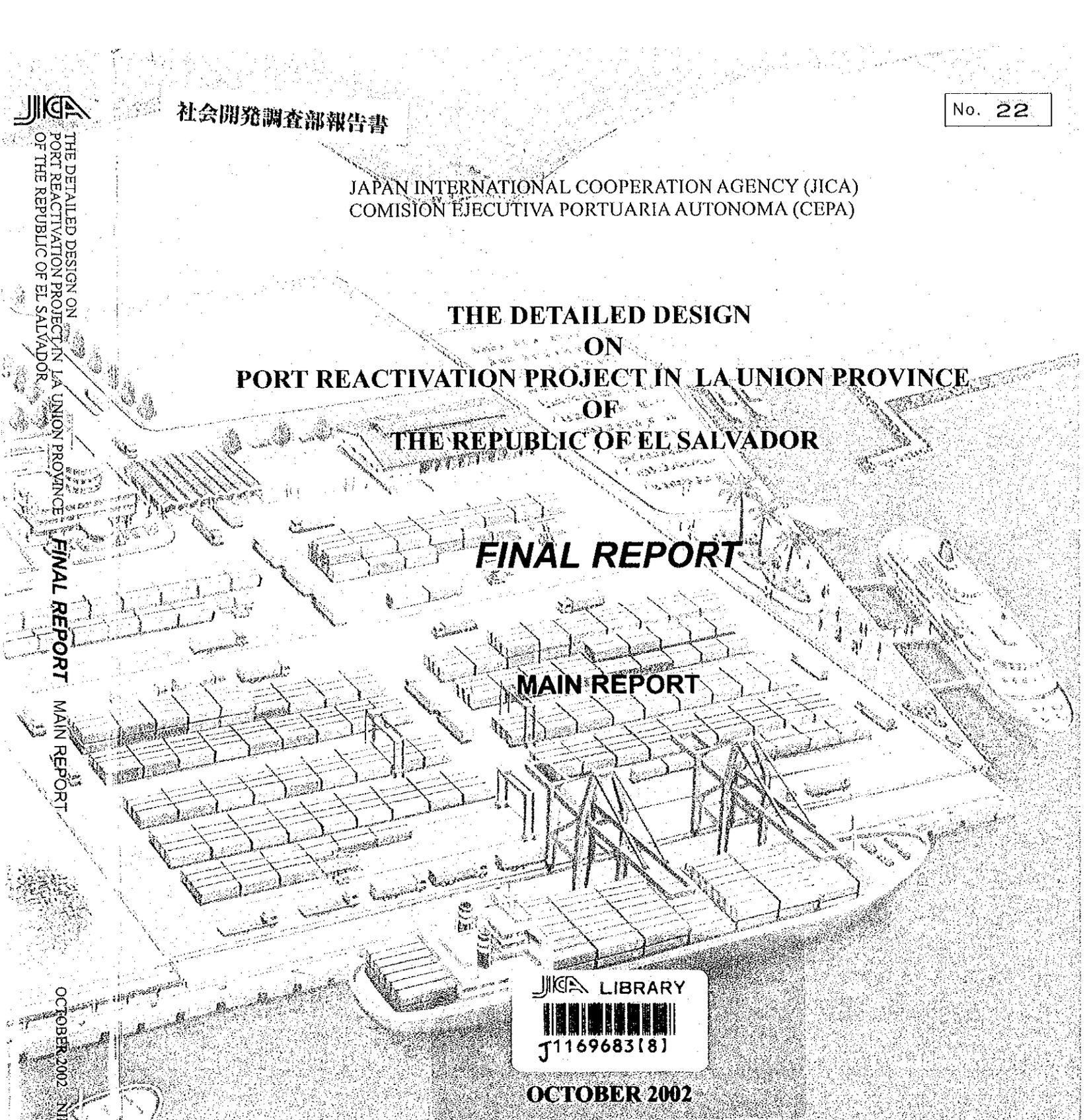
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
COMISION EJECUTIVA PORTUARIA AUTONOMA (CEPA)

THE DETAILED DESIGN ON PORT REACTIVATION PROJECT IN LA UNION PROVINCE OF THE REPUBLIC OF EL SALVADOR

FINAL REPORT

MAIN REPORT



OCTOBER 2002

NIPPON KOEI CO., LTD.

