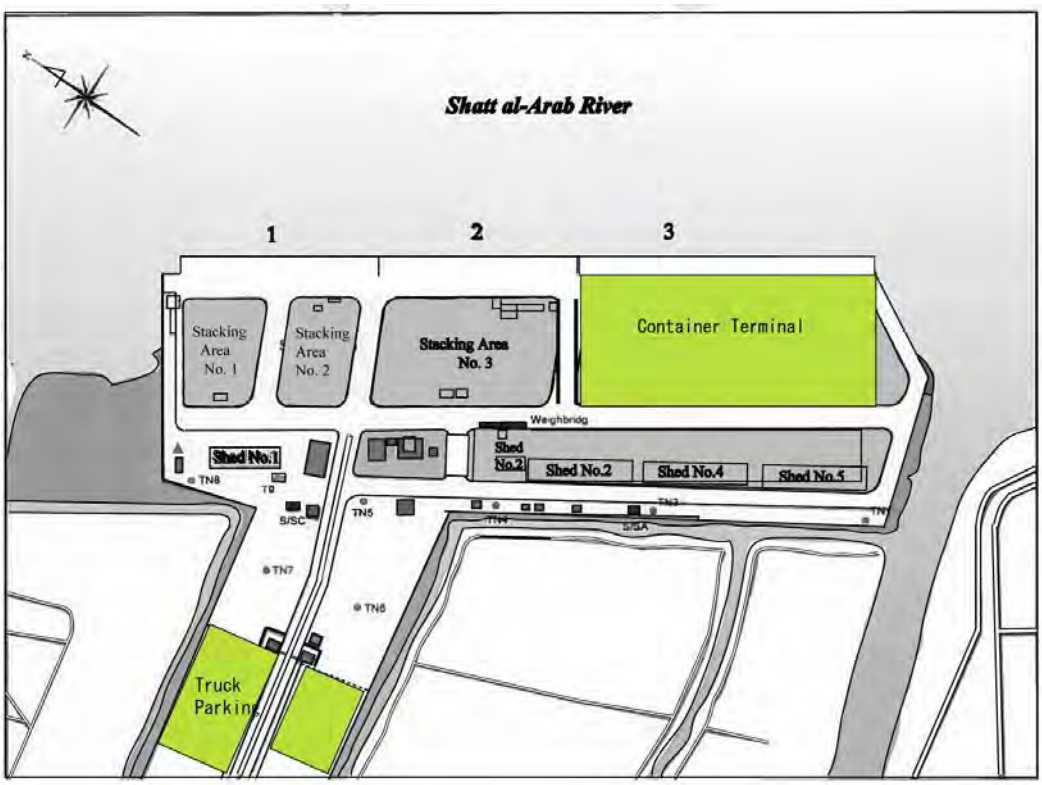
Source: JICA Study Team

Figure 5.2-4 Preliminary facility layout of Long-term development plan of KZP

3) Preliminary facility layout of the Long-term development plan of Abu Flus Port

Container cargoes have become the major cargoes of Abu Flus Port, and the volume of container cargo is expected to increase in coming years. It is thus indispensable to develop a container wharf at Abu Flus Port. It is proposed to expand Wharf No. 3 to 250 m long as well as the construction of a container yard at the back of wharf No. 3.

The construction of an administration building and truck parking area is proposed outside the restricted port area.



Source: JICA Study Team

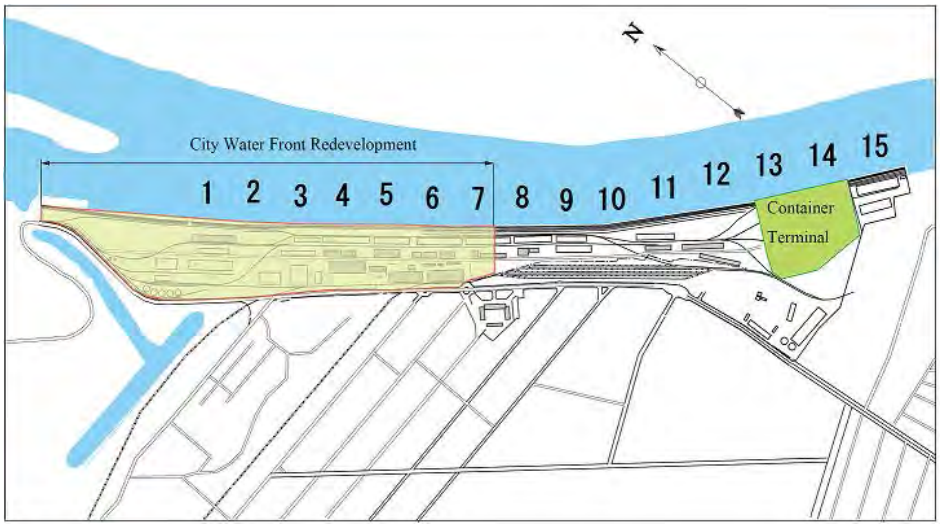
Figure 5.2-5 Preliminary facility layout of Long-term development plan of Abu Flus Port

4) Preliminary facility layout of the Long-term development plan of Al Maqil Port

The major cargoes of Al Maqil Port are cement and general cargoes. Cement is imported from Iran by small ships. While the domestic production of cement is expected to increase, the import of cement by small ships will also increase toward the future. Thus, enough numbers of berths should be reserved to receive increasing numbers of small ships.

Even though a container terminal opened at Berth No. 13 and No. 14 in 2013, it is difficult to estimate container cargo volumes because of the unfavourable environment for container liner services: the passage of ships is possible for three days a week due to the movable bridge operation downstream of Shuttle al Arab River and this is a large obstacle for the ships calling on the port.

However, there is the possibility that the Shatle al Arab River is dredged and deepened, and that the bridges will be reconstructed to allow ships to pass underneath, plus the opening of AFGP. The roles and functions may change in accordance with the change of environment. Thus it is difficult to determine the development plan at this moment and, therefore, it is recommended for Al Maqil port to reserve the facilities, with only minor repair and maintenance, so that the port reserves the flexibility to provide new services in addition to traditional ones (see Figure 5.2-6).



Source: JICA Study Team

Figure 5.2-6 Preliminary facility layout of Long-term development plan of Al Maqil Port

5) Preliminary facility layout of the Long-term development plan of AFGP

GCPI is currently implementing Stage I of AFGP Project to open the port in 2018 (see Figure 5.2-7). The west and the east breakwaters are under construction. According to the construction plan, the wharves located at the end of the basin are constricted in the first stage.

Source: Edited by JICA Study Team based on information from GCPI

Figure 5.2-7 Stage I Plan of AFGP Project

The construction plan requires a large volume of dredging before the port is operational due to the location of the wharf that was constructed first. Therefore, Study Team proposes to modify the construction plan and to construct a wharf at the location near the port entrance so that the volume of dredging of the basin is reduced substantially. The proposed layout of the modified plan is shown in Figure 5.2-8 of the Long-term Development Plan.

In addition, the design water depth of the wharves is -17m, however, it is the assessment of Study Team that -17 m is unnecessary for the container wharves and that -16m is deep enough even for post Panamax size container ships. Therefore, it is proposed -16m should be applied instead of -17m for the design of wharf structures. In addition, the water depth at the start of port operation should be -13m and the channel and the basins can be deepened afterwards in accordance with the demand of port calls by post Panamax ships.

Source: JICA Study Team

Figure 5.2-8 Alternative Stage I Plan of AFGP

5.2.2 Preliminary Development Plan of Waterways

(1) Estimation of number of ships passing through the waterways

The total number of ships calling on each port in 2025 and 2035 is estimated by calculating as follows:

- Number of ships required to bring the total volume of each commodity is calculated by dividing the latter by the average volume per ship assumed for the commodity.
- Sum of the number of ships calculated for each commodity at respective port is the total number of ship calls of the port.

Table 5.2-25 is the calculation table of the numbers of ship calls of each port.

Table 5.2-25 Calculation of ship calls at each port and the number of Ship Traffic

Unit Ship

Name of Port	TEU/Ship	2025					2035				
		Low	Middle		High		Low	Middle		High	
			L.D.P	Altern.	L.D.P	Altern.		L.D.P	Altern.	L.D.P	Altern.
Conrtainer ships											
AFGP	2,000	0	0	389	0	770	403	797	1,216	1,867	2,781
UQP	1,000	1,860	2,588	1,809	3,496	1,957	1,896	2,606	1,768	2,444	1,100
KZP *		0	0	0	0	0	0	0	0	0	0
Abu Flus	200	697	727	727	1,474	1,474	779	1,180	1,180	2,316	2,318
Al Maqil	200	348	727	727	490	490	774	1,180	1,180	1,155	1,153
Other type of Ships											
AFGP		0	0	0	0	0	0	0	0	0	0
UQP		473	596	596	791	791	645	770	770	979	979
KZP		332	572	572	1,014	1,014	430	604	604	1,074	1,074
Abu Flus		37	59	59	103	103	48	79	79	126	126
Al Maqil		112	778	778	2,109	2,109	143	1,104	1,104	2,579	2,579
Total Ship Calls											
AFGP		0	0	389	0	770	403	797	1,791	1,867	2,781
UQP		2,334	3,184	2,405	4,287	2,748	2,541	3,376	1,387	3,422	2,079
KZP		332	572	572	1,014	1,014	430	604	604	1,074	1,074
Abu Flus		734	786	786	1,578	1,578	826	1,259	1,497	2,442	2,445
Al Maqil		460	1,505	1,505	2,599	2,599	917	2,283	2,045	3,734	3,732
Ship calls per Day											
AFGP		0.0	0.0	1.1	0.0	2.1	1.1	2.2	4.9	5.1	7.6
UQP		6.4	8.7	6.6	11.7	7.5	7.0	9.2	3.8	9.4	5.7
KZP		0.9	1.6	1.6	2.8	2.8	1.2	1.7	1.7	2.9	2.9
Abu Flus		2.0	2.2	2.2	4.3	4.3	2.3	3.4	4.1	6.7	6.7
Al Maqil		1.3	4.1	4.1	7.1	7.1	2.5	6.3	5.6	10.2	10.2
Traffic along waterways (Incoming ship only)											
Khawar abd Allah		7.3	10.3	8.2	14.5	10.3	8.1	10.9	5.5	12.3	8.6
Shatle al Arab		3.3	6.3	6.3	11.4	11.4	4.8	9.7	9.7	16.9	16.9

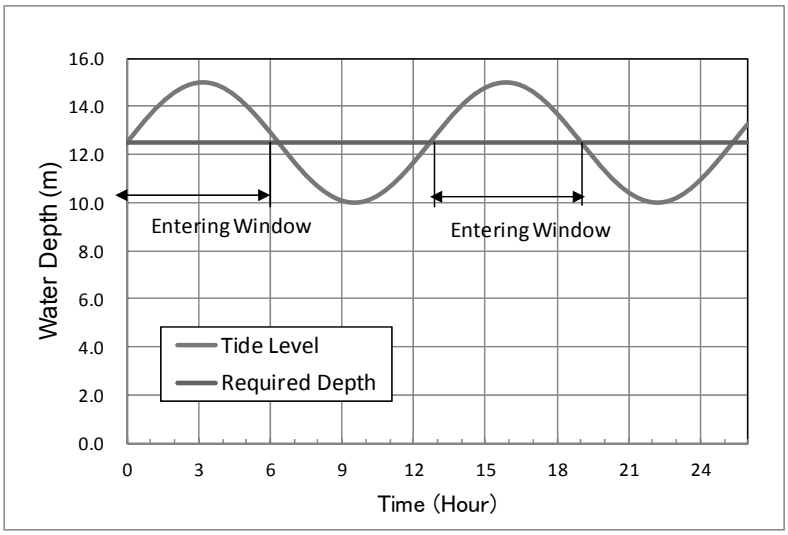
Note:* Containers are brought by Other type of shipts to KZP
L.D.P.: Long-term Development Plan Altern.: Alternative Plan
Source: JICA Study Team

(2) Discussion on the capacity of the navigation channel along Khawr abd Allah and Umm Qasr Channel

According to the interview with Operation Division of GCPI, it is the instruction of GCPI to suspend the navigation along Khawr abd Allah and Umm Qasr Channels during the peak period of tidal current. In addition, large ships tend to travel along the channel during high tide to ensure the draft clearance. Therefore, it is assumed that a total of 6 hours from 3 hours before until 3 hours after the time of high water is the period for inward navigation.

a) Most of the outgoing ships are loaded with no cargo or little amount of cargo. and they can travel along the channel during low tide. Therefore, it is assumed that incoming ships travel along the channel during period from 3 hours earlier and 3 hours after the high tide, while outgoing ships travel along the channel during a total of 6 hours of low tide. High and low tides generally occur twice a day.

b) Though the water depth of the channel is said to be -11m, it is assumed that there are some shallow areas due to sedimentation. Thus actual minimum depth is assumed to be -10m. Large ships having draft of 11 m travel the channel during the water depth is 12.5 m or larger. Since the tidal range is 5.0 m, the period of the water depth at 12.5 m or larger lasts for 6 hours, which is the period the incoming ships can travel along the channel. Thus a navigable period of 6 hours occurs twice a day (see Figure 5.2-9)



Source: JICA Study Team

Figure 5.2-9 Windows for incoming ships for navigation along the channel

c) Assumption for the calculation

i) Navigation channel is one way over the full length

ii) No tug boat assistance is required while ships are traveling along the channel and enough numbers of tug boats are available at UQP for smooth docking at the wharves,

iii) Incoming ships travel along the channel in convoy and the time interval of ships is assumed to be 5 minutes, which corresponds to space interval of 1,852 m along Khawr Abdallah, where ships travel at 12 knots and 1,235 m along other channel where ships travel at 8 knots.

iv) The travel times for a ship to complete the passage of channel portions are estimated as follows:

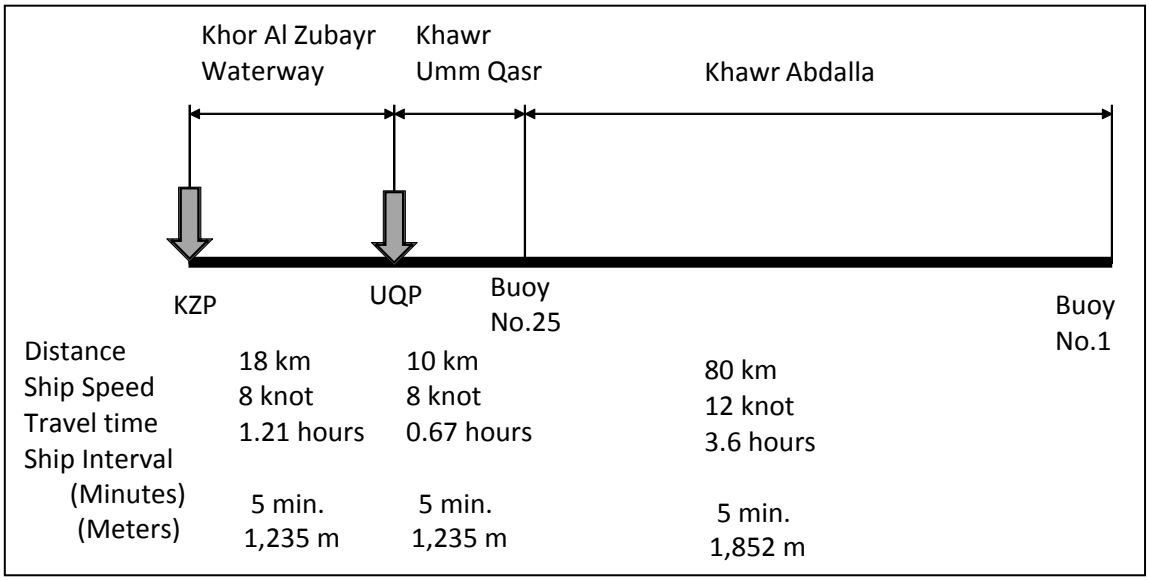
Khawr Abdallah：12 knot、3.6hours

Khawr Umm Qasr：8 knot、0.67hours

Khor Al Zubayr Waterway：8 knot、1.21hours

2) Time window for navigation and the number of ships passable within the time window

The conditions of navigation along respective channel portions are shown in Figure 5.2-10.



Source: JICA Study Team

Figure 5.2-10 Conditions of travelling along the channel portions

The travel time between Buoy No.1 in the Arabian Gulf and Umm Qasr Port is 4.27 hours (3.6 hours in Khawr Abdalla and 0.67 hours in Khawr Umm Qasr) , and that between Buoy No. 1 and Khor Al Zubayer Port is 5.47 hours. The first ship of a convoy starts at Buoy No.1, 3 hours before high tide and the last ship has to arrive Um Qasr Port 3 hours after the high tide.

Thus, the period of time for incoming ships allowed to enter past Buoy No.1 is1.73 hours or 103.8 minutes (=6 hours - 4.27hours). Ships start at Buoy No. 1 every 5 minutes, a total of 20 ships are allowed to enter Khawr Abdalla. Those ships calling on Khor Al Zubayr Port are able to reach the port within the time window of 6 hours, provided they are placed in the first 7 ships (or start at Buoy No. 1 within the first 30 minutes) of the convoy.

Since high tide occurs twice a day, twice as many ships, i.e., 40 ships are able to call on UQP and KZP. A maximum of 14 ships can call on Khor Al Zbayr Port a day, while a minimum of 26 and a maximum of 40 ships are able to call on UQP.

Table 5.2-25 shows that the average total number of calling ships on UQP and KZP per day is about 10 for middle growth scenarios both in 2025 and 2035, while that for high growth scenarios is 11(in 2025) and 17 (in 2035). Thus it is assessed that the capacity of the one way waterways to UQP and KZP has enough capacity over the coming decades.

3) Remarks on the results of calculation of the capacity of waterways

The capacity of the waterways is estimated under such assumption that incoming ships are allowed to travel Khawr Abdalla Channel over six (6) hours between three (3) hours before and three (3) hours after the time of high tide. In other words, 12 hours when the water level is higher than the mean water level used for incoming ships, while the other 12 hours when the water level is lower than mean sea level is used for outgoing ships. Thus, as long as the navigation channel is one way, no more than 20 ships can pass through the channel in a day unless the interval between the ships is shortened or the travel speed is increased. In such cases, strict ship navigation control is necessary to ensure the safety. Deepening the channel will increase the number of ships able to pass in a day, and contribute to the capacity enhancement by allowing the passage of larger ships that carry larger volumes of cargo.

(3) Restrictions in waterways other than water depth

There are some other restrictions for those ships calling on UQP and KZP in addition to water depths and tidal current.

1) UQP has an anchorage for two ships and KZP has no anchorage. Therefore, the number of ships calling on the ports is limited by the number of available berths and anchorage

2) Ships travel along the channel in convoy. Therefore swift, smooth docking and dispatching is required by providing more tag boats and anchorages.

3) Low cargo handling productivity results in longer occupancy of berths and this, in turn, limits the number of incoming ships.

4) Ships sometimes standby outside of Khawr Abdallah Channel because of bad weather, in particular strong wind.

5.3 Strategic Environmental Assessment

5.3.1 Outline of the Targeted Project

The project targeted for this Strategic Environmental Assessment (SEA) is the Long-term Development Plan proposed in Chapter 5.2. The outline of the project is shown in Table 5.3-1.

The two options for development plan of container terminals proposed in aforementioned sections have differences of types and volumes of cargo handling equipment because this project generally consists of rehabilitation of the ports. These differences do not affect the extent of environmental impact. Hence, SEA shall be carried out for the most probable projects.

Table 5.3-1 Outline of project targeted for environmental assessment

Ports/Waterways	Outline of the Projects
Khor Al Zubayr Port	・ Renovation of general cargo yard No.11, 12 ・ Development of the truck parking ・ Relocation of the administration and custom office
Umm Qasr Port	・ Reconstruction of No.4 – 8 ・ Renovation of No.25 - 27 ・ Construction of logistic center ・ Development of the truck parking ・ Location of administration building
Abu Flus Port	・ Renovation of container terminal No.12, 13 ・ Development of the truck parking ・ Relocation of administration building
Al Maqil Port	・ Yard rehabilitations of No. 13,14
Shatt al Arab Waterway	・ Removal of ship wrecks (about 50 wrecks) ・ Dredging from River Mouth to Al Maquil Port (about 28.25million m^3)
Khawr Abdallah Waterway	・ Removal of ship wrecks (about 9 wrecks) ・ Dredging of Khawr Abdallah Waterway (about 24 million m^3) ・ Dredging of Umm Qasr Waterway (about 17.6 million m^3) ・ Dredging of Khor Al Zubayr Waterway (about 16.4million m^3)

Source: JICA Study Team

5.3.2 Preliminary Environmental Impact Assessment

The preliminary environmental impact assessment is conducted based on the environmental and social conditions (Section 2.9) and the current project plan. The results are shown with possible mitigation measures in Table 5.3-2. This assessment is done at the Master Plan stage and further study will be required on feasibility or detail study stages.

Table 5.3-2 Results of environmental impact assessment and mitigation measures

Items	Rating	Impact	Mitigation
Air quality	Construction Phase C-	Dust will be generated from trucks and construction equipment. The impact will be limited because the project sites will be located in existing facility or unused land. However a few residential areas are located along the access road to Abu Flus Port, illegal residents are staying on No.15 of Al Maqil Port and Umm Qasr City and illegal residential area are located in the south of UQP so the detail study will be required in the mature stage.	- Dust prevention measures and monitoring in case impact predicted
	Operation Phase B-	A great amount of dust is generated because hopper systems are currently used for dry bulk cargo handlings. In case of rehabilitation of dry bulk yards such as for wheat, some mitigation measures are required. Emission of air pollutants from such as trucks will be increased with increment of cargo volumes. However the impact will be limited because current concentrations of air pollutants are generally low around the project sites.	- Distribution and wearing a mask - Installation of vacuum system
Water pollution	Construction Phase B-	Turbidity may be generated during dredging and construction work on the water. Monitoring will be required even though the Shatt al Arab River and Khor Al Zubair Waterway are usually turbid. It is not deniable that oil and pollutants may be spilled out during wreck removal even though oil was not detected from water and sediment from the wrecks	-Water quality monitoring - Equipment maintenance - Preparation and Execution of Wreck Management Plan including oil spill countermeasure
	Operation Phase B-	Waste water and oily waste from buildings and yards may flow into the river. High coliform counts are detected in the Shatt al Arab River and Khor Al Zubair Waterway, so proper waste water management is suggested.	-Water quality monitoring -Waste water management such as installation of septic tank
Solid waste	Construction Phase B-	Dredged soil and construction waste will be generated. Environmental study will be required if new dumping site is proposed. Ship wrecks and construction wastes shall be treated properly	-Environmental study on dumping site -Proper waste management
	Operation Phase B-	Dredged soil from maintenance dredging and solid waste from port facilities and ships will be generated. Environmental study will be required if new dumping site is proposed.	-Environmental study on dumping site -Proper waste management
Soil contamination	Construction Phase	No construction work causing soil contamination is anticipated	-

Items	Rating	Impact	Mitigation
	D		
	Operation Phase D	No facility causing soil contamination is anticipated	-
Noise and vibration	Construction Phase C-	Noise and vibration will be generated from trucks and construction equipment. The impact will be limited because the project sites will be located in existing facility or unused land. However a few residential areas are located along the access road to Abu Flus Port, illegal residents are staying on No.15 of Al Maqil Port and Umm Qasr City and illegal residential area are located in the south of UQP so the detail study will be required in the mature stage.	- Noise and vibration prevention measures and monitoring in case impact predicted
	Operation Phase C-	Noise and vibration from such as trucks will be increased with increment of cargo volumes. The impact will be limited because there are no major residential area along the road. However a few residential area are located along the access road to Abu Flus Port, illegal residents are staying on No.15 of Al Maqil Port and Umm Qasr City and illegal residential area are located in the south of UQP so the detail study will be required in the mature stage.	- Noise and vibration prevention measures and monitoring in case impact predicted
Ground subsidence	Construction Phase D	No construction work causing ground subsidence is anticipated	-
	Operation Phase C-	According to the interview survey, UQP use ground water as water sources. Activities using large amount of ground water is not anticipated, however the detail study will be required in the mature stage.	-Ground subsidence survey
Odor	Construction Phase D	No construction work causing odor is anticipated	-
	Operation Phase D	No activity causing odor is anticipated	-
Sediment quality	Construction Phase C-	Sediment pollutions at the Shatt al Arab River and Khor Al Zubayr Waterway are not significant and the risk of spread of sediment pollution is low. However sediment quality study is required in case of river dumping for dredged soil.	-Sediment quality study at a dumping area

Items	Rating	Impact	Mitigation
	Operation Phase B-	Sediment quality study is required in case of river dumping for dredged soil. Sediment pollution may be progressed following water pollution	-Sediment quality study at a dumping area -Implementation of water pollution measures (same as "Water pollution")
Ecosystem	Construction Phase B-	Renovations of existing facility may not affect the ecosystem. The impact of developments of new facility may also be limited because few vegetation and endangered species in or around the project site. Environmental study will be required if new dumping site is proposed. Aquatic ecosystem degradation may be progressed following water pollution.	-Environmental study at a dumping site -Implementation of water pollution measures (same as "Water pollution")
	Operation Phase B-	No port activity which has negative impact on terrestrial ecosystem is anticipated. Environmental study will be required if new dumping site is proposed. Aquatic ecosystem degradation may be progressed following water pollution.	-Environmental study at a dumping site -Implementation of water pollution measures (same as "Water pollution")
Hydrology	Construction Phase D	The reconstruction of the birth and dredging works may have little impact on the river current.	-
	Operation Phase D	No port activity which has negative impact on the hydrology is anticipated.	-
Topography and geology	Construction/ Operation Phase D	No activity which has negative impact on the topography and geology is not anticipated.	-
Involuntary resettlement	Before/Under Construction Phase B-	Involuntary resettlement may be required because regal or illegal residential areas are located on the proposed truck terminal and administration building of Abu Flus Port, on No.15 which is adjacent to the proposed yard rehabilitation areas(No.13,14) of Al Maqil Port and on the proposed South Port Truck Terminal area in the south of UQP	- Preparation of the Abbreviate Resettlement Action Plan
	Operation Phase D	No resettlement is required for the operation	-
The poor	Before/Under Construction Phase C-	The study on socio-economic conditions of Project Affected Parsons is required.	- Preparation of the Abbreviate Resettlement Action Plan
	Operation Phase B+	Creation of job opportunities and infrastructure improvement may cause positive impact on the poor.	-
Ethnic minority and indigenous	Before/Under Construction	There is no minority or indigenous people around the project sites	-

Items	Rating	Impact	Mitigation
people	Phase D		
Local economy such as employment and livelihood	Construction Phase B+	The construction work may have positive impact on local economy due to creation of job opportunities and inflow of workers. The impact on the fishing activity is limited because there are a few and small fishing activity on the Shatt al Arab River and Khor Al Zubayr Waterway.	-
	Operation Phase B+	The project may have positive impact on local economy due to creation of job opportunities and port related activities. The impact on the fishing activity is limited because there are a few and small fishing activity on the Shatt al Arab River and Khor Al Zubayr Waterway.	-
Land use and local resources	Construction/ Operation Phase D	No activity which has negative impact on land use and local resources (fish resources)is anticipated.	-
Water usage	Construction Phase D	No construction work may use a large amount of water.	-
	Operation Phase C-	The impact at KZP is not anticipated because KZP use water from the Shatt al Arab River. Groundwater is utilized at UQP so detail survey for the future water demand and ground subsidence will be required.	-Study for water demand and ground subsidence
Existing social infrastructures and services	Construction Phase D	The current traffic volume is not large at the roads around the project sites so it is assumed that the construction traffics may not affect significant impact on the existing infrastructures.	-
	Operation Phase D	The volume of cargo truck will increase with increment of cargo throughput. However new truck parking will be developed, the impact on the existing infrastructure may be slight or improved.	-
Cultural heritage	Construction/ Operation Phase D	There is no cultural heritage around the project site.	-

A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C+/-: Extent of positive/negative impact is unknown. (A further examination is required)
D: No impact is expected.
Source: JICA Survey Team

According to the preliminary environmental impact assessment, there were no items that were expected to have significant negative impact (rating: A-). However there were some items that were rated as B- or C-. Items rated as B- were air pollution (operation phase), water pollution

(construction and operation phases), waste (construction and operation phases), sediment pollution (operation phases), ecosystem (construction and operation phases) and resettlement (operation phase). Items rated as C- were air pollution (construction phase) and noise/vibration (construction and operation phases). A detailed environmental impact assessment should be conducted in the ensuing development stages (e.g. feasibility study phase) taking into account the potential impacts identified through the preliminary environmental impact assessment.

5.4 Important Projects of Main Ports and Waterways

5.4.1 Development of Umm Qasr Port North Berths No.25 through 27

GCPI is planning to develop container wharves No. 25 through No. 27 jointly with a private operator in a scheme of concession. The detail construction schedule, and of start of operation time have not yet been announced. GCPI set a target for AFGP to start operation in 2018. If the opening of AFGP is delayed and the Alternative Plan is no longer able to provide enough capacity, the only possible alternative is: Berths No. 25 through No. 27 should be developed to compensate for the shortage of capacity until the opening of AFGP and Long-term Development Plan.

At the project site for Wharves No. 25 through No. 27, a 600 m straight shoreline is available. Thus, development of a container terminal having a couple of 200 m long berths has been proposed as Long-term Development Plan. The container terminal should be equipped with a total of four quay gantry cranes and should also have a container yard large enough to maximize the container handling capacity as a whole of the terminal. The capacity of the terminal is estimated at 520,000 TEU, and a rough layout plan is shown in Figure 5.2-3.

5.4.2 Redevelopment of Umm Qasr Port South

GCPI is taking steps to renovate UQP South to cope with the increase of container cargo volume. The proposals for the renovation of the whole UQP South, i.e., Berth No. 2 through No. 8, have been submitted by private operators and are now in the process of evaluation.

At present, various types of cargoes are handled at UQP South. Dry bulk, container and general cargoes are mixed up in yard areas of the wharves. Thus, the productivity is lower than terminals for exclusive use. In addition, the structure is already time worn.

Productivity can be improved by specifying some of the wharves for exclusive use for containers and by installing quay gantry cranes. However, for the introduction of gantry cranes, the wharf structures need to be reconstructed to support heavy equipment.

Since the development of South Port will be done by the investment by private operators, and no solid plan has been announced yet, the Study Team has prepared two options (Long-term Development Plan and Alternative Plan of container terminals in UQP South) under the hypotheses of two different scales of investment needed for the development of UQP South. The two options are:

- Long-term Development Plan

Wharves will be reconstructed for the installation of quay gantry cranes. If all the five wharves are renovated and equipped with two gantry cranes per berth, the capacity will be increased up to 1,300,000 TEU (=260,000 TEU x 5) per year.

- Alternative Plan

The existing wharves will be used with repair to damaged portions. The capacity will be enhanced by installing mobile cranes. With two mobile cranes per berth, the capacity is expected to increase up to 177,000 TEU per year per berth. If all the five wharves, i.e., Berth No. 4 through No. 8, are improved, the total capacity will be 885,000 TEU.

The Alternative Plan requires earlier opening of AFGP because the capacity is smaller than Long-term Development Plan. Thus, the development scale for long-term by GCPI varies depending on the proposal of the private operators for the renovation of UQP South.

In order to expand the capacity of UQP South, it is necessary to enhance the productivity of the container yards, as well as the development of wharves. The renovation of UQP South is the most urgent, to cope with the container traffic, and the yards exclusively designed for container handling are also urgent.

Though the proposed renovation plan is not known yet, removal of sheds on the wharves and relocation and realignment of rail tracks would be required.

5.4.3 Redevelopment of Port Land Area of Umm Qasr Port

There are several factors that restrict the enhancement of the cargo handling capacity of UQP. Some of those factors are as follows:

- Cargo operation of different types of cargoes are mixed in both North and South Ports.
- Road system within the port area is insufficient and aprons are also used for the passage of trucks to and from other berths.
- General cargoes and some of the dry bulk cargoes are direct unloading from ships to trucks, in particular in North Port, and, thus, many trucks occupy aprons and obstruct the traffic flow.
- Trucks are queuing along the road inside and outside of the port area due to the parking area.
- Cargoes stay in the yards for long periods of time for the clearance procedures.

- **To cope within these factors, the following attempts are made in the process of planning**:

- Traffic separation between South and North Ports,
- South Port handles dry bulk and containers only,
- The traffic within the wharves in North Port is one way, and, to this end, a new main road is provided at the back of wharves exclusively for the traffic of North Port only.
- Removal of sheds on Wharves No. 12 and No. 13, for the improvement of handling productivity of large cargoes such as plant
- Relocation of rail tracks from quays to back of wharves to ease the traffic on aprons and for the convenience of handling rail containers,
- Realignment of rail tracks to ‘go around’ layout to reduce the frequency of suspension of road traffic due to the passage of trains,
- By providing truck parking area outside of port area so that they do not obstruct traffic within the port area,
- Relocating the administration building to reduce traffic inside the port area by allowing only vehicles transporting cargoes to enter the port area, and to provide large enough space for the container wharf No. 20.
- Land space is provided for logistic center that will facilitate yard operation on the wharves.

Figure 5.2-2 and Figure 5.2-3 presented in the previous Section have been drawn to roughly illustrate the facility layout plans for Long-term Development Plan and Alternative Plan, respectively.

5.4.4 Redevelopment of Port Land Area of Khor Al Zubayr Port

At KZP, most of the wharves have not been specialized and different type of cargoes are handled at a wharf: mixed use for unloading or loading dry bulk, general cargoes, liquid bulk and

sometimes containers. Thus, for the improvement of productivity, it is necessary to specify zones for respective type of cargoes. GCPI has an idea to designate the area from wharf No. 4 toward the south for the operation of liquid bulk and the area from Wharf No. 5 toward the north for dry cargo operation. In accordance with this idea, the uses of Wharves No. 2, 3 and 4 in the south area, which have been used for general cargo operation and Wharves No. 8 and 9, which are located in north area, have been exchanged.

It is the intention of KZP Office of GCPI to enhance the capacity of the port by specializing each wharf through awarding concession to private operators. At present, Wharf No. 6 is the only berth that GCPI operates for public users. No more wharves are available for new port users who want to have concession to operate a wharf for exclusive purposes, and the port cannot perform its role as an industrial port. Therefore, Study Team proposes the development of new wharves No. 11 and No. 12 in the Long-term Development Plan of KZP.

Wharf No. 11 is owned by the NAVY and is currently used for mooring a power barge. When the situation of power supply is improved and the power barge is no longer necessary, a 600 m long new wharf can be developed in the area in exchange for wharf No. 11.

The Pier, which is divided into three berths No. 5, 6 and 7, was designed and constructed for the exclusive use of exporting fertilizer, but is no longer used for handling fertilizer since the factory stopped operation. GCPI should make the decision to remove the facilities if no plan to resume fertilizer export is submitted. In accordance with new demands from the companies that start businesses in the industrial estate near the port, the wharf may be renovated or redeveloped as a multipurpose terminal that has flexibility to accept dry bulk, general cargo and containers.

A rough facility layout is shown in Figure 5.2-4.

5.4.5 Redevelopment of Abu Flus Port

The major commodity at Abu Flus Port has been containers in recent years. Berth No. 3 has been considerably damaged due to the operation of heavy equipment to handle containers, and will be repaired by a private operator. Now, a container liner ship is plying between Dubai and this port. It is foreseen the port will play an important role as a container port. Therefore, the development of a container terminal with efficient productivity and capacity should be scheduled in its Long-term Development Plan.

The existing berth No. 3 has a length of only 150 m. The expansion of the berth up to 250m is recommended for the acceptance of ocean going container ships. In addition, the open storage behind berth No. 3 should be enlarged and paved as a container yard. It is also desired to provide truck parking space outside of the port area (see Figure 5.2-5)

5.4.6 Redevelopment of Al Maqil Port

The major commodity at AL Maqil Port is cement. It is expected the volume of cement will keep increasing in the coming decades, and enough numbers of berths should be well maintained. There is a possibility that large ships will call on the port when the Shatt al Arab River is dredged and the bridges existing downstream of the port are reconstructed. In addition, once Al Faw Grand Port (AFGP) starts operation, the feeder services routes may be changed. These changes in the environment of the port will give a large impact to the roles of the port. Thus, it is recommended for the port to reserve flexibility to fulfil any new demands deferent from traditional ones under the new environment (see Figure 5.2-6).

5.4.7 Development of Al Faw Grand Port

In the Long-term Development Plan, AFGP should be operational except in the Alternative Plan under low growth scenario. In the Short/Mid-term Development Plan, the Alternative Plan requires that AFGP is operational and should have a capacity of 800,000 TEU under middle growth scenario: under low growth scenario, both options have enough capacity

without opening AFGP, while under high growth scenario, both options require AFGP to be operational.

Before the opening of AFGP, it is also required that an access road to AFGP and the port administration system also functional.

5.4.8 Development of Khawr Abdallah, Khor Al Zubayr and Umm Qasr Channels

The Khawr Abdallah Channel should be developed based on the maximum size and the number of vessels calling at UQP and KZP by type forecasted in the long-term plan (Year 2035).

(1) Objective Vessel

The objective vessels calling at UQP and KZP through the Khawr Abdallah Channel are shown in Table 5.4-1.

Table 5.4-1 Objective vessels

Vessel Type	Dead Weight Tonnage (DWT)	Overall Length (m)	Molded Breadth (m)	Full Load Draft (m)	Remarks
Container	41,771	199	32.2	12.0	Max. 3,000TEU similar to the present vessel size
General Cargo	40,000	198	30.7	11.5	Max. at present: 50,000 DWT
Bulk Cargo	45,000	205	32.3	11.9	Max. at present: 82,769 DWT
LPG Tanker	25,000	192	29.4	11.5	Max. at present: 83,651 DWT
Ro/Ro	40,000	208	32.3	9.7	-

Source: JICA Study Team

The largest vessel which is presently calling at port has a shallower draft (maximum draft =10.9 m) than the planned objective vessel for the bulk cargo vessels and tankers. It is expected that larger vessels will call at AFGP in the long term. As a result the container vessel (41, 771 DWT) and the bulk cargo vessel (45,000 DWT) are considered as objective vessels calling at UQP and KZP through the Khawr Abdallah Channel.

(2) Required Water Depth in the Channel

According to "Harbour Approach Channels Design Guidelines (Year 2014)" by PIANC, it is recommended that the required water depth should be 1.1~1.15 T and 1.15~1.3 T (T: vessel draft) in the inland channel and the open sea respectively. Hence the planned water depth of 12.5 m is established for the channel considering an excess of at least 1.5 m because of the wide tidal range of maximum 4.0 ~5.5 m, even though there is a lot of sediment in the open sea. While it is desirable that the water depth is 13.2 m and 13.8 m for the inland channel and the open sea respectively. Though the water depth of 12.0 m can be adopted in the inland channel if the wide tidal range is applied, the planned water depth of 12.5 m is also established for the inland channel, considering that the overall length of the channel is more than 100 km and the channel depth is more than 13 m in some areas. The objective tanker with a full draft can navigate the channel during the low tide because the present water depth is 12.3 m ~13.2 m.

(3) Channel Width

The channel width of 250~350 m, and 200 m is planned for the inland channel and the open sea respectively at the initial stage of the study, while at present the channel width is 200~250 m and 125~150 m for the inland channel and a part of the open sea channel respectively. It is important that sufficient channel width should be secured for the safe navigation of the objective vessels, though the large-sized vessels will call at AFGP in the long term.

The required channel width is calculated based on "Harbour Approach Channels Design Guidelines (Year 2014)" by PIANC. The overall bottom width of the channel is given for a one-way channel by:

$$W = WBM + \Sigma Wi + WBR + WBG$$

Where: WBM: width of basic maneuvering lane as a multiple of the design ship's beam B, (1.8B for bulk cargo vessels and tankers and 1.5B for container and other vessels)
Wi: additional widths to allow for the effects of wind, current etc. given in Table 5.4-2
WBR, WBG: bank clearance on the 'red' and 'green' sides of the channel (0.1B~0.5B)

The required channel width for the bulk cargo vessel which has a maximum molded breadth of 32.3 m (B=32.3 m) is as follows based on the above formula:

5.0~5.4 B＝(5.0～5.4） x 32.3 m＝161.5 ～174.4 m, aprox. 200 m

Further the inland channel width (Umm Qasr and Khor Al Zubayr Channels) is established to be 250 m due to reasons below:

1) The present channel is established with a width of 250 m except one part of the channel.

2) It is desirable that the inland channel width should be established in order not to disturb the navigation of vessels which call at and/or leave port often because a section of the open sea channel has a distance of more than 65 km.

(According to the port statistics of UQP in 2012, shares of container vessels and general cargo vessels smaller than 30,000 DWT are about 88 % and 98 % respectively).

3) Hence it is possible that container vessels smaller than 30,000 DWT and general cargo vessels smaller than 20,000 DWT navigate as a two-way channel without any influence of the tide.

Table 5.4-2 Additional widths Wi for straight channel sections

Width W_i	Vessel Speed	Outer Channel (open water)		Inner Channel (protected water)	
(a) Vessel speed V_s (kts, with respect to the water)					
$V_s \geq 12$ kts	fast	0.1 B			
8 kts ≤ V_s < 12 kts	mod	0.0			
5 kts ≤ V_s < 8 kts	slow	0.0			
(b) Prevailing cross wind V_{cw} (kts)					
- mild	fast	0.1 B			
V_{cw} < 15 kts	mod	0.2 B			
(< Beaufort 4)	slow	0.3 B			
- moderate	fast	0.3 B			
15 kts ≤ V_{cw} < 33 kts	mod	0.4 B			
(Beaufort 4 - Beaufort 7)	slow	0.6 B			
- strong	fast	0.5 B			
33 kts ≤ V_{cw} < 48 kts	mod	0.7 B			
(Beaufort 7 - Beaufort 9)	slow	1.1 B			
(c) Prevailing cross-current V_{cc} (kts)					
- negligible V_{cc} < 0.2 kts	all	0.0		0.0	
- low	fast	0.2 B		0.1 B	
0.2 kts ≤ V_{cc} < 0.5 kts	mod	0.25 B		0.2 B	
	slow	0.3 B		0.3 B	
- moderate	fast	0.5 B		0.4 B	
0.5 kts ≤ V_{cc} < 1.5 kts	mod	0.7 B		0.6 B	
	slow	1.0 B		0.8 B	
- strong	fast	1.0 B		-	
1.5 kts ≤ V_{cc} < 2.0kts	mod	1.2 B		-	
	slow	1.6 B		-	
(d) Prevailing longitudinal current V_{lc} (kts)					
- low	all	0.0			
V_{lc} < 1.5 kts					
- moderate	fast	0.0			
1.5 kts ≤ V_{lc} < 3 kts	mod	0.1 B			
	slow	0.2 B			
- strong	fast	0.1 B			
$V_{lc} \geq 3$ kts	mod	0.2 B			
	slow	0.4 B			
(e) Beam and stern quartering wave height H_s (m)					
- $H_s \leq 1$ m	all	0.0		0.0	
- 1 m < H_s < 3 m	all	~0.5 B		-	
- $H_s \geq 3$ m	all	~1.0 B		-	
(f) Aids to Navigation (AtoN)					
- excellent		0.0			
- good		0.2B			
- moderate		0.4 B			
(g) Bottom surface					
- if depth $h \geq 1.5\ T$		0.0			
- if depth h < 1.5 T then					
- smooth and soft		0.1 B			
- rough and hard		0.2 B			
(h) Depth of waterway h		$h \geq 1.5\ T$	0.0 B	$h \geq 1.5\ T$	0.0 B
		1.5 $T > h \geq 1.25\ T$	0.1 B	1.5 $T > h \geq 1.15\ T$	0.2 B
		h < 1.25 T	0.2 B	h < 1.15 T	0.4 B
(i) High cargo hazards		See explanation in box(i) overleaf			

Source: Harbour Approach Channels Design Guidelines_PIANC_2014

(4) Development Items for the Channel

It is expected that the following developments, which should be carried out promptly to cope with increased cargoes efficiently, will be made by year 2035 of the Long-term Development Plan, considering the above result and present issues mentioned in Chapter 2.7.1:

1) The Khawr Abdallah Channel be developed with a water depth of 12.5 m and a width of 250 m over the whole section.

2) The Umm Qasr and Khor Al Zubayr Channels be developed with a water depth of 12.5 m and a width of 250 m over the whole section. Further a part of the above channel which includes dredging work of the KZP basin with a volume of 5.4 million m^3 is planned to be developed by Japanese ODA (Port Sector Rehabilitation Project II).

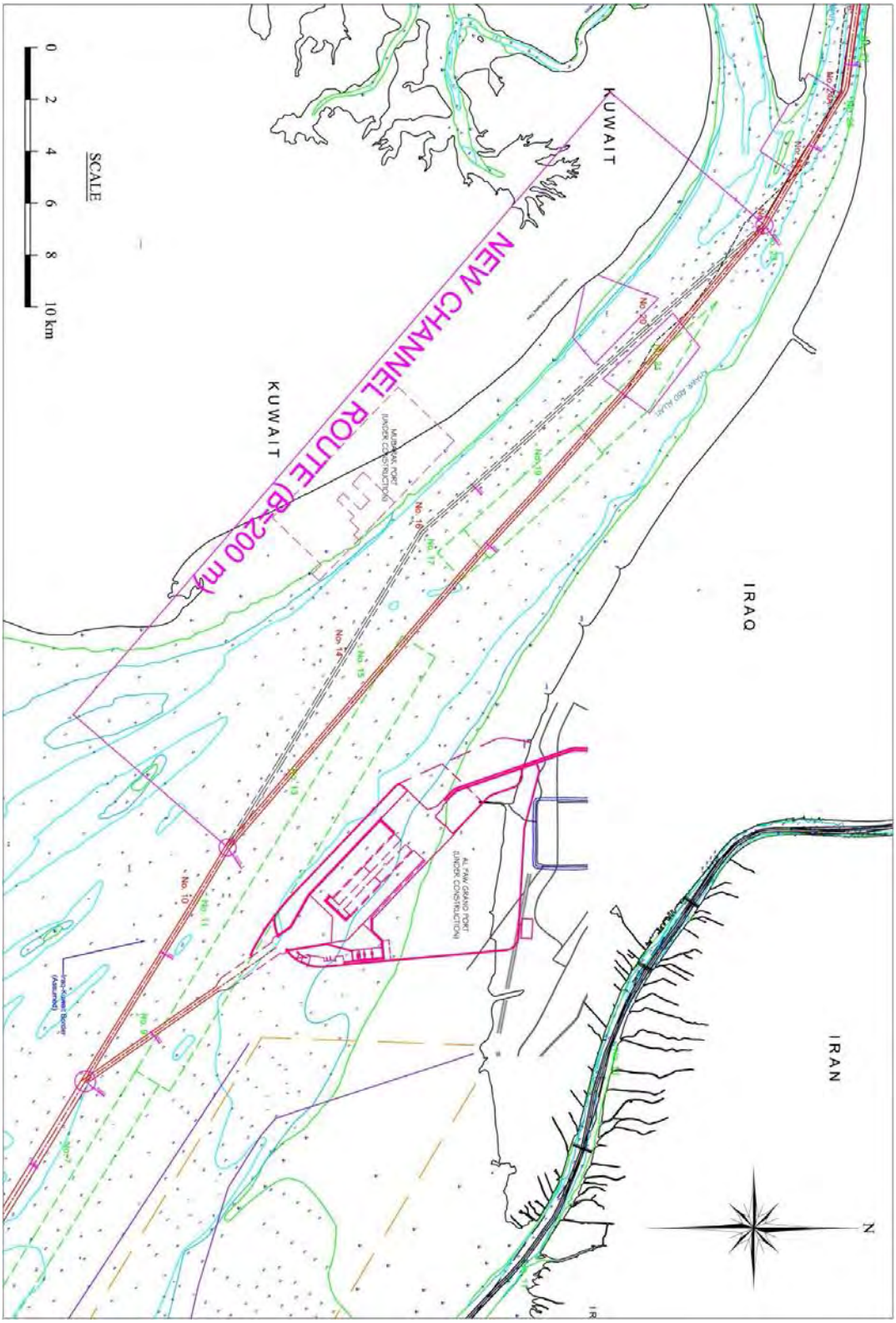
3) Removal of 14 wrecks in the above channel and basins, 4 numbers out of 14 by the Japanese ODA and 1 number shortly by GCPI.

4) Installation of the Navigation Aids in the Khor Al Zubayr channel which is scheduled to be developed by the Japanese ODA.

5) Development of the access channel to AFGP with a water depth of 16 m and a width of 200/300 m.

Further there is a border issue to solve with Kuwait in the Khawr Abdallah Channel and it is indispensable to construct an alternative route if the present route cannot be used.

Based on the above result, development plans of the Khawr Abdallah Channel is planned as shown in Appendix 5.4-1(1)-(4). In the case of rerouting part of the channel to avoid the border issue, new channel layout plan is planned as shown in Figure 5.4-1.



Source: Prepared by JICA Study Team

Figure 5.4-1 Alternative Plan of the Khawr Abdallah Channel

5.4.9 Dredging and Removal of Wrecks in the Shatt Al Arab Channel

As mentioned in Chapter 2.7.1, the water depth of the Shatt al Arab channel is stable over the whole channel except an estuary created where the Tigris River and the Euphrates River are merged together. A water depth of more than 8 m is kept over the whole section between Al Maqil Port and Abu Flus Port, while the channel has partially a water depth of 15~16 m near Al Maqil Port and 6~8 m near Abu Flus port.

The channel has an average depth of 6~8 m in a section near the border with Iran, downstream from Abu Flus port, while it is partially shallower or more than 10 m in depth. Finally it is considered that a water depth of 6 m is kept over the whole channel except the estuary, a section from Buoy No.1 to Buoy No. 7, while a water depth around the estuary is 2~3 m CD and vessels with a draft of more than 5 m cannot navigate because no dredging work has been carried out for a long time in the estuary.

(1) Future Function of the Channel

Presently the channel has functioned as a transportation route to Al Maqil port, a commercial port. It is important that the port will function as a city port, making full use of an advantage of its location with the future restoration and redevelopment in Basrah in addition to functioning as a commercial port. Further it is expected that the port will play an important role by providing a water area near the port if a floating restaurant, a business centre, a shopping centre and facilities for marine sports, yachts and cruisers will be provided for the purpose of developing water front facilities around and downstream from the port, and large-sized cruisers can be accommodated from neighboring countries in the future. Therefore, it is indispensable that border issues with Iran will be solved and a clear agreement that the channel will be used as a common navigable water will be made with Iran. Presently it is difficult to predict the timing of the above development.

(2) Long-term Development

As aforementioned, initial plans for the channel are considered as long-term developments because it is difficult to predict timings for development of the common sections of the channel with Iran. In other words, as a width of more than 150 m over the whole section of the channel, and a water depth shown below; it is planned to solve issues mentioned in Chapter 2.7.1., when secured.

1) Development of the channel with a water depth of CD -8 m from Buoy No.1 to Abu Flus port.
2) Development of the channel with a water depth of CD -10 m from upstream of Abu Flus port to Al Maqil port.
3) Removal of the wrecks of 33 ships and old bridge structures.
4) Installation of light buoys at intervals of 1 mile (70 nos.) for development of the navigation aids
5) Removal of the existing floating bridges and construction of fixed bridges

Plans of the channel development based on the above width and water depth are shown in Appendix 5.4-2(1)-(4).

5.4.10 Development of Al Faw Grand Port Connection Road

"Port Master Plan 2012" by the MOT (Consortium of Italian Engineers & Contractors for Al Faw) is referred to.

(1) Road Network of the Port

The newly designed Al Faw Port will be connected to the existing country road network. As a result, the newly proposed road linking the Al Faw Port with the existing road network is needed. Roads, due to their functions and hierarchy, have been divided according to the nomenclature shown below:

- Main Road: connection of the port internal road network with the existing road network (Al Faw Street) by two lines of two carriage way road: approximate length of 9.2 km. Main Road is classified as a road forming part of Secondary System according to Designing Manual for Highway Engineering, System and Classification of Highways.
- Access Road: connection of road leading to the Tank Farm and then on to the Navy Base and Hoc, Pilots, Tugs Launch Services: approximate length of 16.1 km. Access Road is classified as a road forming the Tertiary System according to Designing Manual for Highway Engineering, System and Classification of Highways.

Road design is determined by the assumption that all the external roads have to cut the flood area in the shortest possible distances, due to very bad geological and hydro geological conditions prevailing in the area, and the threat of damage caused by movements of the bay waters.

(2) Connection Road to the Existing Highway

The connection road from the AFGP to the existing highway near UQP is planned as shown in Figure 5.4-1.

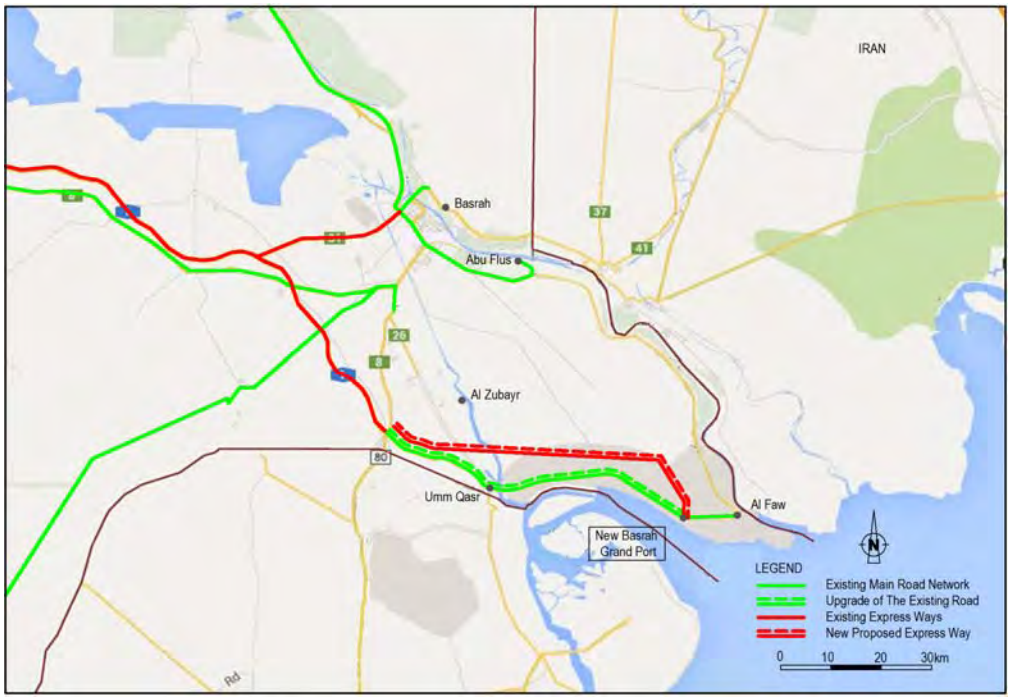
The existing road network linking with the AFGP through Main Road consists of two lanes of single carriageway (Al Faw Street). The existing road does not meet the requirements for the projected traffic generated by the planned port. Therefore, improvement by two lines of two carriage way road and as a road forming part of Secondary System is needed, the same as Main Road, as the newly constructed port starts in operation. It is considered that a tunnel or bridge crossing the Khor Al Zubayr channel should be constructed. It is one option that cargo trucks cross the channel using a ferry boat at an initial stage, if the cost of the tunnel or bridge construction is critical. Further it is an another option, in terms of no construction investment on the tunnel or bridge, that cargo trucks use the existing road from Faw to Basrah located at the eastern part of the new port.

The newly proposed road should be planned as shown in Figure 5.4-2, as cargo volumes in the new port increase and have to cross the Khor Al Zubayr channel through a tunnel or bridge to be connected with the existing highway near UQP. The road is divided as shown in Table 5.4-3.

Table 5.4-3 Summary of the Newly Proposed Road

	Part-1	Part-2	Part-3	Part-4	Total
Road section	16 km	33.5 km	10.3 km	12.4 km	72.2 km

Source: Prepared by JICA Study Team based on the Data of Presentation materials in the Seminar "Iraq Infrastructure 2013", GCPI



Source: Prepared by JICA Study Team based on the Data of Presentation materials in the Seminar "Iraq Infrastructure 2013", GCPI

Figure 5.4-2 Development Plan of Roads from Ports to the Existing Highway

5.5 Preliminary Evaluation of Long-term Important Projects

5.5.1 Preliminary Facility Design

(1) Umm Qasr Port

The design criteria were determined for the purpose of executing preliminary design works for the Project. In the process of determination of design criteria, primary design criteria proposed by the previous studies were deeply reviewed. Based on the collected data and information, and the study on such design codes of practice as Japanese Standard, meteorological, oceanographic and subsoil conditions are interpreted to produce key parameters in common use for the purpose of design port facility components of the Project.

a) Tides

Based on the tidal table (2013) published by GCOI, flood and ebb tides for 4 points including Umm Qasr are described. Table 5.5-1 shows the monthly highest and lowest tide by each month in 2013.

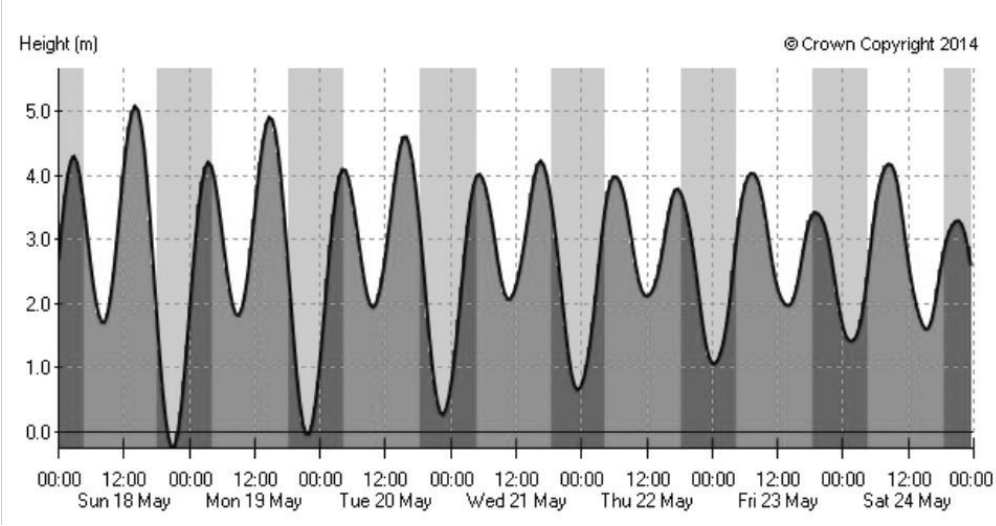
Table 5.5-1 Monthly Highest and Lowest Tide in 2013

	Shatt al-Arab (Outer Bar)		Umm Qasr		Al Faw		Al Maqil	
	Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest
January	3.2	-0.4	5.1	-0.3	3.3	0.2	2.0	0.5
February	3.1	-0.2	5.2	-0.2	3.1	0.3	1.9	0.6
March	3.3	0.1	5.2	0.2	3.4	0.4	2.6	0.9
April	3.4	0.0	5.1	0.1	3.6	0.5	3.0	1.4
May	3.5	-0.1	5.2	-0.1	3.7	0.5	3.1	1.7
June	3.5	-0.2	5.4	-0.1	3.4	0.4	2.9	1.5

July	3.4	-0.1	5.4	-0.1	3.6	0.4	2.5	1.1
August	3.3	0.1	5.4	0.1	3.4	0.5	2.1	0.7
September	3.3	0.3	5.3	0.4	3.4	0.6	1.9	0.6
October	3.3	0.2	5.2	0.2	3.4	0.5	1.9	0.5
November	3.3	0.0	5.1	0.1	3.5	0.3	2.0	0.5
December	3.1	-0.3	5.2	-0.1	3.5	0.3	2.1	0.4
Year 2013	**3.5**	**-0.4**	**5.4**	**-0.3**	**3.7**	**0.2**	**3.1**	**0.4**

Source: Tide Table in 2013, GCPI

The highest tide and lowest tide in Umm Qasr are +5.4m and -0.3m in 2013, respectively. Based on the "Preliminary Studies of UM QASR CONTAINER TERMINAL (1971), it is reported that tide levels show about 15cm variations associated with prolonged north west winds for lower levels, and south east winds for higher levels. Moreover, in 2006, -1.0m of the lowest tide recorded. A consultant in England's data was applied: +5.5m in HHWL and -0.50m in LLWL as the design condition in Umm Qasr Port, therefore the existing tide standard applied to the preliminary design condition of the Project. The following graph shows the estimation of tidal variation in one week. The tide in Umm Qasr is semi-diurnal (two high tides and two low tides each day) as follows.



Source: Hydrographic Office, Admiralty Easytide, UK

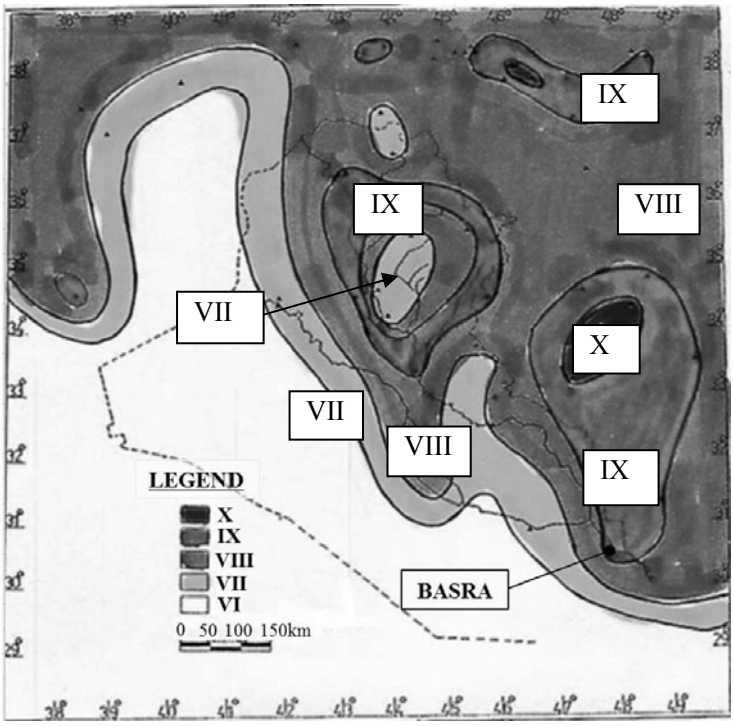
Figure 5.5-1 Estimation of Tidal Variation (18 May 2014 to 24 May 2014) in Umm Qasr

b) Wave

Based on the "Preliminary Studies of UM QASR CONTAINER TERMINAL (1971), it is reported that the maximum wave height observed at Umm Qasr was about 0.7m.

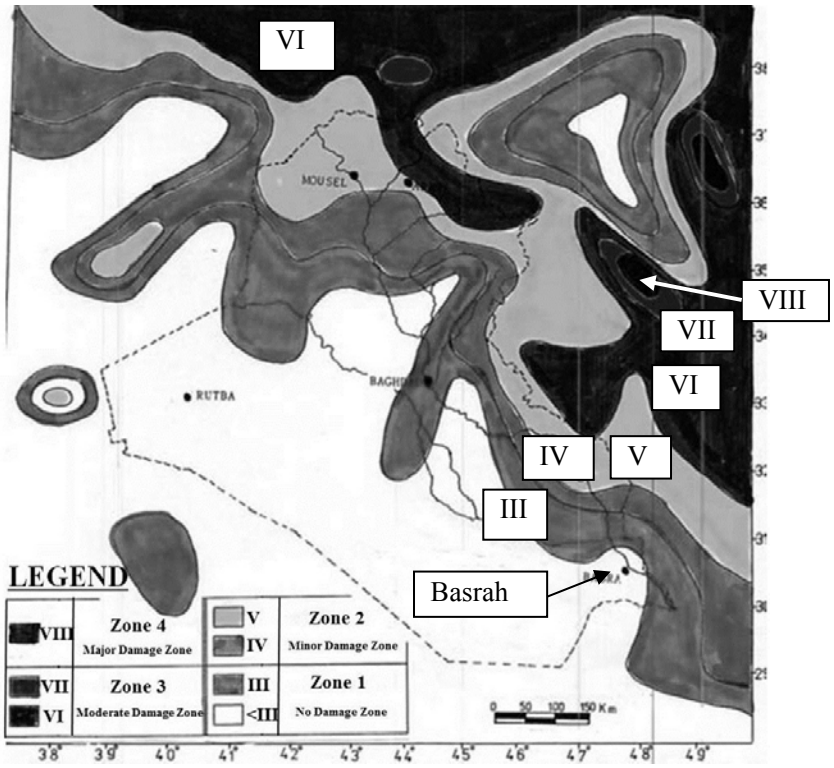
c) Design Seismic Coefficient for Quay wall Structure

The following Figure 5.5-2 shows the historical seismic iso-intensity map 1,260 B.C to 1,900 A.D, Figure 5.5-3 shows the seismic iso-intensity map, and Figure 5.5-4 shows the geological hazards map of earthquake.



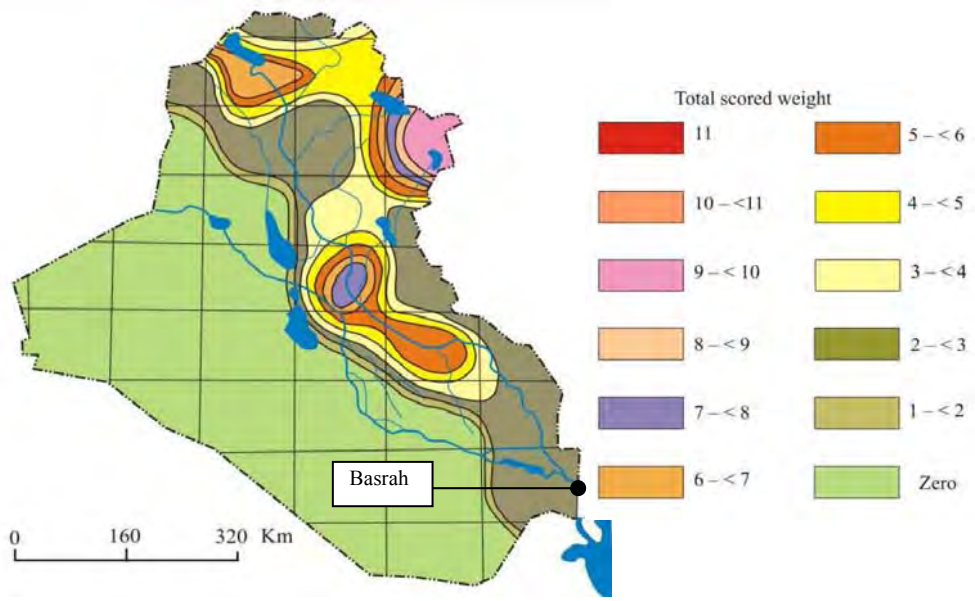
Source: Earthquake Hazards Considerations for Iraq, Forth International Conference of Earthquake Engineering and Seismology, 2003

Figure 5.5-2 Historical Seismic Iso-intensity Map (1260BC-1900A.D. 165 events)



Source: Earthquake Hazards Considerations for Iraq, Forth International Conference of Earthquake Engineering and Seismology, 2003

Figure 5.5-3 Seismic Iso-intensity Map (1900-1988, Zone 1-4)



Source: Classification and Geographical Distribution, Iraqi Bulletin of Geology and Mining, Vol. 7, No. 1, 2011

Figure 5.5-4 Geological Hazard Map of Earthquake

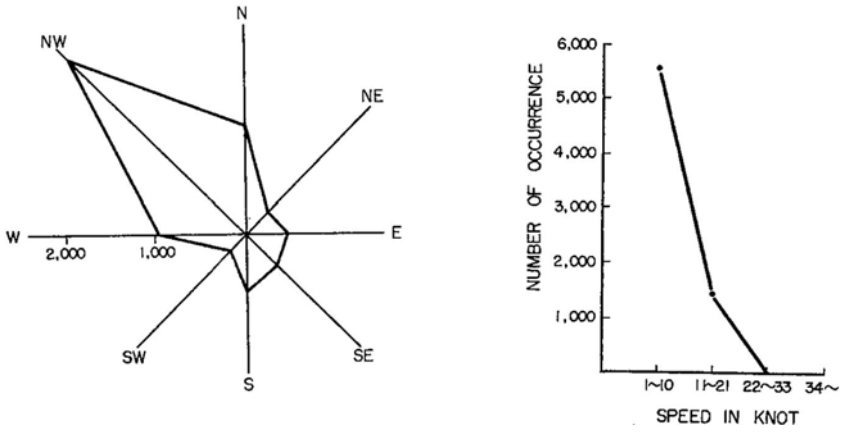
Seismic intensity of Basrah area in the historical seismic iso-intensity map from B.C. 1260 to A.D. 1900 based on 165 events is medium level. And the seismic intensity in the iso-intensity map from 1988 to 1900 is the lowest (No damage zone) in the four zones. Moreover, Basrah area is in the low level of 3 out of 12 zones in the geographical hazard map of earthquakes (2011).

Based on the above information, design seismic coefficient is determined as follows.

- Horizontal Design Coefficient kh=0.05g
- Vertical Design Coefficient kv=0.00g

d) Wind Velocity

The majority of winds come from the north-west direction in the following wind rose. Wind speed less than 10 knots is the majority in number of occurrences as shown in Figure 5.5-5. The maximum wind speed which occurred during the same period was 34 knots, which has been taken as the wind speed for design.

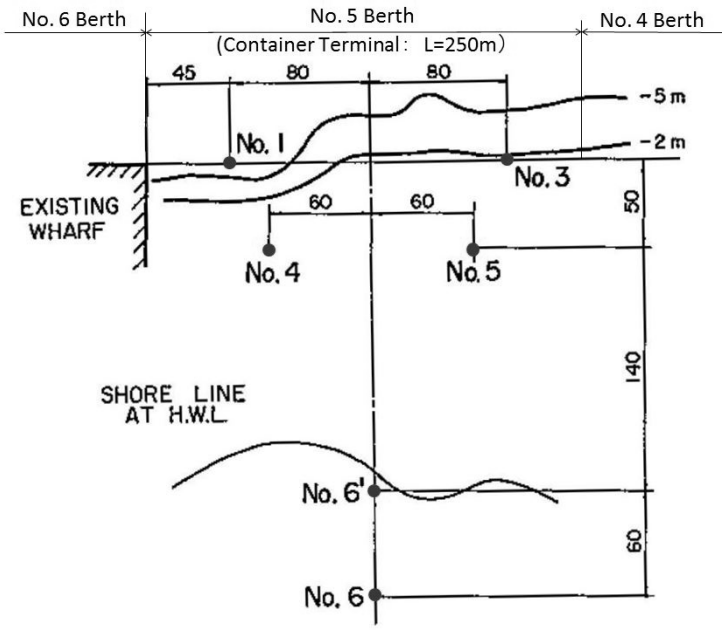


Source: Preliminary Studies of UM QASR CONTAINER TERMINAL (1971), PCKK
Note: Based on data taken 4 time a day at Basrah 1966 to 1970

Figure 5.5-5 Wind Rose and Wind Velocity in Basrah

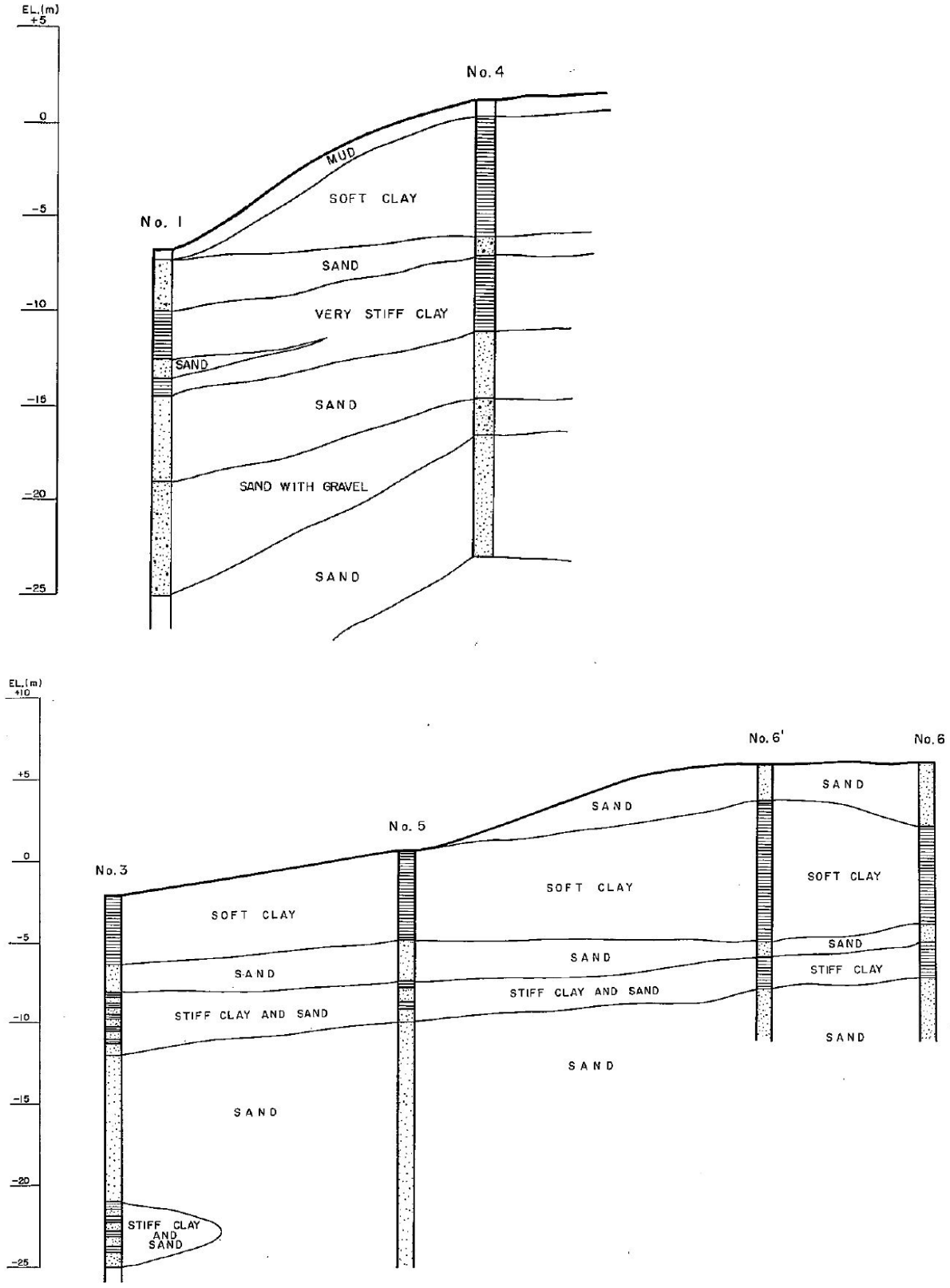
e) Subsoil Conditions

According to the tender drawing of "UM QASR CONTAINER TERMINAL" (1972) and "Preliminary Studies of UM QASR CONTAINER TERMINAL (1971), subsoil investigation was conducted; 4 soil borings in wharf planning area and 2 soil borings in yard planning area as shown in Figure 5.5-6.



Source: Preliminary Studies of UM QASR CONTAINER TERMINAL (1971), PCKK

Figure 5.5-6 Location of Soil Boling at No. 5 Berth in UQP South



Source: Preliminary Studies of UM QASR CONTAINER TERMINAL (1971), PCKK

Figure 5.5-7 Soil Profile at No. 5 Berth in UQP South

In view of the above soil profile, soil layer composition and soil properties are summarized in Table 5.5-2.

Table 5.5-2 Soil Layer Composition and Properties at No. 5 Berth in UQP South

Soil Layer	Depth	Property
Upper soft clay Layer	-2.2m to -6.5m	Cohesion: 24.5kN/m^2
Sand Layer	-6.5m to -10.0m	30 to 40 N-value, 35°φ
Clay/clay-sand Layer	-10m to -15m	40 to 50 N-value, 35°φ
Sand/sand-gravel Layer	-15m to -22m	30 to 50 N-value
Sand-gravel bearing layer	-22m and down	50and more N-value

Source: Preliminary Studies of UM QASR CONTAINER TERMINAL (1971), PCKK

f) Tidal Current

Tidal current is about 3.1 knot for ebb tide and 3.0 knot for flood tide maximum.

g) Existing Port Facilities

The section of No. 5 berth (construction completion year 1997) in Umm Qasr Port as the typical example of port facilities is described in Appendix 5.5-1. Presently, the existing piled pier has damage, especially the corrosion of sheet piles, and damage to and collapse of the fenders.

h) Preliminary Design Condition of Berth and Yard for Redevelopment Project of UQP South

Table 5.5-3shows the preliminary design condition of berth and yard for redevelopment project of UQP South.

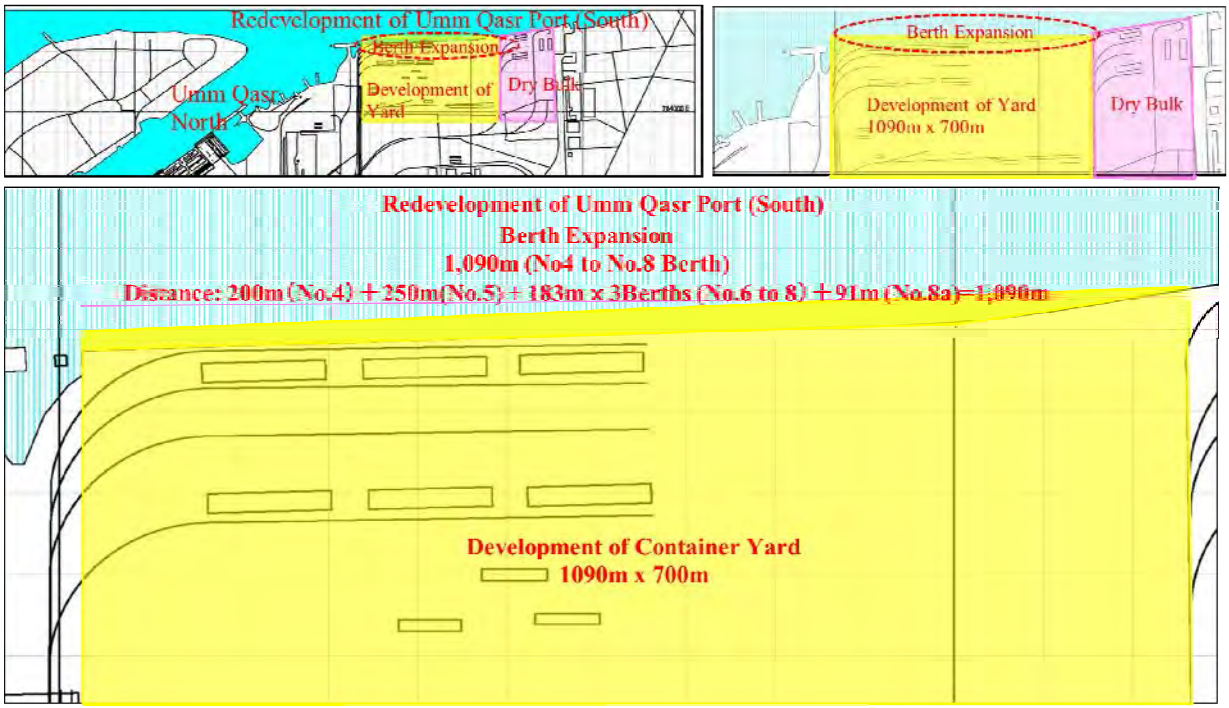
Table 5.5-3 Preliminary Design Condition of Berth and Yard for Redevelopment Project of UQP South

① Berth specification	Crown height	+7.0m
	Planning depth	13.0m
② Design Condition	Maximum design ship(Container Ship)	LOA: 198.9m
		Maximum draft: 12.0m
		DWT: 41,771tons
	Minimum design ship (Container Ship)	LOA: 139m
		Maximum draft: 7.9m
		DWT: 10,000tons
	Gantry Crane	For Panamax ship, 1,000ton of one Gantry Crane
	RTG (Container Stacking in 6 rows and 5 tires)	Span: 23.5m
		Number of wheels: 8
		Max. wheel load: 35t/wheel
	Container stacking yard	5 tiers (20, 40ft container)
	Reach Stacker	Lifting load: 45t
③ Natural condition	Tide	HHWL：＋5.5m, LLWL:-0.5m
	Maximum wind velocity	17．5m/s (34 knot)
	Design CBR	More than 10
	K30at sub-grade	More than 70

Source: JICA Study Team

i) Structure Outline of Redevelopment Project of UQP South

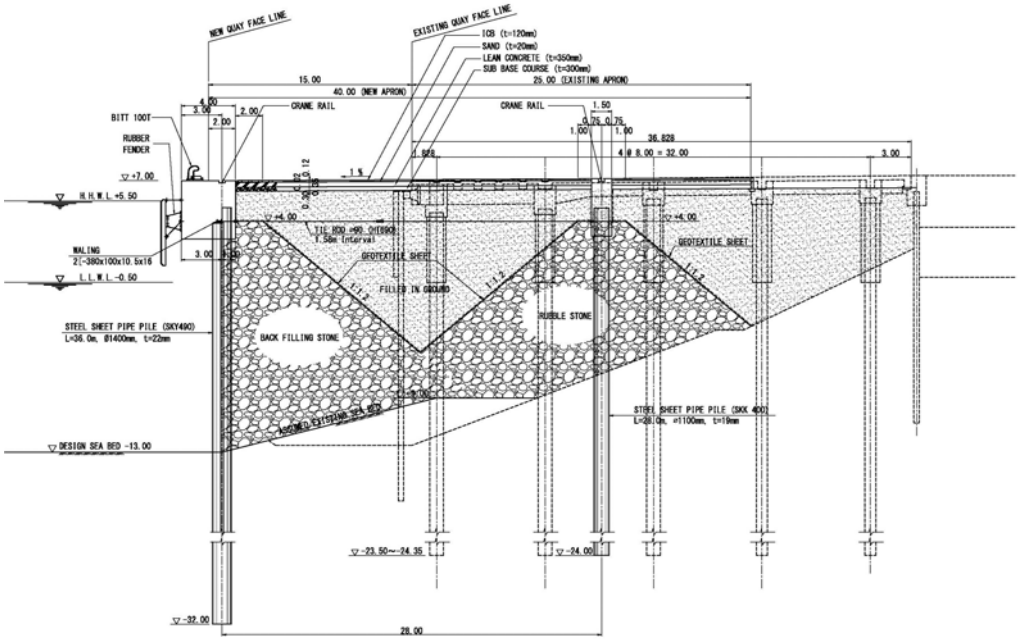
The existing berth from No. 4 to No. 8 (1,090m in length) is planned for redevelopment, as a container berth with a straight wharf face line, by expansion of between 15m to 19m in front of the existing wharf. The container handling equipment planned is the installation of 2 gantry cranes in each berth, and after removal of existing sheds the installation of 8 RTGs in container yards behind each berth.



Source: JICA Study Team

Figure 5.5-8 Section of No. 4 to No. 8 Berth in UQP South

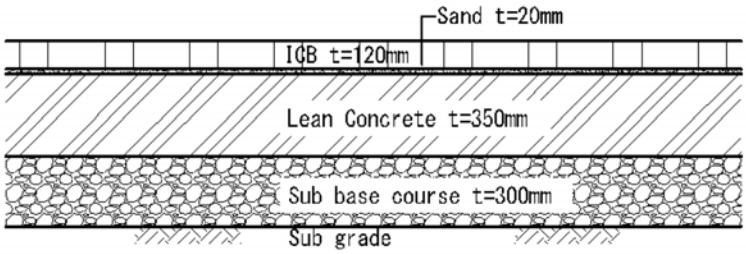
The wharf structure design is a steel sheet pipe pile structure. The typical standard section is described in the following Figure 5.5-9. The upper structure of the existing berth shall be removed, but existing piles may remain in the reclamation. Container handling crane on the wharf is planned, and installation of container gantry crane rails on the steel sheet piles and steel piles of anchorage.



Source: JICA Study Team

Figure 5.5-9 Section of No. 5 Berth in UQP (South) Redevelopment

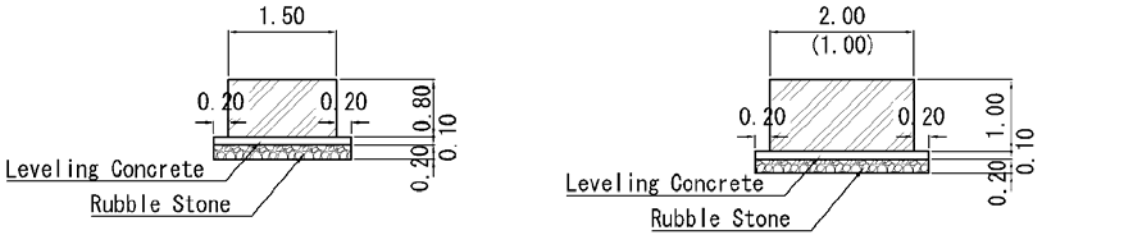
Based on the workability points under the natural condition in the Basrah area, the container yard structure is applied ICB pavement (120mm in thickness of ICB) and selected heavy duty pavement.



Source: JICA Study Team

Figure 5.5-10 Section of Container Yard Pavement

The foundation of RTG passing line and container stacking area (maximum 5 tiers) use a concrete foundation as shown in Figure 5.5-11.



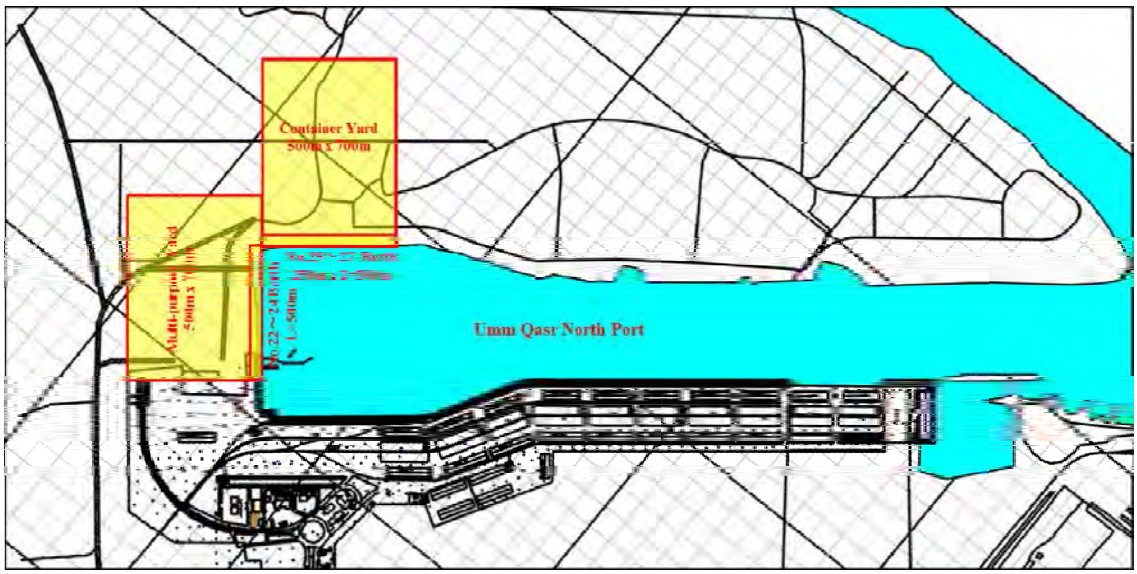
Concrete Foundation for RTG Passing Line **Concrete Foundation for Container Stacking Area**

Source: JICA Study Team

Figure 5.5-11 Section of Concrete Foundation in Container Yard

j) Structure Outline of No. 22 to No. 27 in the Development Project of UQP North

The location of the No. 22 to No. 27 berths and yards in the development of UQP North is described as follows.

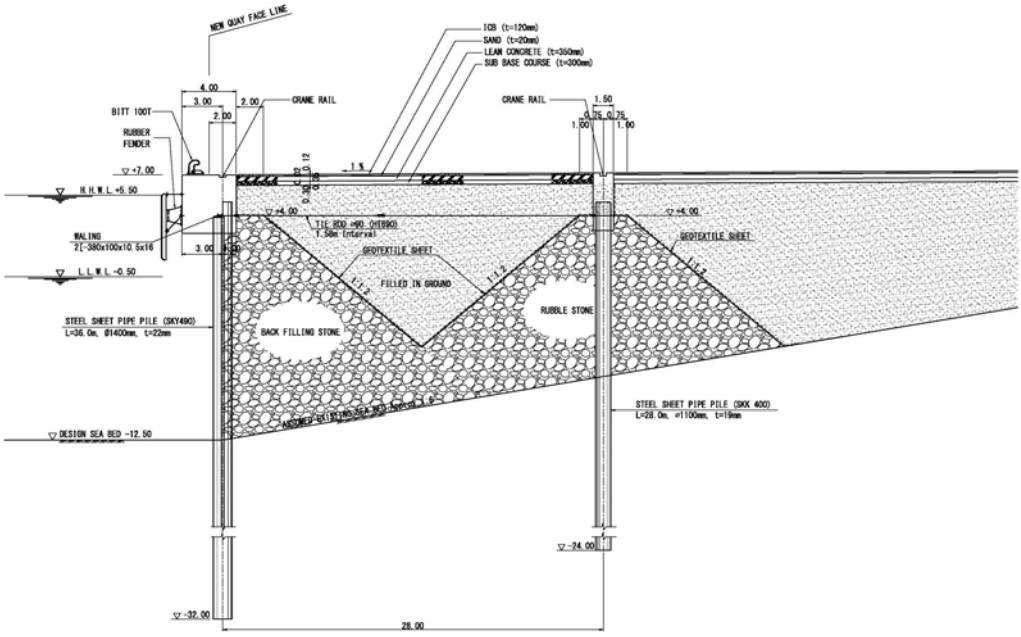


Source: JICA Study Team

Figure 5.5-12 Location of No. 22 to No. 27 berths and yards in the development of UQP North

No. 25 to No. 27 berths (500m in total length) in the UQP North are planned to develop into container berths. The container handling equipment planned is: the installation of 4 gantry cranes in three berths, and the installation of 16 RTGs in container yards behind these berths.

In almost the same design condition, but with 12.5m depth planned in UQP North redevelopment, the wharf structure design is a steel sheet pipe pile structure. The typical standard section is described in the following Figure 5.5-13. The container gantry crane on the wharf is planned with the installation of the crane rails on the steel sheet piles and steel piles anchorage.



Source: JICA Study Team

Figure 5.5-13 Typical Section of No. 25 to 27 Berth in UQP North Development

The container yard structure behind No. 25 to No. 27 will have ICB pavement, same as Umm Qasr South Port Development. No. 22 to 24 (500m in total length) berths are also steel sheet pipe pile structured, with 12.5m in planned depth.

k) Redevelopment Plan for Port Grounds of UQP and Development of Utilities

The redevelopment plan for port grounds of UQP is as follows.

1) Yard redevelopment behind No. 12 & 13 berths in UQP North after removal of sheds (ICB pavement after removal of sheds)
2) Yard redevelopment of area behind No. 14 to No. 19 of general cargo berths in UQP North (ICB pavement)
3) Container yard redevelopment behind No. 20 to 21 in UQP North (ICB pavement)
4) Port access road development behind UQP North and behind UQP South (ICB pavement, 2 lanes per 1 direction)
5) Track parking development (Gravel pavement)
6) Main road development (ICB pavement)
7) Rail Terminal development (Reuse of the existing rails and new rail installation)
8) Loop railway development (Reuse of the existing rails and new rail installation)
9) Main gates Development of UQP South and North (RC building)
10) Relocation of management office (RC building)
11) Reserving of logistic center area (Gravel pavement)

Moreover, development of utilities is planned as follows.

1) Expansion project of the water supplement facilities (seawater desalination facilities)

2) Expansion project of the electricity facilities (electric cable installation)
3) Development of IT system (VMS, Container handling management system, gate management system, rail terminal management system, etc.)
4) Expansion of sewerage treatment facilities (activated sewerage treatment)

(2) Khor Al Zubayr Port

1) Tides

Based on the design condition of tides for Khor Al Zubayr Port by the Consultant in England, HWL=+5.35 and LWL=0.00m are applied for this Khor Al Zubayr redevelopment project. Moreover, HHWL+5.5m and LLWL=-0.5m (tides for preliminary design in Umm Qasr redevelopment project) are also considered for this project.

2) Design Seismic Coefficient for Quay wall Structure

Based on the seismic intensity of Basrah area and other data in the previous Section 5.5.1 (1) c), preliminary design seismic coefficient is determined as follows.

- Horizontal Design Coefficient kh=0.05g
- Vertical Design Coefficient kv=0.00g

3) Subsoil Conditions

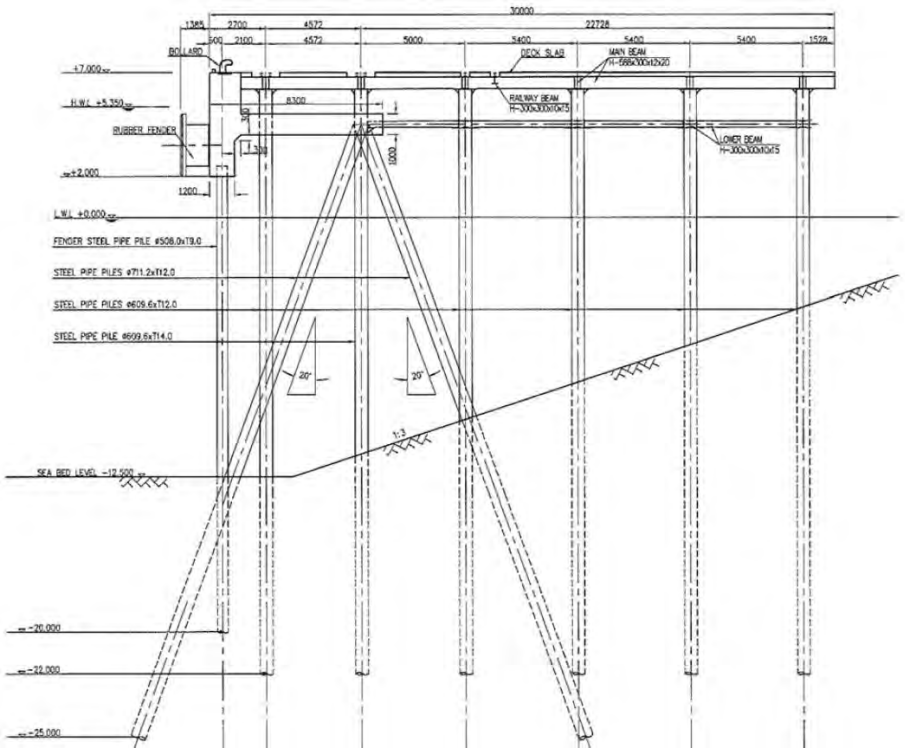
The previous Section 2.2.2 described the results of subsoil investigation in Khor Al Zubayr Port. The bearing layer is estimated at 18 to 19 m, based on subsoil investigation results.

4) Tidal Current, Waves and Wind Velocity

In the previous Section 5.5.1 (1) f), tidal current is about 3.1 knot for ebb tide and 3.0 knot for flood tide maximum. In the previous Section 5.5.1 (1) b) and d), the described data is considered.

5) Existing Port Facilities

The typical section of piled pier facilities in Khor Al Zubayr Port is described in the following Figure 5.5-14.