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EXCHANGE RATE

1US dollar = 8.75 Colones = 120 Yen
(as of July, 2002)

PREFACE

In response to the request from the Government of the Republic of El Salvador, the Government of Japan decided to conduct the detailed design study on Port Reactivation Project in La Union province of the Republic of El Salvador and entrusted the study to the Japan International Cooperation Agency (JICA).

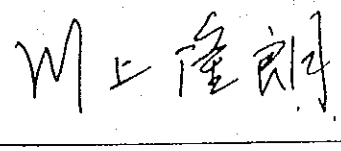
JICA dispatched a study team headed by Mr. Teruo Onuki of Nippon Koei Co., Ltd. to the Republic of El Salvador, several times between August 2001 and August 2002.

The team held discussions with the concerned officials of the Government of the Republic of El Salvador and conducted field surveys in the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

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

Finally, I which to express my sincere appreciation to the concerned officials of the Government of the Republic of El Salvador for their close cooperation extended to the study.

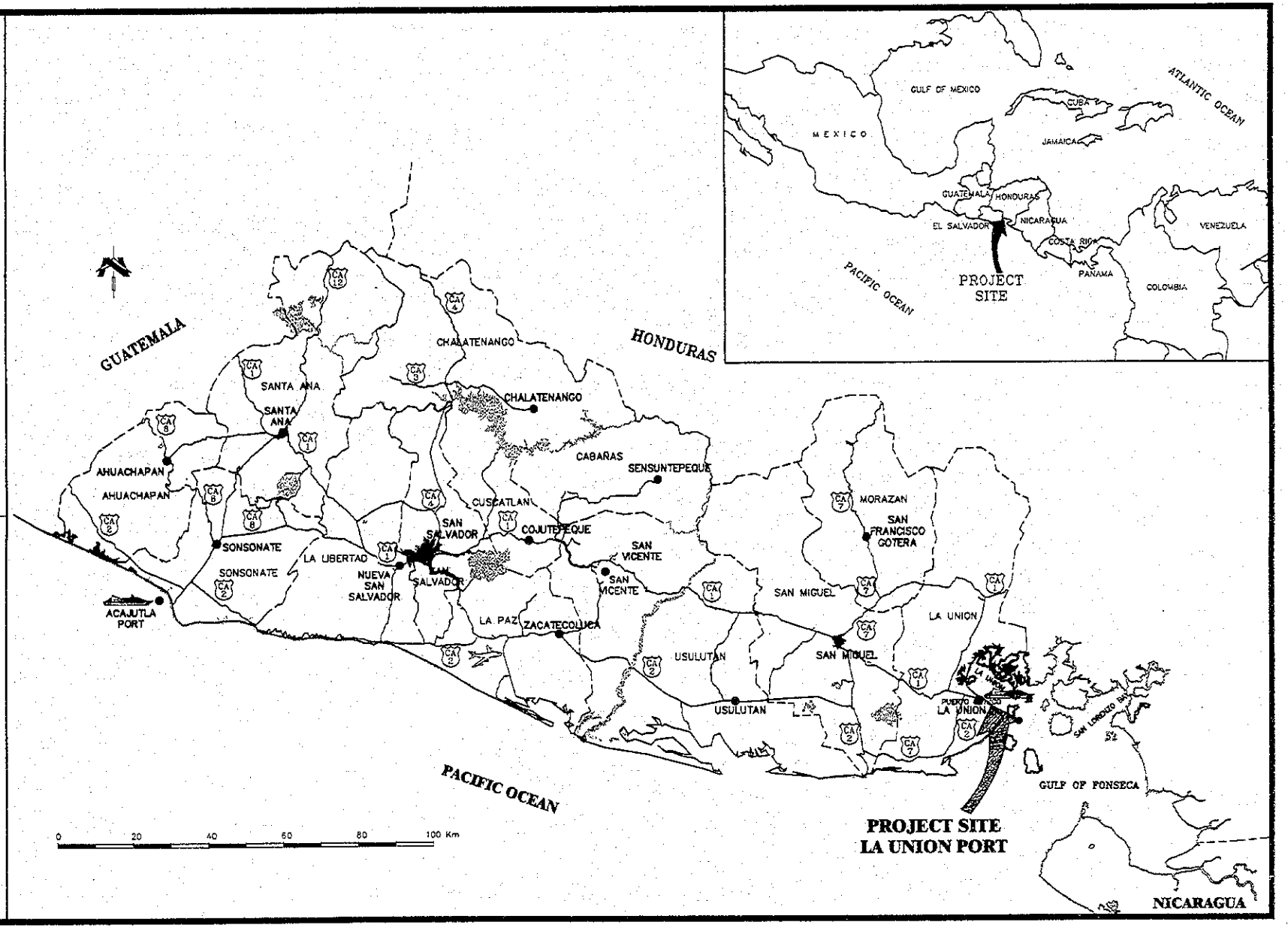
October 2002



Takao Kawakami
President
Japan International Cooperation Agency

DETAILED DESIGN ON PORT REACTIVATION PROJECT IN LA UNION PROVINCE

LOCATION MAP



DETAILED DESIGN ON PORT REACTIVATION PROJECT IN LA UNION PROVINCE	**AERIAL PHOTO OF PROJECT SITE**

ABBREVIATIONS TABLE

ABS	American Bureau of Shipping
ACI	American Concrete Institute
ADCP	Acoustic Doppler Current Profiler
AES	Power Generation and Distribution Corporation, USA
AIA	The American Institute of Architects