Source: Tender drawing of Khor Al Zubayr Port

Figure 5.5-14 Section of Piled Quay in Khor Al Zubayr Port

6) Preliminary Design Condition of Berth and Yard for Redevelopment Project of KZP

Table 5.5-4 shows the preliminary design condition of berth and yard for redevelopment project of KZP

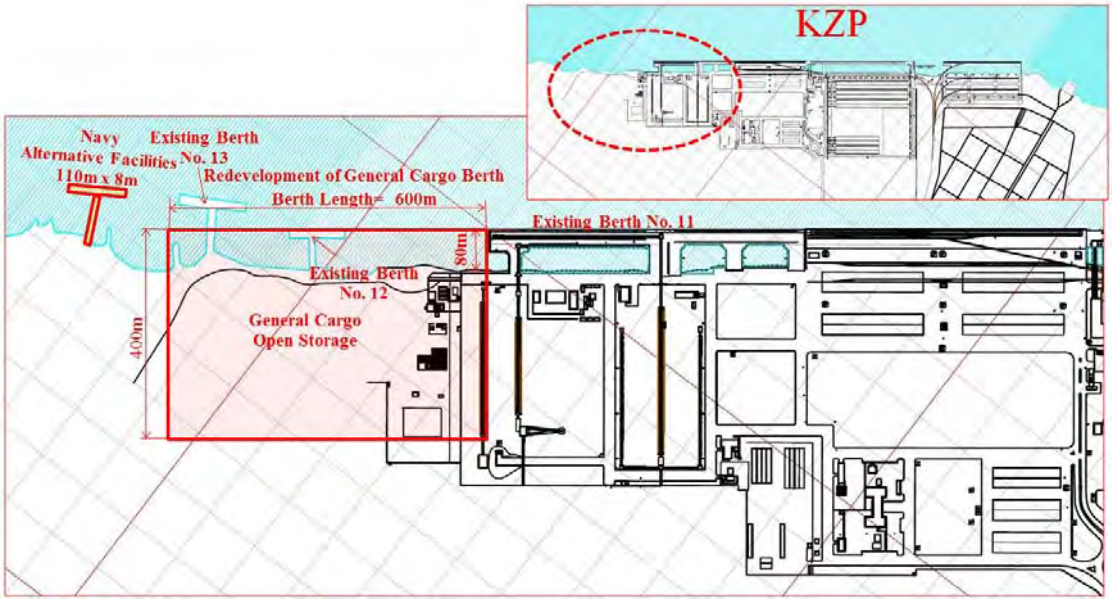
Table 5.5-4 Preliminary Design Condition of Berth and Yard for Redevelopment Project of KZP

① Berth specification	Crown height	+7.0m
	Planning depth	12.5m
	Maximum design ship(General Cargo Ship)	DWT: 25,000tons
	Mobile Crane	Lifting Capacity: Loaded Container 40’
② Natural condition	Tide	HWL：＋5.5m, LWL:-0.5m
	Maximum wind velocity	17．5m/s (34 knot)
	Design CBR	More than 10
	K30at sub-grade	More than 70

Source: JICA Study Team

7) Structure Outline of Redevelopment Project of No. 11 and No. 12 in KZP

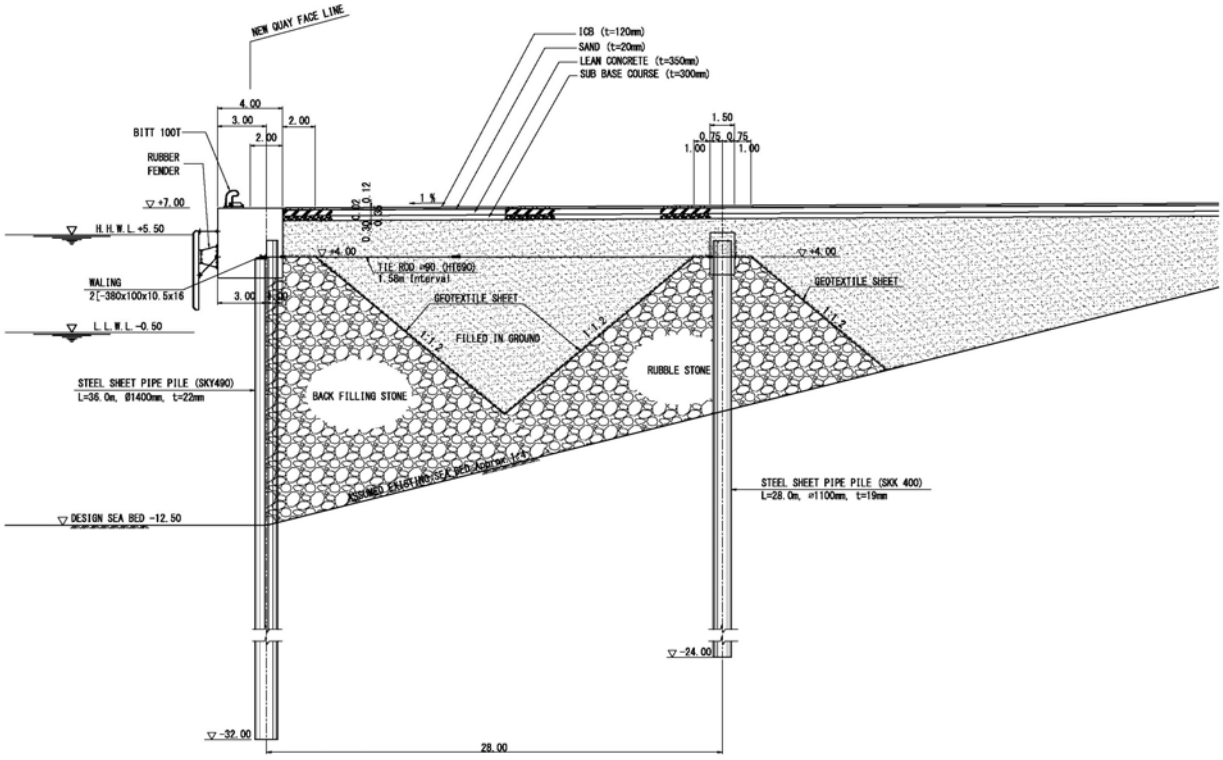
The existing berth No. 11 and No. 12 are planned to redevelop into general cargo berths (600m in length) with a straight wharf face line from the end of existing berth No. 10. Planned berth depth is -12.5m and open storage behind berths is planned in redevelopment. Main cargo handling equipment is mobile crane.



Source: JICA Study Team

Figure 5.5-15 Layout of No.11/12 berth in KZP (2035)

The steel sheet pipe pile wharf structure is applied, same as UQP. Wharf planned depth is -12.5m in elevation. The typical standard section is described in Figure 5.5-16.



Source: JICA Study Team

Figure 5.5-16 Section of No.11/12 berth in KZP

Open storage of general cargo will have ICB pavement (120mm in thickness of ICB) and selected heavy duty pavement.

(3) Redevelopment of Abu Flus Port

1) Existing Wharf Structure

The existing wharf structure is simplified structure (18m in berth width) of the steel covering panel deck on H shaped beams on steel pipe piles. No. 3 berth in Abu Flus Port cannot operate because of the damaged steel covering panel deck.

Source: JICA Study Team

Figure 5.5-17 Berth Structure of Abu Flus Port

2) Preliminary Design Condition of No. 3 Berth Redevelopment Project of Abu Flus Port

Table 5.5-5 shows the preliminary design condition of No. 3 berth for redevelopment project of Abu Flus Port.

Table 5.5-5 Preliminary Design Condition of No. 3 Berth Redevelopment Project of Abu Flus Port

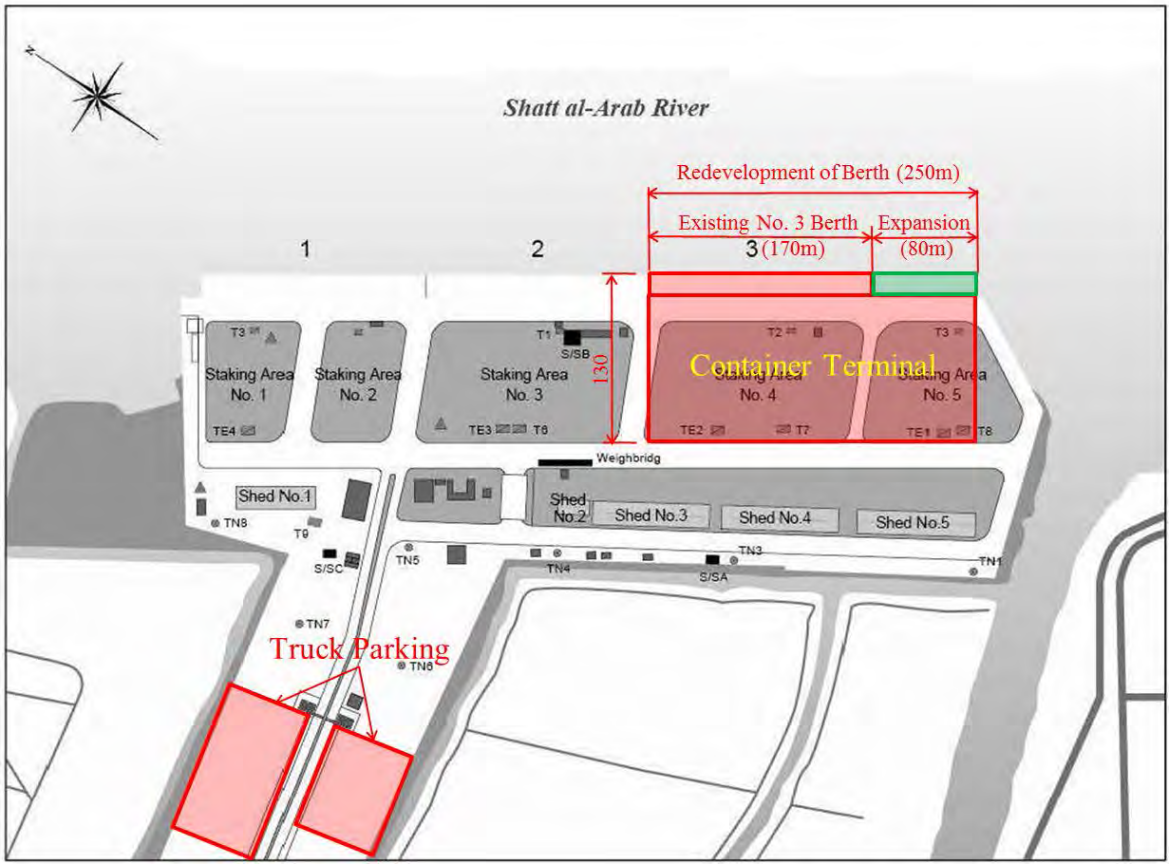
1. Berth specification	Crown height	+5.0m
	Maximum design ship (container ship)	30,000DWT
	Mobile Crane	Lifting Capacity: Loaded Container 40’
2. Natural condition	Tide	HHWL: ＋3.1m, LLWL: 0.4m
	Maximum wind velocity	17. 5m/s (34 knot)
	Design CBR	More than 10
	K30at sub-grade	More than 70

Source: JICA Study Team

a) Structure Outline of Redevelopment Project of No. 12 and No. 13 in KZP

Figure 5.5-18 shows the layout of redevelopment of Abu Flus No. 3 berth. The upper structure of the existing No. 3 (170m in length) berth is planned to change from H shaped beam /steel covering panel deck to RC concrete deck. Structure of expansion berth (80m in length) is also same RC concrete deck on steel pipe pile. In the next detailed design stage, load testing shall be conducted for confirmation of the existing pile bearing capacity for determination of structure.

Container yard behind berth and truck parking area will have ICB pavement (120mm in thickness of ICB) and selected heavy duty pavement.



Source: JICA Study Team

Figure 5.5-18 Berth Structure of Abu Flus Port

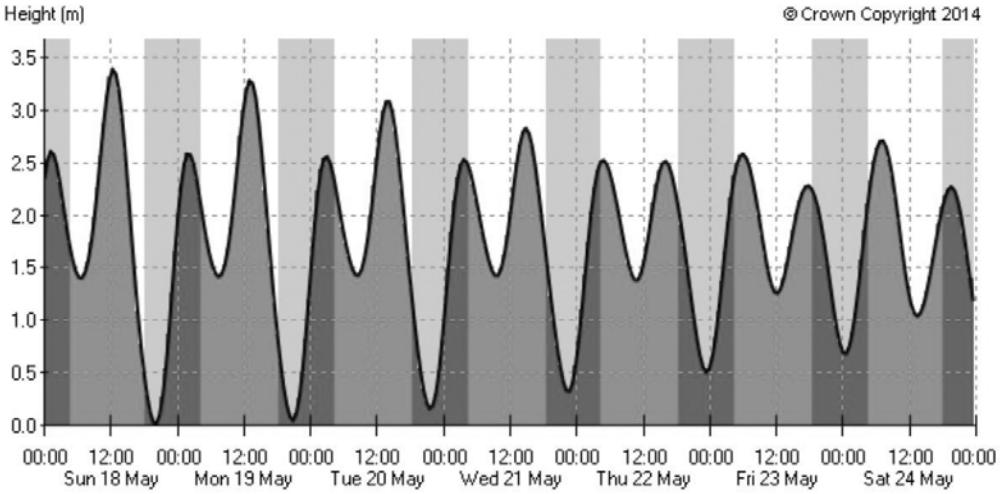
(4) Al Faw Grand Port (AFGP)

1) Tides

Shatt al Arab outer bar is located at offshore of AFGP. Based on the Admiralty Tide Tables vol. 3 "Indian Ocean and South China Sea-NP 203-08", tidal level in Shatt Al Arab outer bar was described as follows:

MHHW: +3.00
MLHW: +2.40
MSL: +1.74
MHLW: +1.30
MLLW: +0.40

Moreover, based on the tidal table (2013) published by GCPI, highest tide is +3.5m, and lowest tide is -0.4m. This data is also considered in the preliminary design condition. The following graph shows the estimation of tidal variation in one week, and the tide in Shatt al Arab outer bar is semi-diurnal (two high tides and two low tides each day) as shown in Figure 5.5-19.



Source: Hydrographic Office, Admiralty Easytide, UK

Figure 5.5-19 Estimation of Tidal Variation (18 May 2014 to 24 May 2014) in Shatt Al Arab outer

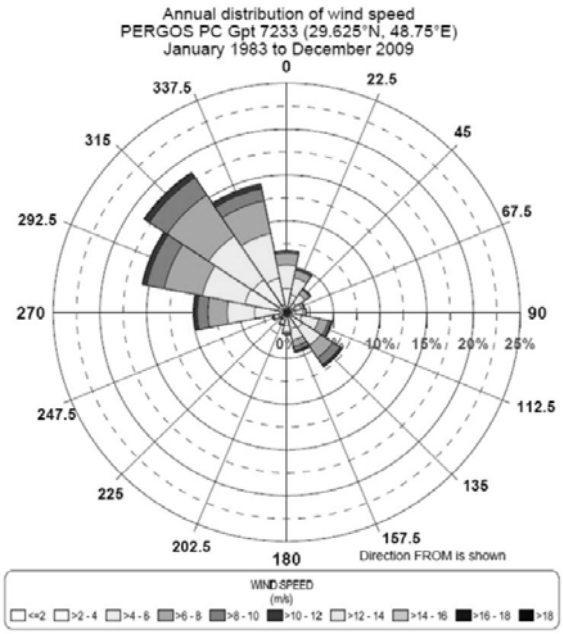
2) Design Seismic Coefficient for Quay wall Structure

Based on the seismic intensity of Basrah area and other data in the previous Section 5.5.1 (1) c), preliminary design seismic coefficient is determined as follows.

- Horizontal Design Coefficient kh=0.05g
- Vertical Design Coefficient kv=0.00g

3) Wind Velocity

Majority of winds come from north-west direction in the following wind rose in Pergos PC Gpt 7233(29.625°N, 48.75°E), offshore of AFGP. Wind speed less than 10 knots.

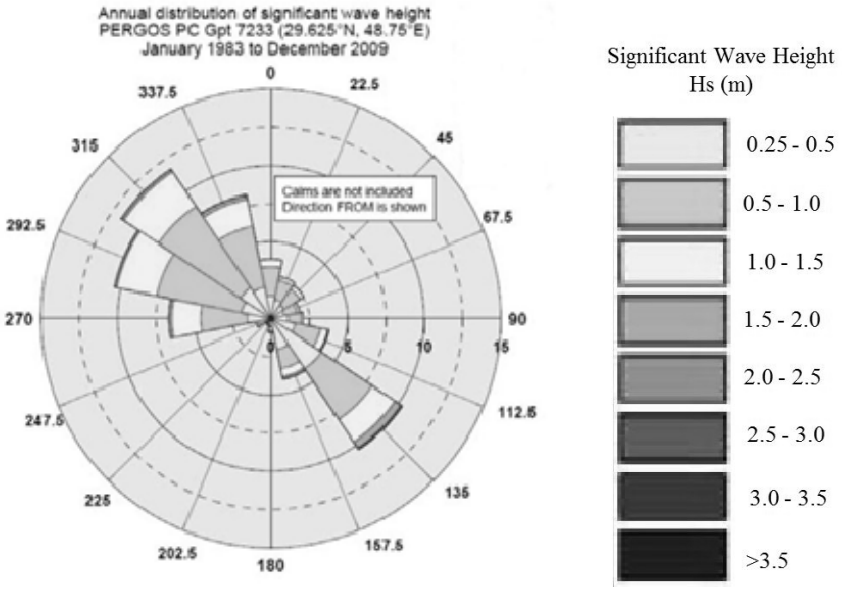


Source: Port Master Plan Report for New Al Faw Port, Consortium CECAF

Figure 5.5-20 Wind Rose of Offshore AFGP

4) Wave

Based on the wave direction and significant wave height in Pergos PC Gpt 7233(29.625°N, 48.75°E), offshore of AFGP, the majority of significant wave height observed was less than 1.5m.



Source: Port Master Plan Report for New Al Faw Port, Consortium CECAF

Figure 5.5-21 Wave Direction and Significant Wave Height of Offshore AFGP

Based on the "Port Master Plan Report for New Al Faw Port", Consortium CECAF, the following return period waves are estimated in the location of Pergos PC Gpt 7233(29.625°N, 48.75°E).

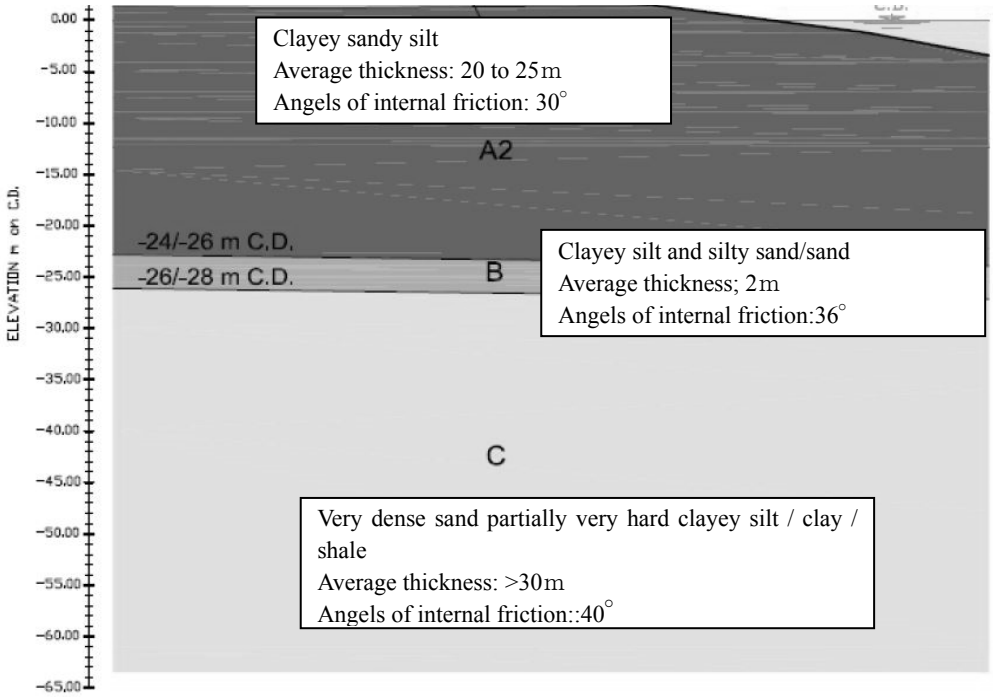
Table 5.5-6 Return Period Waves

Return Period (years)	Significant Wave Height Hs (m)	Peak Wave Period Ts (m)
1	2.3	6.2
5	2.7	6.9
10	2.9	7.4
25	3.2	8.0
50	3.5	8.5
75	3.6	8.7
100	3.7	8.9
200	4.0	9.3
500	4.3	9.9

Source: Port Master Plan Report for New Al Faw Port, Consortium CECAF

5) Subsoil Conditions

According to the "Port Master Plan Report for New Al Faw Port", Consortium CECAF, the following soil layer composition and soil properties are applied as subsoil conditions.



Source: Port Master Plan Report for New Al Faw Port, Consortium CECAF

Figure 5.5-22 Soil Layer Composition and Properties for AFGP

6) Preliminary Design Condition of Berth and Yard for AFGP

The following list shows the preliminary design condition of berth and yard for AFGP.

Table 5.5-7 Preliminary Design Condition of Berth and Yard for AFGP

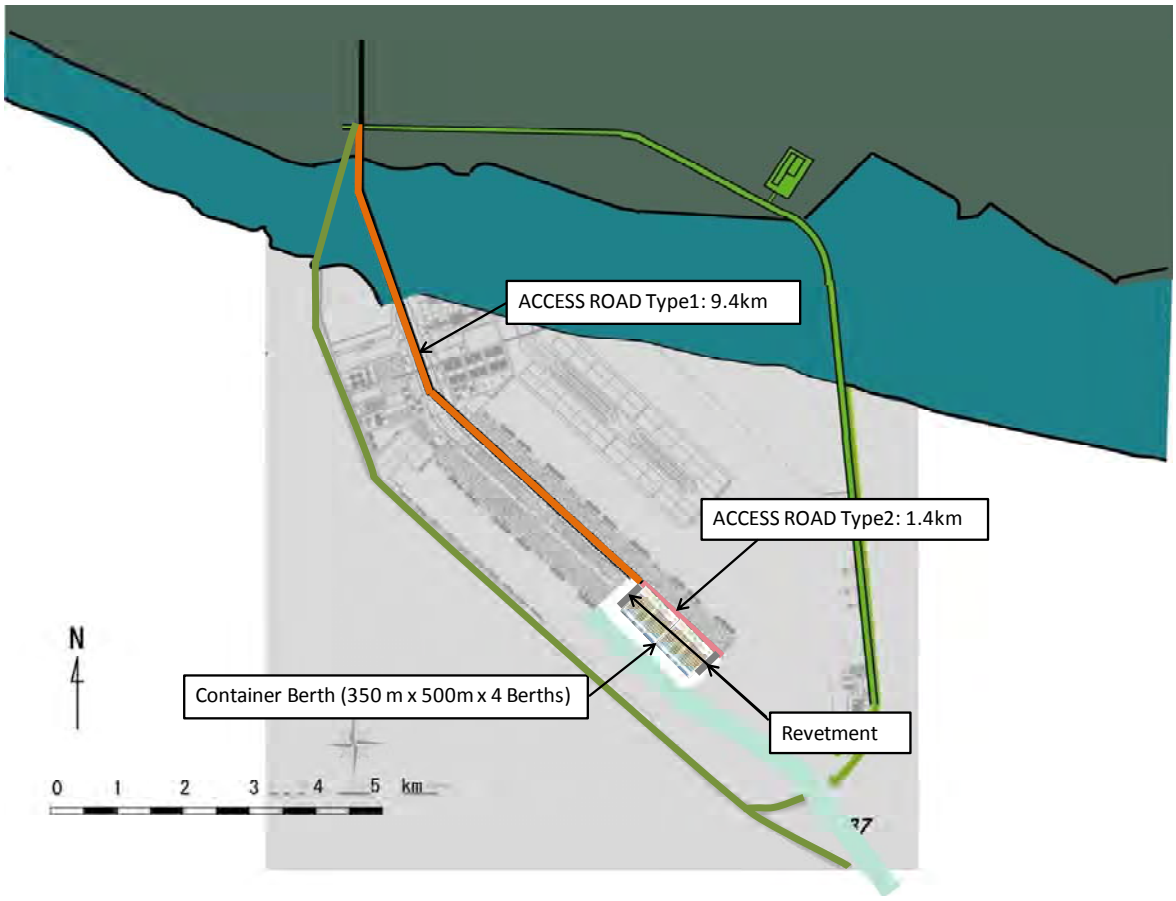
① Berth specification	Crown height	+5.5m
	Planning depth	16.0m
② Design Condition	Maximum design ship(Container Ship)	LOA：350m
		Maximum draft: 14.7m
		DWT：100,000tons
	Gantry Crane	For Post-panamax ship, 1,600ton of one Gantry Crane
	RTG (Container Stacking in 6 rows and 5 tires)	Span: 23.5m
		Number of wheels: 8
		Max. wheel load: 35t/wheel
	Container stacking yard	5 tiers (20, 40ft container)
	Reach Stacker	Lifting load: 45t
④ Natural condition	Tide	HHWL：＋3.0m, LLWL：0.0m
	Maximum wind velocity	23.4m/s
	Design CBR	More than 10
	K30at sub-grade	More than 70

Source: JICA Study Team

7) Structure Outline of Al Faw Ground Port

The berths have a length of 1,400m (1 berth: 350m, total 4 berths) in AFGP, and are estimated to have -14m depth of wharf in 2035. However, in considering future trends of deeper vessels, the preliminary design will be -16m in depth of wharf for post-panamax container vessels. The container handling equipment planned for installation is 2 gantry cranes in each berth and the installation of 8 RTGs in container yards behind each berth.

Furthermore, access road (total distance: 10.8km) behind berths and revetments of both sides of berths are planned for construction. The layout is as follows.



Source: GCPI, JICA Study Team

Figure 5.5-23 Layout of AFGP (2035)

The wharf structure is a steel sheet pipe pile structure, same as UQP. Wharf planned depth is 16m (beginning elevation: -14m). The typical standard section is described in Appendix 5.5-3. Container handling crane on the wharf is planned installation of container gantry crane rails on steel sheet piles and steel piles of anchorage.

5.5.2 Preliminary Cost Estimates

The approximate project cost for Long-term Development Plan (year 2035) is estimated in this Section. The project cost includes all important project components for both major ports and major channels selected in Sections 5.5.1.

(1) Conditions of the estimation

Basic conditions for the estimation are as follows;

1) Base year for the estimation

Year 2014

2) Exchange rates

1 US Dollar (USD) = 101.7208 Japanese Yen (JPY)
1 US Dollar (USD) = 1,162.9935 Iraqi Dinar (IQD)

3) Contingency

Percentages below are adopted for the calculation of contingencies for both reserves and price escalation.

Contingency for Construction	: 20%
Contingency for Engineering Services	: 15%

4) Administration cost and others

The costs of the listed below are taken into account.

Land acquisition and compensation cost	: not included
Administration cost	: 5.0% of each construction cost and engineering services cost
Value added tax	: not included
Sales and other taxes	: not included

(2) Important Project Components

Important project components in major ports and major channels for both Short/Mid-term and Long-term Development Plans are shown in Table 5.5-8 through Table 5.5-12.

Table 5.5-8 Important Project Components for UQP

No.	Project Component	Long-term Development (2035)
1.	**Important Project Components in Main Ports**	
1.1	**UQP-North Berth No.25, 26 & 27 (Container Terminal)**	
1.1.1	New Berth No.25, 26 & 27	600 m (200 m x 50 m (-12.5m) x 3 berths)
1.1.2	Container Yard: Reclamation	1,340,000 m3
1.1.3	Container Yard: Soil Improvement	335,000m2
1.1.4	Container Yard: Pavement	335,000m2
1.1.5	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.
1.1.6	Cargo Handling Equipment: Gantry Crane	4sets
1.1.7	Cargo Handling Equipment: RTG	8 sets (to be confirmed)
1.1.8	Cargo Handling Equipment: Mobile Crane	3 sets
1.1.9	Cargo Handling Equipment: Reach Stacker	10 sets
1.1.10	Cargo Handling Equipment: Top/Side Lifter	6 sets
1.1.11	Cargo Handling Equipment: Tractor & Chassis	13 sets
1.2	**UQP-North Berth No.22 & 23 (General/RoRo/Container Terminal)**	
1.2.1	New Berth No.22 & 23	400m (3 berths)
1.2.2	Yard: Recclamation	1,200,000m3
1.2.3	Yard: Soil Improvement	600,000m2
1.2.4	Yard: Pavement	600,000m2
1.2.5	Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.
1.2.6	Removal of existing berths	400m (3 berths)
1.3	**UQP-North Container Stacking Yard behind of Berth No.20 & 21**	
1.3.1	Container Yard: Pavement	560,000m2 (800m x 700m)
1.3.2	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.
1.4	**UQP-South Berth No.4 ~ No.8a (Container Terminal)**	
1.4.1	Reinforcement / Expansion of Berth No.4	200m x 15m (-13.0m)
1.4.2	Reinforcement / Expansion of Berth No.5	250m x 15m (-13.0m)
1.4.3	Reinforcement / Expansion of Berth No.6	183m x 15m (-13.0m)
1.4.4	Reinforcement / Expansion of Berth No.7	183m x 15m (-13.0m)
1.4.5	Reinforcement / Expansion of Berth No.8	183m x 15m (-13.0m)
1.4.6	Reinforcement / Expansion of Berth No.8a	91m x 15m (-13.0m)
1.4.7	Removal of existing sheds	6 Sheds, 36,000m2 (150m x 40m x 6 shed)
1.4.8	Container Yard: Pavement	730,300m2
1.4.9	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.
1.4.10	Cargo Handling Equipment: Gantry Crane	7 sets for each terminals (545.0m x 2)
1.4.11	Cargo Handling Equipment: RTG	21 sets for each terminals (545.0m x 2)
1.4.12	Cargo Handling Equipment: Mobile Crane	-
1.5	**UQP Area Redevelopment (except for 1.1、1.2、1.3、1.4)**	
1.5.1	Truck Parking	1,500,000m2 (1.5km x 1.0km)
1.5.2	South Port Truck Terminal	L.S.
1.5.3	Administration Building	200,000m2 (200m x 200m x 5 floors)
1.5.4	Main Gates for North Port and South Port	2 Gates
1.5.5	Logistic Center (Bonded Zone) EPZ	1,500,000m2 (500m x 1,500m x 2 area)
1.5.6	Logistic Center	600,000m2 (300m x 2,000m)
1.5.7	General Cargo Terminal/Yard	600,000m2 (1,200m x 500m)
1.5.8	Container Terminal/Stacking Yard behind of No.12 & 13	400,000m2 (400m x 1,000m)
1.5.9	International Container Terminal (ICT)	L.S.
1.5.10	Removal of Existing Sheds behind of Berth No.12 & 13	4 Sheds, 24,000m2 (150m x 40m x 6 shed)
1.5.11	Removal of Existing Jib Cranes	24 nos
1.5.12	Removal of Existing Rails	L.S.
1.5.13	Construction of New Rails	L.S.
1.5.14	New Roads in Port Area	80,000m2 (8m x 10,000m)

Source: JICA Study Team

Table 5.5-9 Important Project Components for KZP, AFGP, Others

No.	Project Component	Long-term Development (2035)
1.6	**KZP Berth No.11 & 12 (General Cargo Terminal)**	
1.6.1	New Berth No.11	300m x 400m (-12.5m)
1.6.2	New Berth No.12	300m x 400m (-12.5m)
1.6.3	Dredging in front of Bert No.11 & 12	500,000m3
1.6.4	Yard: Recclamation	960,000m3
1.6.5	Yard: Soil Improvement	222,000m2
1.6.6	Yard: Pavement	222,000m2
1.6.7	Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.
1.6.8	Removal of Existing Berth No.11, 12 & 13	L.S.
1.6.9	Relocation of Berth No.11	L.S.
1.6.10	Relocation of Berth No.12	L.S.
1.6.11	New Navy Berth No.13 (substitution of old Berth No. 11)	L.S.
1.7	**KZP Area Redevelopment (except for 1.6)**	
1.7.1	New Open Storage Yard 1	250,000 m2, (500m x 500m)
1.7.2	New Open Storage Yard 2	250,000 m2, (500m x 500m)
1.7.3	New Open Storage Yard 3	250,000 m2, (500m x 500m)
1.7.4	New Iron Ore Yards at Berth No. 9 & 10	224,000 m2, (560m x 400m)
1.7.5	New Work Shop behind of No. 9 & 10	112,000 m2, (560m x 200m)
1.7.6	New Sheds at Work Shop behind of No. 9 & 10	3 Sheds, 20,000m2 (100m x 20m x 3 shed)
1.7.7	Removal of Existing Sheds behind of No. 7 & 8	4 Sheds, 28,800m2 (180m x 40m x 4 shed)
1.7.8	Removal of Existing Belt conveyors behind of No. 5 & 6	L.S.
1.7.9	Infrastructure (utility, electricity, drainage etc.)	L.S.
1.7.10	Truck Parking Area	150,000m2, (500m x 300m)
1.7.11	Administration Custom Office Building	150,000m2, (250m x 300m x 2floors)
1.7.12	Rail Terminal	L.S.
1.8	**Abu Flus Port Redevelopment**	
1.8.1	Rehabilitation of Berth No.3 for Container Terminal	250m
1.8.2	Container Staking Yards	25,000m (250m x 100m)
1.8.3	Cargo Handling Equipment: Mobile Crane	3 sets
1.9	**Al Maqil Port Redevelopment**	
1.9.1	River Crossing Bridge	1,000 m x 4 lanes
1.9.2	Yard Rehabilitation	
1.10	**Al Faw Ground Port**	
1.10.1	New Container berth No.1	**350m x 500m (-16.0m)**
1.10.2	New Container berth No.2	**350m x 500m (-16.0m)**
1.10.3	New Container berth No.3	**350m x 500m (-16.0m)**
1.10.4	New Container berth No.4	**350m x 500m (-16.0m)**
1.10.5	New Container berth No.5	-
1.10.6	New Container berth No.6	-
1.10.7	New Container berth No.7	-
1.10.8	New Container berth No.8	-
1.10.9	New Container berth No.9	-
1.10.10	Access Channel Dredging	26,230,000 m3, inner channel: -16.0m
1.10.11	Access Road TYPE-1	5,000m
1.10.12	Access Road TYPE-2	1,400m
1.10.13	Revetment	900 m
1.10.14	Highway AFGP-UQP: Part-1 connecting to Al Faw Port	21.0 km (16.0km + 5.0km)
1.10.15	Highway AFGP-UQP: Part-2	33.5 km
1.10.16	Highway AFGP-UQP: Part-3, incl tunnel approach	10.3 km
1.10.17	Highway AFGP-UQP: Part-4 from Safwan city, incl tunnel approach	12.4 km
1.10.18	Highway AFGP-UQP: Tunnel between Part 3 and Part 4	5,000 m (main tunnel 2,000m)
1.10.19	Cargo Handling Equipment: Gantry Crane	12 sets, 3 sets x 4 berths
1.10.20	Cargo Handling Equipment: RTG	36 sets, 9 sets x 4 berths
1.10.21	Cargo Handling Equipment: Top/Side Lifter	6 sets
1.10.22	Cargo Handling Equipment: Tractor & Chassis	13 sets
1.10.23	West Breakwater	16.0 km
1.10.24	East Breakwater (assumed as 35% in progress)	8.0 km

Source: JICA Study Team

Table 5.5-10 Important Project Components for Waterways

No.	Project Component	Long-term Development (2035)			
2.	**Important Project Components for Major Waterways**	**Depth**	**Width**	**Length**	**Dredging**
		(m)	(m)	(km)	(Mil. m3)
2.1	**Khawar Abdallah Channel**	-	-	-	71.00
2.2.1	Abdallah Channel	-	-	-	68.00
2.2.2	Wreck Removal (1 at buoy No.3 to No.25)	1 wreck			
2.2.3	Umm Qasr Channel	**-12.5**	300	25.10	3.00
2.2.4	Wreck Removal (6 along channel, 3 at berth No.9)	9 wrecks			
2.2.5	Khor Al-Zubayr Channel	-12.5	200/300	17.60	0.00
2.2.6	Wreck Removal (4 along channel)	4 wrecks	(by Phase II)		
2.2	**Shatt Al Arab Channel**			144.00	16.00
2.2.1	Mouth area	-8	150	10.50	8.50
2.2.2	Mouth to Abu Flus Port	-8	120/150	106.50	7.00
2.2.3	Abu Flus Port to Maquil Port	-10	120/150	27.00	0.50
2.2.4	Wreck Removal	Approx. 33 wrecks			
2.3	**AFGP Access Channel**	-	-	-	49.00
2.3.1	AFGP Access Channel	-16.0	200	60.00	49.00

Source: JICA Study Team

(3) Preliminary Project Cost

The preliminary project costs by aforementioned options of the important project components are estimated as shown in Table 5.5-11 and Table 5.5-12.

Table 5.5-11 Project Cost Summary (Long-term Development Plan)

No.		Project Components	Q'ty	FC 1,000USD	LC 1,000USD	Total 1,000USD
A.	Procurement & Construction			0	10,479,136	10,479,136
	1.	Important Project Components for Main Ports		0	6,477,613	6,477,613
	1.1	UQP-North Berth No.25 - 27 (Container Terminal)	1	0	391,581	391,581
	1.2	UQP-North Berth No. 22, 23 & 24 (General/Roro/Container Terminal)	1	0	335,302	335,302
	1.3	UQP-North Container Stacking Yard behind of Berth No.20	1	0	106,232	106,232
	1.4	UQP-South Berth No.4 to No.8a (Container Terminal)	1	0	776,821	776,821
	1.5	UQP Area Redevelopment (except for 1.1, 1.2, 1.3 & 1.4)	1	0	420,758	420,758
	1.6	KZP Berth No.11 & 12 (General Cargo Terminal)	1	0	293,715	293,715
	1.7	KZP Area Redevelopment (except for 1.6)	1	0	318,957	318,957
	1.8	Abu Flus Port Redevelopment	1	0	14,000	14,000
	1.9	Al Maquil Port Redevelopment	1	0	36,000	36,000
	1.10(1)	AFGP Development (Berth, Access Channel, Cranes)	1	0	1,152,180	1,152,180
	1.10(2)	AFGP Development (Inner Access Road)	1	0	167,648	167,648
	1.10(3)	AFGP Development (High Way to AFGP)	1	0	1,504,418	1,504,418
	1.10(4)	AFGP Development (West Breakwater)	1	0	700,000	700,000
	1.10(5)	AFGP Development (East Breakwater, Remaining Works)	1	0	260,000	260,000
	2.	Important Project Components for Waterways		0	2,255,000	2,255,000
	2.1	Khawar Abdallah Channel	1	0	1,115,000	1,115,000
	2.2	Shatt Al Arab Channel	1	0	405,000	405,000
	2.3	AFGP Access Channel	1	0	735,000	735,000
	3.	Base Construction Costs（1.+2.)		0	8,732,613	8,732,613
	4.	Contingency (20.0% of 3.)	20.0%	0	1,746,523	1,746,523
		Contingency（Price Escalation), included in above 4.				0
B.	Engineering Services			0	602,550	602,550
	1.	Base Costs for Engineering (5.0% of A.)	5.0%	0	523,957	523,957
	2.	Contingency (15.0% of 1.)	15.0%	0	78,594	78,594
C.		Sub-total (A.+B.)		0	11,081,686	11,081,686
D.		Administration Costs and others		0	554,084	554,084
	a.	Land Acquisition and Compensation				
	b.	Administration Cost (5.0% of C.)	5.0%	0	554,084	554,084
	c.	Value Added Tax (VAT)				
	d.	Sales and Other Taxes				
E.		Ground Total（C.+D.)		0	11,635,771	11,635,771

Source: JICA Study Team

Table 5.5-12 Project Cost Summary (Alternative Plan)

No.		Project Components	Q'ty	FC 1,000USD	LC 1,000USD	Total 1,000USD
A.	Procurement & Construction			0	10,580,405	10,580,405
	1.	Important Project Components for Main Ports		0	6,562,004	6,562,004
	1.1	UQP-North Berth No.25 - 27 (Container Terminal)	1	0	0	0
	1.2	UQP-North Berth No. 22, 23 & 24 (General/Roro/Container Terminal)	1	0	335,302	335,302
	1.3	UQP-North Container Stacking Yard behind of Berth No.20	1	0	106,232	106,232
	1.4	UQP-South Berth No.4 to No.8a (Container Terminal)	1	0	206,491	206,491
	1.5	UQP Area Redevelopment (except for 1.1, 1.2, 1.3 & 1.4)	1	0	420,758	420,758
	1.6	KZP Berth No.11 & 12 (General Cargo Terminal)	1	0	293,715	293,715
	1.7	KZP Area Redevelopment (except for 1.6)	1	0	318,957	318,957
	1.8	Abu Flus Port Redevelopment	1	0	14,000	14,000
	1.9	Al Maquil Port Redevelopment	1	0	36,000	36,000
	1.10(1)	AFGP Development (Berth, Access Channel, Cranes)	1	0	2,204,118	2,204,118
	1.10(2)	AFGP Development (Inner Access Road)	1	0	162,013	162,013
	1.10(3)	AFGP Development (High Way to AFGP)	1	0	1,504,418	1,504,418
	1.10(4)	AFGP Development (West Breakwater)	1	0	700,000	700,000
	1.10(5)	AFGP Development (East Breakwater, Remaining Works)	1	0	260,000	260,000
	2.	Important Project Components for Waterways		0	2,255,000	2,255,000
	2.1	Khawar Abdallah Channel	1	0	1,115,000	1,115,000
	2.2	Shatt Al Arab Channel	1	0	405,000	405,000
	2.3	AFGP Access Channel	1	0	735,000	735,000
	3.	Base Construction Costs (1.+2.)		0	8,817,004	8,817,004
	4.	Contingency (20.0% of 3.)	20.0%	0	1,763,401	1,763,401
		Contingency (Price Escalation), included in above 4.				0
B.	Engineering Services			0	608,373	608,373
	1.	Base Costs for Engineering (5.0% of A.)	5.0%	0	529,020	529,020
	2.	Contingency (15.0% of 1.)	15.0%	0	79,353	79,353
C.		Sub-total (A.+B.)		0	11,188,778	11,188,778
D.		Administration Costs and others		0	559,439	559,439
	a.	Land Acquisition and Compensation				
	b.	Administration Cost (5.0% of C.)	5.0%	0	559,439	559,439
	c.	Value Added Tax (VAT)				
	d.	Sales and Other Taxes				
E.		Ground Total (C.+D.)		0	11,748,217	11,748,217

Source: JICA Study Team

The approximate project costs for both major ports and major channels by aforementioned options of the important project components are estimated as shown in Table 5.5-13 through Table 5.5-15.

Table 5.5-13 Project Cost Breakdown for UQP (Long-term Development Plan)

No.	Project Component	Particulars	Units	Q'ty	Rate (USD)	Amount (USD)
1.	**Important Project Components in Main Ports**					
1.1	**UQP-North Berth No.25,No.26 & 27 (Container Terminal)**		**Subtotal**			**391,581,324**
1.1.1	New Berth No.25, No.26&No.27	600m (200 m x 50 m (-12.5m) x 3berths)	L.S.	1	117,270,074	117,270,074
1.1.2	Container Yard: Reclamation	1,340,000 m3	m3	1,340,000	35	46,900,000
1.1.3	Container Yard: Soil Improvement	335,000m2	m2	335,000	153	51,255,000
1.1.4	Container Yard: Pavement	335,000m2	m2	335,000	202	67,670,000
1.1.5	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.	式	1	6,986,250	6,986,250
1.1.6	Cargo Handling Equipment: Gantry Crane	4sets	No.	4	14,950,000	59,800,000
1.1.7	Cargo Handling Equipment: RTG	8 sets (to be confirmed)	No.	8	2,300,000	18,400,000
1.1.8	Cargo Handling Equipment: Mobile Crane	3 sets	No.	3	2,000,000	6,000,000
1.1.9	Cargo Handling Equipment: Reach Stacker	10 sets	No.	10	1,000,000	10,000,000
1.1.10	Cargo Handling Equipment: Top/Side Lifter	6 sets	No.	6	1,000,000	6,000,000
1.1.11	Cargo Handling Equipment: Tractor & Chassis	13 sets	No.	13	100,000	1,300,000
1.2	**UQP-North Berth No.22, 23 & 24 (General/RoRo/Container Terminal)**		**Subtotal**			**335,301,751**
1.2.1	New Berth No.22,No.23 & 24	400m (3berths)	L.S.	1	116,846,664	116,846,664
1.2.2	Yard: Recclamation	1,200,000m3	m3	1,200,000	35	42,000,000
1.2.3	Yard: Soil Improvement	600,000m2	m2	600,000	133	79,800,000
1.2.4	Yard: Pavement	585,000m2	m2	585,000	140	81,900,000
1.2.5	Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	12,161,250	12,161,250
1.2.6	Removal of existing berths	400m (3berths)	m	1	2,593,837	2,593,837
1.3	**UQP-North Container Stacking Yard behind of Berth No.20&No.21**		**Subtotal**			**106,232,000**
1.3.1	Container Yard: Pavement	560,000m2 (800m x 700m)	m2	560,000	169	94,640,000
1.3.2	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	11,592,000	11,592,000
1.4	**UQP-South Berth No.4 ~ No.8a (Container Terminal)**		**Subtotal**			**776,821,294**
1.4.1	Reinforcement / Expansion of Berth No.4	200m x 15m (-13.0m)	L.S.	1	52,189,119	52,189,119
1.4.2	Reinforcement / Expansion of Berth No.5	250m x 15m (-13.0m)	L.S.	1	65,236,398	65,236,398
1.4.3	Reinforcement / Expansion of Berth No.6	183m x 15m (-13.0m)	L.S.	1	47,753,043	47,753,043
1.4.4	Reinforcement / Expansion of Berth No.7	183m x 15m (-13.0m)	L.S.	1	47,753,043	47,753,043
1.4.5	Reinforcement / Expansion of Berth No.8	183m x 15m (-13.0m)	L.S.	1	47,753,043	47,753,043
1.4.6	Reinforcement / Expansion of Berth No.8a	91m x 15m (-13.0m)	L.S.	1	23,746,049	23,746,049
1.4.7	Removal of existing sheds	6 Sheds, 36,000m2 (150m x 40m x 6 shed)	No.	6	4,074,354	24,446,124
1.4.8	Container Yard: Pavement	730,300m2	m2	730,300	201	146,790,300
1.4.9	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	15,254,175	15,254,175
1.4.10	Cargo Handling Equipment: Gantry Crane	7 sets for each terminals (545.0m x 2)	No.	14	14,950,000	209,300,000
1.4.11	Cargo Handling Equipment: RTG	21 sets for each terminals (545.0m x 2)	No.	42	2,300,000	96,600,000
1.4.12	Cargo Handling Equipment: Mobile Crane	-	No.	-	2,000,000	0
1.5	**UQP Area Redevelopment (except for 1.1、1.2、1.3、1.4)**		**Subtotal**			**420,758,000**
1.5.1	Truck Parking	1,500,000m2 (1.5km x 1.0km)	m2	1,500,000	23	34,500,000
1.5.2	South Port Truck Terminal	L.S.	L.S.	1	-	0
1.5.3	Administration Building	200,000m2 (200m x 200m x 5 floors)	m2	200,000	800	160,000,000
1.5.4	Main Gates for North Port and South Port	2 Gates	No,	2	5,750,000	11,500,000
1.5.5	Logistic Center (Bonded Zone) EPZ	1,500,000m2 (500m x 1,500m x 2 area)	m2	1,500,000	-	0
1.5.6	Logistic Center	600,000m2 (300m x 2,000m)	m2	600,000	-	0
1.5.7	General Cargo Terminal/Yard	600,000m2 (1,200m x 500m)	m2	600,000	169	101,400,000
1.5.8	Container Terminal/Stacking Yard behind of No.12 & 13	400,000m2 (400m x 1,000m)	m2	400,000	169	67,600,000
1.5.9	International Container Terminal (ICT)	L.S.	L.S.	1	-	0
1.5.10	Removal of Existing Sheds behind of Berth No.12 & 13	4 Sheds, 24,000m2 (150m x 40m x 6 shed)	No,	4	1,150,000	4,600,000
1.5.11	Removal of Existing Jib Cranes	24 nos	No.	24	-	0
1.5.12	Removal of Existing Rails	L.S.	L.S.	1	-	0
1.5.13	Construction of New Rails	L.S.	L.S.	1	26,358,000	26,358,000
1.5.14	New Roads in Port Area	80,000m2 (8m x 10,000m)	m2	80,000	185	14,800,000

Source: JICA Study Team

Table 5.5-14 Project Cost Breakdown for KZP, AFGP, Others (Long-term Development Plan)

No.	Project Component	Particulars	Units	Q'ty	Rate (USD)	Amount (USD)
1.6	**KZP Berth No.11 & 12 (General Cargo Terminal)**		**Subtotal**			**293,715,374**
1.6.1	New Berth No.11	300m x 400m (-12.5m)	L.S.	1	73,585,187	73,585,187
1.6.2	New Berth No.12	300m x 400m (-12.5m)	L.S.	1	73,585,187	73,585,187
1.6.3	Dredging in front of Bert No.11 & 12	500,000m3	m3	500,000	15	7,500,000
1.6.4	Yard: Recclamation	960,000m3	m3	960,000	35	33,600,000
1.6.5	Yard: Soil Improvement	222,000m2	m2	222,000	153	33,966,000
1.6.6	Yard: Pavement	222,000m2	m2	222,000	140	31,080,000
1.6.7	Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	4,899,000	4,899,000
1.6.8	Removal of Existing Berth No.11, 12 & 13	L.S.	L.S.	1	11,500,000	11,500,000
1.6.9	Relocation of Berth No.11	L.S.	L.S.	1	-	0
1.6.10	Relocation of Berth No.12	L.S.	L.S.	1	-	0
1.6.11	New Navy Berth No.13 (substitution of old Berth No. 11)	L.S.	L.S.	1	24,000,000	24,000,000
1.7	**KZP Area Redevelopment (except for 1.6)**		**Subtotal**			**318,957,000**
1.7.1	New Open Storage Yard 1	250,000 m2, (500m x 500m)	m2	250,000	140	35,000,000
1.7.2	New Open Storage Yard 2	250,000 m2, (500m x 500m)	m2	250,000	140	35,000,000
1.7.3	New Open Storage Yard 3	250,000 m2, (500m x 500m)	m2	250,000	140	35,000,000
1.7.4	New Iron Ore Yards at Berth No.9 & 10	224,000 m2, (560m x 400m)	m2	224,000	23	5,152,000
1.7.5	New Work Shop behind of No.9 & 10	112,000 m2, (560m x 200m)	m2	112,000	140	15,680,000
1.7.6	New Sheds at Work Shop behind of No.9 & 10	3 Sheds, 20,000m2 (100m x 20m x 3 shed)	No.	3	1,000,000	3,000,000
1.7.7	Removal of Existing Sheds behind of No.7 & 8	4 Sheds, 28,800m2 (180m x 40m x 4 shed)	No.	4	1,581,250	6,325,000
1.7.8	Removal of Existing Belt conveyors behind of No.5 & 6	L.S.	L.S.	-	-	0
1.7.9	Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	10,350,000	10,350,000
1.7.10	Truck Parking Area	150,000m2, (500m x 300m)	m2	150,000	23	3,450,000
1.7.11	Administration Custom Office Building	150,000m2, (250m x 300m x 2floors)	m2	150,000	800	120,000,000
1.7.12	Rail Terminal	L.S.	L.S.	1	50,000,000	50,000,000
1.8	**Abu Flus Port Redevelopment**		**Subtotal**			**14,000,000**
1.8.1	Rehabilitation of Berth No.3 for Container Terminal	250m	m	250	-	0
1.8.2	Container Staking Yards	25,000m2 (250m x 100m)	m2	25,000	200	5,000,000
1.8.3	Cargo Handling Equipment: Mobile Crane	3 sets	No.	3	3,000,000	9,000,000
1.9	**Al Maqil Port Redevelopment**		**Subtotal**			**36,000,000**
1.9.1	River Crossing Bridge	1,000 m x 4 lanes	m	1,000	-	0
1.9.2	Yard Rehabilitation		m2	180,000	200	36,000,000
1.10	**Al Faw Ground Port**		**Subtotal**			**3,784,246,528**
1.10.1	New Container berth No.1	**350m x 500m (-16.0m)**	L.S.	1	122,307,532	122,307,532
1.10.2	New Container berth No.2	**350m x 500m (-16.0m)**	L.S.	1	122,307,532	122,307,532
1.10.3	New Container berth No.3	**350m x 500m (-16.0m)**	L.S.	1	122,307,532	122,307,532
1.10.4	New Container berth No.4	**350m x 500m (-16.0m)**	L.S.	1	122,307,532	122,307,532
1.10.5	New Container berth No.5	-	L.S.	-	122,307,532	0
1.10.6	New Container berth No.6	-	L.S.	-	122,307,532	0
1.10.7	New Container berth No.7	-	L.S.	-	122,307,532	0
1.10.8	New Container berth No.8	-	L.S.	-	122,307,532	0
1.10.9	New Container berth No.9	-	L.S.	-	122,307,532	0
1.10.10	Access Channel Dredging	26,230,000 m3, inner channel: -16.0m	m3	26,230,000	15	393,450,000
1.10.11	Access Road TYPE-1	5,000m	m	5,000	24,353	121,765,000
1.10.12	Access Road TYPE-2	1,400m	m	1,400	21,133	29,586,200
1.10.13	Revetment	900 m	m	900	18,108	16,297,200
1.10.14	Highway AFGP-UQP: Part-1 connecting to Al Faw Port	21.0 km (16.0km + 5.0km)	m	21,000.0	8,315	174,615,000
1.10.15	Highway AFGP-UQP: Part-2	33.5 km	m	33,500.0	8,315	278,552,500
1.10.16	Highway AFGP-UQP: Part-3, incl tunnel approach	10.3 km	m	10,300.0	8,315	85,644,500
1.10.17	Highway AFGP-UQP: Part-4 from Safwan city, incl tunnel approach	12.4 km	m	12,400.0	8,315	103,106,000
1.10.18	Highway AFGP-UQP: Tunnel between Part 3 and Part 4	5,000 m (main tunnel 2,000m)	m	5,000	172,500	862,500,000
1.10.19	Cargo Handling Equipment: Gantry Crane	12 sets, 3 sets x 4 berths	No.	12	14,950,000	179,400,000
1.10.20	Cargo Handling Equipment: RTG	36 sets, 9 sets x 4 berths	No.	36	2,300,000	82,800,000
1.10.21	Cargo Handling Equipment: Top/Side Lifter	6 sets	No.	6	1,000,000	6,000,000
1.10.22	Cargo Handling Equipment: Tractor & Chassis	13 sets	No.	13	100,000	1,300,000
1.10.23	West Breakwater	16.0 km	km	16	43,750,000	700,000,000
1.10.24	East Breakwater (assumed as 35% in progress)	8.0 km	km	8	32,500,000	260,000,000

Note: Amounts in above table is except for Engineering services and administration costs and others
Source: JICA Study Team

Table 5.5-15 Project Cost Breakdown for Waterways (Long-term Development Plan)

No.	Project Component	Particulars				Units	Q'ty	Rate (USD)	Amount (USD)
2.	**Important Project Components for Major Waterways**	**Depth** (m)	**Width** (m)	**Length** (km)	**Dredging** (Mil. m3)				
2.1	**Khawar Abdallah Channel**	-	-	-	71.00	**Subtotal**	**71,000,000**		**1,115,000,000**
2.2.1	Abdallah Channel	-12.5	-	-	68.00	m3	68,000,000	15	1,020,000,000
2.2.2	Wreck Removal (1 at buoy No.3 to No.25)	1 wrecks				wrecks	1	5,000,000	5,000,000
2.2.3	Umm Qasr Channel	**-12.5**	300	25.10	3.00	m3	3,000,000	15	45,000,000
2.2.4	Wreck Removal (6 along channel, 3 at berth No.9)	9 wrecks				wrecks	9	5,000,000	45,000,000
2.2.5	Khor Al-Zubayr Channel	-12.5	200/300	17.60	0.00	m3	-	15	0
2.2.6	Wreck Removal (4 along channel)	4 wrecks (by Phase II)				wrecks	0	5,000,000	0
2.2	**Shatt Al Arab Channel**			144.00	16.00	**Subtotal**	**16,000,000**		**405,000,000**
2.2.1	Mouth area	-8	150	10.50	8.50	m3	8,500,000	15	127,500,000
2.2.2	Mouth to Abu Flus Port	-8	120/150	106.50	7.00	m3	7,000,000	15	105,000,000
2.2.3	Abu Flus Port to Maquil Port	-10	120/150	27.00	0.50	m3	500,000	15	7,500,000
2.2.4	Wreck Removal	Approx. 33 wrecks				wrecks	33	5,000,000	165,000,000
2.3	**AFGP Access Channel**	-	-	-	49.00	**Subtotal**	**49,000,000**		**735,000,000**
2.3.1	AFGP Access Channel	-16.0	200	60.00	49.00	m3	49,000,000	15	735,000,000

Note: Amounts in above table is except for Engineering services and administration costs and others
Source: JICA Study Team

(4) Disbursement

The schedules of disbursement based on the construction schedule shown in Section 6.5.3 are shown in Appendix 5.5-12 and 5.5-13 by options.

5.5.3 Economic Evaluation of Development Projects

In this study the important project is analyzed and evaluated from the national economic aspects under two options (Long-term Development Plan and Alternative Plan) in Section 5.2.

(1) General

The purpose of the economic analysis is to assess the economic feasibility of the Important Projects on the target year from the viewpoint of the national economy. In this chapter, the economic benefits and costs are calculated with economic price, and to evaluate whether the benefits exceed those that could be obtained from other investment opportunities in Iraq.

(2) Methodology of Economic Analysis

Economic analysis is assessed by the following method. The important project ("With case") is defined and it is compared to the "Without the project" case (hereinafter referred to as the "Without case"). All benefits and costs in market price of the difference between "With case" and "Without case" are calculated and converted to economic price. All benefits and costs are evaluated at economic prices.

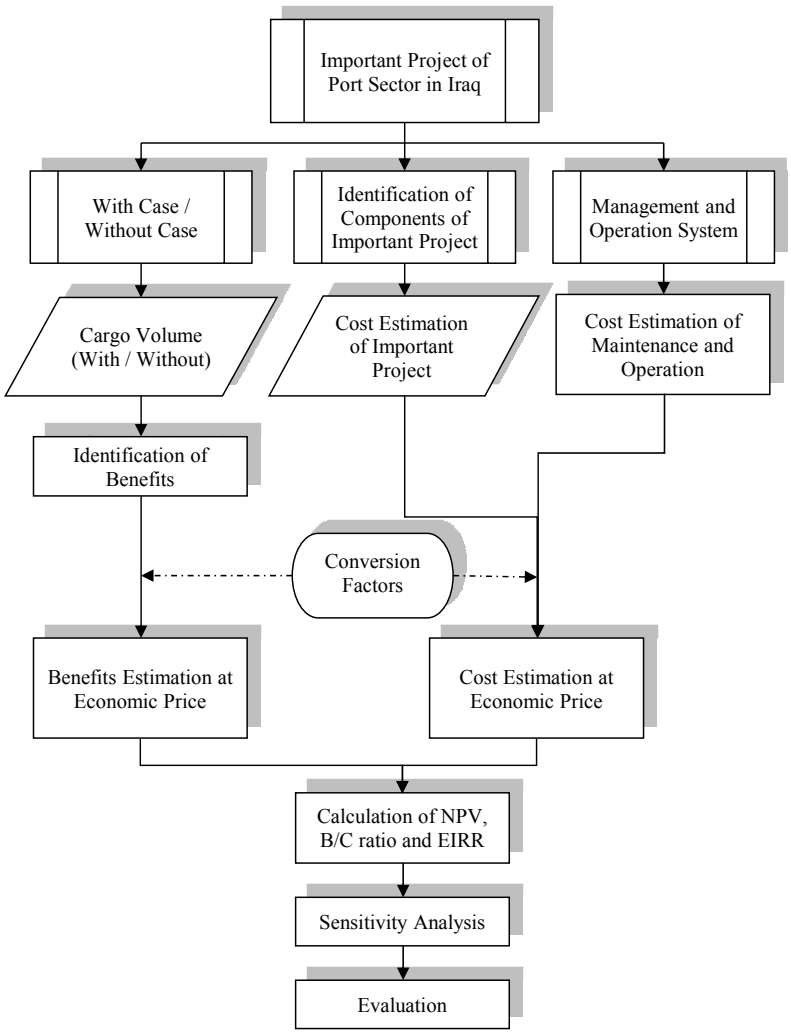
In this study, the Net Present Value (NPV), the benefit/cost ratio (B/C ratio) and the economic internal rate of return (EIRR), based on a cost-benefit analysis, are used to assess the feasibility of the project. The EIRR is a discount rate, which makes the costs and the benefits of the project during the project life equal. The benefit/cost ratio is obtained by dividing the benefits by costs based on the present value. The procedure used for the economic analysis is shown in Figure 5.5-24.

The benefits of the important project are listed as follows.

a) Development of container terminals in north and south UQP to increase terminal capacity,
b) Improvement of cargo handling efficiency by providing additional cargo handling equipment, thus reducing berthing times of ships.
c) Redevelopment of back yard area of UQP to avoid congestion in container yard at UQP,
d) Development of general and bulk cargo berth facilities in KZP to increase terminal capacity,
e) Development of a container terminal in Abu Flus port to maintain current terminal

capacity,

f) Rehabilitation of existing terminal in Al Maqil port to handle various cargo in the near future,
g) Development of container terminals, as the Study Team proposed in Al Faw Grand Port, to be balanced between container demand and terminal capacity under two options,
h) Widening and deepening of Khawr Abdallha to avoid problems with vessels using Kuwait port,
i) Removal of ship wrecks, and dredging in Shatt al Arab, to accommodate large ships,
j) As a result, the sea and land transport costs will be able to be minimized.



Source: JICA Study Team

Figure 5.5-24 Procedure of the Economic Analysis

1) Based Year

The year of 2014 is applied as base year mentioned in the Section of "5.5.2 Preliminary Cost"

2) Project Life

The project life (the period calculation) in the economic analysis is assumed to be forty five years from the year 2014 to the year 2058. The reason such long period is set is to combine and evaluate the feasibility of projects on the target year 2035 in Long-term Development Plan.

3) Foreign Exchange Rate

The Exchange rate adopted for this study is US$ 1.00 = JPY 101.72 and US$ 1.00 = IQD 1,163 (as of May, 2014), the same rates are used in the project cost estimation.

4) "With Case" and "Without Case"

A cost-benefit analysis is conducted on the difference between the "With case" in which an investment is made and the "Without case" in which no investment is made, that is; the benefits and costs arising from the investment for the Project are compared.

The ports of Important Project do not have extra facilities to handle the estimated cargo volume unless Important Project is implemented. In addition, port congestion including ship waiting, and small vessel berthing, will continue under current capacities in Iraq ports.

It is considered that Kuwait ports are an alternative to Iraqi ports in "Without case". It means that the cargo volume exceeding the current capacity of Iraqi Ports is supposed to be handled at Kuwait ports, and transported by trucks from Kuwait ports to Iraq. Container handling charge (CHC) of import cargo of Iraq is collected by a terminal operator of Kuwait ports. Handling charge of transhipment is also collected at Dubai regional hub port to switch from large vessels to small because the shallow channel of Iraq does not accept large vessels. These additional transportation costs in neighboring countries are income of the other countries economies, not Iraq. The additional transportation costs are shifted to, and are a burden of, the Iraqi people. Regarding port congestion and ships waiting, that time loss will produce additional costs as a surcharge of port congestion by container levies from shipping lines, which will also be shifted to, and a burden of, the Iraqi people.

It is generally said that large vessel operations reduce average cost of sea transportation as a merit of scale, which means large vessels entering Iraq's ports contributes to saving sea transportation costs. Iraq's economy cannot enjoy the savings unless the important projects are implemented.

(3) Economic Price

1) General

For the economic analysis, all prices must be expressed as economic prices. In general, the construction costs, the operation costs and the maintenance costs are estimated at market prices. In addition, the market prices often include transfer items, such as customs duties, subsidies, etc. Therefore, the market prices have to be converted into economic prices by using a conversion factor and eliminating these transfer elements.

2) Standard Conversion Factor (SCF)

Customs duties create a price difference between the domestic market and the international market. The SCF is used to determine the economic price of non-tradable goods that have only market prices.

In this study, the SCF is tentatively set at 85% for conversion to the economic price from the project cost estimated based on the market prices.

(4) Economic Benefits of the Project

1) Benefit Items

Considering the above mentioned "With case" and "Without case", the following economic benefits are envisaged from the important projects.

a) The saving of transportation cost

b) The saving of port congestion surcharge

c) The allocation effect on the regional development of Southern provinces

d) Additional employment and income opportunity induced by the port construction and operation

Among these four abovementioned economic benefits, a) and b) are evaluated quantitatively.

2) Calculation of Benefit

The evaluation of benefit is conducted as economic price converted by SCF on the basis of a middle demand forecast scenario.

a) The saving of transportation cost

i) Land Transportation Cost

1 truck carries about 45 ton of bulk cargo/ general cargo or 1 container box by one trailer for a one way trip. The TEU/box rate at 1.6 is used to calculate container boxes. The required number of trucks to transport the cargo volume exceeding the existing capacity is estimated under both conditions of Long-term Development Plan and Alternative Plan. The cost saving of land transportation is assumed as one day of transportation expense from Kuwait and it is estimated US$100 per truck in market price.

ii) Sea Transportation Cost

- CHC:
  Handling container volume at Kuwait ports is container overflow of Iraq ports in "Without case". The rate of CHC at Kuwait ports is assumed at US$250 per TEU in market price.
- Transshipment charge:
  Container volume of transshipment at Dubai port is assumed at a half of container forecast in Iraq. The tariff of transshipment at Dubai port is estimated at US$150 per box per transshipment in market price.
- Merit of Scale:
  All container cargo will be enjoy the merit of scale by using large vessels into Iraqi ports. The cost saving of sea transportation by berthing panamax vessels to UQP is estimated at US$245 per 20' box and US$365 per 40' box in market price, respectively. And that of AFGP by berthing post-panamax vessels will be at US$ 370 per 20' box and US$550 per 40' box in market price, respectively.

b) The saving of port congestion surcharge

Shipping lines levy approximately US$150 per TEU as port congestion surcharge around Iraq ports if port congestion creates additional cost to them. It is assumed that the port congestion surcharge will be levied to the cargo volume of current capacity in Iraqi ports because overflow cargo will be handled at Kuwait port if no investment is implemented.

(5) Economic Cost of the Project

1) Project Costs

In economic analysis, Project costs are generally divided into the two categories, viz. foreign portion (traded goods and services) and local portion (non-traded goods and services).

Local portion, such as non-traded goods and services, that is priced in local (domestic) markets is converted into an amount expressed in economic prices by multiplying the SCF.

Foreign portion, such as traded goods and services, that is priced in the international market is assumed to be expressed in economic prices as it is.

The project cost is divided into foreign and local currency portions as the following assumption.

Table 5.5-16 Ratio of Foreign and Local Portion of the Works

Works	Foreign	Local
Construction Works	50%	50%
Equipment Procurement	90%	10%
Dredging and Wreck Removal	75%	25%
Engineering Cost	70%	30%

Source: JICA Study Team

Breakwater cost of AFGP, which was already completed, for construction is excluded from the economic calculation because the cost is treated as sunk cost.

The project cost in market price including the contingency portion is converted to the economic price using the conversion factor. The project cost converted into economic price is shown in Table 5.5-17 for Long-term Development Plan and in Appendix 5.5-14 for Alternative Plan, respectively.

2) Operation and Maintenance Costs

Cost items for management / operation and maintenance are listed below:

a) Maintenance Costs for Infrastructures

It is assumed to be 1% of initial investment costs of infrastructures.

b) Maintenance Costs for Equipment

It is assumed to be 3% of initial investment costs of equipment.

c) Fuel and Utilities Costs

It is assumed to be included the above mentioned “Maintenance Costs for Equipment”.

d) Personnel Cost

The employee number for the important project will be 4,500 staffs. The average annual salary of GCPI in 2012 is IQD 14 million equivalent to US$12,000 per year. Therefore, annual personnel cost is US$54 million; 4,500×12,000 US$/year.

And the administration cost is calculated as 5% of personnel cost. Therefore, these costs are US$3 million per year.

3) Renewal Investment Costs

From the start of operations, and through the project life, equipment that will be procured in the initial stage will be renewed when lifetime expires. The shorter ones (5 years) are Reach Stacker, Forklift and Tractor/Chassis. Longer lives (20 years) are assumed in Quayside Gantry Cranes and Rubber Tire Mounted Gantry Cranes.

4) Total Cost

Total cost is the sum of project cost and maintenance & operation cost evaluated in the economic cost concept. It is shown for whole project life in Table 5.5-17 for Long-term Development Plan and in Appendix 5.5-14 for Alternative Plan, respectively.

(6) Economic Evaluation of the Project

1) Calculation of the Net Present Value (NPV)

The Net Present Value is calculated by using the following formula.

$$NPV = \frac{\sum_{i=1}^{n}(Bi - Ci)}{(1+r)^{i-1}}$$

Where, *n*: Period of economic calculation (project life)
Bi: Benefit in *i* year
Ci: Cost in *i* year
r: Discount rate = 6 %

The result of NPV estimation is shown as following in Table 5.5-17 for Long-term Development Plan and in Appendix 5.5-14 for Alternative Plan, respectively. It amounts to US$ 2,102 million for Long-term Development Plan and US$ 1,511 million for Alternative Plan.

Table 5.5-17 Result of Economic Calculation on Long-term Development Plan

Year	Cost ('000 USD)					Benefit ('000 USD)			Total Benefit-Cost	Present Value		
	Project Cost	Operation & Maintenance			Cost Total	Transport Cost Saving	Congestion Cost Saving	Benefit Total		Total Cost	Total Benefit	Net Benefit
		Renewal Investment	Personnel & Administration	Maintenance								
2014	0	0	0	0	0	0	0	0	0	0	0	0
2015	253,681	0	0	0	253,681	0	0	0	-253,681	253,681	0	-253,681
2016	352,056	0	0	0	352,056	0	0	0	-352,056	313,329	0	-313,329
2017	531,256	0	0	0	531,256	0	0	0	-531,256	446,053	0	-446,053
2018	653,622	0	0	0	653,622	89,341	73,886	163,227	-490,395	517,730	129,291	-388,439
2019	624,220	0	0	0	624,220	109,831	73,886	183,717	-440,503	466,453	137,284	-329,169
2020	251,942	0	29,610	22,251	303,803	336,776	73,886	410,662	106,860	214,169	289,501	75,332
2021	1,003,137	0	29,736	26,922	1,059,795	371,208	73,886	445,095	-614,700	704,824	296,013	-408,811
2022	1,403,389	0	29,736	26,922	1,460,047	405,641	73,886	479,527	-980,520	916,052	300,861	-615,190
2023	1,499,549	0	29,736	26,922	1,556,206	440,073	73,886	513,959	-1,042,247	921,116	304,212	-616,904
2024	1,565,546	0	29,736	26,922	1,622,204	474,505	73,886	548,392	-1,073,812	905,830	306,219	-599,611
2025	1,037,244	17,300	35,280	39,236	1,129,060	528,186	73,886	602,072	-526,987	594,775	317,164	-277,610
2026	0	0	45,360	77,946	123,306	590,772	73,886	664,658	541,352	61,279	330,315	269,035
2027	340,528	0	45,360	77,946	463,834	634,422	73,886	708,308	244,474	217,464	332,083	114,619
2028	340,528	0	45,360	77,946	463,834	678,073	73,886	751,959	288,124	205,154	332,592	127,438
2029	229,035	0	45,360	95,196	369,591	721,723	73,886	795,609	426,018	154,218	331,980	177,762
2030	229,035	17,300	31,500	95,196	373,031	759,753	73,886	833,640	460,608	146,842	328,159	181,317
2031	0	3,650	42,840	104,335	150,825	822,853	73,886	896,739	745,915	56,011	333,017	277,006
2032	0	0	42,840	104,335	147,175	867,130	73,886	941,017	793,842	51,562	329,679	278,118
2033	0	0	42,840	104,335	147,175	911,407	73,886	985,294	838,119	48,643	325,652	277,009
2034	0	0	42,840	104,335	147,175	955,685	73,886	1,029,571	882,396	45,890	321,025	275,135
2035	0	17,300	42,840	104,335	164,475	999,962	73,886	1,073,848	909,373	48,381	315,878	267,497
2036	0	7,300	42,840	104,335	154,475	1,044,239	73,886	1,118,125	963,650	42,868	310,285	267,418
2037	0	0	42,840	104,335	147,175	1,088,516	73,886	1,162,402	1,015,228	38,530	304,314	265,784
2038	0	0	42,840	104,335	147,175	1,132,793	73,886	1,206,679	1,059,505	36,349	298,024	261,675
2039	0	0	42,840	104,335	147,175	1,177,070	73,886	1,250,956	1,103,782	34,291	291,471	257,180
2040	0	292,400	42,840	104,335	439,575	1,221,347	73,886	1,295,234	855,659	96,623	284,705	188,082
2041	0	7,300	42,840	104,335	154,475	1,265,624	73,886	1,339,511	1,185,036	32,033	277,772	245,739
2042	0	0	42,840	104,335	147,175	1,265,723	73,886	1,339,609	1,192,435	28,792	262,068	233,276
2043	0	0	42,840	104,335	147,175	1,265,821	73,886	1,339,708	1,192,533	27,162	247,252	220,090
2044	0	0	42,840	104,335	147,175	1,265,920	73,886	1,339,806	1,192,632	25,625	233,274	207,649
2045	0	26,300	42,840	104,335	173,475	1,266,019	73,886	1,339,905	1,166,430	28,494	220,086	191,592
2046	0	138,400	42,840	104,335	285,575	1,266,019	73,886	1,339,905	1,054,330	44,252	207,628	163,376
2047	0	0	42,840	104,335	147,175	1,266,019	73,886	1,339,905	1,192,730	21,515	195,876	174,361
2048	0	0	42,840	104,335	147,175	1,266,019	73,886	1,339,905	1,192,730	20,297	184,788	164,491
2049	0	0	42,840	104,335	147,175	1,266,019	73,886	1,339,905	1,192,730	19,148	174,329	155,180
2050	0	17,300	42,840	104,335	164,475	1,266,019	73,886	1,339,905	1,175,430	20,188	164,461	144,273
2051	0	138,400	42,840	104,335	285,575	1,266,019	73,886	1,339,905	1,054,330	33,068	155,152	122,084
2052	0	0	42,840	104,335	147,175	1,266,019	73,886	1,339,905	1,192,730	16,077	146,370	130,292
2053	0	0	42,840	104,335	147,175	1,266,019	73,886	1,339,905	1,192,730	15,167	138,085	122,917
2054	0	0	42,840	104,335	147,175	1,266,019	73,886	1,339,905	1,192,730	14,309	130,268	115,960
2055	0	17,300	42,840	104,335	164,475	1,266,019	73,886	1,339,905	1,175,430	15,085	122,895	107,809
2056	0	7,300	42,840	104,335	154,475	1,266,019	73,886	1,339,905	1,185,430	13,366	115,938	102,572
2057	0	0	42,840	104,335	147,175	1,266,019	73,886	1,339,905	1,192,730	12,014	109,376	97,362
2058	0	0	42,840	104,335	147,175	1,266,019	73,886	1,339,905	1,192,730	11,334	103,185	91,851
Total	10,314,770	707,550	1,596,294	3,514,774	16,133,387	39,148,655	3,029,336	42,177,991	26,044,604	7,936,041	10,038,527	2,102,486

Iraq Treasury Bond, coupon rate: 5.8%

EIRR 8.4%
B/C ratio 1.26

Source: JICA Study Team

2) Calculation of the Benefit/Cost ratio (B/C ration)

The benefit/cost ratio is obtained by dividing the economic benefit by the economic cost. The result of B/C ratio is shown in Table 5.5-17 for Long-term Development Plan and in Appendix 5.5-14 for Alternative Plan, respectively. It is 1.26 for Long-term Development Plan and 1.13 for Alternative Plan, respectively. The discount rate adopted for calculation of B/C is 6 %, which is same as the one in NPV calculation.

3) Calculation of the EIRR

The economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise the economic feasibility of the important project. The EIRR is the discount rate, which makes the costs and benefits of a project life equal.

It is calculated by using the following formula.

$$\frac{\sum_{i=1}^{n}(Bi - Ci)}{(1+r)^{i-1}} = 0$$

Where, n: Period of economic calculation (project life)
Bi: Benefit in i year
Ci: Cost in i year
r: Discount rate

The result of EIRR is shown in Table 5.5-17 for Long-term Development Plan and in Appendix 5.5-14 for Alternative Plan, respectively. The estimated EIRR is at 8.4% for Long-term Development Plan and at 7.0 % for Alternative Plan, respectively.

4) Sensitivity Analysis

In order to see whether the project is still feasible when some conditions change, a sensitivity analysis is made for the following three alternatives.

Case 1: Project cost increases by 10%
Case 2: Benefit volume decreases by 10%
Case 3: Both Case 1and Case 2 occur simultaneously

The result of the sensitivity analysis is derived as follows.

Long-term Development Plan

Case	NPV (USD million)	B/C ratio	EIRR
Base Case	2,102	1.26	8.4 %
Case 1	1,309	1.15	7.4 %
Case 2	1,099	1.14	7.3 %
Case 3	305	1.03	6.3 %

Alternative

Case	NPV (USD million)	B/C ratio	EIRR
Base Case	1,151	1.13	7.0 %
Case 1	240	1.02	6.2 %
Case 2	125	1.01	6.2 %
Case 3	- 786	0.92	5.4 %

Source: JICA Study Team

Even with Case 3 on sensitivity analysis of Long-term Development Plan, the economic feasibilities of the important project are exceeding threshold value i.e. EIRRs are above at 6%, NPVs are plus and B/C ratios are above 1.0. Case 3 of Alternative Plan is, however, below the threshold value of NPV, B/C ratio and EIRR.

5) Conclusion

Both options are economically beneficial to Iraq on Base Case. The favorable option is, however, the Long-term Development Plan taking the results of sensitivity analysis into consideration. Therefore, the Long-term Development Plan of the important projects is recommended to be implemented as soon as possible from the viewpoint of the national economy.

5.6 Improvement of Port Management and Operations

5.6.1 Direction of Port Management Reform

(1) General Direction of Port Reform

Port authorities, including the other form of public agencies, used to be a popular port management system at major commercial ports. Port authority is largely responsible for the tasks of construction, administration, and sometimes the operation of port facilities. When the port authority provides operational services, it is categorized as a service port. Service port was a suitable system for making a port independent from the government on the basis of self-financing, non-political and non-profit making principles.

However, the service port model had shortcomings when it came to improving port performance and service levels due to labor schemes and less competitive situations. In the early 1980's, British ports were directed towards privatization and major commercial ports under British Transport and Docks Board were privatized and formed a company.

Port privatization in terms of the transfer of ownership from public to private was undertaken in the UK and some other countries, however, many countries focused on commercializing their public ports without transferring the ownership of port facilities.

Major direction of global port reform is the shift from service ports to landlord ports, or the commercialization of public ports. Many ports encourage private participation in the construction of port facilities and operation of terminals. Public and private partnership facilitates development of new ports/terminals and improves the efficiency of terminal operations. Direction of port reform of developing countries is not the same as that of developed countries. Private sector is not well established in developing countries, or conversely a negative side of private operation may appear in port reform.

Iraqi ports are managed by GCPI, a state owned company established under Law on Ports and Harbors in 1995, and deemed as a typical service port. Recently, GCPI has been inviting private investors and operators for terminal development and operations. However, such private operators are given less freedom in fixing charges and developing facilities. GCPI has a large workforce for stevedoring at each port and marine services for ships. In view of this situation, Iraqi ports can be categorized as service ports. Separation of regulatory functions and operational functions is imperative to change to a landlord port.

Taking into account directions of global port reform and the situation of Iraqi ports, port administration system shall be established under the principles of:

- Deregulation and decentralization;
- Private participation;
- Fair competition;
- Better services; and
- Safe, secure, and environmentally sound ports.

(2) Basic Concept of Port Reform

Aiming at providing better services at reasonable fees, it is imperative to improve productivity of cargo handling, shorten dwelling time of cargoes, and introduce competitive

services. The following items are possible measures to encourage private participation, introduce fair competition, and establish appropriate port administration and management systems in Iraqi ports.

- To introduce competitive situation into port operations and services by encouraging private participation;
- To minimize regulations and levies on port services and pricing;
- To encourage private investment in port development;
- To develop and maintain navigation channels, roads, and other public utilities for the ports.
- To introduce private transport business into port operations;
- To involve shipping lines, shippers and other port users into terminal operations;
- To prepare national a port master plan and coordinate port development projects;
- To separate regulatory functions and operational functions on port management and operations;
- To allow GCPI to establish a joint-stock company for terminal operation under its own capacity or jointly with another private company.
- To establish an organization responsible for maritime and port administration;
- To organize rules on port planning, construction and operation;
- To legislate rights and responsibilities of private investors and operators, and rules on public intervention;
- To stipulate rules on private transport businesses in port services;
- To establish and enforce regulations on port facility security;
- To establish rules on port development planning and construction;
- To regulate discharges from ships and prevent water/air pollution in ports;
- To prepare necessary contingency plans and equipment for dealing with accidents; and
- To publicize port statistics for policy makers, investors, port users and researchers.

(3) Iraqi Port Reform

World Bank Port Reform Toolkit categorizes port management systems into four types, i.e. Service Port, Tool Port, Landlord Type and Private Port. Service Port provides all services required for the functioning of the port. The service port owns, maintains, and operates all available port facilities. Cargo handling activities are executed by labor employed directly by the port management body.

In case of a Tool Port, the port management body owns, develops, and maintains the port infrastructure as well as the superstructure, including quay cranes, yards, sheds and other port facilities. Labor of the port management body sometimes operate equipment owned by the port management body, or private cargo handling companies contracted by the shipping agents, sometimes operate port facilities owned by the port management body and carry out cargo handling activities.

Landlord port under WB model acts as a regulatory body and as landlord, while cargo handling activities are carried out by private companies. Operation of port facilities or terminals is sometimes granted to a concessionaire contracted by the port management body. Landlord port is characterized by its public ownership and private operation.

In case of a Fully Privatized Port, port land is privately owned and port facilities are transferred to private companies. This requires the transfer of ownership of such land from the public to the private sector. This transfer is an extreme case of privatization and the port company which succeeded the public assets can sell or lease out port land for non-port activities.

These four types are not clearly separated in actual cases. In case of the Port of Singapore, it has labor and operates equipment, allows private cargo handling companies to carry out stevedoring services, and gives concession to a private company to operate a terminal. It’s deemed

as a Tool Port and Landlord Port. In the case of the Port of Colombo, which is a Service Port, it allows a private terminal company to develop and operate a container terminal in the port area, so it is also partly a Landlord Port.

Taking into consideration the direction of world port reform and the necessity of realizing the goals mentioned in the above Section (2), Iraqi ports shall be transformed to Landlord Ports. Regulatory functions shall be transferred to a department of MOT, and pilotage and marine services of GCPI may be succeeded to a government agency. Managerial and operational functions may be transferred to a commercial company succeeding GCPI, which can give a private company concession to operate a terminal.

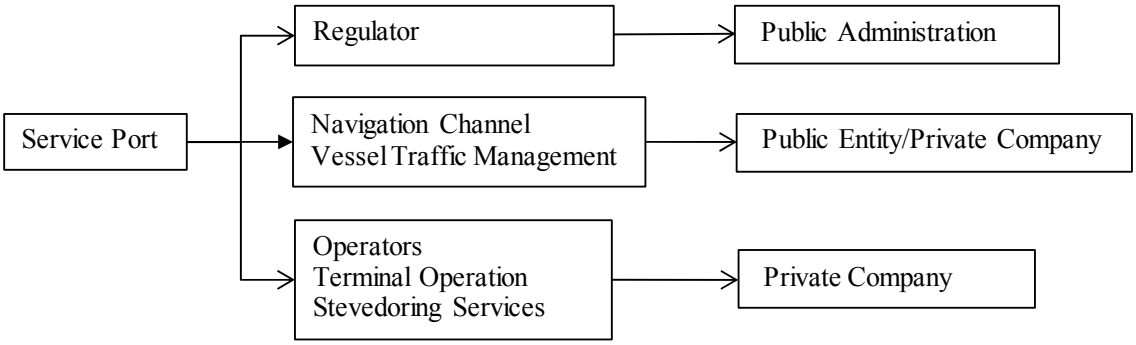


Figure 5.6-1 Reform of Service Port

5.6.2 Improvement of Container Terminal Operations

Operation and management of container terminals (CTs) is carried out in the same manner as other industries, especially manufacturing companies. In the case of importing containers, the operators grasp the details of the containers by vessel voyage, and prepare discharging pre-plans, assigning yard slots for containers before the ship's arrival in a systematic manner. Containers are delivered to consignees whenever the freights are paid, and then Customs procedures are cleared. The procedure for exporting containers is exactly the opposite.

However, whether the operation is efficient or not is depends on whether the operator has mastered the skills and know-how required for operating and managing modern CTs effectively. It is also important for the operator to examine the whole ships' stevedoring work-processes using a PDCA (Plan, Do, Check and Action) tool for improving efficiency and productivity.

(1) Container Terminal Operations

There are five (5) container terminals (CT) in Iraq ports at present as stated already. They are all located in UQP North and South. It should be said that they are not full-fledged CTs as they have been converted from general cargo terminals. Hence, there are some difficulties to operate the CTs smoothly and or efficiently even for experienced terminal operators (TOC) at present.

Firstly, the berths and the container yards (CY) are separated by CY-gates, though they are integrated in one at modern CTs; thus, ship and CY-gate operations interfere with each other, lowering efficiency. Secondly, main container handling equipment (CHE) used at the CTs are Reach Stackers (RS) as mentioned previously resulting in poor efficiency.

- Ship and CY-gate operations are totally set apart at modern CTs by locating the gates on public roads on the other side of the berth apron.
- There are six (6) units of QGC in the ports in total but productivity is only 50~60% of the level of advanced CTs in the world.
- This is partially due to inadequate investment as stated already.
- It is necessary for every CT operator to invest not only in container-handling equipment (CHE) such as QGC, RTG (or Straddle carriers) and computerized terminal operating system (TOS), but also to hire/educate/train staff and labor for realizing systematic and

efficient operation.

However, four (4) CTs out of five (5) are privatized already by joint operations with GCPI. This was a wise decision on GCPI's part because operation and management of CTs has become harder and more intricate due to the rapid increase of container cargoes in recent decades. Accordingly, it has become difficult for governmental corporations such as GCPI to operate complicated CTs smoothly and effectively.

Hence, the trend is for CTs, old or modern, either in developing countries or in developed countries, to be privatized by concession agreement as a part of public private partnership (PPP) with well-experienced international TOCs. Accordingly, UQP-GCPI's decision to privatize the CTs is wise.

UQP-GCPI should privatize Berth No. 20 CT too as soon as possible because the CT has many difficulties as mentioned already. The CT has a 200 meter-long berth, but the CY capacity is the smallest in the port. Accordingly, its operation and management is very difficult even for well-experienced private TOCs.

Accordingly, the most critical issues for GCPI on the port/CT operation and management in Iraq are;

a) Utilize the existing assets (ports and its facilities including CTs) to the maximum extent by letting competent TOCs operate and manage the assets.

b) Develop a plan for constructing necessary facilities of a sufficient scale, not only for containers but also GC/bulk cargoes, which takes into account the needs of the Iraqi economy for the next 100 years at least.

(2) Technologies and Know-how for GCPI's own operation

If GCPI operates and manages No.20 CT in North UQP, upper management of GCPI will be required to learn and master management know-how and skill. Management is also required to prepare enough CHE and CY-space without delay to cope with increases in volume, and has to foster well-trained Ship as well as CY planners as private operators do.

Next, it will be appropriate that GCPI will send several young talents (three (3) as ship planners, two (2) each as CY planners and maintenance and repair (M&R) mechanics at least) to a CT of Gulftainer in UAE for at least two (2) years of training. When they return they should be allowed to operate and manage the CT based on various pre-plans which they will prepare.

Alternatively, GCPI could hire 4 to 5 well-experienced planners from abroad to learn necessary knowledge and skills on CT operations from them. Young talented employees could benefit from their training and through OJT through the daily CT operations. The period should be two (2) years at least, because it takes time for mastering systematic modern CT operations even for talented people.

- It looks easy to make a work sequence plan or CY allocation plan even for un-trained planners using a standard TOS (computerized terminal operating system); however, it is not true, i.e. "A little knowledge (learning) is a dangerous thing".
- When ships' operation productivity exceeds 30 lifts/QGC/hour or more in Net in normal situations, the plan can be said to be effective and well-considered, and the planners who can make such plans all the time can be said to be independent or well-experienced planners.
- For attaining such a level, ship as well as CY planners have to learn and understand various fundamental rules, principals and or restrictions for stowing cargoes/containers onto ships safely at first; it is also necessary to memorize various facts, restrictions and or particulars of ships which call the port/CT, own CY, CHE used at the CT, daily/seasonal tendencies of cargo movement at the port/CT and so on.
- Moreover, good planners obtain discharging and loading container data beforehand by

vessel voyages, and allocate the yard (CY) in several places by the ship voyages on a weekly basis to avoid CY congestion by CHEs, hiring one (1) or two (2) units per QGC during the ship's operations.

- General CY allocation planning is done by segregating the CY by status of containers, "laden or empty" at first, followed by "export or import" and finally by vessel voyages.
- Once the chief CY planner makes a general CY allocation plan for a week, other CY planners prepare "CY decking plan for discharging containers" by vessel voyage.
- CY decking plan for discharging containers is not as complicated as loading ones. The main concern is to separate the CY locations by cranes (QGC/MC/SC) keeping certain distances in between CHEs assigned by cranes. (Otherwise, the CY will be congested with trailers during the discharging operations.)
- However, loading containers yard stacking plan (called a Marshaling plan) is different. CY planners have to get booking data/information from shipping lines by vessel voyages at first 4-6 days prior to the ship's arrival.
- Then CY planners have to prepare the marshaling yard by vessel voyage, destinations, status (laden or empty), size, height (in the case of 40' containers by 8'-6" or 9'-6"), weight (in the case of laden containers by heavy, medium and light weights) and dangerous or awkward containers, etc. for loading the containers onto the ships properly and safely.
- Booking data in the early stage, however, is not enough for preparing good marshaling plans because information is incomplete; thus, good CY planners work together with ship planners for consulting past stowage patterns for optimum utilization of the limited CY space and for separating the CY into some blocks by CHEs.
- In the case of Iraq, however, ships calling the ports/CTs are feeder ships to/from ports in UAE at present, and export laden cargoes (containers) are very limited; therefore, preparation of marshaling plans is very simple, i.e. one (1) destination and no laden (or very seldom) export containers but empty ones alone in general.
- Ships stowage planning by TOS is done by assigning containers stacked in the marshaling yard to ships-slots by ship's bays/hatches one by one based on general loading plans (loading instructions) issued by central planners of shipping lines or ships' chief officers.
- Ship's operational productivity depends on the plan. If the planner considered all the elements, such as working volumes by cranes, yard conditions for the sequencing by cranes, possible conflicts with CY-Gate operations during the actual ship operations and so on, in the planning stage, then the plan should work well.
- After completing these processes, the ship planner prints out ship's loading plans (stowage bay plans and or container lists) with remarks (special matters such as dangerous / reefer / awkward containers and so on) on the plans for reminding CHE drivers and or stevedoring key labors to pay special attention.
- Moreover, main ship planner assigned for the ship calls a meeting with key labor (foreman, hatch bosses at least) before starting the operation for sharing his thoughts/points for the ship operation.
- Once the operation commences, the ship planner stands by in the office through the operations, supervising the works, solving any problems that arise, modifying the plans whenever necessary.
- In the case of No.20 CT (Nos. 19-20 CT in the future) in UQP, it requires extra skills and workloads for the operator due to the very small CY which has a sustainable maximum capacity of 2,596 TEU/time.
- The operator (GCPI, if he operates the CT) has to secure an Off-dock CY of 35 ha for maximizing the berth capacity, 386,000 TEU/year, when the average CY dwelling time of containers is 15 days (21 ha when the average CY dwelling time is 10 days).
- Once the Off-dock CY is secured and the handling volume has increased, GCPI has to shift all the import laden containers from On-dock CY to Off-dock CY before the CY becomes tight which may be within 2-3 days after cargo is discharged from ships. GCPI can ask shipping lines to haul all the empty containers into their ICD right after being

discharged from ships.

- In the case of loading containers in which the majority are empties, GCPI can ask shipping lines to start hauling the containers to On-dock CY from 2~3 days prior to the ship's arrival, until CY cut-off time for marshaling them without problems based on loading patterns by ships by cranes.
- Beside on all the above, if GCPI changes the CY operating system from RS to RTG at Berth No.20, GCPI has to remove all the rail-trucks; otherwise GCPI cannot expect to increase the operational efficiency or the capacity as planned as there are too many burdens/restrictions in the CY to achieve them.
- Hence, only well-experienced private operators can operate and manage the No.20 CT effectively due to its complexity and difficulty.

(3) Maximum Utilization of Five (5) CTs in Umm Qasr Port

Berth capacity of UQP will reach 1,102,000 TEU per annum, as shown in Table 3.8-2, when all the CT operators in the port adopt the best practices. Accordingly, there is 462,000 TEU/year of excess capacity as 640,000 TEU/year was expected to be handled in 2013. However, these figures are not based on the actual practices of the operators; capacity of only 933,000 TEU per annum is indicated in Table 3.8-1.

GCPI, therefore, has to work hard together with private operators to adopt the best practices at all the CTs in UQP to utilize the facilities to the maximum. Based on the Table, there is a lot of room to increase berth capacity, except CTs operated by Gulftainer. Other than these CTs operated by Gulftainer, only one ship per week is being handled at dedicated terminals in general, and thus capacities are underutilized. Accordingly, GCPI needs to rent the CTs, two (2) CTs at least per operator, to regular TOC instead of shipping lines in order to increase ship calls and container volumes.

On the other hand, quite lengthy dwell-time of the import containers is another issue of Iraqi ports. Capacity of the existing On-dock CYs of UQP is not enough for storing containers there due to the lengthy dwell-time of the containers at present. It requires 628,000 m2 of Off-dock CY space in total when the average dwell-time is 15 days, or 258,000 m2 when dwell-time 10 days as shown in Table 3.8-2.

Accordingly, it can be said the CTs in Iraqi ports have less competitiveness and or user-friendliness at present, forcing the TOCs to secure huge spaces for extra Off-dock CYs to keep the CTs running smoothly due to the lengthy CY dwelling time. MOT/GCPI, hence, have to simplify the current customs clearance system with the cooperation of Customs/MOF in order to drastically reduce the dwelling time.

- Usual practices at such On-dock and Off-dock CYs are as follows. Firstly remove all the imported containers from On-dock CYs to Off-dock CYs once they aren't delivered within certain days (it depends on the capacity of On-dock CYs), then deliver them to consignees at Off-dock CYs.
- Receive all the laden export containers at Off-dock CYs at once, and start shifting them to On-dock CYs two (2) to three (3) days prior to the ships arrival for loading on to the ships.
- Average CY dwelling time of containers at ports in developed countries, except transshipment ports, is around 5~6 days though it is more than 10 days at developing countries because consignees at these countries use the CY as storage places for their cargoes in many cases.
- Hence, GCPI/MOT has to try to reduce the average dwelling time at Iraqi CTs down to 10 days at least.
- For achieving an average dwelling time of 10 days, it should become 16 days on average for the import containers, assuming 4 days as average for export ones, including empties.
- CHE used at both On-dock and Off-dock CYs should be RTGs instead of RSs, except empty handlers, because the import laden containers require a lot of unavoidable yard

shifting during the delivery operations; in addition, more containers can be stacked.

- RTG system is not realized at any CTs in Iraqi ports; however, it has many advantages, such as allowing CT operators to reduce the CY space by around 20% (or increasing the stacking capacities of the CY per m2). In addition, safety is enhanced.
- However, it is expensive to introduce the RTG system, not only from the cost of the equipment itself but also due to the required modification of the container yard (CY).
- Therefore, GCPI has to change the contract periods, from the existing 5~10 years to 20~25 years at least, when the operators change their CT operation from RS system to RTG ones, including QGC for modernizing their operations at the port.
- Furthermore, GCPI has to share more revenue with private operators for encouraging them to invest in the modernization of the CTs, guarantying certain volumes in the contract periods.
- Otherwise private operators would hesitate to modernize the CTs in UQP because of Al Faw Grand port, which has various advantages compared with UQP as described below.

(4) Container Terminals in Al Faw Grand Port (AFGP)

A container berth planned to be built by MOT/GCPI in Al Faw Grand port has a 350 meter-long berth with a CY that is approximately 450 meters wide. MOT/GCPI plans to privatize five (5) of the berths as a unit per time. However, five (5) berths, 1,750 meters each, create a huge surplus in capacity based on the container handling volume of Iraq ports at present and the near future.

When the first CTs (five (5) berths with a length of 1,750 meters) are completed at the new port in 2018 as MOT/GCPI planned, almost all of the containers should be moved from UQP to Al Faw Grand port due to various advantages of the new port as described below. Moreover, if MOT/GCPI controls the volumes among the ports fairly, GCPI may not get a satisfactory level of concession fees from the CT operators of the new port due to its handling volume which will be small relative to its huge capacity.

- Al Faw Grand port is located in the Arabian Gulf with sufficient water depth to accommodate 80,000 DWT ships alongside; thus, shipping lines can enjoy the scale merits on their services.
- The new port is very close to the pilot station and will not be affected by the tides, thus, shipping lines can save a lot of hours not only in waiting for tides but also during ordinary maneuvering which will allow shipping lines to refine their schedules.
- CT operations at the new port will be efficient and productive as it will be privatized and operated by a competent international CT operator; thus, the shipping lines calling at the new port can surely shorten the port-calling hours furthermore.

Accordingly, MOT/GCPI has to develop two (2) berths as a unit CT at Al Faw Grand port per time, for coexisting with CTs in UQP. In that case, dead Max CY capacity of the CT in the new port becomes 20,451 TEU/time, and workable Max CY capacity becomes 15,338 TEU/time, then sustainable Max CY capacity becomes 11,799 TEU/time.

- It is good to concession out the CTs with two (2) berths as a unit for preventing a Monopoly.

Hence, possible annual CY Capacity of the CT in Al Faw Grand port becomes 538,000 TEU when the average CY dwelling time is 8 days, and 430,000 TEU at 10 days, then 358,000 TEU at 12 days, though only 307,000 TEU when the dwelling time is 14 days as shown in Table 5.6-1.

- It can create 85 20’ CY-bays alongside the berth (700m) with two (2) 32.5 meter side traffic lanes, a 30.0 meter center traffic lane, and two (2) RTG’s lane-changing spaces in between two (2) blocks of the CY.
- Also it can create nine (9) RTG lanes in the 450 meter wide CY with a berth apron of 65

meters, 6 meters of space for lighting poles (2 units x 3m), and 109 meters of space at the back of the CT to build various facilities for managing the CT operations as shown in the Table 5.6-2.

Furthermore, if GCPI manages and controls the volume among the ports, GCPI can expect some improvements in the operation of the CTs at UQP, such as relocating the CY-gates and/or changing the CY operating system from RS to RTG.

Table 5.6-1 Possible CY Capacity of 700m Berth Terminal in AFGP

1. Container Yard Operation System: RTG System		
Thus, ships operations are done by combined use of QGC, RTG and Tractor & Chassis.		
2. Container Storage Yard:		
1) RTG Lane Numbers	**9**	Lanes
2) 20' Bay Numbers in each RTG Lane	**85**	Bays for 9 Lanes
3. Ground TEU Slots Number	**4,590**	Slots
4. Dead Max CY Capacity, under following conditions	**20,451**	TEU/Time
1) First 2 lanes from sea-side for marshaling Export containers at 5.0 high, including some Empties booked.		
2) Next 5 lanes for Stacking Import laden containers at 4.3-high; due to long dwelling with large amounts.		
3) Last 2 lanes for stacking Empty conts at 4.3 high by RTG (Lifters), segregating by shipping lines, size etc.		
5. Workable Max CY Capacity	**15,338**	TEU/Time
Assume 75% of the Dead Max CY Capacity as the Workable Max. CY Capacity		
6. Sustainable Max CY Capacity	**11,799**	TEU/Time
* Assuming 1.3 as the CY Peak-volume factor (PF = Peak-day volume / Average volume in a week)		
When average dwell-day is 4 days:	**1,076,627**	TEU/year
When average dwell-day is 5 days:	**861,302**	TEU/year
When average dwell-day is 6 days:	**717,751**	TEU/year
When average dwell-day is 8 days:	**538,314**	TEU/year
When average dwell-day is 10 days:	**430,651**	TEU/year
When average dwell-day is 12 days:	**358,876**	TEU/year
When average dwell-day is 14 days:	**307,608**	TEU/year

Source: Prepared by JICA Study Team based on information from GCPI

On the other hand, Berth Capacity of the new CT (with a 700m-berth) in AFGP becomes 805,000 TEU/year when three (3) QGC are installed per 350m-berth, and 1,003,000 TEU/year when four (4) QGC are installed per berth, as shown in Appendix 5.6-2.

- Container handling volume is assumed to be 1,750 lifts per call on average.
- Operations are assumed to be carried out 21 hours a day in Net at 0.8 of work efficiency rate on 360 days a year basis.
- Stevedoring productivity is assumed as 25 Lifts/QGC/hour in Net.

Accordingly, there are big imbalances between CY and Berth capacities for the CT in AFGP due to the narrow CY as well as the long dwelling time of import laden containers in Iraqi ports. The CT with 700 meter-berth has satisfactory berth capacity by installing three (3) or four (4) QGC as mentioned already; however, its CY capacity is only 430,000 TEU/year when the average dwelling time is 10 days or 358,000 TEU/year when it was 12 days as shown in Table 5.6-2.

Table 5.6-2 Possible Capacity of a 700m Berth CT with 9 RTG Lanes in AFGP

Case-1: with 3 GC x 2 Berths	4 Days	6 Days	8 Days	10 Days	12 Days
CY Capacity by Dwell-days, TEU/year:	1,076,627	717,751	538,314	430,651	358,876
Berth Capacity with 6 QGC, TEU/year:	805,820	805,820	805,820	805,820	805,820
Terminal Capacity, TEU/year:	805,820	717,751	538,314	430,651	358,876
CY Capa Shortage (vs Berth), TEU/year:	270,807	-88,069	-267,506	-375,169	-446,944
Case-2: with 4 GC x 2 Berths					
Berth Capacity with 8 QGC, TEU/year:	1,003,742	1,003,742	1,003,742	1,003,742	1,003,742
Terminal Capacity, TEU/year:	1,003,742	717,751	538,314	430,651	358,876
CY Capa Shortage (vs Berth), TEU/year:	72,885	-285,991	-465,428	-573,091	-644,866

Source: Prepared by JICA Study Team based on information from GCPI

This imbalance of capacities will be a big problem for the CT operator who leases or develops the CT. This is because the capacity of a terminal is either the berth or CY capacity, whichever is smaller. Accordingly, the CT capacity of Al Faw Grand Port becomes only 430,000 TEU per annum, even though the CT operator could reduce the dwelling time to 10 days on average.

To alleviate this problem, MOT/GCPI has to do the following;

1) Reduce the average CY dwelling time as much as possible by cooperating with MOF/Customs.

* Try to reduce the average dwell-time of import laden containers to 15 days at first, then 10 days in the near future (in that case, dwelling time of the whole containers should be 7~8 days.).

2) GCPI or a CT operator who rents/develops the CT should be obliged to develop a certain size of Off-dock CY as;

a) 380,000 TEU/year capacity when three (3) units of QGC are installed per berth
b) 580,000 TEU/year capacity when four (4) units of QGC are installed per berth

Assuming 10 days in total as average container dwelling time at the CYs, with nine (9) RTG lanes, as shown in Table 5.6-2.

3) Expand the width of the CY about 60 meters in order to add at least two (2) of RTG lanes and to increase CY capacity by 21% as shown in Table 5.6-3.

(* Spans of RTG and trailer's passage per RTG-lane are 23.47m and 6.5m =29.97 meters in total)

Table 5.6-3 Possible Capacity of a 700m Berth CT with 11 RTG Lanes in AFGP

Case-1: with 3 GC x 2 Berths	4 Days	6 Days	8 Days	10 Days	12 Days
CY Capacity by Dwell-days, TEU/year:	1,307,525	871,683	653,762	523,010	435,842
Berth Capacity with 6 QGC, TEU/year:	805,820	805,820	805,820	805,820	805,820
Terminal Capacity, TEU/year:	805,820	805,820	653,762	523,010	435,842
CY Capa Shortage (vs Berth), TEU/year:	501,705	65,863	-152,058	-282,810	-369,978
Case-2: with 4 GC x 2 Berths					
Berth Capacity with 8 QGC, TEU/year:	1,003,742	1,003,742	1,003,742	1,003,742	1,003,742
Terminal Capacity, TEU/year:	1,003,742	871,683	653,762	523,010	435,842
CY Capa Shortage (vs Berth), TEU/year:	303,783	-132,059	-349,980	-480,732	-567,900

Source: Prepared by JICA Study Team based on informattion from GCPI

If the operator (or GCPI) develops an Off-dock CY of 500m x 500m (25 ha) with more than 4,900 ground-TEU-slots, he can handle 445,000 TEU of containers per annum when the average dwelling time is 10 days, or 556,000 TEU/year when the dwelling time is 8 days.

- Hence, if the CT operator installed three (3) units of QGC per berth, berth capacity (805,000) would balance with the CY capacity [On-dock CY (430,000) plus Off-dock CY

(445,000) = 875,000 when the average CY dwelling time is 10 days].

- In the case in which the operator installs four (4) units of QGC per berth, he must prepare an Off-dock CY wider than 25 ha, or he has to reduce the average CY dwelling time to 8 days in total.

*538,000(On-d) + 556,000(Off-d) – 1,003,000(Berth) = 91,000 TEU/year's surplus in CY's.

*It is always better to have surplus capacity in CY side than births in order to cope with unexpected (seasonal) fluctuations of container handling volumes.

- However, operation and management of Off-dock CYs will become a big expense not only for the operators but also shipping lines/consignees; thus, GCPI has to expand the width of the On-dock CY to the maximum to minimize the scale of the Off-dock CY, or to eliminate the extra facility.

When GCPI/MOT expands the width of the CY in Al Faw Grand Port by 60 meters (or increases the width by 50 meters to be 500 meters in total) in order to add two (2) RTG lanes and to increase CY capacity by 21% as shown in Table 5.6-3, the scale of the Off-dock CY becomes smaller as follows;

a) 290,000 TEU/year capacity when three (3) units of QGC are installed per berth
b) 480,000 TEU/year capacity when four (4) units of QGC are installed per berth

Assuming 10 days in total as average container dwelling time at the CYs.

In that case, if the dwelling time becomes six (6) days in total, the operator does not need any Off-dock CY when three (3) QGC are installed per 350 meter-berth. Furthermore, if he could reduce it to five (5) days, cooperating with shipping lines utilizing their ICDs near Bagdad or other key locations, the TOC can install four (4) units of QGC per berth without developing any Off-dock CYs.

5.6.3 Improvement of Conventional Cargo Terminal Operations

(1) Current productivity of the Iraqi ports

In the stage of the preparation of port development plans, the cargo handling productivity for various commodities is a vital factor to determine the required number of berths. Thus, current handling productivity was estimated for various commodities on the basis of statistics of UQP, KZP and Al Maqil Port.

The cargo handling productivity in 2012 is evaluated as the volume handled in a day, which was calculated as the ratio of the annual total volume of a certain commodity and the total hours required to unload the total volume of the commodity. While the statistics of UQP indicate the time of start and end of the unloading, that of KZP indicate only the days when cargo handling work started and ended. The statistics of Al Maqil Port indicates only the days of docking and leaving the quays.

Thus, the total days required for unloading the commodities were calculated using total handling hours for UQP, total days used for cargo handling for KZP and total days the ships were moored at the quays for Al Maqil Port. Therefore, net working hours were employed for UQP, while gross mooring days including idle hours or days were employed for KZP and Al Maqil Port.

The average handling volumes in a day of UQP, KZP and Al Maqil Port are shown in Table 5.6-4, Table 5.6-5 and Table 5.6-6, respectively. In these tables, hourly productivity is also indicated. For the calculation of the hourly productivity the assumed working hours are indicated in the right column.

Table 5.6-4 Cargo handling productivity by commodity (UQP, 2012)

Commodity	Unit	t/day		ton/hr	Work Hr
		Maximum	Average		(Assumption)
GC	t/day	4,852	827	59	14
Clinker			2,221	111	20
Pipe		1,861	867	62	14
Steel Plate/Bar		4,388	3,557	254	14
Rice		5,250	3,124	156	20
Sugar		3,333	1,918	137	14
Wheat		8,500	4,725	197	24
Container	Box	825	409		
Car (RoRo)	Unit	3,225	3,225		

Source: Prepared by Study Team based on GCPI ship arrival record of UQP, 2012

Table 5.6-5 Cargo handling productivity by commodity (KZP, 2012)

Commodity	Condition	t/day		ton/hr	Work Hr
		Maximum	Average		(Assumption)
Geneal Cargo	Ship Size >1,000 t	962	207	10	20
	Ship size < 1,000 t	460	96	7	14
Cement	Ship Size >1,000 t	1,429	734	37	20
	Ship size < 1,000 t	906	289	21	14
Pipe (2012)	Ship Size >1,000 t	7,206	4,088	204	20
	Ship size < 1,000 t	4,784	1,591	114	14
Iron Powder		1,504	238	17	14
Equipment		664	207	15	14
Liquid Bulk	Benzene	3,604	3,095	129	24
	Fuel Oil	3,438	1,966	82	24
	Dgas Oil	6,167	4,102	171	24
	Kerosene	2,596	2,098	87	24
Dhaw	Dates (Export)	222	107	8	14
	Soy Bean (Import) +	150	102	7	14
	Sugar (Import) + Dat	132	89	6	14

Source: Prepared by Study Team based on GCPI ship arrival record of KZP, 2012

Table 5.6-6 Cargo handling productivity by commodity (Al Maqil Port, 2012, 2013)

Commodity	Year	Unit	t/day		ton/hr	Work Hr
			Maximum	Average	(Assumption)	
GC	2012 (Jan. - Dec.)	t/day	843	384	27	14
GC	2013 (Jan.-Aug.)		707	338	24	14
Cement	2012 (Jan. - Dec.)	t/day	1,055	525	26	20
Cement	2013 (Jan.-Aug.)		1,173	569	28	20

Source: Prepared by Study Team based on GCPI ship arrival record of Al Maqil Port, 2012

(2) Comparison with the cargo handling productivity of Aqaba Port

"Iraq Port Study, UNDP, 2006" reported the cargo handling productivity for several commodities observed at Aqaba Port, Jordan. The cargo handling productivity exhibited in Iraqi Ports is compared with those of Aqaba Port (see Table 5.6-7).

Table 5.6-7 Cargo handling productivities by commodity at Aqaba Port and Iraqi Ports

Aqaba[1)]		Umm Qasr[2)]		KZP[2)]		Al Maqil[2)]	
Commodity	ton/day	Commodity	ton/day	Commodity	ton/day	Commodity	ton/day
General Cargo	1,000	General Cargo	827	General Cargo	207	GC	384
		Steel Plate/Bar	3,557				
Grains	12,000	Wheat	4,725				
Rice	6,000	Rice	3,124				
Bagged cargo	6,000	Sugar	1,918	Cement	734	Cement	525
Steel Billets	3,500			Iron Powder	238		
Cement	5,000	Cement	2,221				
Timber	2,300						
				Steel Pipe	4,088		
Cars	3,000	Car	3,225				

Source: 1) Iraq Port Study, UNDP, 2006, 2) Prepared by Study Team based on GCPI ship arrival record, 2012

a) General Cargo (GC) and cars

The cargo handling productivity of GC at UQP is just a little lower than that at Aqaba Port since the productivity of steel plate and bars is higher than that of Aqaba. If the productivity of GC is calculated including steel products, which are heavy cargoes, the productivity at UQP is assessed to be competitive to that of Aqaba Port.

The productivity of GC at KZP and Al Maqil Port are much lower than that of Aqaba Port, since smaller ships are employed and the cargo handling time includes idle time in the two Iraqi ports.

The productivity of cars is higher at UQP than at Aqaba Port.

b) Dry bulk

The handling productivity of wheat and rice at UQP is about half of that at Aqaba Port. Since large dry bulk carriers are employed for the import of these commodities at both ports, the difference in the productivity must have resulted from the difference of capacities of the handling systems between the two; productivity at UQP can be improved by installing proper facilities.

c) Bagged cargoes

Typical bagged cargo at UQP is sugar, while that of KZP is cement. Productivity at the two Iraqi Ports are much lower than that at Aqaba. The low productivity at KZP and Al Maqil Port is due to the employment of small ships. Even though sugar is brought to UQP in large ships, which are equipped with belt conveyers to unload and haul the bags directly to trucks on the quay, the productivity is much lower than that at Aqaba. It is the assessment of the Study Team that the direct unloading from the ships to trucks is sometimes suspended during the change of fully loaded trucks to empty trucks.

The handling productivity can be improved by utilizing a warehouse as buffer to avoid interruption of unloading work.

d) Cement

At UQP, cement is brought by large bulk carriers having DWT of more than 20,000. Compared with the productivity exhibited at Aqaba Port, it is assessed that the productivity at UQP can be improved.

e) Pipes

A specialized terminal for pipes started operation at KZP. There is no data available at Aqaba for comparison, but compared with the productivity of timber at Aqaba Port and taking into consideration the difference of weight of the materials, the productivity at KZP is high enough.

(3) Fundamental assumption of cargo handling productivity in port planning

NDP 2013-2017 indicates the number of berths required by 2017, which seems to be based on an estimation of the rough assumption that the annual productivity of container terminals should be 1,000 TEU per each meter of berth while that of other dry commodities should be 1,000 ton per each meter and that the length of a berth is 350 meters.

As discussed above, the handling productivity varies from commodity to commodity. Therefore, for the purpose of determining required port facilities, it is necessary to establish proper criteria for the handling productivity with careful consideration of types and sizes of calling ships, cargo handling system and operational schemes of the respective ports.

(4) Possible measures for the improvement of GC handling productivity

General cargo (GC) handling operations at Iraqi ports are done by direct discharging (and or loading) system; i.e. discharging cargoes at ship side by ship's cranes or unloading directly onto trucks prepared by consignees, as stated already. It seems very convenient and economical for GCPI as few laborers are required, nor are warehouses or cargo handling equipment (CHE) such as fork lifts or trucks required.

However, as addressed already, this system has many problems in terms of productivity and berth utilization efficiency. Firstly, terminal operators (shipping lines?) have to prepare necessary trucks in berth aprons on a daily basis through the consignees based on operation schedules. Hence, the aprons are generally congested. Secondly, ship operations become very slow because often there is only one (1) laborer (the driver in many cases?) per truck due to the narrow working space.

Accordingly, GCPI can continue its current practices at the GC terminals in Iraqi ports until there are enough margins. However, once the berthing window becomes shorter in future, GCPI has to change to an "indirect" system for increasing the operational productivity or reducing the berth utilization rate. The following measures should be taken;

a) Allocate around five (5) laborers in the ship hatch and around four (4) with fork lifts (and trucks if necessary) on the berth-apron per ship-crane (ship's gear).

b) Labor in the ship's hatch pile the cargoes flatly on a pallet, placed on a net-sling, for discharging by the ship-gear onto the berth apron. The sling must be used safely without breaking the form on a pallet.
   * Whether pallets are used or not depends on the packing style; however, when possible it is better to use them to save time and manpower

c) The pallets with cargo on them are moved to warehouses and stored there by fork lifts.
   * These pallets are usually stacked in the warehouses by two (2) or three (3) tiers to save space; thus, it is necessary to keep piling cargoes flatly on the pallets at the same height; this should be done by commodity by consignees in general.

d) The cargo on pallets are delivered to consignees at the warehouses, after clearing Customs, using other doors than apron-side, so as not to interfere with ship operations.
   * Once GCPI adopts this system, GCPI can double the ships operational productivity easily (though it depends on the cargo type) by drastically reducing the berth utilization rates.
   * This orthodox system should work well at No.12~No.18 berths at North UQP because warehouses are located just behind the berths.
   * If GCPI continues the current "direct" operations at the terminals even for a while, it would be better to hire/allocate two (2) laborers each at the ship hatches and on the trucks all the time through the operations by rotating them by every one (1) hour or so in order to increase productivity.

CHAPTER 6

Chapter 6. Short/Mid-term Development Plan for UQP and KZP

6.1 Cargo Demand Forecast for UQP and KZP in Year 2025

6.1.1 Allotment of Seaborne Cargo to Ports in Iraq

The following commodities are handled exclusively at ports in Iraq. According to the table, Umm Qasr Port (UQP) is handling mainly containers and conventional cargoes like grain, sugar, cement, steel & pipes and vehicles while Khor Al Zubayr Port (KZP) is handling mainly liquid bulk and conventional cargoes like sugar, cement, steel & pipes and dates.

Table 6.1-1 Commodities Handled at Ports in Iraq

UQP	KZP	Abu Flus	Al Maqil
Containers	Containers	Containers	Cement
Grain	Grain	Cement	Dates
Rice	Rice	Other Conventional	Other Conventional
Sugar	Sugar	-	-
Cement	Cement	-	-
Steel & Pipes	Steel & Pipes	-	-
Vehicles	Vehicle	-	-
Other Conventional	Dates	-	-
	Other Conventional	-	-
	Liquid Bulk	-	-

Source: Prepared by JICA Study Team based on GCPI's Port Statistics

Table 6.1-2 shows share of cargo handling by ports for each commodity from 2008 to 2011.

Table 6.1-2 Commodity-wise Share of Cargo Handling by Ports (2008-2012)

(Unit: %)

Commodity/Port	UQP	KZP	Abu Flus	Al Maqil
Containers	89.03	1.10	9.87	0
Grain (Wheat)	99.56	0.44	0	0
Rice	99.84	0.16	0	0
Sugar	87.95	12.05	0	0
Cement	27.95	54.60	0.43	17.03
Steel & Pipes	59.13	40.87	0	0
Dates	0	99.66	0	0.34
Other Conventional	52.95	22.14	17.15	7.76

Source: Prepared by JICA Study Team based on GCPI's Port Statistics

Based on the above table, it is assumed that:

- Share of container handling volumes for UQP, KZP and Abu Flus in the future will be 89%, 1% and 10% respectively,
- Clean cargoes (wheat, rice, and sugar) will be handled exclusively at UQP in the future,
- Dirty cargoes (cement) will be handled exclusively at KZP and Al Maqil,
- Share of steel & pipe handling volumes for UQP and KZP in the future is 59% and 41% respectively,
- Vehicles will be handled exclusively at UQP in the future,
- Liquid bulk cargo will be handled exclusively at KZP in the future.

6.1.2 Cargo Demand for UQP and KZP in 2025

Cargo traffic demand for UQP, KZP and other ports in Iraq in 2025 is estimated based on the above assumptions and shown in Table 6.1-3 to Table 6.1-6 below.

Table 6.1-3 Cargo Traffic Demand for UQP

Cargo/Year	Unit	2012	2015			2025		
			Low	Middle	High	Low	Middle	High
(Import Cargo)								
1. Container Cargo	TEU	265,634	385,000	430,000	476,000	930,000	1,294,000	1,748,000
2. Conventional Cargo								
(1) Grain (wheat)	ton	2,637,732	1,372,000	2,244,000	2,520,000	1,152,000	1,152,000	2,149,000
(2) Rice	ton	1,092,684	1,211,000	1,211,000	1,211,000	1,416,000	1,416,000	1,416,000
(3) Sugar	ton	714,794	773,000	773,000	773,000	1,129,000	1,129,000	1,129,000
(4) Cement	ton	129,008	0	0	0	0	0	0
(5) Steel & Pipes	ton	514,862	195,000	325,000	454,000	171,000	496,000	561,000
(6) Vehicle	no.	69,694	93,000	93,000	93,000	570,000	570,000	570,000
(7) Others	ton	681,959	292,000	465,000	655,000	316,000	502,000	875,000
Sub-total (except Vehicle)	ton	5,771,039	3,843,000	5,018,000	5,613,000	4,184,000	4,695,000	6,130,000
(Export Cargo)								
1. Container Cargo (Empty)	TEU	265,634	385,000	430,000	476,000	930,000	1,294,000	1,748,000
2. Conventional Cargo	ton	0	0	0	0	0	0	0
Grand Total								
Container Cargo	TEU	531,267	770,000	860,000	952,000	1,860,000	2,588,000	3,496,000
Conventional Cargo	ton	5,771,039	3,843,000	5,018,000	5,613,000	4,184,000	4,695,000	6,130,000
Vehicle	no	69,694	93,000	93,000	93,000	570,000	570,000	570,000

Source: JICA Study Team

Table 6.1-4 Cargo Traffic Demand for KZP

Cargo/Year	Unit	2012	2015			2025		
			Low	Middle	High	Low	Middle	High
(Import Cargo)								
1. Container Cargo	TEU	725	4,300	4,800	5,400	10,500	14,500	19,600
2. Conventional Cargo								
(1) Sugar	ton	27,445	0	0	0	0	0	0
(2) Cement	ton	731,793	0	836,000	2,280,000	0	1,368,000	4,104,000
(3) Steel & Pipes	ton	219,267	135,000	226,000	316,000	119,000	344,000	390,000
(4) Others	ton	90,072	121,000	193,000	272,000	131,000	208,000	363,000
Sub-total	ton	1,068,577	256,000	1,255,000	2,868,000	250,000	1,920,000	4,857,000
3. Liquid Bulk (Oil Product)	ton	2,731,572	0	4,510,000	4,750,000	0	0	480,000
Import Total	ton	3,800,149	256,000	5,765,000	7,618,000	250,000	1,920,000	5,337,000
(Export Cargo)								
1. Container Cargo (Empty)	TEU	720	4,300	4,800	5,400	10,500	14,500	19,600
2. Conventional Cargo								
(1) Dates	ton	82,510	106,000	106,000	106,000	0	0	0
Sub-total	ton	82,510	106,000	106,000	106,000	0	0	0
3. Liquid Bulk								
(1) Oil Product (heavy fuel oil)	ton	365,772	600,000	600,000	600,000	600,000	600,000	600,000
(2) Oil Product (gasoline, gasoil)	ton	0	0	0	710,000	3,480,000	5,220,000	9,320,000
(3) LNG/LPG	ton	0	0	0	0	2,000,000	2,000,000	2,000,000
Sub-total	ton	365,772	600,000	600,000	1,310,000	6,080,000	7,820,000	11,920,000
Export Total	ton	448,282	706,000	706,000	1,416,000	6,080,000	7,820,000	11,920,000
Grand Total								
Container Cargo	TEU	1,445	8,600	9,600	10,800	21,000	29,000	39,200
Conventional Cargo	ton	1,151,087	362,000	1,361,000	2,974,000	250,000	1,920,000	4,857,000
Liquid Bulk Cargo	ton	3,097,344	600,000	5,110,000	6,060,000	6,080,000	7,820,000	12,400,000

Source: JICA Study Team

Table 6.1-5 Cargo Traffic Demand for Abu Flus

Cargo/Year	Unit	2012	2015			2025		
			Low	Middle	High	Low	Middle	High
(Import Cargo)								
1. Container Cargo	TEU	28,291	43,300	48,300	53,500	104,500	145,400	196,400
2. Conventional Cargo								
(1) Others	ton	51	94,000	149,000	210,000	101,000	161,000	281,000
Sub-total	ton	51	94,000	149,000	210,000	101,000	161,000	281,000
(Export Cargo)								
1. Container Cargo (Empty	TEU	28,291	43,300	48,300	53,500	104,500	145,400	196,400
Grand Total								
Container Cargo	TEU	56,582	86,600	96,600	107,000	209,000	290,800	392,800
Conventional Cargo	ton	51	94,000	149,000	210,000	101,000	161,000	281,000

Source: JICA Study Team

Table 6.1-6 Cargo Traffic Demand for Al Maqil

Cargo/Year	Unit	2012	2015			2025		
			Low	Middle	High	Low	Middle	High
(Import Cargo)								
1. Conventional Cargo								
(1) Cement	ton	726,468	0	264,000	720,000	0	432,000	1,296,000
(2) Others	ton	150,395	44,000	70,000	99,000	48,000	76,000	132,000
Sub-total	ton	876,863	44,000	334,000	819,000	48,000	508,000	1,428,000
Grand Total								
Conventional Cargo	ton	876,863	44,000	334,000	819,000	48,000	508,000	1,428,000

Source: JICA Study Team

6.2 Short/Mid-term Plan for Port Facilities

As mentioned in the previous Sections 5.2 and 5.4, the concepts of Long-term Development Plan and Alternative Plan is based on a different opening year of AFGP. Concepts of Short/Mid-term Development Plan and Alternative Plan are also depending on the start of operation of AFGP.

6.2.1 Port Facilities Development Plan for UQP North Berths No.25 to 27

As noted in the previous Section 5.4.1, according to GCPI, UQP No.25 to 27 berth will be developed and operated by private sector (ICTSI) with the concession agreement. No. 25 to 27 berth has approx. 600m in a straight line on the beach. Therefore, the development of 3 berths (each berth: 200m in length) with the capacities of 520,000TEU/Year is recommended

Development Plan of the No. 22 to No. 27 berths and yards is described in Figure 5.5-12 of Section 5.5.1.

6.2.2 Port Facilities Development Plan for UQP South

As noted in the previous Section 5.4.2, according to GCPI, No.2 and No.8 berth in UQP North will be redeveloped by private sector to respond to increased future demand for container cargo. At present, GCPI is conducting examinations for the submitted proposals in 2013.

Presently, the cargo operation in UQP South is mixed as container cargo, dry bulk and general cargo. Therefore, the cargo handling capacities of the berth in UQP South is less than the specialized cargo berth. Moreover, the existing berth structure is already deteriorated. Thus, if the effective gantry cranes are planned to be installed at the existing berth in UQP South, it is necessary for reconstruction of the berth.

The reconstruction of the existing berths is proposed for the installation of the gantry cranes. If two gantry cranes will be installed at each berth in the No. 4 to No. 8 of UQP South, yearly cargo handling volume will be 260,000TEU per berth (total 1,300,000TEU for 5 berths).

For more effective cargo handling capacity in UQP South, not only effectiveness of cargo handling in berths, but also it is necessary to increase cargo handling effectiveness in the yards. Redevelopment of specialized container yard is essential with strengthening of container handling capacity by reconstruction of berth in UQP South. The plans of private sector are unknown, however, it is important to remove the existing sheds and rearrange the railway route.

Development Plan of UQP South is shown in Figure 5.5-8 of Section 5.5.1.

6.2.3 Redevelopment Plan for Port Land Area of UQP

Both South and North Ports in Umm Qasr Port handle containers, dry bulk and general cargoes without clear zoning, and this situation sometimes causes obstruction of smooth traffic flow in the port area. In addition, the insufficient size of yard area limits the capacity of the container yards resulting in lower productivity of the container terminal as a whole. To cope with this situation, the following items are proposed to be dome for redevelopment of the ports.

The development of UQP aims to expand the capacity of container handling in order to cope with the increasing container traffic until AFGP starts operations and, thus, the redevelopment of the port area should be implemented as a part of the medium-term development.

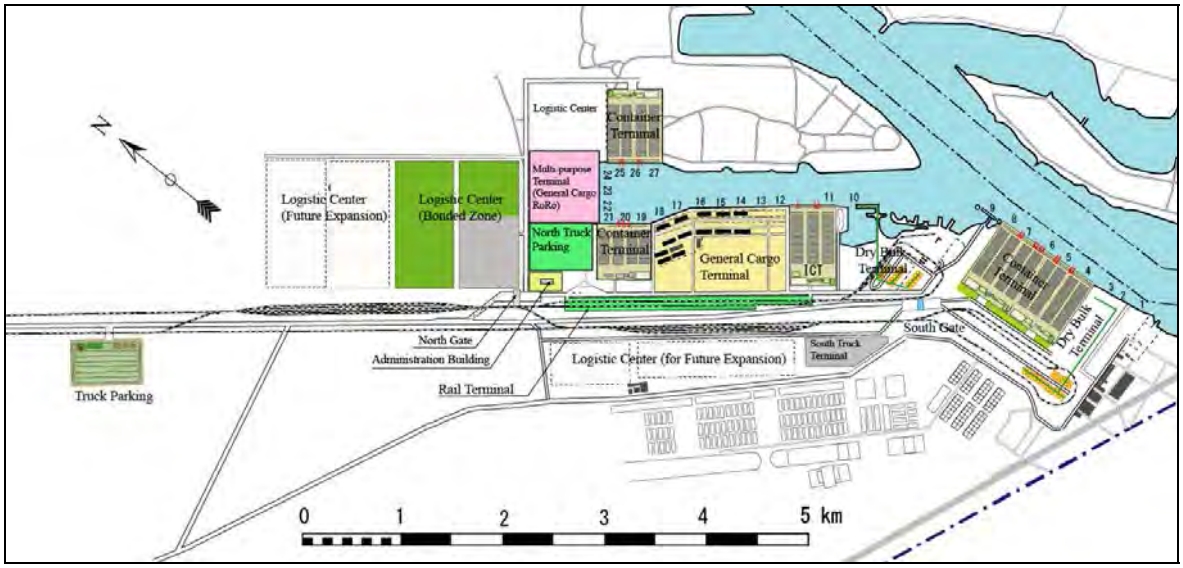
As explained in Section 5.4.3, the redevelopment of the UQP port area includes the following items:

a) Separation of access roads leading to South and North Port,
b) South port should handle dry bulk and containers only. To this end, general cargoes should be removed from South Port, the sheds on wharves No. 6, 7, and 8 should be demolished and the rail tracks should be relocated,
c) to construct additional port roads in North Port, for the purpose that the traffic on aprons will be one way.
d) to demolish sheds on wharves no. 12 and 13 for the convenience of handling large and heavy cargoes such as plant materials,
e) to construct a railway terminal behind the wharves for the purpose of the enlargement of yard areas of the container terminals and the convenience of railway transportation of containers,
f) to arrange the railway tracks in a circulating alignment to reduce shunting and suspensions of vehicle traffic by trains crossing roads.
g) To provide truck parking area outside of port area to stop trucks parking in the port.
h) To construct GCPI administration building outside of Port gates in order to reduce the number of vehicles inside the port area. Demolish the existing GCPI administration building to provide a space for the expansion of the container yard on Wharf No. 20, and
i) To provide land spaces for logistic centers for the purpose of reducing the duration that cargoes stay inside yards on the wharves.

It is urgent and important for the wharves handling conventional cargoes to upgrade their cargo handling productivity, especially general and dry bulk cargoes. To this end, the operational system should be enhanced as well as infrastructure so that vehicle traffic within the port is well controlled.

For the Short/Mid-term Development Plan, it is assumed that the general cargoes will be handled at the existing facilities at Wharves No. 14 through No. 19.

The facility layout of the Short/Mid-term Development Plan is shown in Figure 6.2-1.



Source: JICA Study Team

Figure 6.2-1 Short/Mid-term Development Plan of UQP

6.2.4 Redevelopment Plan of KZP and Utility Facilities

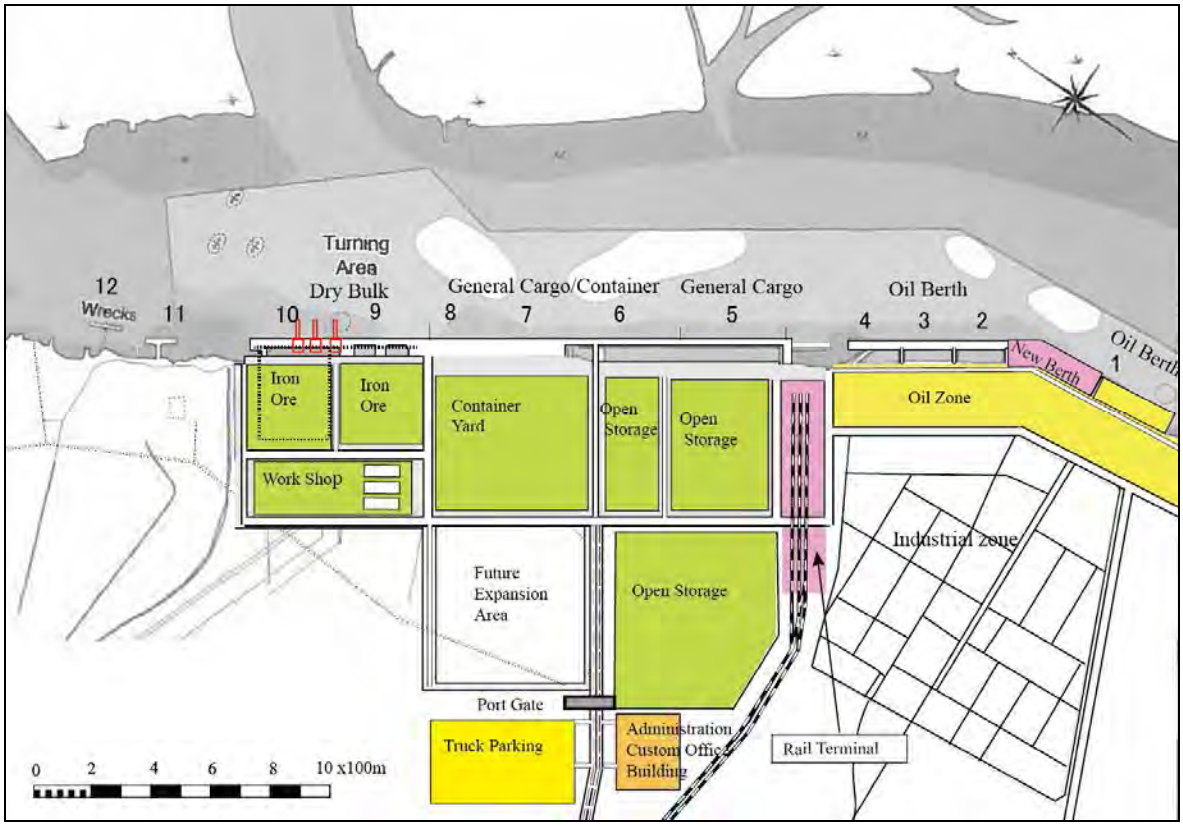
In Khor Al Zubayr Port, a new wharf is to be developed between Wharf No. 1 and Wharf No. 2 under the project "Iraq Port Sector Rehabilitation Project Phase II". Though the new wharf will be constructed for the handling of general cargoes, it was agreed between GCPI and MOO that the adjacent wharves No. 1 through No. 4 are to be used for the export of petroleum products. Thus, the new wharf is the only one among the oil wharves, and it will be used for oil products.

The wharves from No. 5 to the north are only used for the handling of dry cargoes , i.e., dry bulk and general cargoes, and the cargo handling productivity at these wharves can be improved by installing equipment specialized for specific commodity or type of cargo. In such case that the dry cargo volume grows as forecasted for the high growth scenario, additional wharves will be required. New wharves No. 11 and 12 that are proposed in the Long-term Development Plan should be constructed as the substitution for the wharf to be constructed between Wharf No. 1 and No.2 which will be used for oil product instead of dry cargoes as originally planned.

In the Long-term Development Plan of Khor Al Zubayr Port, it is desired the liquid cargo zone and dry cargo zone should be physically separated. In order to upgrade the productivity of dry cargo handling at the existing Wharves No. 5 through No. 10, it is proposed that the following improvement measures should be realized:

a) Zoning of open storage yards on and behind Wharves No. 5 through No. 8. This includes the construction of roads in the port area and the removal of warehouses and belt-conveyer on Wharf No. 5 through No. 8,
b) Rezoning of storage yards for iron ore on wharves No. 9 and 10,.
c) To relocate the workshop for the cargo handling equipment
d) The Installation of utility system
e) To relocate GCPI Administration building outside of port gate
f) To provide truck parking area,
g) To construct railway terminal

The layout plan of the Short/Mid-term Development Plan of Khor Al Zubayr Port is shown in Figure 6.2-2.



Source: JICA Study Team

Figure 6.2-2 Facility layout of Short/Mid-term Development Plan of Khor Al Zubayr port

6.2.5 Improvement of Khawr Abdallah Channel

Since it is necessary to cope with the increasing cargoes until the completion of AFGP Project Step-1, all the essential items described in Section 5.4.7 of the Long-term Development Plan are to be done urgently, except for the following Two(2) items;

- Re-routing of the channel part which is passing through Kuwaiti Territory.
- Deepening of the existing channel between the meeting point of AFGP Approach Channel and the Channel Entrance (Buoy No.3). It is however necessary to deepen the channel to 16m water depth according to the AFGP STEP-1 Project.

From the above, the following development shall be carried out in the Short/Mid-term Development Plan:

Table 6.2-1 Short/Mid-term Development Plan related to Khawr Abdallah Channel

Location	Development Scope	Remarks
1. Khawr Abdallah Channel	Water depth:12.5m between Buoy No.3 and Buoy No.25 Channel width: 200m	Dredging volume : Approximately 1.8 million m3
2 Buoy No.25～KZP	Water depth:12.5m、Width:250m	*To be done under Maintenance Dredging works.
3 UQP(North) Basin	Water depth: 12.5m、 Expand width to 300m/600m	Dredging volume: Approximately 3.0 million m3
4 AFGP Approach Channel	Water depth: 14.0 m Width: 200/300m	Dredging volume: Approximately 2,700 million m3
5 Khawr Abdallah Channel, All areas	Total 14wrecks be removed.	4 wrecks of 14 are to be removed under Phase II Project
6 UQP～KZP	Provide Navigation Aids	*Under Phase II Project

Source: JICA Study Team

6.2.6 Improvement of Shatt al Arab Channel

Main Issues in the Development of Shatt al Arab Channel are;

1) Establishment/agreement on the Border with Iran
2) Removal of obstacles from the channel, such as shipwrecks
3) Severe siltation/ sedimentation at River mouth segment

It will be essential to solve the above issues for an effective utilization of the channel. Although the agreement/conclusion of Item i) above is a prerequisite for the implementation of Item ii), it may be rather difficult to foresee when Item i) will be started and concluded.

As such, the Short-Middle Term Development Plan will contain only Item iii) above. It is however, not so critical to deepen the channel to 8m water depth which is a long-term target of the channel development, since many places along the channel are shallower than 8m, and considering the huge dredging volume required. However, most of the channel areas are generally maintaining a water depth around 6m throughout except the area at the river mouth.

From the above, it must be reasonably justified to deepen the channel at the river mouth portion (Buoy No.1~Buoy No.7) with the water depth at 6m, under the Short-Middle Term Development of the Channel. In this case, the dredging volume required is estimated around 4.5 million m3.

6.2.7 Port Facilities Development Plan for Al Faw Grand Port

In case of an Alternative of Short/Mid-term Development Plan, new two container berths are required by the year 2018 or 2019 and an additional two berths by the year 2025 or 2026, supposing the mid-growth case of cargo throughput. Therefore, AFGP is required to enter into service by 2018/2019 with at least two container berths. Before the opening of a container terminal with two berths, necessary infrastructures are 1) west and east breakwaters, 2) access channel dredging with a depth of 14-16 meters, 3) access road from the coastal land area to the terminal, 4) highway of 72 km from Al Faw to Umm Qasr with tunnel under Khor Alzubayr Channel, 5) quay gantry cranes, and 6) RTGs and other cargo handling equipment.

Early after the opening of AFGP, the highway to Umm Qasr may not be completed, and a provisional road will be used for hinterland transportation. However, the highway from Al Faw to Umm Qasr is indispensable for encouraging the use of AFGP and for realizing well balanced development of UQP and AFGP.

On the other hand, in the case of Short/Mid-term Development Plan, AFGP is expected to enter into operation by the year 2026, supposing the mid-growth case of cargo throughput, so it is not included in Short/Mid-term Development Plan.

6.3 Priority Projects for Short/Mid-term Port Development and Operations

6.3.1 Priority Projects for Short/Mid -term Port Development

According to the previous Section 5.2 and 5.4, the difference between the two options is the time of opening of AFGP. In the case of early opening of AFGP, the investment on the container terminals in UQP can be smaller, while, in the case of late opening of AFGP, a larger amount of investment in UQP is necessary to avoid overflows of containers at UQP, which would cause adverse impacts on the Iraqi economy.

Thus, selection of the two options is not a simple choice of two alternatives. Unless AFGP starts operations by 2018 as scheduled, the Alternative Plan is no longer eligible as an alternative. To choose the Alternative Plan will mean that it is most important to complete AFGP urgently including related infrastructures such as highways and the operation system of the new port. On the other hand, to choose the Short/Mid-term Development Plan means that all the possible investments are done to expand capacity to respond to container traffic volume. To this end, GCPI should encourage private operators to invest enough to expand the capacity of their container terminal to fulfill the requirements, and, when necessary, GCPI itself has to implement some project components that cannot be completed by private operators only.

Incidentally, a priority project is a set of project components that are picked up among constituents of the Short/Mid-term Development Plan, which is a project package that will generate the expected economic benefits provided that the whole package is realized. Thus, it is not possible to assess the economic viability of the priority project, and, therefore, economic evaluation will be done for the whole Short/Mid-term Development Plan in the following section. List of short/mid-term port development projects are shown in Table 6.3-1.

Table 6.3-1 Short/Mid-term Port Development Projects

UQP-North Berth No.25 to 27 (Container Terminal)
New Berth No.25 to 27
Container Yard: Reclamation
Container Yard: Soil Improvement
Container Yard: Pavement
Container Yard: Infrastructure (utility, electricity, drainage etc.)
Cargo Handling Equipment: Gantry Crane
Cargo Handling Equipment: RTG and Reach Stacker
Cargo Handling Equipment: Mobile Crane
Cargo Handling Equipment: Top/Side Lifter
Cargo Handling Equipment: Tractor & Chassis
UQP-North Berth No. 22 to 24 (General/RoRo/Container Terminal)
New Berth No.22 to 24
Yard: Reclamation
Yard: Soil Improvement
Yard: Pavement
Yard: Infrastructure (utility, electricity, drainage etc.)
Removal of existing berths

UQP-North Container Stacking Yard behind of Berth No.20

Container Yard: Pavement
Container Yard: Infrastructure (utility, electricity, drainage etc.)

UQP-South Berth No.4 ~ No.8a (Container Terminal)

Reinforcement / Expansion of Berth No.4
Reinforcement / Expansion of Berth No.5
Reinforcement / Expansion of Berth No.6
Reinforcement / Expansion of Berth No.7
Reinforcement / Expansion of Berth No.8
Reinforcement / Expansion of Berth No.8a
Removal of existing sheds
Container Yard: Pavement
Container Yard: Infrastructure (utility, electricity, drainage etc.)
Cargo Handling Equipment: Gantry Crane
Cargo Handling Equipment: RTG
Cargo Handling Equipment: Mobile Crane

UQP Land Area Redevelopment

Truck Parking
South Port Truck Terminal
Administration Building
Main Gates for North Port and South Port
Logistic Center (Bonded Zone) EPZ
Logistic Center
General Cargo Terminal/Yard
Container Terminal/Stacking Yard behind of No.12 & 13
International Container Terminal (ICT)
Removal of Existing Sheds behind of Berth No.12 & 13
Removal of Existing Jib Cranes
Removal of Existing Rails
Construction of New Rails
New Roads in Port Area

KZP Land Area Redevelopment

New Open Storage Yard 1
New Open Storage Yard 2
New Open Storage Yard 3
New Iron Ore Yards at Berth No. 9 & 10
New Work Shop behind of No. 9 & 10
New Sheds at Work Shop behind of No. 9 & 10
Removal of Existing Sheds behind of No.7 & 8
Removal of Existing Belt conveyors behind of No.5 & 6
Infrastructure (utility, electricity, drainage etc.)
Truck Parking Area
Administration Custom Office Building
Rail Terminal

Abu Flus Port Redevelopment Rehabilitation of Berth No.3 for Container Terminal Container Staking Yards Cargo Handling Equipment: Mobile Crane
Al Maqil Port Redevelopment Yard Rehabilitation
Khawar Abdallah Channel Abdallah Channel Wreck Removal (1 at buoy No.3 to No.25) Umm Qasr Channel Wreck Removal (6 along channel, 3 at berth No.9) Khor Al-Zubayr Channel Wreck Removal (4 along channel)
Shatt Al Arab Channel Mouth area Mouth to Abu Flus Port Abu Flus Port to Maquil Port Wreck Removal

6.3.2 Priority Projects for Improving Port Operations and Facility Maintenance

The short/mid-term port development projects in the previous section are priority projects which can increase the cargo handling capacity of the port to meet future demand. In addition it is important to improve port management and operations of Iraqi ports. Necessary actions for improving port management and operations are reported in Chapter 7.2, in which the following projects need installation of equipment/ facilities, or the implementation of maintenance work.

List of projects for improving/maintaining port facilities and equipment necessary for port management and operations.

Table 6.3-2 Projects for Port Management, Operations and Facility Maintenance

1. Introduction of Port EDI System and IT Reduction of gate processing time and shortening queues Introduction Port EDI for single window system for port management and operations
2. Installation/Modernization of Cargo Handling Equipment Installation of RTG system to increase yard capacity Installation of quay gantry cranes Good maintenance of cargo handling equipment
3. Development of Port Land Area Development of access road, port zone, and utility facilities Land area expansion for private operators, logistics companies

4. Rehabilitation and Reinforcement of Existing Facilities Redevelopment of old terminals, rehabilitation and reinforcement of old port facilities
5. Introduction of Vessel Traffic Service Introduction of AIS-VTS to secure safety of navigation and increase capacity of channel traffic
6. Maintenance of Navigation Channels Implementation of maintenance dredging by own fleet Removal of wrecks and obstacles in channels
7. Security Management of International Port Facilities Preparation of port security plans, Installation of port security facilities, Port security drills and exercises
8. Management of Waste from Ship & Port Activities and Floating Waste Reception of oil, oily water, sewage, garbage and other waste from ships. Installation of reception facilities. Recovery and treatment of floating waste on port waters
9. Development of Service Berths Construction of service berths for dredgers, tug boats and other work vessels
10. Improvement of Training Institute Modernization of seafarers/port labors training institute Training facilities for vessel traffic control, pilotage service, operation of dredgers and other services

6.3.3 Comparative Evaluation of Priority Projects

Among short/mid-term port development projects, projects for improving port management, and operations and facility maintenance, the priority of each project is evaluated from the viewpoints of urgency, necessity, effectiveness, and others.

Evaluation items selected for short/mid-term port development projects are 1) cargo handling capacity to be increased by the project, 2) urgency for implementation, 3) necessity for public initiative and assistance to private investment, 4) effectiveness on national interests in security, safety and environmental protection, and 5) amount of obstacles for project implementation. Each item is assessed by three ranks, i.e. A: important, B: necessary, C: less effective. Negative evaluation is introduced from the viewpoint of project implementation, i.e. -A: very difficult, and -B: fairly difficult. Overall evaluation is made based on number of A and B as shown in Table 6.3-3.

Projects for improving port management, operations and facility maintenance are evaluated from the viewpoint of 1) urgency of the project, 2) responsibility for GCPI, private operators, and assistance in the past, 3) effectiveness on national interests on security, safety and environmental protection. Definition of the rating A, B, C is the same as the previous paragraph. Results of the overall evaluation is as shown in Table 6.3-4.

Table 6.3-3 Evaluation of Priorities of Short/Mid-term Port Development Projects

Factors / Project	Capacity Expansion	Urgency	Necessity for Public Initiative	Effective on Safety	Obstacles in Imple-mentation	Overall Evaluation
1. UQP-North Berths No.25 to 27	A	B	C	-	-	1A1B
2. UQP-North Berths No. 22 to 24	B	A	C	-	-	1A1B
3. UQP-North Yard behind No. 20	B	A	C	-	-	1A1B
4. UQP-South Berths No.4 to No. 8	A	A	A	-	-	3A
5. UQP Land Area Redevelopment	B	B	A	B	-B	1A2B
6. KZP Land Area Redevelopment	B	B	A	-	-B	1A1B
7. Abu Flus Port Redevelopment	C	B	B	-	-	2B
8. Al Maqil Port Redevelopment	C	B	B	-	-	2B
9. Khawr Abdallah Channel	B	B	A	B	-B	1A2B
10. Shatt Al Arab Channel	B	C	A	B	-A	2B

Note: A: Very Important, B: Necessary, C: Less Impact, -A: Very Difficult, -B: Fairly Difficult
Source: JICA Study Team

Table 6.3-4 Evaluation of Priorities of Projects for Management and Operations

	Urgency	Necessity for GCPI's Initiative	Safety, Security, Environmental Protection	Overall Evaluation
1. Introduction of Port EDI system and IT	A	A	B	2A1B
2. Installation/Modernization of Cargo Handling Equipment	A	B	B	1A2B
3. Rehabilitation/Reinforcement of Existing Facilities	A	B	A	2A1B
4. Introduction of Vessel Traffic Service	A	A	B	2A1B
5. Maintenance of Navigation Channels, Development of Service Berth	A	A	B	2A1B
6. Security Management of International Port Facilities	B	A	A	2A1B
7. Management of Waste from Ships & Port Activities	B	A	A	2A1B
8. Improvement of Training Institute	A	A	C	2A

Note: A: Very Important, B: Necessary, C: Less Impact
Source: JICA Study Team

The abovementioned evaluation shows the high priority for GCPI's early implementation, given by number of A followed by number of B. Among the short/mid-term port development projects, priority ranking is assessed as follows.

1) UQP South Berths No.4-No.8 (Container Terminal) Infrastructure Development (Superstructure by Private Operators)

Effective on expanding container handling capacity, Necessity for urgent implementation and Importance on public initiative

2) UQP Land Area Redevelopment

Public initiative is necessary and important for encouraging private investment in port facilities

2) Khawr Abdallah Channel

Important for navigation safety. Public initiative is imperative for channel dredging. Difficulties are anticipated in dredging in Kuwait waters.

3) UQP North Berths No. 25 to 27, Berths No. 22 to 24, and Yard behind No.20

Effective on expanding container handling capacity, Private operators given concession to develop and operate these terminals, Less necessity for public investment.

3) KZP Land Area Redevelopment

Necessary for improving port capacity, UQP has higher priority in land area redevelopment

4) Abu Flus Port Redevelopment and Al Maqil Port Redevelopment

Expansion of container handling capacity is smaller than those of UQP and KZP, Public initiative in redevelopment is much expected.

4) Shatt Al Arab Channel

Dredging to the original depth is expected, Difficulties are anticipated in dredging the river mouth due to UXO clearance

Among projects for improving port management, operations and facility maintenance listed in previous section, priority ranking is assessed as follows.

1) Security Management of International Port Facilities

Following ISPS Code, installation of security facilities and monitoring is an urgent task for GCPI.

1) Management of Waste from Ships, Port Activities and Floating Waste

In accordance with Annexes of MARPOL Convention, installation of reception facilities and their operation is an important task for GCPI.

1) Maintenance of Navigation Channel, Development of Service Berths

The GCPI's dredging fleet shall implement maintenance dredging steadily and effectively, Service berths for dredgers, tug boats, pilot boats and other work vessels are indispensable for their mooring, loading and discharging of materials, boarding and disembarking of passengers.

1) Introduction of Vessel Traffic Service

VTS is urgently required for Khawr Abdallah Channel and navigation to/from UQP and KZP. Installation of VTS is already planned.

1) Rehabilitation and Reinforcement of Existing Facilities

Old deteriorated facilities must be replaced, rehabilitated or reinforced. New development or improvement projects will help their replacement.

1) Introduction of Port EDI system and IT

Port EDI system and one stop service plays an important role in effective operations and better service to port users. New IT system is planned by GCPI

2) Installation/Modernization of Cargo Handling Equipment

Private operators are required to install and operate cargo handling equipment. Replacement of old cranes and RTGs shall be encouraged.

2) Improvement of Training Institute

Training of seafarers, ship surveyors, port pilots, crane operators and other port service professionals is necessary under Iraqi education system.

6.4 Preliminary Evaluation of Priority Projects

6.4.1 Preliminary Facility Design

(1) Preliminary Design Condition of Berth and Yard for Redevelopment Project of UQP South

Table 6.4-1 shows the preliminary design condition of berth and yard for redevelopment project of UQP South.

Table 6.4-1 Preliminary design condition of berth and yard for redevelopment project of UQP South

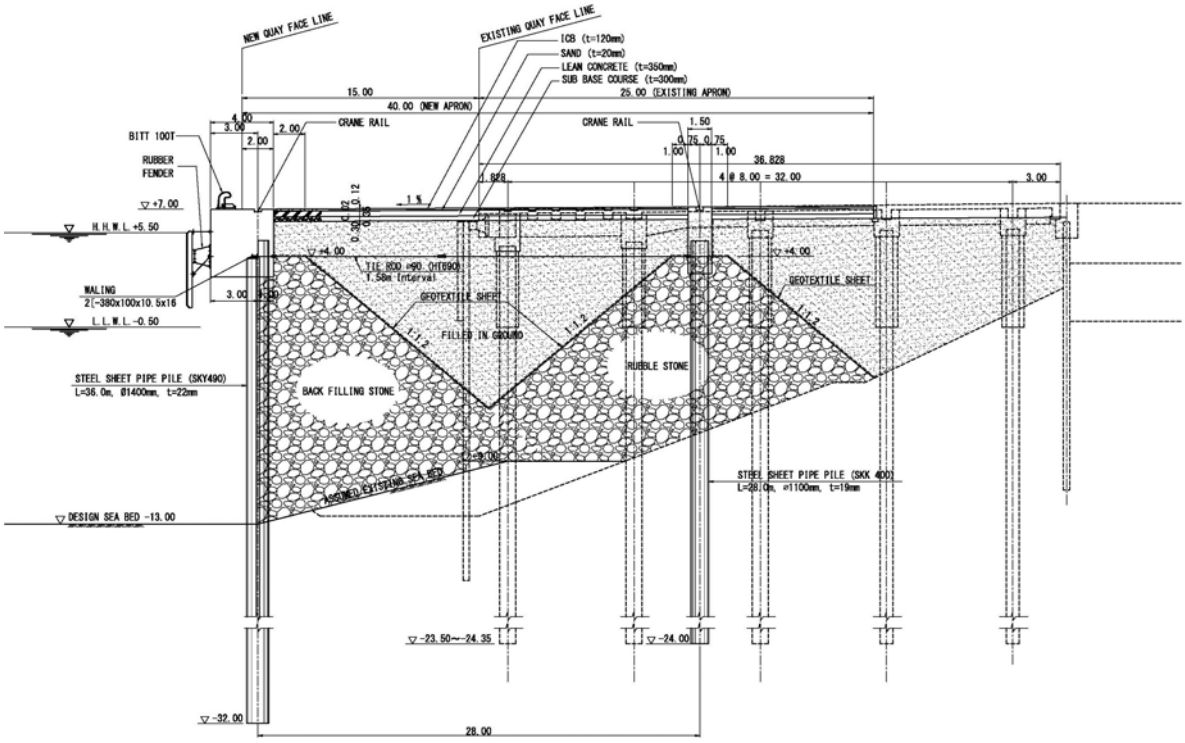
1) Berth specification	Crown height	+7.0m
	Planning depth	13.0m
2) Design Condition	Maximum design ship(Container Ship)	LOA: 198.9m
		Maximum draft: 12.0m
		DWT: 41,771tons
	Minimum design ship (Container Ship)	LOA: 139m
		Maximum draft: 7.9m
		DWT: 10,000tons
	Gantry Crane	For Panamax ship, 1,000ton of one Gantry Crane
	RTG (Container Stacking in 6 rows and 5 tires)	Span: 23.5m
		Number of wheels: 8
		Max. wheel load: 35t/wheel
	Container stacking yard	5 tiers (20, 40ft container)
	Reach Stacker	Lifting load: 45t
3)Natural condition	Tide	HHWL: ＋5.5m, LLWL: -0.5m
	Maximum wind velocity	17．5m/s (34 knot)
	Design CBR	More than 10
	K30at sub-grade	More than 70

Source: JICA Study Team

(2) Structure Outline of Redevelopment Project of UQP South

The existing berths from No. 4 to No. 9 (1,090m in length) are planned for container berth redevelopment, with the straight wharf face line expanded by between 15m to 19m in front of the existing wharf. The container handling equipment planned for installation is 4 gantry cranes in three berths and the installation of 8 RTGs in a container yard behind the berths, after the removal of existing sheds.

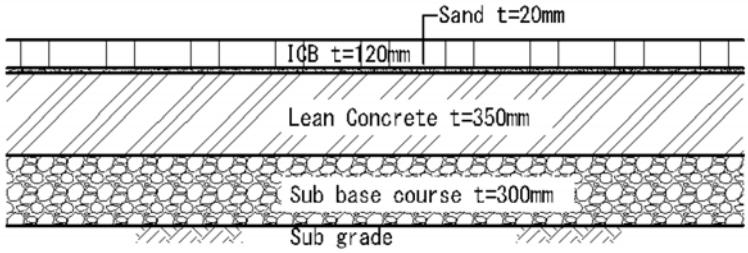
The wharf structure will be a steel sheet pipe pile structure. The typical standard section is described in Figure 6.4-1. The upper structure of the existing berth shall be removed, but existing piles may remain after reclamation. A container gantry crane upon rails, above the steel sheet piles, with steel piles for anchorage; is planned for the wharf.



Source: JICA Study Team

Figure 6.4-1 Section of No. 5 Berth in UQP South Redevelopment

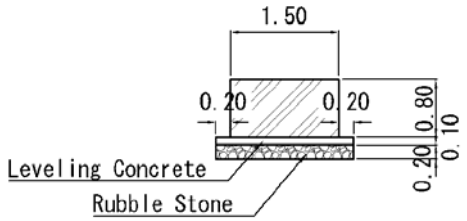
Based on the workability points under the natural condition in the Basrah area, the container yard structure will be applied ICB pavement (120mm in thickness of ICB) and selected heavy duty pavement.

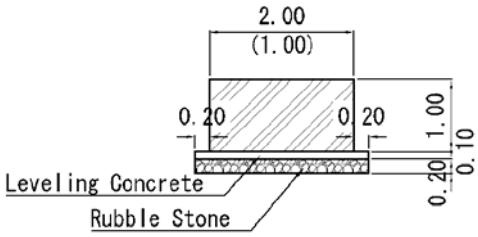


Source: JICA Study Team

Figure 6.4-2 Section of Container Yard Pavement

The foundation of RTG passing line and container stacking area (maximum 5 tiers) are applied concrete foundation as follows.





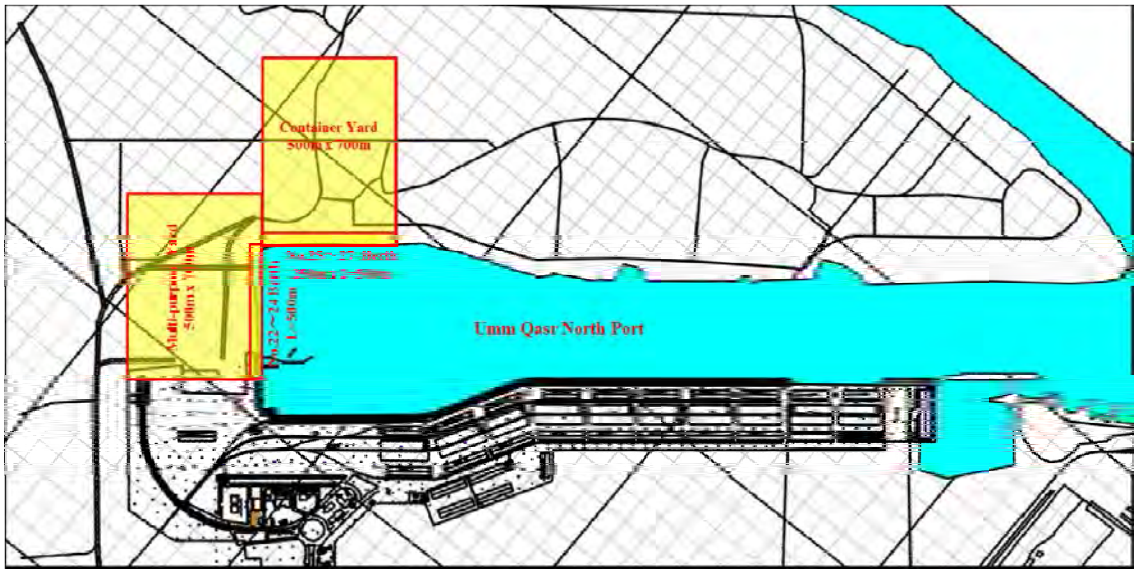
Concrete Foundation for RTG Passing Line **Concrete Foundation for Container Stacking Area**

Source: JICA Study Team

Figure 6.4-3 Section of Concrete Foundation in Container Yard

(3) Structure Outline of No. 22 to No. 27 in the Development Project of UQP North

The location of the No. 22 to No. 27 berths and yards in the development of UQP North is described as follows.

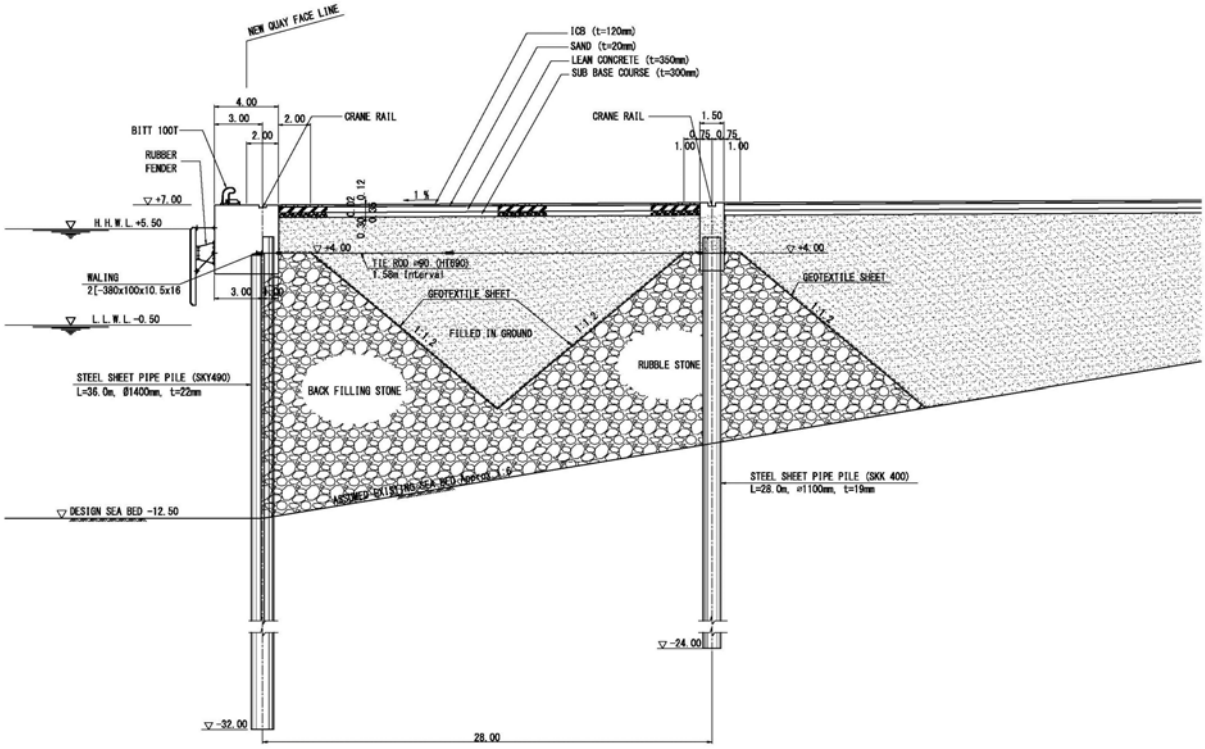


Source: JICA Study Team

Figure 6.4-4 Location of No. 22 to No. 27 berths and yards in the development of UQP North

The No. 25 to No. 27 berth (200m in length each) in the UQP North are planned for development as container berths. The container handling equipment planned for installation is 4 gantry cranes in these berths and the installation of 8 RTGs in container yard behind the berths.

In almost the same design condition, but with 12.5m planned depth of UQP North redevelopment, the wharf structure will be steel sheet pipe pile structure. The typical standard section is described in Figure 6.4-5. A container gantry crane upon rails, above the steel sheet piles, with steel piles for anchorage; is planned for the wharf.



Source: JICA Study Team

Figure 6.4-5 Typical Section of No. 25 to 27 Berth in UQP South Development

The container yard structure behind No. 25 to No. 27 is applied ICB pavement same as Umm Qasr South Port Development. No. 22 to 24 (500m in total length) berths are also applied steel sheet pipe pile structure with 12.5m depth.

(4) Redevelopment Plan for Port Grounds of UQP and Development of Utilities

The redevelopment plan for port grounds of UQP is as follows.

1) Yard redevelopment behind No. 12 & 13 berth in UQP North after removal of sheds (ICB pavement after removal of sheds)
2) Yard redevelopment of area behind No. 14 to No. 19 of general cargo berth in UQP North (ICB pavement)
3) Container yard redevelopment behind No. 20 to 21 in UQP North (ICB pavement)
4) Port access road development behind UQP North and behind UQP South (ICB pavement, 2 lanes per 1 direction)
5) Track parking development (Gravel pavement)
6) Main road development (ICB pavement)
7) Rail Terminal development (Reuse of the existing rails and new rail installation)
8) Loop railway development (Reuse of the existing rails and new rail installation)
9) Main gates Development of UQP South and North (RC building)
10) Relocation of management office (RC building)
11) Reservation of logistic center area (Gravel pavement)

Moreover, development of utilities is planned as follows.

1) Expansion project of the water supplement facilities (seawater desalination facilities)
2) Expansion project of the electricity facilities (electric cable installation)
3) Development of IT system (VMS, Container handling management system, gate management system, rail terminal management system, etc.)
4) Expansion of sewerage treatment facilities (activated sewerage treatment)

6.4.2 Preliminary Cost Estimates

Approximate project cost for Short/Mid-term Development Plan (2025) is estimated in this section. The project cost is calculated for necessary project components in both major ports and major channels selected in Sections 6.3 and 6.4.1 respectively.

(1) Condition of the Estimation

Refer to Section 5.5.2(2)

(2) Priority Project Components

Priority project components in both major ports and major channels for Short/Mid-term Development Plan are indicated in Table 6.4-2 through Table 6.4-4.

Table 6.4-2 Priority Project Components for UQP (Short/Mid-term Development Plan)

No.	Project Component	Short/Mid-term Development (2025)
1.	**Important Project Components in Main Ports**	
1.1	**UQP-North Berth No.25, 26 & 27 (Container Terminal)**	
1.1.1	New Berth No.25, 26 & 27	600 m (200 m x 50 m (-12.5m) x 3 berths)
1.1.2	Container Yard: Reclamation	1,340,000 m3
1.1.3	Container Yard: Soil Improvement	335,000m2
1.1.4	Container Yard: Pavement	335,000m2
1.1.5	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.
1.1.6	Cargo Handling Equipment: Gantry Crane	4sets
1.1.7	Cargo Handling Equipment: RTG	8 sets (to be confirmed)
1.1.8	Cargo Handling Equipment: Mobile Crane	3 sets
1.1.9	Cargo Handling Equipment: Reach Stacker	10 sets
1.1.10	Cargo Handling Equipment: Top/Side Lifter	6 sets
1.1.11	Cargo Handling Equipment: Tractor & Chassis	13 sets
1.2	**UQP-North Berth No.22, 23 & 24 (General/RoRo/Container Terminal)**	
1.2.1	New Berth No.22, 23 & 24	400m (3 berths)
1.2.2	Yard: Recclamation	1,200,000m3
1.2.3	Yard: Soil Improvement	600,000m2
1.2.4	Yard: Pavement	600,000m2
1.2.5	Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.
1.2.6	Removal of existing berths	400m (3 berths)
1.3	**UQP-North Container Stacking Yard behind of Berth No.20 & 21**	
1.3.1	Container Yard: Pavement	560,000m2 (800m x 700m)
1.3.2	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.
1.4	**UQP-South Berth No.4 ~ No.8a (Container Terminal)**	
1.4.1	Reinforcement / Expansion of Berth No.4	200m x 15m (-13.0m)
1.4.2	Reinforcement / Expansion of Berth No.5	250m x 15m (-13.0m)
1.4.3	Reinforcement / Expansion of Berth No.6	183m x 15m (-13.0m)
1.4.4	Reinforcement / Expansion of Berth No.7	183m x 15m (-13.0m)
1.4.5	Reinforcement / Expansion of Berth No.8	183m x 15m (-13.0m)
1.4.6	Reinforcement / Expansion of Berth No.8a	91m x 15m (-13.0m)
1.4.7	Removal of existing sheds	6 Sheds, 36,000m2 (150m x 40m x 6 shed)
1.4.8	Container Yard: Pavement	763,000m2, (1,090m x 700 m)
1.4.9	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.
1.4.10	Cargo Handling Equipment: Gantry Crane	7 sets for each terminals (545.0m x 2)
1.4.11	Cargo Handling Equipment: RTG	21 sets for each terminals (545.0m x 2)
1.4.12	Cargo Handling Equipment: Mobile Crane	-
1.5	**UQP Area Redevelopment (except for 1.1、1.2、1.3、1.4)**	
1.5.1	Truck Parking	1,500,000m2 (1.5km x 1.0km)
1.5.2	South Port Truck Terminal	L.S.
1.5.3	Administration Building	200,000m2 (200m x 200m x 5 floors)
1.5.4	Main Gates for North Port and South Port	2 Gates
1.5.5	Logistic Center (Bonded Zone) EPZ	1,500,000m2 (500m x 1,500m x 2 area)
1.5.6	Logistic Center	600,000m2 (300m x 2,000m)
1.5.7	General Cargo Terminal/Yard	600,000m2 (1,200m x 500m)
1.5.8	Container Terminal/Stacking Yard behind of No.12 & 13	400,000m2 (400m x 1,000m)
1.5.9	International Container Terminal (ICT)	L.S.
1.5.10	Removal of Existing Sheds behind of Berth No.12 & 13	4 Sheds, 24,000m2 (150m x 40m x 6 shed)
1.5.11	Removal of Existing Jib Cranes	24 nos
1.5.12	Removal of Existing Rails	L.S.
1.5.13	Construction of New Rails	L.S.
1.5.14	New Roads in Port Area	80,000m2 (8m x 10,000m)

Source: JICA Study Team

Table 6.4-3 Priority Project Components for KZP, AFGP, Others (Short/Mid-term Development Plan)

No.	Project Component	Short/Mid-term Development (2025)
1.6	**KZP Berth No. 11 & 12 (General Cargo Terminal)**	
1.6.1	New Berth No.11	-
1.6.2	New Berth No.12	-
1.6.3	Dredging in front of Bert No. 11 & 12	-
1.6.4	Yard: Recclamation	-
1.6.5	Yard: Soil Improvement	-
1.6.6	Yard: Pavement	-
1.6.7	Yard: Infrastructure (utility, electricity, drainage etc.)	-
1.6.8	Removal of Existing Berth No. 11, 12 & 13	-
1.6.9	Relocation of Berth No. 11	-
1.6.10	Relocation of Berth No. 12	-
1.6.11	New Navy Berth No. 13 (substitution of old Berth No. 11)	-
1.7	**KZP Area Redevelopment (except for 1.6)**	
1.7.1	New Open Storage Yard 1	250,000 m2, (500m x 500m)
1.7.2	New Open Storage Yard 2	250,000 m2, (500m x 500m)
1.7.3	New Open Storage Yard 3	250,000 m2, (500m x 500m)
1.7.4	New Iron Ore Yards at Berth No. 9 & 10	224,000 m2, (560m x 400m)
1.7.5	New Work Shop behind of No. 9 & 10	112,000 m2, (560m x 200m)
1.7.6	New Sheds at Work Shop behind of No. 9 & 10	3 Sheds, 20,000m2 (100m x 20m x 3 shed)
1.7.7	Removal of Existing Sheds behind of No. 7 & 8	4 Sheds, 28,800m2 (180m x 40m x 4 shed)
1.7.8	Removal of Existing Belt conveyors behind of No. 5 & 6	-
1.7.9	Infrastructure (utility, electricity, drainage etc.)	L.S.
1.7.10	Truck Parking Area	150,000m2, (500m x 300m)
1.7.11	Administration Custom Office Building	150,000m2, (250m x 300m x 2floors)
1.7.12	Rail Terminal	L.S.
1.8	**Abu Flus Port Redevelopment**	
1.8.1	Rehabilitation of Berth No.3 for Container Terminal	250m
1.8.2	Container Staking Yards	25,000m (250m x 100m)
1.8.3	Cargo Handling Equipment: Mobile Crane	2 sets
1.9	**Al Maqil Port Redevelopment**	
1.9.1	River Crossing Bridge	-
1.9.2	Yard Rehabilitation	180,000m2 (600m x 300m)
1.10	**Al Faw Ground Port**	
1.10.1	New Container berth No.1	-
1.10.2	New Container berth No.2	-
1.10.3	New Container berth No.3	-
1.10.4	New Container berth No.4	-
1.10.5	New Container berth No.5	-
1.10.6	New Container berth No.6	-
1.10.7	New Container berth No.7	-
1.10.8	New Container berth No.8	-
1.10.9	New Container berth No.9	-
1.10.10	Access Channel Dredging	-
1.10.11	Access Road TYPE-1	-
1.10.12	Access Road TYPE-2	-
1.10.13	Revetment	-
1.10.14	Highway AFGP-UQP: Part-1 connecting to Al Faw Port	-
1.10.15	Highway AFGP-UQP: Part-2	-
1.10.16	Highway AFGP-UQP: Part-3, incl tunnel approach	-
1.10.17	Highway AFGP-UQP: Part-4 from Safwan city, incl tunnel approach	-
1.10.18	Highway AFGP-UQP: Tunnel between Part 3 and Part 4	-
1.10.19	Cargo Handling Equipment: Gantry Crane	-
1.10.20	Cargo Handling Equipment: RTG	-
1.10.21	Cargo Handling Equipment: Top/Side Lifter	-
1.10.22	Cargo Handling Equipment: Tractor & Chassis	-
1.10.23	West Breakwater	-
1.10.24	East Breakwater (assumed as 35% in progress)	-

Source: JICA Study Team

Table 6.4-4 Priority Project Components for Waterways (Short/Mid-term Development Plan)

No.	Project Component	Short/Mid-term Development (2025)			
2.	**Important Project Components for Major Waterways**	**Depth**	**Width**	**Length**	**Dredging**
		(m)	(m)	(km)	(Mil. m3)
2.1	**Khawar Abdallah Channel**	-	-	-	21.00
2.2.1	Abdallah Channel	-	-	-	18.00
2.2.2	Wreck Removal (1 at buoy No.3 to No.25)	1 wreck			
2.2.3	Umm Qasr Channel	**-12.5**	300	25.10	3.00
2.2.4	Wreck Removal (6 along channel, 3 at berth No.9)	9 wrecks			
2.2.5	Khor Al-Zubayr Channel	-12.5	200/300	17.60	0.00
2.2.6	Wreck Removal (4 along channel)	4 wrecks	(by Phase II)		
2.2	**Shatt Al Arab Channel**			144.00	4.50
2.2.1	Mouth area	-6	150	10.50	4.50
2.2.2	Mouth to Abu Flus Port	-6	120/150	106.50	-
2.2.3	Abu Flus Port to Maquil Port	-6	120/150	27.00	-
2.2.4	Wreck Removal	Approx. 23 wrecks			
2.3	**AFGP Access Channel**	-	-	-	-
2.3.1	AFGP Access Channel	-	-	-	-

Source: JICA Study Team

(3) Approximate Project Cost

Detailed project costs for necessary project components are estimated as shown in Table 6.4-5 and Table 6.4-6.

Table 6.4-5 Project Cost Summary (Short/Mid-term Development Plan)

No.		Project Components	Q'ty	FC 1,000USD	LC 1,000USD	Total 1,000USD
A.	Procurement & Construction			0	3,536,582	3,536,582
	1.	Important Project Components for Main Ports		0	2,399,651	2,399,651
	1.1	UQP-North Berth No.25, 26 & 27 (Container Terminal)	1	0	391,581	391,581
	1.2	UQP-North Berth No.22, 23 & 24 (General/Roro/Container Terminal)	1	0	335,302	335,302
	1.3	UQP-North Container Stacking Yard behind of Berth No.20	1	0	106,232	106,232
	1.4	UQP-South Berth No.4 to No.8a (Container Terminal)	1	0	776,821	776,821
	1.5	UQP Area Redevelopment (except for 1.1, 1.2, 1.3 & 1.4)	1	0	420,758	420,758
	1.6	KZP Berth No.11 & 12 (General Cargo Terminal)	1	0	0	0
	1.7	KZP Area Redevelopment (except for 1.6)	1	0	318,957	318,957
	1.8	Abu Flus Port Redevelopment	1	0	14,000	14,000
	1.9	Al Maquil Port Redevelopment	1	0	36,000	36,000
	1.10(1)	AFGP Development (Berth, Access Channel, Cranes)	1	0	0	0
	1.10(2)	AFGP Development (Inner Access Road)	1	0	0	0
	1.10(3)	AFGP Development (High Way to AFGP)	1	0	0	0
	1.10(4)	AFGP Development (West Breakwater)	1	0	0	0
	1.10(5)	AFGP Development (East Breakwater, Remaining Works)	1	0	0	0
	2.	Important Project Components for Waterways		0	547,500	547,500
	2.1	Khawar Abdallah Channel	1	0	365,000	365,000
	2.2	Shatt Al Arab Channel	1	0	182,500	182,500
	2.3	AFGP Access Channel	1	0	0	0
	3.	Base Construction Costs （1.+2.)		0	2,947,151	2,947,151
	4.	Contingency (20.0% of 3.)	20.0%	0	589,430	589,430
		Contingency（Price Escalation), included in above 4.				0
B.	Engineering Services			0	203,353	203,353
	1.	Base Costs for Engineering (5.0% of A.)	5.0%	0	176,829	176,829
	2.	Contingency (15.0% of 1.)	15.0%	0	26,524	26,524
C.		Sub-total (A.+B.)		0	3,739,935	3,739,935
D.		Administration Costs and others		0	186,997	186,997
	a.	Land Acquisition and Compensation				
	b.	Administration Cost (5.0% of C.)	5.0%	0	186,997	186,997
	c.	Value Added Tax (VAT)				
	d.	Sales and Other Taxes				
E.		Ground Total（C.+D.)		0	3,926,932	3,926,932

Source: JICA Study Team

Table 6.4-6 Project Cost Summary (Alternative Plan)

No.		Project Components	Q'ty	FC 1,000USD	LC 1,000USD	Total 1,000USD
A.	Procurement & Construction			0	6,799,470	6,799,470
	1.	Important Project Components for Main Ports		0	4,713,725	4,713,725
	1.1	UQP-North Berth No.25, 26 & 27 (Container Terminal)	1	0	0	0
	1.2	UQP-North Berth No.22, 23 & 24 (General/Roro/Container Terminal)	1	0	335,302	335,302
	1.3	UQP-North Container Stacking Yard behind of Berth No.20	1	0	106,232	106,232
	1.4	UQP-South Berth No.4 to No.8a (Container Terminal)	1	0	206,491	206,491
	1.5	UQP Area Redevelopment (except for 1.1, 1.2, 1.3 & 1.4)	1	0	420,758	420,758
	1.6	KZP Berth No.11 & 12 (General Cargo Terminal)	1	0	0	0
	1.7	KZP Area Redevelopment (except for 1.6)	1	0	318,957	318,957
	1.8	Abu Flus Port Redevelopment	1	0	14,000	14,000
	1.9	Al Maquil Port Redevelopment	1	0	36,000	36,000
	1.10(1)	AFGP Development (Berth, Access Channel, Cranes)	1	0	641,665	641,665
	1.10(2)	AFGP Development (Inner Access Road)	1	0	169,902	169,902
	1.10(3)	AFGP Development (High Way to AFGP)	1	0	1,504,418	1,504,418
	1.10(4)	AFGP Development (West Breakwater)	1	0	700,000	700,000
	1.10(5)	AFGP Development (East Breakwater, Remaining Works)	1	0	260,000	260,000
	2.	Important Project Components for Waterways		0	952,500	952,500
	2.1	Khawar Abdallah Channel	1	0	365,000	365,000
	2.2	Shatt Al Arab Channel	1	0	182,500	182,500
	2.3	AFGP Access Channel	1	0	405,000	405,000
	3.	Base Construction Costs（1.+2.)		0	5,666,225	5,666,225
	4.	Contingency (20.0% of 3.)	20.0%	0	1,133,245	1,133,245
		Contingency(Price Escalation), included in above 4.				0
B.	Engineering Services			0	390,970	390,970
	1.	Base Costs for Engineering (5.0% of A.)	5.0%	0	339,973	339,973
	2.	Contingency (15.0% of 1.)	15.0%	0	50,996	50,996
C.		Sub-total (A.+B.)		0	7,190,439	7,190,439
D.		Administration Costs and others		0	359,522	359,522
	a.	Land Acquisition and Compensation				
	b.	Administration Cost (5.0% of C.)	5.0%	0	359,522	359,522
	c.	Value Added Tax (VAT)				
	d.	Sales and Other Taxes				
E.		Ground Total(C.+D.)		0	7,549,961	7,549,961

Source: JICA Study Team

Project cost breakdowns for necessary project components in both major ports and major channels are shown in Table 6.4-7 through Table 6.4-9.

Table 6.4-7 Project Cost Breakdown for Priority Project Components in UQP (Short/Mid-term Development Plan)

No.	Project Component	Particulars	Units	Q'ty	Rate (USD)	Amount (USD)
1.	**Important Project Components in Main Ports**					
1.1	**UQP-North Berth No.25,No.26 & 27 (Container Terminal)**		**Subtotal**			**391,581,324**
1.1.1	New Berth No.25, No.26&No.27	600m (200 m x 50 m (-12.5m) x 3berths)	L.S.	1	117,270,074	117,270,074
1.1.2	Container Yard: Reclamation	1,340,000 m3	m3	1,340,000	35	46,900,000
1.1.3	Container Yard: Soil Improvement	335,000m2	m2	335,000	153	51,255,000
1.1.4	Container Yard: Pavement	335,000m2	m2	335,000	202	67,670,000
1.1.5	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.	式	1	6,986,250	6,986,250
1.1.6	Cargo Handling Equipment: Gantry Crane	4sets	No.	4	14,950,000	59,800,000
1.1.7	Cargo Handling Equipment: RTG	8 sets (to be confirmed)	No.	8	2,300,000	18,400,000
1.1.8	Cargo Handling Equipment: Mobile Crane	3 sets	No.	3	2,000,000	6,000,000
1.1.9	Cargo Handling Equipment: Reach Stacker	10 sets	No.	10	1,000,000	10,000,000
1.1.10	Cargo Handling Equipment: Top/Side Lifter	6 sets	No.	6	1,000,000	6,000,000
1.1.11	Cargo Handling Equipment: Tractor & Chassis	13 sets	No.	13	100,000	1,300,000
1.2	**UQP-North Berth No.22, 23 & 24 (General/RoRo/Container Terminal)**		**Subtotal**			**335,301,751**
1.2.1	New Berth No.22,No.23 & 24	400m (3berths)	L.S.	2	58,423,332	116,846,664
1.2.2	Yard: Recclamation	1,200,000m3	m3	1,200,000	35	42,000,000
1.2.3	Yard: Soil Improvement	600,000m2	m2	600,000	133	79,800,000
1.2.4	Yard: Pavement	585,000m2	m2	585,000	140	81,900,000
1.2.5	Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	12,161,250	12,161,250
1.2.6	Removal of existing berths	400m (3berths)	m	1	2,593,837	2,593,837
1.3	**UQP-North Container Stacking Yard behind of Berth No.20 & 21**		**Subtotal**			**106,232,000**
1.3.1	Container Yard: Pavement	560,000m2 (800m x 700m)	m2	560,000	169	94,640,000
1.3.2	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	11,592,000	11,592,000
1.4	**UQP-South Berth No.4 ~ No.8a (Container Terminal)**		**Subtotal**			**776,821,294**
1.4.1	Reinforcement / Expansion of Berth No.4	200m x 15m (-13.0m)	L.S.	1	52,189,119	52,189,119
1.4.2	Reinforcement / Expansion of Berth No.5	250m x 15m (-13.0m)	L.S.	1	65,236,398	65,236,398
1.4.3	Reinforcement / Expansion of Berth No.6	183m x 15m (-13.0m)	L.S.	1	47,753,043	47,753,043
1.4.4	Reinforcement / Expansion of Berth No.7	183m x 15m (-13.0m)	L.S.	1	47,753,043	47,753,043
1.4.5	Reinforcement / Expansion of Berth No.8	183m x 15m (-13.0m)	L.S.	1	47,753,043	47,753,043
1.4.6	Reinforcement / Expansion of Berth No.8a	91m x 15m (-13.0m)	L.S.	1	23,746,049	23,746,049
1.4.7	Removal of existing sheds	6 Sheds, 36,000m2 (150m x 40m x 6 shed)	No.	6	4,074,354	24,446,124
1.4.8	Container Yard: Pavement	730,300m2	m2	730,300	201	146,790,300
1.4.9	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	15,254,175	15,254,175
1.4.10	Cargo Handling Equipment: Gantry Crane	7 sets for each terminals (545.0m x 2)	No.	14	14,950,000	209,300,000
1.4.11	Cargo Handling Equipment: RTG	21 sets for each terminals (545.0m x 2)	No.	42	2,300,000	96,600,000
1.4.12	Cargo Handling Equipment: Mobile Crane	-	No.	-	2,000,000	0
1.5	**UQP Area Redevelopment (except for 1.1、1.2、1.3、1.4)**		**Subtotal**			**420,758,000**
1.5.1	Truck Parking	1,500,000m2 (1.5km x 1.0km)	m2	1,500,000	23	34,500,000
1.5.2	South Port Truck Terminal	L.S.	L.S.	1	-	0
1.5.3	Administration Building	200,000m2 (200m x 200m x 5 floors)	m2	200,000	800	160,000,000
1.5.4	Main Gates for North Port and South Port	2 Gates	No,	2	5,750,000	11,500,000
1.5.5	Logistic Center (Bonded Zone) EPZ	1,500,000m2 (500m x 1,500m x 2 area)	m2	1,500,000	-	0
1.5.6	Logistic Center	600,000m2 (300m x 2,000m)	m2	600,000	-	0
1.5.7	General Cargo Terminal/Yard	600,000m2 (1,200m x 500m)	m2	600,000	169	101,400,000
1.5.8	Container Terminal/Stacking Yard behind of No.12 & 13	400,000m2 (400m x 1,000m)	m2	400,000	169	67,600,000
1.5.9	International Container Terminal (ICT)	L.S.	L.S.	1	-	0
1.5.10	Removal of Existing Sheds behind of Berth No.12 & 13	4 Sheds, 24,000m2 (150m x 40m x 6 shed)	No,	4	1,150,000	4,600,000
1.5.11	Removal of Existing Jib Cranes	24 nos	No.	24	-	0
1.5.12	Removal of Existing Rails	L.S.	L.S.	1	-	0
1.5.13	Construction of New Rails	L.S.	L.S.	1	26,358,000	26,358,000
1.5.14	New Roads in Port Area	80,000m2 (8m x 10,000m)	m2	80,000	185	14,800,000

Note: Amounts in above table exclude engineering services and administration costs and others
Source: JICA Study Team

Table 6.4-8 Project Cost Breakdown for Priority Project Components for KZP, AFGP, Others (Short/Mid-term Development Plan)

No.	Project Component	Particulars	Units	Q'ty	Rate (USD)	Amount (USD)
1.6	**KZP Berth No. 11 & 12 (General Cargo Terminal)**		**Subtotal**	-		**0**
1.6.1	New Berth No.11	-	L.S.	-	73,399,967	0
1.6.2	New Berth No.12	-	L.S.	-	73,399,967	0
1.6.3	Dredging in front of Bert No. 11 & 12	-	m3	-	15	0
1.6.4	Yard: Recclamation	-	m3	-	35	0
1.6.5	Yard: Soil Improvement	-	m2	-	153	0
1.6.6	Yard: Pavement	-	m2	-	140	0
1.6.7	Yard: Infrastructure (utility, electricity, drainage etc.)	-	L.S.	-	4,899,000	0
1.6.8	Removal of Existing Berth No. 11, 12 & 13	-	L.S.	-	11,500,000	0
1.6.9	Relocation of Berth No. 11	-	L.S.	-	-	0
1.6.10	Relocation of Berth No. 12	-	L.S.	-	-	0
1.6.11	New Navy Berth No. 13 (substitution of old Berth No. 11)	-	L.S.	-	24,000,000	0
1.7	**KZP Area Redevelopment (except for 1.6)**		**Subtotal**			**318,957,000**
1.7.1	New Open Storage Yard 1	250,000 m2, (500m x 500m)	m2	250,000	140	35,000,000
1.7.2	New Open Storage Yard 2	250,000 m2, (500m x 500m)	m2	250,000	140	35,000,000
1.7.3	New Open Storage Yard 3	250,000 m2, (500m x 500m)	m2	250,000	140	35,000,000
1.7.4	New Iron Ore Yards at Berth No. 9 & 10	224,000 m2, (560m x 400m)	m2	224,000	23	5,152,000
1.7.5	New Work Shop behind of No. 9 & 10	112,000 m2, (560m x 200m)	m2	112,000	140	15,680,000
1.7.6	New Sheds at Work Shop behind of No. 9 & 10	3 Sheds, 20,000m2 (100m x 20m x 3 shed)	No.	3	1,000,000	3,000,000
1.7.7	Removal of Existing Sheds behind of No. 7 & 8	4 Sheds, 28,800m2 (180m x 40m x 4 shed)	No.	4	1,581,250	6,325,000
1.7.8	Removal of Existing Belt conveyors behind of No. 5 & 6	-	L.S.	1		0
1.7.9	Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	10,350,000	10,350,000
1.7.10	Truck Parking Area	150,000m2, (500m x 300m)	m2	150,000	23	3,450,000
1.7.11	Administration Custom Office Building	150,000m2, (250m x 300m x 2floors)	m2	150,000	800	120,000,000
1.7.12	Rail Terminal	L.S.	L.S.	1	50,000,000	50,000,000
1.8	**Abu Flus Port Redevelopment**		**Subtotal**			**14,000,000**
1.8.1	Rehabilitation of Berth No.3 for Container Terminal	250m	m	250	-	0
1.8.2	Container Staking Yards	25,000m (250m x 100m)	m2	25,000	200	5,000,000
1.8.3	Cargo Handling Equipment: Mobile Crane	2 sets	No.	3	3,000,000	9,000,000
1.9	**Al Maqil Port Redevelopment**		**Subtotal**			**36,000,000**
1.9.1	River Crossing Bridge	-	m	1,000	-	0
1.9.2	Yard Rehabilitation	180,000m2 (600m x 300m)	m2	180,000	200	36,000,000
1.10	**Al Faw Ground Port**		**Subtotal**			**0**
1.10.1	New Container berth No.1	-	L.S.	-	122,307,532	0
1.10.2	New Container berth No.2	-	L.S.	-	122,307,532	0
1.10.3	New Container berth No.3	-	L.S.	-	122,307,532	0
1.10.4	New Container berth No.4	-	L.S.	-	122,307,532	0
1.10.5	New Container berth No.5	-	L.S.	-	122,307,532	0
1.10.6	New Container berth No.6	-	L.S.	-	122,307,532	0
1.10.7	New Container berth No.7	-	L.S.	-	122,307,532	0
1.10.8	New Container berth No.8	-	L.S.	-	122,307,532	0
1.10.9	New Container berth No.9	-	L.S.	-	122,307,532	0
1.10.10	Access Channel Dredging	-	m3	-	15	0
1.10.11	Access Road TYPE-1	-	m	-	24,353	0
1.10.12	Access Road TYPE-2	-	m	-	21,133	0
1.10.13	Revetment	-	m	-	18,108	0
1.10.14	Highway AFGP-UQP: Part-1 connecting to Al Faw Port	-	m	-	8,315	0
1.10.15	Highway AFGP-UQP: Part-2	-	m	-	8,315	0
1.10.16	Highway AFGP-UQP: Part-3, incl tunnel approach	-	m	-	8,315	0
1.10.17	Highway AFGP-UQP: Part-4 from Safwan city, incl tunnel appr	-	m	-	8,315	0
1.10.18	Highway AFGP-UQP: Tunnel between Part 3 and Part 4	-	m	-	172,500	0
1.10.19	Cargo Handling Equipment: Gantry Crane	-	No.	-	14,950,000	0
1.10.20	Cargo Handling Equipment: RTG	-	No.	-	2,300,000	0
1.10.21	Cargo Handling Equipment: Top/Side Lifter	-	No.	-	1,000,000	0
1.10.22	Cargo Handling Equipment: Tractor & Chassis	-	No.	-	100,000	0
1.10.23	West Breakwater	West Breakwater	km	-	43,750,000	0
1.10.24	East Breakwater (assumed as 35% in progress)	East Breakwater (Remaining under construction)	km	-	32,500,000	0

Note: Amounts in above table exclude engineering services and administration costs and others
Source: JICA Study Team

Table 6.4-9 Project Cost Breakdown for Priority Project Components in Major Channels (Short/Mid-term Development Plan)

No.	Project Component	Particulars				Units	Q'ty	Rate (USD)	Amount (USD)
2.	**Important Project Components for Major Waterways**	**Depth (m)**	**Width (m)**	**Length (km)**	**Dredging (Mil. m3)**				
2.1	**Khawar Abdallah Channel**	-	-	-	21.00	**Subtotal**	**21,000,000**		**365,000,000**
2.2.1	Abdallah Channel	-	-	-	18.00	m3	18,000,000	15	270,000,000
2.2.2	Wreck Removal (1 at buoy No.3 to No.25)	1 wrecks				wrecks	1	5,000,000	5,000,000
2.2.3	Umm Qasr Channel	**-12.5**	300	25.10	3.00	m3	3,000,000	15	45,000,000
2.2.4	Wreck Removal (6 along channel, 3 at berth No.9)	9 wrecks				wrecks	9	5,000,000	45,000,000
2.2.5	Khor Al-Zubayr Channel	-12.5	200/300	17.60	0.00	m3	-	15	0
2.2.6	Wreck Removal (4 along channel)	4 wrecks (by Phase II)				wrecks	0	5,000,000	0
2.2	**Shatt Al Arab Channel**			144.00	4.50	**Subtotal**	**4,500,000**		**182,500,000**
2.2.1	Mouth area	-6	150	10.50	4.50	m3	4,500,000	15	67,500,000
2.2.2	Mouth to Abu Flus Port	-6	120/150	106.50	-	m3	-	15	0
2.2.3	Abu Flus Port to Maquil Port	-8	120/150	27.00	-	m3	-	15	0
2.2.4	Wreck Removal	Approx. 23 wrecks				wrecks	23	5,000,000	115,000,000
2.3	**AFGP Access Channel**	-	-	-	-	**Subtotal**	**0**		**0**
2.3.1	AFGP Access Channel	-	-	-	-	m3	-	15	0

Note: Amounts in above table exclude engineering services and administration costs and others
Source: JICA Study Team

(4) Disbursement

Detailed disbursement schedules based on the construction schedule in Section 6.5.2 are shown in Appendix 6.4-7 and 6.4-8.

6.4.3 Economic Evaluation of Development Project

(1) General

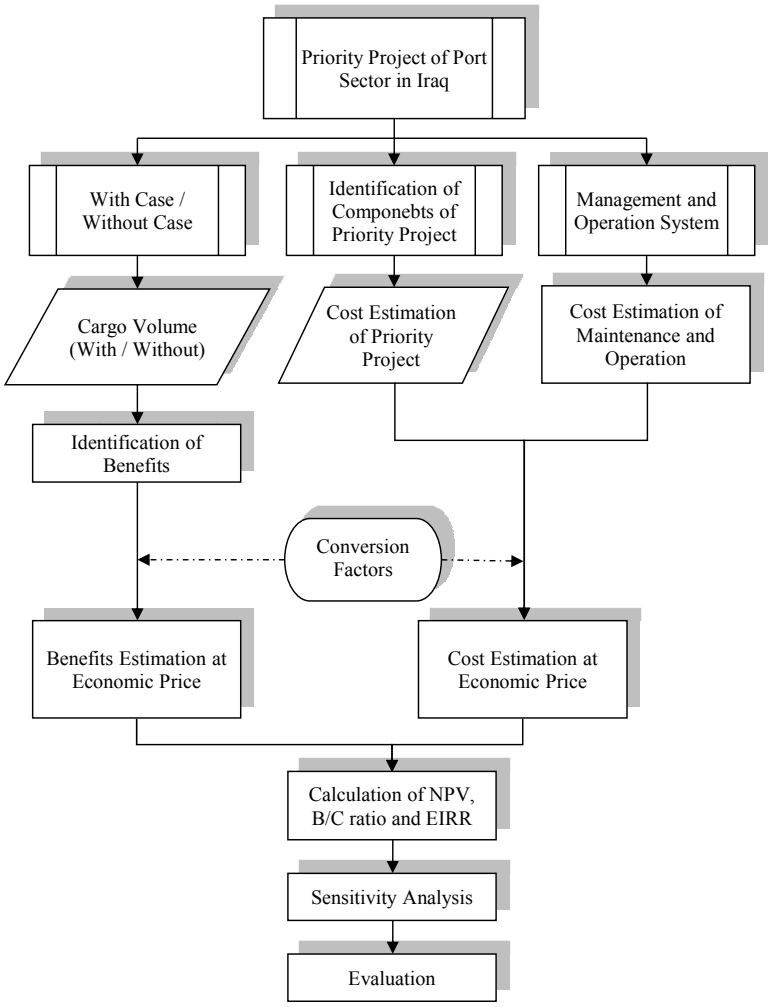
The purpose of the economic analysis is to assess the economic feasibility of the Priority Projects on the target year, from the viewpoint of the national economy. In this chapter, the economic benefits and costs are calculated with economic price and to evaluate whether the benefits exceed those that could be obtained from other investment opportunities in Iraq.