AIS	Automatic Identification System
AISC	American Institute of Steel Construction
AMAP	Port and Maritime Administration
AMSS	Metropolitan Area of San Salvador
ANDA	Administracion Nacional de Acueductos y Alcantarillados
ANEP	National Association of Private Enterprise
ANSI	American National Standard Institute
ANWA	American Water Works Association
ASHRAE	American Society of Heating, Refrigeration
ASHRAF	Air-Conditioning Engineers
ASIA	Asociacion Salvadorena de Ingenierous y Arquitectos
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing & Materials
AASHTO	American Association of State Highway and Transportation Officials
API	American Petroleum Industry
AWG	American Wire Gage
B/C Ratio	Benefit/Cost Ratio
BCIE	Bank of Central America for Economic Integration
BCR	Banco Cenral de Reseva
BCR	Reserve Central Bank
BOD	Biochemical Oxygen Demand
BS	British Standard
C.A.	Central America
CA-1	Pan-American Highway
CA-2	Littoral Highway
CAESS	Electrical and Illumination Company of San Salvador
CBI	Caribbean Basin Initiative
CBR/Value	California Bearing Ratio Value
CCTV System	Closed Circuit Television System
CDM	Cement Deep Mixing Method
CDL	Chart Datum Level
CEL	Comision Ejecutiva Hidroelectrica del Rio Lempa
CEPA	COMISION EJECUTIVA PORTUARIA AUTONOMA
CENDEPESCA	Centro de Desarrollo Pesquero
CFC	Conversion Factor for Consumption
CFS	Container Freight Station
CFSL	Conversion Factor for Labor
CFUL	Conversion Factor for Unskilled Labor
CH	Silty Clay
CIF	Cost, Insurance, and Freight
CITES	Convention on International Trade in Endangered Species of Wild