(2) Methodology of Economic Analysis

The priority project ("With case") is defined in Section 6.1, and the economic analysis is assessed by the method mentioned in the Section 5.5.3. The procedure used for the economic analysis is shown in Figure 6.4-6

Benefits of the priority project are listed as follows.

a) Development of container terminals in north and south UQP to increase terminal capacity,
b) Improvement of cargo handling efficiency by providing additional cargo handling equipment, thus reducing berthing times of ships.
c) Redevelopment of back yard area of UQP to avoid congestion in container yard at UQP,
d) Development of a container terminal in Abu Flus port to maintain current terminal capacity,
e) Rehabilitation of existing terminal in Al Maqil port to handle various cargo in the near future,
f) Widening and deepening of Khor Abdhalla to avoid complications with vessels using Kuwait port,
g) As a result, the sea and land transport costs will be able to be minimized.



Source: JICA Study Team

Figure 6.4-6 Procedure of the Economic Analysis

1) Based Year

The year of 2014 is applied as the same of the important project mentioned in the Section 5.5.3.

2) Project Life

The project life (the period calculation) in the economic analysis is assumed to be thirty five years from the year 2014 to the year 2048.

3) Foreign Exchange Rate

The Exchange rate is the same as the important project mentioned in the Section 5.5.3.

4) "With Case" and "Without Case"

A cost-benefit analysis is conducted on the difference between the "With case" in which an investment is made and the "Without case" in which no investment is made, that is; the benefits and costs arising from the investment for the Project are compared.

The ports of priority project do not have extra facilities to handle the estimated cargo volume unless priority projects are implemented. In addition, port congestion including ship waiting and small vessel berthing will continue under current capacity in Iraq's ports.

It is considered Kuwait port is an alternative to Iraqi ports in "Without case". It means that the cargo volume exceeding the current capacity of Iraqi ports is supposed to be handled at Kuwait ports, and transported by trucks from Kuwaiti ports to Iraq. Container handling charge (CHC) of import cargo of Iraq is collected by a terminal operator of Kuwaiti ports. Handling charges of transshipment are also collected at Dubai port, a regional hub, to switch from large vessels to small because a shallow channel of Iraq does not accept large vessels. These additional transportation costs in neighboring countries are income of the other country economies, not Iraq. The additional transportation costs shift to and are a burden of Iraqi people eventually. Regarding port congestion and ship waiting, that time loss will produce additional cost as a surcharge of port congestion for containers, levied by shipping line, which will be also shifted to Iraq as a burden.

It is generally said that large vessel operations reduce the average cost of sea transportation by a merit of scale, which means entering large vessels into Iraqi ports contribute to saving sea transportation costs. Iraq's economy cannot enjoy the contributions unless the priority projects are implemented.

(3) Economic Benefits of the Project

1) Benefit Items

Considering the above mentioned "With case" and "Without case", we evaluate the following economic benefits from the priority project.

a) The saving of transportation costs
b) The saving of port congestion surcharges

2) Calculation of Benefit

The evaluation of benefit is conducted as economic price converted by SCF on the basis of a middle demand forecast scenario.

a) The saving of transportation cost

i) Land Transportation Cost

Calculation method and unit price of benefit is the same as the important project mentioned in the Section 5.5.3. The required number of trucks to transport the cargo volume exceeding the existing capacity is estimated under the priority project.

ii) Sea Transportation Cost

Calculation method and unit price of benefit is the same as the important project mentioned in the Section 5.5.3.

- CHC:
  Container handling volume at Kuwaiti ports is overflowed containers of Iraqi ports in "Without case" on the priority project.
- Transshipment charge:
  Container volume of transshipment at Dubai port is assumed at half of forecasted containers in Iraq on the priority project.
- Merit of Scale:
  All container cargo will enjoy the merit of scale by large vessel entering Iraqi ports on the priority project.

b) The saving of port congestion surcharge

The port congestion surcharge will be levied to the cargo volume of current capacity in Iraqi ports because overflow cargo will be handled at Kuwaiti ports in "Without case".

(4) Economic Cost of the Project

1) Project Costs

The calculation method of the priority project costs is the same as the important project in the Section 5.5.3. The project cost converted into economic price is shown in Table 6.4-10 for Short/Mid-term Development Plan and in Appendix 6.4-9 for Alternative Plan.

2) Operation and Maintenance Costs

Cost of items for management / operation and maintenance are the same as the important project mentioned in the Section 5.5.3, as below:

a) Maintenance Costs for Infrastructures

It is assumed to be 1% of initial investment costs of infrastructures.

b) Maintenance Costs for Equipment

It is assumed to be 3% of initial investment costs of equipment.

c) Fuel and Utilities Costs

It is assumed to be included the above mentioned "Maintenance Costs for Equipment".

d) Personnel Cost

The employee number for the priority project will be 3,800 staffs. The average annual salary of GCPI in 2012 is IQD 14 million equivalent to USD 12,000 per year. Therefore, annual personnel cost is US$45.6 million; 3,800×12,000 US$/year.

And the administration cost is calculated as 5% of personnel cost. Therefore, these costs are USD 2.3 million per year.

3) Renewal Investment Costs

Renewal investment cost is the same as the important project mentioned in Section 5.5.3.

4) Total Cost

Total cost is the sum of project cost and maintenance & operation cost evaluated in the economic cost concept. It is shown for the whole project life in Table 6.4-10 for Short/Mid-term Development Plan and in Appendix 6.4-9 for Alternative Plan.

(5) Economic Evaluation of the Project

1) Result of the Net Present Value (NPV)

The result of NPV estimation is shown as following in Table 6.4-10 for Short/Mid-term Development Plan and in Appendix 6.4-9 for Alternative Plan. The amount is US$ 4,865 million for Short/Mid-term Development Plan and US$ 224 million for Alternative Plan.

Table 6.4-10 Result of Economic Calculation for Short/Mid-term Development Plan

Year	Cost ('000 USD)					Benefit ('000 USD)			Total Benefit-Cost	Present Value		
	Project Cost	Operation & Maintenance			Cost Total	Transport Cost Saving	Congestion Cost Saving	Benefit Total		Total Cost	Total Benefit	Net Benefit
		Renewal Investment	Personnel & Administration	Maintenance								
2014	0	0	0	0	0	0	0	0	0	0	0	0
2015	253,681	0	0	0	253,681	0	0	0	-253,681	253,681	0	-253,681
2016	352,056	0	0	0	352,056	0	0	0	-352,056	313,329	0	-313,329
2017	511,326	0	0	0	511,326	0	0	0	-511,326	429,319	0	-429,319
2018	573,905	0	0	0	573,905	89,341	74,078	163,418	-410,487	454,587	129,443	-325,144
2019	544,503	0	0	0	544,503	109,831	74,078	183,908	-360,595	406,884	137,427	-269,457
2020	219,087	0	29,610	22,251	270,947	336,776	74,078	410,854	139,906	191,007	289,636	98,629
2021	168,009	0	29,736	26,922	224,667	371,208	74,078	445,286	220,619	149,416	296,141	146,725
2022	231,670	0	29,736	26,922	288,328	405,641	74,078	479,718	191,391	180,900	300,981	120,081
2023	266,683	0	29,736	26,922	323,341	440,073	74,078	514,151	190,810	191,385	304,325	112,940
2024	266,683	0	29,736	26,922	323,341	474,505	74,078	548,583	225,242	180,552	306,326	125,774
2025	0	17,300	35,280	39,236	91,816	528,136	74,078	602,213	510,397	48,367	317,238	268,871
2026	0	0	35,280	39,236	74,516	570,606	74,078	644,683	570,168	37,032	320,388	283,356
2027	0	0	35,280	39,236	74,516	613,076	74,078	687,154	612,638	34,936	322,164	287,229
2028	0	0	35,280	39,236	74,516	655,546	74,078	729,624	655,108	32,958	322,713	289,755
2029	0	0	35,280	39,236	74,516	698,016	74,078	772,094	697,578	31,093	322,168	291,075
2030	0	17,300	21,420	39,236	77,956	740,487	74,078	814,564	736,608	30,687	320,650	289,963
2031	0	0	21,420	39,236	60,656	782,957	74,078	857,034	796,378	22,525	318,272	295,747
2032	0	0	21,420	39,236	60,656	825,427	74,078	899,504	838,849	21,250	315,136	293,885
2033	0	0	21,420	39,236	60,656	867,897	74,078	941,975	881,319	20,048	311,335	291,287
2034	0	0	21,420	39,236	60,656	910,367	74,078	984,445	923,789	18,913	306,955	288,042
2035	0	17,300	21,420	39,236	77,956	952,837	74,078	1,026,915	948,959	22,931	302,073	279,141
2036	0	0	21,420	39,236	60,656	982,425	74,078	1,056,502	995,846	16,832	293,185	276,352
2037	0	0	21,420	39,236	60,656	1,000,856	74,078	1,074,933	1,014,277	15,880	281,415	265,535
2038	0	0	21,420	39,236	60,656	1,019,287	74,078	1,093,364	1,032,709	14,981	270,038	255,057
2039	0	0	21,420	39,236	60,656	1,037,718	74,078	1,111,795	1,051,140	14,133	259,047	244,914
2040	0	292,400	21,420	39,236	353,056	1,056,149	74,078	1,130,227	777,171	77,605	248,435	170,830
2041	0	0	21,420	39,236	60,656	1,074,580	74,078	1,148,658	1,088,002	12,578	238,195	225,617
2042	0	0	21,420	39,236	60,656	1,074,677	74,078	1,148,754	1,088,099	11,866	224,731	212,865
2043	0	0	21,420	39,236	60,656	1,074,774	74,078	1,148,851	1,088,196	11,194	212,028	200,834
2044	0	0	21,420	39,236	60,656	1,074,871	74,078	1,148,948	1,088,292	10,561	200,044	189,483
2045	0	26,300	21,420	39,236	86,956	1,074,967	74,078	1,149,045	1,062,089	14,283	188,736	174,453
2046	0	0	21,420	39,236	60,656	1,074,967	74,078	1,149,045	1,088,389	9,399	178,053	168,654
2047	0	0	21,420	39,236	60,656	1,074,967	74,078	1,149,045	1,088,389	8,867	167,975	159,108
2048	0	0	21,420	39,236	60,656	1,074,967	74,078	1,149,045	1,088,389	8,365	158,467	150,101
Total	3,387,602	370,600	731,934	1,071,596	5,561,732	24,067,933	2,296,403	26,364,336	20,802,603	3,298,344	8,163,716	4,865,372

Iraq Treasury Bond, coupon rate: 5.8%

EIRR 16.8%

B/C ratio 2.48

Source: JICA Study Team

2) Result of the Benefit/Cost ratio (B/C ratio)

The result of B/C ratio is shown in Table 6.4-10 for Short/Mid-term Development Plan and in Appendix 6.4-9 for Alternative Plan, and it is 2.48 for Short/Mid-term Development Plan and 1.04 for Alternative Plan.

3) Result of the EIRR

The result of EIRR is shown in Table 6.4-10 for Short/Mid-term Development Plan and in Appendix 6.4-9 for Alternative Plan. The estimated EIRR is at 16.8% for Short/Mid-term Development Plan and at 6.4% for Alternative Plan.

4) Sensitivity Analysis

In order to see whether the project is still feasible when some conditions change, a sensitivity analysis is made for the following three alternatives.

Case 1: Project cost increases by 10%
Case 2: Benefit volume decreases by 10%
Case 3: Both Case 1and Case 2 occur simultaneously

The results of the sensitivity analysis is derived as follows.

Short/Mid-term Development Plan

Case	NPV (USD million)	B/C ratio	EIRR
Base Case	4,865	2.48	16.8 %
Case 1	4,536	2.25	15.4 %
Case 2	4,049	2.23	15.3 %
Case 3	3,179	2.03	14.0 %

Alternative

Case	NPV (USD million)	B/C ratio	EIRR
Base Case	224	1.04	6.4 %
Case 1	- 353	0.94	5.6 %
Case 2	- 375	0.93	5.5 %
Case 3	-952	0.85	4.6 %

Source: JICA Study Team

Even in Case 3 of sensitivity analysis of Short/Mid-term Development Plan, the economic feasibilities of the important project are exceeding threshold value i.e. EIRRs are above 6%, NPVs are plus and B/C ratios are above 1.0. The Alternative Plan, however, is below the threshold value of NPV, B/C ratio and EIRR other than the Base Case..

5) Conclusion

The Alternative Plan has no economic feasibility if benefit or cost fluctuates like Case 1 or Case 2. In addition, the results of Short/Mid-term Development Plan including sensitivity analysis are better than that of the Alternative Plan. Therefore, the priority projects are recommended to be implemented as early as possible from the viewpoint of the national economy.

6.5 Implementation of Priority Projects

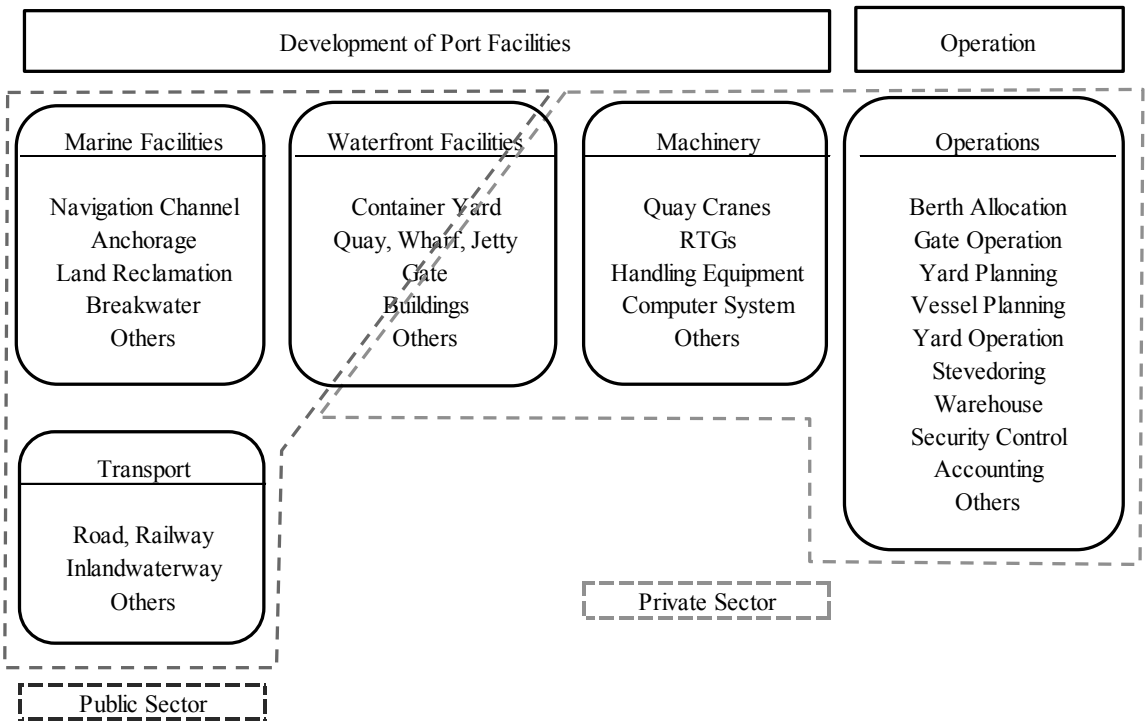
6.5.1 Management and Operation of Port Facilities

(1) Container Terminals

Container terminal operation is a considerably profitable business, therefore private investors are usually interested in participating in container terminal development and operation. In case that container terminal development needs the development of access roads and/or navigation channels simultaneously, public sector shall invest in such non-commercial infrastructures and recover the cost by means of tax or concession fees. Public-private partnership plays a key role in successful container terminal development through reducing the investment of the public sector and enabling terminal operators to use their own systems and equipment. Productivity of container terminal will be kept at international level by private terminal operators.

Public sector will develop mainly infrastructures such as navigation channel, anchorage, breakwater, land reclamation from the sea, access road to port, bridge, railway and other public utilities. Private sector will invest in super structures such as quay crane, RTG, reach stacker, other cargo handling equipment and terminal management computer system.

Ship berthing facilities, terminal pavement and buildings are sometimes made by the public sector in case the port authority needs to encourage private investment and the private sector is reluctant to make a large long-term investment. However, the private sector sometimes develops ship berthing facilities and whole container terminals when eligible to make long-term large scale investment. In the early stage of development, public sector likely invests in such facilities and gives private sector operating concession, and at a later stage, private sector likely invests in such facilities under development concession granted by port authority. Figure 6.5-1 shows such demarcation of public and private sector investment.



Source: JICA Study Team

Figure 6.5-1 Public and Private Development Facilities and Equipment

(2) Umm Qasr Port South

UQP South was built more than two decades ago, and therefore needs to be reinforced in the near future. Berths Nos. 2-3 will be rehabilitated as berths for bulk cargo handling, and berths Nos.4-8 will be redeveloped as container berths by a selected private terminal operator. In case that berths Nos.4-8 are expanded to the seaside by the construction of new berths, and quay gantry cranes are installed on the berths, private investor shall be granted a development and operating concession for a long-term period of over 30 years, and enough revenue share to cover the investment

Berths Nos.2-3 will accommodate bulk carriers of Panamax size, so that grain unloaders and conveyors shall be equipped on the berth, and silos be in the backyard. If private investors are reluctant to rehabilitate berths, GCPI may be required to reinforce the berths by themselves and grant operating concession to a terminal operator of berths Nos.2-8, or invite other private investors for the redevelopment of berths Nos.2-3. In case that private operator installs large scale cargo handling equipment, concession period shall be 20 years or more.

(3) Umm Qasr Port North

UQP North plans to develop berths Nos. 22-24 for Ro/Ro, conventional and container vessels, and has already granted concession to a private company. Concession contract needs articles on the period of development and operation, timeline of the construction of berths, concession fees, penalty for not completing the construction by a specific date, minimum cargo volume to be handled at berths, cancellation of contract due to idle operations, and the like.

Berths Nos.25-27 are planned to be container berths and private investors are sought for development and operation. In case of private development of container terminal, concession period shall be 30 years or more, and concession fees shall be carefully assessed whether private and public sector can recover their investment in a certain period. If private investors are reluctant to construct berthing structures, GCPI needs to develop berths and let private company install quay cranes, RTGs and other equipment for their operation. GCPI is also required to develop access road,

truck gate, water supply, drainage and other public utilities in connection with the construction of the terminal.

(4) Khor Al Zubayr Port

KZP is a deep water port for bulk and conventional cargoes, and used for exporting oil products and the import of bulk/break bulk cargoes. The port has berths Nos.1-11 and some berths are operated by the Ministry of Oil and some are by Mar-Log Co. Ltd. It is planned to change the use of berths after completion of a multi-purpose berth which is under construction. After rearrangement of berths' cargo handling, Nos.1-4 will be used for oil products, Nos.5-8 for general cargo and some containers, Nos. 9-10 for dry bulk cargoes such as sponge iron, Nos.11-12 for general cargoes. In order to introduce private operation properly, it is appropriate to grant an operating concession to each abovementioned group, in view of introducing a competitive situation and installing dedicated cargo handling equipment.

Berths Nos. 6, 11-12 remain under operation of GCPI, but GCPI does not engage in stevedoring services, which will be provided by stevedoring companies requested by shippers or consignees. This type falls in the category of "Tool Port".

6.5.2 Implementation Schedule

Short/Mid-term Development Plan and Long-term Development Plan shall be completed before 2025 and 2035, respectively. An outline of the implementation schedule of important project components, and preliminary implementation schedule of the priority projects, are shown in Table 6.5-1. Implementation schedule of Short/Mid-Development Plan, Long-term Development Plan and those of Alternatives are shown in Appendix 6.5-1 to 6.5-4, respectively.

Table 6.5-1 Summary of Implementation Schedule for Short/Mid and Long-term D. P.

No.	Project Components	1 2014	2 2015	3 2016	4 2017	5 2018	6 2019	7 2020	8 2021	9 2022	10 2023	11 2024	12 2025	13 2026	14 2027	15 2028	16 2029	17 2030	18 2031	19 2032	20 2033	21 2034	22 2035	23 2036	Duration (Month)
1.	**Important Project Components for Main Ports**																								
	UQP Berth Maintenance and Area Redevelopment																								72
	KZP Berth Maintenance and Area Redevelopment																								48
	Abu Flus Port Redevelopment																								24
	Al Maquil Port Redevelopment																								48
	AFGP Development																								120
2.	**Important Project Components for Main Waterways**																								0
	Channel Maintenance (Khawar Abdallah・Shatt Al Arab・AFGP Access, etc)																								69
3.	**Others**																								0
	Engineering Services																								204
	Administration Costs and others by Iraqi Side																								204

:Short/Mid-term Development
:Long-term Development

Source: JICA Study Team

CHAPTER 7

Chapter 7. Short/Mid-term Action Plan to Improve Port Management and Operations

7.1 Action Plan for the Improvement of Port Management System

7.1.1 Establishment of Rational Port Management System

Containerization brought larger container vessels and dedicated terminals for container handling. Container terminals need large scale quay cranes and cargo handling equipment as well as a high level of operational performance. Specialized terminal operators are now providing terminal operation services at many major ports. Many port authorities introduce their services under government policy and play the role of regulator.

UK Government stated in "Modern Ports, a UK Policy" in 2000 that Government's relationship with the port industry has been confined largely to the endowment of duties and powers. There has been a strong recent emphasis on de-regulation in the industry, aiming to stimulate it by exposure to market forces. The need for an integrated transport policy has been neglected in the last twenty years, and the role of ports in such a strategy has not been adequately considered.

Most recent policy on the development of Iraqi ports is shown in National Development Plan (2013-2017), which indicates problems with Iraqi ports and the need for the capacity of facilities to be developed. However, it does not indicate the direction of port reform, nor encouragement of private participation, nor state administration on private operators.

To support the country's economic growth and encourage international trade, Iraqi port administration aims at establishing competitive ports, promoting international gateway ports, providing greater convenience to port users, maintaining orderly port development, establishing appropriate public private partnership, maintaining the safety and security of ports, and protecting the environment.

Measures and actions to realize these goals are to prepare national port policy to coordinate port development projects; to encourage private investment in port development; to organize rules on port development, construction and operations; to establish regulations and rules on port services and pricing; to introduce private transport business in port operations; to ensure fair competition between port operators; to establish a regulatory organization responsible for maritime and port administration; to implement appropriate supervision and inspection on safety and security of port operations; to regulate discharges from ships and inspect water/air pollution in ports; and to prepare necessary contingency plans and equipment for dealing with accidents. These are summarized in Table 7.1-1.

Table 7.1-1 Goals and Measures of Iraqi Port Policy

Goals	Measures	Actions
1) Facilitating economic development and foreign investment through encouraging international trade		
- Establishment of competitive ports	- To increase the productivity of cargo handling; - To reduce turnaround time of ships and cost at port; - To introduce competition between operators.	- To introduce competitive situation into port operations and services by encouraging private participation; - To minimize regulations on port services and pricing.
- Providing greater convenience to shippers, consignees and other port users	- To reflect comments of shippers, consignees, shipping lines and port users in port management; - To introduce private transport business into port operations; - To simplify documentation and procedures for port services.	- To organize consultative committee comprising of shipping lines, shippers and other port users; - To allow private companies to join port services such as stevedoring, transportation and the like; - To introduce one-stop service.
- Increasing port capacity to meet the future demand	- To develop new terminals and port facilities by means of PPP; - To promote public invest in non-profitable facilities.	- To encourage private investment in port facility development; - To invest in channel dredging, land reclamation, roads, drainage and utilities in port area.
- Modernizing port facilities	- To encourage private investment in super structures; - To provide to investors financial benefits/tax exemption.	- To give longer concession period to private investors; - To give concessionaire tax exemption on modern cargo handling equipment, and/or other financial benefits.
2) Establishment of rational port system in Iraq		
- Maintaining orderly port development	- Separation of regulator and operator of port services; - To establish an organization for administrating and supervising port development and operation; - To prepare national port master plan and coordinate port development projects.	- To separate terminal operating function from GCPI and establish a commercial company for cargo handling services; - To establish an organization responsible for maritime and port state administration; - To organize rules on port planning, construction and operation.
- Establishing appropriate Public Private Partnership	- To define rights and responsibilities of private investors and operators.	- To legislate rights and responsibilities of private investors and operators, and rules on public intervention.

Goals	Measures	Actions
- Maintaining the safety of port operations and ship navigation	- To supervise safety operations of private terminal operators and stevedoring companies;	- To inspect private terminal operations and qualifications of port labors.
	- To introduce port state control.	- Ship inspection by authorized surveyor.
- Ensuring the port facility security	- To make a port facility security plan and implement the duly recognized plan at each international port.	- To establish and enforce regulations on port facility security.
- Protecting the port environment	- To restrict and inspect discharges from ships of noxious or harmful substances;	- To establish rules on port development planning and construction;
	- To prepare a contingency plan and necessary equipment against oil spills and accidents in a port;	- To regulate discharges from ships and prevent water/air pollution in ports;
	- To examine a development plan and inspect its construction and operation.	- To prepare necessary contingency plan and equipment for dealing with accidents.

Source: JICA Study Team

7.1.2 Revision of Port Act and Regulations

Iraq Port Act, established in 1995, stipulates power, roles and responsibilities of General Company of Ports of Iraq. GCPI is responsible for port management, port development planning, implementation of development projects, and port services. GCPI is also entrusted to coordinate related organizations to port activities. Article 5 of the Port Act specifies five items for which GCPI is responsible and empowered, as follows:

The Company is in charge of managing and organizing the ports and harbors. It is also responsible for setting the rules, making the necessary decisions to operate, develop, grow and improve those ports and harbors in coordination with related parties, Henceforth, the Company does the following:

First: Setting the necessary rules for operating the ports and harbors according to modern methods and systems, as well as setting instructions for that.

Second: Providing all the services and equipment related to the operation of the ports and harbors.

Third: Building docks and wharfs, exploiting and maintaining those facilities.

Fourth: Purchasing, leasing or borrowing any ship or vessel for the purpose of using them in the services and operations of the ports and harbors, according to effective laws.

Fifth: Supervising the entry and departure of ships and vessels to and from the ports and harbors, as well as controlling their movement.

GCPI has a wide range of powers on port state administration, port management, port operation, and port development. If GCPI is reformed to a landlord port authority, it is essential to clarify powers, functions and responsibilities of new GCPI and private companies. Revision of Port Act shall have provisions on GCPI as a landlord, and private sector as a developer and operator. Since the present Port Act does not suppose a case that private companies develop and operate terminals in Iraqi ports, amendments of the Port Act is imperative in the near future.

Among the above mentioned functions of GCPI, the first and fifth tasks will be done by state administration, and the second, third and fourth tasks by operating companies. It is also imperative to make rules and regulations on operations of terminal companies, stevedoring companies and other port service providers.

GCPI Regulation No.1, 1998, entitled "Regulations of Ports and Harbors" is legislation for ship entry and departure, navigation to ports, search and rescue, and other activities necessary for port operation and ship control. Sixty percent of the Regulation refers to maritime issues, thirty percent to cargo handling issues, and ten percent to penalties and final provisions. The Regulation supposes a case that private companies engage in stevedoring work.

However, there are no provisions on operating concession, nor rights and responsibility of private investors and operators, nor port development planning and implementation. Rules on application for and approval of construction work, supervision of operations, and other port related activities, shall be added to the Regulation. Revision of Port Act and Regulations needs to refer to followings.

- Port Development, Planning and Construction;
- National Port Policy;
- Development of Port Facility by Private Company;
- Concession for Port Development and/or Operations;
- Road and other Supporting Infrastructure/Facilities to Port;
- Port Construction Works;
- Power, Responsibility and Functions of Port Operators;
- Port Transport Business;
- Port Statistics;
- Organization of GCPI
- Port Facility Security
- Prohibited Activities
- Delegation of Power
- Others

7.1.3 Reorganization of Port Administration and Management

(1) Functions of GCPI

When GCPI changes to landlord type port authority in the future, operating functions will be transferred to operating companies. Pilotage and towing services may also be transferred to private operation or GCPI may provide such services if it changes to a commercial company. As dredging work is a marine service provided by GCPI, it may be done by private companies if private sector grows to have dredgers and undertake dredging work in the future. Functions of the present GCPI are categorized into 5 fields, i.e. 1) general affairs, 2) state administration, 3) marine services, 4) engineering services, and 5) port operation services, as shown in Table 7.1-2.

Among the functions/services in Table 7.1-2, item 2) shall be the role of government agency. Pilotage, ship repair, dredging, and other maritime services in item 3) can be provided by private companies. It is also possible to transfer stevedoring and other cargo handling services to private companies.

Table 7.1-2 Work Categories of GCPI

1) General Affairs

- Planning and Follow up Department
  - Planning Section
  - Following Up Section
  - Statistical H.R. and Training Section
  - Loading and Unloading Section
  - Research and Studies Department
- Legal Department
  - Lawsuit Section
  - Execution Section
  - Contracts and Agreements Section
  - Housing Service Section
- Human Resources Department
  - Employment and Staff Section
  - Employed Staff Section
  - Retired Staff Section
  - Training and Development
  - H.R., Studies and Development
  - Personal Information and Folders Sec.
  - Services Section
  - Fire Fighting Section
  - Transport Section
  - Athletics Section

2) State Administration

- Marine Inspection Department
  - Marine Inspection Section
  - Vessel Registration Section
  - Environmental Section
  - Marine Legislation Section
- ISPS Section
- Ports Training Center
  - Planning and Courses Section
  - Training and Education Section

3) Marine Services

- Marine Affairs Department
  - Marine Navigation Section
  - Marine Service Section
  - Faw/Fishing Jetty Unit
- Marine Salvage Department
  - Technical Section
  - Operations Section
- Marine Dredging Department
  - Marine Dredging Section
  - Marine Lighting Section
  - Marine Survey Section
- Dry Docks and Marine Industry Department
  - Marine Dockyard Section
  - Marine Slipway Section
  - Marine Maintenance Section
- Financial Affairs Department
  - Salaries and Human Affairs Section
  - Balance Section
  - Revenues Section
  - Stores Account Section
  - General Balance Section
  - Expenditure Section
  - Treasury Section
- Auditing and Internal Monitoring Section
  - Salaries Auditing Section
  - Stores Auditing Section
  - Accounts Auditing Section
  - Revenue Auditing Section
- Contracts Department
  - Jointly Operation Section
  - International Contracts Section
  - Local Contracts Section
- Media and Relationship Section
- Main Stores Section
- Citizen Affairs Section
- Quality Control Section
- Following Up Jointly Operation Section
  - Investment Unit

4) Engineering Services

- Commercial Department
  - Customs Clearance Section
  - Purchases Section
- Engineering Affairs Department
  - Civil Engineering Section
  - Project Section
  - Electrical Air Condition Section
  - Machinery Maintenance Section
  - Communication Section
  - Water Section
- I.T. Section
- Computers Department
  - Programming and Systems Analysis
  - Maintenance and Operation Section
  - Information Preparation Section

5) Port Operation Services

- Northern UQP
  - Loading and Unloading Section
  - Technical Affairs Section
  - Admin and Services
- Southern UQP
  - Loading and Unloading Section
  - Technical Affairs Section
  - Admin and Services

Marine Industry Section

Source: Prepared by JICA Study Team
based on GCPI Organization Chart 2012

➢ KZP Loading and Unloading Section Technical Affairs Section Admin and Services
➢ Abu Flus Port Loading and Unloading Section Technical Affairs Section Admin and Services
➢ Al Maqil Port Loading and Unloading Section Technical Affairs Section Admin and Services

(2) Functions of Landlord Port Authority

Functions of landlord type port authority are usually policy making, supervision, legislation, planning, concession award, funding and the like. Actual operation of port and related activities, such as stevedoring, towing, pilotage services, is carried out by private companies. Duties and functions of Iraqi port public administration are summarized in Table 7.1-3. Port authority of Iraq shall perform tasks of policy making, development planning, legal affairs, port entry and departure management, vessel control, supervision on marine services, enforcement of port safety, security and environment protection, seafarers certification, education at training institute, port labor standards, and other managerial functions. Stevedoring service, transportation, storage and other operational services will be provided by a succeeding company from GCPI or other private companies.

Table 7.1-3 Duties and Functions of Iraqi Port Public Administration

General Affairs International Department Financial Department Human Resources Department Internal Audit
Policy and Planning Port Development Planning Statistics Department Project Management Unit
Legal Affairs Port Legislation & Regulation Operating Concession
Port Safety, Security, & Environment Operations Safety Inspection Port Security Control Marine & Port Environment Protection

Source: Prepared by JICA Study Team

Port Entry & Vessel Control Port Entry and Departure Port State Control Vessel Traffic Management Ship Registration and Inspection Hydrographic Survey
Marine Services Supervision Pilotage License Tugboat Service License Seafarers Training and Certificate
Technology Department Engineering & Planning Research and Technology Channel and Anchorage Maintenance I.T. System
Training Institute Training Standards

7.2 Action Plan for the Improvement of Port Operations

7.2.1 Improvement of Terminal Operations

The most critical issues for GCPI on the CT operation and management in Iraq are, as stated many times already, not to operate them by GCPI itself, but to utilize the existing facilities to the maximum extent by letting competent TOCs operate and manage them and also to develop necessary facilities in the right locations based on the needs of Iraq's economy for the future.

Another critical issue for the CT operation at Iraq's ports is dwelling time of stored containers. The lengthy dwelling time of the import containers forces CT operators to prepare huge Off-dock CYs when they handle containers to their berth capacities. In the case of UQP, 628,000m2 and or 231,999m2 of Off-dock CY spaces are required even when the operators reduce the average dwelling time up to 15 days and or 10 days respectively as shown in Table 3.8.1-2.

Extra expenditures and operations of the operators in UQP for developing and operating the Off-dock CYs would become a big burden for them by reducing competitiveness and user-friendliness of the port. Therefore, GCPI and MOT will work closely together to reduce the dwell-time drastically and cooperate with Iraqi Customs/MOF by modernizing and or simplifying their procedures/systems.

- Average CY dwelling time of containers at ports in developed countries, except transshipment ports, is around 5~6 days though it is more than 10 days at developing countries because consignees at these countries use the CY as storage places for their cargoes in many cases.
- Hence, GCPI/MOT has to try to reduce the average dwelling time at Iraqi CTs to 10 days at least.
- To achieve an average dwelling time of 10 days, it should become 16 days on average for the import containers, assuming 4 days on average for export ones, including empties.
- However, "10" day dwelling period should be a tentative goal for the port. GCPI/MOT has to aim to reduce the average dwelling time to 5~6 days as a whole in the near future.

The actions GCPI should take from now on, based on the above standpoints, at existing Iraqi ports are as follows.

1) Umm Qasr Port

Container handling volume at Iraqi ports should exceed the maximum capacity (1,100,000 TEU /year) of the existing CTs in UQP by 2017, and 2,000,000 TEU by the end of 2022, and then 3,000,000 TEU in the year of 2026 if the volume increases according to the middle case estimation. Accordingly, GCPI shall develop certain sized CTs in the right location(s) based on expected volumes.

The best location to construct the new CTs in Iraq is Al Faw Grand port because Al Faw Grand port has many advantages compared with the existing ports. The port faces the Arabian deep sea; therefore, shipping line can enjoy shorter transit time to/from the port, and deploy larger size ships to the port which will lower the transportation cost to/from Iraqi markets.

Once Al Faw Grand port is even partially completed , the base of international container handling in Iraqi ports should be shifted to the new port, i.e., shipping lines calling UQP at present would call Al Faw Grand port instead, once they could secure a CT at there. This means it would be very risky for private operators to invest in UQP for developing and or rehabilitating CT facilities in the port.

Accordingly, GCPI shall encourage private operators who have an interest in developing and/or rehabilitating CT facilities in UQP when the construction schedule of Al Faw Grand port is delayed or suspended. In that case, GCPI has to extend the contract period to 10 years or more and share a greater percentage of revenue as well as guaranteeing a certain volume of containers during the concession period and so on.

- Concession period should be 20~25 years at least when the concessionaire invests a large amount of money for developing a CT with "QGC & RTG" system; revenue-share for the concessionaire in that case should be around 60~70%.
- However, when the operator develops a CT with "Mobile crane and Reach-stacker" system, a concession period of 10~15 years is sufficient and the revenue-share can be 40~50%.
- A CT operator in UQP currently gets only a little bit less than 30% of the revenue excluding the storage fee; thus, the operator could not get appropriate returns for modernizing the operation. Poor performance such as low productivity or lengthy truck turn-time at the CT are partially a result of the current revenue sharing scheme.
- In principle, these concession contracts should be made through an open bidding system; however, if potential CT operators are reluctant to join the bidding due to security concerns or for other reasons, GCPI has to increase the revenue share percentage up to the international standard level. This will be necessary to attract an operator who can maintain a certain level of operational efficiency.
- Performance indicators for GCPI to assess the performance of the operators fare as follows;

  - Capacity (Throughput volume) :
    When QGC is installed; 100,000 TEU/year/QGC as Minimum
    When MC is installed ; 70,000 TEU/year/MC as Minimum
    * These numbers are around 80% of the estimated capacities.
  - Productivity:
    When QGC is installed ; 25.0 lifts/hour/QGC in Net
    When MC is installed ; 17.0 lifts/hour/MC in Net
  - Truck's Turn-time (Gate-In through Out):
    30 Minutes on average, or 2 hours in busy hours on busy days

2) Khor Al Zubayr Port

There is very slim chance for Khor Al Zubayr port to be developed as a container handling port in Iraq. It would happen only when the capacity of UQP reaches its limitation due to a delay or postponement of the development of Al Faw Grand port. Otherwise, the port should be developed as non-container handling port based on its location and conditions.

3) Al Maqil Port

There is no chance that Al Maqil port will be developed as a standard container handling port due to shallow areas at the river mouth of Shatt Al Arab River although some smaller feeder container ships between hub ports in UAE and or between some ports in Iran facing Shatt Al Arab River will call the port, as at present. The very shallow areas at the river mouth of Shatt Al Arab River extend for a few miles with the shallowest place being minus 2 meters, also two (2) small bridges around six (6) km downstream of the port prevent ships from entering the port smoothly.

4) Abu Flus Port

Abu Flus port will also not be developed as a standard container handling port although some smaller feeder container ships between some ports in Iran facing Shatt Al Arab River will call the port as it is at present. This is because the apron, made by iron structured plates, is not strong enough to support heavy equipment such as reach stackers. The plates, seriously damaged already, will be replaced by concrete ones within 18 months from now; however the concrete ones will also not be strong enough for the use of heavy container handling equipment.

7.2.2 Improvement of Cargo Import and Delivery Procedures

(1) Present Situation of the Customs Procedures

A questionnaire survey of the customs in UQP and an interview survey of the customs and private agencies involved in customs clearance have been conducted to investigate present situations of the customs formalities.

1) Customs Clearance of imported/exported cargoes

Documents necessary for customs clearance in Iraqi ports are shown in Table 7.2-1.

Table 7.2-1 Document Lists for Customs Clearance

Import	Export
・ Cargo manifests and container lists certified by the Iraqi Embassy in the country of origin ・ Certificate of Origin certified by the Iraqi Embassy in the country of origin ・ Bill of Lading certified by the Iraqi Embassy in the country of origin ・ Invoices of imported cargoes certified by the Iraqi Embassy in the country of origin ・ Import License ・ Certificate of Conformity certified by the Iraqi Embassy in the country of origin ・ Quittance ・ Insurance Certificate if any ・ Environmental inspection certificate	・ Packing lists and container lists ・ Export License ・ Payment Certificate of export fees issued by the main customs office in Basrah

Source: Prepared by the Study Team based on the questionnaire survey

The Electric Import/Export Declaring Certificates for cargoes, if necessary, are printed by customs and provided to the shipping company, the owner of goods and the consignor.

It takes 2 hours for customs clearance of imported cargoes, and 1 hour for exported cargoes; for which documentations have been settled.

2) Physical Inspection of Cargoes

Details of the physical inspection for container cargoes are shown in Table 7.2-2.

Table 7.2-2 Physical Inspection of Container Cargoes

Inspection Item	Import Container	Export Container
Ratio of Physical Inspection	10～20％ of the whole cargoes	10～20％ of the whole cargoes
Inspection method	Inspection of the whole cargoes by X-ray and visual inspection judged from the result of the X-ray inspection	Inspection of the whole cargoes by X-ray and visual inspection judged from the result of the X-ray inspection
Inspection time ・ Whole cargoes ・ A part of cargoes ・ Cargoes somewhere around the door of container	 ・ 1 hour/container ・ 7 minutes/container ・ 5 minutes/container	 ・ 1 hour/container ・ 7 minutes/container ・ 5 minutes/container
Maximum handling number per day	Max. 400 nos. for 12 working hour and it is possible to work at night if necessary	Max. 700 nos. for 12 working hour and it is possible to work at night if necessary

Source: Prepared by the Study Team based on the questionnaire survey

The above ratio of physical inspection seems to be high. Other government organizations may inspect imported cargoes if customs doesn't inspect them. The customs staff attend an inspection when exported cargoes are inspected inside the terminal.

The following comments on the long dwelling time of cargo in Iraqi ports were given by customs:

- The reason why the dwelling time of cargoes at the port is long is that it takes a lot of time for inspections, or required certificates by other government organizations.
- One authority consisting of customs and the port authority should be created to simplify the customs clearance.
- It is important for smooth customs clearance to introduce an IT (information technology) system; this point is from higher level customs officials.
- Occasionally it takes two months for the clearance of food because of quality tests when there is an international certificate of cargoes. Improvement of the above situation is under consideration in the customs.

(2) User's View on the Present Customs Procedure

1) Public Organization

The following comments have been obtained through an interview with the customs department in GCPI. The department is in charge of customs clearance of cargo handling equipment and marine equipment including their spare parts on international cargoes which GCPI handles.

- GCPI imported 22 containers from January to beginning of June in 2014 for own use.
- Average dwelling days for these containers was at least 2 weeks, and about 2 months if the necessary procedure for tax exemption, from the ministry of finance, was followed and permission of the ministry of transport was needed.
- It takes a lot of time to obtain permission from several ministries (Environmental Dept., MO Health, GOI Security Agency, MO Defense, MO Interior and Iraq Organization of Communication) and up to 2 weeks for the customs inspection of parts.
- It takes one month for the customs inspection of cars and rubber fenders because they are sent to Baghdad and their prices are investigated.

2) Private Agencies

The following comments have been obtained through an interview with a private agency of shipping companies which handles the customs clearance of containers and cars.

- The agency handles about 140 import containers per day. About 30% of containers are government-related goods and the rest under private companies.
- About 800 containers per month are government-related containers for sugar and foods.
- It takes 2 days for the customs inspection, after provision of all the documentation. The documents for some cargo can be provided before ship arrival.
- It is under an obligation to inspect quality of foods. The inspection is conducted in Baghdad and it takes 20 to 25 days for sampling, transportation, inspection and notification of the result.
- The customs determine whether goods pass the customs after the quality test.
- The port clearance including payment of the Lo-Lo and storage charge is carried out together with the customs clearance after the quality test. It takes about 5 days for port clearance of general cargoes.
- The customs clearance and port clearance are rejected in the case of poor documentation or unusual precedent.

3) Other Private Sources

The following comments have been obtained from other private sources:

- The customs clearance is conducted for all the import containers. The customs inspection includes not only X-ray inspection but also visual inspection. The visual inspection methods are ①visual check after door opening、②visual check after removal of goods at the central part、and ③visual check after removal of all the goods in the container.
- There is only one piece of X-ray equipment for inspections at the UQP North. It was planned there would have been three X-rays at the North, and two at the South, installed by the middle of 2014. This equipment breaks down often due to poor maintenance. Customs operate and maintain it themselves.
- The General Company of Maritime Agency is in charge of all agent related business of shipping companies in Iraq. The consignors or agents provide them information on container cargoes passing customs clearance.
- There are only 17 lamps in total at the inspecting stations in UQP North and South. Therefore it takes 3 to 4 days on average until containers are collected after they are delivered to the container yard and inspected. 550 to 600 imported containers per day on average are inspected in UQP.
- It takes a lot of time for the quality test of imported foods. Further, imported toys from China cannot pass the customs due to anxiety about poisonous paint use. As a result, these goods are abandoned after a long keeping at ports because their cost is cheap and the owner doesn't collect them.

(3) Recommendations on the Present Customs Procedure

The following issues on the customs clearance in Iraqi ports are pointed out based on interviews with the customs and private agencies.

a) It was understood that customs clearance taking a long time in Iraq is caused by time-consuming procedures to obtain approval, including inspections from a lot of government organizations.

b) Simplification and acceleration of the customs procedure will be enabled through computerization.

c) Simplification of various inspections and issuance of certificates by government organizations is required.

It is important for simplification and acceleration of the customs procedure to extend functions of the customs station and working hours, including an increase in X-ray equipment, lamps in the inspecting station, and 24 business hours.

Customs clearance for containers should be limited to; for example, only goods from suspicious countries or owners, based on information of manifests. Further inspected containers should be phased down from 100%, the present inspection level. For its realization it is important to establish computerization and systematization of the inspection. Cargo information should be controlled with unification by linking the customs system to the system of shipping companies. Finally it is essential for the customs clearance to change the present customs manual drastically, and simplify it under computerization.

7.2.3 Port Entry Procedures and IT System

(1) Conformity with FAL Convention Procedures

The Republic of Iraq ratified the Convention on Facilitation of International Maritime Traffic (FAL Convention), 1965, and established national laws and regulations of Iraq related to the convention in 1977, which stipulate standardization of documents necessary for ships entry and departure, customs clearance, immigration control, quarantine, sanitation control and others. The aim of FAL Convention is to facilitate maritime transport by reducing paper work, simplifying formalities, documentary requirements and procedures.

The Iraqi government has encouraged the implementation of FAL convention since its ratification, however, the effort was not successful due to port entry limitations on foreign flagged vessels caused by wars and economic sanctions between 1980 and 2003.

In recent years, numbers of ship calls and cargo throughput at Iraqi ports have gradually increased, and it is therefore an urgent issue to simplify port entry and customs clearance procedures. Port users and shipping companies request one stop service for such documentation. At each Iraqi port, GCPI is the sole organization responsible for ship entry approval, pilotage for approaching and leaving vessels, allocation of berth to ship, tug boat services and other maritime services. Other organizations manage cargo import and export (Customs), entry of passengers and seafarers (Immigration Office, Quarantine Agency), quality and safety of foods (Food Safety, Sanitation, Animal/Plant Quarantine), security control (Police) and other port related activities.

FAL convention stipulates eight forms for port entry and cargo handling in terms of simple and unified formats, which can reduce duplication of forms submitted to several agencies and standardize forms submitted to several ports in different countries. Iraqi authorities are requested to follow the forms and simply documents in line with the standard format. In case that Iraqi authorities request an additional form, it is required to inform the IMO. Recently, ports have required the submission of pre-arrival declaration 24 hours prior to ship arrival from the viewpoint of port security regulations. Standard forms necessary for port entry are as follows:

Form 1 General Declaration
Form 2 Cargo Declaration
Form 3 Ship's Stores Declaration
Form 4 Crew's Effects Declaration
Form 5 Crew List
Form 6 Passenger List
Form 7 Dangerous Goods Manifest
Form 8 Maritime Declaration of Health
Pre-arrival Procedure Form (Security Control)

Unless one stop service is not introduced or standardization of documents is not authorized, port users are obliged to make several thick files of documents and bring them to several authorities. Unless electronic data submission is not accepted and documents are not simplified, shipping companies are usually requested to submit documents shown in Table 7.2-3. It is imperative to introduce one stop service and port EDI system together with simplification and standardization of documents.

Table 7.2-3 Necessary Documents for Port Entry

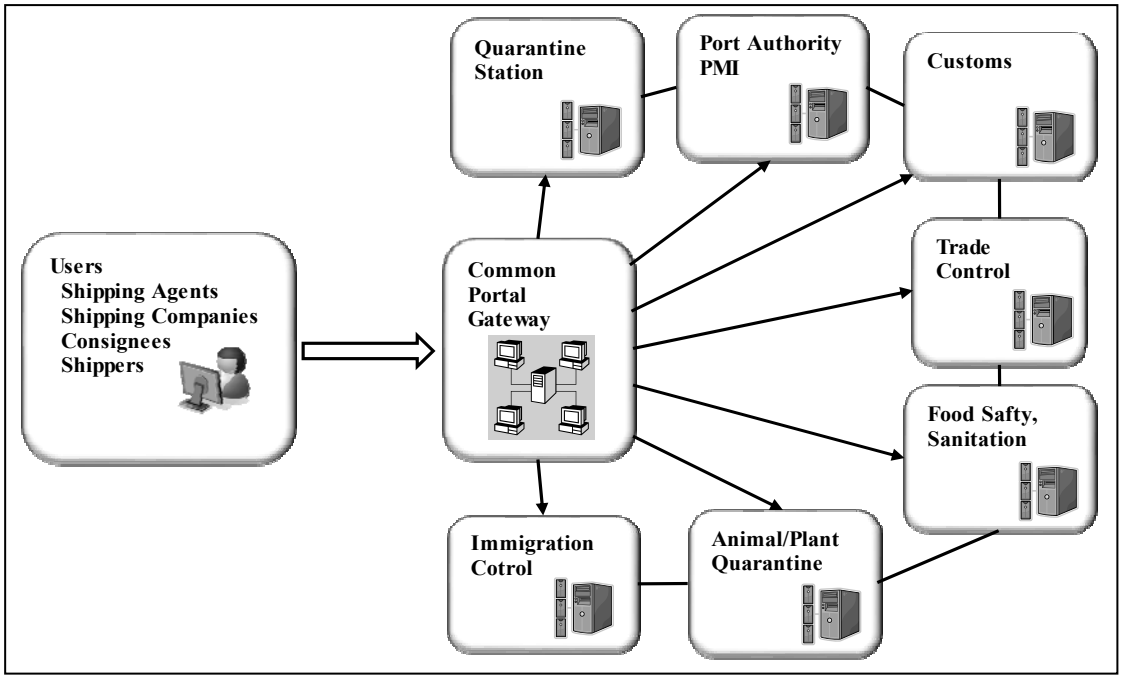
Common document required by several authorities :
Declaration of Ship's Arrival
Documents required by Port Authority:
Last Port Clearance
Crew List
Passenger List
Inward Cargo Manifest
Ship's Certificates
International Ship Security Certificate (ISSC)
Ship's Particulars
Ship Arrival Condition
Others
Documents required by Customs:
Crew List
Bill of Lading (B/L)
Inward Cargo Manifest
Passenger List
Passenger Personal Effects Declaration
Crew Personal Effects
Bounded Store List
Currency List
Provision Store List
Deck & Engine Store List
Ship's Inventory List
Duty Free Article List
Others
Documents required by Immigration Control:
Crew List
Passenger List
Passport or Seaman Book
Inward Cargo Manifest
List of Articles Forbidden to be used in Port
Others
Documents required by Quarantine Office:
Maritime Declaration of Health
Crew List
Ship Sanitation Control Certificate
Inward Cargo Manifest
Crew Vaccination List
Yellow Book
Provision Store List)
Free Pratique
Others

(2) Port EDI System

Documentation on ship entry and departure used to be a heavy burden for shipping lines, agents, shippers and consignees because authorities requested the submission of original signed form of application with a lot of references, i.e. import cargo manifest, bill of lading, export cargo details, transship cargo list, ship registration certificate, origin port and ports of call, next port, crew list, passenger list, and many others. Messengers of shipping agents used to carry these documents to the office of each agency in port or nearby area. During the past two decades, port-related authorities introduced Electronic Data Interchange (EDI) system and one stop service in many countries, and port users submit port entry application with soft data through the internet instead of hard copies through messengers.

Iraqi ports have not yet installed port EDI system and request the submission of hard copies

for every sort of application It is imperative for GCPI to introduce port EDI system with other port-related authorities and realize one stop service for ship entry. Port EDI system shall cover agencies and authorities shown in Figure 7.2-1.

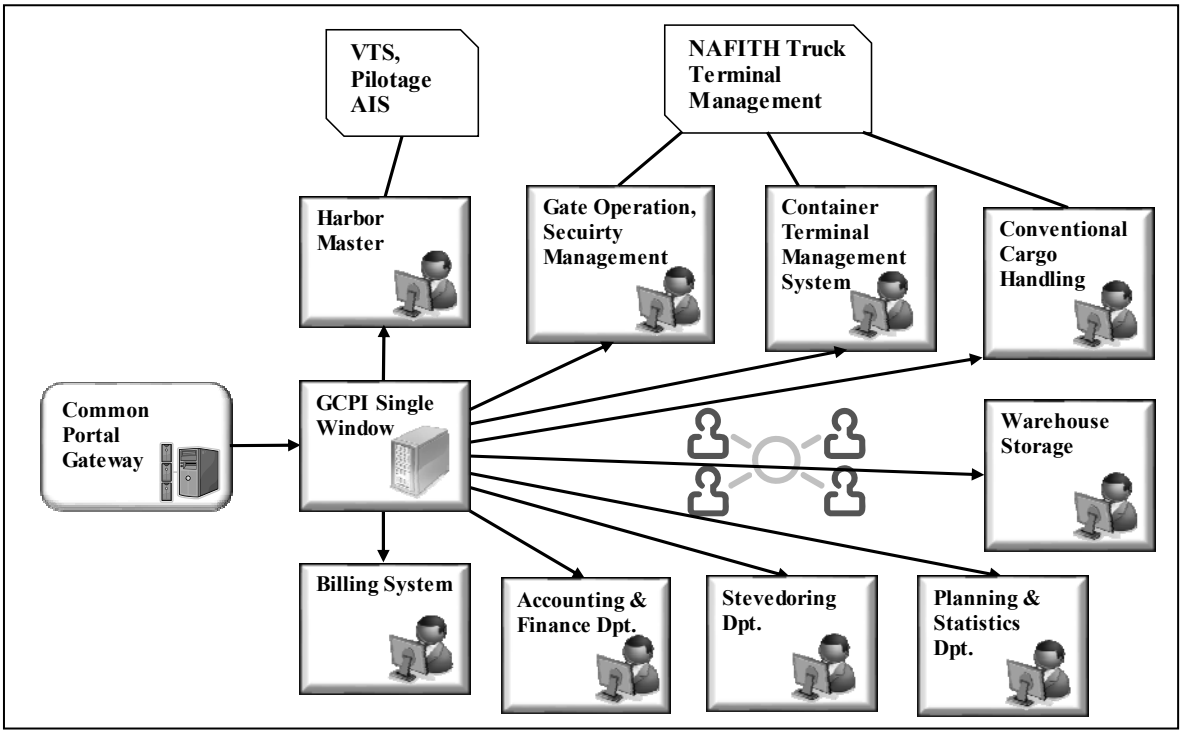


Source: JICA Study Team

Figure 7.2-1 Port EDI system for Iraqi Ports and One Stop Service

When GCPI receives a request for port entry and cargo loading/discharging, GCPI makes arrangements for pilotage, tug boats, berth allocation, cargo loading and discharging, transportation, gate clearance, storage and other services. After completing services, GCPI sends invoices and receives fees and dues. Through the course from port entry declaration to bill of clearance, every step shall be well coordinated by computerized information system. GCPI is therefore required to establish port management information system with subsystems on vessel traffic control, gate operation, container terminal management system, conventional cargo stevedoring, billing, accounting, statistics and other operating systems. GCPI's port management information system shall be well linked with NAFITH's truck control system and makes Iraqi ports' operations more efficient and productive.

GCPI's port management system shall be established with subsystems on ship control, terminal operations and accounting, and others as shown in Figure 7.2-2. In the case that port EDI system will not be introduced in the near future, GCPI shall set up its own single window at the first stage and allow port users to submit documents by means of email and soft data. Port procedures in Iraq shall be conformed to standards of world ports through the introduction of the IT system.



Source: JICA Study Team

Figure 7.2-2 GCPI's Port Management Information System

7.2.4 Environmental Conservation and Monitoring

Environmental Impact Assessment (EIA) is stipulated in Protection and Improvement of the Environment (Law No.27, 2009). This law requires development projects to submit an EIA report to obtain a permission from MOE.

The project of AFGP is a huge project with the development area of 52 km^2 with a reclamation area of 36 km^2 and the huge tidal flat exists along the coast. However, the environmental impact assessment report has still not been submitted to MOEn even though the breakwater constructions are currently underway.

Protection and Improvement of the Environment (Law No.27, 2009) stipulates that waste water from a facility shall not be discharged unless carrying out the necessary treatments. Some ports installed septic tanks however these facilities are not receiving proper maintenance. The coliform counts show high levels in both the Shatt al Arab River and the Khor Al Zubayr Waterway, so proper waste water treatment is required.

There are no laws or regulations related to dredging and dumping activities, MOEn requests consultations with MOEn before commencement of these activities. However, GCPI has little consultation with MOEn regarding dredging and dumping which are currently carried out.

MOEn is a relatively new organization established in 2003 and allegedly has little power of influence in Iraqi. MOEn conducts experimental water and air quality monitoring but its budget and technical capabilities are not enough.

Iraq has precious habitats including the Ramsar marshes even though they have been impacted catastrophically by the disturbances. The project sites are also selected as important bird areas.

In order to conserve and recover these precious environments, appropriate environmental impact assessment, mitigation measures and monitoring regarding the development activity are required. To achieve this, it is important not only to build the capability of MOEn but also to raise awareness, and build the capacity of GCPI to implement sustainable port development.

7.2.5 Necessary Actions for Improving Port Management and Operation

Issues on Iraqi port management and operation are summarized in Section 4.4.2 in this report. Coping with these issues, necessary actions to be taken by GCPI and MOT are examined and listed in Table 7.2-4. Regarding issues on terminal management and operation, important directions are separation of private and public services, improvement of cargo handling productivity and reduction of cargo dwelling time in port.

GCPI's change from a service port to a landlord port is another important issue. It is therefore imperative to make an organizational reform plan, which may include the establishment of an operating company that succeeds operational functions of GCPI, and authority/department of MOT that succeeds regulatory functions and is responsible for port administration.

Port development needs the encouragement of private investment by means of granting attractive conditions on port development and operation concession. Longer concession period and bigger revenue share will encourage private companies to make larger investment. It is also important to make a port development master plan and authorize it for the implementation of public agencies and private investors.

In order to promote the indispensable Iraqi port development, maintenance and improvement of navigation channels shall be done by public agencies. Revision of port tariff will play an important role for the promotion of Iraqi ports, which shall include the review of wharf-age, stevedoring fees, and rates of tonnage fee which increase by ship tonnage but shall decrease by ship tonnage in case of container ships. Efforts shall be made to reduce dwelling time of imported cargoes, which discourages the use of Iraqi ports and reduces the annual capacity of cargo storage per unit area. Human resources development is one of the important actions to be taken in due course, in particular capacity and capability development of port administration, and improvement of training institutes are important actions for better port management and operation.

Table 7.2-4 Necessary Actions for Improving Port Management and Operation

Items		Directions		Necessary Actions
Terminal management and operation	1	Separation of Private and Public Services	1	Facilitation of granting operation concession to private terminal operators
			2	Encouragement of stevedoring work by private companies
	2	Improvement of productivity of cargo handling	3	Reduction of cargo dwelling time in port, and increase of annual yard capacity of cargo handling.
			4	Utilization of berths by increasing berth occupancy ratio
			5	Reduction of customs clearance hours
			6	Reduction of gate processing time and shortening queues in front of the gates
	3	Introduction of Port EDI system and IT	7	Introduction of single window system for port management and operations through the establishment of Port EDI system
	4	Installation of modern cargo handling equipment	8	Installation of RTG system in container yard operations, and increase in yard capacity
			9	Installation of quay gantry cranes
			10	Good maintenance of cargo handling equipment
Organiza-tional reform	5	Change from the service port to the landlord port	11	Establishment of an operating company which succeeds operational function of GCPI
			12	Establishment of authority/department in charge of port administration
			13	Revision of the present "Port Law" and clarification of roles, duties, functions and powers of port management body and operators
			14	Establishment of marine agency responsible for the maintenance of navigation channels, pilotage service.
			15	Administration on port safety, port and ship security, and environment protection
	6	Improvement of financial management	16	Reduction of personnel cost and excess labor force for cargo operations
			17	Increase in cargo handling activities by modern equipment and productive work force
			18	Increases in cargo throughput and ship calls in line with the national economic growth
Port development	7	Expansion of port capacity ahead of demand	19	Authorization of port development master plan and approval on each port development plan in due course
			20	Implementation of Public Private Partnership projects

			21	Promotion of granting development concession to private investors
			22	Encouragement of private investment by means of granting longer concession period
			23	Appropriate profit margin for private investors to introduce modern efficient equipment
			24	Development of access road, port zone, and utility facilities to encourage port investment
			25	Development of wharves and infra structures by public fund and super structures by private operators
	8	Rehabilitation and reinforcement of existing facilities	26	Redevelopment of old terminals, rehabilitation and reinforcement of old port facilities
			27	Promotion of the establishment of port related business through preparing logistics area, roads, water supply and drainage, utilities in port area.
Improvement of navigation channel	9	Navigation channel improvement in depth and width	28	Deepening and widening crucial part of navigation channel and rmoval of obstacles to enable larger ships' entry without tidal restriction
	10	Introduction of Vessel traffic control	29	Introduction of AIS-VTS to secure safety of navigation and increase capacity of channel traffic
	11	Maintenance of navigation channels	30	Implementation of maintenance dredging by own fleet
			31	Joint management of Khor Abdallah channel with Kuwait authority
Promotion of Iraqi ports	12	Revision of port tariff for port promotion	32	Introduction of rational tariff at container port, review of wharfage and increasing rates on tonnage fee, and others
	13	Better services for shippers and consignees	33	Reduction of necessary time for clearing port documentation, customs procedure, and dwelling time of imported cargoes
			34	Review of tariff system and enabling private operators set own charges on cargo handling and other own services
	14	Better services for shipping lines	35	Reduction of berthing time of a ship by offering speedy cargo handling
			36	Less tidal restrictions on ships entering into approach channel or departing from port
			37	Improvement of productivity of cargo handling and shortening ships' turnaround time
			38	Reduction of total port cost including storage fee and unofficial charges
Assurance of Port Security	15	Security management of international port facilities	39	Implementation of port security evaluation in accordance with ISPS Code, Assessment of port security management of each terminal

			40	Preparation of port security plans, Installation of port security facilities, Port security drills and exercises
Preservation of Port Environment	16	Conformity with regulations of MARPOL convention	41	Reception of oil, oily water, sewage, garbage and other waste from ships. Installation of reception facilities.
	17	Management of waste from port activities and floating waste	42	Supervision and monitoring of waste disposal and treatment from terminal operations, port services and other port activities
			43	Recovery and treatment of floating waste on port waters and navigational channels.
Human resources development	18	Capacity development of port administration staff	44	Capacity development of managers and officers in planning port policy, making development strategy and implementing development projects
			45	Capacity development of officers in evaluating port development projects and coordinating related projects
			46	Capacity development of officers in monitoring and supervising private terminal operations
	19	Improvement of training institute	47	Modernization of seafarers training institute, and introduction of port labor training program
			48	Training of personnel for vessel traffic control, pilotage service, operation of dredgers and other services
			49	Training of staff members of private port operators

Source: JICA Study Team

7.3 Port Security Management and Security Facilities

7.3.1 Current Situation of Port Security Management in Iraq

(1) Organization of port security

"Contracting Government" is represented by the Ministry of Transport. "Designated Authority" is represented by the deputy Minister of Transport who is the chairman of Iraq Maritime Security Committee which approves the Port Facility Security Plans (PFSP). Iraqi government does not entrust any Recognized Security Organization with the port facility security.

ISPS Section is established in GCPI Headquarters, and its chairman is the Director General of GCPI. Each of 5 ports under GCPI have their own ISPS Unit of the port which is supervised by the ISPS Section of Headquarters. The port security measures are implemented by those ISPS Units of the ports. Port Facility Security Officers (PFSO) are engaged as ISPS Unit managers of the port.

(2) Development of law to implement ISPS Code in Iraq

Since 2009 the Government has commenced to prepare the domestic law for implementing the ISPS Code in Iraq, however, it has not been promulgated yet and the promulgation date is unknown. The preparation of this domestic law is undertaken by the Ministry of Transport and the promulgation of the same will be done by the Counselor of the Cabinet.

(3) Port facilities applicable to implement ISPS Code

The Government decided that the following 5 ports are applicable to the requirements of ISPS Code. Another Oil Port Facility under South Oil Company is also applicable to ISPS Code, but this port facility is not targeted in our MP Study.

1) Umm Qasr Port North (UQP-N)
2) Umm Qasr Port South (UQP-S)
3) Khor Al Zubayr Port (KZP)
4) Al Maqil Port
5) Abu Fuls Port

(4) Security level

The Government decided the security level as "Level 1" at this moment. The port facilities are implementing their security measures based on the security level decided by the Government.

(5) Port Facility Security Assessment (PFSA)

1) The expert group consisting of mainly United States Coast Guard (USCG), with the assistance of UNDP visited Umm Qasr Port North (UQP-N) and Umm Qasr Port South (UQP-S) and conducted the Port Facility Security Assessments (PFSA) at those 2 ports respectively, together with GCPI. PFSAs of another 3 ports were conducted by GCPI based on the procedures and methods which the expert group above conducted at UQP-N and UQP-S.

2) The results of PFSA were reviewed by Iraq Maritime Security Committee and approved by the Deputy Minister of Transport.

(6) Port Facility Security Plan (PFSP)

1) The expert group consisting of mainly United States Coast Guard (USCG), with the assistance of UNDP visited Umm Qasr Port North (UQP-N) and Umm Qasr Port South (UQP-S) and prepared the Port Facility Security Plans (PFSP) at those 2 ports respectively, together with GCPI. PFSPs of another 3 ports were prepared by GCPI based on the contents and methods which the expert group above described in PFSP for UQP-N and UQP-S.

2) PFSPs were reviewed and approved by Iraq Maritime Security Committee which is chaired by the Deputy Minister of Transport.

3) Statement of Compliance of a Port Facility has not been issued for any port facilities of which PFSPs have been approved by Iraqi Government. This statement is specified in Part B of ISPS Code, therefore, this is not the mandatory requirement.

(7) Port Facility Security Officer (PFSO)

Port Facility Security Officers (PFSO) were selected by ISPS Section of GCPI headquarters and appointed by Iraq Maritime Security Committee. PFSOs had undergone training carried out abroad and those PFSOs conducted security training to the security personnel who are engaging in security duties at the ports.

(8) Implementation status of port facility security measures

1) The security measures such as (a) access control to the port facilities, (b) access control to the restricted area, (c) installation of fences, (d) surveillance activities by surveillance cameras, (e) installation of lighting equipment and (f) readiness of communication equipment are basically conducted, however, there are differences of the security measure implementation conditions among the 5 ports due to the absence of the technical guidelines for implementing the security measures.

2) There are international port facilities and domestic ones in the same port area, but all of the port facilities are subject to the application of the requirements of the ISPS Code.

3) In order to restrict access of unauthorized personnel / vehicles to restricted areas, identification of personnel, professional affiliation and purpose of entry, issuance of temporary entry pass for personnel and vehicle and verification of cargos to go in and out at the gate, is carried out. However, there are different systems of gate control among the ports under the control of GCPI at this moment. The following are the gate control systems currently deployed:

a. For entry of a vehicle, upon surrender of ID card / driving license and a car registration document to the gate control, a temporary entry permit card for the personnel and vehicle entry permit card are issued and the vehicle entry permit card should be displayed on the windshield. When a person enters the port compound on foot, the ID card is surrendered at the gate and a temporary entry permit card is issued.

b. For entry of a vehicle, upon surrender of ID card / driving license to the gate control, a temporary entry permit card is issued. When a person enters the port compound on foot, the ID card is surrendered at the gate and a temporary entry permit card is issued.

c. Only weapons / ammunition are checked and kept at the gate control area and the entry of the vehicle and personnel are allowed.

4) The surveillance cameras are mostly installed on the existing structure, therefore, the surveillance cameras cannot monitor the inside and outside of the fence simultaneously, in other words, there are blind spots along the fence. Where the private terminal operators are operating in the port, they have their own surveillance cameras including monitoring facility, but their monitoring results are not connected to the control room of the ISPS Unit of the port. Number of the surveillance cameras installed in the ports are as follow:

- Umm Qasr Port North（UQP-N） : 45 units
- Umm Qasr Port South（UQP-S） : 37 units
- Khor Al Zubayr Port（KZP） : 27 + Private terminal 4 = 31 units
- Al Maqil Port : 16 units
- Abu Fuls Port : 36 + Private terminal 4 = 40 units

5) The majority of the construction of perimeter fencing is block masonry and the height of the fence is about 2 meters. Many of the damaged portions are left unfixed.

6) Back-up generating facilities and emergency lines are provided in case of power outage for all of the port.

7) PFSOs conduct the security drills for the security personnel at their ports including classroom lectures.

(9) Expenditure for response to ISPS Code requirements

GCPI disbursed the port facility security expenses for the 5 ports under GCPI, GCPI Headquarters and the related organizations. GCPI implemented 2 projects, one of which aimed at the provision of security facilities, equipment and instruments for 5 ports under GCPI (the amount of IQD 1.95 Billion) and another for GCPI Headquarters and related organizations including administration costs (IQD 0.59 Billion).

(10) Notification to IMO

Port Facility Security Plans of 5 ports had been prepared by the ports and approved by Deputy Minister of Transport as Designated Authority, however, the Ministry of Transport has not notified this fact to IMO. The Ministry of Transport is advised to inform IMO immediately on the details of the port facilities of which PFSPs have been approved by the Iraqi Government.

7.3.2 Compliance with ISPS Code

The International Ship and Port Facility Security Code (ISPS Code), mandatory requirements regarding the provisions of Chapter XI-2 of the Annex to the International Convention for the Safety of Life at Sea, 1974, as amended (SOLAS Chapter XI-2) specifies the obligations of the Contracting Government and port terminal operators as follows;

(1) Obligations of the Contracting Governments

The following provisions are obligations for the contracting governments.

SOLAS XI-2: Regulation 2 Application

1. This chapter applies to:
   - .1 the following types of ships engaged on international voyages:
   - .1.1 passenger ships, including high-speed passenger craft;
   - .1.2 cargo ships, including high-speed craft, of 500 gross tonnage and upwards; and
   - .1.3 mobile offshore drilling units; and
   - .2 port facilities serving such ships engaged on international voyages.

2. Notwithstanding the provisions of paragraph 1.2, Contracting Governments shall decide the extent of application of this chapter and of the relevant sections of part A of the ISPS Code to those port facilities within their territory which, although used primarily by ships not engaged on international voyages, are required, occasionally, to serve ships arriving or departing on an international voyage.

2.1. Contracting Governments shall base their decisions, under paragraph 2, on a port facility security assessment carried out in accordance with the provisions of part A of the ISPS Code.

SOLAS XI-2: Regulation 3 Obligations of Contracting Governments with respect to security

3. Contracting Governments shall set security levels and ensure the provision of security level information to port facilities within their territory, and to ships prior to entering a port or whilst in a port within their territory. When changes in security level occur, security level information shall be updated as the circumstance dictates.

ISPS Code : 4 RESPONSIBILITIES OF CONTRACTING GOVERNMENTS

4.1. Subject to the provisions of regulation XI-2/3 (Obligation of Contracting Governments with respect to security), Contracting Governments shall set security levels and provide guidance for protection from security incidents.

4.2. Contracting Governments, when they set security level 3, shall issue, as necessary, appropriate instructions and shall provide security related information to the ships and port facilities that may be affected.

4.4. Contracting Governments shall, to the extent they consider appropriate, test the effectiveness of the Ship or the Port Facility Security Plans, or of amendments to such plans, they have approved, or, in the case of ships, of plans which have been approved on their behalf.

SOLAS XI-2: Regulation 7 Threats to ships

1. Contracting Governments shall set security levels and ensure the provision of security level information to ships operating in their territorial sea or having communicated an intention to enter their territorial sea.

2. Contracting Governments shall provide a point of contact through which such ships can request advice or assistance and to which such ships can report any security concerns about other ships, movements or communications.

3. Where a risk of attack has been identified, the Contracting Government concerned shall advise the ships concerned and their Administrations of:
   - .1 the current security level;
   - .2 any security measures that should be put in place by the ships concerned to protect themselves from attack, in accordance with the provisions of part A of the ISPS Code; and
   - .3 security measures that the coastal State has decided to put in place, as appropriate.

SOLAS XI-2: Regulation 10 Requirements for port facilities

2. Contracting Governments with a port facility or port facilities within their territory, to which this regulation applies, shall ensure that:

.1 port facility security assessments are carried out, reviewed and approved in accordance with the provisions of part A of the ISPS Code; and

.2 port facility security plans are developed, reviewed, approved and implemented in accordance with the provisions of part A of the ISPS Code (development and review by port operators).

3. Contracting Governments shall designate and communicate the measures required to be addressed in a port facility security plan for the various security levels, including when the submission of a Declaration of Security will be required.

SOLAS XI-2: Regulation 11 Alternative security agreements

4. Alternative security agreements covering short international voyages on fixed routes shall be reviewed periodically, taking into account the experience gained as well as any changes in the particular circumstances or the assessed threats to the security of the ships, the port facilities or the routes covered by the agreement.

SOLAS XI-2: Regulation 12 Equivalent security arrangements

2. When implementing this chapter and part A of the ISPS Code, a Contracting Government may allow a particular port facility or a group of port facilities located within its territory, other than those covered by an agreement concluded under regulation 11, to implement security measures equivalent to those prescribed in this chapter or in Part A of the ISPS Code, provided such security measures are at least as effective as those prescribed in this chapter or part A of the ISPS Code. The Contracting Government, which allows such security measures, shall communicate to the Organization particulars thereof.

SOLAS XI-2: Regulation 13 Communication of information

1. Contracting Governments shall, not later than 1 July 2004, communicate to the Organization and shall make available for the information of Companies and ships:

.1 the names and contact details of their national authority or authorities responsible for ship and port facility security;

.2 the locations within their territory covered by the approved port facility security plans.

.3 the names and contact details of those who have been designated to be available at all times to receive and act upon the ship-to-shore security alerts, referred to in regulation 6.2.1(Ship security alert system);

.4 the names and contact details of those who have been designated to be available at all times to receive and act upon any communications from Contracting Governments exercising control and compliance measures, referred to in regulation 9.3.1 (Control and compliance measures); and

.5 the names and contact details of those who have been designated to be available at all times to provide advice or assistance to ships and to whom ships can report any security concerns, referred to in regulation 7.2 (Threats to ships);

and thereafter update such information as and when changes relating thereto occur.

2. Contracting Governments shall, not later than 1 July 2004, communicate to the Organization the names and contact details of any recognized security organizations authorized to act on their behalf together with details of the specific responsibility and conditions of authority delegated to such organizations. Such information shall be updated as and when changes relating thereto occur. .

3. Contracting Governments shall, not later than 1 July 2004 communicate to the Organization a list showing the approved port facility security plans for the port facilities located within their territory together with the location or locations covered by each approved port facility security plan and the corresponding date of approval and thereafter shall further communicate when any of the following changes take place:

.1 changes in the location or locations covered by an approved port facility security plan are to be introduced or have been introduced. In such cases the information to be communicated shall indicate the changes in the location or locations covered by the plan and the date as of which such changes are to be introduced or were implemented;

.2 an approved port facility security plan, previously included in the list submitted to the

Organization, is to be withdrawn or has been withdrawn. In such cases, the information to be communicated shall indicate the date on which the withdrawal will take effect or was implemented. In these cases, the communication shall be made to the Organization as soon as is practically possible; and

.3 additions are to be made to the list of approved port facility security plans. In such cases, the information to be communicated shall indicate the location or locations covered by the plan and the date of approval.

4. Contracting Governments shall, at five year intervals after 1 July 2004, communicate to the Organization a revised and updated list showing all the approved port facility security plans for the port facilities located within their territory together with the location or locations covered by each approved port facility security plan and the corresponding date of approval (and the date of approval of any amendments thereto) which will supersede and replace all information communicated to the Organization, pursuant to paragraph 3, during the preceding five years.

5. Contracting Governments shall communicate to the Organization information that an agreement under regulation 11 (Alternative security agreement) has been concluded. The information communicated shall include:

.1 the names of the Contracting Governments which have concluded the agreement;

.2 the port facilities and the fixed routes covered by the agreement;

.3 the periodicity of review of the agreement;

.4 the date of entry into force of the agreement; and

.5 information on any consultations which have taken place with other Contracting Governments; and thereafter shall communicate, as soon as practically possible, to the Organization information when the agreement has been amended or has ended.

6. Any Contracting Government which allows, under the provisions of regulation 12 (Equivalent security arrangements), any equivalent security arrangements with respect to a ship entitled to fly its flag or with respect to a port facility located within its territory, shall communicate to the Organization particulars thereof.

ISPS Code: 5 DECLARATION OF SECURITY (for Governments)

5.1. Contracting Governments shall determine when a Declaration of Security is required by assessing the risk the ship/port interface or ship to ship activity poses to people, property or the environment.

5.6. Contracting Governments shall specify, bearing in mind the provisions of regulation XI-2/9.2.3, the minimum period for which Declarations of Security shall be kept by the port facilities located within their territory.

ISPS Code: 15 PORT FACILITY SECURITY ASSESSMENT

15.1. The port facility security assessment is an essential and integral part of the process of developing and updating the port facility security plan.

15.2. The port facility security assessment shall be carried out by the Contracting Government within whose territory the port facility is located. A Contracting Government may authorize a recognized security organization to carry out the port facility security assessment of a specific port facility located within its territory.

15.2.1. When the port facility security assessment has been carried out by a recognized security organization, the security assessment shall be reviewed and approved for compliance with this section by the Contracting Government within whose territory the port facility is located.

15.3. The persons carrying out the assessment shall have appropriate skills to evaluate the security of the port facility in accordance with this section, taking into account the guidance given in part B of this Code.

15.4. The port facility security assessments shall periodically be reviewed and updated, taking account of changing threats and/or minor changes in the port facility and shall always be reviewed and updated when major changes to the port facility take place.

15.5. The port facility security assessment shall include, at least, the following elements:

.1 identification and evaluation of important assets and infrastructure it is important to protect;

.2 identification of possible threats to the assets and infrastructure and the likelihood of their occurrence, in order to establish and prioritize security measures;

.3 identification, selection and prioritization of counter measures and procedural changes and their level of effectiveness in reducing vulnerability; and

.4 identification of weaknesses, including human factors in the infrastructure, policies and procedures.

15.6. The Contracting Government may allow a port facility security assessment to cover more than one port facility if the operator, location, operation, equipment, and design of these port facilities are similar. Any Contracting Government, which allows such an arrangement shall communicate to the Organization particulars thereof.

15.7. Upon completion of the port facility security assessment, a report shall be prepared, consisting of a summary of how the assessment was conducted, a description of each vulnerability found during the assessment and a description of counter measures that could be used to address each vulnerability. The report shall be protected from unauthorized access or disclosure.

ISPS Code: 16 PORT FACILITY SECURITY PLAN

16.2. The port facility security plan shall be approved by the Contracting Government in whose territory the port facility is located.

16.5. The Contracting Government in whose territory the port facility is located shall determine which changes to the port facility security plan shall not be implemented unless the relevant amendments to the plan are approved by them.

16.9. Contracting Governments may allow a port facility security plan to cover more than one port facility if the operator, location, operation, equipment, and design of these port facilities are similar. Any Contracting Government, which allows such an alternative arrangement, shall communicate to the Organization particulars thereof.

(2) Obligations of Port Terminal Operators

Following provisions are obligations for operators in a port.

SOLAS XI-2: Regulation 10 Requirements for port facilities

1. Port facilities shall comply with the relevant requirements of this chapter and part A of the ISPS Code, taking into account the guidance given in part B of the ISPS Code.

2.2) Port facility security plans are developed, reviewed, approved and implemented in accordance with the provisions of part A of the ISPS Code (approval by Contracting Government).

ISPS Code: 5 DECLARATION OF SECURITY (for Operators)

5.3. Requests for the completion of a Declaration of Security, under this section, shall be acknowledged by the applicable port facility or ship.

5.4. The Declaration of Security shall be completed by:

.1 the master or the ship security officer on behalf of the ship(s); and, if appropriate,

.2 the port facility security officer or, if the Contracting Government determines otherwise, by any other body responsible for shore-side security, on behalf of the port facility.

5.5. The Declaration of Security shall address the security requirements that could be shared between a port facility and a ship (or between ships) and shall state the responsibility for each.

ISPS Code: 14 PORT FACILITY SECURITY

14.1. A port facility is required to act upon the security levels set by the Contracting Government within whose territory it is located. Security measures and procedures shall be applied at the port facility in such a manner as to cause a minimum of interference with, or delay to, passengers, ship, ship's personnel and visitors, goods and services.

14.2. At security level 1, the following activities shall be carried out through appropriate measures in all port facilities, taking into account the guidance given in part B of this Code, in order to identify and take preventive measures against security incidents:

.1 ensuring the performance of all port facility security duties;

.2 controlling access to the port facility;

.3 monitoring of the port facility, including anchoring and berthing area(s);

.4 monitoring restricted areas to ensure that only authorized persons have access;

.5 supervising the handling of cargo;

.6 supervising the handling of ship's stores; and
.7 ensuring that security communication is readily available.

14.3. At security level 2, the additional protective measures, specified in the port facility security plan, shall be implemented for each activity detailed in section 14.2, taking into account the guidance given in part B of this Code.

14.4. At security level 3, further specific protective measures, specified in the port facility security plan, shall be implemented for each activity detailed in section 14.2, taking into account the guidance given in part B of this Code.

14.4.1. In addition, at security level 3, port facilities are required to respond to and implement any security instructions given by the Contracting Government within whose territory the port facility is located.

14.5. When a port facility security officer is advised that a ship encounters difficulties in complying with the requirements of chapter XI-2 or this part or in implementing the appropriate measures and procedures as detailed in the ship security plan, and in the case of security level 3 following any security instructions given by the Contracting Government within whose territory the port facility is located, the port facility security officer and ship security officer shall liaise and co-ordinate appropriate actions.

14.6. When a port facility security officer is advised that a ship is at a security level, which is higher than that of the port facility, shall report the matter to the competent authority and shall liaise with the ship security officer and co-ordinate appropriate actions, if necessary.

ISPS Code: 16 PORT FACILITY SECURITY PLAN

16.1. A port facility security plan shall be developed and maintained, on the basis of a port facility security assessment, for each port facility, adequate for the ship/port interface. The plan shall make provisions for the three security levels, as defined in this part of the Code.

16.3. Such a plan shall be developed taking into account the guidance given in Part B of this Code and shall be in the working language of the port facility. The plan shall address, at least, the following:

.1 measures designed to prevent weapons or any other dangerous substances and devices intended for use against people, ships or ports and the carriage of which is not authorized, from being introduced into the port facility or on board a ship;
.2 measures designed to prevent unauthorized access to the port facility, to ships moored at the facility, and to restricted areas of the facility;
.3 procedures for responding to security threats or breaches of security, including provisions for maintaining critical operations of the port facility or ship/port interface;
.4 procedures for responding to any security instructions the Contracting Government, in whose territory the port facility is located, may give at security level 3;
.5 procedures for evacuation in case of security threats or breaches of security;
.6 duties of port facility personnel assigned security responsibilities and of other facility personnel on security aspects;
.7 procedures for interfacing with ship security activities;
.8 procedures for the periodic review of the plan and updating;
.9 procedures for reporting security incidents;
.10 identification of the port facility security officer including 24-hour contact details;
.11 measures to ensure the security of the information contained in the plan;
.12 measures designed to ensure effective security of cargo and the cargo handling equipment at the port facility;
.13 procedures for auditing the port facility security plan;
.14 procedures for responding in case the ship security alert system of a ship at the port facility has been activated; and
.15 procedures for facilitating shore leave for ship's personnel or personnel changes, as well as access of visitors to the ship including representatives of seafarers. welfare and labour organizations.

16.4. Personnel conducting internal audits of the security activities specified in the plan or evaluating its implementation shall be independent of the activities being audited unless this is impracticable due to the size and the nature of the port facility.

16.7. The plan may be kept in an electronic format. In such a case, it shall be protected by

procedures aimed at preventing its unauthorized deletion, destruction or amendment.
16.8. The plan shall be protected from unauthorized access or disclosure.

ISPS Code: 17 PORT FACILITY SECURITY OFFICER

17.1. A port facility security officer shall be designated for each port facility. A person may be designated as the port facility security officer for one or more port facilities.
17.3. The port facility security officer shall be given the necessary support to fulfil the duties and responsibilities imposed by chapter XI-2 and this part of this Code.

ISPS Code: 18 TRAINING, DRILLS AND EXERCISES ON PORT FACILITY SECURITY

18.1. The port facility security officer and appropriate port facility security personnel shall have knowledge and have received training, taking into account the guidance given in part B of this Code.
18.2. Port facility personnel having specific security duties shall understand their duties and responsibilities for port facility security, as described in the port facility security plan and shall have sufficient knowledge and ability to perform their assigned duties, taking into account the guidance given in part B of this Code.
18.3. To ensure the effective implementation of the port facility security plan, drills shall be carried out at appropriate intervals taking into account the types of operations of the port facility, port facility personnel changes, the type of ship the port facility is serving and other relevant circumstances, taking into account guidance given in part B of this Code.
18.4. The port facility security officer shall ensure the effective coordination and implementation of the port facility security plan by participating in exercises at appropriate intervals, taking into account the guidance given in part B of this Code.

(3) Compliance with ISPS Code

Major requirements of SOLAS Chapter XI-2and Part A of ISPS Code and responses of the Contracting Government and port terminal operators are as follow;

Table 7.3-1 Major requirements and responses

Major requirements of SOLAS Chapter XI-2 and Part A of ISPS Code	Responses
Contracting Government shall decide the extent of application of SOLAS XI-2 and Part A of ISPS Code	Complied, 5 ports under GCPI and other ports under South Oil Company
Contracting Government shall set security levels.	Complied, set Level 1 now
Port Facility Security Assessment (PFSA) shall be carried out by the Contacting Government and periodically be reviewed and updated.	Complied
Port Facility Security Plan (PFSP) shall be developed and maintained on the basis of PFSA and PFSP shall be approved by the Contracting Government.	Complied
Contracting Government shall communicate to IMO the details of the port facilities of which PFSPs have been approved by the Contracting Government.	PFSPs have been approved, but the Contracting Government has not communicated to IMO
Port Facility Security Officer (PFSO) shall be designated for each port facility.	Complied
The following activities shall be carried out through appropriate measures;	
ensuring the performance of all port facility security duties;	Complied
controlling access to the port facility;	Complied, but improvement required
monitoring of the port facility, including anchoring and berthing area(s);	Complied, but improvement required
monitoring restricted areas to ensure that only authorized persons have access;	Complied, but improvement required
supervising the handling of cargo;	Complied
supervising the handling of ship's stores; and	Complied

ensuring that security communication is readily available.	Complied
Contracting Governments shall test the effectiveness of the Port Facility Security Plans, or of amendments to such plans, they have approved.	Procedures shall be documented and records shall be maintained.
To ensure the effective implementation of the port facility security plan, drills shall be carried out at appropriate intervals and the port facility security officer shall ensure the effective coordination and implementation of the port facility security plan by participating in exercises at appropriate intervals,	Drills have been conducted under the lead of PFSO, but exercises shall be conducted together with the related organizations for reliable communication in case security incident occurs.

Source: JICA Study Team

Although the achievement of the security measures implementation differs among the port facilities under GCPI, the requirements of SOLAS XI-2 and Part A of ISPS Code are mostly implemented other than that the Contracting Government has not communicated to IMO the details of the port facilities of which PFSPs have been approved by the Contracting Government.
Points to be taken into account will be described in the following section.

7.3.3 Installation of Port Security Facilities

(1) Major Emphases on Port Facility Security Measures

The port facility security measures are currently implemented at each port facility based on their Port Facility Security Plans, however, there may be room for improvement of the systems, methods or techniques to be used to fulfil the tighter implementation of the port facility security measures. The following are the comments of JICA Study Team on the implementation of the port facility security measures.

1) Controlling access to the port facility

Controlling access to the port facility is currently conducted at each port facility by checking IDs of the persons entering into the port facilities and by some other measures, depending on each port facility, however, in order to ensure the proper control of entry into the port facilities and restricted areas, JICA Study Team proposes to deploy the following system.

One of the most important as well as difficult measures to be complied with properly and efficiently with the requirements in port facility security is the access control to the port facility which contains restricted areas. Ideally, it is to adopt the entry pass system in which GCPI issues Port Security Cards (hereinafter called as PS Card) to GCPI staffs, terminal operator employees, port workers, truck and trailer drivers who are engaged in port operation activities for managing access control to the port facilities and restricted areas.

The following are the recommended requirements for issuing PS Cards and management of the issued PS Card;

a. PS Cards should be issued only to personnel who are entitled to be issued, and the professional affiliation should be identified by the PS Card which is controlled by the procedures for the application of issuing PS Card and registration of the said personnel
b. The said personnel should be identified by the PS Card which should be issued through the application procedures that guarantee the uniqueness of the personnel, together with attaching a face photo to the PS Card.
c. Preventative measures from the falsification should be technically provided.
d. Unusable PS Card should be identified by keeping track of forfeiture and restoration of PS Cards and by ledger control
e. Renewal control should be carried out (maximum period of validity should be 5 years).
f. If the name of the port terminal is mentioned on the PS Card, it is easy to identify the

purpose of the entry.

Until the time GCPI will arrange the entry pass system mentioned above, the following method to identify 3 important items is recommended to be deployed:

a. Identification of uniqueness of the personnel; Checking ID with photo and the face of the personnel
b. Identification of professional affiliation: The said personnel should fill his/her name and professional affiliation into the registration book, and temporary entry pass should be issued to the personnel and collected the same when going out.
c. Identification of purpose of entry: The purpose of entry and target area should be recorded into the registration book and the cargo carrying in/out slip should be verified, if any. Any other items which PFSO requires should be recorded into the registration book.

2) Monitoring port facility, including anchoring and berthing areas and monitoring restricted areas to ensure that only authorized persons have access

In order to ensure the monitoring requirements are properly conducted, the following emphases are noted;

Fencing

- Fencing should be installed at the boundaries of the port facilities and restricted areas. In case it is not possible to install fencing at the boundary of the restricted area, movable type of fencing together with security signboards can be used to indicate the boundary clearly.
- The heights of fencing are to follow referred technical guidance.
- Damaged portions should be remedied immediately.
- The width of the clear zone (both sides of the fencing) is recommended to keep 3 or more meters each side, but minimum outside clearance will be 1.5 meter or more.
- It is recommended to install fence sensors on the fencing in case the fencing is wire-wove type.
- Facility ledger should be maintained

Surveillance cameras

- Location and height of the towers / poles for surveillance cameras should be reviewed in order to monitor the inside and outside of fencing simultaneously and avoid any blind spots. The cameras should be set almost directly over the fencing lines.
- Surveillance cameras should be installed beside the gates to monitor and record the persons and vehicles entering into / exiting from the port facility through the gates.
- A surveillance record should be taken custody for a period of the transportation time of the ship to the destination plus about 1 week or more.
- Monitoring and surveillance system of GCPI terminals and the private terminal operator who operates in the same port area should be connected to GCPI system for effective monitoring.
- Facility and equipment ledger should be maintained.

Lighting

- Location and height of the lighting poles should be reviewed in order to secure the illuminance of 3 lux at all area including the boundary of the port facility.
- The specifications of lighting bulbs should be reviewed in order to attain the illuminance of 3 lux and to minimize the operating costs.
- Facility and equipment ledger should be maintained.

Ensuring that security communication is readily available

- The functional capability of the existing communication equipment should be checked and any equipment with functional failure should be updated.
- Facility and equipment ledger should be maintained.

3) Test the effectiveness of the Port Facility Security Plan

- The Contracting Government should prepare the procedures for testing the effectiveness of PFSPs and maintain the records of the test results.
- The Contracting Government and port terminal operators should discuss the test results for further improvement of the effectiveness of PFSP.

4) Training, drills and exercises on port facility security

- PFSOs conduct the security drills for the security personnel at their ports including the classroom lectures, however, the exercises designed for communication among the related organizations should be conducted together with those organizations for reliable communication on the assumption that a security incident could occur.
- The record of the drills and exercises should be maintained.

(2) Technical Guidance for Major Security Facilities and Equipment

1) General

Group A: Pier dedicated for containers, pier for regular passenger liners, or pier dedicated for hazardous materials

Group B: Pier for irregular passenger liners, pier for hazardous materials other than stated above, pier for handling bulk materials, or multi-purpose pier

2) Restricted area

Functional requirements

Restricted areas should be properly designated based on the consideration of the local port arrangements, berthing conditions of international ships, loading and unloading of cargoes, embarkation and disembarkation of international passengers and other conditions, at the same time, based on sufficient understandings according to the provisions of the ISPS Code.

Interpretations

- The purpose of designating restricted areas according to Part B of ISPS Code is to:
  - protect the passengers, ship personnel, port facility personnel and visitors, including those visiting in connection with a ship;
  - protect the port facility;
  - protect ships using, and serving, the port facility;
  - protect security-sensitive locations and areas within the port facility;
  - protect security and surveillance equipment and systems; and
  - protect cargo and ship stores from tampering..
- The PFSP should ensure that all restricted areas have clearly established security measures to control:
  - access by individuals;
  - the entry, parking, loading and unloading of vehicles;
  - movement and storage of cargo and ship stores; and
  - unaccompanied baggage or personal effects.
- Restricted areas may include;

- shore and waterside areas immediately adjacent to the ship;
- embarkation and disembarkation areas, passenger and ship personnel holding and processing areas including search points;
- areas where loading, unloading or storage of cargo and ship store is undertaken;
- locations where security sensitive information, including cargo documentation, is held;
- areas where dangerous goods and hazardous substance are held;
- vessel traffic management system control rooms, aids to navigation and port control buildings, including security and surveillance control rooms;
- areas where security and surveillance equipment are stored or loaded;
- essential electrical, radio and telecommunication, water and other utility installations; and
- other locations in the port facility where access by vessels, vehicles and individuals should be restricted.

3) Barriers / fixed fence

Functional requirements

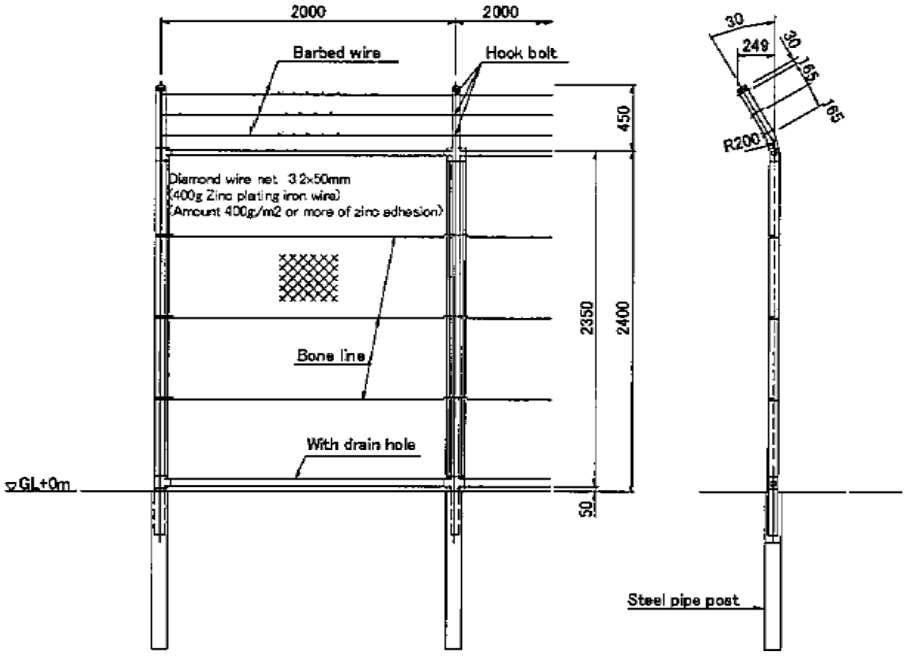
- Installation of the fencing should be able to increase the observation capacity of the security personnel by providing psychological restraint to any possible intruder, slowing any intruding actions or by providing clear zones.
- Sufficient height to prevent any person from intruding.
- Sufficient strength and durability to withstand assumed loads.
- Wire mesh or grid rod diameter that will not be easily cut.
- Structure that will not allow detour for entry at water edge sections of boundaries with neighboring land.
- Sign posted to prohibit any trespassing.
- Clear zone provided on both sides of fences.

Standard specifications

- Effective height of 2,400 mm or over for Group A facilities and 1,800 mm or over for Group B facilities (less the height of Top Guard (spike)).
- Top Guard (spike) added on top as overhung outward (length of 450 mm or over, angle 30 degree or over outward and barbed).
- The assumed load is wind load (standard wind speed is 34 m/sec).
- Mesh size (diamond size of 50 mm or less) or grid of width (50 mm or less).
- Mesh wire diameter of 3.2 mm or over (without cladding) and grid rod diameter of 6.0 mm or over.
- Prevention and/or construction against any curling up or intrusion from the bottom of fence.
- Fence used near the sea should be highly resistant to corrosion in consideration of salt damage.
- Standard clear zone should be 3 meters inside the fence and as necessary on the outside for the early detection of any unauthorized intrusion.

Interpretations

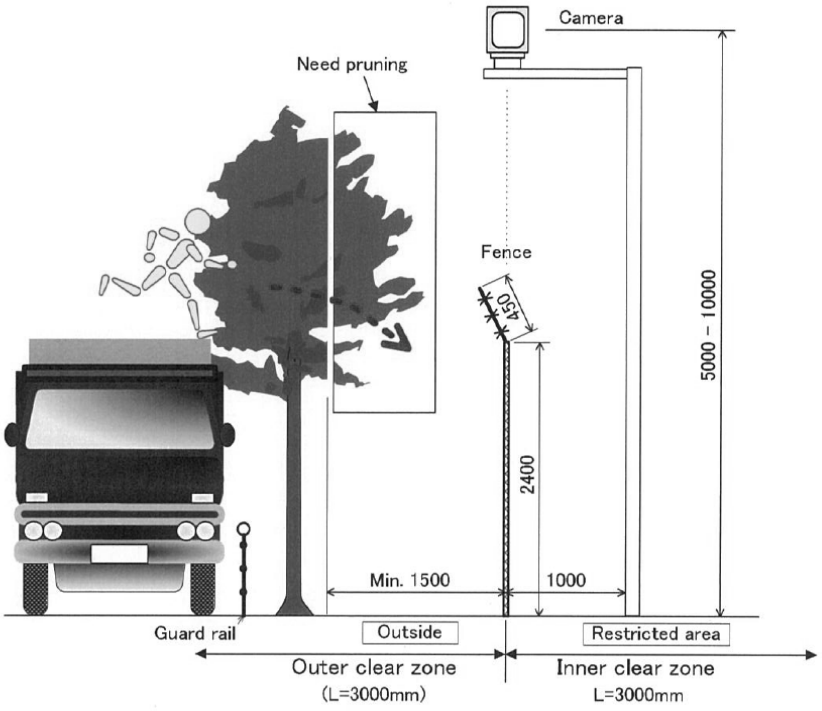
- The effective height has been determined based on case examples of other countries. The wind load is a value that is commonly used in Japan as standard and is a force equivalent to 960N per square meter. The fundamental condition for net fencing is a long term permissible soil bearing capacity of 100 kN/m2.
- When using any existing facility, secure equivalent functionality. When using existing block fencing, for example, ensure the effective height and install a spike on top of the fencing. The effective height of the fencing does not include the spike and the foundation.
- In case the above mentioned spike cannot be arranged outward because the land area is adjacent to private residence or may constitute an obstacle to the road traffic, make the barbed wire fencing vertical as high as practical (600 mm or over).



Source: Port Security Manual of Ides Inc.

Figure 7.3-1 Example of Fixed Fencing Construction

- The clear zone should be provided on both sides of the fencing of 3 meters wide as standard. If it is difficult to provide the width of 3 meters on the outside, the minimum width of 1.5 meters should be secured.



Source: Port Security Manual of Ides Inc.

Figure 7.3-2 Example of Clear Zone

4) Barriers / mobile fence

Functional requirements;

- It can clearly indicate the boundaries to restricted areas to identify any intruder.
- Signs are posted to prohibit any trespassing.
- Clear zone is provided.

Standard specifications

- It has self-supported construction that is not easily to fall.

5) Barriers / gates

Functional requirements

- The installation of a gate is intended to prevent any intrusion of persons and vehicles for the control of ingress and egress by restricting or closing the entrance to and exit from restricted areas.
- Gates should have the same height as fixed fences and be of strong and durable construction to withstand assumed loads.
- Car bump or cross bar barrier should be provided at the gate.
- Gate should be of a construction that allows locking. When locked, the lock and key should not be easily removed, replaced or replicated.
- Personnel and vehicles should have separate accesses.

Standard specifications

- The standard specifications should be the same as the fixed fences.

6) Barriers / vehicle stopping equipment

Functional requirements

- It can clearly indicate the instruction to stop the vehicles.
- It makes vehicle drivers recognize the necessity of stopping.

Standard specifications

- Group A facilities should be equipped with vehicle stopping equipment. With Group B facilities, installation of such equipment is desired.
- The equipment should be of a construction that will easily prevent any vehicle from intrusion by onrushing, running over or under.

7) Security lighting equipment

Functional requirements

- The lighting should provide an illuminance that allows surveillance of any suspicious individual's behavior by the naked eyes of the security personnel or through surveillance cameras.
- The height of the lighting should be designed to provide sufficient level of illuminance for the cameras to operate.
- The lighting arrangement should be designed to provide sufficient level of the illuminance at the boundary areas.
- The lighting should be able to illuminate the entire apron of the pier to watch any intrusion from the pier or any access to ships,
- In case of surveillance through cameras, sufficient level of illuminance should be secured at the boundary areas.
- Considerations should be given for securing a sufficient illuminance at any narrow places.
- It should be able to illuminate the entire range within the yard.
- It should provide a sufficient level of illuminance at the gate that allows the checking of identification documents required for the authorization of the entry.
- Emergency power sources should be provided to maintain function of the surveillance of the

boundary in case of power outage.

Standard specifications

S-1 Boundary area

- The illuminance should basically be 3 lux to allow surveillance by the naked eye. Where cameras are used for the surveillance, the illuminance should meet a level that allows camera-based surveillance (approx. 3 lux). The illuminance level and lighting equipment should be determined based on the capacity of the camera used.
- The lighting equipment should be capable of illuminating the boundary areas to find any intrusion.

S-2 Yard

- In case the illuminance may be insufficient for some particular purpose, additional lighting equipment should be provided for safety and security reasons.

S-3 Gate

- Spot lighting should be provided at the position of the security personnel. The standard illuminance should be 30 – 50 lux that will allow reading 10 point (approximately 3.5 mm) characters almost smoothly.

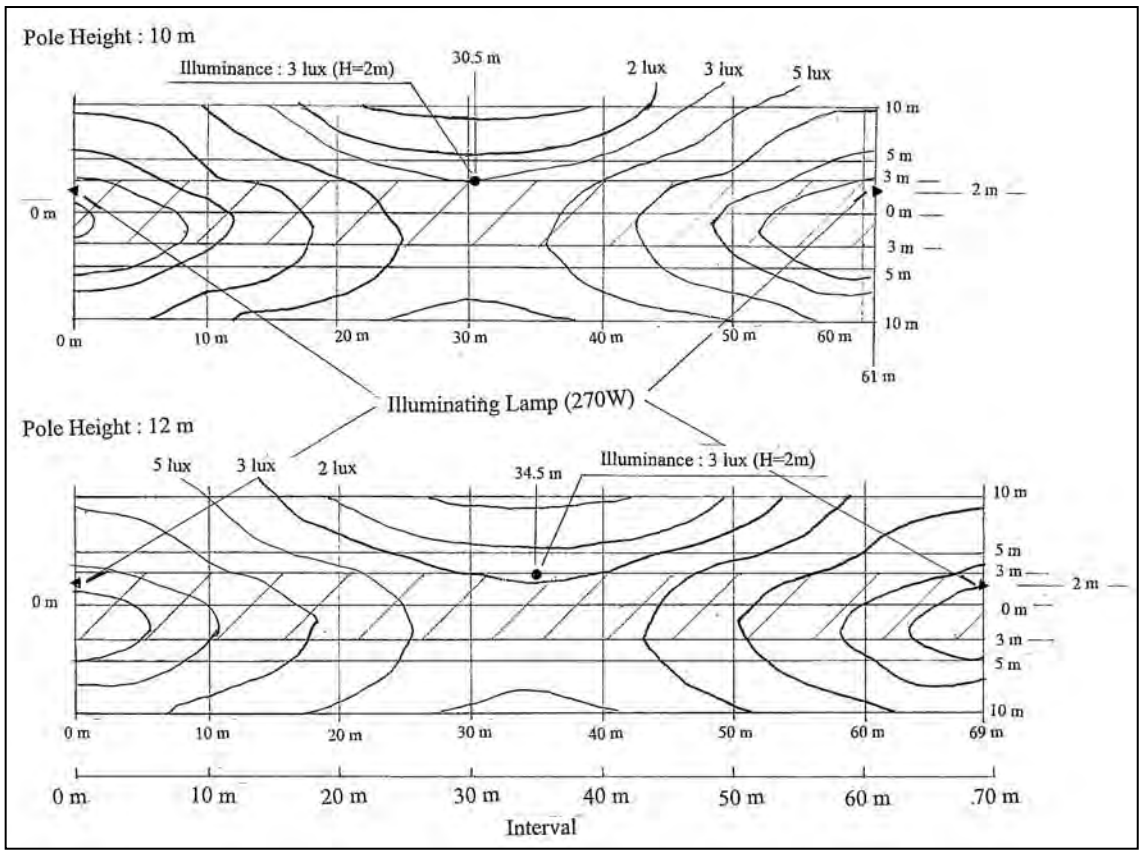
S-4 Other

- Backup measures should be provided for any power outage to ensure the minimum level of surveillance functionality including the surveillance of boundary areas.
- Group A facilities should be equipped with emergency power source. With Group B facilities, while having emergency power source is recommended, alternative measures may be used such as enhancing the patrol surveillance upon any power outage.

Interpretation

- A certain level of illuminance should be secured at the boundaries of restricted areas as a psychological deterrent to any intrusion. For that reason, the boundary lighting needs to be provided separately from the yard lighting so that the illumination can be maintained throughout the night.
- When conducting patrol, surveillance by the naked eye in the illuminance of 1 lux is extremely difficult. The illuminance that will allow naked-eye surveillance is approximately 3 lux. Even though the surveillance cameras with high level of capability can work properly under the illuminance of 3 lux, the minimum surveillance illuminance level may not be reduced because surveillance by human patrol is always necessary. Therefore, a minimum illuminance of approximately 3 lux is desired within the port facilities from the security point of view. If the surveillance camera capacity requires more than 3 lux, the illuminance level should be determined in accordance with the capacity of the cameras.
- Illuminance includes the horizontal illuminance and the vertical illuminance. The horizontal illuminance represents the amount of light exposure on a horizontal plane of unit area and the vertical illuminance the amount of light exposure on a vertical plane. Normally, the illuminance represents the horizontal illuminance. Since observation by surveillance cameras and patrol is primarily based on the observation of vertical surfaces, the illuminance required for observation should be beyond the standard value for either the horizontal or vertical illuminance.
- When providing 3 lux illuminance for the entire boundary, the use of 270-watt sodium lights at the height of 12 meters is considered optimum because of the long interval between lights and small variation in the illuminance. The following figure shows the distribution of illuminance where a series of 270-watt lights are installed.
- The following figure shows that, when illuminating with a low level of 3 lux, the lights

installed at a height of 12 meters provide wider range of illumination than the case of 10 meters height. It also shows that the interval of lights is 69 meters for the light height of 12 meters which is longer than 61 meters for the height of 10 meters.



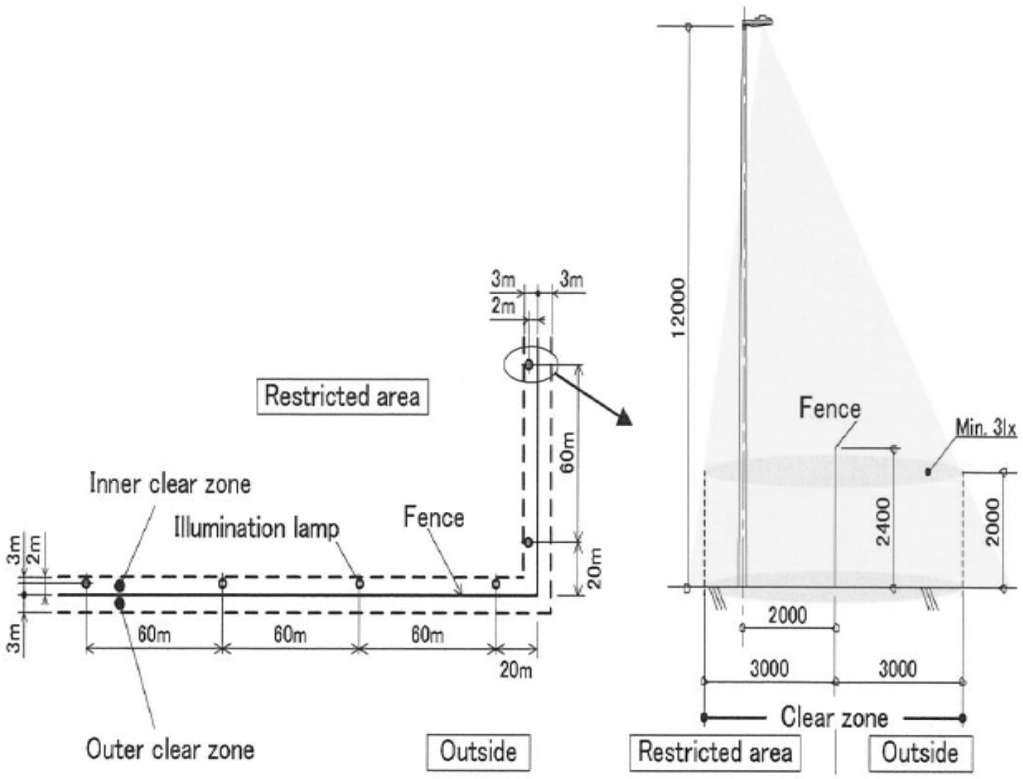
Source: Port Security Manual of Ides Inc.

Figure 7.3-3 Illuminance distribution

- To prevent any attempt to use a lighting pole as by a ladder to climb over the fence, the pole should be installed away from the fencing. According to the above figure, a distance of 2 meters from the fencing is considered optimum and economical because of the long interval of poles installed.
- It is recommended to separate the circuits for the surveillance lighting from other lighting.

Reference

- Installation policy on lighting system is as follows:
  - A) Lighting system should provide enough brightness for security personnel to monitor suspicious persons with the naked eye or surveillance camera in harmony with site conditions.
  - B) Lighting system should provide enough brightness for security personnel to check the identification documents at a gate.
- Layout of lighting poles is arranged to ensure the brightness of 3 lux in the clear zone of 3 meters each (outside and inside) along the fence. The following figure represents a sample layout of 270-watt lighting poles with a lighting height of 12 meters for illuminating the boundary area so that the illuminance of 3 lux may be secured for the width of 3 meters in the clear zone of the boundary both inside and outside of the fencing. The lighting poles should be installed inside the boundary to shed the light outward to the fencing from within the boundary.



Source: Port Security Manual of Ides Inc.

Figure 7.3-4 Example Layout of 270 W Lighting Poles along the Boundary

8) Surveillance camera unit

Functional requirements

- It should be able to cover all boundary areas of the restricted area for surveillance.
- It should be able to watch any particular area in the range of camera operation within the restricted area.
- With the combination of surveillance equipment and lighting equipment, it should be possible to identify specific actions of suspicious persons when such persons intrude into the restricted area.
- Camera images should be recorded for a certain period of time.
- The functionality of the surveillance equipment should be maintained for a certain period of time upon any power outage.

Standard functional requirements of the camera system

- It should have the place and time of the images recorded at the same time.
- The frame rate of the recorded images should satisfy the surveillance camera requirements.
- Preventive measures should be provided against any potential functional disorder resulting from electromagnetic interference.
- Where there are network connections with the outside, preventive measures should be implemented against any virus infection, network troubles, unauthorized access etc.
- It should be able to conduct automatic sequential surveillance in a preset sequence.
- It should be able to monitor multiple areas at the same time.
- It should be able to turn at speeds that will not constitute an obstacle to the detection of an intruder.
- Measures should be provided against any condensation, penetration of raindrops, lightning and salt damage.

Standard specification

- Group A facilities should be equipped with surveillance cameras. Group B facilities are recommended to equip surveillance cameras depending on usage conditions.
- Under the illuminance of 3 lux at night, the camera and lens should meet the required specifications that enable identification of the motions of a person in black clothes at the largest shooting range.
- Pier cameras should be installed at the end of aprons without interfering with cargo loading / unloading operations. The maximum range covered by a single camera will be up to 350 meters and the optimum range is to be determined depending on the specifications of the pier where the cameras are installed.
- The surveillance cameras installed in buildings, such as in the passenger terminal, should be able to monitor the major traffic lines in the buildings.
- Surveillance images should be preserved for the period necessary for the transportation time to the destination plus about one week or over.
- The system should be able to import the image data from the preserved surveillance images for transferring to external media.
- Images should be in color.
- Monitor screen should be 20 inches or over.
- The cameras should have telescopic and auto-focusing functions.
- The turning range should allow surveillance of the pier, boundary areas and inside of the yard.
- In order to turn the camera to one of the preset observation points based on reported information or alarm from the intrusion detection sensors, and to zoom in on any suspicious person, the standard preset turning speed should be 180 deg/second or over horizontally and 60 deg/second or over vertically. The turning speed under manual operation should allow the tracking of a running person.
- The surveillance points of cameras should be preset to the fixed surveillance points as well as the points indicated by the intrusion detection sensor within the yard.
- The surveillance cameras used within the port should be of a robust and highly reliable outdoor oriented construction that will withstand a long period of service, with sufficient consideration of salt damage, weather, etc.
- In consideration of winds, rain, humidity and temperature changes, the cameras should be equipped with wiper, defroster and other devices for securing visibility.
- Sufficient consideration should be given against any lightning strike

9) Intrusion detection sensors

9)-1 Fence sensor

Functional requirements

- It should always be able to monitor any intrusion from the periphery of the restricted area and any tampering with the fence (by the provision of automatic detection functionality) and to notify the security personnel.
- The intrusion detection sensors to be installed on the barriers (fencing, etc.) should be reliable for the detection of possible assumed scenarios, including intrusions by crossing over, cutting, ,crashing into, and tampering with the barriers.
- Where surveillance cameras with preset functions are provided, the alert areas should be divided into sections of a length (width) that can be observed at a single preset point of camera, then the entire section of the fencing to be reported is contained in the visual range of the camera. In addition, such functions should be designed to be performed in coordination with the motions of the other surveillance cameras.

Standard specifications

- Fence sensors should be installed when they are necessary for any particular purposes. They are not essential for the security facilities.

- Candidates are vibration sensor (coaxial cable type or optic fiber type), tension sensor, infrared ray sensor, electric field sensor, and image sensor, among which selection is to be made based on the criteria of adaptability, reliability in detection performance, serviceability, ease of installation and economic efficiency.

9)-2 Gate sensor

Functional requirements

- It should have automatic detection functionality to detect any suspicious person and have the capability to report the detection to the security personnel.
- The intrusion detection sensors to be installed on the gates should be fit and reliable for the detection of possible assumed scenarios, including intrusions by crossing over, cutting, crashing into, and tampering with the gate.
- The gate sensor should be provided with a key switch box so that the security personnel can either set or release the alert mode of the gate sensor at the site depending on how the gate is used. The system should be designed to preclude any possibility of non-alert mode while the gate is closed.

Standard specifications

- Gate sensors should be installed when they are necessary for any particular purpose. They are not essential conditions for the security facilities.
- Candidates are tension sensor, infrared ray sensor and image sensor, among which selection is to be made based on the criteria of adaptability, reliability in detection performance, serviceability, ease of installation and economic efficiency.

10) Hand luggage inspection equipment

Functional requirements

- The following are the functional requirements for hand luggage inspection equipment.
  a. It should be able to easily detect weapons, explosives and other objects that are prohibited from being brought onto the ship.
  b. For the inspection of hand luggage, every inspection site is equipped with a set of X-ray inspection devices and portal-type metal detectors as well as handheld metal detectors.
  c. To prevent any concealed carriage of hazardous materials, the inspections of hand luggage should be conducted through the X-ray inspection device simultaneously with the inspection of the person carrying the luggage through the portal-type metal detector. For that purpose, the X-ray inspection device and the portal-type metal detector should be positioned in parallel.
  d. Handheld metal detectors should be provided at the inspection site so that they can be used at any time as necessary.

Standard specifications

- It is desired that international passenger facilities that international regular passenger lines routinely call with a lot of passengers are provided with X-ray inspection devices and portal-type metal detectors for the inspection of hand luggage.
  a. X-ray inspection device
  - It should display the entire object being inspected.
  - It should have sufficient capacity to distinguish.
  - It should have sufficient penetrating power.
  - It should be able to obtain information on the material of any explosives or any other hazardous objects.

  b. Metal detector
  - It should be able to detect metallic objects irrespective of their directions and positions.
  - It should be able to detect stainless steel and non-ferrous metals such as aluminum.

- It should be able to adjust the sensitivity.
- Portal-type and handheld metal detectors are used for the inspection of personal effects of the passengers.

11) Telecommunication equipment

11)-1 Telecommunications between ships and port facilities

Functional requirements

- It should have the capability to communicate with ships directly.

Standard specifications

- Communication means
  - Telephone, fax and e-mail using INMARSAT telecommunications satellite
  - Marine satellite phone (satellite handheld phones via Iridium, Thuraya, Asis, etc.)
  - Other communications media for ships in port, including cellular phone, transceiver and megaphone
  - Telecommunications via shipping company or agent
  - Voice communications via Marine Safety Agency
  - VHF communications are used as supplemental communications media at ports with a port radio station facility

Interpretations

- It should always or at times of emergency be provided with the means to exchange information immediately and securely. The security level of ships should be confirmed and the security level of the port facilities be reported. Security-related information should be transmitted and received between ships and port facilities.

11)-2 Communications within port facilities

Functional requirements

- Security personnel should be able to make voice calls promptly at times of emergency.
- Upon any occurrence of harmful acts by unlawful intruder(s), the emergency reporting system should be able to notify the security personnel immediately.
- At times of emergency, the security personnel should be able to inform the workers within the restricted areas and give them instructions.
- Communication facilities / equipment should have the ability to transmit the same broadcast to all restricted areas simultaneously (including bridges of the ships).

Standard specifications

- Communication means among security personnel (security personnel should have any one of the followings) :
  - Radio telephone for business purpose, or transceiver
  - Cellular phone, or other
- Communications means at gate / gate house (security personnel should have any one of the followings) :
  - Radio telephone for business purpose, or transceiver
  - Cellular phone
  - Telephone, fax
  - Alarm bell, or other
- Communications means used for informing and instructing the workers (including those at bridges of the ships) :
  - Public address system

- Megaphone or other

Interpretations

- Communication means should be provided to exchange information immediately and securely at times of emergency. Suitable communication facilities and equipment should be provided to make it possible for the security personnel or other people of the port facilities to inform or report to the security control rooms and competent organizations immediately at the time of detection of any intrusion or harmful acts.
- It is necessary to have facilities and equipment to inform or instruct the personnel in the restricted areas and ships moored in port on the need for evacuation or any other actions.

Standard specifications for public address facilities

- The following are the standard specifications for the public address facilities that can broadcast announcements to the entire restricted area.
  - The area to be addressed should include aprons and ships where workers are primarily engaged in port operations. In addition, loudspeakers should be provided at the boundary zones for the purpose of warning any suspicious persons.
  - Loudness of the public address should be 75 dB and an attenuation of 10 dB should be considered that will occur at the bridge of ships.
  - When determining the locations of loudspeakers, they should be selected to satisfy the above requirements while ensuring no adverse effects on the utilization of the port facilities.

12) Power supply facility

Functional requirements

- Electric power to the security facilities should be supplied consistently and sufficiently.
- Even at times of power outage in an emergency situation, power should be supplied to keep the surveillance equipment functional in order to capture the situation of the site continuously and maintain communication to the police and other relevant organizations.

Standard specifications

- Group A facilities should be equipped with uninterruptible power supply (UPS) devices. The installation of UPS devices is recommended in Group B facilities if there are surveillance cameras installed.
- Uninterruptible power supply (UPS) system: UPS prevents any functional interruption or fault of security surveillance equipment by any instantaneous power outage, such as by lightning shock. The device is also used as the emergency power source upon any outage of power.
  - All-time inverter supplied type (instantaneous interruption-free switching type) is to avoid any instantaneous power interruption immediately after the outage of primary power and to eliminate the possibility of damage to equipment and data or blackout of security lighting equipment attributable to such instantaneous power outage. Furthermore, all-time power supply will provide the connected equipment with a stable and consistent quality of the power.
  - The back-up time should be 10 minutes or over to make it possible to identify the cause of any power outage and to report to the relevant organizations and international navigating ships. During the time, the system should work as the emergency power supply.
  - Bypass switching circuit should be provided to allow the immediate switching to the utility power upon any fault of the UPS.
  - Automatic shutdown signal should be released upon any voltage drop.
  - The equipment to be supported includes the surveillance equipment installed in the security control room, surveillance equipment and security lighting equipment that is installed at the site as well as the communication equipment used in the port facilities.

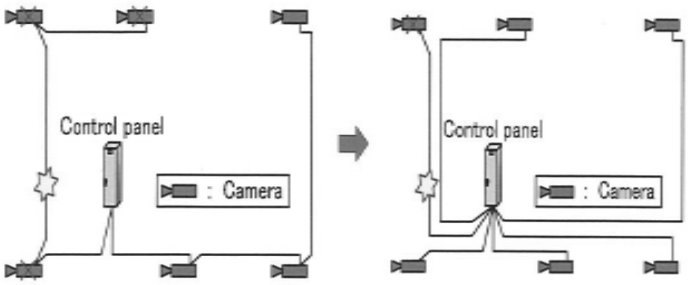
- Emergency power generation facility: Emergency power generation facility supplies power to the security surveillance facilities even at a time of extended power outage or during work on the port facilities without power.
  - Starting time should be 40 seconds or less.
  - The fuel tank should be of a capacity that will allow 12 hours or more of continuous operation in consideration of potential night-time lighting.
  - The facility should get started automatically by the power outage signal received from the automatic switching device and stopped also automatically by the power recovery signal.
- Dual power receiving system: Dual power receiving system should be used for ensuring backup upon any power outage.
- Power distribution system: To minimize the effects of any fault, there should be multiple power distribution channels so that a local fault will not propagate to the entire system.

Interpretations

- The back-up time of 10 minutes or over for the UPS and the starting time of 40 seconds or less for the emergency power generation facility are based on the Japanese standards.
- Since critical security equipment needs to be functional even during any power outage, it is desired to have the emergency power generation facility for the surveillance cameras, security lighting and emergency reporting / communicating system.
- The installation of UPS system is desired for equipment that may be damaged or suffer data loss by any instantaneous power outage, and for the surveillance cameras, security lighting and emergency reporting / communicating system that are required for maintaining the minimum level of surveillance. Connected equipment that needs to be protected upon any power outage should be automatically shut down based on the shutdown signal received from the UPS.
- The emergency power generator takes approximately 1 minute from the detection of power outage and subsequent automatic start to the time that allows 100 % load. On the other hand, since lighting equipment (high voltage sodium lights, etc.) take 15 to 20 minutes from the time of energization to the full illumination, considerations should be made about the fact that sufficient illuminance required for security will not be obtained during that time. For that reason, a combination of the emergency power generation facility and UPS is recommended.
- Instead of using the emergency power generation facility, the batteries of the UPS may be used for the power backup. However, meeting the need for the backup of extended hours will require many batteries, at extremely high costs. It also involves high costs for replacing the batteries. Therefore, a combined usage of the emergency power generation facility and UPS will be the most economical.
- The power capacity of UPS devices should be approximately up to 20 kW. If any power beyond 20 kW is required, it should be separated by a capacity of 15 kW. If the capacity exceeds 20 kW, the price may sharply increase because it will likely become outside of general purpose devices. When separating the UPS devices by capacity, the separation should be one for the surveillance equipment and communication equipment and the other for lighting equipment. In order for the UPS devices to be separated from the power line for repair purpose upon any fault, an input-output panel should be installed. The input-output panel should be designed to bypass the UPS devices to supply power directly to the load. When installing a UPS device that is dedicated for the lighting equipment, the input-output panel may not be installed because the UPS may be repaired during the daytime by stopping the power supply to the lighting equipment.
- The power supply system to lighting equipment and security equipment such as surveillance cameras should be designed with separate wiring connections so that the propagation of the effect from any local fault may be minimized. Since, however, separating the wiring connections will require increased wiring channel space, decreased workability, and increased equipment costs, the scale of the equipment should be taken into consideration for the design.

The following are the examples of wiring configurations.

a. For surveillance cameras, any cascade wiring that connects multiple cameras on a single wiring system is very likely to shut down the power to all cameras on the system upon any fault at a single component. To avoid such a situation, it is desirable to employ the star wiring that supplies power individually to each of the cameras.

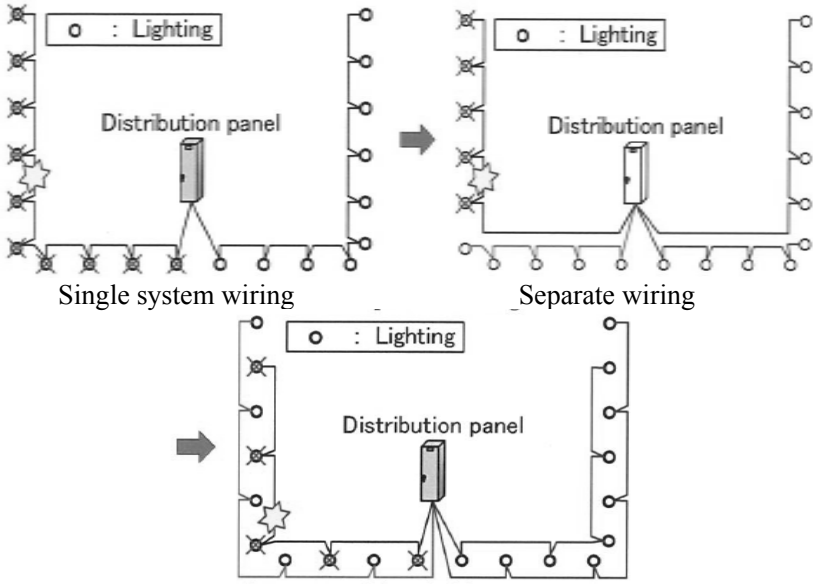


Cascade wiring Star wiring

Source: Port Security Manual of Ides Inc.

Figure 7.3-5 Wiring Configurations of Power Supply to Surveillance Cameras

b. The power to the security lighting equipment should be supplied through separate individual wiring systems so that any local fault will not shut down the entire lighting power. In addition, to avoid any blackout of the entire area for one wiring system, alternate wiring connection of two power systems are also considered.



Single system wiring Separate wiring

Separate wiring (wiring connection to alternate lights)

Source: Port Security Manual of Ides Inc.

Figure 7.3-6 Power Supply Wiring Configuration for Security Lighting

13) Maintenance of port security facilities

Functional requirements

- Inspection and maintenance services should be conducted on a regular basis in order to maintain the functions of port security facilities and equipment properly.

Interpretations

- Maintenance work to keep the facilities and equipment in proper working condition includes routine inspections, scheduled inspections and maintenance services.
  - Inspection: In order to keep the facilities and equipment in proper working condition,

inspections should be conducted on a scheduled basis.

- Maintenance: Once it has been determined that the security facilities and equipment are not functioning properly as a result of the routine inspections, scheduled inspections or report from the person who found the undesirable condition; maintenance work should be conducted without delay.

➢ The following table shows the outline of the maintenance work:

Table 7.3-2 Maintenance work

Maintenance type	Purpose	Action
Routine inspection	Inspect visually the facilities and equipment for any unusual conditions. Or check in the course of the daily operations for any fault.	・ Check the inspection items and follow the inspection procedures in accordance with the instructions. ・ Actions to be taken by the operators
Scheduled inspection	Check the operating conditions of each piece of the equipment and at the same time conduct the maintenance to the parts that cannot be checked during the routine inspections for the early detection and prevention of any fault which may arise as a result of deterioration by aging.	・ To be conducted based on the scheduled inspection contract ・ To be conducted by the maintenance service contractors or equipment manufactures
Maintenance	Take remedial actions upon any accidental malfunction or fault	・ To be conducted by on-call maintenance service contracts ・ To be conducted by the maintenance service contractors or equipment manufactures

Source: JICA Study Team

➢ Maintenance plans should be developed to cover a period of 10 years for items that should be inspected on a regular basis.

➢ Dedicated personnel should be designated in advance for the maintenance and service of port security facilities and equipment, and held responsible for the proper maintenance of the facilities and equipment.

a. The personnel should know where to contact the representatives of the maintenance service contractor or maintenance personnel of the equipment manufacturers. Personnel should also know the contents of the maintenance work that can be conducted for immediate remedy including the time for those maintenance personnel to arrive at the site.
b. Once it has been made clear that any of the security facilities is not properly maintained, notify the maintenance contractor promptly by telephone for the execution of the maintenance work.
c. It is recommended to prepare training programs developed for the execution of the scheduled inspections and remedial actions for any accidental fault or malfunction.

➢ If it is impossible to take immediate maintenance action, some provisional action should be taken to supplement the functionality until the functions of the relevant security facility are restored.

➢ To ensure the proper maintenance of port security facilities, it is important to conduct day-to-day maintenance work and scheduled preventive maintenance that is planned from a long term point of view. The following are action to that end.

a. The contents and frequencies as well as the service procedures of the routine and scheduled inspections for the security facilities and equipment should be developed to ensure the proper execution of such works.
b. Long term maintenance plans should be developed to include the frequencies of

scheduled inspections, frequencies of the replacement / provision of consumable parts, overhaul intervals and equipment renewal intervals.
- Example of consumable parts: illumination lamps
- Example of equipment overhaul: surveillance camera
- Example of equipment renewal: surveillance server (computer system)

c. To ensure the prompt fix of any accidental malfunction or fault, it is recommended to keep the security devices and parts at site which cannot be immediately procured, as spare parts.
d. It is possible to enhance the human security efforts (patrol, etc.) as the alternative action until the functionality of the security facilities / equipment is restored.

➢ The following are items to be considered when developing the maintenance plan.
a. Once it has been made clear that any of the security equipment functions are not properly maintained, carry out the maintenance work without delay. Leaving its condition without repair will not maintain the proper level of the security. Moreover, it will increase the damage to the equipment afterwards.
b. In relation to the lighting bulbs and other consumable components, develop the replacement plans in accordance with the predicted service lives of the individual parts and, based thereupon, replace any components that are close to the replacement time at the scheduled service time. Since the time of installation is the same, then the time of the replacement comes at the same time for a lot of components, but it is possible to plan the replacement of 20 to 30% progressively at each scheduled time of the service.
c. In relation to the surveillance cameras and other equipment which require overhaul, develop the overhaul plans based on the predicted service life and, based thereupon, progressively conduct the overhaul starting with the components which are close to the scheduled time. When sending the surveillance cameras to a service station for the overhaul service, the surveillance work by camera is not possible for some days. The surveillance work should be either conducted by human efforts to fill the gap or have replacement cameras (accessible reserved cameras) ready for the surveillance.
d. Since any renewal of the surveillance server is costly, develop long term maintenance plans and also develop renewal plans that involve renewal every few years in accordance with the predicted service life.

7.3.4 Recommendations for the Management of Port Security

Based on the results of the current situation review conduced in Section 7.3.1 above, the JICA Study Team will discuss the rectification and improvement strategy of the security measures with the ISPS Section of GCPI, and will recommend possible and sustainable measures to GCPI for further effective implementation of security measures at port facilities applicable to the requirements of SOLAS XI-2 and Part A of ISPS Code.

(1) Domestic law

The Iraqi domestic law in compliance with the requirements of SOLAS XI-2 and Part A of ISPS Code should be enacted as soon as possible in order to justify the implementation of the security measures required by SOLAS XI-2 and ISPS Code by this domestic law. The Ministry of Transport has commenced the development of this law since 2009, however, the developing work is now suspended. In a similar manner, Iraq submitted the application to be affiliated with World Trade Organization (WTO) in 2004, but this application could not be realized due to the failure to enact the domestic law following WTO protocol.

(2) Communication to IMO

Major noncompliance with the requirements of SOLAS XI-2 is because the Contracting Government has not communicated to IMO the details of port facilities of which PFSPs have been approved by the Contracting Government even though PFSAs have been conducted by the

Contracting Government and PFSPs have been developed by port operators based on PFSA's results. This means that the port facilities in Iraq are not considered by ships as well as port facilities of other countries as port facilities complying with ISPS Code. There is some possibility that a ship sailing out from such port facility may be refused call at the destination port. Furthermore, some shipping companies may decide not to call at port facilities which do not comply with the requirements of ISPS Code. Consequently, it is feared that port facilities not complying with the global standard will experience huge setbacks in international trade and weaken their national economy. Therefore, the Iraqi Government is required to complete the communication to IMO about the details of port facilities of which PFSPs have been approved by the Iraqi Government.

(3) Security measures

1) Controlling access to the port facility

Controlling access to the port facility is currently conducted at each port facility by checking the IDs of persons who enter into the port facilities and by some other measures, depending on each port facility, however, in order to ensure proper control of entry into the port facilities and restricted areas, JICA Study Team proposes to deploy the following system.

One of the most important as well as difficult measures to be complied with properly and efficiently with the requirements in port facility security is access control to port facilities which contain restricted areas. Ideally, an entry pass system in which GCPI issues Port Security Card (hereinafter called as PS Card) to GCPI staffs, terminal operator employees, port workers, truck and trailer drivers who are engaged in port operation activities for managing access control to port facilities and restricted areas, be adopted.

The following are the recommended requirements for issuing PS Cards and management of issued PS Card;

a. PS Cards should be issued only to personnel who are entitled to be issued, and professional affiliation should be identified by the PS Card which is controlled by procedures for the application of issuing PS Card and registration of said personnel

b. The said personnel should be identified by the PS Card which should be issued through application procedures that guarantee the uniqueness of personnel, together with attaching a face photo to the PS Card.

c. Preventative measures from falsification should be technically provided.

d. Unusable PS Cards should be identified by keeping track of forfeiture and restoration of PS Cards, and by ledger control.

e. Renewal control should be carried out (maximum period of validity should be 5 years).

f. If name of port terminal is mentioned on the PS Card, it is easy to identify the purpose of entry.

Until the time GCPI will arrange the entry pass system mentioned above, the following methods to identify 3 important items is recommended to be deployed:

a. Identification of uniqueness of the personnel; Checking ID with photo and face of the personnel

b. Identification of professional affiliation: The said personnel should fill his/her name and professional affiliation into the registration book, and temporary entry pass should be issued to the personnel and collected the same when going out.

c. Identification of purpose of entry: The purpose of entry and target area should be recorded into the registration book and the cargo carrying in/out slip should be verified, if any. Any

other items which PFSO requires should be recorded into the registration book.

2) Monitoring port facility, including anchoring and berthing areas and monitoring restricted areas to ensure that only authorized persons have access

In order to ensure the monitoring requirements be properly conducted, the following emphases are noted;

a. Fencing
- The fencing should be installed at the boundaries of port facilities and restricted areas. In case it is not possible to install fencing at the boundary of a restricted area, movable type of fencing together with security signboards can be used to indicate the boundary clearly.
- The effective heights of fencing are (less height of barbed top guard for both cases);

H=2,400 mm or over: Exclusive to pier for container ships, regular passenger liners and ships carrying hazardous substance

H=1,800 mm or over: Pier for ships carrying general and bulk cargoes, and non-regular passenger liners; and non-exclusive pier for ships carrying hazardous substances

- Damaged portions should be remedied immediately.
- The width of the clear zone (both sides of the fencing) is recommended to keep 3 meters or more each, but minimum outside clearance will be 1.5 meter or more.
- It is recommended to install fence sensors on wire-wove type fencing.
- Facility ledger should be maintained.

b. Surveillance cameras
- Location and height of towers/poles for surveillance cameras should be reviewed in order to monitor the inside and outside of fencing simultaneously and avoiding any blind spots along the fence. The cameras should be set almost directly over the alignment of fencing lines.
- Surveillance cameras should be installed beside the gates to monitor and record the persons and vehicles entering into / exiting from the port facility through the gates.
- The surveillance record should be kept for the transportation time of the ship to destination plus about 1 week or more.
- Monitoring and surveillance system of GCPI terminals and the private terminal operator who operates in the same port area should be connected to GCPI system for effective monitoring.
- Facility and equipment ledger should be maintained.

c. Lighting
- Location and height of the lighting poles should be reviewed in order to maintain illuminance of 3 lux at all areas including the boundary of the port facility.
- The specifications of lighting bulbs should be reviewed in order to attain the illuminance of 3 lux and to minimize the operating costs.
- Facility and equipment ledger should be maintained.

d. Ensuring that security communication is readily available
- The functional capability of existing communication equipment should be checked and any equipment with functional failure should be updated.
- Facility and equipment ledger should be maintained.

3) Test effectiveness of the Port Facility Security Plan

- The Contracting Government should prepare procedures for testing the effectiveness of PFSPs and maintain records of the test results.
- The Contracting Government and port terminal operators should discuss the test results for further improvement of the effectiveness of PFSP.
- The record of the test results should be maintained.

4) Training, drills and exercises on port facility security

- PFSOs conduct security drills for the security personnel at their ports including classroom lectures, however, the exercises designed for communication among related organizations should be conducted together with those organizations to ensure reliable communication in the event that a security incident occurs.
- The record of the drills and exercises should be maintained.

7.4 Port Reception Facility Plan

The main objective of this Section is to propose a port reception facility (PRF) plan for the GCPI administered ports. The proposed plan was developed by studying and analyzing: characteristics of ship wastes, relevant MARPOL and domestic regulations, status of current PRF, case studies of other countries, waste reception needs at GCPI ports and so on. The ensuing sections summarize the main results of the study as well as the proposed PRF plan.

7.4.1 Types and Quantities of Wastes generated by Ships

(1) Types of Wastes generated by Ships

Ships generate various types of wastes through their normal operation, which could be hazardous or non-hazardous waste in either liquid or solid form or a mixture of both. Although the type of generated wastes will differ between ships, wastes such as oily residues, sewage and domestic waste (garbage) are often generated by all ship types. On the other hand, wastes such as tank washings, cargo residuals and dirty ballast water are generated only from specific ship types (e.g. oil tanker, bulk carrier) and activities. Table 7.4-1 shows the types of ship-generated wastes and their common sources.

Table 7.4-1 Types of ship-generated wastes and their common sources

Waste type		Common source	Ship type
Oil	Oily residue	・ Purification of fuel or lubricating oil for main or auxiliary machinery ・ Separated waste oil from oil filtering equipment ・ Waste oil collected in drip trays ・ Used hydraulic and lubricating oil	All ships
	Oily bilge water	・ Contamination of bilge water through leakages and maintenance in the machinery spaces	All ships
	Oily tank washings	・ Residues generated from tank washing	Oil tanker Product carrier
	Oily ballast water	・ When ballast water is introduced into oily cargo tanks. Common with ships with no segregated ballast tank	
Noxious Liquid Substances (NLS)	Tank washings	・ Residues generated from tank washing	Chemical tanker
Sewage		・ Drainage from toilets ・ Drainage from medical premises	All ships Livestock carrier

		・ Drainage from spaces containing living animals	
Garbage	Cargo residues	・ Remnants from cargo hold and deck after unloading activities	Bulk carrier
	Animal carcass	・ Death during voyage	Livestock carrier
	Domestic waste	・ Wastes generated from accommodation spaces.	All ships
	Cooking oil	・ Kitchen	All ships
	Food waste	・ Kitchen	All ships
	Operational waste	・ Solid wastes (including slurries) generated from normal maintenance or operation, including cargo stowage and handling.	
	Plastics	・ Often included in domestic and operational wastes	All ships

Source: Prepared based on MARPOL Consolidated Edition 2011 and Resolution MEPC.201 (62)

(2) Quantity of Wastes generated by Ships

The quantity of ship wastes that will be generated and subsequently delivered to port reception facility (PRF) will vary significantly between ships. Following are some factors that may influence ship waste quantity:

- Ship type and size
- Available onboard treatment equipment
- Maintenance level of the ships
- Length of voyage
- Sailed distance from previous port where waste was delivered

In order to collect information/data on ship waste quantity, the JICA Study Team conducted a literature survey and also interviewed a private waste oil operator (Asada Shokai Co. Ltd.) based in Tokyo Bay. Table 7.4-2 shows information on ship waste quantity collected from existing literature. Table 7.4-3 shows the volume of waste oil collected from ships by Asada Shokai Co. Ltd. in FY 2014.

Table 7.4-2 Information on ship waste quantity based on existing literature

Waste type	Waste quantity	Source
Oily bilge water	1-10 m^3 for ships < 400 GT that has not discharged their bilge water at sea.	Comprehensive Manual on Port Reception Facilities (IMO 1999)
Oily residue	Monthly average of around 250 m^3 from an average of around 8 ships, i.e. around 31 m^3/per ship/month (data from Mombasa port in Kenya)	T. A. Khamis, MARPOL Waste Reception Facility: Mombasa, Ports and Harbors December 2003
Domestic waste (Garbage)	1.5 kg/person/day (cargo ships) 3.0 kg/person/day (passenger ships)	Comprehensive Manual on Port Reception Facilities (IMO 1999)

Source: Prepared based on data provided from Asada Shokai Co. Ltd.

Table 7.4-3 Volume of waste oil collected from ships by Asada Shokai Co. Ltd. (FY 2014)

Waste type	Ship type (no. of ships)	Volume collected (kl)	Ship size (net tonnage)
Oily bilge water	General cargo, tanker (total of 18 ships)	Max.: 33	43,758 (general cargo)
		Ave.: 7.5	4,809 (average of 18 ships)
Oily residue	General cargo, tanker (total of 9 ships)	Max.: 118	5,713 (tanker)
		Ave.: 49	36,823 (average of 9 ships)

Source: Prepared based on data provided from Asada Shokai Co. Ltd.

7.4.2 Overview of MARPOL Regulations relevant to Ship Waste

(1) Outline of MARPOL

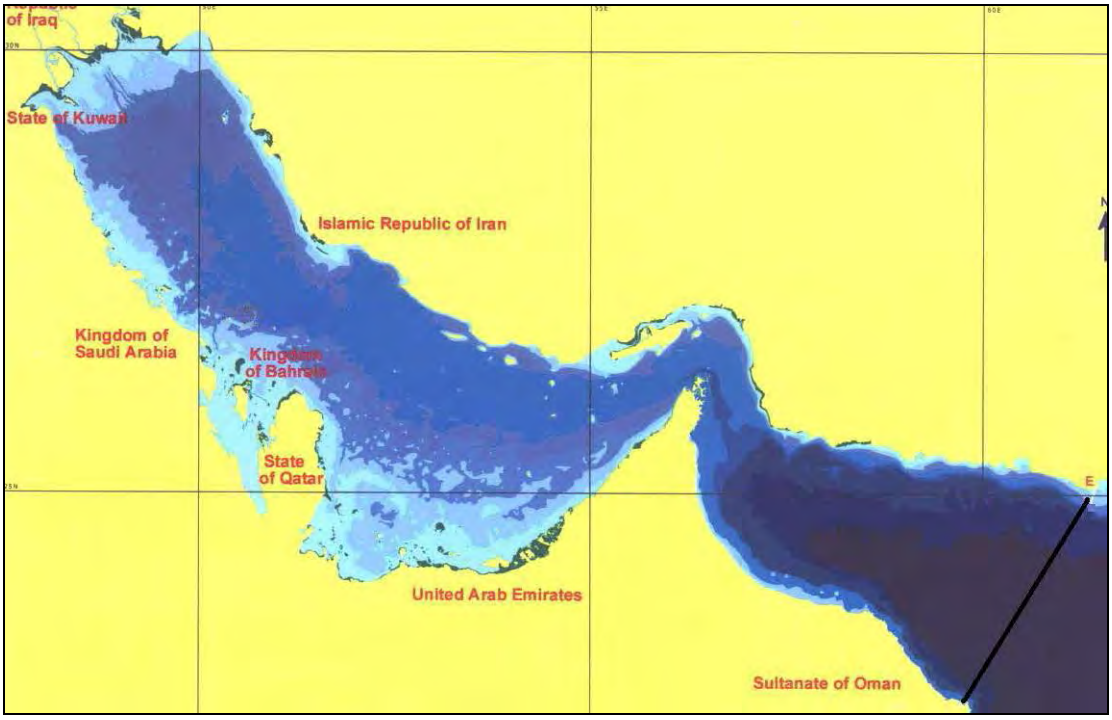
The International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. It was adopted in November 1973 by the International Maritime Organization (IMO) and entered into force on 2 October 1983. The Convention includes

regulations aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations - and currently includes the following six technical Annexes:

Annex I	Regulations for the prevention of pollution by oil
Annex II	Regulations for the control of pollution by noxious liquid substances in bulk
Annex III	Regulations for the prevention of pollution by harmful substances carried by sea in packaged form
Annex IV	Regulations for the prevention of pollution by sewage from ships
Annex V	Regulations for the prevention of pollution by garbage from ships
Annex VI	Regulations for the prevention of air pollution from ships

(2) Special Area

MARPOL defines certain sea areas as "special areas", where higher a level of protection is considered necessary for example due to its oceanographical, ecological or sea traffic conditions. Special area regulations are applied to Annex I, II, IV and V. The Arabian Gulf and the Gulf of Oman (inclusively termed "Gulfs area") was adopted by IMO as a special area in 1973 (for Annex I and V), and came into effect in 2008. Figure 7.4-1 shows the special area boundary of the Gulfs area.



Source: ROPME (http://ropme.org/home.clx)

Figure 7.4-1 Special area boundary of the Gulfs area

(3) Regulations on Waste Discharge and PRF

In regards to ship-generated waste, Annexes I, II, IV and V set discharge standards for specific waste types covered under their respective Annexes. Table 7.4-4 shows the waste discharge standards set under Annexes I, II, IV and V.

Table 7.4-4 Waste discharge standards set under Annexes I, II, IV and V

Annex	Type	Discharge regulation	Applicable ships
I	Oil	[Discharge of oil and oily mixture from machinery spaces (Regulation 15)] ・ The ship is proceeding *en route*	All ships ≧ 400 GT

Annex	Type	Discharge regulation	Applicable ships
		・ The oily mixture is processed through oil filtering equipment* ・ The oil content of the effluent without dilution does not exceed 15 ppm *: In special areas, the oil filtering equipment must be equipped with an automatic system that stops discharge when oil content exceeds 15 ppm.	
		[Discharge of oil and oily mixture from cargo area (Regulation 34)] ・ The tanker is not within a special area (i.e. no discharge in special area) ・ The tanker is more than 50 nm from nearest land ・ The tanker is proceeding *en route* ・ The instantaneous rate of discharge of oil does not exceed 30 liters/nm ・ The quantity of oil discharged into the sea does not exceed 1/30,000 of the total quantity of the cargo carried on the previous voyage (1/15,000 in case of tankers delivered before 1979) ・ The tanker has in operation a monitoring and control system and slop tank arrangements as required by regulations 29 and 31	Oil tanker
II	NLS	[Discharge of residues of NLS from cargo area (Regulation 13.2)] ・ The ship is proceeding *en route* at minimum speed of 7 knots (self propelled) or 4 knots (not self propelled) ・ The ship is at least 12 nm from the nearest land and in waters not less than 25 m. ・ The discharge is made below the waterline through the underwater discharge outlet. Note: Regulation 13.6 and 13.7 also sets discharge provisions for each category of NLS. In other words, these provisions must be met prior to discharging in accordance to Regulation 13.2.	Chemical tanker
IV	Sewage	[Discharge of sewage (Regulation 11)] ・ Ships with approved sewage treatment plant: no restrictions ・ Ships with approved sewage comminuting and disinfecting system: at least 3 nm from nearest land ・ Untreated sewage: at least 12 nm from nearest land and proceeding at not less than 4 knots	Ships≧400 GT or carry more than 15 persons engaged in international voyage
V	Garbage	[Discharge of garbage (Regulation 4)] All discharge prohibited except the following: ・ Food waste (comminuted): at least 3 nm from nearest land (in case of special area: 12 nm) ・ Food waste (non-comminuted): at least 12 nm from nearest land (in case of special area: not allowed) ・ Cargo residue: at least 12 nm from nearest land providing it does not include substances classified as not harmful to the marine environment ・ Animal carcass: as far as possible from nearest land (in case of special area: not allowed) ・ Cleaning agent: no restrictions providing it does not include substances classified as not harmful to the marine environment	All ships

Source: MARPOL Consolidated Edition 2011

Wastes that cannot be discharged in accordance to MARPOL regulations must be unloaded at ports for subsequent treatment and disposal. Member countries are therefore required under MARPOL to provide "adequate" waste reception facilities for such wastes. In accordance to the definition of MARPOL, adequate waste reception facilities should meet the needs of ships using the ports without causing undue delay. IMO's "Guidelines for ensuring the adequacy of port waste reception facilities (resolution MEPC.83(44))" further defines adequate facilities as those which:

- mariners use;
- fully meet the needs of the ships regularly using them;
- do not provide mariners with a disincentive to use them;
- contribute to the improvement of the marine environment;
- allow for the ultimate disposal of ships' waste to take place in an environmentally appropriate way.

(4) Status of Ratification in the Gulf Region

In the Gulf region, all countries except Iraq have ratified MARPOL, although the ratified Annexes differ by country. The Iraqi government is however considering its ratification according to GCPI. Table 7.4-5 shows the MARPOL Annexes ratified by the Gulf countries.

Table 7.4-5 MARPOL Annexes ratified by the Gulf countries (as of April 2015)

	Annex I & II	Annex III	Annex IV	Annex V	Annex VI
Bahrain	✔	-	-	✔	-
Iraq	-	-	-	-	-
Iran	✔	✔	✔	✔	✔
Kuwait	✔	✔	✔	✔	✔
Oman	✔	✔	✔	✔	
Qatar	✔	✔	✔	✔	
Saudi Arabia	✔	✔	✔	✔	✔
UAE	✔	✔	✔	✔	

Note: Annex I and II are mandatory but other Annexes are optional.
Source: IMO (http://www.imo.org/About/Conventions/StatusOfConventions/Pages/Default.aspx)

7.4.3 National Laws/Regulations of Iraq relevant to Ship Waste

National laws/regulations relevant to ship waste discharge are covered mainly under the following two laws:

- Law for Protection and Improvement of Environment (No.27/2009)
- Law and Instruction of Ports (No.21/1995)

Table 7.4-6 shows the regulations adopted under these laws that are relevant to ship waste discharge.

Table 7.4-6 Regulations relevant to ship waste discharge

Law	Article	Regulation
Law for Protection and Improvement of Environment No.27/2009	14 (i)	Prohibits discharge of wastewater into surface waters unless it satisfies national discharge standards.
	14 (ii)	Prohibits discharge of solid waste, carcass, animal waste into water areas.
	14 (v)	Prohibits discharge of oil residues, fuels, ballast water of tankers into shallow water or marine water.
Law and Instruction of Ports No.21/1995	166	Prohibits ships to discharge waste (garbage) into sea
	168	Prohibits ships to discharge sewage while anchored at the port wharfs
	170	Prohibits ships to discharge wastewater within the boundaries of maritime ports

Source: Law for Protection and Improvement of Environment No.27/2009 and Law and Instruction of Ports No.21/1995

7.4.4 Status of Waste Management at GCPI Ports

(1) Waste reception of incoming ships

The status of waste reception from cargo ships at the GCPI ports was studied by conducting interview surveys with relevant GCPI departments (Environmental Section, Planning Department) and the port managers of UQP (north and south), KZP and Al Maqil Port in April 2015. Gulftainer (a private terminal operator) was also interviewed. The main types of cargo ships that come to GCPI ports are container ships, general cargo ships, bulk carriers, product carriers and chemical tankers. The main findings are as summarized as follows:

- GCPI ports only collect garbage from ships under a fee of 50,000 IQD per ship.
- Garbage is collected by the Service Unit of each port with garbage trucks, which is then transported to the local landfill for disposal. Garbage is not segregated for recycling. UQP North and South each own one garbage truck with some additional mid-sized trucks, which are used when there are excessive wastes.
- Although the volume of the collected garbage is not recorded, UQP collects from around 25% of the incoming ships.
- There are plans by GCPI to receive waste oil from ships in the future but are still under consideration by the government.
- Gulftainer does not collect any types of ship waste. They do however have a garbage truck for collecting waste from their own facilities.
- In 2014, GCPI purchased several oil recovery vessels as a measure against oil spills, which are currently berthed at Al Maqil Port or Abu Flus Port. The two largest vessels are named Siba 1 and 2, and it was suggested that these vessels could be employed also for waste oil collection from ships in the future. Siba 1 is currently berthed at Abu Flus Port and Siba 2 at Al Maqil Port. The plan of GCPI is to locate one Siba vessel in UQP but it has not been possible so far due to lack of berthing area. Table 7.4-7 shows the specifications of Siba 1 and 2. Figure 7.4-2 is a photo of Siba 2.

Table 7.4-7 Specifications of GCPI oil recovery vessels (Siba 1 and 2)

Vessel name	Specification
Siba 1 and 2	Length overall (LOA): 42 m Breath: 8.5 m Depth: 3.75 m Draught: 3.20 m Tank capacity: 500 m^3 Deadweight: 550 t

Source: JICA Study Team

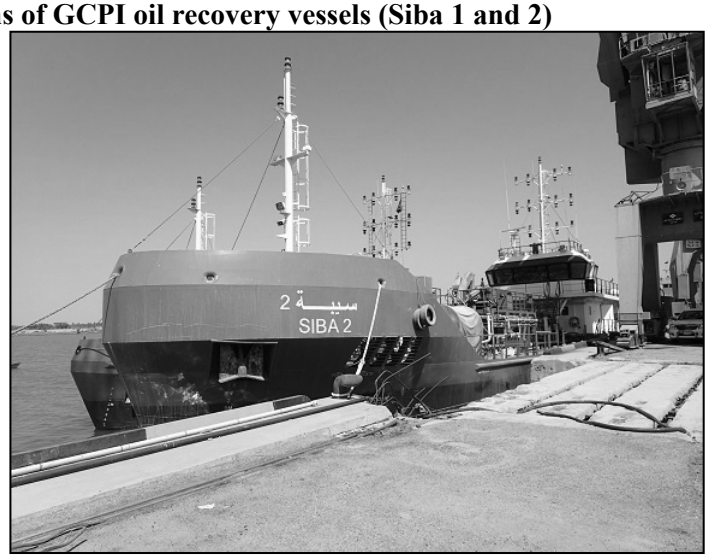


Figure 7.4-2 Photo of Siba 2 (taken at Al Maqil Port in April 2015)

(2) Waste reception of GCPI ships

In addition to cargo ships, GCPI's port vessels (dredgers, tug boat) also generate waste such as waste oil, bilge water and garbage. However, apart from garbage, no clear answers were obtained from GCPI on how waste oil and bilge water are collected from the port vessels. In fact, it

was raised by one of the port managers that waste collection from the port vessels has been an issue due to a lack of necessary collection equipment.

(3) Waste reception of other ships

A power ship operated by a Turkish company (Karadeniz) is permanently berthed at berth 9 of UQP south. All the wastes generated by the power ship are collected and disposed of by the operator and not GCPI. Waste oil is collected directly by tank trucks and subsequently transported to the oil facility of South Oil Company (SOC) for disposal.

(4) Waste management of GCPI port facilities

Port facilities also generate various wastes such as from workshops and administrative buildings. Table 7.4-8 shows the main wastes generated from GCPI port facilities and the employed treatment/disposal methods.

Table 7.4-8 Main wastes generated from GCPI facilities and the employed treatment/disposal methods

Waste type	Treatment/disposal method
Waste oil from maintenance workshops	Waste oil is collected into containers (e.g. drums) and then transported either to GCPI's storage area in Basra for temporary storage or to SOC oil facility for disposal.
Domestic waste from administrative buildings	Collected by garbage trucks and transported to local landfill for disposal.
Domestic wastewater from administrative buildings	Treatment by septic tank. Sludge is collected by local operator but how it is disposed is uncertain.

Source: JICA Study Team

(5) PRF plan of GCPI

According to interviews with GCPI, there has been a plan to develop a large-scale PRF in the area between UQP and KZP covering major GCPI ports and oil terminals. The PRF is envisioned to be established by involving the private sector through a BOOT model[1]. The revenue will come from two sources: service charge imposed on all ships calling Iraqi ports and from selling recovered oil. Following is some additional information obtained through the interviews (note that the information may not be completely accurate as there might have been some misinterpretation through translation):

Project facilities:

- Waste inspection facility
- Waste collection and transportation facilities
- Waste treatment facilities (10,000 m^2)
- Waste landfill (5,000 m^2)

Target wastes: Cargo residues, oily sludge, waste oil, garbage, sewage, NLS, dirty ballast
Investment period: 15 years

7.4.5 Port Reception Facilities in other Regions and Countries

In the process of preparing the PRF plan for GCPI ports, it was considered useful to study the status in other regions and countries as a reference and learn from their experiences. The following presents the main findings obtained from the Gulf region, EU region and Japan.

[1] Public-private partnership (PPP) project model in which a private organization conducts a large development project under contract to a public-sector partner.

(1) PRF in the Gulf region

IMO has developed Port Reception Facility Database (PRFD) as a module of the IMO Global Integrated Shipping Information System (GISIS). The database provides data on facilities for the reception of all categories of ship-generated waste for all IMO member countries.

In accordance to PRFD, within the 7 Gulf countries (Bahrain, Iran, Iraq, Kuwait, Qatar, Oman, Saudi Arabia, UAE) excluding Iraq, PRF was available only for the ports of Iran and UAE (note that the some countries may have not informed IMO of their waste reception facilities).

Table 7.4-9 show information (e.g. accepted waste type, type of facility, charging system) on the PRF available in UAE Port.

Table 7.4-9 Status of PRF in UAE (Jebel Ali Port)

Accepted waste type			Facility type	Charging system	Service provider
Annex I	Oily bilge water	✔	Fixed/Tank truck/portable tank (discharge limitation: 1,000 m^3)	Cost charged in addition to other services	Private operator (GULF ENVIRONMENT & WASTE FZE)
	Oily residues	✔			
	Oily tank washings	✔			
	Dirty ballast water	✔			
	Scale and sludge from tanker cleaning	✔			
	Oily mixtures containing chemicals	✔	Fixed/Tank truck/portable tank (discharge limitation: 100 m^3)		
Annex II	NLS	✔			
Annex IV	Sewage	N/A	-	-	-
Annex V	Garbage	N/A	-	-	-

Source: IMO PRFD (https://gisis.imo.org/Public/PRF/Default.aspx)

(2) PRF in the EU region

1) Directive 2000/59/EC on port reception facilities for ship-generated waste and cargo residues

To reduce illegal discharges of ship-generated waste and cargo residues into the sea, and to improve the availability and use of PRF for ship-generated waste and cargo residues, the European Union (EU) has adopted Directive 2000/59/EC. The Directive provides requirements on waste reception and handling plans, notification, delivery of ship-generated waste, fees, inspection and so on. Following is a summary of the key requirements of the Directive (text extracted from EU website: http://europa.eu/legislation_summaries/environment/waste_management/l24199_en.htm):

Waste reception and handling plans

A waste reception and handling plan must be drawn up in each port. These plans must be approved and assessed by the Member State it relates to. The plans must be re-approved at least every three years.

Notification

Captains of ships bound for a Community port are required to notify certain information, in particular the date and the last port in which ship-generated waste was delivered and the quantity of waste remaining on board

Delivery of ship-generated waste

Unless exempted, all ships are required to deliver their ship-generated waste before leaving a Community port, unless the captain can prove that his vessel has adequate storage capacity. Ships which do not deliver their waste without providing valid reasons for exemption are not allowed to leave the port until such delivery has taken place.

Fees for ship-generated waste

All ships calling at a Member State port will bear a significant part of the cost (which the Commission interprets as meaning at least 30%), whether they use the facilities or not. This cost recovery system comprises this built-in, fixed element and, possibly, a variable element according to the amount and type of waste actually delivered.

2) Study on PRF of EU ports by European Maritime Safety Agency (EMSA)

European Maritime Safety Agency has conducted a comprehensive study on PRF of forty major EU ports, focusing mainly on: waste delivery status, waste handling systems and factors affecting waste delivery. The results of the study are available through the report titled "EMSA Study on the delivery of ship-generated waste and cargo residues to port reception facilities in EU Ports, 2012 (hereinafter abbreviated as "EMSA Study")". Some of the key findings of the EMSA Study are summarized below:

Type of wastes accepted/received

- All ports receive oily waste from machinery space (MARPOL Annex I waste) and garbage (MARPOL Annex V waste). Liquid oily wastes are mainly collected by trucks (or barge if collected from seaside). Garbage is mainly collected by containers placed on the berth or garbage collection trucks.
- All ports accept sewage (MARPOL Annex IV waste) except for 2 ports. However, only 27 out of 40 ports actually receive sewage. However, many ships do not request this service as ships are able to discharge legally into the sea during voyage and therefore have no real need for this service, except if they have to stay for a long period of time in the port.
- While most ports accept cargo residues (e.g. Annex I oily cargo residues, Annex V cargo residues, Annex II NLS residues), these are commonly handled directly by individual terminals that handle this particular product type or by external waste operators. The port authorities therefore usually take no responsibility for these wastes.
- Most ports outsourced part or all of their ship-waste handling to private waste operators. Some ports that do handle waste mainly applied to sewage, where the infrastructure and facility already exist inside the port.

Waste fee system

According to EU Directive 2000/59/EC all EU Member States' ports are required to implement an indirect fee[2] into the port waste fee system. All ports have introduced such an indirect fee, but in many different models:

- Indirect fee per GT – all ship-generated waste accepted
- Indirect fee per GT – all ship-generated waste accepted but limitations on volume
- Indirect fee per GT, net tonnage or main engine power – discharge right granted
- Indirect fee per GT as deposit but possibility to reclaim part of it
- Indirect fee just as contribution to operating the reception facilities – direct fee payment for all waste delivery

(3) PRF in Japan

In Japan, the Law Relating to the Prevention of Marine Pollution and Maritime Disaster (Law no. 136/1970) is the principal law that regulates ship waste discharge, which also requires ports to plan waste reception facilities. Since the law came in to force in 1970, public ship waste reception facilities were established at some of the major ports to meet the increasing demand for

[2] Indirect fee means a fee which is paid by the ship regardless of services provided. In contrary, direct fee means payment for waste collection services only if provided.

receiving ship wastes.

However, some of these facilities are no longer in operation for various reasons. One such facility is the ship waste oil processing facility established in the 1970's in Yokohama, Kanagawa Prefecture. While this facility used to process at its peak in 1973 of around 617,000 m^3 of waste oil (oily ballast water: approx. 611,500 m^3, oily bilge water: approx.5,500 m^3), by 2002 its processing volume has decreased to around 18,000 m^3, around 3% of the peak volume in 1973. Subsequently the facility was closed in 2004[3]. The main reason for the decrease in demand was due to the increase in double-hull tankers (i.e. reduction of ships with dirty ballast water). The increase use of onboard bilge water treatment system also contributed to the decrease in demand albeit at a lesser degree.

As a general trend, oily wastes are now collected and processed by private operators. One such operator (Asada Shokai Co. Ltd.) was interviewed, which collects waste oil from ships calling at Tokyo Port. The main findings of the interview are as follows:

- In general, waste oil is collected from around 2-3 ships per week including both domestic and international ships. (see Section 7.4.1 for more details on collected quantities)
- Waste oil is collected either by tank truck or oil collection vessel (500t capacity).
- Collection fee of bilge water is ¥12/liter plus transportation fees.
- Reusable or recyclable waste oil is purchased from the ships. The recovered oil is usually sold as fuel oil to other factories which is in high demand due to its relatively low price.
- Effluent from the treatment process is discharged into the local sewage network providing that it satisfies the effluent discharge standard. Polluted effluents are disposed through water incineration plants.
- Solid remnants (sludge) from the treatment process are recycled as solid fuel, which can be used as supplementary fuel at for example incineration plants. Although the company actually pays the users to use the solid fuel, it is cheaper than disposing the solid remnants as industrial waste.
- Collection of ship waste oil is only a minor part of the company's business. The company cannot profit from just collecting ship waste oil due to limited demand.

7.4.6 PRF Plan of GCPI Ports

Although most GCPI ports now receive MARPOL Annex V wastes (garbage) from the calling ships, GCPI will need to strengthen its PRF in order to comply with the requirements of MARPOL, which Iraq intends to ratify soon. It seems that GCPI is well aware of this situation and they have already started considering certain PRF plans, for example with private sector involvement. Under these circumstances, the JICA Study Team has prepared a PRF plan for the GCPI ports, focusing primarily on UQP (including both north and south) and KZP, as needs for PRF were considered highest at these ports mainly due to the comparatively high number of ship calls.

(1) Factors considered in Developing the PRF Plan

In the process of planning a PRF there are various factors that should be considered. This study mainly focused on the following factors:

- The present and projected number of ships calls
- Types of commodities handled
- Waste reception needs
- Existing waste reception facilities
- Available waste treatment facilities in the local area
- Available PRF in the Gulf area

[3] Information based on statistics collected from Yokohama Port.

The main findings of the above factors are summarized below.

1) The present and projected number of ship calls

Table 7.4-10 shows the types and number of ships calling at UQP and KZP in year 2012.

Table 7.4-10 Types and number of ships calling at UQP and KZP (year 2012)

Port	Types and number of ship calls
UQP (South and North)	Total ship calls: 834 Ship type and ratio: Container ship (41%), general cargo ships/ bulk carrier (43%), RORO (10%), Car carrier (5%)
KZP	Total ship calls: 416 Ship type and ratio: Product carrier (52%), general cargo ships/bulk carrier (48%)

Source: Prepared by JICA Study Team based on GCPI statistics

In accordance to the future cargo demand under the middle-case growth scenario, the total number of annual ship calls in year 2025 are projected to increase to 3,184 and 572 for UQP and KZP respectively. When compared to year 2012, this will be an approximate 4 and 1.4 fold increase at UQP and KZP respectively.

2) Types of commodities handled

Table 7.4-11 shows the types of commodity handled at UQP and KZP in year 2012. According to the middle-case growth scenario, no major changes in commodity types are expected at UQP and KZP for the foreseeable future.

Table 7.4-11 Types of commodities handled at UQP and KZP (year 2012)

Port	Types of commodity
UQP (South and North)	Import: Container, general cargo (grain, rice, sugar, cement, steel, car) Export: Container
KZP	Import: Container, general cargo (grain, rice, sugar, cement, steel, car), liquid bulk (gasoline, kerosene, benzene, diesel) Export: Container, general cargo (dates), liquid bulk (fuel oil)

Source: Prepared by JICA Study Team based on GCPI statistics

3) Waste reception needs

Since information on the type of ship-generated wastes at UQP and KZP was limited, the waste reception needs at these ports were assessed by referring to the calling ship types, handled commodities and interview surveys with port managers. Table 7.4-12 shows the assessed waste reception needs for UQP and KZP.

Table 7.4-12 Assessment of waste reception needs for UQP and KZP

Port	Waste reception needs			Reason
UQP	Annex I	Oily bilge water	Yes	While most ships generate oily bilge water, ships without oil filtering equipment cannot discharge during voyage under MARPOL.
		Oily residues	Yes	All ships generate oily residue, which cannot be discharged during voyage under MARPOL.
		Oily tank washings	No	There are no oil tankers calling at UQP. Tank washing is also not conducted.
		Oily ballast water	No	There are no oil tankers calling at UQP, hence no need for receiving oily ballast water.

		Scale/sludge from tanker cleaning	No	There are no oil tankers calling at UQP. Tank washing is also not conducted.
	Annex II	NLS tank washings	No	There are no chemical tankers calling at UQP. Tank washing is also not conducted.
	Annex IV	Sewage	No	Most ships can discharge their sewage legally during voyage under MARPOL.
	Annex V	Cargo residue	No	There are no ships that carry harmful bulk commodities. Non-harmful cargo residue can be discharged legally during voyage under MARPOL.
		Animal carcass	No	Can be discharged legally during voyage under MARPOL.
		Domestic waste	Yes	All ships generate domestic waste and cannot be discharged during voyage under MARPOL.
		Cooking oil	Yes	Most ships use cooking oil and cannot be discharged during voyage under MARPOL.
		Food waste	No	Can be discharged legally during voyage under MARPOL.
		Operational waste	Yes	All ships generate operational waste (e.g. dunnage/linings, incinerator ash) and cannot be discharged during voyage under MARPOL, except non-harmful cleaning agents or additives.
		Plastics	Yes	All ships generate plastic waste and cannot be discharged during voyage under MARPOL.
KZP	Annex I	Oily bilge water	Yes	While most ships generate oily bilge water, ships without oil filtering equipment cannot discharge during voyage under MARPOL.
		Oily residues	Yes	All ships generate oily residue, which cannot be discharged during voyage under MARPOL.
		Oily tank washings	No	Tank washing is not conducted at KZP as calling tankers carry only single products.
		Oily ballast water	Yes	Although modern tankers are likely to be equipped with segregated ballast tanks in accordance to MARPOL, some old or small tankers not regulated under MARPOL may carry oily ballast water.
		Scale/sludge from tanker cleaning	No	Tank cleaning is not conducted at KZP.
	Annex II	NLS	No	Tank washing is not conducted at KZP as calling tankers carry only single products.
	Annex IV	Sewage	No	Most ships can discharge their sewage legally during voyage under MARPOL.
	Annex V	Cargo residue	No	There are no ships that carry harmful bulk commodities. Non-harmful cargo residue can be discharged legally during voyage under MARPOL.
		Animal carcass	No	Can be discharged legally during voyage under MARPOL.
		Domestic waste	Yes	All ships generate domestic waste and cannot be discharged during voyage under MARPOL.
		Cooking oil	Yes	Most ships use cooking oil and cannot be discharged during voyage under MARPOL.

		Food waste	No	Can be discharged legally during voyage under MARPOL.
		Operational waste	Yes	All ships generate operational waste (e.g. dunnage/linings, incinerator ash) and cannot be discharged during voyage under MARPOL, except non-harmful cleaning agents or additives.
		Plastics	Yes	All ships generate plastic waste and cannot be discharged during voyage under MARPOL.

Source: JICA Study Team

Based on the above assessment, there are needs to receive Annex I (oily bilge water, oily residues, oily ballast water*) and Annex V (domestic waste, cooking oil, operational waste, plastics) wastes at UQP and KZP.
*: Reception of oily ballast water required only at KZP.

4) Existing waste reception facilities

Currently the ports only have garbage trucks, usually one truck per port. GCPI recently purchased two oil recovery vessels, which could be used for waste oil collection.

5) Available waste treatment facilities in the local area

In the Basra area, there are facilities to treat/dispose waste oil (e.g. SOC oil production facility and SRC refinery) and garbage (local landfill). However, there are concerns whether these existing facilities can adequately treat and dispose ship wastes.

6) Available PRF in the Gulf area

According to IMO's database, PRF is available in Iran and UAE ports. All ports receive oily wastes (Annex I) and most ports receive garbage (Annex V). Around half of the ports receive sewage (Annex IV) and only one port receives NLS (Annex II).

(2) Proposed PRF Plan

1) Basic policy

Based on lessons learnt from past experiences in Japan and other countries, the JICA Study Team recommends that PRF should be developed through a phased approach, based on foreseeable short-term demands (e.g. 5 years) and periodical reviews. This is because there are many factors that could influence the future quantity of ship waste (e.g. advance in ship design, changes in socioeconomic status), especially for a developing country like Iraq. In other words, the scope of the PRF should be limited to the minimum investment and facility as possible, so to minimize the risk of overinvestment. In relation to the above, the JICA Study Team also applied the following basic policies in the proposed PRF plan:

- Full utilization of existing treatment and disposal facilities in the area.
- GCPI should not receive wastes that cannot be adequately treated and disposed inside the country
- GCPI should only receive wastes that are generated commonly by all ships (e.g. oily residue, bilge water, domestic waste (garbage))
- Wastes that are generated only from specific ships (e.g. tank washings, oily ballast water) should be handled by the cargo owner/shipper or ship operator.
- Promotion of waste recycling

2) PRF Plan

Assuming that Iraq will ratify MARPOL in the coming few years and based on the findings of this study, GCPI should as soon as possible establish PRF for receiving Annex I waste (oily residue, oily bilge water) and improve the current PRF for Annex V wastes (domestic waste, cooking oil, operational waste, plastics). While the waste types and required PRF are similar between UQP and KZP, KZP may be required to receive oily ballast water as oil tankers visit the port. However, since oily ballast water is generated only from specific ships, the responsibility will not be GCPI but the cargo owner/shipper or ship operator.

Table 7.4-13 shows the proposed waste reception method and required facilities for each ship waste foreseen to be generated in UQP and KZP. Nevertheless, the same method can be applied to other ports such Al Maqil Port and Abu Flus Port.

Table 7.4-13 Proposed waste reception method and required facilities for each ship waste generated in UQP and KZP

Port		Waste type	Reception method	Required facility
UQP	Annex I	Oily bilge water Oily residues	Collection by tank truck/oil collection vessel, then transport to local treatment facility (e.g. SOC facility) for treatment/disposal.	・Tank truck ・Vacuum truck (for collecting sludge) ・Oil collection vessel ・Holding tank (in case of excessive waste oil)
	Annex V	Garbage	・ Receive only non-hazardous garbage ・ Collection by garbage truck, then transport to local landfill. ・ Segregation of recyclable waste*	・Receptacles (garbage bins) ・Garbage truck ・Temporary storage area for recyclable waste*
KZP	Annex I	Oily bilge water Oily residues	Collection by tank truck/oil collection vessel, then transport to local treatment facility (e.g. SOC facility) for treatment/disposal.	・Tank truck ・Vacuum truck (for collecting sludge) ・Oil collection vessel ・Holding tank (in case of excessive waste oil)
		Oily ballast water	Same as above but should be handled under the responsibility of the cargo owner/shipper.	
	Annex V	Garbage	・ Receive only non-hazardous garbage ・ Collection by garbage truck, then transport to local landfill. ・ Segregation of recyclable waste*	・Receptacles (garbage bins) ・Garbage truck ・Temporary storage area for recyclable waste*

*: When waste recycling starts in Basra area
Source: JICA Study Team

At this moment it was not possible to estimate the quantity and scale of the reception facilities required due to the difficulty in estimating the quantity of ship generated waste. Further studies will hence be required for estimating waste quantity for example by conducting interview surveys with the ship operators. In addition, the following studies among others should be conducted to further refine the PRF plan:

- Types of wastes can be treated by existing local waste treatment facilities and required treatment fees
- Method of how to charge waste reception fee from ships
- Possibility to outsource waste handling (collection, treatment, disposal)
- Necessary amendments to relevant laws/regulations
- System and format for advance notification for waste delivery from ships
- Storage and maintenance plan of facilities

- Impacts on port operation

(3) Alternative PRF Plan

Although the above proposed PRF plan is considered as the most realistic and low-risk approach, an alternative approach is to treat and dispose ship-generated wastes in-house by constructing new waste treatment facilities, rather than relying on existing local waste treatment facilities. This alternative approach may be worth considering for example in case of:

- The existing local waste reception facilities are inadequate for handling ship wastes (e.g. employment of inappropriate treatment/disposal methods)
- Large quantity of ship waste is expected in/for the long term
- Lack of PRF in other ports in the region

In any case, a detailed feasibility study should be conducted on whether to adopt such an option, as it will require significant initial investment as well as high cost for operation and maintenance. Possibilities for receiving wastes from other sectors may also be considered which may provide additional revenue. Following are examples of reception/treatment facilities for Annex I (oily waste) and Annex V (garbage) wastes.

1) Reception/treatment facility for waste oil

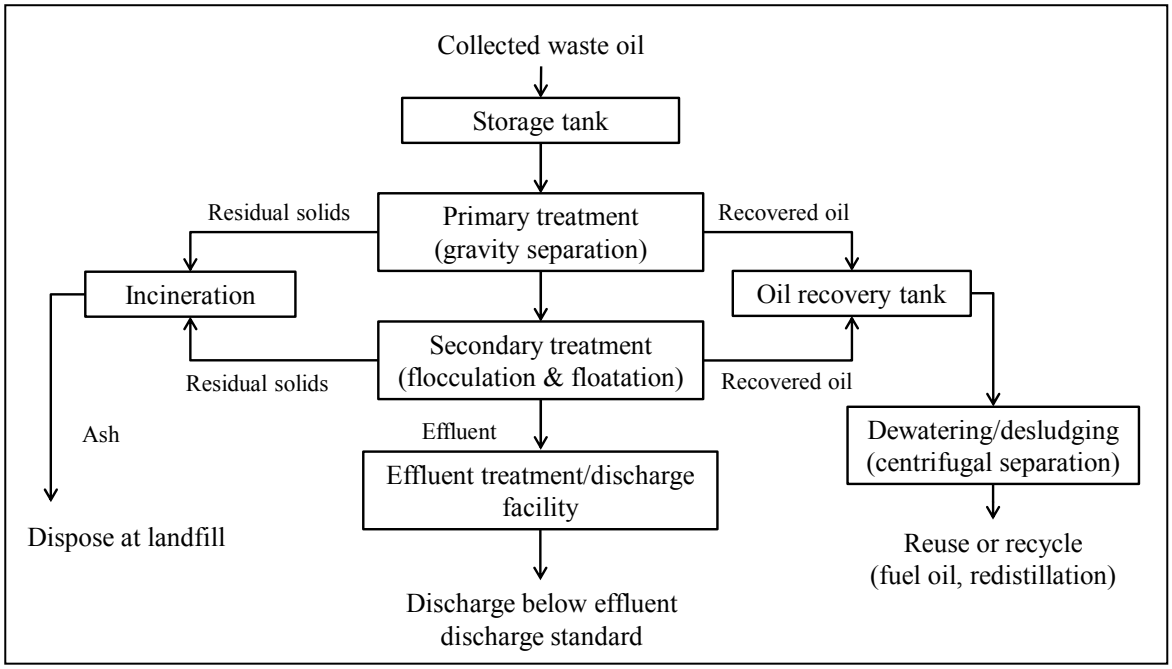
The main objectives of waste oil treatment are as follows:

- To remove oil from water to produce an aqueous effluent which meets effluent discharge standard
- To recover oil for re-use or recycling

The type of treatment facilities required will depend on the degree of treatment required to achieve effluent discharge standard. Following are some of the main facilities that are typically required:

- Facility for receiving collected waste oil (e.g. storage tank)
- Primary treatment facility: separation of oil and water through gravity separation (e.g. settling tank)
- Secondary treatment facility: treatment of oil/water emulsions (e.g. flocculation and floatation unit, centrifugal separation unit)
- Facility for storing recovered oil (e.g. recovery tank)
- Facility for treating and discharging effluent
- Facility for treating residual solid waste (e.g. incinerator)
- If locally unavailable, facility for disposing residual solid waste (e.g. landfill)

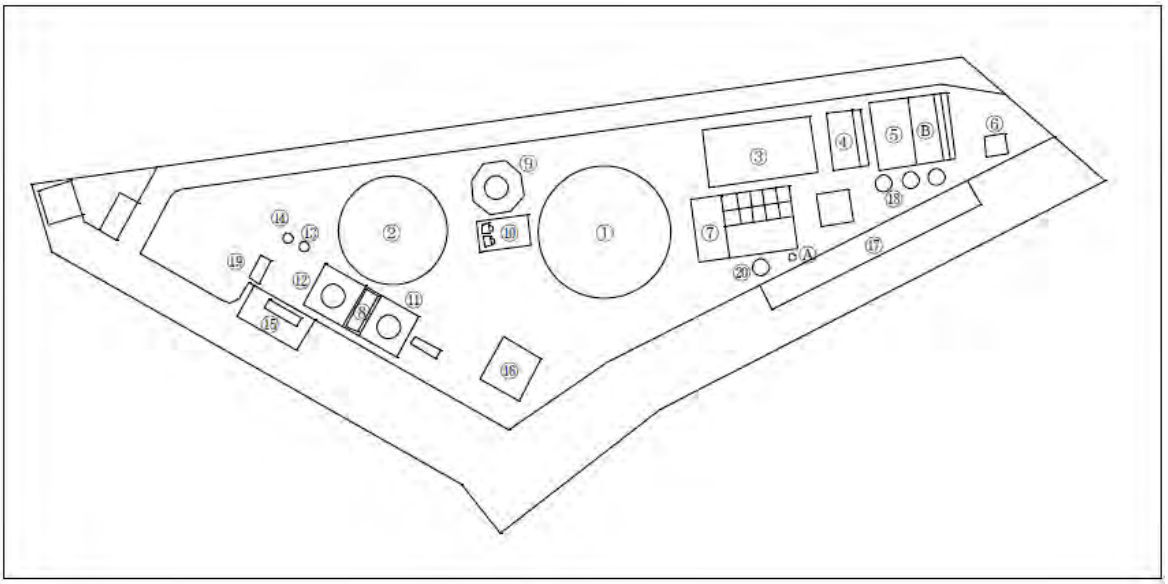
An example of treatment and disposal process of collected waste oil from ships is shown in Figure 7.4-3.



Source: JICA Study Team

Figure 7.4-3 An example of treatment and disposal process of collected waste oil from ships

A layout of a public ship waste oil treatment facility is illustrated in Figure 7.4-4, which was constructed in Yokohama, Japan. Waste oil is treated through primary and secondary treatment.



①Buffer Tank 3000 m^3, ②Buffer Tank 2000 m^3, ③CPI Tank 300 m^3/h, ④Filter Tank, ⑤Raw Water Pond, ⑥Electric and Instrument Room, ⑦Drain Pond No.1, ⑧Drain Pond No.2, ⑨Oil Collecting Tank 20 m^3, ⑩Centrifugal Separator No.1, 2
⑪Recovery Tank No.130 m^3, ⑫Recovery Tank No.2 60 m^3, ⑬Tap-Water Tank 10 m^3, ⑭Steam-Generator, ⑮Oil Discharge Point, ⑯Control Room, ⑰Pressurized Surfacing Equipment, ⑱Deep Sand Filtration Tank, ⑲Drain Pond No.3, ⑳PAC Tank, (A) NaOH (Caustic Soda) Tank, (B) Discharge Water Reservoir

Source: Yokohama Waste Oil Processing Facility, Port of Yokohama Waste Oil Processing Association

Figure 7.4-4 Layout of a waste oil treatment facility constructed in Yokohama, Japan

The above mentioned waste oil treatment facility was built for accepting ballast water and bilge water from coastal ships. Capacity and facilities of the Yokohama Ship Waste Oil Reception Facility were as follows:

- Ground area: 4,600 m^3
- Lifting Berth: 68.8 m, (Water depth 4.2 m)
- Mooring Berth: 140 m (Water depth 4.6 -5.9 m, Max size 3,000 GT)
- Maximum receiving capacity: 7,500 m^3/day
- Standard treatment capacity: 2,500 m^3/day
- Receiving Tanks: 3,000 m3 and 2,000 m^3
- Oil Separator: 300 m^3/hour
- Charges: 110 yen/m^3 (Ballast Water), 1,100 yen/m^3 (Bilge Water) up to the year 2003

2) Reception/treatment facility for garbage

Non-recyclable garbage is often disposed in a landfill, which should be designed in such manner so that it does not cause any pollution to the groundwater. Garbage may also be incinerated providing that flue gas can be appropriately treated. Following are reception facilities typically required for garbage:

- Receptacles for collecting garbage (e.g. containers, bins, dumpsters)
- Garbage trucks for collecting and transporting garbage
- Controlled landfill for final disposal (should be fitted with impervious layer, drainage control, monitoring system)
- Bull dozer for compacting garbage (or Landfill Compactor)
- Incinerator to reduce garbage volume (optional)

7.5 Environmental Management Requirements for Private Terminal Operators

Terminal operators are required to protect the environment of the port and surrounding areas to ensure that environmental impacts from port operations are minimized. This Section provides some of the basic environmental management requirements for private terminal operators, focusing primarily on the operational stage. Although ships are one of the main sources of environmental pollution, it was not covered in the scope of this study as most of the responsibility lies with the ship operator. The study covers the following aspects:

- Environmental impact assessment
- Pollution control
- Waste management
- Spill prevention and control

Implementation responsibilities may be demarcated between GCPI and private terminal operators but should be made clear in the contract.

7.5.1 Environmental Impact Assessment

While construction and operation of a terminal may have a wide range of environmental impacts, the type and degree of impacts will usually differ between projects depending on for example with the scale, location and nature of port operation. Therefore, for new projects, an environmental impact assessment (EIA) should be conducted in the planning phase to assess the potential environmental impacts and environmental management measures required to prevent or minimize those impacts. Besides in Iraq, EIA is a mandatory requirement under the "Law for Protection and Improvement of Environment No.27/2009", and projects cannot proceed without an environmental approval from Ministry of Environment. Although enforcement and compliance towards EIA regulations have been weak so far in the port sector, acquirement of environmental approval should be a prerequisite unless exempted by the Ministry of Environment. The party responsible for implementing the EIA will depend on the nature of the contract between GCPI and

private operator and should be determined accordingly.

7.5.2 Pollution Control

Terminal operators will be required to prevent or minimize pollution from operational activities by implementing appropriate pollution control measures. Pollution that may occur through terminal operation are air, noise and water pollution. More details are provided below.

(1) Air Pollution Control

Common air pollution sources in terminals include exhaust emission from cargo handling equipment and dust emission from dry bulk. Strict air pollution control measures should be required if the terminal is located near sensitive areas (e.g. residential area, school, hospital). Table 7.5-1 shows common air pollution sources and examples of air pollution control measures.

Table 7.5-1 Common air pollution sources and example of air pollution control measures

Common pollution sources	Recommended pollution control measures
Exhaust emission from cargo handling equipment	・ Keeping equipment (e.g. cranes, forklifts, and trucks) in good working condition ・ Upgrading the land vehicle fleet with less-polluting trucks and vehicles, and using alternative fuels and fuel mixtures ・ Encouraging reduction in engine idling during on- and off-loading activities
Dust emission from dry bulk storage and handling facilities	・ Installing dust suppression mechanisms (e.g. water spray or covered storage areas) ・ Using telescoping chutes to eliminate the need for slingers ・ Using vacuum collectors at dust-generating activities ・ Minimizing free fall of materials ・ Minimizing dry cargo pile heights and containing piles with perimeter walls ・ Ensuring hatches are covered when material handling is not being conducted ・ Covering transport vehicles ・ Regularly sweeping docks and handling areas, truck /rail storage areas, and paved roadway surfaces

Source: JICA Study Team and IFC Environmental, Health and Safety Guideline (Ports, Harbors and Terminals)

(2) Noise Control

Common noise sources in terminals include cargo handling and vehicular traffic. Strict noise control measures should be required if the terminal is located near noise sensitive areas (e.g. residential area, school, hospital). Following are examples of noise control measures:

- Planting of vegetation or installation of walls
- Keeping equipment (e.g. cranes, forklifts, and trucks) in good working condition
- Avoid using roads that pass near sensitive areas

(3) Water Pollution Control

Common water pollution sources in terminals include sewage and storm water runoff. Strict water pollution control measures should be required if the terminal is located near sensitive areas (e.g. ecologically important habitat, fishing ground). Table 7.5-2 shows common water pollution sources and examples of water pollution control measures.

Table 7.5-2 Common water pollution sources and example of water pollution control measures

Common pollution sources	Recommended pollution control measures
Sewage (e.g. toilet, kitchen) from terminal facilities	・Installation of septic tank for domestic water and excreta. Treated effluent should be discharged under concentrations stipulated in national discharge standard (e.g. BOD conc.<40 mg/l) ・Connection to central sewage treatment facility (if available)
Stormwater runoff from terminal facilities	・Avoiding installation of storm drainage catch basins that discharge directly into surface waters ・Using containment basins in areas with a high risk of accidental releases of oil or hazardous materials (e.g. fueling or fuel transfer locations) ・Using oil / water separators in all runoff collection areas. ・Installing filter mechanisms (e.g. sediment traps and sediment basins) to prevent sediment and particulates from reaching the surface water.

Source: JICA Study Team and IFC Environmental, Health and Safety Guideline (Ports, Harbors and Terminals)

(4) Pollution Monitoring

Environmental monitoring should be conducted in cases such as:

- There are sensitive natural habitats around the port
- There are sensitive communities around the port
- There are uncertainties in the effectiveness of the pollution control measures
- Required by the environmental authorities

If environmental monitoring is required, a detailed monitoring plan should be prepared including reporting requirements.

7.5.3 Waste Management

The type and amount of wastes generated from port operations may vary significantly depending on the nature of port operations. Wastes may include inert solid waste from cargo packaging and from administrative offices, as well as hazardous or potentially hazardous waste associated with vehicle maintenance operations (e.g. used lubricating oils and engine degreasing solvents). The terminal should also have reception facilities for ship wastes, but this is covered in Chapter III and hence will not be mentioned further. A detailed waste management plan should be prepared which should provide information on the storage, transportation, treatment and disposal methods for each waste type.

7.5.4 Spill Prevention and Control

Terminals handling hazardous liquids such oil and chemicals should be equipped with appropriate spill prevention system such as:

- Installation of secondary containment for above ground liquid storage tanks and tanker truck loading and unloading areas
- Separate, as far as possible, from active traffic and protect storage areas from vehicle accidents.
- Design of terminal so that leaks and spills can be easily collected

In case of any spills, terminal operators should be well prepared to respond to such incidents by preparing spill response plan. The plan should include:

- Risk analysis of areas sensitive to spills and releases of hazardous materials
- Responsibility for managing spills, including reporting and alerting mechanisms
- Availability of spill response equipment (e.g. containment booms, recovery devices, and oil recovery or dispersant application vessels)

- Training plan of responsible personnel

7.5.5 Responsibilities of Private Operatos and GCPI

GCPI should regulate private terminal operators or other agencies located in the port to take necessary action to prevent pollution in port land areas and waters. The party responsible for implementing the environmental management measures should be clearly stated in the EIA and incorporated into the contract between GCPI and private operator. Other recommended measures to be taken by private operators and GCPI are as follows.

- Private terminal operators or any agency who will develop and operate a terminal shall prepare EIA report, which covers operational aspects of port activities and shall include an Environmental Management Plan and Waste Management Plan;
- Private terminal buildings, workshops and other houses shall install combined waste water treatment tanks for toilet and domestic water, and discharge treated effluent under Iraqi discharge standard (e.g. BOD concentrations of 40 mg/litter or less);
- Workshops, power generators and other machinery maintenance service shops shall be equipped with oil spill containments and prevent runoff into port waters; and
- GCPI should periodically monitor water quality of channel and basin in UQP and KZP, e.g. chemical oxygen demand, dissolved oxygen, suspended solids, coliform bacteria, normal hexane extracts (oily substances), and other necessary items.

7.6 Capacity Development of GCPI

7.6.1 Current Situation of GCPI Port Training Center and Future Plan

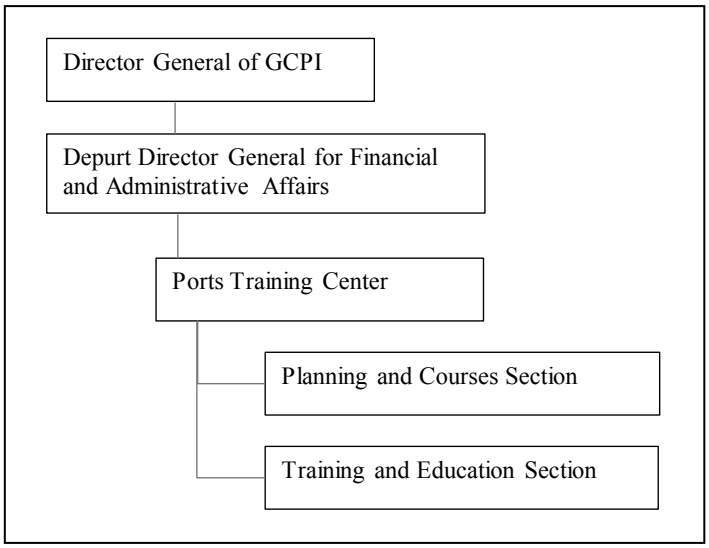
(1) Organization and Training Courses

GCPI's port training center holds regular in-house training courses throughout the year. In 2013, there were 36 training courses and total number of participants was 465 in those courses. In 2014, number of training courses increased by 50% to 54, and total number of participants increased by 100% to 921. Training courses cover a wide range of Marine Affairs, Electric Engineering, Mechanical Engineering, English Language, Port Management, Cargo Handling Operations, Safety Measures, Environmental Protection, Fire Prevention and General Administration.

The organization of GCPI port training center is as shown in Figure 7.6-1, which is directly operated by GCPI as an internal organization. The port training center has two divisions, namely Planning and Courses Section and Training and Education Section, with a total staff of 96 in 2012. Training courses in 2013 are listed in Table 7.6-1. English courses were held every month except Ramadan and Eid al Adha. General courses cover work health and safety, fire prevention, first aid, operation and maintenance of office equipment.

Special courses cover port planning and management, projects management, contracts and investment, purchases management, port tariff, marine international agreements and pacts, gantry crane operation, maintenance of household equipment, driving skills, maintenance and operation of the electronic control board, engineering design software (CAD), modern technology for the freezing equipment, marine anti-pollution, search and rescue, and so forth.

The center does not have the function of seafarer's training and is not well equipped with facilities for training of harbor pilots. GCPI is now developing new buildings for administration, canteen and laboratories, however, training equipment is not installed as of the end of 2014.



Source: GCPI

Figure 7.6-1 Organizational Structure of GCPI Training Center (Present)

Table 7.6-1 Training Courses in 2013

	Month	Name of the Training Course	Duration	Trainees Qualifications
General Administration				
	Jan/July	Work (or vocational) Safety and Health	1 week	For All Staff
	Feb	Fire Prevention	1 week	For All Staff
	Mar	First Aid	1 week	For All Staff
	May/June	Operation and Maintenance of Modern Copy Machine	1 week	For All Staff
	June	Fire Prevention and Fire Fighting	1 week	For All Staff
	June	Ports Catholic Protection	1 week	Secondary School or More
	Dec	Modern Disinfection (Sterilization) Methods for Water and Lab Equipment	1 week	All Staff
English				
	Jan	English Course	2 weeks	
	Feb	English Course	2 weeks	
	Mar	English Course	2 weeks	
	April	English Course	2 weeks	
	May	English Course	2 weeks	
	June	English Course	2 weeks	
	August	English Course	2 weeks	
	Sep	English Course	2 weeks	
	Nov	English Course	2 weeks	
	Dec	English Course	2 weeks	
Port Management				
	Feb	Strategic Planning and Management	1 week	Secondary School or More
	Mar	Projects Management	1 week	Engineers
	April	Contracts and Investment	1 week	Secondary School or More
	June	Marine International agreements and pacts	1 week	Marine Engineers and Officers
	July	Basic Course for Ports Dues and Income	1 week	Secondary School or More
	July	Purchases Management	1 week	Secondary School or More
	August	Administration Management	1 week	Secondary School or More
	Sep	Proposed (or Planned) Budgets and Applications by Using Computer	1 week	Secondary School or More
	Oct	Planning for Ports	1 week	Engineers
	Oct	Final Finance Accounts	1 week	Secondary School or More
	Nov	Stores Accounts	1 week	Secondary School or More
Operations				
	Jan	Management and Operation for Container Yards	1 week	GCPI Staff
	Feb	Gantry Cranes (ZPMC)	1 week	GCPI Staff
	April	Maintenance of Household Equipment	2 weeks	For All Staff
	May	Driving Skills and Ordinary Driving	1 week	Secondary School or More
	July	ISPS	1 week	For All Staff

	Month	Name of the Training Course	Duration	Trainees Qualifications
	August	Management of Loading and Un-Loading Operations	1 week	Staff of Loading and Un-Loading Field
	Oct	Drivers (Operators) of Marine Cranes	1 week	Staff work in Marine Field
	Nov	Quality Control	1 week	Secondary School or More
	Nov	Dealing with Hazardous Materials	1 week	Staff work in Marine Field
Engineering				
	Jan	Maintenance and Operation of the Electronic Control Board	1 week	Electrical Technicians
	Mar	Engineering Design Software (AutoCAD)	2 weeks	Engineers
	April	Design of Ships	1 week	Marine Engineers
	April	Modern Technology for the AC and Freezing Equipment	1 week	AC and Electrical Technicians
	May	Operation and Maintenance for Water Treatment Units	1 week	Technicians
	Sep	Operation and Maintenance for Electrical Transformers	1 week	Electrical Technicians
	Sep	Precautionary Maintenance Methods	1 week	Engineers
	Oct	Operation and Maintenance Methods for Water Treatment Units	1 week	Technicians
	Oct	Electrical Wiring Installation	2 weeks	Electrical Technicians
	Nov	Electrical and Mechanical Maintenance for Cars and Equipment	1 weeks	Electrical and Mechanical Technicians
	Dec	Modern Specifications for Modern Engineering Works	1 week	Engineers
Marine Affairs				
	Jan	Marine Anti-Pollution	1 week	Staff of Marine Field
	Feb	Connection of Hydraulic Systems in Marine vessels	1 week	Secondary School or More
	Mar	Marine Safety and Deliverance of Souls	1 week	Marine Engineers and Officers
	May	Active Negotiation Skills	1 week	Secondary School or More
	Sep	Marine Safety and Deliverance of Souls	1 week	Staff work in Marine Field
	Nov	Emergency Procedure on Ships	1 week	Staff work in Marine Field
	Dec	GMDSS Global Maritime Distress and Safety System	1 week	Marine Engineers and Officers
	Dec	Stipulations and Marine Insurance Contracts	1 week	Marine Engineers and Officers

Source: GCPI

(2) Development Plan of Ports Institute

Feasibility study for ports institute project was implemented by the committee organized by GCPI in April 2013. The committee consisted of nine members from GCPI and submitted a report in 2013 entitled “Technical and Economic Feasibility Study and Ports Institute Project.” The study was carried out to establish the Ports Institute which can educate GCPI staff to implement port development projects and to manage port operations properly, in particular the development and management of Al Faw Grand Port. Specific objectives of the establishment of the ports institute are as follows:

- To be a new educational institution, which contributes to educational, scientific, cultural, social and economic development.
- To qualify students who completed the preparatory level of school education for technical vocational certification and give them opportunities to get jobs.
- To contribute to unemployment reduction.
- To develop the workforce of either the public and/or private sectors.