	Fauna and Flora
CL	Gravelly/Sandy Clay
CLESA	Santa Ana Electrical Company
CNR	Centro National de Registros
CNR	National Registry Center
CNRS	French National Research Organization Standard
CNT	Container Terminal
CNT	Containerization
CONACYT	Consejo Nacional de Ciencia y Technologia
CORSAIN	Corporacion Salvadorena de Inversiones
COD	Chemical Oxygen Demand
CPI	Consumer Price Index
CSA	Canadian Standard Association
CY	Container Yard
D/D	Detailed Design
DB	Dry Bulk
DELSUR	Electrical Distributor of the South
DL	Chart Datum Level
DOF	Degree of Freedom
DWT	Dead Weight Tonnage
DFPS	Differential Global Positioning System
E	East
ECW	Environmental Clerk or Works, provided by the Supervisin g Consultant to supervise Environmental ,matters
EEO	Empresa Electrica de Oriente
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EMP	Environmental Management and Monitoring Plan
EMS	Environmental Management System
EMPORNAC	Santo Tomás de Castilla National Port Company
EPZ	Export Processing Zone
Epc	Environmental Permit Conditions
ESE	East South East
ETA	Estimate time of Arrival
ETD	Estimate time of Departure
F.D	Floating Dock
F/S	Feasibility Study
F/C Portion	Foreign Currency Portion
FCL	Full Container Load
FENADESAL	National Railway Company of El Salvador
FIRR	Financial Internal Rate of Return
FOB	Free on Board
FUSADES	Salvadorian Foundation for Economic and Social Development
GDP	Gross Domestic Product
GOES	Government of the Republic of El Salvador
GOJ	Government of Japan
GPS	Global Positioning System
GRT	Gross Registered Tonnage
GT	Gross Tonnage
H.W.L	Mean Springs High Water Level

$H_{1/3}$	Significant Wave Height
HWONT	High Water Level of Ordinary Neap Tide
HWOST	High Water Level of Ordinary Spring Tide
ICB	Interlocking Concrete Block
ICB	International Competitive Bidding
IEEE	The Institute of Electrical and Electronic Engineers Standard
IESNA	Illuminating Engineering Society of North America
IPI	Industrial Price Index
IUCN	International Union for the Conservation of Nature and Natural Resources
IVA	Impuesto al Valor Agregado
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
JIS	Japan Industrial Standards
L.W.L	Mean Springs Low Water Level
LCL	Less than Container Load
LOA	Length Overall
L/C Portion	Local Currency Portion
LPG	Liquid Propane Gas
LWONT	Low Water Level of Ordinary Neap Tide
LWOST	Low Water Level of Ordinary Spring Tide
Lux	Illumination Unit
MARN	Ministry of Environment and Natural Resources
MCM	Mille Circular Mil
MMG	Mathematical Modeling Grouped
MOP	Ministry of Public Works
MPT	Multi-purpose Terminal
MSL	Mean Sea Level
MSPAS	Ministry of Public Health and Social Assistance
MSS	Model for Slow and Shallow Motions
MT	Metric Tonnage
Max	Maximum
Min	Minimum
N	North
NAD 27	North American Datum 1927
NCD	New Chart Datum
NK	Nippon Koei
NE	North East
NEC	National Electrical Code
NEMA	National Electrical Manufactures Association
NFPA	National Fire Protection Association
NPC	National Plumbing Codes
NPV	Net Present Valve
NSO	National Council of Science
NTU	Nephelometric Turbidity Unit (NTU)
NW	North West
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
OHS	Occupational Health and Safety Plan
OM	Operations Manual

ONAN Type	Oil Natural, Air Natural
OIRSA	Regional International Organism of Agriculture and Cattle Health
OPAMS	Planning Office of the San Salvador Metropolitan Area
PC	Personal Computer
PCC	Pure Car Carriers
PEU	Port Environmental Unit to be formed by CEPA
PIANC	Permanent International Association of Navigation Congresses
PPL	Pennsylvania Power and Lighting
PPP	Puebla Panama Plan
PSI	Pound Per Square Inch
PVC	Polyvinyl Chloride
PCO	Navigation Control Office
PRO-ESA	Promotion of El Salvador
R.C	Reinforcement Concrete
RASA	Petroleum Refinery of Acajutla
RH	Relative Humidity
RO/RO	Roll on Roll off
RTG	Rubber Tired Gantry Crane System
S	South
SAND	Natural Protected Areas System
SANP	Natural Protected Area System
SC	Straddle Carrier
SCF	Standard Conversion Factor
SE	South East
SG	Gravelly Sand
SIGET	Superintendence of Electricity and Telecommunic ations
SHS	Trailing Suction Hopper Dredger
SMB	The Sverdrup Munk Bretschneider
SPT	Standard Penetration Tests
SP-SM	Poorly Graded Sand with Silt
SS	Suspended Solid
SW	South West
TBM	Temporary Bench Mark
TEU	Twenty Feet Equivalent Container Units
TSS	Total Suspended Solids
UDL	Uniformly Distributed Live Loads
UL	Underwriter's Laboratories, Inc.
UN	United Nation
USA	United States of America
UTM	Universal Transverse Mercator
UTP Network	Unshielded Twisted-Pair Network
VAC	Ventilation and Air-Conditioning
VHF	Very High Frequency
VTS	Vessel Traffic Service
W	West
WB	Word Bank
WGS 84	World Geodetic System 1984
WNW	West North West
WWTP	Waster Water Treatment Plant
XLPE/PVC	Polyvinyl Chloride Cross-Linked Polyethylene Insulated