Faculties to be established:

a. Marine Science Division

b. Marine (Nautical) Engineering Division

c. Port Management and Operation Division

Operation of Ports Institute:

- Granting middle level staff with the required certificate (Technical Diploma), in order to fulfill the needs of the ports sector companies and departments;
- Giving training and conducting development courses for different levels of and various specialties of port workers;
- Preparing and developing literatures, scientific sources, and subject matter publications in port activities;
- Cooperating with foreign ports and with maritime/scientific professional institutions in and outside Iraq through exchange experiences & information;
- Implementing tests for the company workers for the purposes of promotion and job title upgrading;
- Developing the technical skills of the workers, and
- Investing in innovation capacities of institute workshops and laboratories

Necessary investment in the establishment of the ports institute is estimated in the report of the feasibility study for ports institute project as summarized in Table 7.6-2. Total amount of the investment is assessed at about USD 36 million, in which cost for ship handling simulator and laboratory test equipment is calculated at about USD 28 million and workshop equipment is USD 2.4 million.

It is also estimated that necessary numbers of lecturers and staff members of the ports institute is 158, necessary total wages are USD 2 million per year, and annual operation cost is in a range of USD 4.5 to 4.9 million including wages. Among the amount of total investment, foreign currency portion is estimated at USD 25 million, therefore foreign donors, aid agencies and funds are expected to grant financial aid to GCPI's ports institute.

Table 7.6-2 Necessary Investment in Ports Institute

Items		Estimated Cost	
		1,000,000 Dinar	1,000 USD
Fixed capital - Fixed assets			
	Buildings , Construction and Ceilings	1,500	1,200
	Furniture	450	360
	Machinery, equipment and devices (for laboratories and workshops and Vocal)	35,000	28,000
	Transportation and transfer	1,060	848
	Systems (burning, contacts, watering, Internet, Intranet)	30	24
	Yards and roads	300	240
	Equipment and supplies	100	80
Total fixed assets		38,440	30,752
Establishment expenses		3,880	3,104
Total Working Capital		2,816	2,253
Total Investment expenditures		45,136	36,109

Note: 1,250 ID = 1 USD
Source: Feasibility Study Ports Institute Project, The Committee of Feasibility Study, 2013

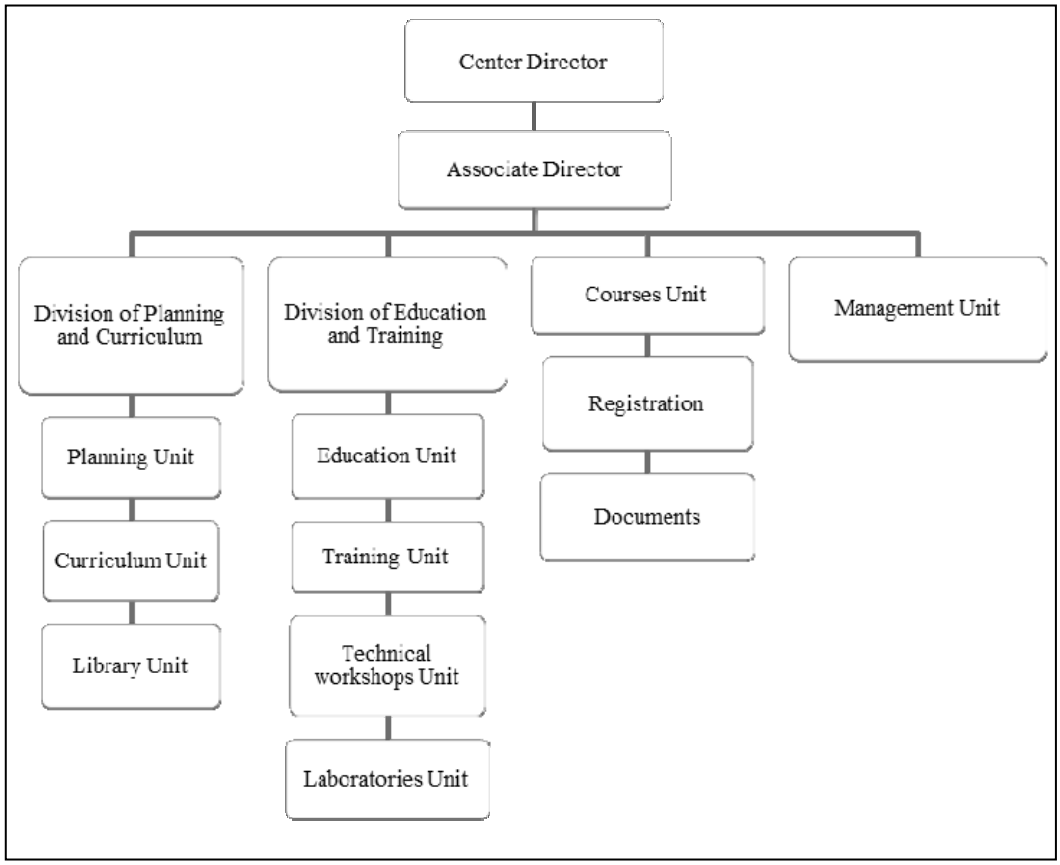
(3) Requirements of the GCPI Training Center

GCPI training center is now preparing for the structural reform and will be reorganized as the abovementioned ports institute. While the construction of buildings for laboratories and administration office is ongoing, irequired is to install training equipment for mechanical and electrical technicians. The training center requires the installation of training equipment and facilities as follows:

- To equip maritime and scientific laboratories with ship handling simulators and other training equipment;
- To enlarge, rebuild the existing buildings and construct new buildings for more laboratories and training courses;
- To re-educate and train technical staff and administrative employees of the training center;
- To specialize one port berth for the use of practical training;
- To supply the library with scientific and maritime books, language textbooks, dictionaries, and references for administrative work; and
- To install and integrate IT network.

The ports institute may have training courses in mechanical and electrical work skills, which are necessary for the maintenance and repair of port facilities and cargo handling equipment. These skills are generally acquired through training at a vocational school, so that GCPI ports institute will play a role of vocational training school.

Ship handling simulator is usually used for training seafarers and will be helpful for training harbor pilots. However, such simulator is not essential to train harbor pilots if onboard practical training is available. If a candidate for harbor pilot has experience in tugboat operation or other vessels in the Khwar Abdarallah Channel, such candidate may take part in training at another training institute for seafarers. Organizational structure of new ports institute is planned as shown in Figure 7.6-2.



Source: GCPI

Figure 7.6-2 Organizational Structure Plan of New Ports Institute

7.6.2 Needs for Capacity Development

(1) Capacity Assessment for Implementation of Action plan

As shown in the section 7.2.5 "Necessary Actions for Improving Port Management and Operation", Table 7.2-4 summarizes necessary actions that will improve cargo handling capacity and productivity, improve customer relations through proper port management and operations. In order to realize the action plan, necessary capacities for GCPI staff are examined and assessed as shown in Table 7.6-3.

Table 7.6-3 Capacity Assessment for Action Plan

Themes of CD	Necessary Outputs	Actors	Necessary Expertise
Improvement of capacity for port administration	Establishment of national port policy and strategic port development plan	MOT, GCPI Planning Dept.	Port and maritime business analysis, administration and policy making
	Examination of private port development plan, Coordination of port development plans	MOT, GCPI Planning Dept.	Port planning and coordination
	Supervision of private terminal development and operations	GCPI Planning Dept. / Contract Dept.	Terminal operations and supervision
	Revision of laws and regulations on port development, management and operation	MOT, GCPI Legal Dept.	Establishment, enforcement and implementation of port laws and regulations
Improvement of capacity for terminal management and operations	Productivity of terminal operations	GCPI Planning Dept./ Admin. & Services, Local Ports	Terminal operations, stevedoring, and logistics
	Training of yard planners and vessel planners	Admin. & Services, Local Ports	Container cargo handling, ship planning, and container yard operations
	Introduction of port EDI system and promotion of IT system	GCPI IT Section/ Commercial Dept. / Computers Dept.	Port EDI system, one stop service, port management IT system
	Installation and modernization of cargo handling equipment	GCPI Planning Dept. / Admin. & Services, Local Port Offices	Operation and maintenance of cargo handling equipment
	Training of stevedores and port workers	GCPI Human Resources Dept. /Ports Training Center	Training and certificate on container lashing, slinging, forklift operation and others
	Training of operators of QGC, RTG and other cargo handling equipment	GCPI Human Resources Dept. / Ports Training Center	License for operating QGC, RTG and other handling equipment
Enhancement of capacity for business management	Concession of terminal operation, Introduction of private stevedoring business	MOT GCPI Planning Dept. / Contracts Dept.	Bid management, evaluation and contract on port operation concession or private participation
	Rationalization of port tariff	GCPI Financial Affairs Dept. / Commercial Dept.	Financial management of port
	Increase in revenue, Prompt disbursement of allocated budget	GCPI Financial Affairs Dept. / Commercial Dept.	Human resources management, budget control, contract and fund management
	Coordination of public private partnership	GCPI Follow Up Jointly Operation Section /Contract Dept.	PPP management, development and operation concession, coordination of projects

Themes of CD	Necessary Outputs	Actors	Necessary Expertise
Enhancement of capacity for marketing and port promotion	Promotion of services for shipping companies, consignees and shippers	GCPI Commercial Dept.	Port logistics, customer relations
	Increase in cargo throughput, shipcalls and gross tonnage	GCPI Commercial Dept.	Port sales and marketing, Analysis of shipping network and potential users
	Introduction of one stop service	Customs, MOT GCPI Commercial Dept. Marine Service Dept.	Coordination of customs, immigration, pilotage, shipping agents and stevedores
Enhancement of capacity for port/channel planning and implementation of development project	Master plan of the development of each port	MOT GCPI Planning Dept.	Port and channel planning, regional development, port facility layout planning
	Budget allocation to port and channel development projects	MOT GCPI Planning Dept.	Budget allocation, fund raising, project coordination
	Development of access road, railway, water supply and other port related facilities	MOT GCPI Planning Dept.	City planning, transportation planning
	Implementation of port development projects	GCPI Planning Dept. / Contract Dept.	Port facility design, cost estimate, construction contract, supervision, and completion inspection
	Development and maintenance of navigation channels	GCPI Planning Dept. / Marine Dredging Dept.	Channel design, dredging work, bathymetric survey, nautical chart and navigation aids
Improvement of capacity of staff members in marine services	Education and qualification of harbor pilots	MOT GCPI Ports Training Center	Prevention of collision at sea, ship safety, meteorology and oceanography, navigation aids, ship manoeuvering techniques and knowledge
	Training of seafarers for dredgers, tugboats and other service boats	GCPI Ports Training Center, /Marine Dredging Dept. /Salvage Dept.	Laws on maritime safety and navigation, meteorology and oceanography, navigation aids, techniques for dredger and tugboat operation
	Training of vessel traffic controller, dredging engineers and administrative clerks	GCPI Ports Training Center, /Marine Dredging Dept. /Affairs Dept.	Laws and rules on navigation, , rules, meteorology and oceanography, navigation aids, technical knowledge on ship manoeuvering
Improvement of capacity for maintenance of port facilities and channels	Repair and maintenance of quays, piers, and other port facilities	GCPI Engineering Affairs Dept.	Port facility design, cost estimate, construction, maintenance and repair
	Maintenance of warehouses, sheds, mechanical and electric facilities	GCPI Engineering Affairs Dept.	Design, construction and maintenance of buildings, mechanical and electrical equipment

Themes of CD	Necessary Outputs	Actors	Necessary Expertise
	Maintenance dredging, removal of wrecks and obstacles	GCPI Marine Dredging Dept. /Marine Salvage Dept.	Bathymetric survey, channel dredging, salvage of wrecks
Capacity for port security management, port environment protection	Introduction of VTS and navigation controller	GCPI Marine Affairs Dept.	Installation and operation of VTS, vessel traffic control
	Compliance with ISPS Code of port facilities	MOT, GCPI ISPS Section/ Marine Inspection Dept.	Security assessment of port facilities, planning and installation of port security system, port security drills
	Reception of wastes from calling ships, Treatment of sewage and waste in ports	Marine Inspection Dept. /Planning Dept.	Reception facility planning, treatment of ship wastes and inspection

Source: JICA Study Team

(2) Selection of Areas for Capacity Development

Recalling the abovementioned capacity assessment for the implementation of action plan, necessary expertise is selected as shown in Table 7.6-4. One target group of capacity development is middle class management in terms of port administration and management, terminal management and operations, business management of GCPI, port sales and marketing, and port/channel planning.

Another target group is marine staff, engineers and supervisors in the area of marine services, port channel construction work, maintenance and repair of port facilities and other practical work. Both groups are targeted in terms of port security management, port environment protection and safety measures in ports.

Table 7.6-4 Selected Areas for Capacity Development

Themes of CD	Area for Capacity Development	
Improvement of capacity for port administration	➢ Establishment of Port Policy ➢ Port Development Planning ➢ Port Operation ➢ Port Administration	➢ Port Legislation ➢ Maritime Transportation Analysis ➢ Port Privatization
Improvement of capacity for terminal management and operations	➢ General Cargo Handling ➢ Container Cargo Handling ➢ Port EDI System, Port Management IT System ➢ Cargo Handling Equipment ➢ Stevedoring Work ➢ QGC/RTG Operation	➢ Port Logistics ➢ Container Yard Operation ➢ Port Entry and Departure Control
Enhancement of capacity for business management of GCPI	➢ Port Business Management ➢ Human Resources Management ➢ Budget Management ➢ PPP Project Planning and Management	➢ Contract Management ➢ Financial Management of Port ➢ Coordination of Port Services
	➢ Port Development and Operation Concession	

Themes of CD	Area for Capacity Development	
Enhancement of capacity for marketing and port promotion	➢ Port Transport and Stevedoring Services ➢ Maritime Network Analysis ➢ One Stop Service	➢ Attraction of Enterprises ➢ Port Sales and Marketing
Enhancement of capacity for port/channel planning and implementation of development project	➢ Port Layout Design ➢ Financial Arrangements ➢ Road Planning, City Planning ➢ Port Facility Design ➢ Navigation Channel Development	➢ Project Cost Estimation ➢ Construction Contract Management ➢ Construction Work Implementation
Improvement of capacity of staff members in marine services	➢ Laws on Maritime Safety and Navigation ➢ Laws and Regulations on Ship Safety ➢ Meteorology and Oceanography ➢ Navigation Aids ➢ Dredging Techniques	➢ Seafarers Training ➢ Ship Manoeuvering ➢ Dredger Manoeuvering ➢ Tugboat Manoeuvering
Improvement of capacity for maintenance of port facilities and channels	➢ Civil Engineering and Architecture Design ➢ Construction Work Management ➢ Bathymetric Survey ➢ Dredging Work Management ➢ Maintenance Shop Management	➢ Mechanical Design ➢ Mechanical Facility Maintenance ➢ Electric Facility Maintenance ➢ Salvage of Wrecks
Capacity for port security management, port environment protection	➢ VTS Operation and Maintenance ➢ Port Facility Security Plan ➢ Port Security Management ➢ Reception of Ship Waste	➢ Vessel Traffic Controller ➢ Safety and Prevention of Accident in Port ➢ Port Environment Protection ➢ Sanitation in Port

Source: JICA Study Team

(3) Seafarer's Education, Training of Harbor Pilots

Seafarers engaging in international voyage must be qualified in accordance with their job titles, such as master mariner, chief officer, second officer, chief engineer, second engineer, and so forth. Qualification and certification of these seafarers are regulated by the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, which stipulates the flag country shall supervise seafarers training and certify seafarers' qualification.

Though the Republic of Iraq ratified the STCW convention, Iraq is not included in the white list of IMO, which admits that seafarers' education meets the standard of STCW and the certification issued by a white list country is acceptable. Therefore, Iraqi flag ships may receive strict inspection at port entry and have a possibility that their entry declaration may be rejected.

Seafarer's certificate issued by Iraqi government is probably not accepted by ships of the white list[4] countries.

In 2014, the number of Iraqi flag vessels is not so many, but there are 59 vessels of Iraqi flag, in which four are tankers, six are general cargo vessels, others are dredgers, tugboats and the like[5]. It may be necessary that Iraq has a seafarers training institute and joins the white list countries. Seafarers' training is the responsibility of the Ministry of Transport and GCPI shall make efforts to train harbor pilots, crew of dredgers and tugboats, and other marine staff members.

Curriculum of seafarers' training has generally two courses, i.e. compulsory course and optional course. The Philippines is famous for seafarers' education and many Filipino seafarers are employed by ships of many nationalities. Typical curriculum of the compulsory course is as follows. Optional courses are selected in accordance with the type of ship to be boarded.

- Ship Handling Simulator & Bridge Teamwork
- Engine Room Simulator Course
- Ship Handling and Maneuvering
- Electronic Chart Display System
- Collision Regulations
- Deck Watchkeeping
- Meteorology
- Control Engineering
- Auxiliary System
- Engine Watchkeeping
- General Tanker Familiarization
- Shore-based Fire Fighting
- Basic Safety Course
- MARPOL 73/78 Annex I & II, Consolidated MARPOL
- Medical Emergency First Aid
- Advanced Fire Fighting
- Proficiency in Survival Craft and Rescue Boat

The above example has a course of ship handling simulator, however, there is a case that a white list country has no ship simulator but well qualified to issue seafarer's certificate. Ship simulator will be of help to but not always necessary for seafarers' training.

7.6.3 Technical Cooperation for Port Development, Management & Operations

Following the rehabilitation of port facilities and dredging of approach channels, UQP and KZP are now available for larger vessels and import cargo has increased every year since 2010. Cargo throughput in 2014 remained at the same level as 2013 owing to the attack by ISIS. Southern gateway ports have become more important for Iraqi trade due to the fact that trade routes from Syria and Aqaba are not available, and southern ports are the only gateway to the country.

Aimed at promoting economic development, smooth international trade plays a key role, and Iraqi southern ports are imperative to supporting international trade. Development of port facilities and strengthening of port management is urgently required at Iraqi southern gateway ports.

Phase II projects of the yen loan will promote the development of port facilities of GCPI and channel dredging. Private operators are investing in terminal development and cargo handling equipment. Therefore, it becomes important for GCPI to coordinate private terminal development and public infrastructure, to prioritize and organize private investment projects, to supervise private terminal operations from the viewpoint of safety, security and environment. As GCPI is solely

[4] IMO publicizes list of countries which have seafarers education system and whose seafarer's certificate meets the standard of the STCW Convention. As of December 2014, 115 countries are listed in the white list, but Iraq is not included in the list.

[5] UNCTAD Data Center, Merchant fleet by flag of registration, 1980-2015

responsible for channel maintenance and improvement, dredging work becomes one of the important tasks.

Taking into account these tasks of GCPI, capacity development of staff members becomes one of the important areas of technical cooperation. Together with assistance in hardware development, technical cooperation in software of port management and capacity development will play an important role for economic development of the country.

Capacity development shall place emphasis on the establishment of effective port development, management and operation system in the Republic of Iraq. Goals, objectives and outputs of technical cooperation are supposed as follows:

Overall goal:

Port development, management and operation system in Iraq will be improved and changed to Landlord type management.

Project purpose:

Knowledge and implementation skills on port development, management and operations are strengthened and cargo handling capacity is increased.

Outputs:

1) Basic policy for port development, management and operation is drafted and framework of institutional reform is drawn up.

2) Maintenance of navigation channels and ship traffic control is properly carried out.

3) Port management is implemented in accordance with related international conventions.

4) Operations and maintenance of cargo handling equipment are effectively and promptly implemented.

Activities:

1-1) Clarification of present situation and difficulties of Iraqi ports;
1-2) Recognition of patterns of port reform in developed countries and their advantages and disadvantages;
1-3) Examination of types and the quantity of port facilities, necessary investment in future development;
1-4) Preparation of institutional reform plan for port management;
1-5) Draft of basic policy for port development, management, operation and maintenance;

2-1) Review of present situation and issues on the maintenance of navigation channels;
2-2) Establishment of maintenance plan of navigation channels;
2-3) Improvement of productivity of dredging work, utilization of dredgers;
2-4) Preparation of training curriculum for marine staff (harbor pilots, crew of dredgers and tugboats, other marine work staff).

3-1) Establishment of reception policy for wastes from ships,
3-2) Development of reception facilities and announcement of tariff for the reception of ship wastes by types;
3-3) Preparation of port facility security plan for GCPI facilities, supervision of PFSP of private terminals;
3-4) Designation of recognized organization to evaluate PFSP; and
3-5) Implementation of port state control.

4-1) Monitoring of productivity of cargo handling and the rate of operation of cargo handling equipment
4-2) Training of engineers and workshop staff to upgrade maintenance skills of cargo handling equipment and facilities; and

4-3) Storage of spare parts of cargo handling equipment for implementing prompt repair work.

Necessary Expertise and Lectures:

- Port Policy and Organization
- Project Management
- Port and Channel Planning
- Dredging Management, Dredgers Operation
- Cargo Handling Equipment Maintenance
- Port Security Management
- Port Environment, Reception Facilities
- Port Management IT System
- Others

Necessary Equipment:

- Personal computers for training at workshop
- Projector
- Design and planning software
- Others

In order to proceed with a technical cooperation project in an effective manner, preparation by the receiving side is very important, and the establishment of a taskforce team is indispensable. This technical cooperation may need a taskforce team comprised of the following members:

- Ministry of Transport (MOT)
- General Company for Ports of Iraq (GCPI)
- State Company for Maritime Transport (SCMT)

Important conditions for this technical cooperation are supposed as follows:

- GCPI will change to a Landlord type port management body;
- Maintenance and management of navigation channels are the responsibility of GCPI;
- Ratification of maritime conventions will be encouraged in Iraq;
- Security risks in Iraq will be reduced or at least not worsened; and
- Expansion and rehabilitation of GCPI Training Center will be encouraged.

In a course of technical cooperation, capacity development of GCPI staff shall be given high priority to realize rational and effective port development, quality port management, and productive operations.

CHAPTER 8

Chapter 8. Conclusions and Recommendations

8.1 Conclusions

8.1.1 Cargo Demand Forecast

Future container cargo throughput of Iraqi ports is estimated in connection with GDP growth, and those of conventional and liquid cargo are examined by analyzing demand for consumption of major commodities. Results of the forecast are summarized in Table 8.1-1. Container cargo will increase to 2.09 - 3.93 million TEUs by 2025 and increase to 3.11 - 6.94 million TEUs by 2035.

Table 8.1-1 Cargo Throughput Forecast of Iraqi Ports

	Unit	2014	2025			2035		
	(in 1000)		Low	Middle	High	Low	Middle	High
(Import)								
1. Container Cargo	TEU	389	1,045	1,454	1,964	1,553	2,359	3,471
2. Conventional Cargo (ex. Vehicle)	ton	6,516	4,583	7,284	12,694	5,870	9,732	15,544
3. Oil Products	ton	3,077	0	0	480	0	0	4,520
(Export)								
1. Container (Empty)	TEU	389	1,045	1,454	1,964	1,553	2,359	3,471
2. Conventional Cargo	ton	99	0	0	0	0	0	0
3. Oil Products	ton	1,233	6,080	7,820	11,920	6,990	7,050	11,210
Total)								
Container Cargo	TEU	778	2,090	2,908	3,928	3,106	4,718	6,942
Conventional Cargo	ton	6,615	4,583	7,284	12,694	5,870	9,732	15,544
Liquid Bulk Cargo	ton	4,310	6,080	7,820	12,400	6,990	7,050	15,730

Source: JICA Study Team

Present container handling capacity of UQP is assessed at about 783,000 TEUs per year due to long dwelling time of imported containers and insufficient yard areas. Supposing container yards are expanded to have enough capacity, and average dwelling time is reduced to 10 days, the handling capacity is estimated at about 959,000 TEUs. In addition, if container handling productivity is improved, it is estimated to increase to 1,280,000 TEUs, which will be the maximum level of container throughput reached by present facilities without developing a new berth. Berth capacity is assessed as shown in Table 8.1-2.

Handling capacity for conventional cargo is also assessed and concluded that general cargo berths and liquid cargo berths may be sufficient in number, subject to proper redevelopment and maintenance, in the low growth and middle growth cases. In the high growth case, the number of general cargo berths and liquid cargo berths will be insufficient and need new development.

Table 8.1-2 Present Capacity of Container Terminals in UQP

(1,000 TEUs)

Berth Operator	No.4 CMA-CGM	No.5 Gazal	No.8 Gulftainer	ICT (11a,b) Gulftainer	No.20 GCPI	Total
Present Conditions						
Berth Capacity	172	154	186	311	135	959
Yard Capacity*1	105	139	95	350	95	783
Best Practice						
Berth Capacity	177	219	186	311	386	1,279
Yard Capacity*2	151	199	135	499	135	1,119

Note: *1 Average dwell time of 10 days, *2 Average dwell time of 7 days
Source: JICA Study Team

8.1.2 Long-term Strategy for Port Development and Administration

Roles and goals of GCPI are to develop, maintain, and operate the infrastructure for maritime transport, and to contribute to the economic development of Iraq through ensuring smooth maritime transportation for import and export. For the sake of this purpose, it is imperative to 1) develop international trade ports to satisfy the demand for import and export, and 2) to provide competitive and satisfactory customer services.

Analyzing internal and external environments of GCPI, strategies to cope with strengths, weaknesses, opportunities and threats are summarized as shown in Table 8.1-3.

Table 8.1-3 SWOT Analysis Matrix

		External Environment	
		Opportunities	Threats
Internal Environment	Strengths	・ To promote maritime transportation through Iraqi ports	・ To maintain security of Iraqi ports and ensure safety of transportation
		・ To develop and maintain approach channels coping with the increasing number and size of calling vessels	・ To maintain channels by public work of GCPI
		・ To develop port facilities and terminals coping with the increasing cargoes	・ To establish laws and regulation to ensure proper port development, management and operation
	Weaknesses	・ To encourage private participation in port development and operation	・ To promote the development of highways, port access roads and railways
		・ To provide user friendly and competitive services	・ To reduce cost of Iraqi ports and improve services

Source JICA Study Team

Based on this SWOT analysis, strategic goals of port development and management in Iraq are summarized as the following 7 items.

1) To promote maritime transportation through Iraqi ports

Iraqi ports are required to strengthen the competitiveness of transportation through the Arabian Gulf coast route compared with the Aqaba port route and Mersin port route, by reducing the cost at Iraqi ports, shortening transportation time, and improving port services)

2) To develop and maintain approach channels that cope with the increasing number and size of calling vessels

Khawr Abdullah, Umm Qasr and Khor Al Zubayr channels maintain a depth of 12 meters. Al Faw Grand Port shall be dredged to a depth of 12 m at the initial stage, deepened further at the

later stage. Shatt-al-Arab channel mouth maintains a status quo and will be dredged to a depth of 8 meters.

3) To develop port facilities and terminals to cope with the increase in cargo

UQP is required to develop container facilities to handle up to 250 - 300 million TEUs. Al Faw Grand Port is expected to start operations in 2020 - 2025. Bulk terminals for grain, cement, fertilizer and others shall be developed.

4) To encourage private participation in port development and operation

Private investment plays key role in successful port development, it is therefore important to ensure investors enough period to recover their investment in the concession contract, and give incentives for their investment to overcome risks of investment.

5) To provide friendly and competitive services for users

Port management shall aim at providing competitive services by modernizing port facilities and equipment, improving productivity of cargo handling, enhancing performance of ports, reducing cargo dwelling time in port, realizing prompt customs clearance, introducing systematic gate and truck operations, and rationalizing port procedures.

6) To promote the development of highways, port access roads and railways

Transportation from a port to hinterland is a critical factor for shippers and consignees. Efforts shall be made to develop an express highway from UQP to Bagdad, restore railways from port to major cities, develop a port access road to Al Faw Grand Port, to develop dry ports in the suburbs of Bagdad.

7) To establish laws and regulations for port development, management and operations

Iraqi ports shall be administered under national law and regulations, which clarify rights, duties and responsibilities of private investors in port development and operations, clarify powers, functions, duties and responsibilities of GCPI, and transform Iraqi ports from Service Ports to Landlord Ports.

8.1.3 Long-term Stage Plan for Port Development

Three alternative concepts for Iraqi port development were raised as Concept A, B and C as follows.

Concept A: The least investment in port development

UQP and KZP will be developed less and efforts be made to build the AFGP. In case seaborne cargo overflows the capacity of Iraqi ports, Mubarak Port in Kuwait, Aqaba Port in Jordan, and/or Mersin Port in Turkey will be used for importing to Iraq.

Concept B: Moderate development of UQP and KZP

Assuming that all seaborne cargo from the Arabian Gulf shall be handled at Iraqi ports, UQP and KZP will be developed to cope with the cargo demand until AFGP will enter into operation.

Concept C: Full development of UQP and KZP, Least development of AFGP

Coping with all seaborne cargo destined for Iraqi ports, UQP and KZP will be expanded to the maximum capacity. The development of AFGP will be given less priority.

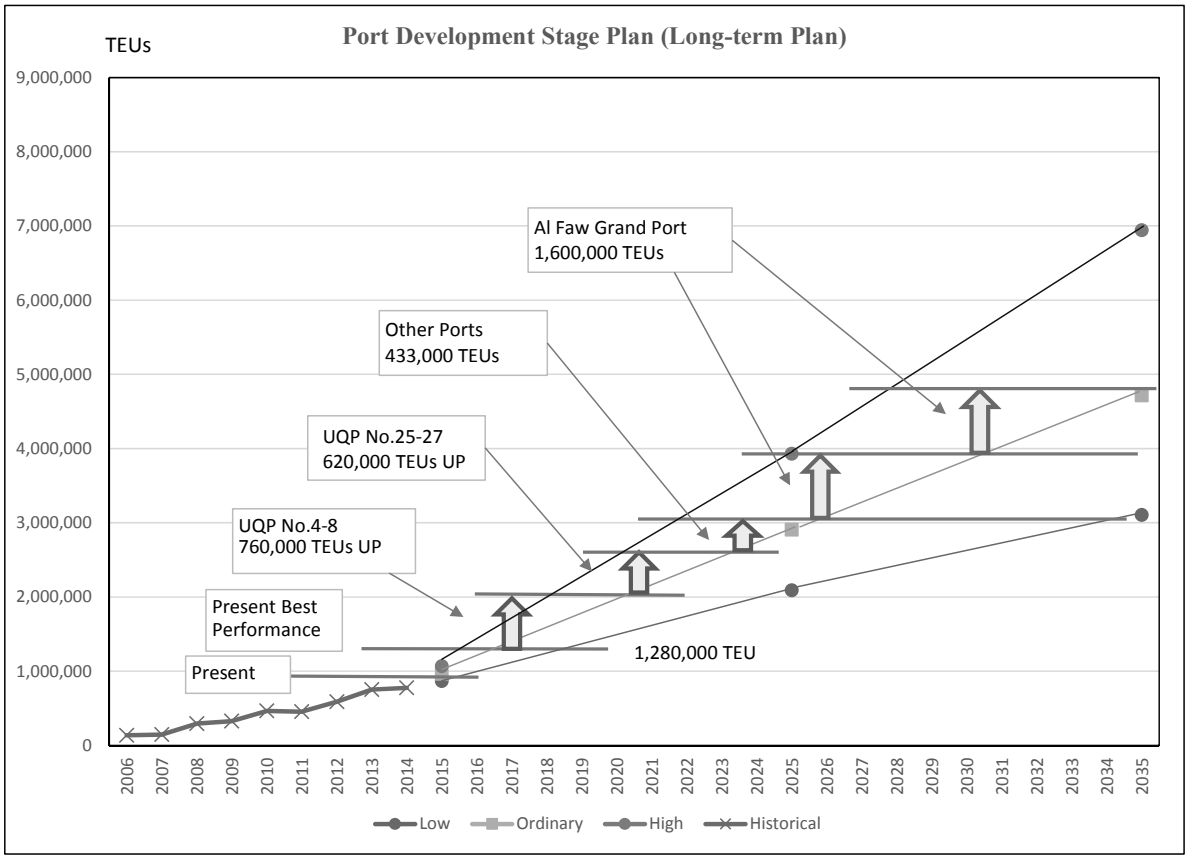
Taking into account the policy of the Iraqi government, this master plan is prepared based on the Concept B, which is moderate development of UQP and KZP until AFGP enters into full operation.

In order to make a master plan based on Concept B, two options for the opening of AFGP are taken into consideration. One option is that the opening of AFGP may be delayed for several years. The other option is that the first berth of AFGP may be completed at the earliest by the end of 2018 and enter into operation.

[Option 1] AFGP may enter into operation in 2026 or later. UOP South berths will be redeveloped and expanded to the water front. Quay gantry cranes will be installed in the UQP South berths. UQP North Berths No.25 to 27 are also developed as a large scale modern container terminal.

[Option 2] AFGP may enter into operation in 2018. Before the opening, UQP South will be rehabilitated and reinforced by private sector and used for container handling with mobile cranes. UQP North No.25 to 27 will not be developed due to limited demand for container handling at UQP.

Stage plan of port development under the abovementioned option 2, which is proposed as the long-term development plan, is illustrated in Figure 8.1-1.



Source: JICA Study Team

Figure 8.1-1 Port Development Stage Plan

8.1.4 Long-term Port Development Projects

Supposing the demand for seaborne cargo handling in 2035, necessary projects are examined and the following projects are selected for long-term port development. Contents of each project and estimated cost are as shown in Table 8.1-4.

Table 8.1-4 Possible Long-term Development Projects

UQP North Berths No. 25 to 27	**USD 522 mil.**
New Berths No.25-27	
Container Yard Reclamation	
Container Yard Soil Improvement	
Container Yard Pavement	
Container Yard Utilities	
Cargo Handling Equipment (QGC)	
Equipment (RTG, Mobile Crane, Reach Stacker, Top/Side Lifter, Tractor & Chassis)	

UQP North Berths No.22 to 24 New General/RoRo/Container Terminal, Berths No.22 to 24 Yard Reclamation Yard Soil Improvement Yard Pavement Yard Utilities Removal of Existing Berths	**USD 447 mil.**

UQP North Berth No.20 Container Yard Pavement Container Yard Utilities	**USD 142 mil.**

UQP South Berths No.4 – 8 Reinforcement & Expansion of Berths No.4-8 Removal of Existing Sheds Container Yard Pavement Container Yard Utilities Cargo Handling Equipment (QGC) Equipment（RTG, Mobile Cranes, Reach Stacker）	**Long-term Development Plan: USD 1,035 mil.** **Alternative Plan: USD 275 mil.**

UQP Port Area Redevelopment Truck Parking South Port Truck Terminal Administration Building Main Gates for North Port and South Port Logistic Center (Bonded Zone) EPZ Logistic Center General Cargo Terminal/Yard Container Terminal/Stacking Yard behind of No.12 & 13 International Container Terminal (ICT) Removal of Existing Sheds Behind No.12 & 13 Removal of Existing Jib Cranes Removal of Existing Rail, Construction of New Rail New Road inside Port Area	**USD 561 mil.**

KZP Berth No.11 & 12 New General Cargo Berths No.11 & No.12 Dredging in front of Berths No.11 & No.12 Yard Reclamation Yard Soil Improvement Yard Pavement Yard Utilities Removal of Existing Berths No.11, 12, 13 Relocation of Berth No.11-13	**USD 391 mil.**

KZP Area Redevelopment New Open Storage Yard 1, Yard 2, Yard 3 New Iron Ore Yard at Berths No. 9 & 10 New Work Shop Behind of No. 9 & 10 New Sheds at Work Shop behind No. 9 & 10 Removal of Existing Sheds Behind No.7 & 8 Removal of Existing Belt Conveyors Behind of No.5 & 6 Yard Utilities Truck Parking Area Administration Custom Office Building Rail Terminal	**USD 425 mil.**

Abu Flus Port Redevelopment Rehabilitation of Berth No.3 for Container Terminal Container Staking Yards Equipment (Mobile Crane)	**USD 19 mil.**

Al Maqil Port Redevelopment Yard Rehabilitation	**USD 48 mil.**

Al Faw Ground Port Development New Container Terminals (Long-term Development Plan: No.1-4, Alternative Plan: No.1- 9) Access Channel Dredging Access Road (Type-1, Type 2) Access Road (Revetment) Highway, Part-1 connecting to Al Faw Port Highway, Part-2 Highway, Part-3, incl. tunnel approach Highway, Part-4 from Safwan city, incl. tunnel approach Highway, Tunnel Between Part 3 and Part 4 Container Handling Equipment (QGC) Equipment (RTG, Top/Side Lifter, Tractor & Chassis)	**Long-term Development Plan: USD 5,042 mil.** **Alternative Plan: USD 6,436 mil.**

Khawr Abdallah Channel System	
Abdallah Channel ( ) in case of Rerouting	USD 360 (1,359) mil.
Removal of Sunken Vessel (One)	USD 7 mil.
Umm Qasr Channel	USD 60 mil.
Removal of Sunken Vessels (6 along Channel, 3 at Berth)	USD 60 mil.
Khor Alzubayr Channel	-
Removal of Wrecks (4 along Channel)	-

Shatt al Arab Channel	
River Mouth Area	USD 170 mil.
River Mouth - Abu Flus Port	USD 140 mil.
Abu Flus to Al Maqil Port	USD 10 mil.
Removal of Wreaks (Approximately 33)	USD 220 mil.

Source: JICA Study Team

8.1.5 Short/Mid-term Port Development Projects

Coping with estimated demand in 2025, possible port development projects are selected in UQP, KZP. Other supplementary projects are also selected as short/mid-term development projects as shown in Table 8.1-5. Supposing two cases of the development of AFGP, project cost is estimated for each case of Short/Mid-term Development Plan and the Alternative Plan.

Table 8.1-5 Possible Short/Mid-term Development Projects

UQP-North Berths No.25 to 27		
New Berth No.25 to 27	600 m x 50 m (-12.5m)	**USD 522 mil.**
Container Yard: Reclamation	1,340,000 m3	
Container Yard: Soil Improvement	335,000m2	
Container Yard: Pavement	335,000m2	
Container Yard: Infrastructure	L.S.	
Equipment: Gantry Crane	4 sets in 3 berths	
Equipment: RTG	8 sets	
Equipment: Mobile Crane	3 sets	
Equipment: Reach Stacker	10 sets	
Equipment: Top/Side Lifter	6 sets	
Equipment: Tractor & Chassis	13 sets	

UQP-North Berths No. 22 to 24		
New Berth No.22 to 24	400m	**USD 447 mil.**
Yard: Reclamation	1,200,000m3 (1,200m x 500m x 2m)	
Yard: Soil Improvement	600,000m2 (1,200m x 500m)	
Yard: Pavement	585,000m2	
Yard: Infrastructure	L.S.	
Removal of existing berths	400m	

UQP-North Yard behind Berth No.20		**USD 142 mil.**
Container Yard: Pavement	560,000m2 (800m x 700m)	
Container Yard: Infrastructure	1 set	

UQP-South Berths No.4 - No.8		Least Dev.	Full Dev.
		275 mil.	**1,035 mil.**
Expansion of Berths No.4-8*1	1,090m x 15m (-13m)	-	379 mil.
Removal of existing sheds	6 Sheds, 36,000m2	33 mil.	33 mil.
Container Yard: Pavement	730,300m2, (1,090m x 670 m)	195 mil.	195 mil.
Container Yard: Infrastructure	L.S.	20 mil.	20 mil.
Equipment: Gantry Cranes*1	14 sets, 7 sets per 545.0 m x2	-	279 mil.
Equipment: RTG	42 sets, 21 sets per 545.0 m x2	-	129 mil.
Equipment: Mobile Crane*2	10 sets, 2 x 5berths	27 mil.	-

Note: *1 in case of full development, *2 in case of the least development of UQP South

UQP Area Redevelopment		
Truck Parking	1,500,000m2 (1.5km x 1.0km)	**USD 561 mil.**
South Port Truck Terminal	L.S.	
Administration Building	200,000m2 (200m x 200m x 5 floors)	
Main Gates for North Port and South Port	2 Gates	
Logistic Center (Bonded Zone) EPZ	1,500,000m2 (500m x 1,500m x 2 area)	
Logistic Center	600,000m2 (300m x 2,000m)	
General Cargo Terminal/Yard	600,000m2 (1,200m x 500m)	

UQP Area Redevelopment		
Yard behind of No.12 & 13	400,000m2 (400m x 1,000m)	
International Container Terminal (ICT)	L.S.	
Removal of Sheds behind No.12 & 13	4 Sheds, 24,000m2 (150m x 40m x 6 shed)	
Removal of Existing Jib Cranes	24 nos	
Removal of Existing Rails	L.S.	
Construction of New Rails	L.S.	
New Roads in Port Area	80,000m2 (8m x 10,000m)	

KZP Area Redevelopment (except for 1.6)		**USD 425 mil.**
New Open Storage Yard 1, 2 & 3	250,000 m2, (500m x 500m) x3	
New Iron Ore Yards at Berth No. 9 & 10	224,000 m2, (560m x 400m)	
New Work Shop behind of No. 9 & 10	112,000 m2, (560m x 200m)	
New Sheds at Work Shop No. 9 & 10	3 Sheds, 20,000m2 (100m x 20m x 3 shed)	
Removal of Sheds behind of No.7 & 8	4 Sheds, 28,800m2 (180m x 40m x 4 shed)	
Removal of Belt Conveyors No.5 & 6	L.S.	
Infrastructure	L.S.	
Truck Parking Area	150,000m2, (500m x 300m)	
Administration Customs Office Building	150,000m2, (250m x 300m x 2floors)	
Rail Terminal	L.S.	

Abu Flus Port Redevelopment		**USD 19 mil.**
Rehabilitation No.3 for Container Terminal	250m	
Container Staking Yards	250,000m2 (250m x 100m)	
Equipment: Mobile Crane	2 sets	

Al Maqil Port Redevelopment		**USD 48 mil.**
Yard Rehabilitation	180,000 m2	

Khawr Abdallah Channel	**USD 487 mil.**
Abdallah Channel	360 mil.
Wreck Removal (1 at buoy No.3 to No.25)	7 mil.
Umm Qasr Channel	60 mil.
Wreck Removal (6 along channel, 3 at berth No.9)	60 mil.
Khor Al-Zubayr Channel	-
Wreck Removal (4 along channel)	-

Shatt Al Arab Channel	**USD 243 mil.**
Mouth area	90 mil.
Wreck Removal	153 mil.

Source: JICA Study Team

8.1.6 Economic Analysis

National benefits of long-term port development projects are assessed in accordance with following effects to be realized by the implementation of projects.

- Expansion of container handling capacity by the development of UQP;
- Reduction of ship berthing hours resulting from productivity improvement brought by the introduction of new modern cargo handling equipment;
- Reduction of traffic congestion in port area owing to the redevelopment of road and utilities inside the port;

- Expansion of bulk/general cargo handling capacity resulted from the development of KZP;
- Maintenance of container handling capacity resulting from the rehabilitation of Abu Flus Port;
- Expansion of container handling capacity resulting from the development of AFGP;
- Avoidance of interruption of ship traffic along Khawr Abdallah Channel which may be caused by ships calling at Mubarak Port;
- Navigation of larger ships along the Shatt al Arab River owing to dredging and removal of sunken ships;
- Reduction of ocean freight rates and land transportation cost in comparison with a case of no port development

Economic benefits of the long-term projects are calculated based on the abovementioned items and the project value is analyzed by three indicators, i.e. Net Present Value (NPV), Benefit Cost Ratio (B/C) and Economic Internal Rate of Return (EIRR). These indicators of the Long-term Development Plan and Alternative Plan are simulated as shown in Table 8.1-6. B/C of the Long-term Development Plan is slightly higher than the Alternative Plan.

Economic analysis of the Short/Mid-term projects shows larger B/C ratio and EIRR than the cases of Long-term Projects as shown in
Table 8.1-7. NPV, B/C ratio and EIRR of the Short/Mid-term Development Projects are larger than those of the Alternative Plan, which indicates that the development of UQP and KZP is more economically beneficial than the development of Al Faw Grand Port.

Table 8.1-6 Economic Analysis of Long-term Development Projects

Long-term Plan	NPV (million USD)	B/C ratio	EIRR
Base Case	2,102	1.26	8.4 %
Case 1	1,309	1.15	7.4 %
Case 2	1,099	1.14	7.3 %
Case 3	305	1.03	6.3 %
Alternative Plan	NPV (million USD)	B/C ratio	EIRR
Base Case	1,151	1.13	7.0 %
Case 1	240	1.02	6.2 %
Case 2	125	1.01	6.2 %
Case 3	- 786	0.92	5.4 %

Note: Case 1: Cost up by 10%; Case 2: Benefit down by 10%, Case 3: Both cases happen simultaneously, Social discount rate is supposed to be 5.8% (Iraq Treasury Bond)
Source: JICA Study Team

Table 8.1-7 Economic Analysis of Short/Mid-term Projects

Short/Mid-term Plan	NPV (million USD)	B/C ratio	EIRR
Bae Case	4,865	2.48	16.8 %
Case 1	4,536	2.25	15.4 %
Case 2	4,049	2.23	15.3 %
Case 3	3,179	2.03	14.0 %
Alternative Plan	NPV (million USD)	B/C ratio	EIRR
Base Case	224	1.04	6.4 %
Case 1	- 353	0.94	5.6 %
Case 2	- 375	0.93	5.5 %
Case 3	-952	0.85	4.6 %

Note: Case 1: Cost up by 10%; Case 2: Benefit down by 10%, Case 3: Both cases happen simultaneously, Social discount rate is supposed to be 5.8% (Iraq Treasury Bond)
Source: The Study Team

8.1.7 Necessary Actions for Improving Port Management and Operations

Regarding the improvement of terminal management and operations, important directions are separation of private and public services, improvement of cargo handling productivity and reduction of cargo dwelling time in port. GCPI's change from the service port to the landlord port is another important issue.

Port development needs the encouragement of private investment by means of granting attractive conditions on port development and operation concessions. Longer concession period and bigger revenue share will encourage private companies to make larger investment. It is also important to make a port development master plan and authorize it for the implementation of public agencies and private investors. Human resources development is one of important actions to be taken in due course, in particular capacity development of port administration and improvement of training institute are important actions for better port management and operation. Necessary actions for improving port management and operations are summarized as shown in Table 8.1-8.

Table 8.1-8 Necessary Directions for Improving Port Management and Operations

Item		Actions
Terminal management and operations	1	Separation of Private and Public Services
	2	Improvement of productivity of cargo handling
	3	Introduction of Port EDI system and IT
	4	Installation of modern cargo handling equipment
Organizational reform	5	Change from the service port to the landlord port
	6	Improvement of financial management
Port development	7	Expansion of port capacity ahead of demand
	8	Rehabilitation and reinforcement of existing facilities
Improvement of navigation channel	9	Navigation channel improvement in depth and width
	10	Introduction of Vessel traffic control
	11	Maintenance of navigation channels
Promotion of Iraqi ports	12	Revision of port tariff for port promotion
	13	Better services for shippers and consignees
	14	Better services for shipping lines
Assurance of Port Security	15	Security management of international port facilities
Preservation of Port Environment	16	Conformity with regulations of MARPOL convention
	17	Management of waste from port activities and floating waste
Human resources development	18	Capacity development of port administration staff
	19	Improvement of training institute

Source: JICA Study Team

8.1.8 Port Security Management

Major requirements of SOLAS Chapter XI-2 and Part A of ISPS Code and the situation of compliance in Iraqi ports are assessed as follows. The requirements are mostly implemented except that the details of the approved port facilities are not reported to IMO. However, implementation of security measures needs more drills, and improvement of security equipment and human resources.

Table 8.1-9 Major Requirements and Responses in Iraqi Ports

Major requirements of SOLAS Chapter XI-2 and Part A of ISPS Code	Responses
Contracting Government shall decide the extent of application of SOLAS XI-2 and Part A of ISPS Code ·····	Complied, 5 ports under GCPI and other ports under South Oil Company

Contracting Government shall set security levels.	Complied, set Level 1 now
Port Facility Security Assessment (PFSA) shall be carried out by the Contacting Government and periodically be reviewed and updated.	Complied
Port Facility Security Plan (PFSP) shall be developed and maintained on the basis of PFSA and PFSP shall be approved by the Contracting Government.	Complied
Contracting Government shall communicate to IMO the details of the port facilities of which PFSPs have been approved by the Contracting Government.	PFSPs have been approved, but the Contracting Government has not communicated to IMO
Port Facility Security Officer (PFSO) shall be designated for each port facility.	Complied
The following activities shall be carried out through appropriate measures;	
ensuring the performance of all port facility security duties;	Complied
controlling access to the port facility;	Complied, but improvement required
monitoring of the port facility, including anchoring and berthing area(s);	Complied, but improvement required
monitoring restricted areas to ensure that only authorized persons have access;	Complied, but improvement required
supervising the handling of cargo;	Complied
supervising the handling of ship's stores;	Complied
ensuring that security communication is readily available	Complied
Contracting Governments shall test the effectiveness of the Port Facility Security Plans, or of amendments to such plans, they have approved.	Procedures shall be documented and records shall be maintained.
To ensure the effective implementation of the port facility security plan, drills shall be carried out at appropriate intervals and the port facility security officer shall ensure the effective coordination and implementation of the port facility security plan by participating in exercises at appropriate intervals	Drills have been conducted under the lead of PFSO, but exercises shall be conducted together with the related organizations for reliable communication in case security incident occurs.

Source: JICA Study Team

8.1.9 Port Reception Facilities

In the Gulf region, all countries except Iraq have ratified MARPOL convention. Iraq regulates ship discharges under provisions of the Law and Instruction of Ports in 1995 and the Law for Protection and Improvement Environment in 2009. Ship waste reception needs at UQP and KZP are assessed as shown in Table 8.1-10. Waste reception methods are examined and summarized as shown in Table 8.1-11.

Table 8.1-10 Assessment of Ship Waste Reception Needs

Waste reception needs			Reason
Annex I	Oily bilge water	Yes	While most ships generate oily bilge water, ships without oil filtering equipment cannot discharge during voyage under MARPOL.
	Oily residues	Yes	All ships generate oily residue, which cannot be discharged during voyage under MARPOL.
	Oily tank washings	No	Tank washing is not conducted at KZP as calling tankers carry only single products. There are no oil tankers calling at UQP.
	Oily ballast water	Yes	Although modern tankers are likely to be equipped with segregated ballast tanks in accordance to MARPOL, some old or small tankers not regulated under MARPOL may carry oily ballast water. There are no oil tankers calling at UQP.
	Scale/sludge from tanker cleaning	No	Tank cleaning is not conducted at KZP. There are no oil tankers calling at UQP.
Annex II	NLS	No	Tank washing is not conducted at KZP as calling tankers carry only single products. There are no chemical tankers calling at UQP.
Annex IV	Sewage	No	Most ships can discharge their sewage legally during voyage under MARPOL.
Annex V	Cargo residue	No	There are no ships that carry harmful bulk commodities. Non-harmful cargo residue can be discharged legally during voyage under MARPOL.
	Animal carcass	No	Can be discharged legally during voyage under MARPOL.
	Domestic waste	Yes	All ships generate domestic waste and cannot be discharged during voyage under MARPOL.
	Cooking oil	Yes	Most ships use cooking oil and cannot be discharged during voyage under MARPOL.
	Food waste	No	Can be discharged legally during voyage under MARPOL.
	Operational waste	Yes	All ships generate operational waste (e.g. dunnage/linings, incinerator ash) and cannot be discharged during voyage under MARPOL, except non-harmful cleaning agents or additives.
	Plastics	Yes	All ships generate plastic waste and cannot be discharged during voyage under MARPOL.

Source: JICA Study Team

Table 8.1-11 Proposed Waste Reception Method and Required Facilities

MARPOL	Waste type	Reception method	Required facility
Annex I	Oily bilge water Oily residues	Collection by tank truck/oil collection vessel, then transport to local treatment facility (e.g. SOC facility) for treatment/disposal.	・Tank truck ・Vacuum truck (for collecting sludge) ・Oil collection vessel ・Holding tank (in case of excessive waste oil)
	Oily ballast water	Same as above but should be handled under the responsibility of the cargo owner/shipper.	
Annex V	Garbage	Receive only non-hazardous garbage Collection by garbage truck, then transport to local landfill. Segregation of recyclable waste*	・Receptacles (garbage bins) ・Garbage truck ・Temporary storage area for recyclable waste*

Source: JICA Study Team

8.2 Capacity Development

Capacity assessment for the implementation of the Action Plan summarized in section 7.2.5 implied that necessary expertise for GCPI staff is extended over many areas as shown in Table 8.2-1. The target group of capacity development is middle class management for port administration, terminal management and operations, business management of GCPI, port sales and marketing, and port/channel planning. Another target group is engineers, supervisors and marine staff for training of marine services, port channel construction work, maintenance and repair of port facilities and other practical work.

The training center of GCPI will establish courses for practical skills and studies. However, policy matters and/or legislative/administrative matters, such as Establishment of Port Policy, Port Legislation, Port Privatization, Port Development and Operation Concession, Financial Management of Port and the like, may need special collaboration between foreign experts and executive members of GCPI.

Table 8.2-1 Priority Areas for Capacity Development

Themes of CD	Area for Capacity Development	
Improvement of capacity for port administration	- Establishment of Port Policy - Port Development Planning - Port Operation - Port Administration	- Port Legislation - Maritime Transportation Analysis - Port Privatization
Improvement of capacity for terminal management and operations	- General Cargo Handling - Container Cargo Handling - Cargo Handling Equipment - Stevedoring Work - QGC/RTG Operation - Port EDI System, Port Management IT System	- Port Logistics - Container Yard Operation - Port Entry and Departure Control

Themes of CD	Area for Capacity Development	
Enhancement of capacity for business management of GCPI	- Port Business Management - Human Resources Management - Budget Management - PPP Project Planning and Management - Port Development and Operation Concession	- Contract Management - Financial Management of Port - Coordination of Port Services
Enhancement of capacity for marketing and port promotion	- Port Transport and Stevedoring Services - Maritime Network Analysis - One Stop Service	- Port Sales and Marketing - Attraction of Enterprises
Enhancement of capacity for port/channel planning and implementation of development project	- Port Layout Design - Financial Arrangements - Road Planning, City Planning - Port Facility Design - Navigation Channel Development	- Project Cost Estimation - Construction Contract Management - Construction Work Implementation
Improvement of capacity of staff members in marine services	- Laws on Maritime Safety and Navigation - Laws and Regulations on Ship Safety - Meteorology and Oceanography - Navigation Aids - Dredging Techniques	- Seafarers Training - Ship Manoeuvering - Dredger Manoeuvering - Tugboat Manoeuvering
Improvement of capacity for maintenance of port facilities and channels	- Civil Engineering and Architecture Design - Construction Work Management - Bathymetric Survey - Dredging Work Management - Maintenance Shop Management	- Mechanical Design - Mechanical Facility Maintenance - Electric Facility Maintenance - Salvage of Wrecks
Capacity for port security management, port environment protection	- VTS Operation and Maintenance - Port Facility Security Plan - Port Security Management - Reception of Ship Waste	- Vessel Traffic Controller - Safety and Prevention of Accident in Port - Port Environment Protection - Sanitation in Port

Source: JICA Study Team

Qualification and Certificate of Seafarers

Qualification and certificate of seafarers are regulated by the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978. Though the Republic of Iraq ratified the STCW convention, Iraq is not included in the white list of IMO, which admits that seafarers' education meets the standard of STCW and that the certification issued by a white list country is acceptable.

The number of Iraqi flag vessels is not so many, but there are 59 vessels of Iraqi flag, in which four are tankers, six are general cargo vessels, others are dredgers, tugboats and the like, as of 2014. It may be necessary that Iraq has a seafarers` training institute and joins as a member of the white list countries. Seafarers` training is the responsibility of the Ministry of Transport and GCPI shall make efforts to train harbor pilots, crews of dredgers and tugboats, and other marine staff members.

Seafarers' training may employ a training ship and/or ship handling simulator. Ship

simulator will be of help to seafarer's training, but not always necessary for it. On board training can qualify seafarers to obtain the certificate of officers or seaman license.

8.3 Recommendations

(1) Stage Plan for Port Development

Recalling the development of Al Faw Grand Port, two options for the stage plan of the development of UQP are assumed, and comparison is made by economic analysis of Long-term Development Projects and Short/Mid-term Projects. The first option is priority development of UQP in the early stage and moderate development of AFGP to meet demand after 2025. The second option is intensive investment in Al Faw Grand Port and less development of UQP.

Due to the large investment necessary to open Al Faw Grand Port and its access channel, the first option "priority development of UQP" shows a higher economic rate of return than the second option "intensive investment in Al Faw Grand Port and less investment in UQP".

Taking this into account, the following stage plan is appropriate to improve/expand cargo handling capacity of Iraqi ports.

1st) To improve cargo handling capacity by increasing productivity and reducing dwell time of imported cargo;

2nd) To redevelop UQP-South Berths No.4-No.8 as a modern container terminal with Quay gantry cranes;

3rd) To develop UQP-North Berths No.25-27 as a new container terminal;

4th) To encourage container handling at KZP, Al Maqil Port and Abu Flus Port;

5th) Container handling capacity of the present four ports shall be expanded to 3 million TEUs in total; and

6th) Al Faw Grand Port will enter into operation after container throughput of Iraq reaches 3 million TEUs.

(2) Priority Projects for Short/Mid-term Port Development

Among the Short/Mid-term development projects listed in Chapter 6.3.3 of this report, some projects need early implementation, and some projects need public and private partnership for effective implementation. Priority ranking of the projects are assessed from the viewpoints of expansion of cargo handling capacity, urgency, necessity for public initiative, effectiveness on port safety, and obstacles in project implementation. Short/Mid-term projects for port development are listed in Table 8.3-1 in order of priority ranking.

Table 8.3-1 Priority Ranking of Short/Mid-term Development Projects

Project / Factors	Capacity Expansion	Urgency	Necessity Public Initiative	Effective on Safety	Obstacles in Imple-mentation	Priority Ranking
UQP-South Berths No.4 to No.8	A	A	A	-	-	1
UQP Land Area Redevelopment	B	B	A	B	-B	2
Khawr Abdallah Channel	B	B	A	B	-B	2
UQP-North Berths No.25 to 27	A	B	C	-	-	3
UQP-North Berths No. 22 to 24	B	A	C	-	-	3
UQP-North Yard behind No.20	B	A	C			3
KZP Land Area Redevelopment	B	B	A	-	-B	3
Abu Flus Port Redevelopment	C	B	B	-	-	4

Project / Factors	Capacity Expansion	Urgency	Necessity Public Initiative	Effective on Safety	Obstacles in Imple-mentation	Priority Ranking
Al Maqil Port Redevelopment	C	B	B	-	-	4
Shatt Al Arab Channel	B	C	A	B	-A	4

Note: A: Very Important, B: Necessary, C: Less Impact, -A: Very Difficult, -B: Fairly Difficult
Source: JICA Study Team

It is therefore recommended to place the highest priority on the development of UQP-South Berths No.4-No.8, followed by the redevelopment of UQP land area and the improvement of Khawr Abdallah Channel. The third priority project is the development of UQP-North Berths No. 25 to No. 27, UQP-North No. 22 to No. 24, and UQP-North Yard behind No. 20.

(3) Priority Projects for Improving Port Management and Operations

Necessary actions for improving port management and operations are analyzed as shown in Table 7.2-4, in which projects shown in Table 8.3-2 need the installation of equipment/facilities for maintenance or monitoring work. Among these projects, priority is examined from the viewpoint of urgency, necessity for GCPI's initiative and importance for port safety, security and environment. Priority ranking is assessed as shown in Table 8.3-2.

It is also recommended to place the highest priority on the improvement and implementation of security management of international port facilities; management of wastes from ships and port activities; maintenance of channel and development of service berth; introduction of vessel traffic management systems; rehabilitation/reinforcement of existing facilities; and improvement of training institute.

Table 8.3-2 Priority Ranking of Projects for Improving Management and Operations

	Urgency	Necessity for GCPI's Initiative	Safety, Security, Environmental Protection	Overall Evaluation	Priority Ranking
Security Management of International Port Facilities	B	A	A	2A1B	1
Management of Waste from Ships & Port Activities	B	A	A	2A1B	1
Maintenance of Channels, Development of Service Berth	A	A	B	2A1B	1
Introduction of Vessel Traffic Management Systems	A	A	B	2A1B	1
Rehabilitation/Reinforcement of Existing Facilities	A	B	A	2A1B	1
Improvement of Training Institute	A	A	C	2A	1
Introduction of Port EDI system and IT	B	A	B	2A1B	2
Installation/Modernization of Cargo Handling Equipment	A	B	B	1A2B	2

Note: A: Very Important, B: Necessary, C: Less Impact
Source: JICA Study Team

(4) Necessary Institutional Actions to Improve Port Management and Operations

Regarding the improvement of terminal management and operations, important directions are separation of private and public services, improvement of cargo handling productivity and reduction of cargo dwelling time in port. GCPI's change from service port to landlord port is another important issue.

Port development needs the encouragement of private investment by means of granting attractive conditions on port development and operation concession. Longer concession period and bigger revenue share will encourage private companies to make larger investment. It is also important to make a port development master plan and authorize it for the implementation of public agencies and private investors. Human resources development is one important action to be taken in due course, in particular capacity development of port administration and improvement of training institute are important actions for better port management and operations.

(5) Recommendations on Port Security Management

1) Domestic Law

The Iraqi domestic law in compliance with the requirements of SOLAS XI-2 and Part A of ISPS Code should be enacted as soon as possible in order to justify the implementation of the security measures required by SOLAS XI-2 and ISPS Code.

2) Communication to IMO

A major noncompliance with the requirements of SOLAS XI-2 is that the Contracting Government has not informed IMO the details of the port facilities of which PFSPs have been approved by the Contracting Government. This means that the port facilities in Iraq are not considered by ships, as well as port facilities of other countries, as port facilities complying with ISPS Code. Consequently, it is feared that the port facilities not complying with the global standard will exert huge influence on international trade and prejudice the national economy.

3) Controlling access to the port facility

Port Security Card system (PS Cards will be issued as the entry pass by GCPI to persons required to enter port facilities) is recommended to implement tighter access control at the gate of the port facilities. Until GCPI arranges the PS Card system, it is recommended to implement a) checking ID with photo and the face of the personnel; b) requesting person to fill his/her name and professional affiliation into the registration book and issuing temporary entry pass; and c) keeping the records of entry registration book.

4) Access monitoring to port facilities

In order to ensure the monitoring requirements be properly conducted, the improvement of a) fencing; b) surveillance cameras, c) lighting; and d) security communication.

5) Training, drills and exercises on port facility security

Drills and exercises should be conducted together with related organizations for reliable communication on the assumption that a security incident could occur.

(6) Port Reception Facilities

In order to comply with the requirements of MARPOL, which Iraq intends to ratify soon, Iraqi ports need to strengthen the reception facilities for ship wastes. In particular, it is necessary to receive MARPOL Annex I (oily waste) and Annex V (garbage) wastes.

It is appropriate that GCPI only receives wastes generated commonly by all ships (e.g. oily residue, bilge water, domestic waste (garbage)). Wastes generated only from specific ships (e.g. oily ballast water, cargo residue) shall be handled by the cargo owner/shipper or ship operator. The scope of the reception facilities should be limited to the minimum investment and facility as

possible, by utilizing existing treatment and disposal facilities in the area. Specifically, the following reception facilities are expected at UQP and KZP.

- Tank truck, vacuum truck, oil collection vessel, and holding tank for receiving Annex I waste;
- Receptacles, garbage truck, and temporary storage area for recyclable garbage for receiving Annex V waste

In order to estimate the quantity and scale of the reception facilities required, it is imperative to clarify volume and types of wastes to be received at Iraqi ports, fees to be collected, and regulations and procedures for reception. The following studies among others should be conducted to further refine the reception facility plan:

- Types of wastes that can be treated by existing local waste treatment facilities and required treatment fees
- Method of how to charge waste reception fee from ships
- Possibility to outsource waste handling (collection, treatment, disposal)
- Necessary amendments to relevant laws/regulations
- System and format for advance notification for waste delivery from ships
- Storage and maintenance plan of facilities
- Impacts on port operation

Since there are many factors that could influence the quantity of ship waste (e.g. advance in waste treatment equipment on board, revision of regulations on discharges from ship, and the like), periodical reviews shall be conducted to assess the waste reception needs.

(7) Capacity Development

Taking into account future tasks of GCPI, capacity development of staff members becomes one of most important factors for successful port development and management. Capacity development shall place emphasis on the establishment of effective port development, management and operation systems in the Republic of Iraq. Goals, objectives and outputs of capacity development are supposed as follows:

Overall goal:

Port development, management and operation systems in Iraq will be improved and changed to Landlord type system.

Purpose of Capacity Development:

Knowledge and implementation skills on port development, management and operations are strengthened and cargo handling capacity is increased.

Expected Outputs of Capacity Development:

1) Institutional reform plan for port development, management and operation drafted.

2) Concession agreement for terminal development and operations undertaken in accordance with public initiatives.

3) Maintenance of navigation channels and ship traffic control properly carried out.

4) Port management implemented in accordance with related international conventions.

5) Public port facilities well maintained and the port area managed orderly.

Necessary Expertise for Capacity Development

- Port Policy, Organization

- Project Management
- Concession Contract and Management
- Port and Channel Planning
- Dredging Management, Dredgers Operation
- Port Security Management
- Port Environment, Reception Facilities
- Port Management IT System
- Others

It is therefore recommended that part of the necessary areas for capacity development shown in Section 7.6.2 of this report shall be incorporated in several cooperation schemes, such as 1) on-the-job training during Port Sector Rehabilitation Project Phase (II), 2) JICA's technical cooperation, and 3) UNDP's capacity development project in Iraq.

APPENDIX

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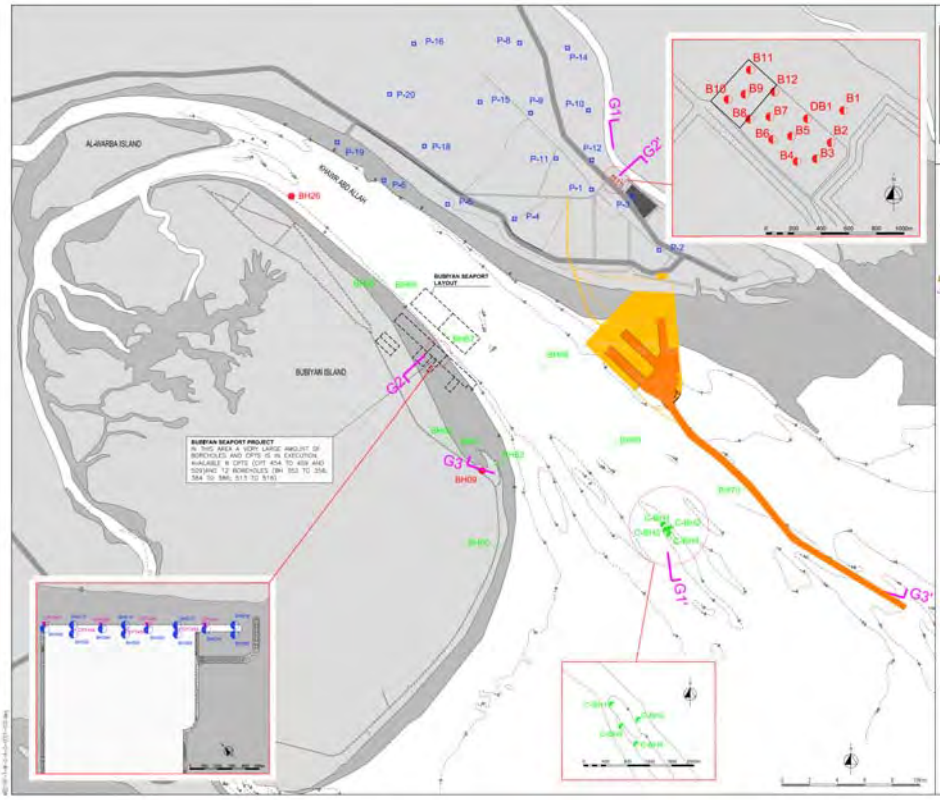
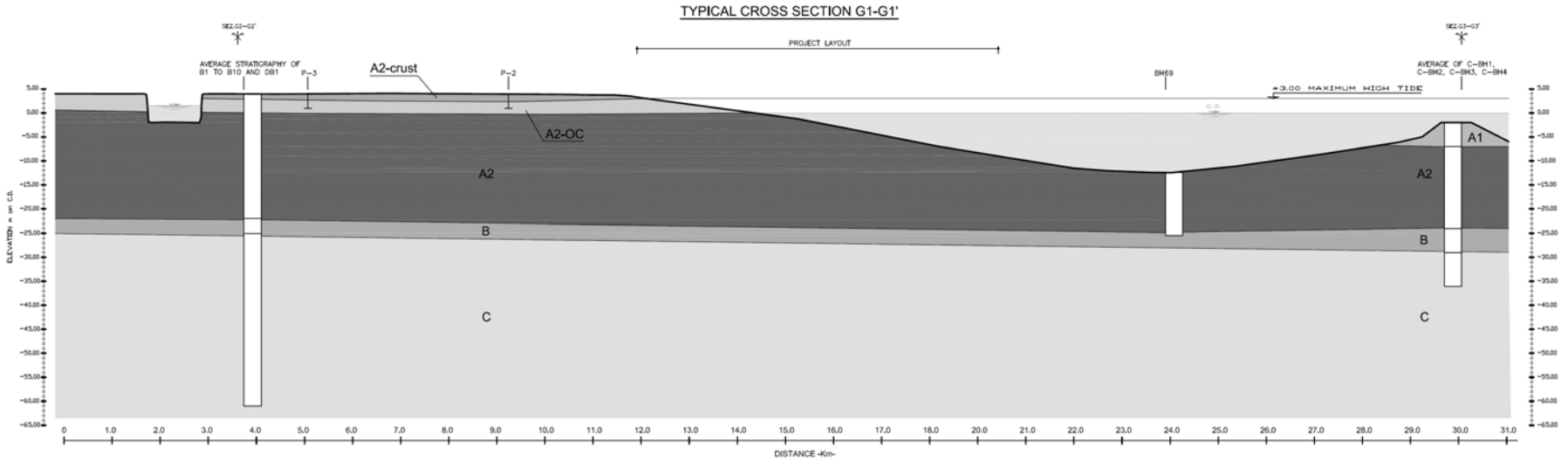


Source: Engineering Consultancy Service for New Al Faw Pot Port Master Plan / Consortium IECAF

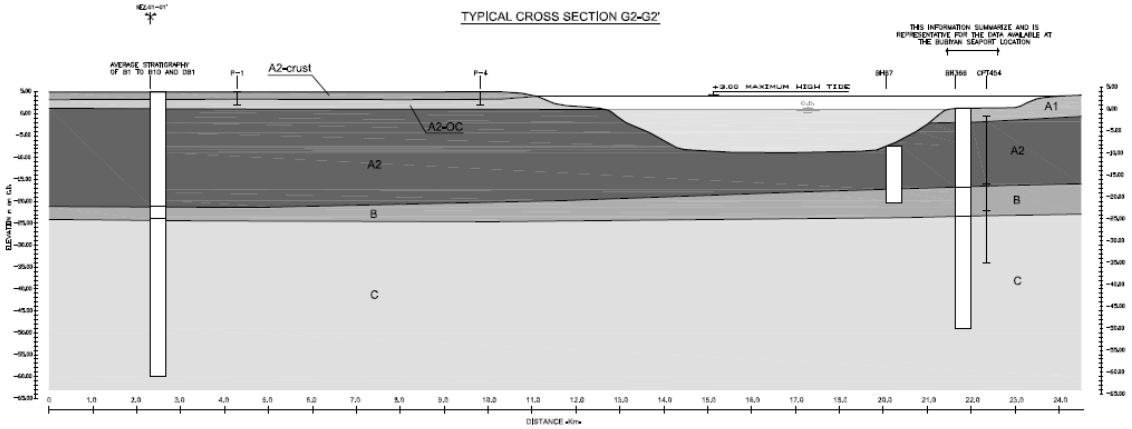
Appendix 2.2-1 Location Map of Soil investigation at AF

Appendix 2.2-2 Soil Profile Cross section (AFGP G1- G1)



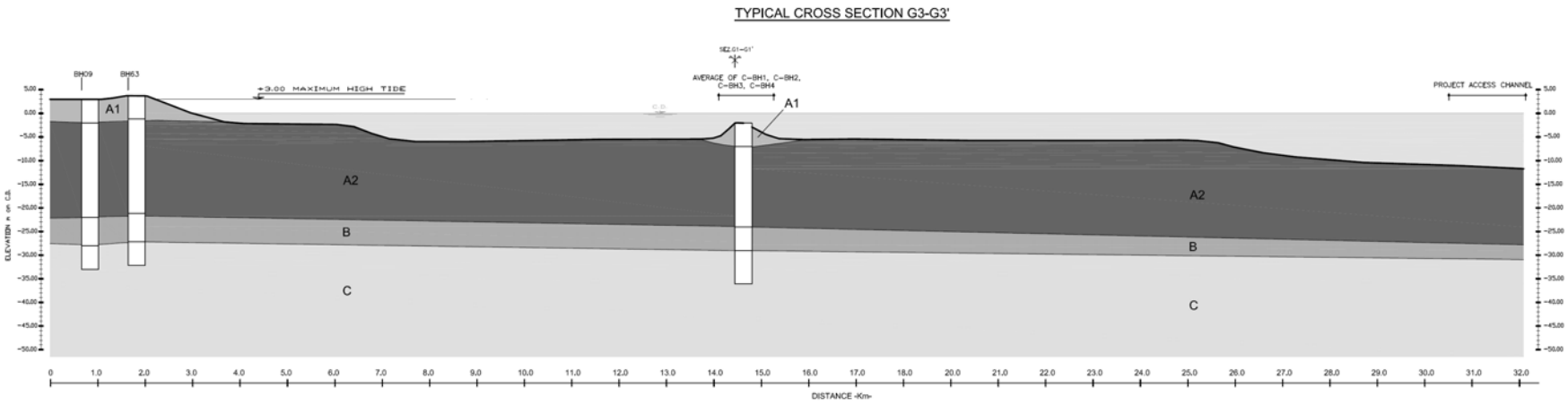
Source: Engineering Consultancy Service for New Al Faw Pot Port Master Plan / Consortium IECAF

Appendix 2.2-3 Soil Profile Cross section (AFGP G2- G2)



Source: Engineering Consultancy Service for New Al Faw Pot Port Master Plan / Consortium IECAF

Appendix 2.2-4 Soil Profile Cross section (AFGP G3- G3)



Source: Engineering Consultancy Service for New Al Faw Pot Port Master Plan / Consortium IECAF

Appendix 2.6-1 Ship Size Distribution by Ship Type at KZP in 2011

Ship Size by Ship Type called at KZP in 2011

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total (nos.)	Ratio (%)
Tanker (Ship Size/DWT)														
0~9,999	1	0	0	2	1	2	0	1	1	0	1	0	9	5.9
10,000~19,999	8	3	5	5	4	3	2	2	4	6	6	3	51	33.6
20,000~29,999	0	1	1	0	3	0	0	1	0	1	0	0	7	4.6
30,000~39,999	1	1	3	2	2	2	5	5	3	2	2	1	29	19.1
40,000~49,999	1	2	1	2	1	5	2	3	4	3	5	5	34	22.4
50,000~59,999	0	0	1	1	2	1	2	1	3	4	2	3	20	13.2
60,000~90,000	1	1	0	0	0	0	0	0	0	0	0	0	2	1.3
Total Number of Ships	12	8	11	12	13	13	11	13	15	16	16	12	152	100.0
Ratio (%)	7.9	5.3	7.2	7.9	8.6	8.6	7.2	8.6	9.9	10.5	10.5	7.9	100.0	
General Cargo Ships (Cargo Volume/ton)														
0~999	3	4	4	3	2	2	1	0	1	3	4	8	35	17.0
1,000~1,999	1	2	1	1	2	0	1	1	4	0	4	1	18	8.7
2,000~2,999	0	1	2	5	1	3	2	1	2	3	3	3	26	12.6
3,000~3,999	2	4	0	4	1	2	4	1	2	3	2	1	26	12.6
4,000~4,999	3	1	0	0	1	0	0	2	2	1	2	2	14	6.8
5,000~9,999	7	2	4	4	5	3	5	4	4	5	3	5	51	24.8
10,000~14,999	1	0	1	2	1	2	1	2	0	0	0	0	10	4.9
15,000~19,999	2	2	1	0	3	4	1	2	0	4	1	2	22	10.7
20,000~25,000	1	2	0	0	0	0	0	0	0	1	0	0	4	1.9
Total Number of Ships	20	18	13	19	16	16	15	13	15	20	19	22	206	100.0
Ratio (%)	9.7	8.7	6.3	9.2	7.8	7.8	7.3	6.3	7.3	9.7	9.2	10.7	100.0	
Dhow Ships														
Total Number of Ships	28	27	7	16	7	3	1	0	3	21	24	10	147	
Ratio (%)	19.0	18.4	4.8	10.9	4.8	2.0	0.7	0.0	2.0	14.3	16.3	6.8	100.0	
Grand Total of Ships	60	53	31	47	36	32	27	26	33	57	59	44	505	
Total except Dhow Ships	32	26	24	31	29	29	26	26	30	36	35	34	358	
Seasonal Ratio %	8.9	7.3	6.7	8.7	8.1	8.1	7.3	7.3	8.4	10.1	9.8	9.5	100.0	

Source: Prepared by Study Team based on GCPI's statistics data

Appendix 2.6-2 Ship Size Distribution by Ship Type at UQP in 2011

Ship Size by Ship Type called at UQP in 2011

Ship Size in Deadweight	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total	Ratio %
(Container Ships)														
0~9,999	4	3	1	3	0	2	1	0	0	1	0	0	15	1.7
10,000~14,999	3	6	4	4	3	4	5	7	9	8	8	4	65	7.2
15,000~19,999	12	9	8	9	9	17	7	2	4	3	5	7	92	10.2
20,000~29,999	11	11	9	12	13	3	8	13	12	10	11	13	126	14.0
30,000~39,999	0	1	1	3	6	5	6	3	6	4	3	3	41	4.6
40,000~50,000	0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
Total Number of Ships	30	30	23	31	31	31	27	25	31	27	27	27	340	37.8
Ratio (%)	8.8	8.8	6.8	9.1	9.1	9.1	7.9	7.4	9.1	7.9	7.9	7.9	100.0	
(General Cargo Ships)														
0~999	1	2	3	1	0	0	1	0	0	0	0	1	9	1.0
1,000~1,999	0	2	1	0	0	1	0	0	1	0	0	0	5	0.6
2,000~2,999	3	7	2	3	4	3	3	1	2	1	0	1	30	3.3
3,000~3,999	0	1	0	0	0	3	0	0	0	0	0	0	4	0.4
4,000~4,999	0	0	2	1	2	1	2	0	0	0	0	0	8	0.9
5,000~9,999	5	8	9	10	16	9	5	4	5	5	8	4	88	9.8
10,000~14,999	2	4	3	4	2	4	3	6	4	4	4	1	41	4.6
15,000~19,999	0	4	2	2	3	3	2	5	2	5	5	6	39	4.3
20,000~29,999	2	2	1	3	5	3	7	3	5	1	4	2	38	4.2
30,000~50,000	0	0	0	2	0	0	0	0	0	1	1	1	5	0.6
Total Number of Ships	13	30	23	26	32	27	23	19	19	17	22	16	267	29.7
Ratio (%)	4.9	11.2	8.6	9.7	12.0	10.1	8.6	7.1	7.1	6.4	8.2	6.0	100.0	
(RO/RO)														
0~4,999	3	1	2	0	0	2	0	0	0	0	1	0	9	1.0
5,000~9,999	6	8	6	9	7	1	6	3	4	4	4	3	61	6.8
10,000~19,999	5	4	2	1	3	0	2	4	3	3	3	3	33	3.7
20,000~30,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Total Number of Ships	14	13	10	10	10	3	8	7	7	7	8	6	103	11.4
Ratio (%)	13.6	12.6	9.7	9.7	9.7	2.9	7.8	6.8	6.8	6.8	7.8	5.8	100.0	
(PCTV /Vehicle Carriers)														
0~9,999	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
10,000~19,999	2	2	1	1	1	3	4	3	1	2	1	5	26	2.9
20,000~30,000	3	4	2	2	1	2	2	0	2	0	1	0	19	2.1
Total Number of Ships	5	6	3	3	2	5	6	3	3	2	2	5	45	5.0
Ratio (%)	11.1	13.3	6.7	6.7	4.4	11.1	13.3	6.7	6.7	4.4	4.4	11.1	100.0	
(Bulk Carriers)														
0~9,999	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
10,000~14,999	0	0	0	0	0	1	0	0	0	1	0	0	2	0.2
15,000~19,999	0	0	1	0	0	0	0	0	0	2	0	0	3	0.3
20,000~29,999	4	2	4	0	3	3	0	2	3	2	3	4	30	3.3
30,000~49,999	7	1	4	7	2	6	3	4	5	4	1	5	49	5.4
50,000~80,000	1	5	6	8	7	7	8	7	5	3	1	2	60	6.7
Total Number of Ships	12	8	15	15	12	18	11	13	13	12	5	11	145	16.1
Ratio (%)	8.3	5.5	10.3	10.3	8.3	12.4	7.6	9.0	9.0	8.3	3.4	7.6	100.0	
Grand Total of Ships	74	87	74	85	87	84	75	67	73	65	64	65	900	100.0
Seasonal Ratio %	8.2	9.7	8.2	9.4	9.7	9.3	8.3	7.4	8.1	7.2	7.1	7.2	100.0	

Source: Prepared by Study Team based on GCPI's statistics data

Appendix 2.6-3 Ship Size Distribution by Ship Type at KZP in 2012

Ship Size by Ship Type called at KZP in 2012

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total (nos.)	Ratio (%)
Tanker (Ship Size/DWT)														
0~9,999	0	0	0	0	2	0	0	0	1	2	5	5	15	7.0
10,000~19,999	4	7	6	6	6	3	3	6	4	4	3	4	56	26.0
20,000~29,999	0	0	0	1	0	0	0	0	0	0	0	0	1	0.5
30,000~39,999	2	2	2	3	0	0	2	3	4	3	4	3	28	13.0
40,000~49,999	3	4	7	7	8	10	4	6	8	9	6	6	78	36.3
50,000~59,999	5	4	3	0	2	3	5	4	3	3	2	3	37	17.2
60,000~90,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Total Number of Ships	14	17	18	17	18	16	14	19	20	21	20	21	215	100.0
Ratio (%)	6.5	7.9	8.4	7.9	8.4	7.4	6.5	8.8	9.3	9.8	9.3	9.8	100.0	
General Cargo Ships (Cargo Volume/ton)														
0~999	0	1	5	6	4	5	2	7	6	2	7	5	50	24.9
1,000~1,999	0	3	3	4	2	2	1	4	3	4	0	1	27	13.4
2,000~2,999	2	0	2	1	1	2	1	0	2	3	1	3	18	9.0
3,000~3,999	6	2	2	1	1	1	2	0	1	0	2	0	18	9.0
4,000~4,999	2	3	1	1	0	2	3	1	2	1	1	2	19	9.5
5,000~9,999	3	3	4	5	4	4	3	1	2	1	2	1	33	16.4
10,000~14,999	1	0	2	1	1	1	2	1	1	5	2	2	19	9.5
15,000~19,999	1	3	1	2	1	1	1	0	1	0	1	2	14	7.0
20,000~25,000	0	0	0	1	0	1	0	0	0	1	0	0	3	1.5
Total Number of Ships	15	15	20	22	14	19	15	14	18	17	16	16	201	100.0
Ratio (%)	7.5	7.5	10.0	10.9	7.0	9.5	7.5	7.0	9.0	8.5	8.0	8.0	100.0	
Dhow Ships														
Total Number of Ships	9	14	7	5	2	5	0	0	3	22	16	18	101	
Ratio (%)	8.9	13.9	6.9	5.0	2.0	5.0	0.0	0.0	3.0	21.8	15.8	17.8	100.0	
Grand Total of Ships	38	46	45	44	34	40	29	33	41	60	52	55	517	
Total except Dhow Ships	29	32	38	39	32	35	29	33	38	38	36	37	416	
Seasonal Ratio %	7.0	7.7	9.1	9.4	7.7	8.4	7.0	7.9	9.1	9.1	8.7	8.9	100.0	

Source: Prepared by Study Team based on GCPI's statistics data

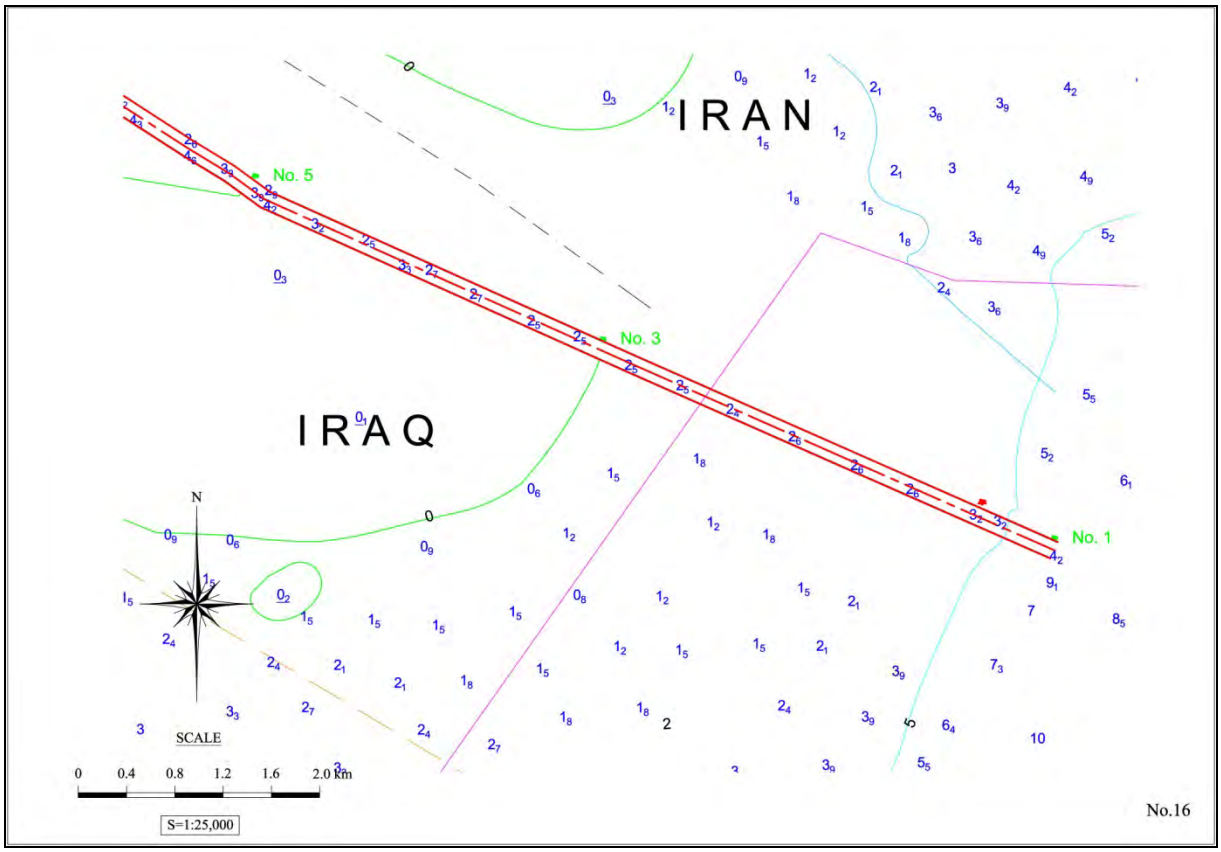
Appendix 2.6-4 Ship Size Distribution by Ship Type at UQP in 2012

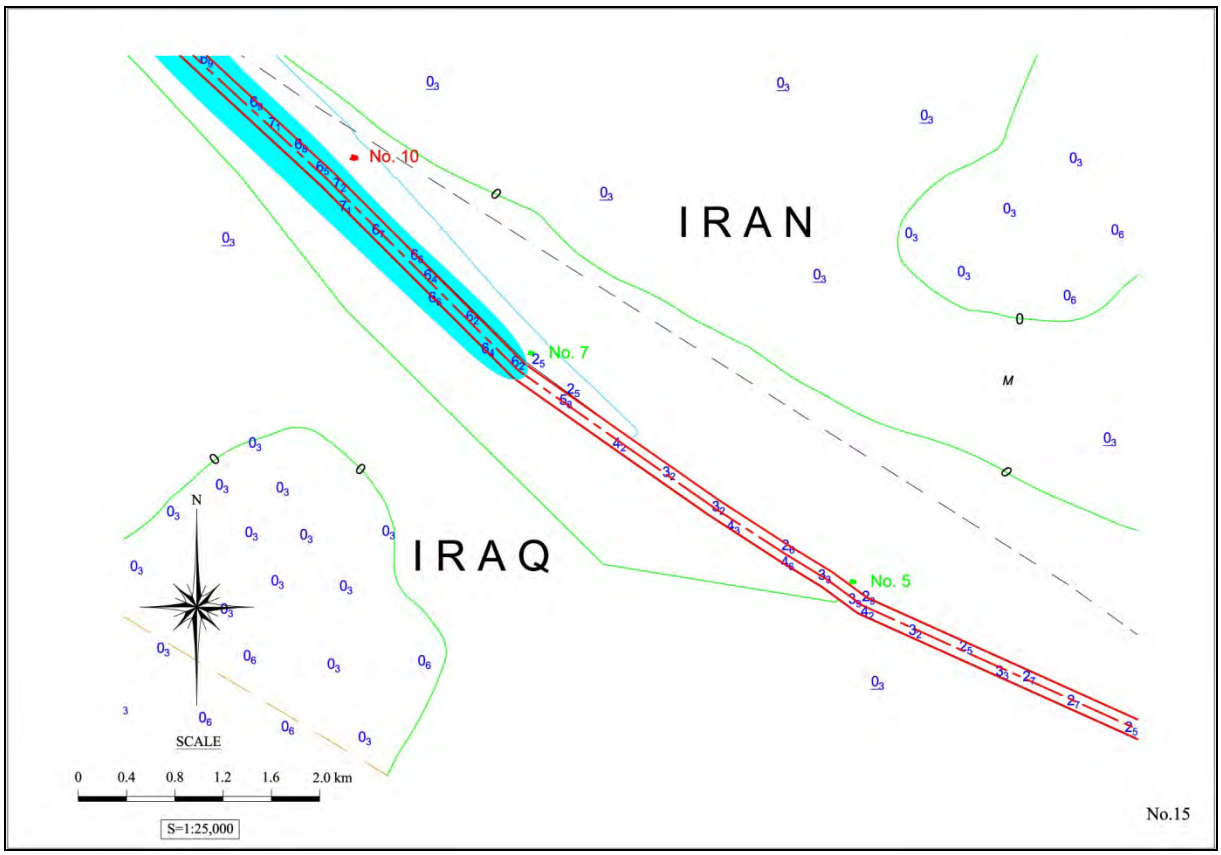
Ship Size by Ship Type called at UQP in 2012

Ship Size in Deadweight	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total	Ratio %
(Container Ships)														
0~9,999	0	0	0	1	3	1	0	0	0	0	0	0	5	0.6
10,000~14,999	6	4	5	6	5	6	4	3	6	6	7	9	67	8.0
15,000~19,999	11	13	8	6	4	7	6	9	6	6	4	4	84	10.1
20,000~29,999	13	12	14	17	17	14	15	14	15	16	16	14	177	21.2
30,000~39,999	4	1	0	1	0	0	0	0	1	1	3	2	13	1.6
40,000~50,000	0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
Total Number of Ships	34	30	27	31	29	28	25	26	28	29	30	30	347	41.6
Ratio (%)	9.8	8.6	7.8	8.9	8.4	8.1	7.2	7.5	8.1	8.4	8.6	8.6	100.0	
(General Cargo Ships)														
0~999	0	2	0	1	0	0	0	0	1	3	1	1	9	1.1
1,000~1,999	0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
2,000~2,999	0	3	3	1	0	0	0	0	0	0	1	0	8	1.0
3,000~3,999	0	1	2	1	0	0	0	0	0	0	1	0	5	0.6
4,000~4,999	1	1	0	0	1	0	0	0	3	0	1	1	8	1.0
5,000~9,999	8	5	4	1	4	6	4	5	8	3	5	5	58	7.0
10,000~14,999	10	6	2	2	3	6	4	5	5	1	3	6	53	6.4
15,000~19,999	1	1	3	1	2	0	2	2	0	3	2	3	20	2.4
20,000~29,999	6	2	5	2	4	0	3	2	4	5	2	3	38	4.6
30,000~50,000	3	1	2	1	2	3	2	2	2	1	1	2	22	2.6
Total Number of Ships	29	22	21	11	16	15	15	16	23	16	17	21	222	26.6
Ratio (%)	13.1	9.9	9.5	5.0	7.2	6.8	6.8	7.2	10.4	7.2	7.7	9.5	100.0	
(RO/RO)														
0~4,999	1	1	0	0	0	0	0	0	0	2	0	0	4	0.5
5,000~9,999	0	4	2	3	6	5	4	3	4	4	6	7	48	5.8
10,000~19,999	0	1	3	2	4	4	3	2	5	4	3	3	34	4.1
20,000~30,000	0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
Total Number of Ships	1	6	5	5	10	9	7	5	9	11	9	10	87	10.4
Ratio (%)	1.1	6.9	5.7	5.7	11.5	10.3	8.0	5.7	10.3	12.6	10.3	11.5	100.0	
(PCTV /Vehicle Carriers)														
0~9,999	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
10,000~19,999	2	3	2	2	1	5	2	4	7	4	3	4	39	4.7
20,000~30,000	0	0	1	1	0	1	0	0	0	1	1	0	5	0.6
Total Number of Ships	2	3	3	3	1	6	2	4	7	5	4	4	44	5.3
Ratio (%)	4.5	6.8	6.8	6.8	2.3	13.6	4.5	9.1	15.9	11.4	9.1	9.1	100.0	
(Bulk Carriers)														
0~9,999	3	0	0	0	0	0	0	0	0	0	0	0	3	0.4
10,000~14,999	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
15,000~19,999	0	0	0	2	0	0	0	0	0	0	0	1	3	0.4
20,000~29,999	2	0	1	1	3	4	1	6	1	2	1	1	23	2.8
30,000~49,999	1	3	3	5	1	3	5	3	8	5	3	7	47	5.6
50,000~80,000	4	4	4	1	7	8	5	6	6	7	5	1	58	7.0
Total Number of Ships	10	7	8	9	11	15	11	15	15	14	9	10	134	16.1
Ratio (%)	7.5	5.2	6.0	6.7	8.2	11.2	8.2	11.2	11.2	10.4	6.7	7.5	100.0	
Grand Total of Ships	76	68	64	59	67	73	60	66	82	75	69	75	834	100.0
Seasonal Ratio %	9.1	8.2	7.7	7.1	8.0	8.8	7.2	7.9	9.8	9.0	8.3	9.0	100.0	

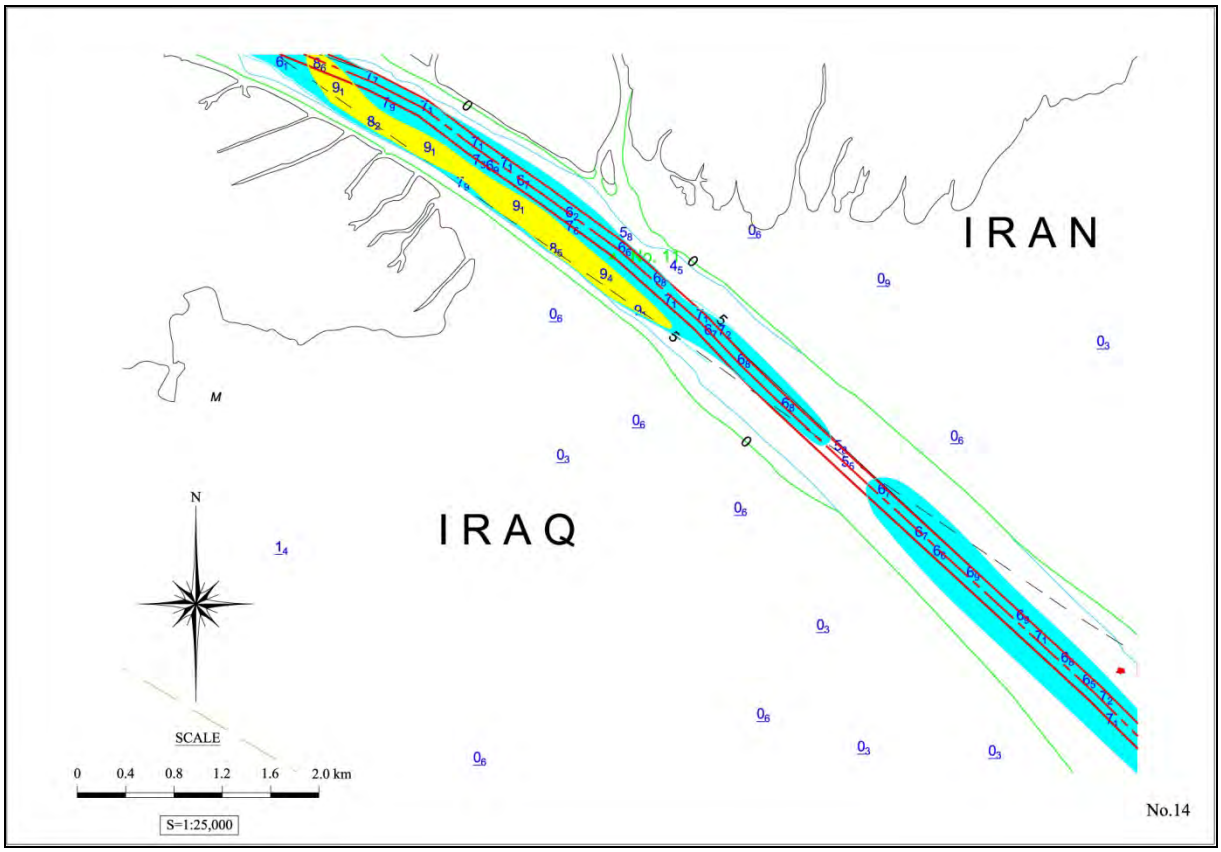
Source: Prepared by Study Team based on GCPI's statistics data

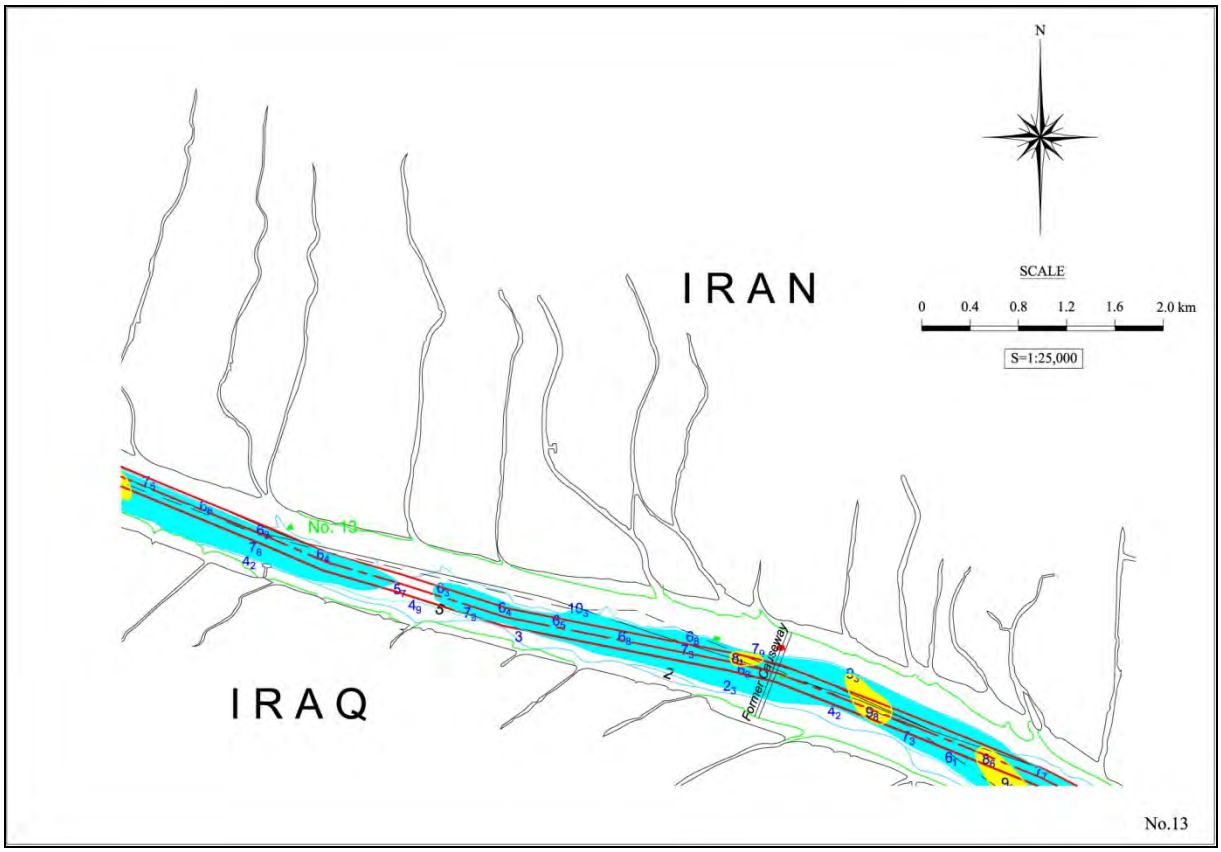
Appendix 2.7-1(1) Depth of Shatt al Arab Water Way(1)



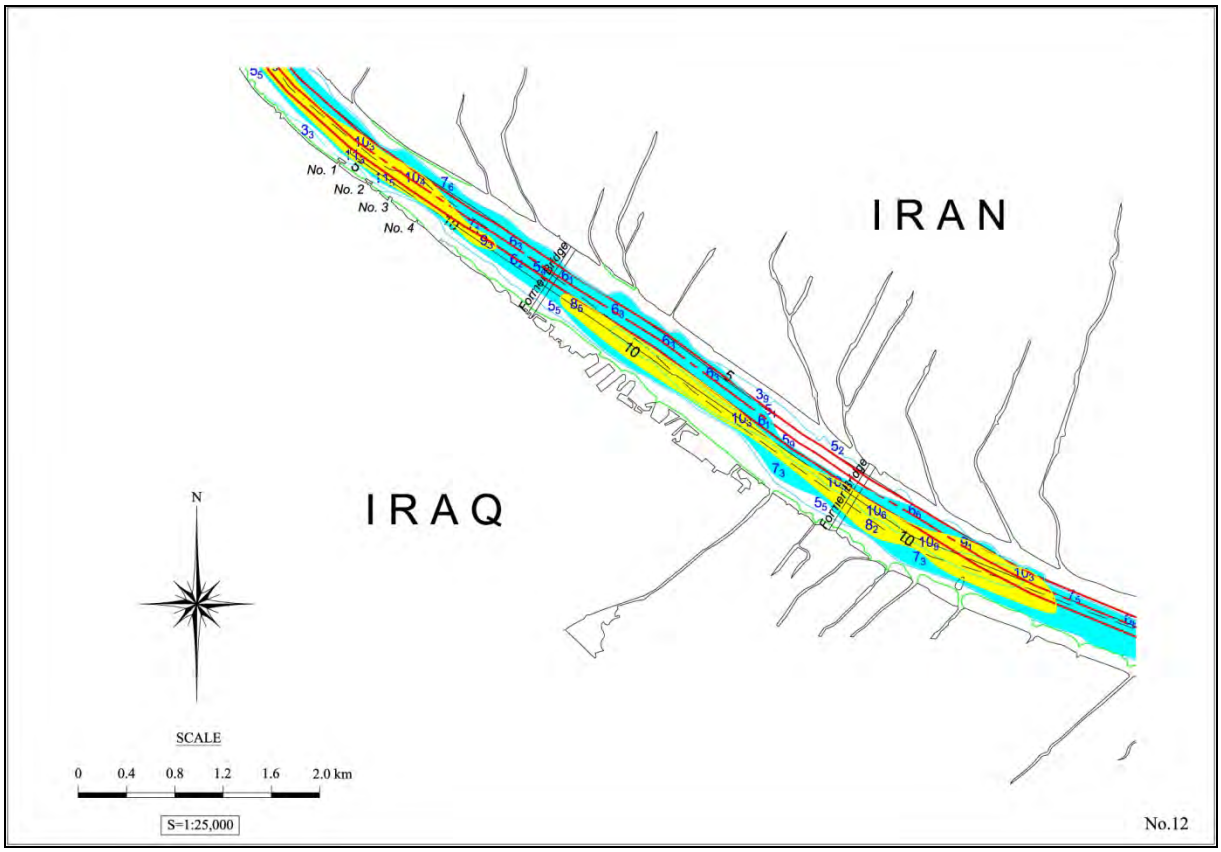


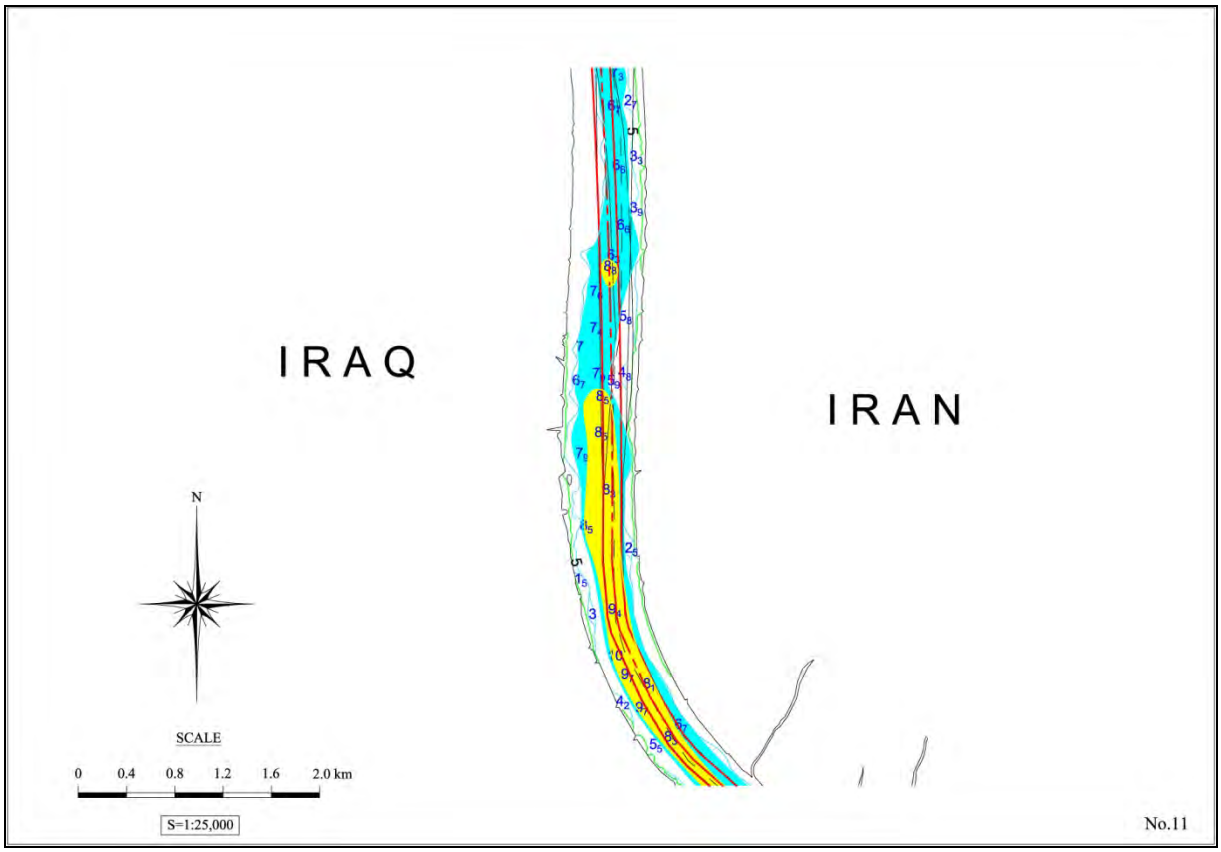
Appendix 2.7-1(2) Depth of Shatt al Arab Water Way(2)



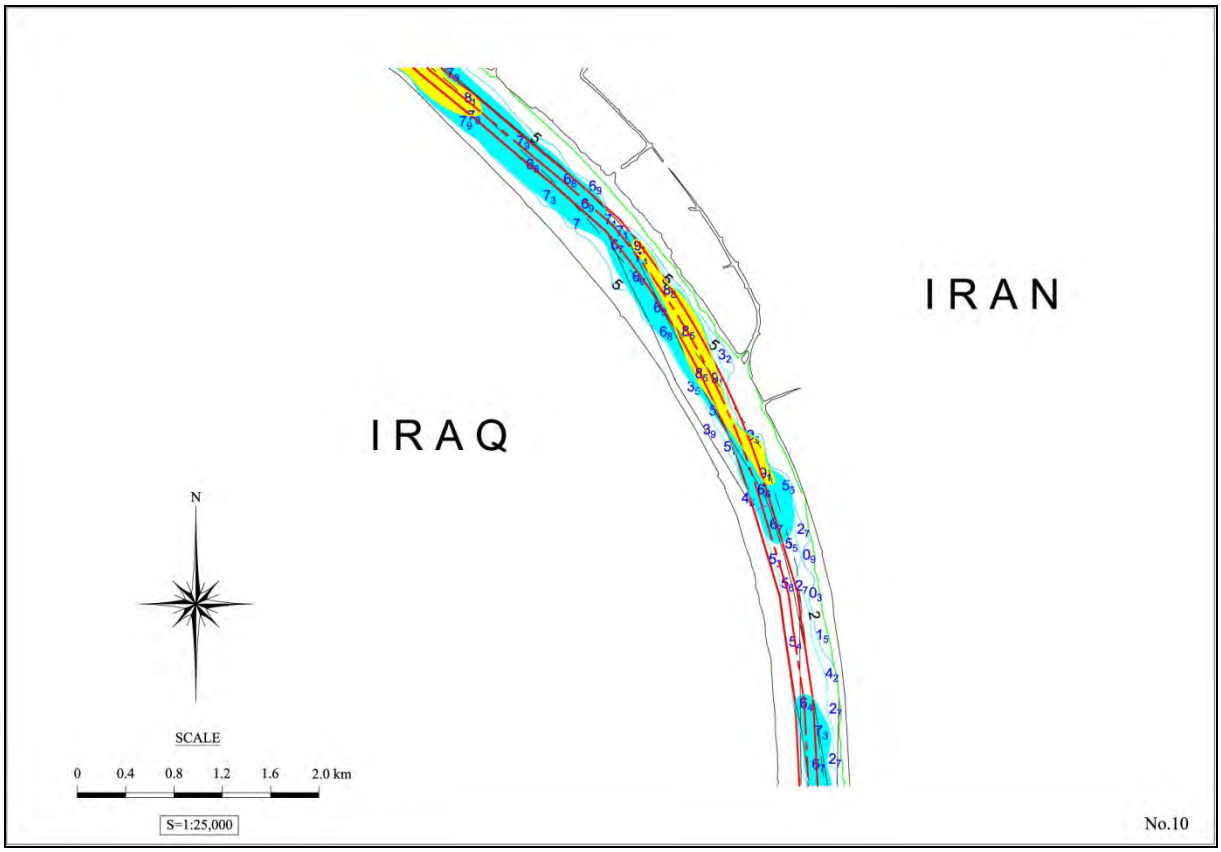


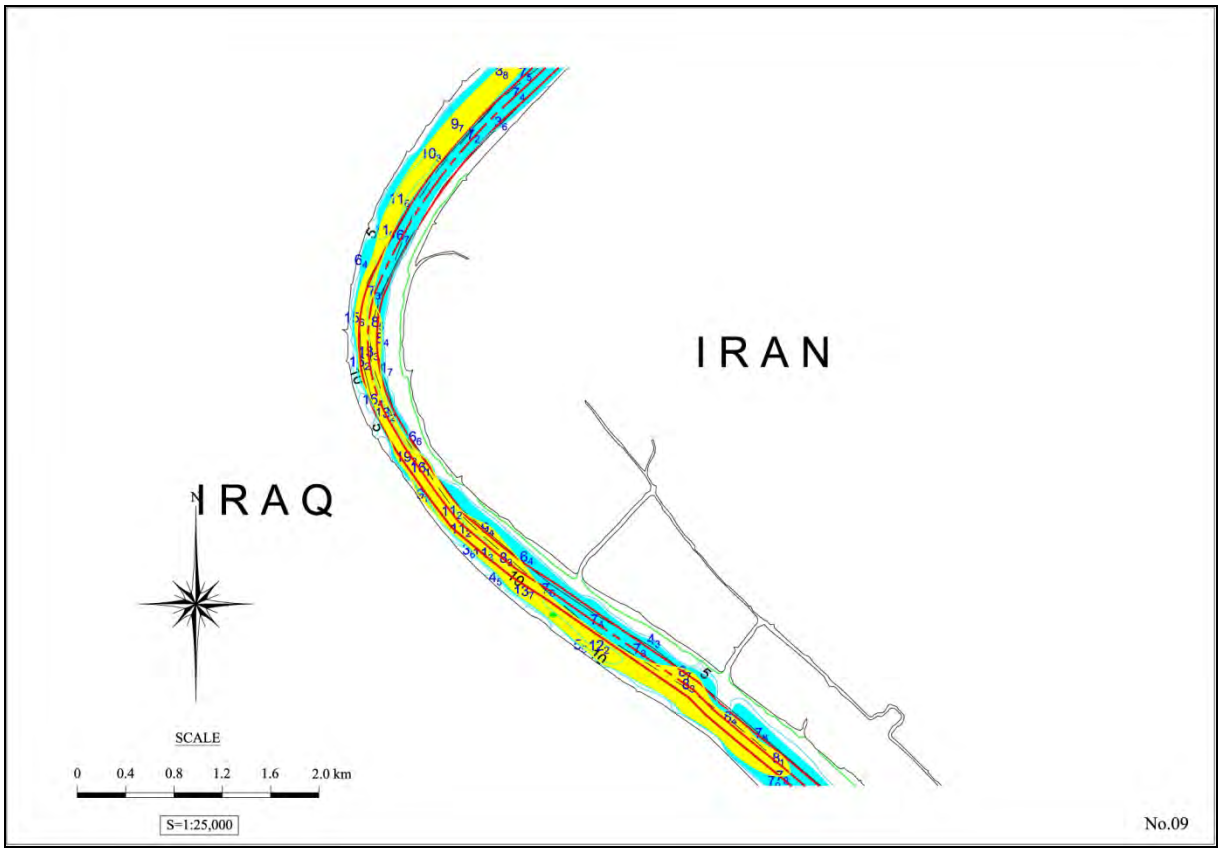
Appendix 2.7-1(3) Depth of Shatt al Arab Water Way(3)



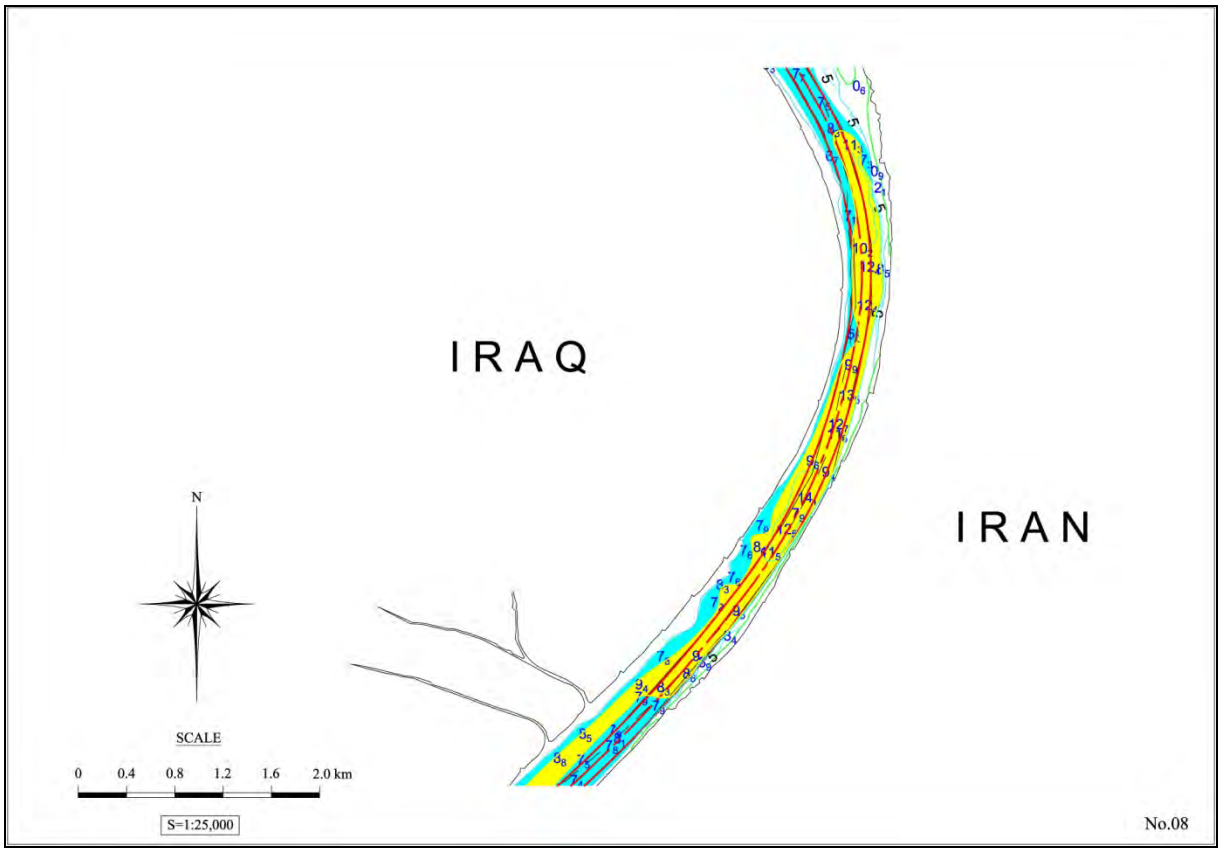


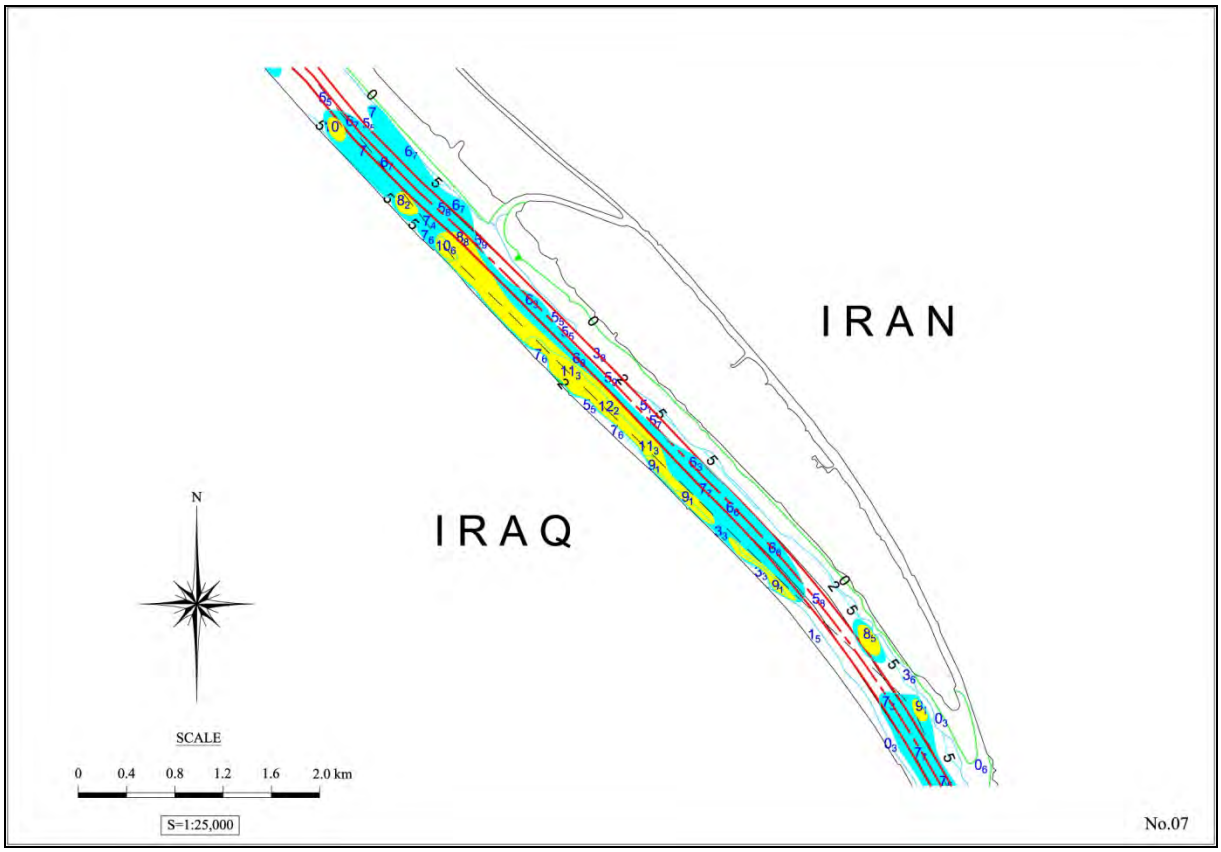
Appendix 2.7-1(4) Depth of Shatt al Arab Water Way(4)



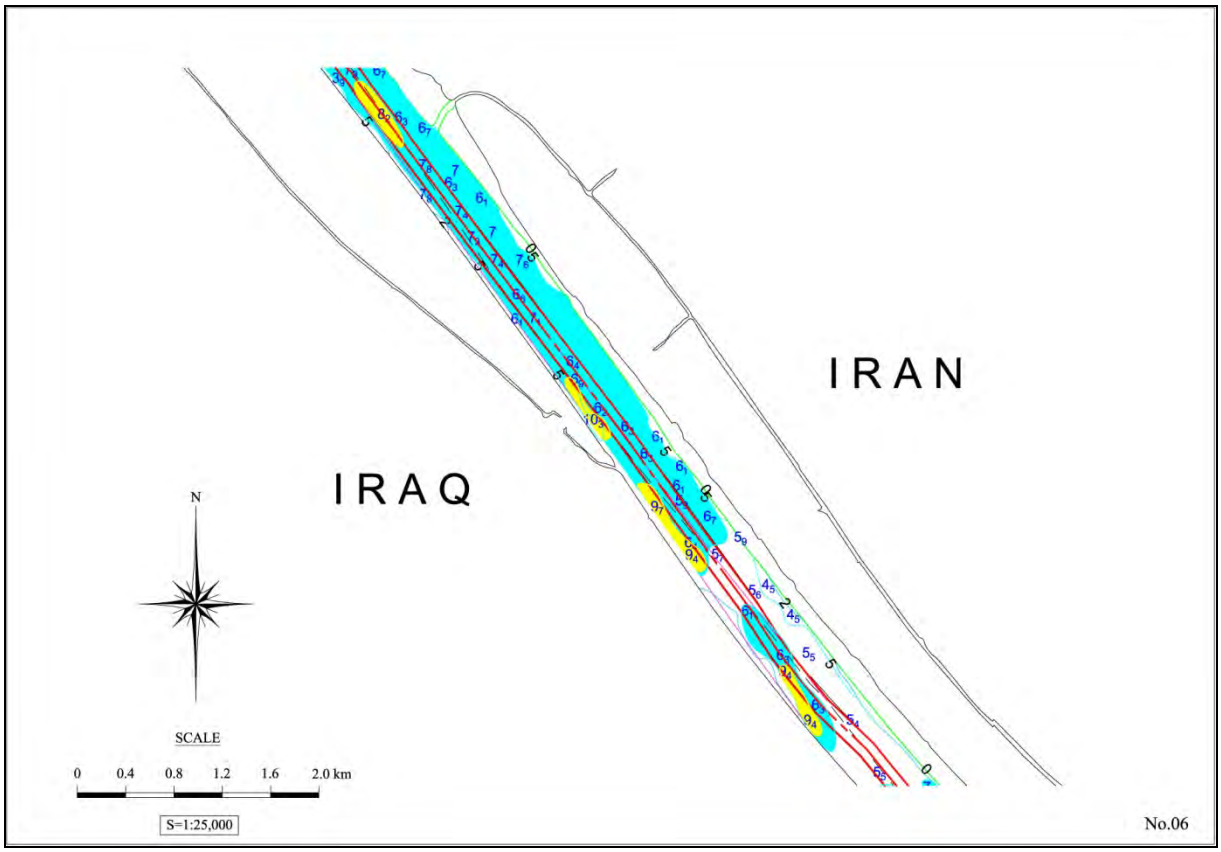


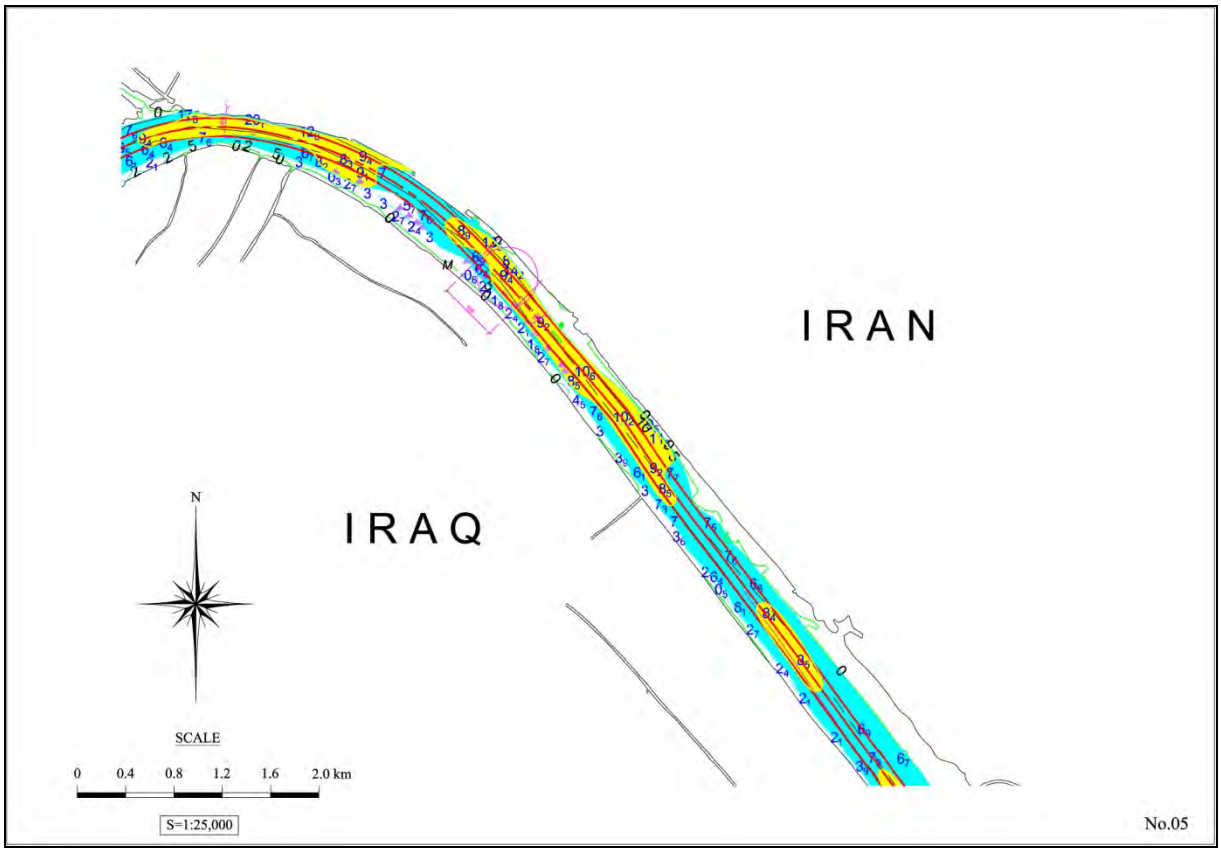
Appendix 2.7-1(5) Depth of Shatt al Arab Water Way(5)



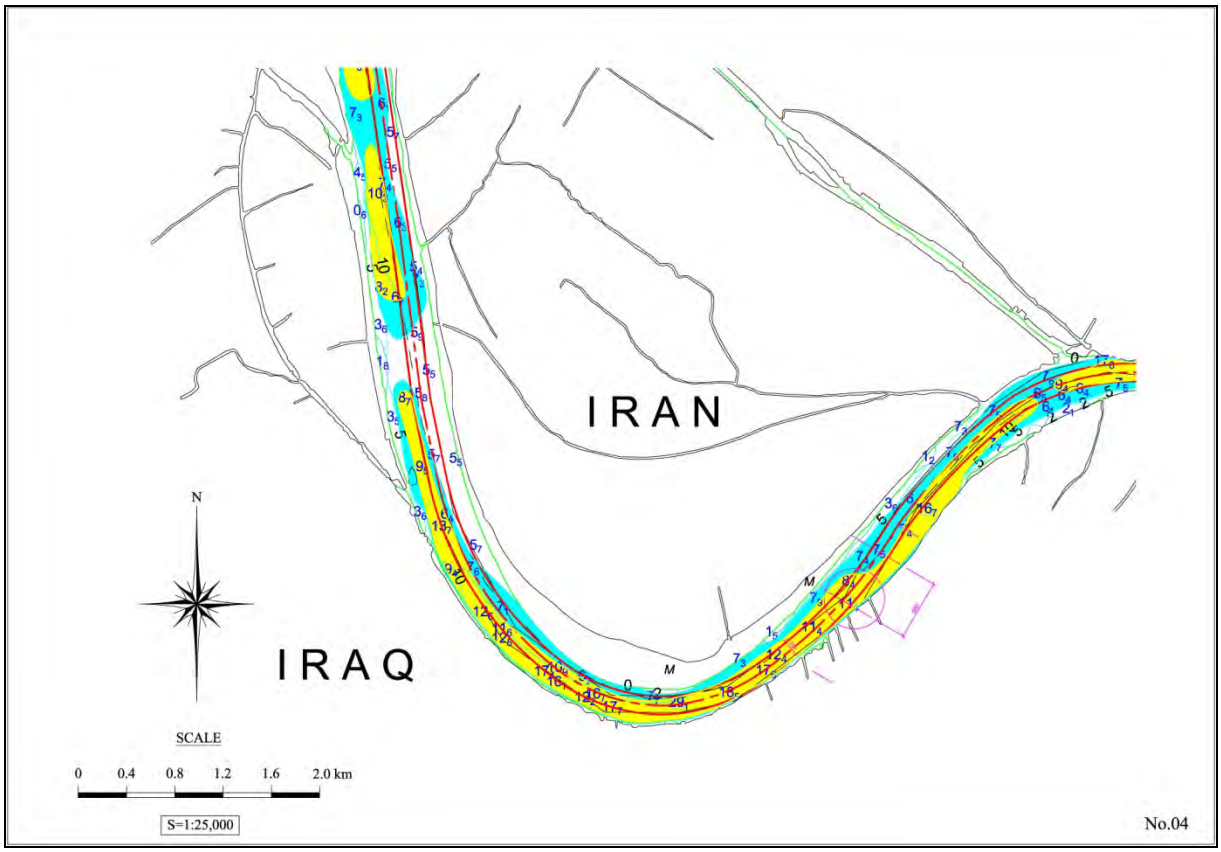


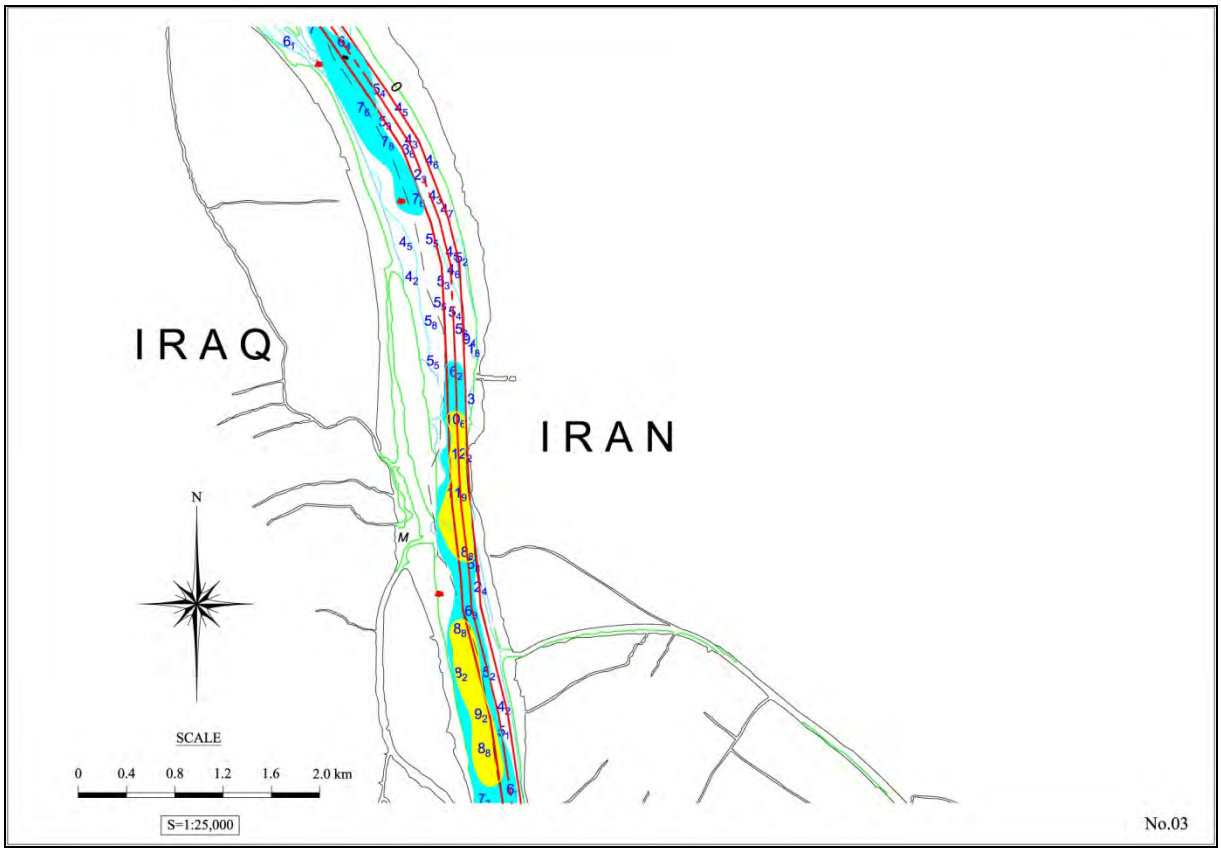
Appendix 2.7-1 (6) Depth of Shatt al Arab Water Way(6)



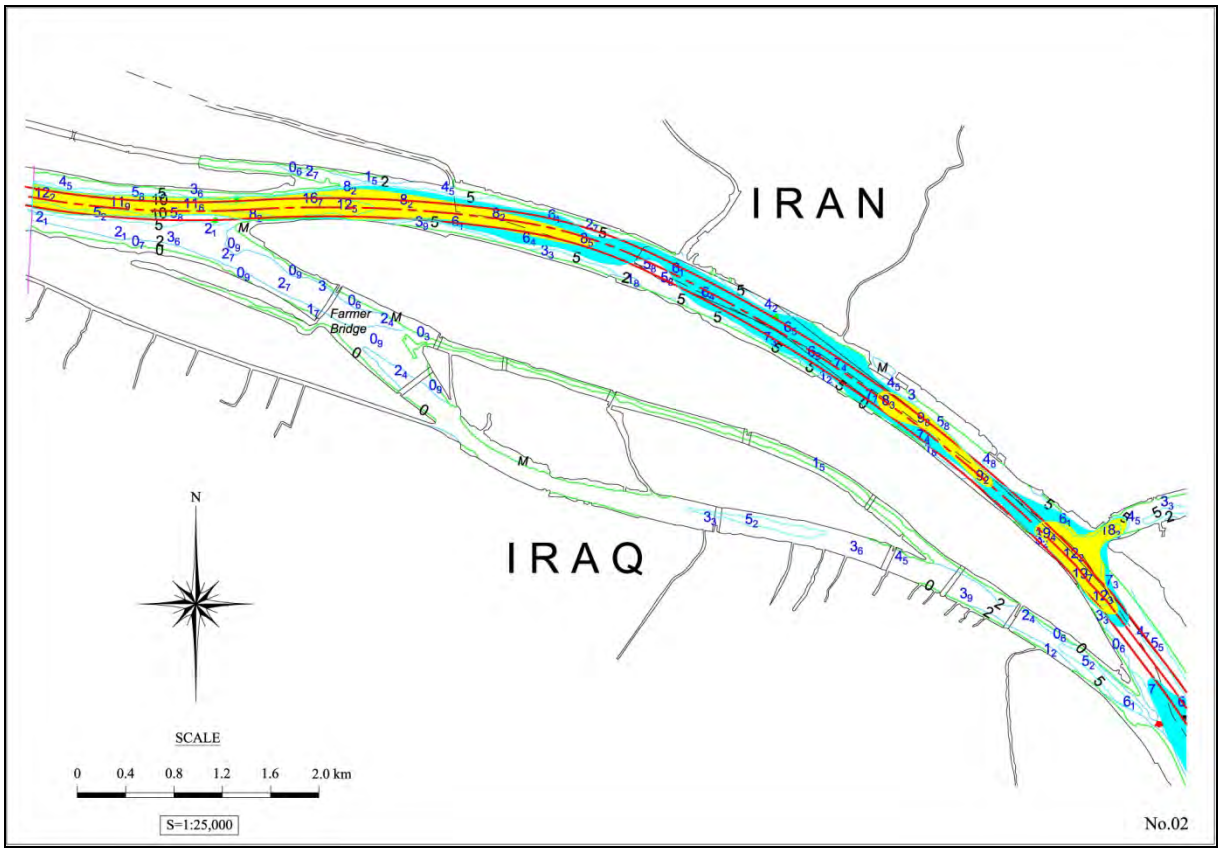


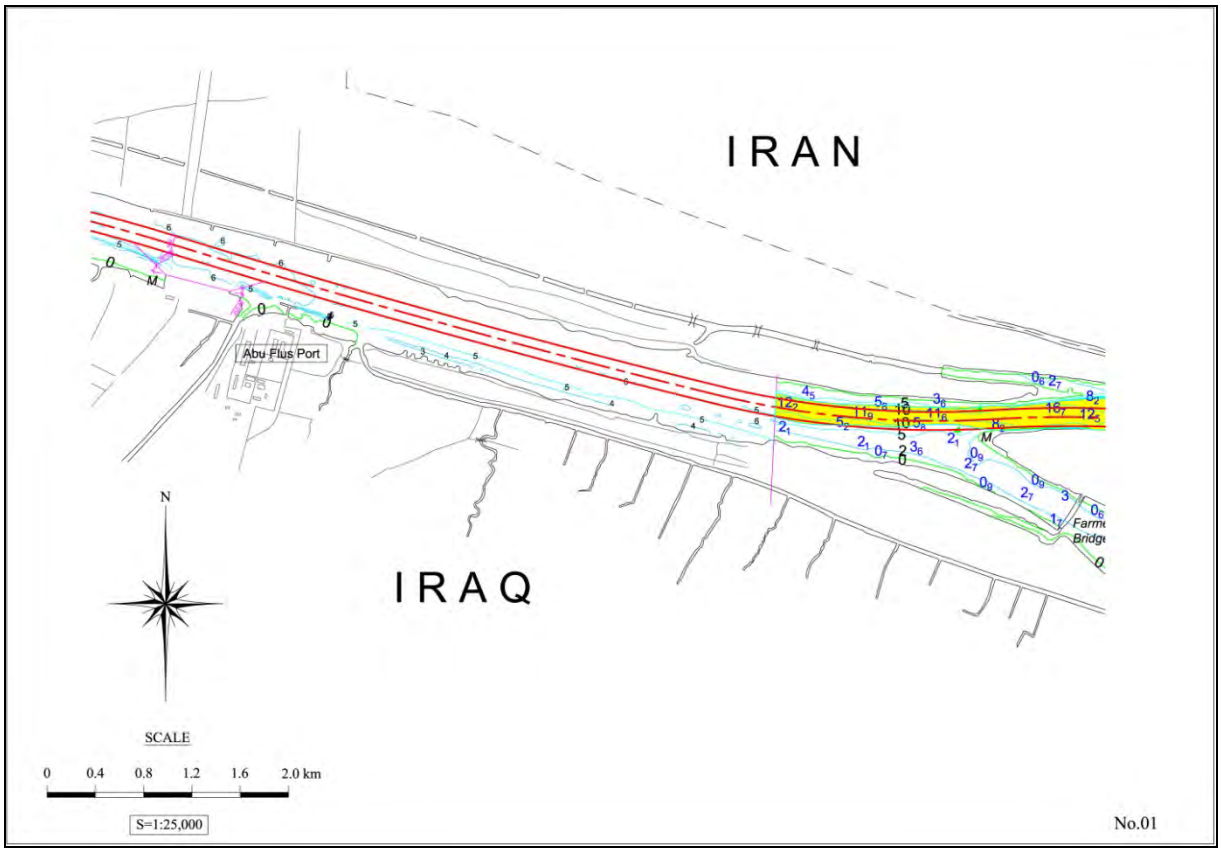
Appendix 2.7-1(7) Depth of Shatt al Arab Water Way(7)



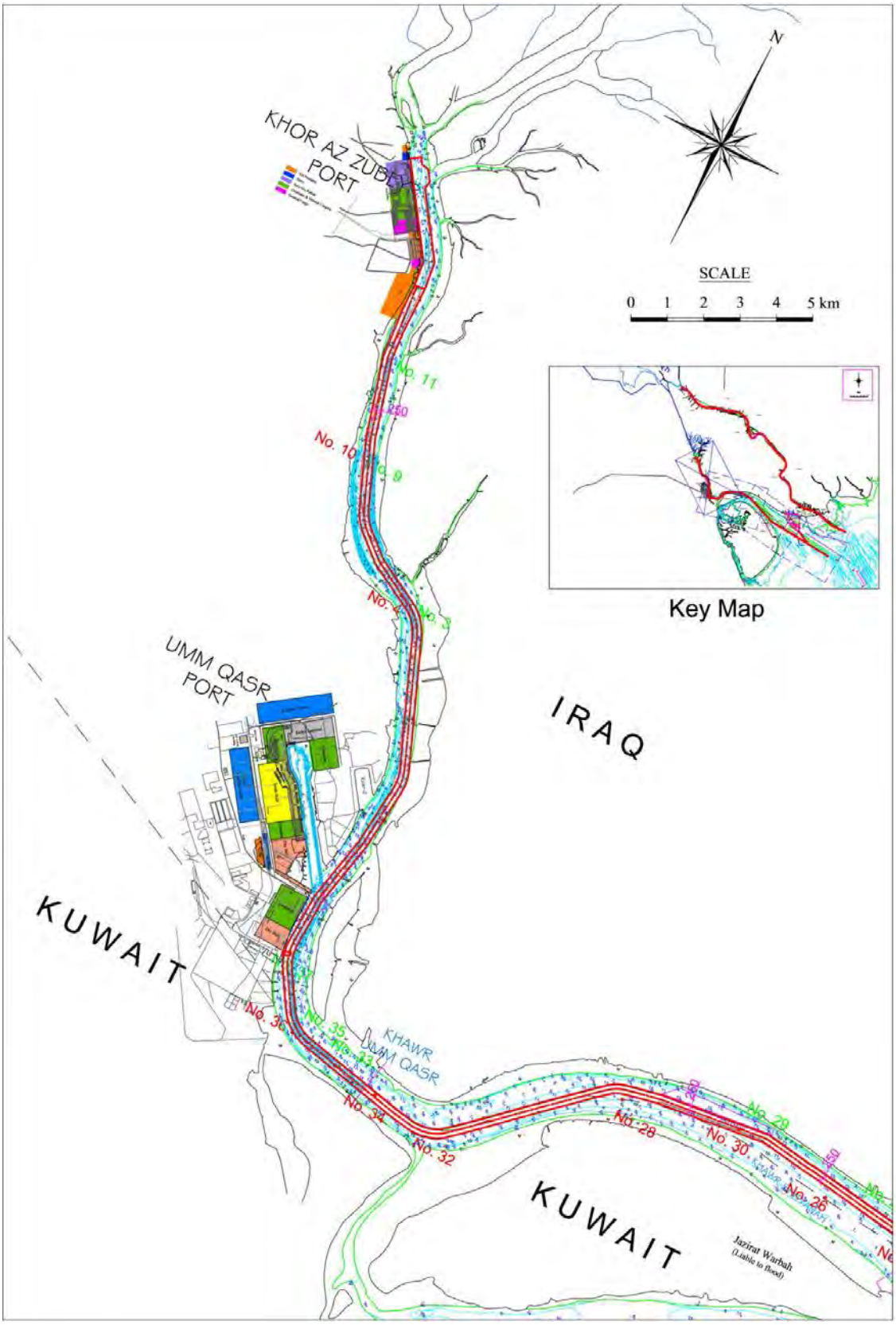


Appendix 2.7-1(8) Depth of Shatt al Arab Water Way(8)



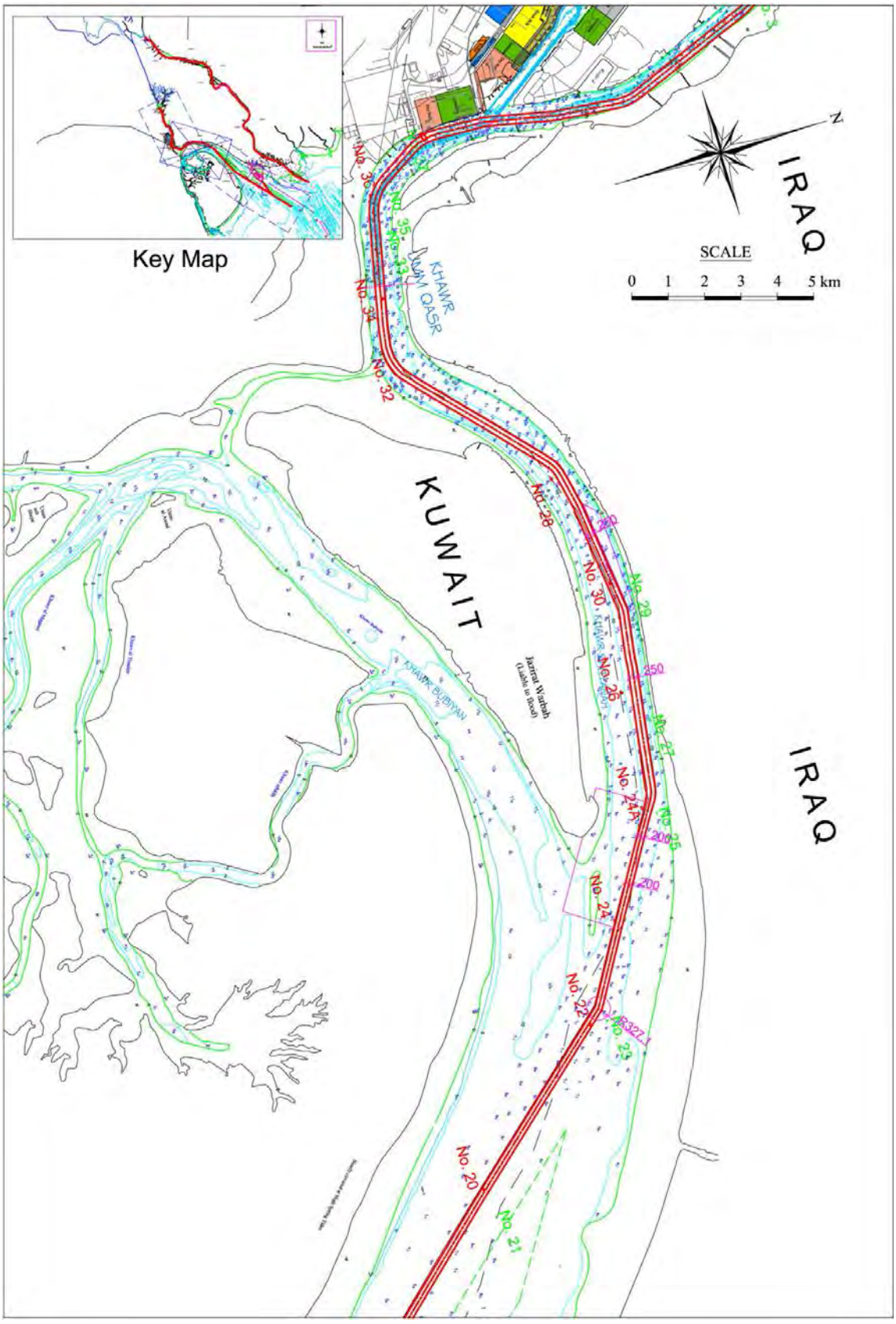


Appendix 5.4-1(1) Development Plans of the Khawr Abdallah Channel (1)



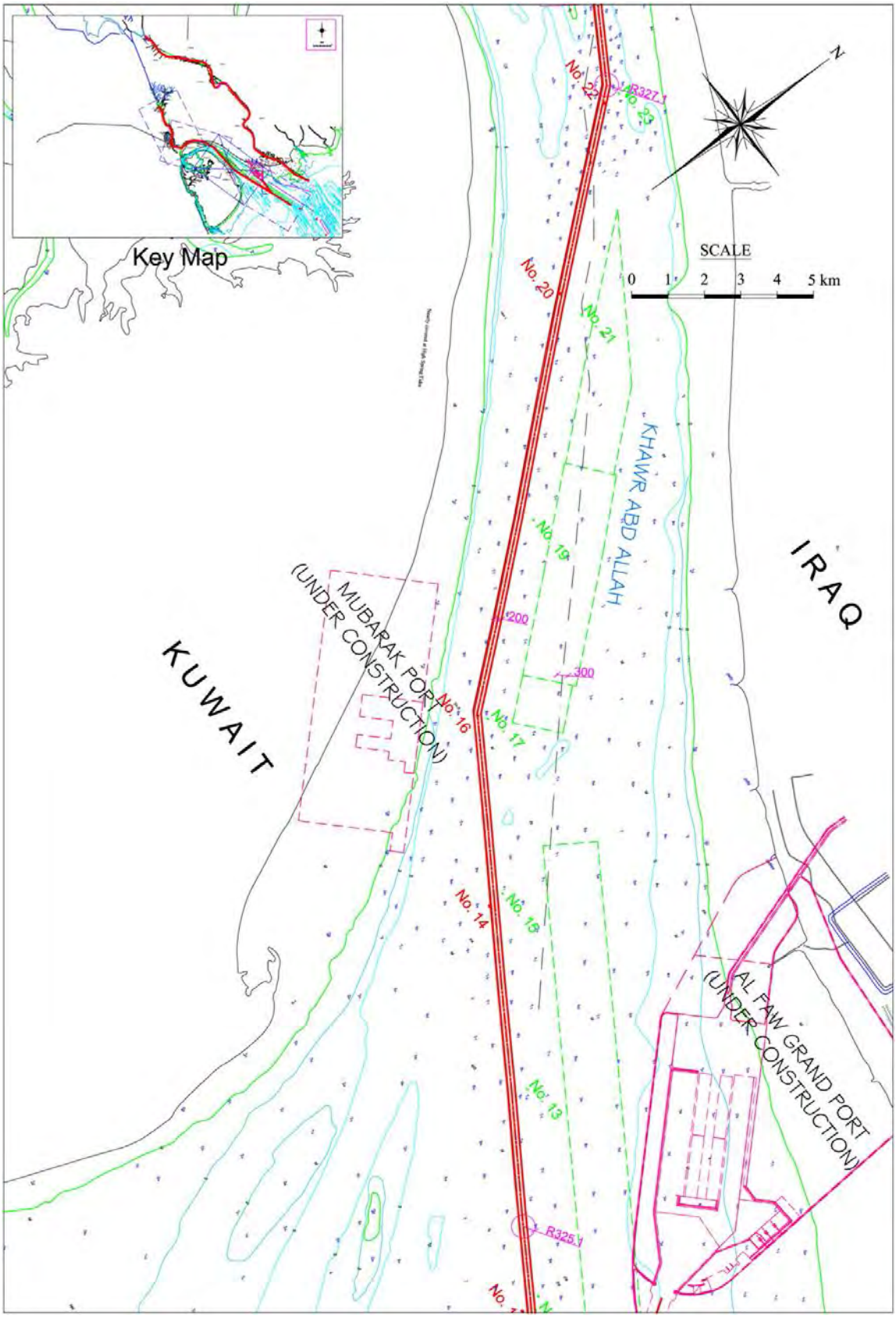
Source: Prepared by JICA Study Team based on charts and hydrographic surveys by GCPI

Appendix 5.4-1(2) Development Plans of the Khawr Abdallah Channel (2)



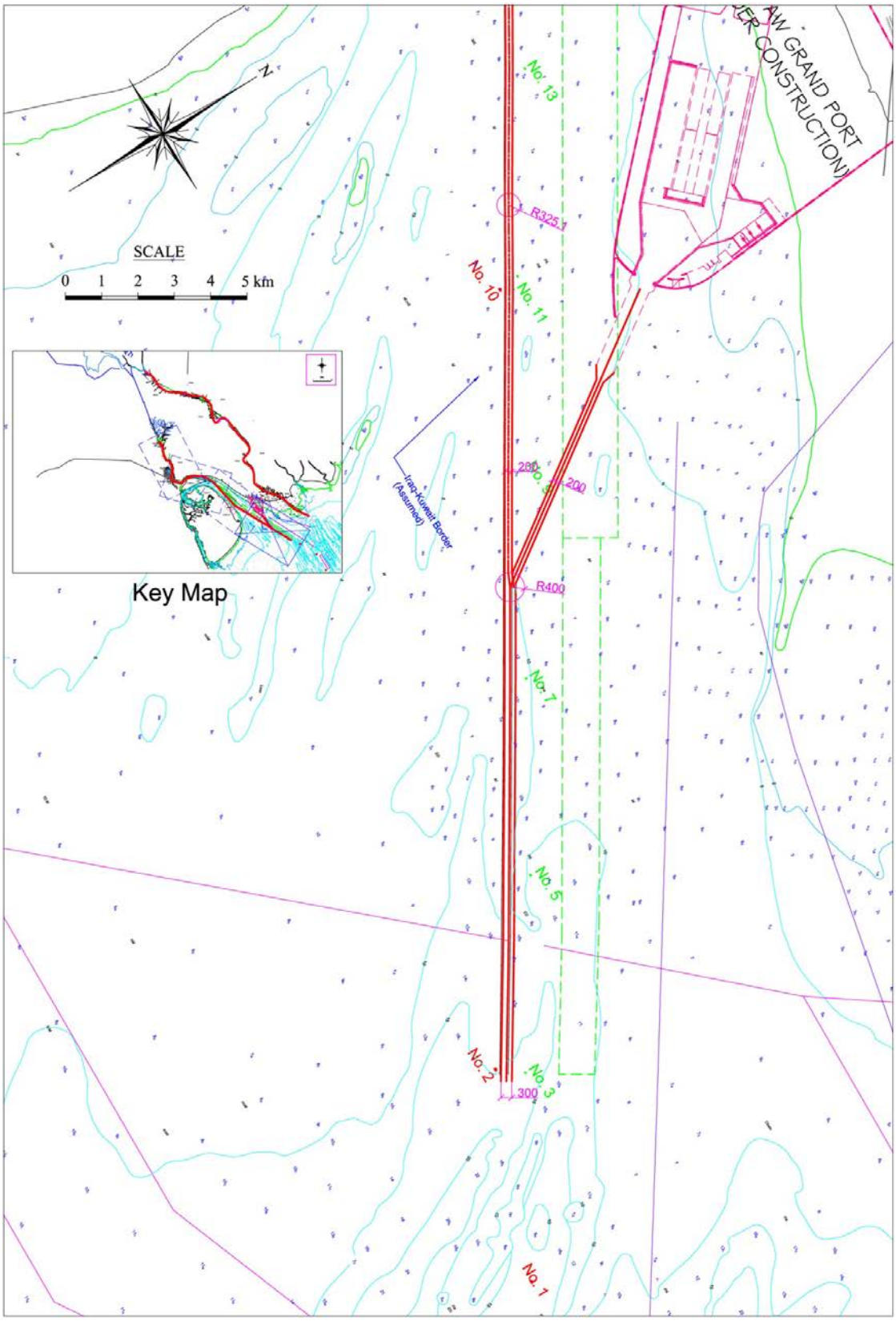
Source: Prepared by JICA Study Team based on charts and hydrographic surveys by GCPI

Appendix 5.4-1(3) Development Plans of the Khawr Abdallah Channel (3)



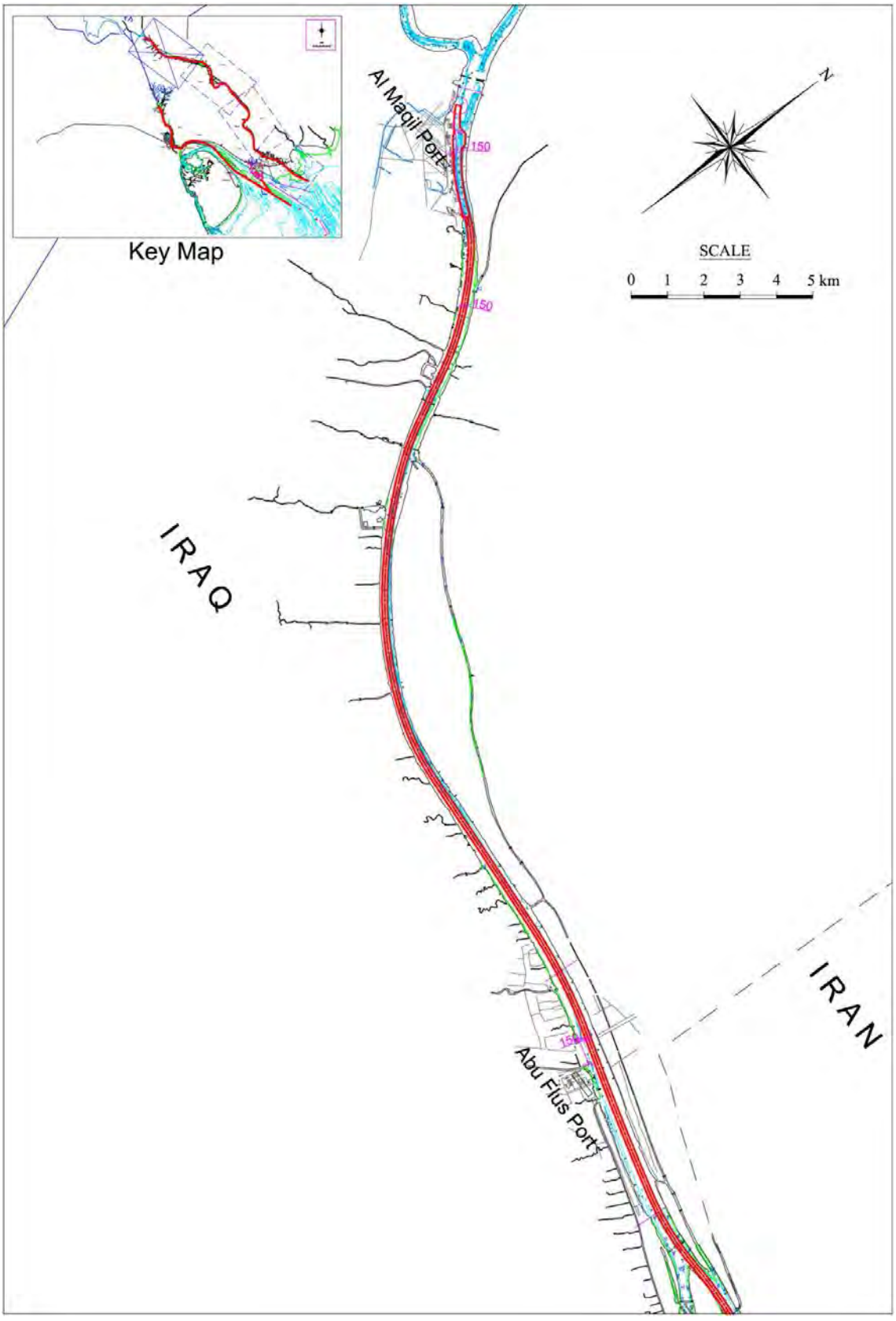
Source: Prepared by JICA Study Team based on charts and hydrographic surveys by GCPI

Appendix 5.4-1(4) Development Plans of the Khawr Abdallah Channel (4)



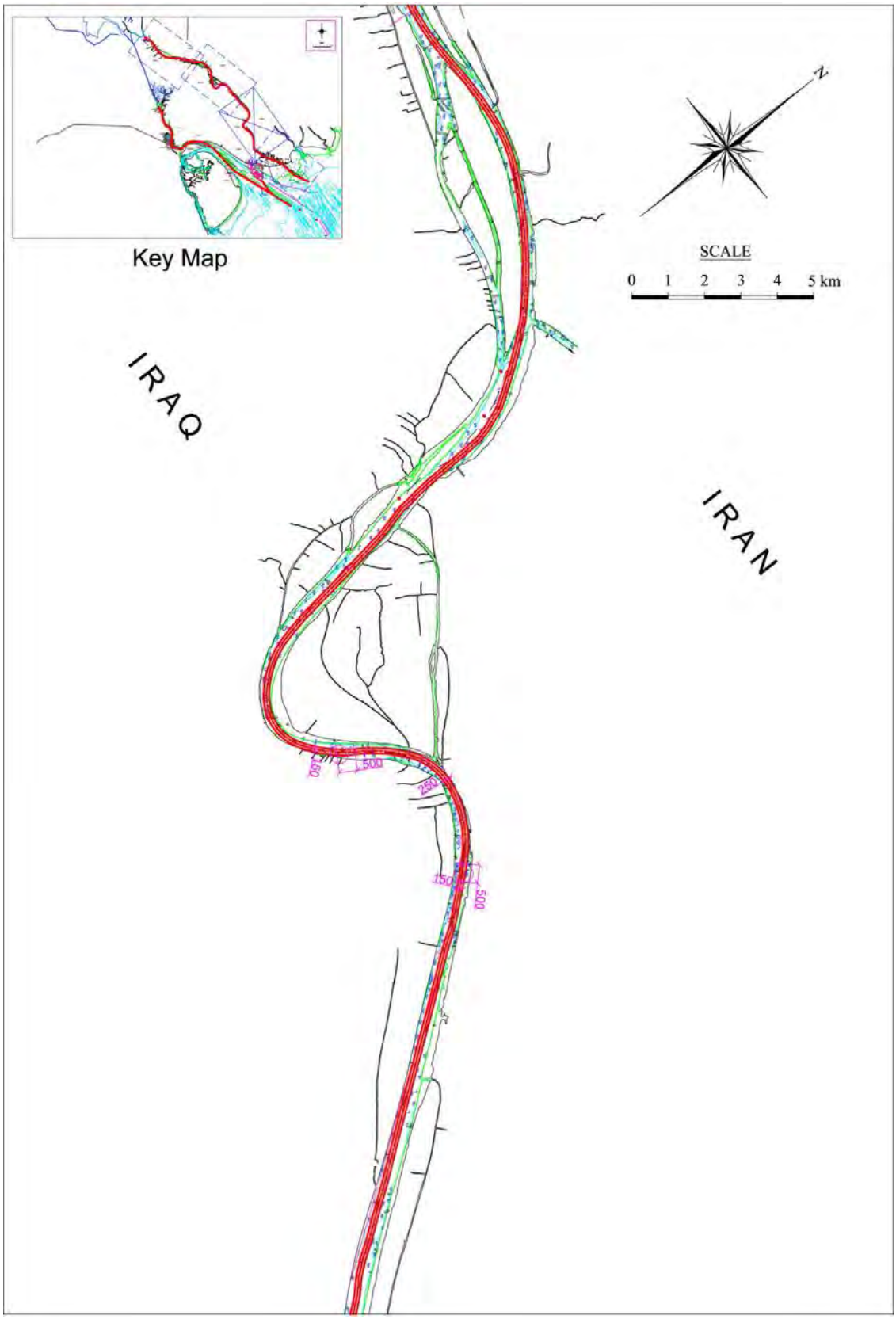
Source: Prepared by JICA Study Team based on charts and hydrographic surveys by GCPI

Appendix 5.4-2(1) Development Plans for the Shatt Al Arab Channel



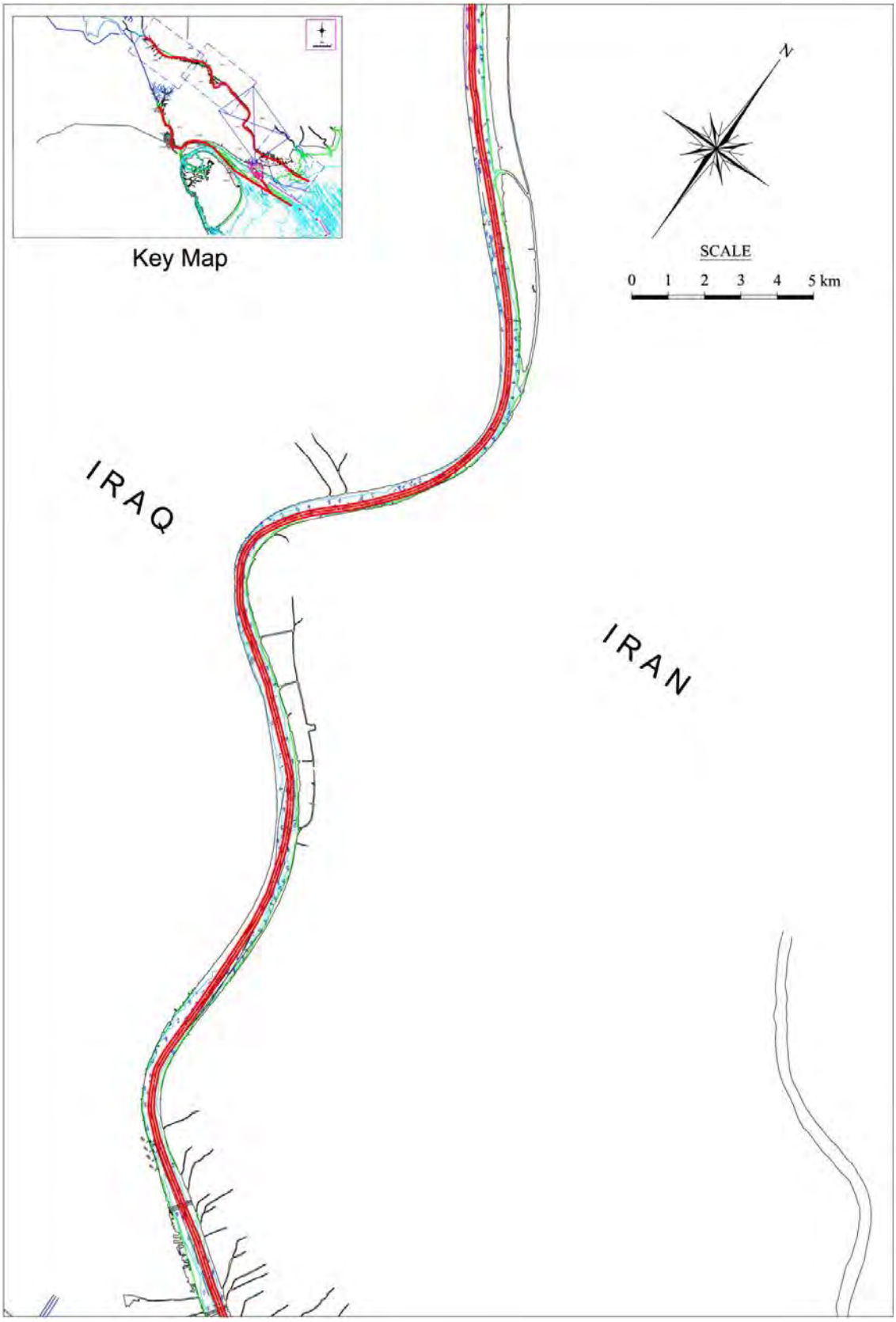
Source: JICA Study Team

Appendix 5.4-2(2) Development Plans for the Shatt Al Arab Channel



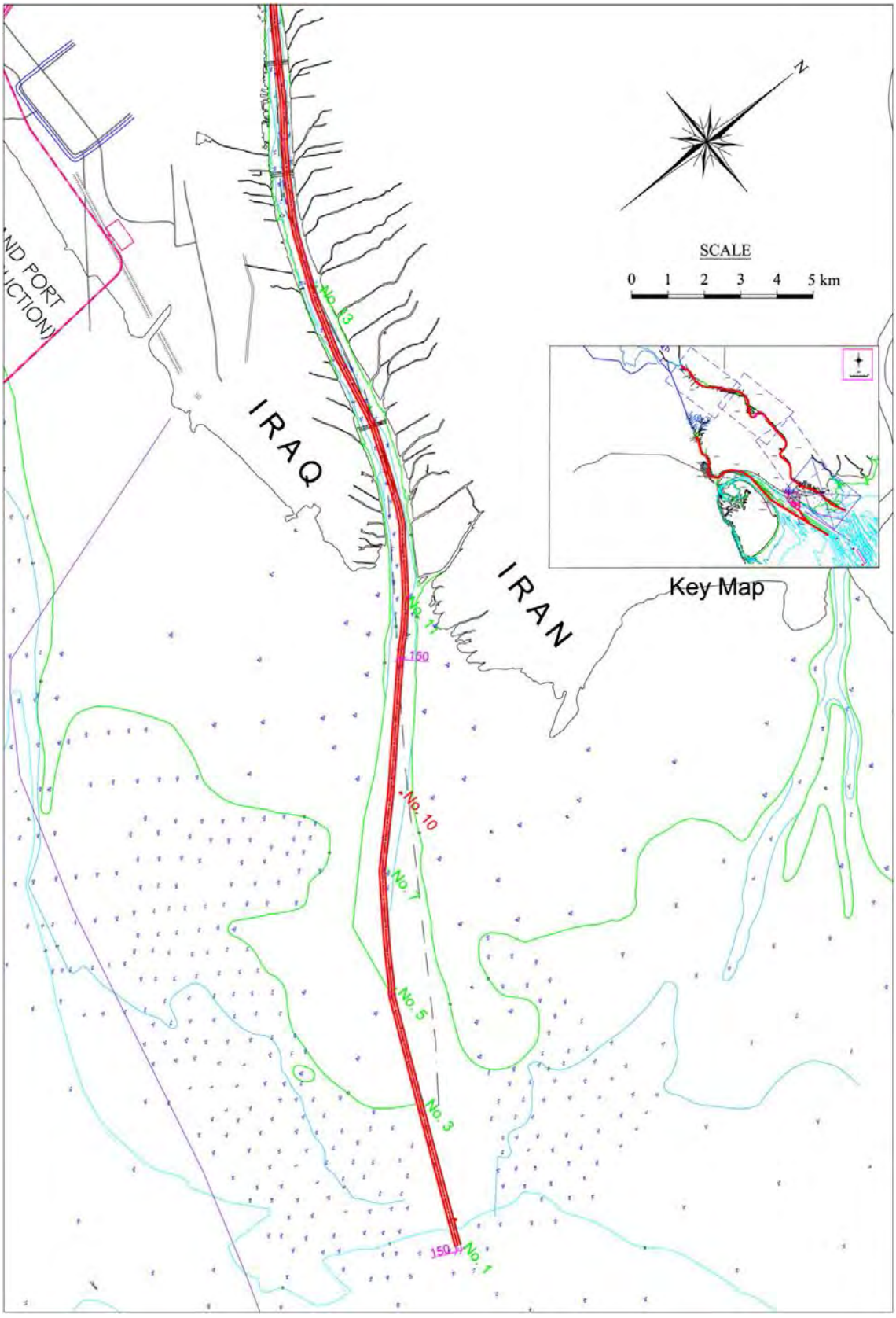
Source: JICA Study Team

Appendix 5.4-2 (3) Development Plans for the Shatt Al Arab Channel



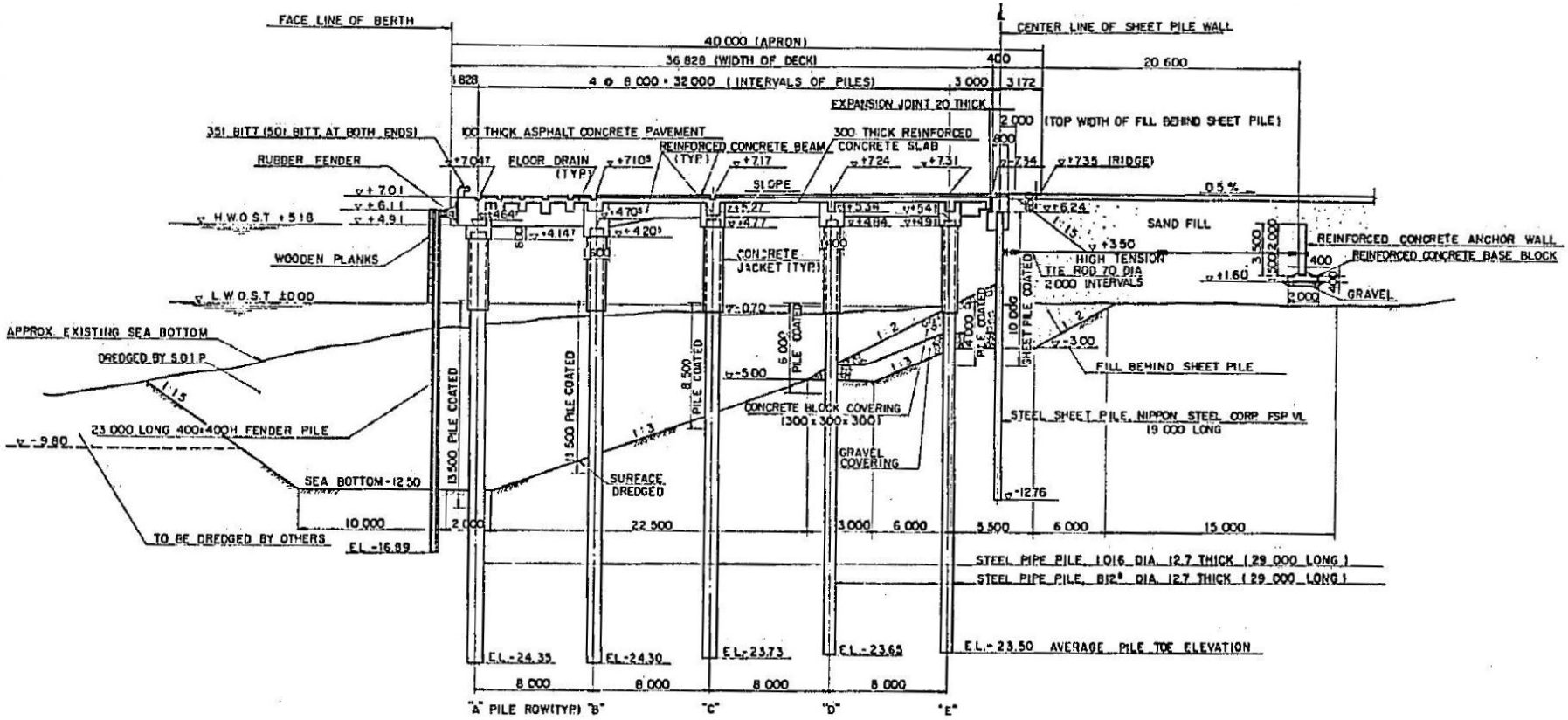
Source: JICA Study Team

Appendix 5.4-2(4) Development Plans for the Shatt Al Arab Channel



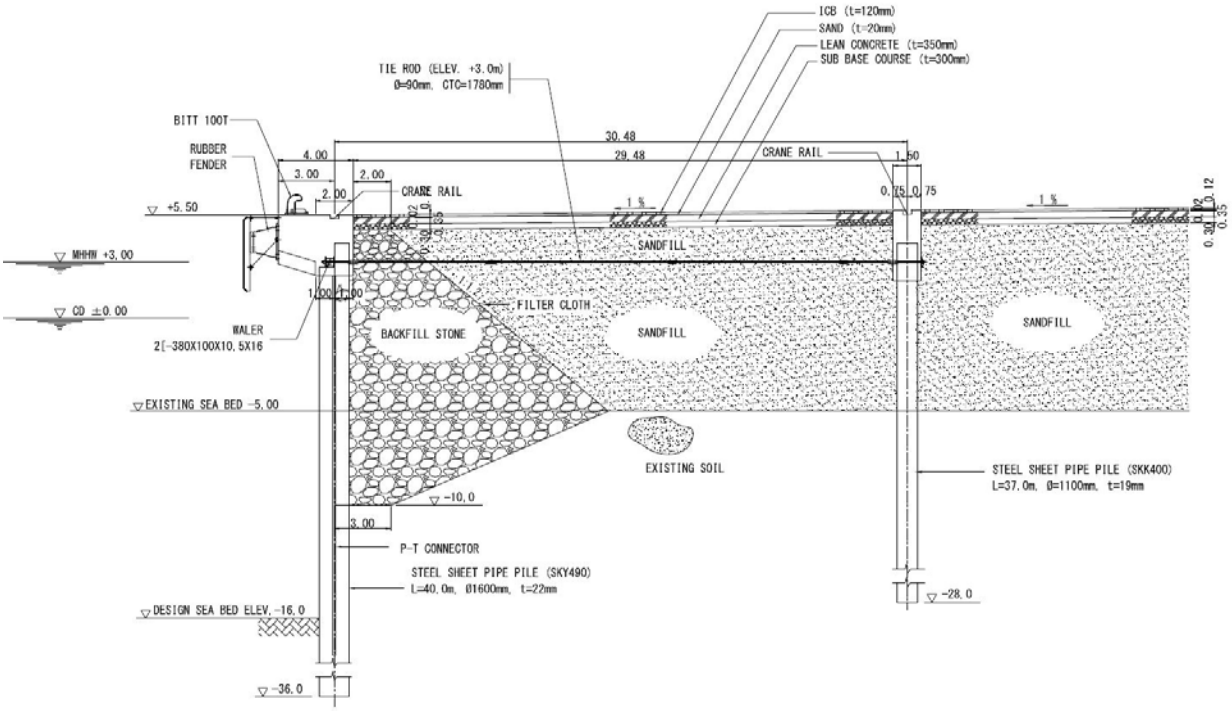
Source: JICA Study Team

Appndix 5.5-1 Section of No. 5 Berth in UQP South



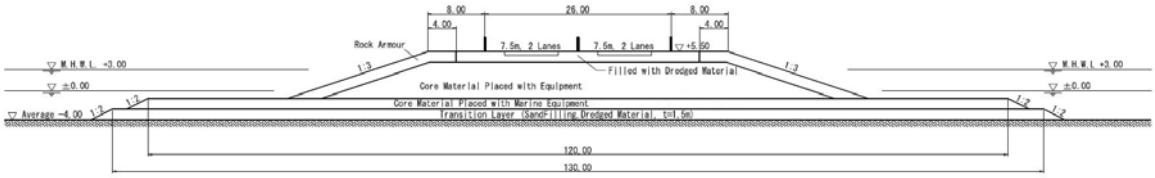
Source: As-Built Drawings Umm Qasr Container Terminal 1977, PCI & Penta Ocean Construction

Appendix 5.5-2 Section of Container Berth in AFGP



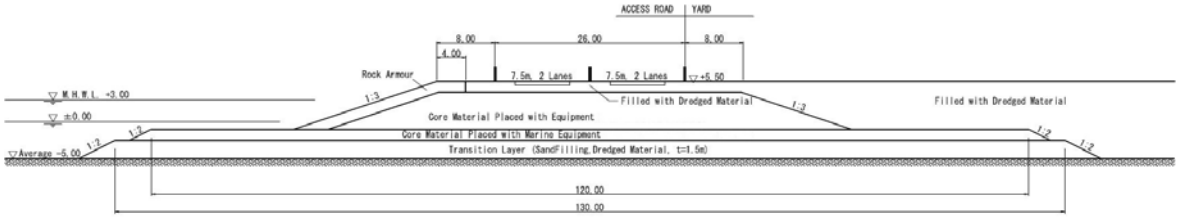
Source：JICA Study Team

Appendix 5.5-3 Section of Access Road (Type 1) in AFGP



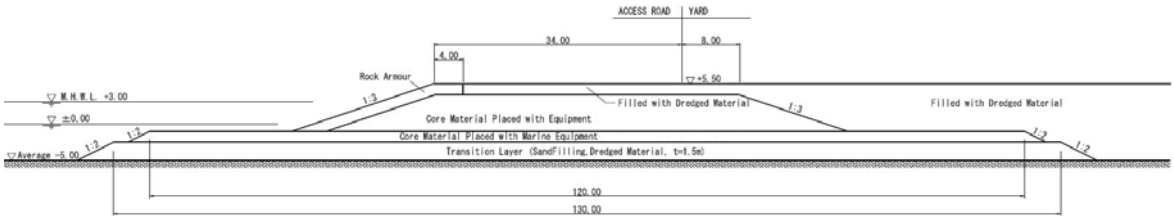
Source：JICA Study Team

Appendix 5.5-4 Section of Access Road (Type 2) in AFGP



Source：JICA Study Team

Appendix 5.5-5 Section of Revetment in AFGP



Source：JICA Study Team

Appendix 5.5-6 Project Components for UQP (Alternative Plan)

No.	Project Component	Long-term Development (2035)
1.	**Important Project Components in Main Ports**	
1.1	**UQP-North Berth No.25,26&27 (Container Terminal)**	
1.1.1	New Berth No.25,26&27	-
1.1.2	Container Yard: Reclamation	-
1.1.3	Container Yard: Soil Improvement	-
1.1.4	Container Yard: Pavement	-
1.1.5	Container Yard: Infrastructure (utility, electricity, drainage etc.)	-
1.1.6	Cargo Handling Equipment: Gantry Crane	-
1.1.7	Cargo Handling Equipment: RTG	-
1.1.8	Cargo Handling Equipment: Mobile Crane	-
1.1.9	Cargo Handling Equipment: Reach Stacker	-
1.1.10	Cargo Handling Equipment: Top/Side Lifter	-
1.1.11	Cargo Handling Equipment: Tractor & Chassis	-
1.2	**UQP-North Berth No.22,23& 24 (General/RoRo/Container Terminal)**	
1.2.1	New Berth No.22,23&24	400m (3berths)
1.2.2	Yard: Recclamation	1,200,000m3
1.2.3	Yard: Soil Improvement	600,000m2
1.2.4	Yard: Pavement	585,000m2
1.2.5	Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.
1.2.6	Removal of existing berths	400m (200m x 2berths)
1.3	**UQP-North Container Stacking Yard behind of Berth No.20 & 21**	
1.3.1	Container Yard: Pavement	560,000m2 (800m x 700m)
1.3.2	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.
1.4	**UQP-South Berth No.4 ~ No.8a (Container Terminal)**	
1.4.1	Reinforcement / Expansion of Berth No.4	-
1.4.2	Reinforcement / Expansion of Berth No.5	-
1.4.3	Reinforcement / Expansion of Berth No.6	-
1.4.4	Reinforcement / Expansion of Berth No.7	-
1.4.5	Reinforcement / Expansion of Berth No.8	-
1.4.6	Reinforcement / Expansion of Berth No.8a	-
1.4.7	Removal of existing sheds	6 Sheds, 36,000m2 (150m x 40m x 6 shed)
1.4.8	Container Yard: Pavement	730,300m2
1.4.9	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.
1.4.10	Cargo Handling Equipment: Gantry Crane	-
1.4.11	Cargo Handling Equipment: RTG	-
1.4.12	Cargo Handling Equipment: Mobile Crane	10 sets, 2 x 5berths
1.5	**UQP Area Redevelopment (except for 1.1、1.2、1.3、1.4)**	
1.5.1	Truck Parking	1,500,000m2 (1.5km x 1.0km)
1.5.2	South Port Truck Terminal	L.S.
1.5.3	Administration Building	200,000m2 (200m x 200m x 5 floors)
1.5.4	Main Gates for North Port and South Port	2 Gates
1.5.5	Logistic Center (Bonded Zone) EPZ	1,500,000m2 (500m x 1,500m x 2 area)
1.5.6	Logistic Center	600,000m2 (300m x 2,000m)
1.5.7	General Cargo Terminal/Yard	600,000m2 (1,200m x 500m)
1.5.8	Container Terminal/Stacking Yard behind of No.12 & 13	400,000m2 (400m x 1,000m)
1.5.9	International Container Terminal (ICT)	L.S.
1.5.10	Removal of Existing Sheds behind of Berth No.12 & 13	4 Sheds, 24,000m2 (150m x 40m x 6 shed)
1.5.11	Removal of Existing Jib Cranes	24 nos
1.5.12	Removal of Existing Rails	L.S.
1.5.13	Construction of New Rails	L.S.
1.5.14	New Roads in Port Area	80,000m2 (8m x 10,000m)

Source: JICA Study Team

Appendix 5.5-7 Project Components for KZP, AFGP and others (Alternative Plan)

No.	Project Component	Long-term Development (2035)
1.6	**KZP Berth No.11 & 12 (General Cargo Terminal)**	
1.6.1	New Berth No.11	300m x 400m (-12.5m)
1.6.2	New Berth No.12	300m x 400m (-12.5m)
1.6.3	Dredging in front of Bert No.11 & 12	500,000m3
1.6.4	Yard: Recclamation	960,000m3
1.6.5	Yard: Soil Improvement	222,000m2
1.6.6	Yard: Pavement	222,000m2
1.6.7	Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.
1.6.8	Removal of Existing Berth No.11, 12 & 13	L.S.
1.6.9	Relocation of Berth No.11	L.S.
1.6.10	Relocation of Berth No.12	L.S.
1.6.11	New Navy Berth No.13 (substitution of old Berth No. 11)	L.S.
1.7	**KZP Area Redevelopment (except for 1.6)**	
1.7.1	New Open Storage Yard 1	250,000 m2, (500m x 500m)
1.7.2	New Open Storage Yard 2	250,000 m2, (500m x 500m)
1.7.3	New Open Storage Yard 3	250,000 m2, (500m x 500m)
1.7.4	New Iron Ore Yards at Berth No.9 & 10	224,000 m2, (560m x 400m)
1.7.5	New Work Shop behind of No.9 & 10	112,000 m2, (560m x 200m)
1.7.6	New Sheds at Work Shop behind of No.9 & 10	3 Sheds, 20,000m2 (100m x 20m x 3 shed)
1.7.7	Removal of Existing Sheds behind of No.7 & 8	4 Sheds, 28,800m2 (180m x 40m x 4 shed)
1.7.8	Removal of Existing Belt conveyors behind of No.5 & 6	L.S.
1.7.9	Infrastructure (utility, electricity, drainage etc.)	L.S.
1.7.10	Truck Parking Area	150,000m2, (500m x 300m)
1.7.11	Administration Custom Office Building	150,000m2, (250m x 300m x 2floors)
1.7.12	Rail Terminal	L.S.
1.8	**Abu Flus Port Redevelopment**	
1.8.1	Rehabilitation of Berth No.3 for Container Terminal	250m
1.8.2	Container Staking Yards	25,000m (250m x 100m)
1.8.3	Cargo Handling Equipment: Mobile Crane	3 sets
1.9	**Al Maqil Port Redevelopment**	
1.9.1	River Crossing Bridge	1,000 m x 4 lanes
1.9.2	Yard Rehabilitation	180,000m2
1.10	**Al Faw Ground Port**	
1.10.1	New Container berth No.1	**350m x 500m (-16.0m)**
1.10.2	New Container berth No.2	**350m x 500m (-16.0m)**
1.10.3	New Container berth No.3	**350m x 500m (-16.0m)**
1.10.4	New Container berth No.4	**350m x 500m (-16.0m)**
1.10.5	New Container berth No.5	**350m x 500m (-16.0m)**
1.10.6	New Container berth No.6	**350m x 500m (-16.0m)**
1.10.7	New Container berth No.7	**350m x 500m (-16.0m)**
1.10.8	New Container berth No.8	**350m x 500m (-16.0m)**
1.10.9	New Container berth No.9	**350m x 500m (-16.0m)**
1.10.10	Access Channel Dredging	33,740,000 m3, inner channel: -16.0m
1.10.11	Access Road TYPE-1	3,250m
1.10.12	Access Road TYPE-2	3,150m
1.10.13	Revetment	900 m
1.10.14	Highway AFGP-UQP: Part-1 connecting to Al Faw Port	21.0 km (16.0km + 5.0km)
1.10.15	Highway AFGP-UQP: Part-2	33.5 km
1.10.16	Highway AFGP-UQP: Part-3, incl tunnel approach	10.3 km
1.10.17	Highway AFGP-UQP: Part-4 from Safwan city, incl tunnel approach	12.4 km
1.10.18	Highway AFGP-UQP: Tunnel between Part 3 and Part 4	5,000 m (main tunnel 2,000m)
1.10.19	Cargo Handling Equipment: Gantry Crane	27 sets, 3 sets x 9 berths
1.10.20	Cargo Handling Equipment: RTG	81 sets, 9 sets x 9 berths
1.10.21	Cargo Handling Equipment: Top/Side Lifter	6 sets
1.10.22	Cargo Handling Equipment: Tractor & Chassis	13 sets
1.10.23	West Breakwater	16.0 km
1.10.24	East Breakwater (assumed as 35% in progress)	8.0 km

Source: JICA Study Team

Appendix 5.5-8 Project Components for Waterways (Alternative Plan)

No.	Project Component	Long-term Development (2035)			
2.	**Important Project Components for Major Waterways**	**Depth**	**Width**	**Length**	**Dredging**
		(m)	(m)	(km)	(Mil. m3)
2.1	**Khawar Abdallah Channel**			103.50	71.00
2.2.1	Abdallah Channel	-12.5	200/300	60.70	68.00
2.2.2	Wreck Removal (1 at buoy No.3 to No.25)	1 wreck			
2.2.3	Umm Qasr Channel	**-12.5**	300	25.10	3.00
2.2.4	Wreck Removal (6 along channel, 3 at berth No.9)	9 wrecks			
2.2.5	Khor Al-Zubayr Channel	-12.5	200/300	17.60	0.00
2.2.6	Wreck Removal (4 along channel)	4 wrecks	(by Phase II)		
2.2	**Shatt Al Arab Channel**			144.00	16.00
2.2.1	Mouth area	-8	150	10.50	8.50
2.2.2	Mouth to Abu Flus Port	-8	120/150	106.50	7.00
2.2.3	Abu Flus Port to Maquil Port	-10	120/150	27.00	0.50
2.2.4	Wreck Removal	Approx. 33 wrecks			
2.3	**AFGP Access Channel**	-	-	-	49.00
2.3.1	AFGP Access Channel	-16.0	200	60.00	49.00

Source: JICA Study Team

Appendix 5.5-9 Project Cost Breakdown for UQP (Alternative Plan)

No.	Project Component	Particulars	Units	Q'ty	Rate (USD)	Amount (USD)
1.	**Important Project Components in Main Ports**					
1.1	**UQP-North Berth No.25,No.26 & 27 (Container Terminal)**		**Subtotal**			**0**
1.1.1	New Berth No.25, No.26&No.27	-	L.S.	-	117,270,074	0
1.1.2	Container Yard: Reclamation	-	m3	-	35	0
1.1.3	Container Yard: Soil Improvement	-	m2	-	153	0
1.1.4	Container Yard: Pavement	-	m2	-	202	0
1.1.5	Container Yard: Infrastructure (utility, electricity, drainage etc.)	-	式	-	6,986,250	0
1.1.6	Cargo Handling Equipment: Gantry Crane	-	No.	-	14,950,000	0
1.1.7	Cargo Handling Equipment: RTG	-	No.	-	2,300,000	0
1.1.8	Cargo Handling Equipment: Mobile Crane	-	No.	-	2,000,000	0
1.1.9	Cargo Handling Equipment: Reach Stacker	-	No.	-	1,000,000	0
1.1.10	Cargo Handling Equipment: Top/Side Lifter	-	No.	-	1,000,000	0
1.1.11	Cargo Handling Equipment: Tractor & Chassis	-	No.	-	100,000	0
1.2	**UQP-North Berth No.22, 23 & 24 (General/RoRo/Container Terminal)**		**Subtotal**			**335,301,751**
1.2.1	New Berth No.22,No.23 & 24	400m (3berths)	L.S.	1	116,846,664	116,846,664
1.2.2	Yard: Recclamation	1,200,000m3	m3	1,200,000	35	42,000,000
1.2.3	Yard: Soil Improvement	600,000m2	m2	600,000	133	79,800,000
1.2.4	Yard: Pavement	585,000m2	m2	585,000	140	81,900,000
1.2.5	Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	12,161,250	12,161,250
1.2.6	Removal of existing berths	400m (3berths)	m	1	2,593,837	2,593,837
1.3	**UQP-North Container Stacking Yard behind of Berth No.20&No.21**		**Subtotal**			**106,232,000**
1.3.1	Container Yard: Pavement	560,000m2 (800m x 700m)	m2	560,000	169	94,640,000
1.3.2	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	11,592,000	11,592,000
1.4	**UQP-South Berth No.4 ~ No.8a (Container Terminal)**		**Subtotal**			**206,490,599**
1.4.1	Reinforcement / Expansion of Berth No.4	-	L.S.	-	52,189,119	0
1.4.2	Reinforcement / Expansion of Berth No.5	-	L.S.	-	65,236,398	0
1.4.3	Reinforcement / Expansion of Berth No.6	-	L.S.	-	47,753,043	0
1.4.4	Reinforcement / Expansion of Berth No.7	-	L.S.	-	47,753,043	0
1.4.5	Reinforcement / Expansion of Berth No.8	-	L.S.	-	47,753,043	0
1.4.6	Reinforcement / Expansion of Berth No.8a	-	L.S.	-	23,746,049	0
1.4.7	Removal of existing sheds	6 Sheds, 36,000m2 (150m x 40m x 6 shed)	No.	6	4,074,354	24,446,124
1.4.8	Container Yard: Pavement	730,300m2	m2	730,300	201	146,790,300
1.4.9	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	15,254,175	15,254,175
1.4.10	Cargo Handling Equipment: Gantry Crane	-	No.	-	14,950,000	0
1.4.11	Cargo Handling Equipment: RTG	-	No.	-	2,300,000	0
1.4.12	Cargo Handling Equipment: Mobile Crane	10sets, 2x5berths	No.	10	2,000,000	20,000,000
1.5	**UQP Area Redevelopment (except for 1.1、**		**Subtotal**			**420,758,000**
1.5.1	Truck Parking	1,500,000m2 (1.5km x 1.0km)	m2	1,500,000	23	34,500,000
1.5.2	South Port Truck Terminal	L.S.	L.S.	1	-	0
1.5.3	Administration Building	200,000m2 (200m x 200m x 5 floors)	m2	200,000	800	160,000,000
1.5.4	Main Gates for North Port and South Port	2 Gates	No,	2	5,750,000	11,500,000
1.5.5	Logistic Center (Bonded Zone) EPZ	1,500,000m2 (500m x 1,500m x 2 area)	m2	1,500,000	-	0
1.5.6	Logistic Center	600,000m2 (300m x 2,000m)	m2	600,000	-	0
1.5.7	General Cargo Terminal/Yard	600,000m2 (1,200m x 500m)	m2	600,000	169	101,400,000
1.5.8	Container Terminal/Stacking Yard behind of No.12 & 13	400,000m2 (400m x 1,000m)	m2	400,000	169	67,600,000
1.5.9	International Container Terminal (ICT)	L.S.	L.S.	1	-	0
1.5.10	Removal of Existing Sheds behind of Berth No.12 & 13	4 Sheds, 24,000m2 (150m x 40m x 6 shed)	No,	4	1,150,000	4,600,000
1.5.11	Removal of Existing Jib Cranes	24 nos	No.	24	-	0
1.5.12	Removal of Existing Rails	L.S.	L.S.	1	-	0
1.5.13	Construction of New Rails	L.S.	L.S.	1	26,358,000	26,358,000
1.5.14	New Roads in Port Area	80,000m2 (8m x 10,000m)	m2	80,000	185	14,800,000