Abbreviation of Common Weights Measures and Technical Terms

M^3/S or cu.m/sec.	Cubic Meter(s) per Second
Db	Decibel
GWh	Gigawatt-hour(s)
GT	Gross ton(s)
Ha	Hectare(s)
Hz	Hertz
Hp	Horsepower
hr or h	Hour(s)
l or lit	Liter
Lit/P	Liter per Person
MVA	Megavolt-ampere
MW	Megawatt(s)
MWh	Megawatt-hour(s)
In.	Inch(es)
Ka	Kilo-ampere
Kgf/cm^2	Kilogram Force per Square Centimeter
Kl	kiloliter(s)
Km	kilometers(s)
kN	Kilo-Newton
kN/m^2	Kilo-Newton per Square Mater
kN/m^3	Kilo-Newton per Cubic Mater
knots	Marine speed measurement
KV	Kilovolt
KVA	Kilovolt-ampere
KW	Kilowatt(s)
KWh	Kilowatt-hour(s)
mg	Milligram(s)
m^2/psn	Square Meter Per Parson
mm	Milimeter(es)
Mill	Million
MAF	Million acre-feet (=1,235 MCM)
MCM	Million Cubic Meter
Mgd	Million gallons per day
Min.	Minute(s) or minimum
Mpa	Mega-Pascal
NM	Nautical mile(s)
N/mm^2	Newton per square millimeter (=Pa)
No	Number (serial number)
no(s)	(units)
Pa	Pascal
ppm	Parts per million
Psi	Pound per square inch
Pf	Power factor
rpm	Revolutions per minute
S	Second(s)
$_^2$,m^2	Square e.g. square meter(s)
t	Ton(s) or tone(s)
t/m^2	Ton per square meter

V	Volt
VA	Volt-ampere
W	Watt(s)
WH	Watt-hour(s)
In.	Reactive kilovolt-ampere
S	Second(s)
_^{2},m^2	Square e.g. square meter(s)
t	Ton(s) or tone(s)

MEASUREMENT UNITS TABLE

Extent	
cm^2	Square-centimeters (1.0 cm x 1.0 cm)
m^2	Square-meters (1.0 m x 1.0 m)
km^2	Square-kilometers (1.0 Km x 1.0 Km)
ha.	Hectares (10,000 m^2)
acr.	Acres (4,046.8 m^2 or 0.40468 ha.)
Length	
mm	Millimeter
cm	Centimeters (10 mm)
m	Meters (100 cm)
km	Kilometers (1,000 m)
Currency	
US$	United State Dollars
J¥	Japanese Yen (J120/1 US$)
cls.	Colones (cls 8.75/1 US$)
Weight	
mg	Milligram (s)
g	Gram (s) (1,000 mg)
Kg	Kilogram (s) (1,000 g)
Ton or MT	Metric tone (1,000 kg)
Time	
sec.	Seconds
min.	Minute (60 Sec.)
hr.	Hours (60 Min.)

Standard Conversions

In.	x	25.4	=	mm
Feet	x	0.3048	=	m
Psi	x	0.070307	=	kg/cm^2
Acre	x	0.404	=	ha

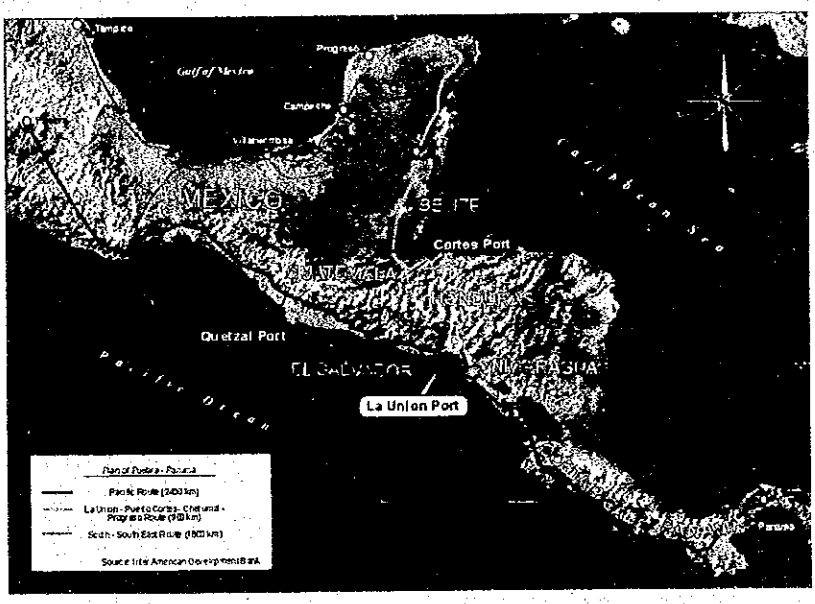
EXECUTIVE SUMMARY

PROFILE

In early 2001 "Puebla Panamá Plan" was envisioned to accelerate integration and development of the region from Southeast México to Central America. The eastern port of El Salvador is in a strategic pivotal point of highlighted transport integration projects within the Pacific Coast Corridor and the Dry Canal Corridor connecting to Puerto Cortés in Honduras. So, the Government of El Salvador (the GOES) decided to develop a new port in La Unión province for the development of the eastern region of El Salvador.

According to the Study, the cargo traffic volume passing through the La Unión Port in 2015 is estimated at 840,000 MT for general and bulk cargo, and 275,000 TEUs for containers. To accommodate this cargo traffic volume, the total required berth length is calculated at 560 m for the main berths with a depth of –14 m, and 240 m for the passenger berth with a depth of –9.5 m. Regarding the access channel, the inner channel is planned to be –14.0 m deep and 140 m wide, and the outer channel to be –14.5 m deep and 137 m wide. The total construction cost is estimated at 116.3 million US$.

Judging from the economic viewpoint, the La Unión Port will be useful for not only El Salvador but also neighboring countries in Central America. The La Unión Port is expected to start operating in 2006.



CHAPTER 1 INTRODUCTION

The existing Cutuco Port is located in the southeast region of El Salvador facing the Gulf of Fonseca. Due to significant deterioration of its facilities, the Cutuco Port was closed in 1996. All the outdated port facilities are beyond repair to meet modern port requirements.

Considering the advantageous location and well sheltered conditions of the Gulf of Fonseca, the GOES has drawn up the port reactivation project in La Unión Province. The GOES has then carried out the Master Plan and Feasibility Study with technical assistance of the Government of Japan (the GOJ) in 1998. The plan recommended the construction of one (1) Container Berth, one (1) Multi-purpose Berth, and one (1) Passenger Berth together with port service facilities. The Study confirmed the viability of the Project, and the GOES requested further assistance from the GOJ for the detailed design of the Project.

The JICA Study Team was dispatched to prepare the detailed designs for the port reactivation in La Unión Province. The Study was carried out in close cooperation with the COMISION EJECUTIVA PORTUARIA AUTONOMA (CEPA), the government agency responsible for the development and management of ports in El Salvador, which acted as the counterpart agency on behalf of the GOES.

CHAPTER 2 EXISTING CONDITIONS

In the period of 1996-2000, the Salvadorean economy has shown steady growth with an average annual rate of 3.5% in total Gross Domestic Product (GDP). As to GDPs by sector, the Industrial Sector indicated the largest growth with 5.0% per annum in the same period, followed by Services (3.3%), and Agriculture (1.7%). Among the industrial sectors, the Manufacturing Sector showed the highest growth with 5.2% in the same period. By the year 2000, El Salvador experienced a slowdown in economic activities with a growth rate of 2.0% against the preceding year. Despite the economic slowdown as a whole, the Manufacturing Sector showed a comparatively high growth rate of 4.5% on a year-to-year basis

CHAPTER 3 TERMINAL PLANNING

The JICA's F/S Report in 1998 was reviewed and updated using the latest statistics, economic and social indices available up to the year 2000. Two methods (macro and micro forecasts) were employed to forecast the entire cargo volume to be handled at the Salvadorean commercial ports of La Unión and Acajutla.