Source: JICA Study Team

Appendix 5.5-10 Project Cost Breakdown for KZP, AFGP and others (Alternative Plan)

No.	Project Component	Particulars	Units	Q'ty	Rate (USD)	Amount (USD)
1.6	**KZP Berth No. 11 & 12 (General Cargo Terminal)**		**Subtotal**			**293,715,374**
1.6.1	New Berth No.11	300m x 400m (-12.5m)	L.S.	1	73,585,187	73,585,187
1.6.2	New Berth No.12	300m x 400m (-12.5m)	L.S.	1	73,585,187	73,585,187
1.6.3	Dredging in front of Bert No. 11 & 12	500,000m3	m3	500,000	15	7,500,000
1.6.4	Yard: Recclamation	960,000m3	m3	960,000	35	33,600,000
1.6.5	Yard: Soil Improvement	222,000m2	m2	222,000	153	33,966,000
1.6.6	Yard: Pavement	222,000m2	m2	222,000	140	31,080,000
1.6.7	Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	4,899,000	4,899,000
1.6.8	Removal of Existing Berth No. 11, 12 & 13	L.S.	L.S.	1	11,500,000	11,500,000
1.6.9	Relocation of Berth No. 11	L.S.	L.S.	1	-	0
1.6.10	Relocation of Berth No. 12	L.S.	L.S.	1	-	0
1.6.11	New Navy Berth No. 13 (substitution of old Berth No. 11)	L.S.	L.S.	1	24,000,000	24,000,000
1.7	**KZP Area Redevelopment (except for 1.6)**		**Subtotal**			**318,957,000**
1.7.1	New Open Storage Yard 1	250,000 m2, (500m x 500m)	m2	250,000	140	35,000,000
1.7.2	New Open Storage Yard 2	250,000 m2, (500m x 500m)	m2	250,000	140	35,000,000
1.7.3	New Open Storage Yard 3	250,000 m2, (500m x 500m)	m2	250,000	140	35,000,000
1.7.4	New Iron Ore Yards at Berth No. 9 & 10	224,000 m2, (560m x 400m)	m2	224,000	23	5,152,000
1.7.5	New Work Shop behind of No. 9 & 10	112,000 m2, (560m x 200m)	m2	112,000	140	15,680,000
1.7.6	New Sheds at Work Shop behind of No. 9 & 10	3 Sheds, 20,000m2 (100m x 20m x 3 shed)	No.	3	1,000,000	3,000,000
1.7.7	Removal of Existing Sheds behind of No. 7 & 8	4 Sheds, 28,800m2 (180m x 40m x 4 shed)	No.	4	1,581,250	6,325,000
1.7.8	Removal of Existing Belt conveyors behind of No. 5 & 6	L.S.	L.S.	-	-	0
1.7.9	Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	10,350,000	10,350,000
1.7.10	Truck Parking Area	150,000m2, (500m x 300m)	m2	150,000	23	3,450,000
1.7.11	Administration Custom Office Building	150,000m2, (250m x 300m x 2floors)	m2	150,000	800	120,000,000
1.7.12	Rail Terminal	L.S.	L.S.	1	50,000,000	50,000,000
1.8	**Abu Flus Port Redevelopment**		**Subtotal**			**14,000,000**
1.8.1	Rehabilitation of Berth No.3 for Container Terminal	250m	m	250	-	0
1.8.2	Container Staking Yards	25,000m (250m x 100m)	m2	25,000	200	5,000,000
1.8.3	Cargo Handling Equipment: Mobile Crane	3 sets	No.	3	3,000,000	9,000,000
1.9	**Al Maqil Port Redevelopment**		**Subtotal**			**36,000,000**
1.9.1	River Crossing Bridge	1,000 m x 4 lanes	m	1,000	-	0
1.9.2	Yard Rehabilitation		m2	180,000	200	36,000,000
1.10	**Al Faw Ground Port**		**Subtotal**			**4,830,549,188**
1.10.1	New Container berth No.1	**350m x 500m (-16.0m)**	L.S.	1	122,307,532	122,307,532
1.10.2	New Container berth No.2	**350m x 500m (-16.0m)**	L.S.	1	122,307,532	122,307,532
1.10.3	New Container berth No.3	**350m x 500m (-16.0m)**	L.S.	1	122,307,532	122,307,532
1.10.4	New Container berth No.4	**350m x 500m (-16.0m)**	L.S.	1	122,307,532	122,307,532
1.10.5	New Container berth No.5	**350m x 500m (-16.0m)**	L.S.	1	122,307,532	122,307,532
1.10.6	New Container berth No.6	**350m x 500m (-16.0m)**	L.S.	1	122,307,532	122,307,532
1.10.7	New Container berth No.7	**350m x 500m (-16.0m)**	L.S.	1	122,307,532	122,307,532
1.10.8	New Container berth No.8	**350m x 500m (-16.0m)**	L.S.	1	122,307,532	122,307,532
1.10.9	New Container berth No.9	**350m x 500m (-16.0m)**	L.S.	1	122,307,532	122,307,532
1.10.10	Access Channel Dredging	33,740,000 m3, inner channel: -16.0m	m3	33,740,000	15	506,100,000
1.10.11	Access Road TYPE-1	3,250m	m	3,250	24,353	79,147,250
1.10.12	Access Road TYPE-2	3,150m	m	3,150	21,133	66,568,950
1.10.13	Revetment	900 m	m	900	18,108	16,297,200
1.10.14	Highway AFGP-UQP: Part-1 connecting to Al Faw Port	21.0 km (16.0km + 5.0km)	m	21,000.0	8,315	174,615,000
1.10.15	Highway AFGP-UQP: Part-2	33.5 km	m	33,500.0	8,315	278,552,500
1.10.16	Highway AFGP-UQP: Part-3, incl tunnel approach	10.3 km	m	10,300.0	8,315	85,644,500
1.10.17	Highway AFGP-UQP: Part-4 from Safwan city, incl tunnel appr	12.4 km	m	12,400.0	8,315	103,106,000
1.10.18	Highway AFGP-UQP: Tunnel between Part 3 and Part 4	5,000 m (main tunnel 2,000m)	m	5,000	172,500	862,500,000
1.10.19	Cargo Handling Equipment: Gantry Crane	27 sets, 3 sets x 9 berths	No.	27	14,950,000	403,650,000
1.10.20	Cargo Handling Equipment: RTG	81 sets, 9 sets x 9 berths	No.	81	2,300,000	186,300,000
1.10.21	Cargo Handling Equipment: Top/Side Lifter		No.	6	1,000,000	6,000,000
1.10.22	Cargo Handling Equipment: Tractor & Chassis		No.	13	100,000	1,300,000
1.10.23	West Breakwater	16.0 km	km	16	43,750,000	700,000,000
1.10.24	East Breakwater (assumed as 35% in progress)	8.0 km	km	8	32,500,000	260,000,000

Source: JICA Study Team

Appendix 5.5-11 Project Cost Breakdown for Waterways (Alternative Plan)

No.	Project Component	Particulars				Units	Q'ty	Rate (USD)	Amount (USD)
2.	**Important Project Components for Major Waterways**	**Depth** (m)	**Width** (m)	**Length** (km)	**Dredging** (Mil. m3)				
2.1	**Khawar Abdallah Channel**			103.50	71.00	**Subtotal**	**71,000,000**		**1,115,000,000**
2.2.1	Abdallah Channel	-12.5	200/300	60.70	68.00	m3	68,000,000	15	1,020,000,000
2.2.2	Wreck Removal (1 at buoy No.3 to No.25)	1 wrecks				wrecks	1	5,000,000	5,000,000
2.2.3	Umm Qasr Channel	**-12.5**	300	25.10	3.00	m3	3,000,000	15	45,000,000
2.2.4	Wreck Removal (6 along channel, 3 at berth No.9)	9 wrecks				wrecks	9	5,000,000	45,000,000
2.2.5	Khor Al-Zubayr Channel	-12.5	200/300	17.60	0.00	m3	-	15	0
2.2.6	Wreck Removal (4 along channel)	4 wrecks (by Phase II)				wrecks	0	5,000,000	0
2.2	**Shatt Al Arab Channel**			144.00	16.00	**Subtotal**	**16,000,000**		**405,000,000**
2.2.1	Mouth area	-8	150	10.50	8.50	m3	8,500,000	15	127,500,000
2.2.2	Mouth to Abu Flus Port	-8	120/150	106.50	7.00	m3	7,000,000	15	105,000,000
2.2.3	Abu Flus Port to Maquil Port	-10	120/150	27.00	0.50	m3	500,000	15	7,500,000
2.2.4	Wreck Removal	Approx. 33 wrecks				wrecks	33	5,000,000	165,000,000
2.3	**AFGP Access Channel**	-	-	-	49.00	**Subtotal**			**735,000,000**
2.3.1	AFGP Access Channel	-16.0	200	60.00	49.00	m3	49,000,000	15	735,000,000

Source: JICA Study Team

Appendix 5.5-12 Disbursement Schedule (Long-term Development Plan)

No.	Project Component	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
		1,000USD	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
A.	Procurement & Construction	10,479,136	0	287,028	387,618	552,029	647,389	615,520	238,073	915,757	1,316,900	1,379,300	1,441,700	1,059,414	19,200	470,979	462,579	348,226	337,426	0	0	0	0	0	0
1.	Important Project Components for Main Ports	6,477,613	0	239,190	323,015	436,201	444,197	417,639	198,394	456,845	631,845	683,845	735,845	735,845	16,000	297,188	290,188	290,188	281,188	0	0	0	0	0	0
1.1	UQP-North Berth No.25, 26 & 27 (Container Terminal)	391,581	0	0	0	65,264	130,527	130,527	65,264	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.2	UQP-North Berth No.22, 23 & 24 (General/Roro/Container Terminal)	335,302	0	83,825	167,651	83,825	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.3	UQP-North Container Stacking Yard behind of Berth No.20	106,232	0	0	0	26,558	53,116	26,558	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.4	UQP-South Berth No.4 to No.8a (Container Terminal)	776,821	0	155,364	155,364	155,364	155,364	155,364	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.5	UQP Area Redevelopment (except for 1.1, 1.2, 1.3 & 1.4)	420,758	0	0	0	105,190	105,190	105,190	105,190	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.6	KZP Berth No.11 & 12 (General Cargo Terminal)	293,715	0	0	0	0	0	0	0	0	0	0	0	0	0	73,429	73,429	73,429	73,429	0	0	0	0	0	0
1.7	KZP Area Redevelopment (except for 1.6)	318,957	0	0	0	0	0	0	0	0	0	0	0	0	0	79,739	79,739	79,739	79,739	0	0	0	0	0	0
1.8	Abu Flus Port Redevelopment	14,000	0	0	0	0	0	0	0	0	0	0	0	0	7,000	7,000	0	0	0	0	0	0	0	0	0
1.9	Al Maquil Port Redevelopment	36,000	0	0	0	0	0	0	0	0	0	0	0	0	9,000	9,000	9,000	9,000	0	0	0	0	0	0	0
1.10(1)	AFGP Development (Berth, Access Channel, Cranes)	1,152,180	0	0	0	0	0	0	0	128,020	128,020	128,020	128,020	128,020	0	128,020	128,020	128,020	128,020	0	0	0	0	0	0
1.10(2)	AFGP Development (Inner Access Road)	167,648	0	0	0	0	0	0	27,941	27,941	27,941	27,941	27,941	27,941	0	0	0	0	0	0	0	0	0	0	0
1.10(3)	AFGP Development (High Way to AFGP)	1,504,418	0	0	0	0	0	0	0	300,884	300,884	300,884	300,884	300,884	0	0	0	0	0	0	0	0	0	0	0
1.10(4)	AFGP Development (West Breakwater)	700,000	0	0	0	0	0	0	0	0	175,000	175,000	175,000	175,000	0	0	0	0	0	0	0	0	0	0	0
1.10(5)	AFGP Development (East Breakwater, Remaining Works)	260,000	0	0	0	0	0	0	0	0	0	52,000	104,000	104,000	0	0	0	0	0	0	0	0	0	0	0
2.	Important Project Compoments for Waterways	2,255,000	0	0	0	23,824	95,294	95,294	0	306,286	465,571	465,571	465,571	147,000	0	95,294	95,294	0	0	0	0	0	0	0	0
2.1	Khawar Abdallah Channel	1,115,000	0	0	0	0	0	0	0	159,286	318,571	318,571	318,571	0	0	0	0	0	0	0	0	0	0	0	0
2.2	Shatt Al Arab Channel	405,000	0	0	0	23,824	95,294	95,294	0	0	0	0	0	0	0	95,294	95,294	0	0	0	0	0	0	0	0
2.3	AFGP Access Channel	735,000	0	0	0	0	0	0	0	147,000	147,000	147,000	147,000	147,000	0	0	0	0	0	0	0	0	0	0	0
2.4	Reserve/Spare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.	Base Construction Costs (1.+2.)	8,732,613	0	239,190	323,015	460,024	539,491	512,933	198,394	763,131	1,097,416	1,149,416	1,201,416	882,845	16,000	392,482	385,482	290,188	281,188	0	0	0	0	0	0
4.	Contingency (20.0% of 3.)	1,746,523	0	47,838	64,603	92,005	107,898	102,587	39,679	152,626	219,483	229,883	240,283	176,569	3,200	78,496	77,096	58,038	56,238	0	0	0	0	0	0
	Contingency (Price Escalation), included in above 4.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B.	Engineering Services	602,550	0	35,444	35,444	35,444	35,444	35,444	35,444	35,444	35,444	35,444	35,444	35,444	35,444	35,444	35,444	35,444	35,444	35,444	0	0	0	0	0
1.	Base Costs for Engineering (5.0% of A.)	523,957	0	30,821	30,821	30,821	30,821	30,821	30,821	30,821	30,821	30,821	30,821	30,821	30,821	30,821	30,821	30,821	30,821	30,821	0	0	0	0	0
2.	Contingency (15.0% of 1.)	78,594	0	4,623	4,623	4,623	4,623	4,623	4,623	4,623	4,623	4,623	4,623	4,623	4,623	4,623	4,623	4,623	4,623	4,623	0	0	0	0	0
C.	Sub-total (A.+B.)	11,081,686	0	322,472	423,062	587,473	682,833	650,964	273,517	951,201	1,352,344	1,414,744	1,477,144	1,094,858	54,644	506,423	498,023	383,670	372,870	35,444	0	0	0	0	0
D.	Administration Costs and others	554,084	0	16,124	21,153	29,374	34,142	32,548	13,676	47,560	67,617	70,737	73,857	54,743	2,732	25,321	24,901	19,183	18,643	1,772	0	0	0	0	0
a.	Land Acquisition and Compensation		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b.	Administration Cost (5.0% of C.)	554,084	0	16,124	21,153	29,374	34,142	32,548	13,676	47,560	67,617	70,737	73,857	54,743	2,732	25,321	24,901	19,183	18,643	1,772	0	0	0	0	0
c.	Value Added Tax (VAT)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d.	Sales and Other Texes		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E.	Ground Total (C.+D.)	11,635,771	0	338,595	444,215	616,847	716,975	683,512	287,193	998,761	1,419,961	1,485,481	1,551,001	1,149,601	57,376	531,744	522,924	402,853	391,513	37,216	0	0	0	0	0

Source: JICA Study Team

Appendix 5.5-13 Disbursement Schedule (Alternative Plan)

No.	Project Component	Total 1,000USD	1 2014	2 2015	3 2016	4 2017	5 2018	6 2019	7 2020	8 2021	9 2022	10 2023	11 2024	12 2025	13 2026	14 2027	15 2028	16 2029	17 2030	18 2031	19 2032	20 2033	21 2034	22 2035	23 2036
A.	Procurement & Construction	10,580,405	157,203	1,132,952	1,171,142	1,259,592	1,244,766	1,182,819	126,227	191,143	602,697	763,061	542,649	300,594	239,612	317,355	529,366	415,013	404,213	0	0	0	0	0	0
1.	Important Project Components for Main Ports	6,562,004	131,002	944,126	975,952	892,200	808,374	756,752	105,190	0	183,676	183,676	0	183,676	199,676	169,168	345,845	345,845	336,845	0	0	0	0	0	0
1.1	UQP-North Berth No.25, 26 & 27 (Container Terminal)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.2	UQP-North Berth No.22, 23 & 24 (General/Roro/Container Terminal)	335,302	0	83,825	167,651	83,825	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.3	UQP-North Container Stacking Yard behind of Berth No.20	106,232	0	53,116	53,116	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.4	UQP-South Berth No.4 to No.8a (Container Terminal)	206,491	0	51,623	51,623	51,623	51,623	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.5	UQP Area Redevelopment (except for 1.1, 1.2, 1.3 & 1.4)	420,758	0	0	0	105,190	105,190	105,190	105,190	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.6	KZP Berth No.11 & 12 (General Cargo Terminal)	293,715	0	0	0	0	0	0	0	0	0	0	0	0	0	73,429	73,429	73,429	73,429	0	0	0	0	0	0
1.7	KZP Area Redevelopment (except for 1.6)	318,957	0	0	0	0	0	0	0	0	0	0	0	0	0	79,739	79,739	79,739	79,739	0	0	0	0	0	0
1.8	Abu Flus Port Redevelopment	14,000	0	0	0	0	0	0	0	0	0	0	0	0	7,000	7,000	0	0	0	0	0	0	0	0	0
1.9	Al Maquil Port Redevelopment	36,000	0	0	0	0	0	0	0	0	0	0	0	0	9,000	9,000	9,000	9,000	0	0	0	0	0	0	0
1.10(1)	AFGP Development (Berth, Access Channel, Cranes)	2,204,118	0	183,676	183,676	183,676	183,676	183,676	0	0	183,676	183,676	0	183,676	183,676	0	183,676	183,676	183,676	0	0	0	0	0	0
1.10(2)	AFGP Development (Inner Access Road)	162,013	27,002	27,002	27,002	27,002	27,002	27,002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.10(3)	AFGP Development (High Way to AFGP)	1,504,418	0	300,884	300,884	300,884	300,884	300,884	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.10(4)	AFGP Development (West Breakwater)	700,000	0	140,000	140,000	140,000	140,000	140,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.10(5)	AFGP Development (East Breakwater, Remaining Works)	260,000	104,000	104,000	52,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.	Important Project Compoments for Waterways	2,255,000	0	0	0	157,460	228,930	228,930	0	159,286	318,571	452,208	452,208	66,818	0	95,294	95,294	0	0	0	0	0	0	0	0
2.1	Khawar Abdallah Channel	1,115,000	0	0	0	0	0	0	0	159,286	318,571	318,571	318,571	0	0	0	0	0	0	0	0	0	0	0	0
2.2	Shatt Al Arab Channel	405,000	0	0	0	23,824	95,294	95,294	0	0	0	0	0	0	0	95,294	95,294	0	0	0	0	0	0	0	0
2.3	AFGP Access Channel	735,000	0	0	0	133,636	133,636	133,636	0	0	0	133,636	133,636	66,818	0	0	0	0	0	0	0	0	0	0	0
2.4	Reserve/Spare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.	Base Construction Costs (1.+2.)	8,817,004	131,002	944,126	975,952	1,049,660	1,037,305	985,682	105,190	159,286	502,248	635,884	452,208	250,495	199,676	264,462	441,139	345,845	336,845	0	0	0	0	0	0
4.	Contingency (20.0% of 3.)	1,763,401	26,200	188,825	195,190	209,932	207,461	197,136	21,038	31,857	100,450	127,177	90,442	50,099	39,935	52,892	88,228	69,169	67,369	0	0	0	0	0	0
	Contingency (Price Escalation), included in above 4.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B.	Engineering Services	608,373	0	35,787	35,787	35,787	35,787	35,787	35,787	35,787	35,787	35,787	35,787	35,787	35,787	35,787	35,787	35,787	35,787	35,787	0	0	0	0	0
1.	Base Costs for Engineering (5.0% of A.)	529,020	0	31,119	31,119	31,119	31,119	31,119	31,119	31,119	31,119	31,119	31,119	31,119	31,119	31,119	31,119	31,119	31,119	31,119	0	0	0	0	0
2.	Contingency (15.0% of 1.)	79,353	0	4,668	4,668	4,668	4,668	4,668	4,668	4,668	4,668	4,668	4,668	4,668	4,668	4,668	4,668	4,668	4,668	4,668	0	0	0	0	0
C.	Sub-total (A.+B.)	11,188,778	157,203	1,168,738	1,206,929	1,295,378	1,280,553	1,218,605	162,014	226,930	638,484	798,848	578,436	336,380	275,398	353,141	565,153	450,800	440,000	35,787	0	0	0	0	0
D.	Administration Costs and others	559,439	7,860	58,437	60,346	64,769	64,028	60,930	8,101	11,346	31,924	39,942	28,922	16,819	13,770	17,657	28,258	22,540	22,000	1,789	0	0	0	0	0
a.	Land Acquisition and Compensation		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b.	Administration Cost (5.0% of C.)	559,439	7,860	58,437	60,346	64,769	64,028	60,930	8,101	11,346	31,924	39,942	28,922	16,819	13,770	17,657	28,258	22,540	22,000	1,789	0	0	0	0	0
c.	Value Added Tax (VAT)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d.	Sales and Other Texes		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E.	Ground Total (C.+D.)	11,748,217	165,063	1,227,175	1,267,275	1,360,147	1,344,580	1,279,536	170,115	238,276	670,408	838,790	607,358	353,199	289,168	370,798	593,411	473,340	462,000	37,576	0	0	0	0	0

Source: JICA Study Team

Appendix 5.5-14 Result of Economic Calculation on Alernative Plan

Year	Cost ('000 USD)					Benefit ('000 USD)			Total Benefit-Cost	Present Value		
	Project Cost	Operation & Maintenance			Cost Total	Transport Cost Saving	Congestion Cost Saving	Benefit Total		Total Cost	Total Benefit	Net Benefit
		Renewal Investment	Personnel & Administration	Maintenance								
2014	154,045	0	0	0	154,045	0	0	0	-154,045	154,045	0	-154,045
2015	1,098,300	0	0	0	1,098,300	0	0	0	-1,098,300	1,098,300	0	-1,098,300
2016	1,135,529	0	0	0	1,135,529	0	0	0	-1,135,529	1,010,617	0	-1,010,617
2017	1,230,217	0	0	0	1,230,217	0	0	0	-1,230,217	1,032,914	0	-1,032,914
2018	1,223,878	0	10,836	7,673	1,242,387	121,375	73,886	195,261	-1,047,126	984,087	154,665	-829,422
2019	1,162,455	0	10,836	7,673	1,180,964	143,620	73,886	217,506	-963,457	882,485	162,533	-719,951
2020	123,707	0	19,516	49,701	192,924	212,299	73,886	286,186	93,262	136,004	201,750	65,746
2021	298,819	0	19,642	54,372	372,834	262,188	73,886	336,075	-36,759	247,956	223,509	-24,447
2022	702,353	0	19,642	54,372	776,368	289,364	73,886	363,250	-413,117	487,103	227,908	-259,195
2023	900,522	0	19,642	54,372	974,536	316,540	73,886	390,426	-584,110	576,826	231,093	-345,734
2024	691,458	0	28,322	61,462	781,242	397,294	73,886	471,180	-310,062	436,241	263,105	-173,137
2025	290,642	1,622	33,740	73,776	399,780	572,646	73,886	646,533	246,752	210,599	340,585	129,986
2026	209,064	0	33,740	73,776	316,580	617,885	73,886	691,772	375,192	157,331	343,789	186,459
2027	202,345	0	42,420	80,866	325,632	678,689	73,886	752,575	426,944	152,669	352,837	200,168
2028	411,409	0	42,420	80,866	534,695	724,790	73,886	798,676	263,980	236,496	353,255	116,759
2029	295,065	1,622	42,420	98,116	437,224	770,890	73,886	844,776	407,553	182,438	352,496	170,057
2030	295,065	1,622	42,420	98,116	437,224	825,861	73,886	899,747	462,523	172,111	354,182	182,071
2031	0	0	50,652	109,219	159,871	892,648	73,886	966,534	806,663	59,370	358,936	299,566
2032	0	1,622	50,652	109,219	161,493	940,088	73,886	1,013,974	852,481	56,578	355,239	298,661
2033	0	0	50,652	109,219	159,871	987,528	73,886	1,061,414	901,543	52,839	350,811	297,972
2034	0	1,622	50,652	109,219	161,493	1,034,968	73,886	1,108,854	947,361	50,354	345,746	295,392
2035	0	1,622	50,652	109,219	161,493	1,082,408	73,886	1,156,294	994,801	47,504	340,130	292,626
2036	0	2,433	50,652	109,219	162,304	1,129,848	73,886	1,203,734	1,041,430	45,040	334,042	289,002
2037	0	1,622	50,652	109,219	161,493	1,177,288	73,886	1,251,174	1,089,681	42,278	327,554	285,276
2038	0	20,000	50,652	109,219	179,871	1,224,728	73,886	1,298,614	1,118,743	44,424	320,730	276,306
2039	0	1,622	50,652	109,219	161,493	1,272,168	73,886	1,346,054	1,184,561	37,628	313,629	276,001
2040	0	132,722	50,652	109,219	292,593	1,305,353	73,886	1,379,239	1,086,646	64,315	303,171	238,856
2041	0	2,433	50,652	109,219	162,304	1,333,096	73,886	1,406,982	1,244,678	33,657	291,763	258,106
2042	0	1,622	50,652	109,219	161,493	1,333,195	73,886	1,407,081	1,245,588	31,593	275,267	243,674
2043	0	0	50,652	109,219	159,871	1,333,293	73,886	1,407,179	1,247,308	29,505	259,704	230,199
2044	0	132,722	50,652	109,219	292,593	1,333,392	73,886	1,407,278	1,114,685	50,943	245,021	194,078
2045	0	10,622	50,652	109,219	170,493	1,333,490	73,886	1,407,376	1,236,883	28,004	231,168	203,164
2046	0	2,433	50,652	109,219	162,304	1,333,490	73,886	1,407,376	1,245,072	25,150	218,083	192,933
2047	0	132,722	50,652	109,219	292,593	1,333,490	73,886	1,407,376	1,114,783	42,773	205,739	162,966
2048	0	0	50,652	109,219	159,871	1,333,490	73,886	1,407,376	1,247,505	22,048	194,093	172,045
2049	0	1,622	50,652	109,219	161,493	1,333,490	73,886	1,407,376	1,245,883	21,011	183,107	162,096
2050	0	1,622	50,652	109,219	161,493	1,333,490	73,886	1,407,376	1,245,883	19,822	172,742	152,921
2051	0	199,083	50,652	109,219	358,954	1,333,490	73,886	1,407,376	1,048,422	41,564	162,965	121,400
2052	0	1,622	50,652	109,219	161,493	1,333,490	73,886	1,407,376	1,245,883	17,641	153,740	136,099
2053	0	0	50,652	109,219	159,871	1,333,490	73,886	1,407,376	1,247,505	16,476	145,038	128,562
2054	0	1,622	50,652	109,219	161,493	1,333,490	73,886	1,407,376	1,245,883	15,701	136,828	121,127
2055	0	1,622	50,652	109,219	161,493	1,333,490	73,886	1,407,376	1,245,883	14,812	129,083	114,271
2056	0	2,433	50,652	109,219	162,304	1,333,490	73,886	1,407,376	1,245,072	14,044	121,777	107,733
2057	0	1,622	50,652	109,219	161,493	1,333,490	73,886	1,407,376	1,245,883	13,183	114,884	101,701
2058	0	20,000	50,652	109,219	179,871	1,333,490	73,886	1,407,376	1,227,505	13,852	108,381	94,529
Total	10,424,873	681,939	1,783,852	3,853,276	16,743,940	40,982,304	3,029,336	44,011,640	27,267,700	9,110,332	10,261,080	1,150,747

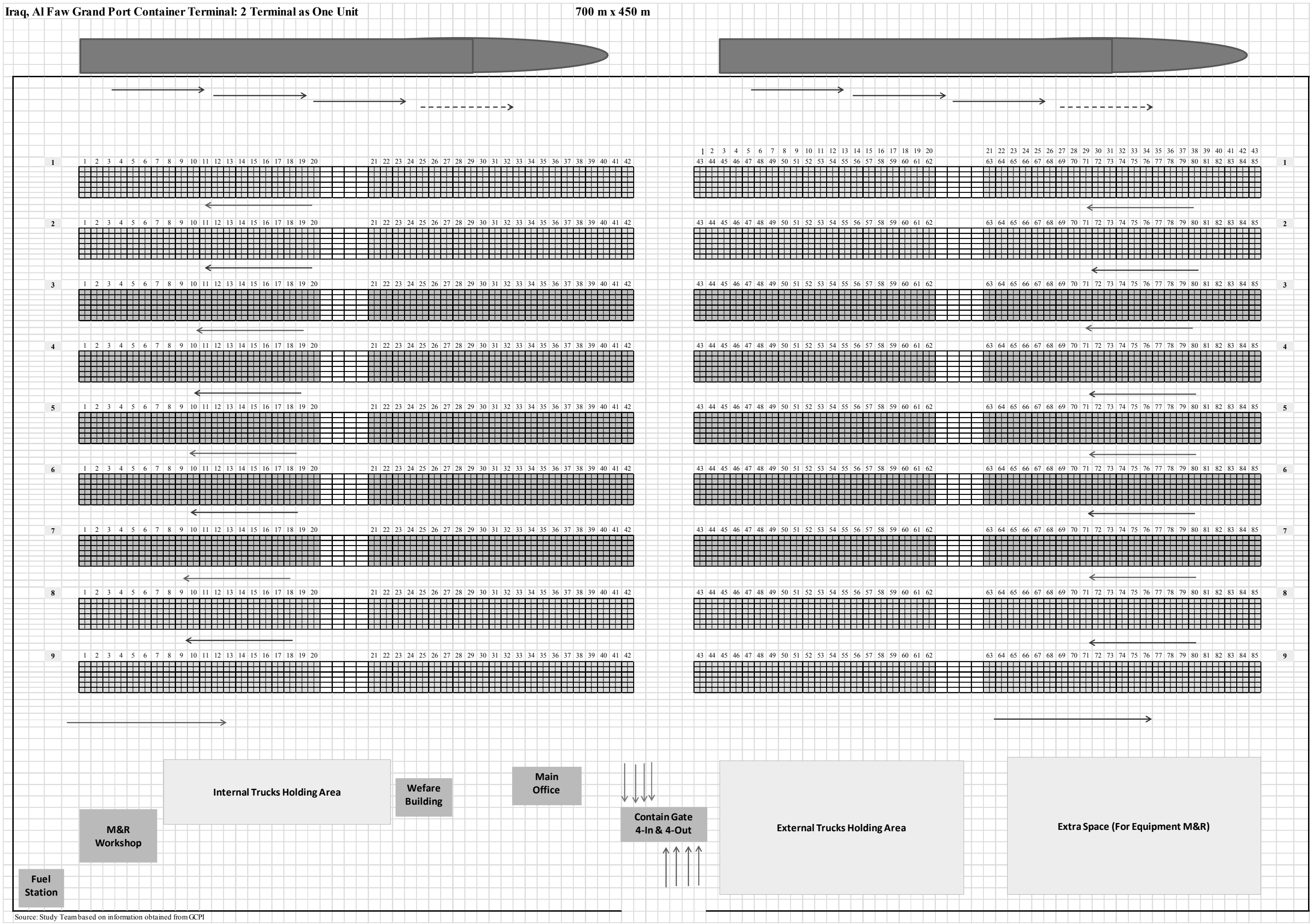
Iraq Treasury Bond, coupon rate: 5.8%

EIRR 7.0%

B/C ratio 1.13

Source: JICA Study Team

Appendix 5.6-1 Drawing of a 700m Berth Terminal in Al Faw Grand Port



Source: Prepared by Study Team based on GCPI's statistics data

Appendix 5.6-2 Possible Berth Capacity of a 700m Berth Terminal in Al Faw Grand Port

Iraq, Al Faw Grand Port CT Phase-1 (2 Berths as a unit): Berth Capacity by Berth Condition

@25.0 Moves/Hour as QGC's Net Productivity

** Berth capacity is regulated or limited by following conditions.	As, Conditions	
1. Berth Number:	**2**	Berth
2. Gantry Crane Number:	**6~8**	G.Cranes
3. Gantry Crane Net Productivity:	**25.0**	Moves/GC/hour
4. Gang Working Days:	**360**	Effective work days/year (5 days as Non-working Holidays)
5. Gang Actual Working Hour:	**21.0**	Have 1 hours each in 3 shifts a day
6. Gang Effective Max Working Hour/day:	**17.9**	As effective net working hour ratio is 85% discounting possible loss times.
7. TEU vs Box ratio	**1.60**	By historical data & Future projection

8. 2nd through 4th QGC's efficiency rates become lower when the ships handling volumes become fewer; due to difficulties to split ships work-volumes evenly.

1) One Berth Situation; Means, workable "One" ship in one-time

* Following GC's efficiency factors should be incurred by GC **work-share split** problem.

	1,500 Lift/call					
	1st GC	2nd GC	3rd GC	4th GC	Average	Realistic GC #
1) 2 berth & 6 GC :	1.00	0.95	0.80		**0.92**	**5.50**
2) 2 berth & 7 GC :	1.00	0.95	0.80	0.60	**0.87**	**6.10**
3) 2 berth & 8 GC :	1.00	0.95	0.80	0.60	**0.84**	**6.70**

	1,750 Lift/call					
	1st GC	2nd GC	3rd GC	4th GC	Average	Realistic GC #
1) 2 berth & 6 GC :	1.00	1.00	0.85		**0.95**	**5.70**
2) 2 berth & 7 GC :	1.00	1.00	0.85	0.70	**0.91**	**6.40**
3) 2 berth & 8 GC :	1.00	1.00	0.85	0.70	**0.89**	**7.10**

	2,000 Lift/call					
	1st GC	2nd GC	3rd GC	4th GC	Average	Realistic GC #
1) 2 berth & 6 GC :	1.00	1.00	0.90		**0.97**	**5.80**
2) 2 berth & 7 GC :	1.00	1.00	0.90	0.80	**0.94**	**6.60**
3) 2 berth & 8 GC :	1.00	1.00	0.90	0.80	**0.93**	**7.40**

	2,500 Lift/call					
	1st GC	2nd GC	3rd GC	4th GC	Average	Realistic GC #
1) 2 berth & 6 GC :	1.00	1.00	0.95		**0.98**	**5.90**
2) 2 berth & 7 GC :	1.00	1.00	0.95	0.90	**0.97**	**6.80**
3) 2 berth & 8 GC :	1.00	1.00	0.95	0.90	**0.96**	**7.70**

		*Good Utilization			*Very Good Utilization			*More than Good Utilization			* Risky: Ships wait Berth often		
	Max Lift per Day	**Max Lift/Year When Berth Utili. % is 45%**		How Many **Ship Call?**	**Max Lift/Year When Berth Utili. % is 50%**		How Many **Ship Call?**	**Max Lift/Year When Berth Utili. % is 55%**		How Many **Ship Call?**	**Max Lift/Year When Berth Utili. % is 60%**		How Many **Ship Call?**
	(Box/day)	(Box/y)	(TEU/y)	(Call/wk)	(Box/y)	(TEU/y)	(Call/wk)	(Box/y)	(TEU/y)	(Call/wk)	(Box/y)	(TEU/y)	(Call/wk)
1) 2 berth & 6 GC :	**2,454**	**397,609**	636,174	**5.1**	**441,788**	706,860	**5.7**	**485,966**	777,546	**6.2**	**530,145**	848,232	**6.8**
2) 2 berth & 7 GC :	**2,722**	**440,984**	705,575	**5.7**	**489,983**	783,972	**6.3**	**538,981**	862,369	**6.9**	**587,979**	940,766	**7.5**
3) 2 berth & 8 GC :	**2,990**	**484,360**	774,976	**6.2**	**538,178**	861,084	**6.9**	**591,995**	947,192	**7.6**	**645,813**	1,033,301	**8.3**
1) 2 berth & 6 GC :	**2,544**	**412,067**	659,308	**4.5**	**457,853**	732,564	**5.0**	**503,638**	805,820	**5.5**	**549,423**	879,077	**6.0**
2) 2 berth & 7 GC :	**2,856**	**462,672**	740,275	**5.1**	**514,080**	822,528	**5.6**	**565,488**	904,781	**6.2**	**616,896**	987,034	**6.8**
3) 2 berth & 8 GC :	**3,168**	**513,277**	821,243	**5.6**	**570,308**	912,492	**6.3**	**627,338**	1,003,741	**6.9**	**684,369**	1,094,990	**7.5**
1) 2 berth & 6 GC :	**2,588**	**419,297**	670,874	**4.6**	**465,885**	745,416	**5.1**	**512,474**	819,958	**5.6**	**559,062**	894,499	**6.1**
2) 2 berth & 7 GC :	**2,945**	**477,131**	763,409	**5.2**	**530,145**	848,232	**5.8**	**583,160**	933,055	**6.4**	**636,174**	1,017,878	**7.0**
3) 2 berth & 8 GC :	**3,302**	**534,965**	855,943	**5.9**	**594,405**	951,048	**6.5**	**653,846**	1,046,153	**7.2**	**713,286**	1,141,258	**7.8**
1) 2 berth & 6 GC :	**2,633**	**426,526**	682,441	**4.7**	**473,918**	758,268	**5.2**	**521,309**	834,095	**5.7**	**568,701**	909,922	**6.2**
2) 2 berth & 7 GC :	**3,035**	**491,589**	786,542	**5.4**	**546,210**	873,936	**6.0**	**600,831**	961,330	**6.6**	**655,452**	1,048,723	**7.2**
3) 2 berth & 8 GC :	**3,436**	**556,652**	890,644	**6.1**	**618,503**	989,604	**6.8**	**680,353**	1,088,564	**7.5**	**742,203**	1,187,525	**8.2**

Source: Prepared by Study Team based on GCPI and Private operatar's interviews

Appendix 6.4-1 Project Components for UQP (Alternative Plan)

No.	Project Component	Mid / Short-term Development (2025)
1.	**Important Project Components in Main Ports**	
1.1	**UQP-North Berth No.25,26&27 (Container Terminal)**	
1.1.1	New Berth No.25,26&27	-
1.1.2	Container Yard: Reclamation	-
1.1.3	Container Yard: Soil Improvement	-
1.1.4	Container Yard: Pavement	-
1.1.5	Container Yard: Infrastructure (utility, electricity, drainage etc.)	-
1.1.6	Cargo Handling Equipment: Gantry Crane	-
1.1.7	Cargo Handling Equipment: RTG	-
1.1.8	Cargo Handling Equipment: Mobile Crane	-
1.1.9	Cargo Handling Equipment: Reach Stacker	-
1.1.10	Cargo Handling Equipment: Top/Side Lifter	-
1.1.11	Cargo Handling Equipment: Tractor & Chassis	-
1.2	**UQP-North Berth No.22,23& 24 (General/RoRo/Container Terminal)**	
1.2.1	New Berth No.22,23&24	400m (3berths)
1.2.2	Yard: Recclamation	1,200,000m3
1.2.3	Yard: Soil Improvement	600,000m2
1.2.4	Yard: Pavement	585,000m2
1.2.5	Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.
1.2.6	Removal of existing berths	400m (3berths)
1.3	**UQP-North Container Stacking Yard behind of Berth No.20 & 21**	
1.3.1	Container Yard: Pavement	560,000m2 (800m x 700m)
1.3.2	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.
1.4	**UQP-South Berth No.4 ~ No.8a (Container Terminal)**	
1.4.1	Reinforcement / Expansion of Berth No.4	-
1.4.2	Reinforcement / Expansion of Berth No.5	-
1.4.3	Reinforcement / Expansion of Berth No.6	-
1.4.4	Reinforcement / Expansion of Berth No.7	-
1.4.5	Reinforcement / Expansion of Berth No.8	-
1.4.6	Reinforcement / Expansion of Berth No.8a	-
1.4.7	Removal of existing sheds	6 Sheds, 36,000m2 (150m x 40m x 6 shed)
1.4.8	Container Yard: Pavement	730,300m2
1.4.9	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.
1.4.10	Cargo Handling Equipment: Gantry Crane	-
1.4.11	Cargo Handling Equipment: RTG	-
1.4.12	Cargo Handling Equipment: Mobile Crane	10 sets 2x5berth
1.5	**UQP Area Redevelopment (except for 1.1、1.2、1.3、1.4)**	
1.5.1	Truck Parking	1,500,000m2 (1.5km x 1.0km)
1.5.2	South Port Truck Terminal	L.S.
1.5.3	Administration Building	200,000m2 (200m x 200m x 5 floors)
1.5.4	Main Gates for North Port and South Port	2 Gates
1.5.5	Logistic Center (Bonded Zone) EPZ	1,500,000m2 (500m x 1,500m x 2 area)
1.5.6	Logistic Center	600,000m2 (300m x 2,000m)
1.5.7	General Cargo Terminal/Yard	600,000m2 (1,200m x 500m)
1.5.8	Container Terminal/Stacking Yard behind of No.12 & 13	400,000m2 (400m x 1,000m)
1.5.9	International Container Terminal (ICT)	L.S.
1.5.10	Removal of Existing Sheds behind of Berth No.12 & 13	4 Sheds, 24,000m2 (150m x 40m x 6 shed)
1.5.11	Removal of Existing Jib Cranes	24 nos
1.5.12	Removal of Existing Rails	L.S.
1.5.13	Construction of New Rails	L.S.
1.5.14	New Roads in Port Area	80,000m2 (8m x 10,000m)

Source: JICA Study Team

Appendix 6.4-2 Project Components for KZP, AFGP and others (Alternative Plan)

No.	Project Component	Short/Mid-term Development (2025)
1.6	**KZP Berth No.11 & 12 (General Cargo Terminal)**	
1.6.1	New Berth No.11	-
1.6.2	New Berth No.12	-
1.6.3	Dredging in front of Bert No.11 & 12	-
1.6.4	Yard: Recclamation	-
1.6.5	Yard: Soil Improvement	-
1.6.6	Yard: Pavement	-
1.6.7	Yard: Infrastructure (utility, electricity, drainage etc.)	-
1.6.8	Removal of Existing Berth No.11, 12 & 13	-
1.6.9	Relocation of Berth No.11	-
1.6.10	Relocation of Berth No.12	-
1.6.11	New Navy Berth No.13 (substitution of old Berth No. 11)	-
1.7	**KZP Area Redevelopment (except for 1.6)**	
1.7.1	New Open Storage Yard 1	250,000 m2, (500m x 500m)
1.7.2	New Open Storage Yard 2	250,000 m2, (500m x 500m)
1.7.3	New Open Storage Yard 3	250,000 m2, (500m x 500m)
1.7.4	New Iron Ore Yards at Berth No.9 & 10	224,000 m2, (560m x 400m)
1.7.5	New Work Shop behind of No.9 & 10	112,000 m2, (560m x 200m)
1.7.6	New Sheds at Work Shop behind of No.9 & 10	3 Sheds, 20,000m2 (100m x 20m x 3 shed)
1.7.7	Removal of Existing Sheds behind of No.7 & 8	4 Sheds, 28,800m2 (180m x 40m x 4 shed)
1.7.8	Removal of Existing Belt conveyors behind of No.5 & 6	-
1.7.9	Infrastructure (utility, electricity, drainage etc.)	L.S.
1.7.10	Truck Parking Area	150,000m2, (500m x 300m)
1.7.11	Administration Custom Office Building	150,000m2, (250m x 300m x 2floors)
1.7.12	Rail Terminal	L.S.
1.8	**Abu Flus Port Redevelopment**	
1.8.1	Rehabilitation of Berth No.3 for Container Terminal	250m
1.8.2	Container Staking Yards	25,000m (250m x 100m)
1.8.3	Cargo Handling Equipment: Mobile Crane	2 sets
1.9	**Al Maqil Port Redevelopment**	
1.9.1	River Crossing Bridge	-
1.9.2	Yard Rehabilitation	180,000m2 (600m x 300m)
1.10	**Al Faw Ground Port**	
1.10.1	New Container berth No.1	**350m x 500m (-16.0m)**
1.10.2	New Container berth No.2	**350m x 500m (-16.0m)**
1.10.3	New Container berth No.3	-
1.10.4	New Container berth No.4	-
1.10.5	New Container berth No.5	-
1.10.6	New Container berth No.6	-
1.10.7	New Container berth No.7	-
1.10.8	New Container berth No.8	-
1.10.9	New Container berth No.9	-
1.10.10	Access Channel Dredging	17,730,000 m3, inner channel: -14m
1.10.11	Access Road TYPE-1	5,700m
1.10.12	Access Road TYPE-2	700m
1.10.13	Revetment	900 m
1.10.14	Highway AFGP-UQP: Part-1 connecting to Al Faw Port	21.0 km (16.0km + 5.0km)
1.10.15	Highway AFGP-UQP: Part-2	33.5 km
1.10.16	Highway AFGP-UQP: Part-3, incl tunnel approach	10.3 km
1.10.17	Highway AFGP-UQP: Part-4 from Safwan city, incl tunnel approach	12.4 km
1.10.18	Highway AFGP-UQP: Tunnel between Part 3 and Part 4	5,000 m (main tunnel 2,000m)
1.10.19	Cargo Handling Equipment: Gantry Crane	6 sets, 3 sets x 2 berths
1.10.20	Cargo Handling Equipment: RTG	18 sets, 9 sets x 2 berths
1.10.21	Cargo Handling Equipment: Top/Side Lifter	-
1.10.22	Cargo Handling Equipment: Tractor & Chassis	-
1.10.23	West Breakwater	16.0 km
1.10.24	East Breakwater (assumed as 35% in progress)	8.0 km

Source: JICA Study Team

Appendix 6.4-3 Project Components for Waterways (Alternative Plan)

No.	Project Component	Mid / Short-term Development (2025)			
2.	**Important Project Components for Major Waterways**	**Depth**	**Width**	**Length**	**Dredging**
		(m)	(m)	(km)	(Mil. m3)
2.1	**Khawar Abdallah Channel**			103.50	21.00
2.2.1	Abdallah Channel	-12.5	200/300	60.70	18.00
2.2.2	Wreck Removal (1 at buoy No.3 to No.25)	1 wreck			
2.2.3	Umm Qasr Channel	**-12.5**	300	25.10	3.00
2.2.4	Wreck Removal (6 along channel, 3 at berth No.9)	9 wrecks			
2.2.5	Khor Al-Zubayr Channel	-12.5	200/300	17.60	0.00
2.2.6	Wreck Removal (4 along channel)	4 wrecks	(by Phase II)		
2.2	**Shatt Al Arab Channel**			144.00	4.50
2.2.1	Mouth area	-6	150	10.50	4.50
2.2.2	Mouth to Abu Flus Port	-6	120/150	106.50	-
2.2.3	Abu Flus Port to Maquil Port	-6	120/150	27.00	-
2.2.4	Wreck Removal	Approx. 23 wrecks			
2.3	**AFGP Access Channel**	-	-	-	27.00
2.3.1	AFGP Access Channel	-14.0	200	60.00	27.00

Source: JICA Study Team

Appendix 6.4-4 Project Cost Breakdown for UQP (Alternative Plan)

No.	Project Component	Particulars	Units	Q'ty	Rate (USD)	Amount (USD)
1.	**Important Project Components in Main Ports**					
1.1	**UQP-North Berth No.25,No.26 & 27 (Container Terminal)**		**Subtotal**			**0**
1.1.1	New Berth No.25, No.26&No.27	-	L.S.	-	117,270,074	0
1.1.2	Container Yard: Reclamation	-	m3	-	35	0
1.1.3	Container Yard: Soil Improvement	-	m2	-	153	0
1.1.4	Container Yard: Pavement	-	m2	-	202	0
1.1.5	Container Yard: Infrastructure (utility, electricity, drainage etc.)	-	式	-	6,986,250	0
1.1.6	Cargo Handling Equipment: Gantry Crane	-	No.	-	14,950,000	0
1.1.7	Cargo Handling Equipment: RTG	-	No.	-	2,300,000	0
1.1.8	Cargo Handling Equipment: Mobile Crane	-	No.	-	2,000,000	0
1.1.9	Cargo Handling Equipment: Reach Stacker	-	No.	-	1,000,000	0
1.1.10	Cargo Handling Equipment: Top/Side Lifter	-	No.	-	1,000,000	0
1.1.11	Cargo Handling Equipment: Tractor & Chassis	-	No.	-	100,000	0
1.2	**UQP-North Berth No.22, 23 & 24 (General/RoRo/Container Terminal)**		**Subtotal**			**335,301,751**
1.2.1	New Berth No.22,No.23 & 24	400m (3berths)	L.S.	2	58,423,332	116,846,664
1.2.2	Yard: Recclamation	1,200,000m3	m3	1,200,000	35	42,000,000
1.2.3	Yard: Soil Improvement	600,000m2	m2	600,000	133	79,800,000
1.2.4	Yard: Pavement	585,000m2	m2	585,000	140	81,900,000
1.2.5	Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	12,161,250	12,161,250
1.2.6	Removal of existing berths	400m (3berths)	m	1	2,593,837	2,593,837
1.3	**UQP-North Container Stacking Yard behind of Berth No.20 & 21**		**Subtotal**			**106,232,000**
1.3.1	Container Yard: Pavement	560,000m2 (800m x 700m)	m2	560,000	169	94,640,000
1.3.2	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	11,592,000	11,592,000
1.4	**UQP-South Berth No.4 ~ No.8a (Container Terminal)**		**Subtotal**			**206,490,599**
1.4.1	Reinforcement / Expansion of Berth No.4	-	L.S.	-	52,189,119	0
1.4.2	Reinforcement / Expansion of Berth No.5	-	L.S.	-	65,236,398	0
1.4.3	Reinforcement / Expansion of Berth No.6	-	L.S.	-	47,753,043	0
1.4.4	Reinforcement / Expansion of Berth No.7	-	L.S.	-	47,753,043	0
1.4.5	Reinforcement / Expansion of Berth No.8	-	L.S.	-	47,753,043	0
1.4.6	Reinforcement / Expansion of Berth No.8a	-	L.S.	-	23,746,049	0
1.4.7	Removal of existing sheds	6 Sheds, 36,000m2 (150m x 40m x 6 shed)	No.	6	4,074,354	24,446,124
1.4.8	Container Yard: Pavement	730,300m2	m2	730,300	201	146,790,300
1.4.9	Container Yard: Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	15,254,175	15,254,175
1.4.10	Cargo Handling Equipment: Gantry Crane	-	No.	-	14,950,000	0
1.4.11	Cargo Handling Equipment: RTG	-	No.	-	2,300,000	0
1.4.12	Cargo Handling Equipment: Mobile Crane	10 sets 2x5berth	No.	10	2,000,000	20,000,000
1.5	**UQP Area Redevelopment (except for 1.1、1.2、1.3、1.4)**		**Subtotal**			**420,758,000**
1.5.1	Truck Parking	1,500,000m2 (1.5km x 1.0km)	m2	1,500,000	23	34,500,000
1.5.2	South Port Truck Terminal	L.S.	L.S.	1	-	0
1.5.3	Administration Building	200,000m2 (200m x 200m x 5 floors)	m2	200,000	800	160,000,000
1.5.4	Main Gates for North Port and South Port	2 Gates	No,	2	5,750,000	11,500,000
1.5.5	Logistic Center (Bonded Zone) EPZ	1,500,000m2 (500m x 1,500m x 2 area)	m2	1,500,000	-	0
1.5.6	Logistic Center	600,000m2 (300m x 2,000m)	m2	600,000	-	0
1.5.7	General Cargo Terminal/Yard	600,000m2 (1,200m x 500m)	m2	600,000	169	101,400,000
1.5.8	Container Terminal/Stacking Yard behind of No.12 & 13	400,000m2 (400m x 1,000m)	m2	400,000	169	67,600,000
1.5.9	International Container Terminal (ICT)	L.S.	L.S.	1	-	0
1.5.10	Removal of Existing Sheds behind of Berth No.12 & 13	4 Sheds, 24,000m2 (150m x 40m x 6 shed)	No,	4	1,150,000	4,600,000
1.5.11	Removal of Existing Jib Cranes	24 nos	No.	24	-	0
1.5.12	Removal of Existing Rails	L.S.	L.S.	1	-	0
1.5.13	Construction of New Rails	L.S.	L.S.	1	26,358,000	26,358,000
1.5.14	New Roads in Port Area	80,000m2 (8m x 10,000m)	m2	80,000	185	14,800,000

Source: JICA Study Team

Appendix 6.4-5 Project Cost Breakdown for KZP, AFGP and others (Alternative Plan)

No.	Project Component	Particulars	Units	Q'ty	Rate (USD)	Amount (USD)
1.6	**KZP Berth No. 11 & 12 (General Cargo Terminal)**		**Subtotal**			**0**
1.6.1	New Berth No.11	-	L.S.	-	73,399,967	0
1.6.2	New Berth No.12	-	L.S.	-	73,399,967	0
1.6.3	Dredging in front of Bert No. 11 & 12	-	m3	-	15	0
1.6.4	Yard: Recclamation	-	m3	-	35	0
1.6.5	Yard: Soil Improvement	-	m2	-	153	0
1.6.6	Yard: Pavement	-	m2	-	140	0
1.6.7	Yard: Infrastructure (utility, electricity, drainage etc.)	-	L.S.	-	4,899,000	0
1.6.8	Removal of Existing Berth No. 11, 12 & 13	-	L.S.	-	11,500,000	0
1.6.9	Relocation of Berth No. 11	-	L.S.	-	-	0
1.6.10	Relocation of Berth No. 12	-	L.S.	-	-	0
1.6.11	New Navy Berth No. 13 (substitution of old Berth No. 11)	-	L.S.	-	24,000,000	0
1.7	**KZP Area Redevelopment (except for 1.6)**		**Subtotal**			**318,957,000**
1.7.1	New Open Storage Yard 1	250,000 m2, (500m x 500m)	m2	250,000	140	35,000,000
1.7.2	New Open Storage Yard 2	250,000 m2, (500m x 500m)	m2	250,000	140	35,000,000
1.7.3	New Open Storage Yard 3	250,000 m2, (500m x 500m)	m2	250,000	140	35,000,000
1.7.4	New Iron Ore Yards at Berth No. 9 & 10	224,000 m2, (560m x 400m)	m2	224,000	23	5,152,000
1.7.5	New Work Shop behind of No. 9 & 10	112,000 m2, (560m x 200m)	m2	112,000	140	15,680,000
1.7.6	New Sheds at Work Shop behind of No. 9 & 10	3 Sheds, 20,000m2 (100m x 20m x 3 shed)	No.	3	1,000,000	3,000,000
1.7.7	Removal of Existing Sheds behind of No. 7 & 8	4 Sheds, 28,800m2 (180m x 40m x 4 shed)	No.	4	1,581,250	6,325,000
1.7.8	Removal of Existing Belt conveyors behind of No. 5 & 6	-	L.S.	1		0
1.7.9	Infrastructure (utility, electricity, drainage etc.)	L.S.	L.S.	1	10,350,000	10,350,000
1.7.10	Truck Parking Area	150,000m2, (500m x 300m)	m2	150,000	23	3,450,000
1.7.11	Administration Custom Office Building	150,000m2, (250m x 300m x 2floors)	m2	150,000	800	120,000,000
1.7.12	Rail Terminal	L.S.	L.S.	1	50,000,000	50,000,000
1.8	**Abu Flus Port Redevelopment**		**Subtotal**			**14,000,000**
1.8.1	Rehabilitation of Berth No.3 for Container Terminal	250m	m	250	-	0
1.8.2	Container Staking Yards	25,000m (250m x 100m)	m2	25,000	200	5,000,000
1.8.3	Cargo Handling Equipment: Mobile Crane	2 sets	No.	3	3,000,000	9,000,000
1.9	**Al Maqil Port Redevelopment**		**Subtotal**			**36,000,000**
1.9.1	River Crossing Bridge	-	m	1,000	-	0
1.9.2	Yard Rehabilitation	180,000m2 (600m x 300m)	m2	180,000	200	36,000,000
1.10	**Al Faw Ground Port**		**Subtotal**			**3,275,985,464**
1.10.1	New Container berth No.1	350m x 500m (-16.0m)	L.S.	1	122,307,532	122,307,532
1.10.2	New Container berth No.2	350m x 500m (-16.0m)	L.S.	1	122,307,532	122,307,532
1.10.3	New Container berth No.3	-	L.S.	-	122,307,532	0
1.10.4	New Container berth No.4	-	L.S.	-	122,307,532	0
1.10.5	New Container berth No.5	-	L.S.	-	122,307,532	0
1.10.6	New Container berth No.6	-	L.S.	-	122,307,532	0
1.10.7	New Container berth No.7	-	L.S.	-	122,307,532	0
1.10.8	New Container berth No.8	-	L.S.	-	122,307,532	0
1.10.9	New Container berth No.9	-	L.S.	-	122,307,532	0
1.10.10	Access Channel Dredging	17,730,000 m3, inner channel: -14m	m3	17,730,000	15	265,950,000
1.10.11	Access Road TYPE-1	5,700m	m	5,700	24,353	138,812,100
1.10.12	Access Road TYPE-2	700m	m	700	21,133	14,793,100
1.10.13	Revetment	900 m	m	900	18,108	16,297,200
1.10.14	Highway AFGP-UQP: Part-1 connecting to Al Faw Port	21.0 km (16.0km + 5.0km)	m	21,000.0	8,315	174,615,000
1.10.15	Highway AFGP-UQP: Part-2	33.5 km	m	33,500.0	8,315	278,552,500
1.10.16	Highway AFGP-UQP: Part-3, incl tunnel approach	10.3 km	m	10,300.0	8,315	85,644,500
1.10.17	Highway AFGP-UQP: Part-4 from Safwan city, incl tunnel appr	12.4 km	m	12,400.0	8,315	103,106,000
1.10.18	Highway AFGP-UQP: Tunnel between Part 3 and Part 4	5,000 m (main tunnel 2,000m)	m	5,000	172,500	862,500,000
1.10.19	Cargo Handling Equipment: Gantry Crane	6 sets, 3 sets x 2 berths	No.	6	14,950,000	89,700,000
1.10.20	Cargo Handling Equipment: RTG	18 sets, 9 sets x 2 berths	No.	18	2,300,000	41,400,000
1.10.21	Cargo Handling Equipment: Top/Side Lifter	-	No.	-	1,000,000	0
1.10.22	Cargo Handling Equipment: Tractor & Chassis	-	No.	-	100,000	0
1.10.23	West Breakwater	16.0 km	km	16	43,750,000	700,000,000
1.10.24	East Breakwater (assumed as 35% in progress)	8.0 km	km	8	32,500,000	260,000,000

Source: JICA Study Team

Appendix 6.4-6 Project Cost Breakdown for Major Cnannels (Alternative Plan)

No.	Project Component	Particulars				Units	Q'ty	Rate (USD)	Amount (USD)
2.	**Important Project Components for Major Waterways**	**Depth** (m)	**Width** (m)	**Length** (km)	**Dredging** (Mil. m3)				
2.1	**Khawar Abdallah Channel**			103.50	21.00	**Subtotal**	**21,000,000**		**365,000,000**
2.2.1	Abdallah Channel	-12.5	200/300	60.70	18.00	m3	18,000,000	15	270,000,000
2.2.2	Wreck Removal (1 at buoy No.3 to No.25)	1 wrecks				wrecks	1	5,000,000	5,000,000
2.2.3	Umm Qasr Channel	**-12.5**	300	25.10	3.00	m3	3,000,000	15	45,000,000
2.2.4	Wreck Removal (6 along channel, 3 at berth No.9)	9 wrecks				wrecks	9	5,000,000	45,000,000
2.2.5	Khor Al-Zubayr Channel	-12.5	200/300	17.60	0.00	m3	-	15	0
2.2.6	Wreck Removal (4 along channel)	4 wrecks (by Phase II)				wrecks	0	5,000,000	0
2.2	**Shatt Al Arab Channel**			144.00	4.50	**Subtotal**	**4,500,000**		**182,500,000**
2.2.1	Mouth area	-6	150	10.50	4.50	m3	4,500,000	15	67,500,000
2.2.2	Mouth to Abu Flus Port	-6	120/150	106.50	-	m3	-	15	0
2.2.3	Abu Flus Port to Maquil Port	-8	120/150	27.00	-	m3	-	15	0
2.2.4	Wreck Removal	Approx. 23 wrecks				wrecks	23	5,000,000	115,000,000
2.3	**AFGP Access Channel**	-	-	-	27.00	**Subtotal**			**405,000,000**
2.3.1	AFGP Access Channel	-14.0	200	60.00	27.00	m3	27,000,000	15	405,000,000

Source: JICA Study Team

Appendix 6.4-7 Disbursement Schedule (Short/Mid-term Development Plan)

No.	Project Component	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
		1,000USD	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
A.	Procurement & Construction	3,536,582	0	287,028	387,618	547,774	630,370	598,500	204,544	169,059	231,630	240,030	240,030	0	0	0	0	0	0	0	0	0	0	0	0
1.	Important Project Components for Main Ports	2,399,651	0	239,190	323,015	436,201	444,197	417,639	170,453	88,739	88,739	95,739	95,739	0	0	0	0	0	0	0	0	0	0	0	0
1.1	UQP-North Berth No.25, 26 & 27 (Container Terminal)	391,581	0	0	0	65,264	130,527	130,527	65,264	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.2	UQP-North Berth No.22, 23 & 24 (General/Roro/Container Terminal)	335,302	0	83,825	167,651	83,825	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.3	UQP-North Container Stacking Yard behind of Berth No.20	106,232	0	0	0	26,558	53,116	26,558	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.4	UQP-South Berth No.4 to No.8a (Container Terminal)	776,821	0	155,364	155,364	155,364	155,364	155,364	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.5	UQP Area Redevelopment (except for 1.1, 1.2, 1.3 & 1.4)	420,758	0	0	0	105,190	105,190	105,190	105,190	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.6	KZP Berth No.11 & 12 (General Cargo Terminal)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.7	KZP Area Redevelopment (except for 1.6)	318,957	0	0	0	0	0	0	0	79,739	79,739	79,739	79,739	0	0	0	0	0	0	0	0	0	0	0	0
1.8	Abu Flus Port Redevelopment	14,000	0	0	0	0	0	0	0	0	0	7,000	7,000	0	0	0	0	0	0	0	0	0	0	0	0
1.9	Al Maquil Port Redevelopment	36,000	0	0	0	0	0	0	0	9,000	9,000	9,000	9,000	0	0	0	0	0	0	0	0	0	0	0	0
1.10(1)	AFGP Development (Berth, Access Channel, Cranes)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.10(2)	AFGP Development (Inner Access Road)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.10(3)	AFGP Development (High Way to AFGP)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.10(4)	AFGP Development (West Breakwater)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.10(5)	AFGP Development (East Breakwater, Remaining Works)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.	Important Project Compoments for Waterways	547,500	0	0	0	20,278	81,111	81,111	0	52,143	104,286	104,286	104,286	0	0	0	0	0	0	0	0	0	0	0	0
2.1	Khawar Abdallah Channel	365,000	0	0	0	0	0	0	0	52,143	104,286	104,286	104,286	0	0	0	0	0	0	0	0	0	0	0	0
2.2	Shatt Al Arab Channel	182,500	0	0	0	20,278	81,111	81,111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.3	AFGP Access Channel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.4	Reserve/Spare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.	Base Construction Costs (1.+2.)	2,947,151	0	239,190	323,015	456,479	525,308	498,750	170,453	140,882	193,025	200,025	200,025	0	0	0	0	0	0	0	0	0	0	0	0
4.	Contingency (20.0% of 3.)	589,430	0	47,838	64,603	91,296	105,062	99,750	34,091	28,176	38,605	40,005	40,005	0	0	0	0	0	0	0	0	0	0	0	0
	Contingency (Price Escalation), included in above 4.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B.	Engineering Services	203,353	0	18,487	18,487	18,487	18,487	18,487	18,487	18,487	18,487	18,487	18,487	18,487	0	0	0	0	0	0	0	0	0	0	0
1.	Base Costs for Engineering (5.0% of A.)	176,829	0	16,075	16,075	16,075	16,075	16,075	16,075	16,075	16,075	16,075	16,075	16,075	0	0	0	0	0	0	0	0	0	0	0
2.	Contingency (15.0% of 1.)	26,524	0	2,411	2,411	2,411	2,411	2,411	2,411	2,411	2,411	2,411	2,411	2,411	0	0	0	0	0	0	0	0	0	0	0
C.	Sub-total (A.+B.)	3,739,935	0	305,514	406,105	566,261	648,856	616,987	223,030	187,545	250,117	258,517	258,517	18,487	0	0	0	0	0	0	0	0	0	0	0
D.	Administration Costs and others	186,997	0	15,276	20,305	28,313	32,443	30,849	11,152	9,377	12,506	12,926	12,926	924	0	0	0	0	0	0	0	0	0	0	0
a.	Land Acquisition and Compensation		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b.	Administration Cost (5.0% of C.)	186,997	0	15,276	20,305	28,313	32,443	30,849	11,152	9,377	12,506	12,926	12,926	924	0	0	0	0	0	0	0	0	0	0	0
c.	Value Added Tax (VAT)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d.	Sales and Other Texes		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E.	Ground Total (C.+D.)	3,926,932	0	320,790	426,410	594,574	681,299	647,836	234,182	196,922	262,622	271,442	271,442	19,411	0	0	0	0	0	0	0	0	0	0	0

Source: JICA Study Team

Appendix 6.4-8 Disbursement Schedule (Short/Mid-term Alternative Plan)

No.	Project Component	Total 1,000USD	1 2014	2 2015	3 2016	4 2017	5 2018	6 2019	7 2020	8 2021	9 2022	10 2023	11 2024	12 2025	13 2026	14 2027	15 2028	16 2029	17 2030	18 2031	19 2032	20 2033	21 2034	22 2035	23 2036
A.	Procurement & Construction	6,799,470	158,780	1,025,007	1,020,087	1,206,509	1,279,509	1,102,601	126,227	169,059	231,630	240,030	240,030	0	0	0	0	0	0	0	0	0	0	0	0
1.	Important Project Components for Main Ports	4,713,725	132,317	854,173	850,073	850,146	850,146	702,723	105,190	88,739	88,739	95,739	95,739	0	0	0	0	0	0	0	0	0	0	0	0
1.1	UQP-North Berth No.25, 26 & 27 (Container Terminal)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.2	UQP-North Berth No.22, 23 & 24 (General/Roro/Container Terminal)	335,302	0	47,900	95,801	95,801	95,801	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.3	UQP-North Container Stacking Yard behind of Berth No.20	106,232	0	53,116	53,116	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.4	UQP-South Berth No.4 to No.8a (Container Terminal)	206,491	0	51,623	51,623	51,623	51,623	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.5	UQP Area Redevelopment (except for 1.1, 1.2, 1.3 & 1.4)	420,758	0	0	0	105,190	105,190	105,190	105,190	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.6	KZP Berth No.11 & 12 (General Cargo Terminal)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.7	KZP Area Redevelopment (except for 1.6)	318,957	0	0	0	0	0	0	0	79,739	79,739	79,739	79,739	0	0	0	0	0	0	0	0	0	0	0	0
1.8	Abu Flus Port Redevelopment	14,000	0	0	0	0	0	0	0	0	0	7,000	7,000	0	0	0	0	0	0	0	0	0	0	0	0
1.9	Al Maquil Port Redevelopment	36,000	0	0	0	0	0	0	0	9,000	9,000	9,000	9,000	0	0	0	0	0	0	0	0	0	0	0	0
1.10(1)	AFGP Development (Berth, Access Channel, Cranes)	641,665	0	128,333	128,333	128,333	128,333	128,333	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.10(2)	AFGP Development (Inner Access Road)	169,902	28,317	28,317	28,317	28,317	28,317	28,317	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.10(3)	AFGP Development (High Way to AFGP)	1,504,418	0	300,884	300,884	300,884	300,884	300,884	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.10(4)	AFGP Development (West Breakwater)	700,000	0	140,000	140,000	140,000	140,000	140,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.10(5)	AFGP Development (East Breakwater, Remaining Works)	260,000	104,000	104,000	52,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.	Important Project Compoments for Waterways	952,500	0	0	0	155,278	216,111	216,111	0	52,143	104,286	104,286	104,286	0	0	0	0	0	0	0	0	0	0	0	0
2.1	Khawar Abdallah Channel	365,000	0	0	0	0	0	0	0	52,143	104,286	104,286	104,286	0	0	0	0	0	0	0	0	0	0	0	0
2.2	Shatt Al Arab Channel	182,500	0	0	0	20,278	81,111	81,111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.3	AFGP Access Channel	405,000	0	0	0	135,000	135,000	135,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.4	Reserve/Spare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.	Base Construction Costs (1.+2.)	5,666,225	132,317	854,173	850,073	1,005,424	1,066,257	918,834	105,190	140,882	193,025	200,025	200,025	0	0	0	0	0	0	0	0	0	0	0	0
4.	Contingency (20.0% of 3.)	1,133,245	26,463	170,835	170,015	201,085	213,251	183,767	21,038	28,176	38,605	40,005	40,005	0	0	0	0	0	0	0	0	0	0	0	0
	Contingency (Price Escalation), included in above 4.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B.	Engineering Services	390,970	0	35,543	35,543	35,543	35,543	35,543	35,543	35,543	35,543	35,543	35,543	35,543	0	0	0	0	0	0	0	0	0	0	0
1.	Base Costs for Engineering (5.0% of A.)	339,973	0	30,907	30,907	30,907	30,907	30,907	30,907	30,907	30,907	30,907	30,907	30,907	0	0	0	0	0	0	0	0	0	0	0
2.	Contingency (15.0% of 1.)	50,996	0	4,636	4,636	4,636	4,636	4,636	4,636	4,636	4,636	4,636	4,636	4,636	0	0	0	0	0	0	0	0	0	0	0
C.	Sub-total (A.+B.)	7,190,439	158,780	1,060,550	1,055,630	1,242,052	1,315,052	1,138,144	161,770	204,601	267,173	275,573	275,573	35,543	0	0	0	0	0	0	0	0	0	0	0
D.	Administration Costs and others	359,522	7,939	53,027	52,782	62,103	65,753	56,907	8,089	10,230	13,359	13,779	13,779	1,777	0	0	0	0	0	0	0	0	0	0	0
a.	Land Acquisition and Compensation		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b.	Administration Cost (5.0% of C.)	359,522	7,939	53,027	52,782	62,103	65,753	56,907	8,089	10,230	13,359	13,779	13,779	1,777	0	0	0	0	0	0	0	0	0	0	0
c.	Value Added Tax (VAT)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d.	Sales and Other Texes		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E.	Ground Total (C.+D.)	7,549,961	166,720	1,113,577	1,108,412	1,304,154	1,380,804	1,195,051	169,859	214,831	280,531	289,351	289,351	37,320	0	0	0	0	0	0	0	0	0	0	0

Source: JICA Study Team

Appendix 6.4-9 Result of Economic Calculation for Alternative Plan

Year	Cost ('000 USD)					Benefit ('000 USD)			Total Benefit-Cost	Present Value		
	Project Cost	Operation & Maintenance			Cost Total	Transport Cost Saving	Congestion Cost Saving	Benefit Total		Total Cost	Total Benefit	Net Benefit
		Renewal Investment	Personnel & Administration	Maintenance								
2014	133,560	0	0	0	133,560	0	0	0	-133,560	133,560	0	-133,560
2015	929,473	0	0	0	929,473	0	0	0	-929,473	929,473	0	-929,473
2016	975,360	0	0	0	975,360	0	0	0	-975,360	868,067	0	-868,067
2017	1,060,442	0	0	0	1,060,442	0	0	0	-1,060,442	890,367	0	-890,367
2018	1,005,365	0	10,836	7,673	1,023,874	121,375	73,886	195,261	-828,612	811,004	154,665	-656,339
2019	943,941	0	10,836	7,673	962,450	143,620	73,886	217,506	-744,944	719,199	162,533	-556,666
2020	123,707	0	13,076	42,027	178,810	212,299	73,886	286,186	107,376	126,054	201,750	75,696
2021	168,009	0	13,202	46,698	227,909	262,188	73,886	336,075	108,166	151,573	223,509	71,936
2022	231,670	0	13,202	46,698	291,570	289,364	73,886	363,250	71,680	182,935	227,908	44,973
2023	266,683	0	13,202	46,698	326,583	316,540	73,886	390,426	63,843	193,304	231,093	37,789
2024	266,683	0	15,442	46,698	328,823	343,716	73,886	417,602	88,779	183,613	233,187	49,574
2025	0	1,622	20,860	59,012	81,495	552,417	73,886	626,303	544,808	42,930	329,929	286,998
2026	0	0	20,860	59,012	79,872	596,398	73,886	670,284	590,412	39,694	333,111	293,417
2027	0	0	20,860	59,012	79,872	640,379	73,886	714,266	634,393	37,447	334,876	297,428
2028	0	0	20,860	59,012	79,872	684,361	73,886	758,247	678,375	35,328	335,373	300,046
2029	0	0	20,860	62,762	83,622	699,332	73,886	773,218	689,596	34,893	322,637	287,744
2030	0	1,622	20,860	62,762	85,245	529,134	73,886	603,021	517,776	33,556	237,377	203,821
2031	0	0	14,812	59,983	74,795	532,217	73,886	606,103	531,308	27,776	225,085	197,309
2032	0	0	14,812	59,983	74,795	535,299	73,886	609,185	534,390	26,204	213,424	187,220
2033	0	0	14,812	59,983	74,795	538,381	73,886	612,267	537,472	24,721	202,362	177,642
2034	0	0	14,812	59,983	74,795	541,463	73,886	615,349	540,554	23,321	191,869	168,547
2035	0	1,622	14,812	59,983	76,417	544,545	73,886	618,431	542,014	22,479	181,915	159,436
2036	0	0	14,812	59,983	74,795	547,627	73,886	621,513	546,718	20,756	172,473	151,717
2037	0	0	14,812	59,983	74,795	550,709	73,886	624,596	549,801	19,581	163,517	143,936
2038	0	10,000	14,812	59,983	84,795	553,791	73,886	627,678	542,883	20,943	155,023	134,080
2039	0	0	14,812	59,983	74,795	556,874	73,886	630,760	555,965	17,427	146,966	129,539
2040	0	132,722	14,812	59,983	207,517	559,956	73,886	633,842	426,325	45,614	139,325	93,710
2041	0	0	14,812	59,983	74,795	563,038	73,886	636,924	562,129	15,510	132,078	116,568
2042	0	0	14,812	59,983	74,795	563,135	73,886	637,021	562,226	14,632	124,620	109,988
2043	0	0	14,812	59,983	74,795	563,232	73,886	637,118	562,323	13,804	117,584	103,780
2044	0	0	14,812	59,983	74,795	563,328	73,886	637,215	562,420	13,023	110,946	97,923
2045	0	10,622	14,812	59,983	85,417	563,425	73,886	637,311	551,894	14,030	104,681	90,651
2046	0	0	14,812	59,983	74,795	563,425	73,886	637,311	562,516	11,590	98,756	87,166
2047	0	0	14,812	59,983	74,795	563,425	73,886	637,311	562,516	10,934	93,166	82,232
2048	0	0	14,812	59,983	74,795	563,425	73,886	637,311	562,516	10,315	87,893	77,577
Total	6,104,893	158,211	481,572	1,685,434	8,430,109	15,358,419	2,290,474	17,648,893	9,218,783	5,765,657	5,989,630	223,974

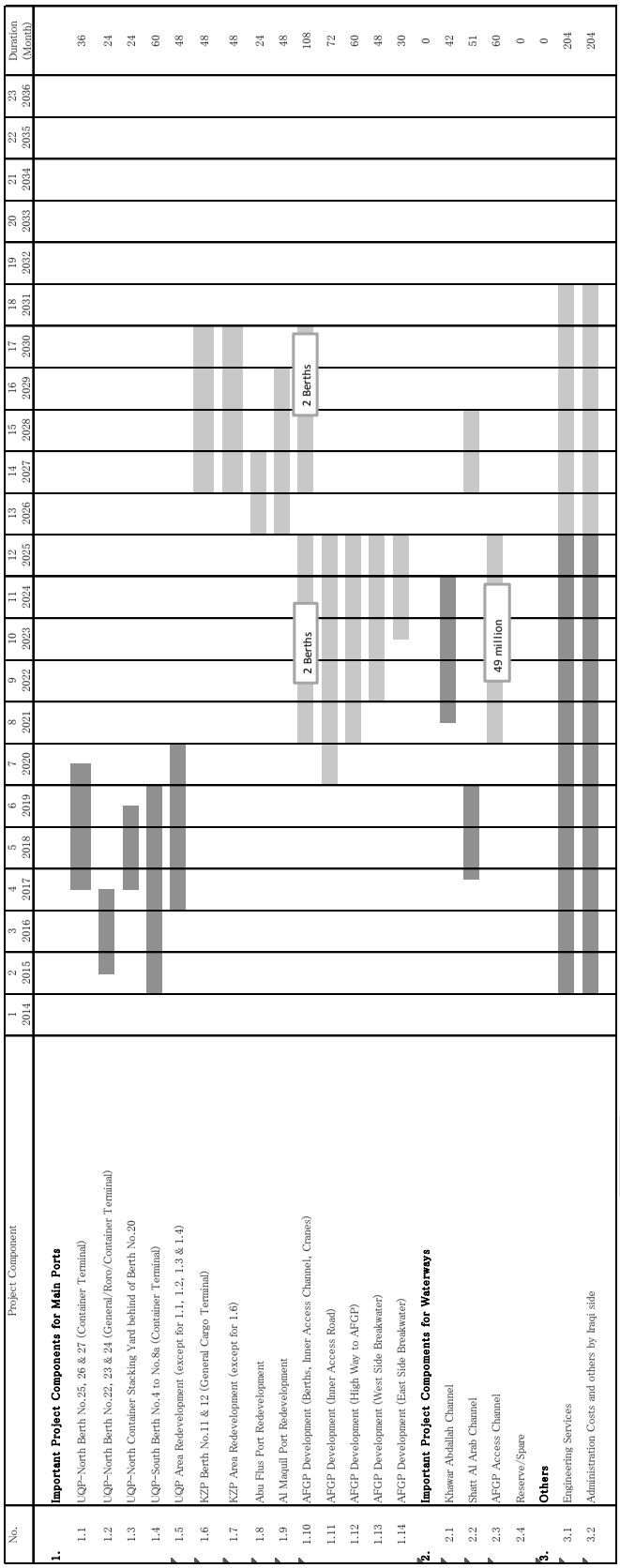
Iraq Treasury Bond, coupon rate: 5.8%

EIRR 6.4%

B/C ratio 1.04

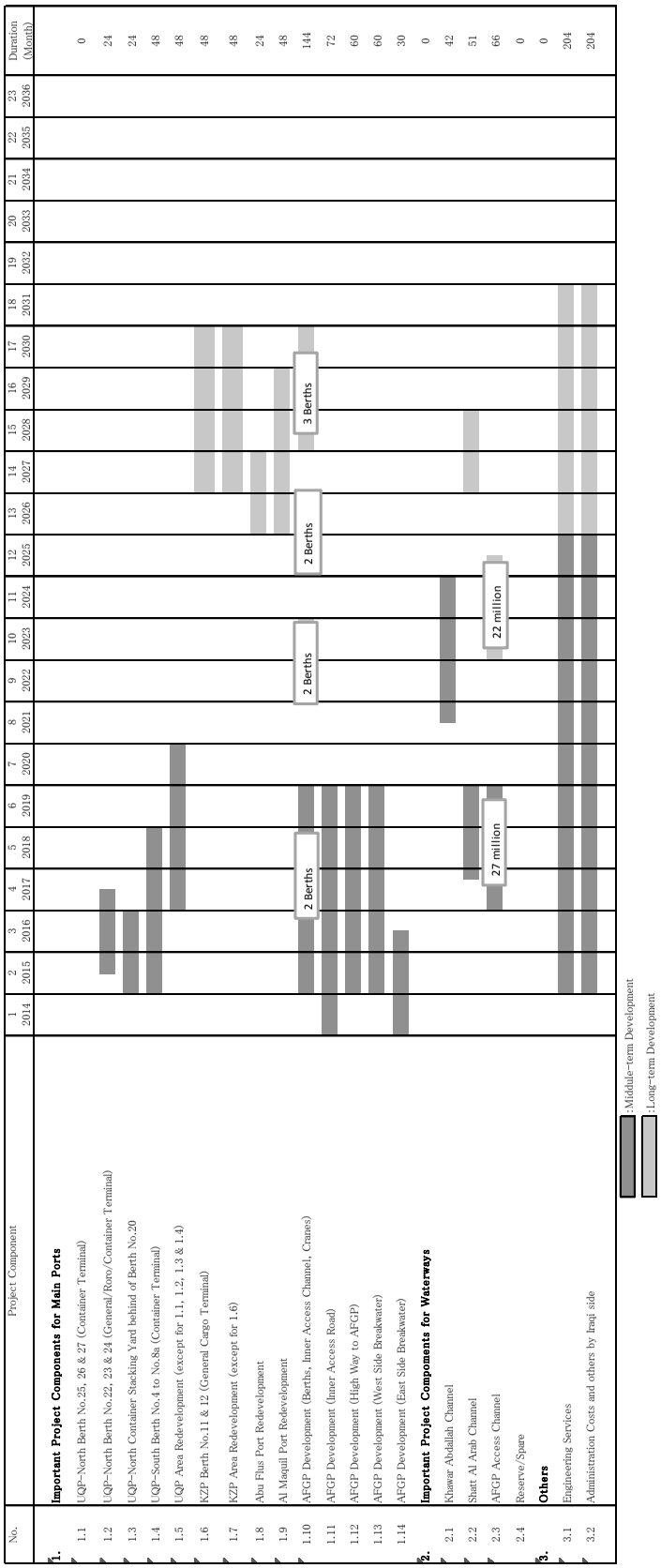
Source: JICA Study Team

Appendix 6.5-1 Implementation Schedule for Long-term Development Plan



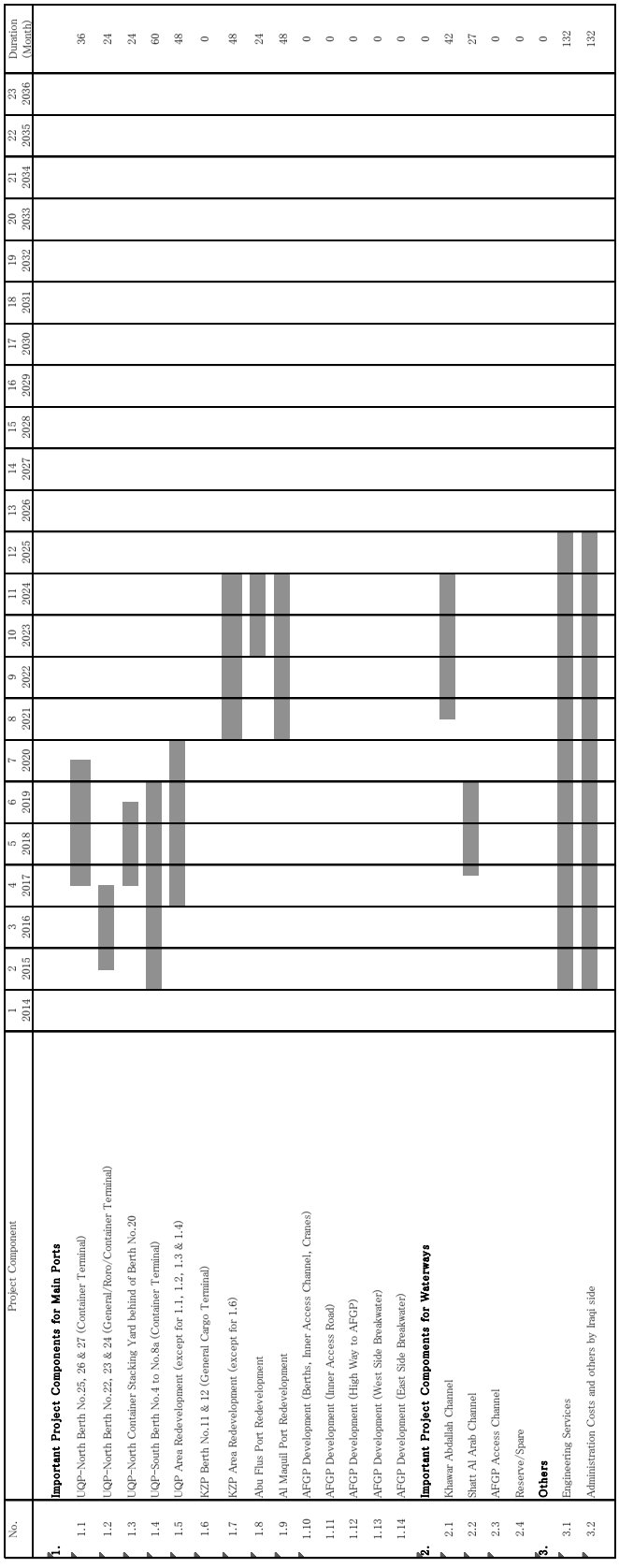
Source: JICA Study Team

Appendix 6.5-2 Implementation Schedule for Alternative Plan



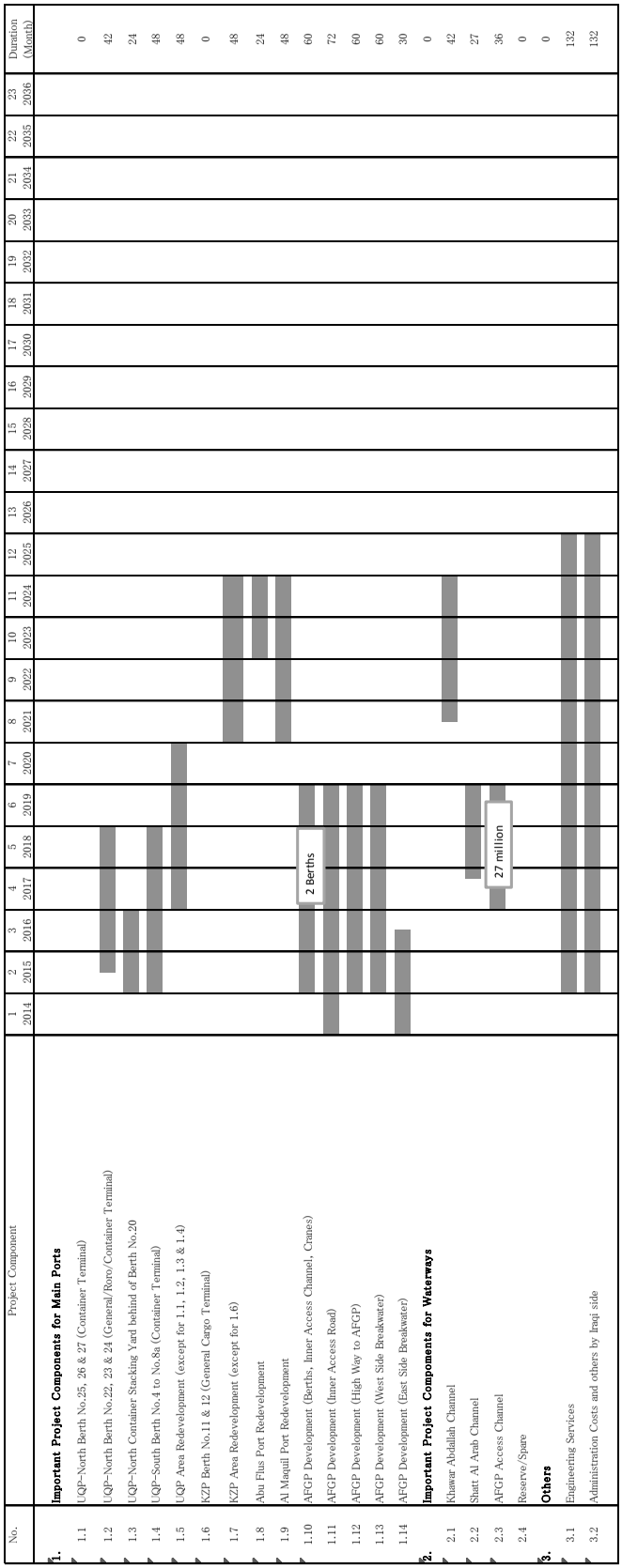
Source: JICA Study Team

Appendix 6.5-3 Implementation Schedule for Short/Mid-term Development Plan

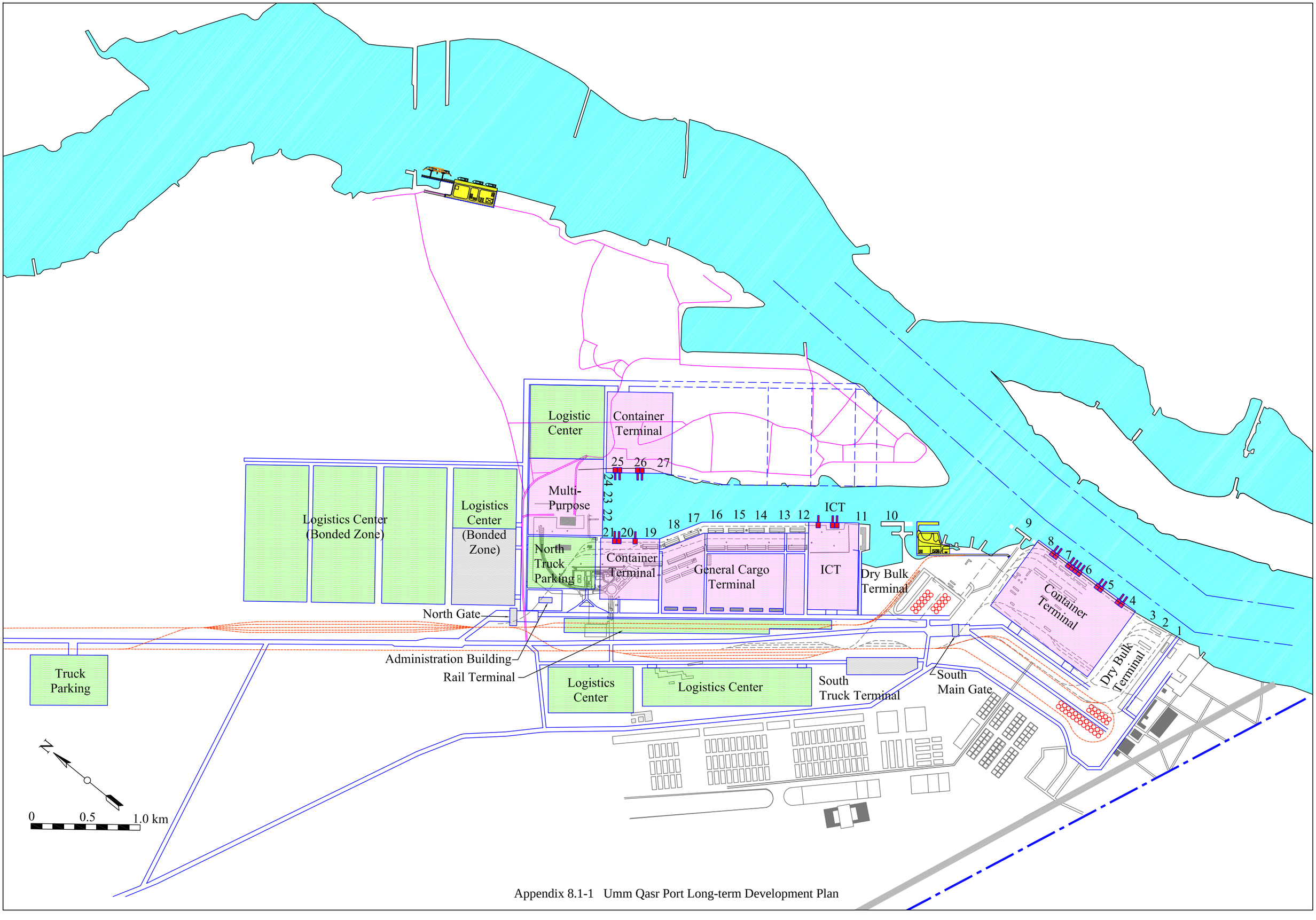


Source: JICA Study Team

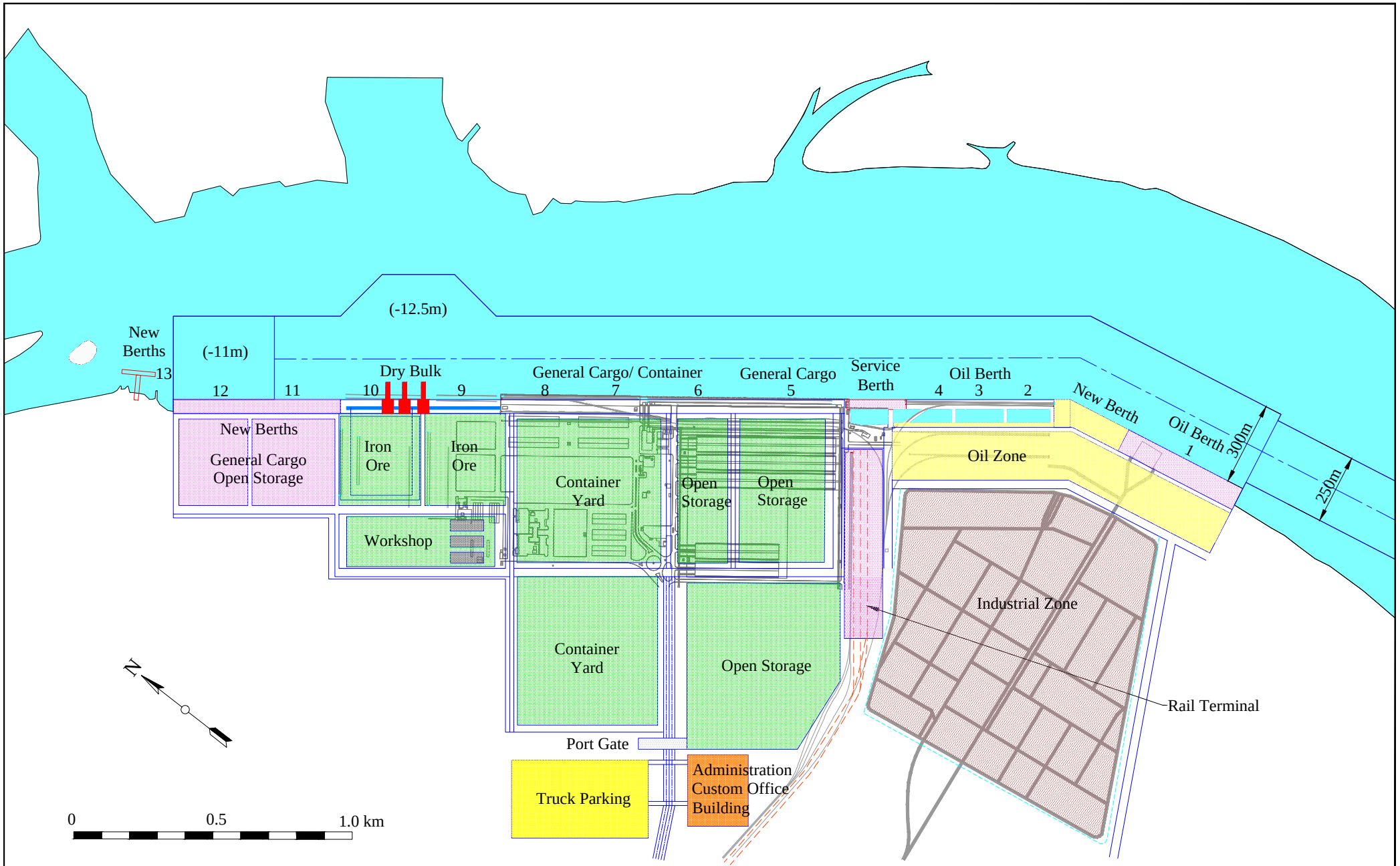
Appendix 6.5-4 Implementation Schedule for Short/Mid-term Alternative Plan



Source：JICA Study Team



Appendix 8.1-1 Umm Qasr Port Long-term Development Plan



Appendix 8.1-2 Khor Al Zubayr Port Long-term Development Plan