The following table shows the forecast non-container cargo volume in metric weight tons and the number of containers in TEUs in the years 2005, 2010, and 2015.

Forecast Cargo Volume	Target Years		
	2005	2010	2015
General, dry bulk, liquid bulk cargo (Ton)	624,700	727,100	841,200
Containers cargo (TEU)	121,000	185,000	275,000

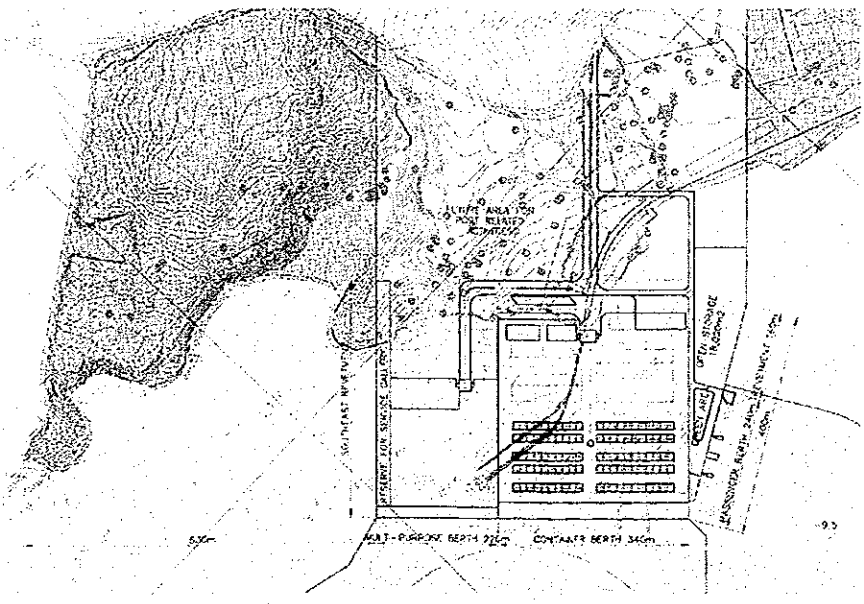
Based on the projected cargo to be handled at La Unión Port, the total number of ship calls estimated for each ship type is summarized below.

Ship Calls	Target Years		
	2005	2010	2015
Container vessel	208	208	208
Bulk carrier	38	46	53
Car carrier (Ro-Ro)	15	22	33
Passenger ship	1	1	1
Total (Calls)	262	277	295

The following table shows the dimensions of the three berths determined based on the characteristics of ships expected to call at the La Unión Port. The total berth length is 560 m for the Container and Multi-purpose Berths, and 240 m for the Passenger Berth.

Berth	Ship Size	Berth Length (m)	Berth Water Depth (m)	Crown Height (m)
Container Berth	55,000 DWT	340 m	- 14.0 m	+5.0 m
Multi-purpose Berth	50,000 DWT	220 m	- 14.0 m	+5.0 m
Passenger Berth	25,000 DWT	240 m	- 9.5 m	+5.0 m

Several container handling systems are required for container terminal operation such as Straddle Carrier System, Rubber Tired Gantry Crane System (RTG), Reach Stacker System, and Forklift System. Among those systems, the RTG system is recommended in consideration of its long service life, low maintenance cost, and adaptability to the computer management system.



As for the Multi-purpose Cargo Terminal, the Terminal is to be operated by a selected concessionaire, and the cargo handling equipment and necessary facilities such as office, storage yard arrangement, and other onshore utilities will be provided to tally by the concessionaire or partially by the port users. Crane rails (73 kg/m) for gantry cranes and quay-side cranes are to be installed under the project.

CHAPTER 4 DESIGN OF CIVIL WORKS

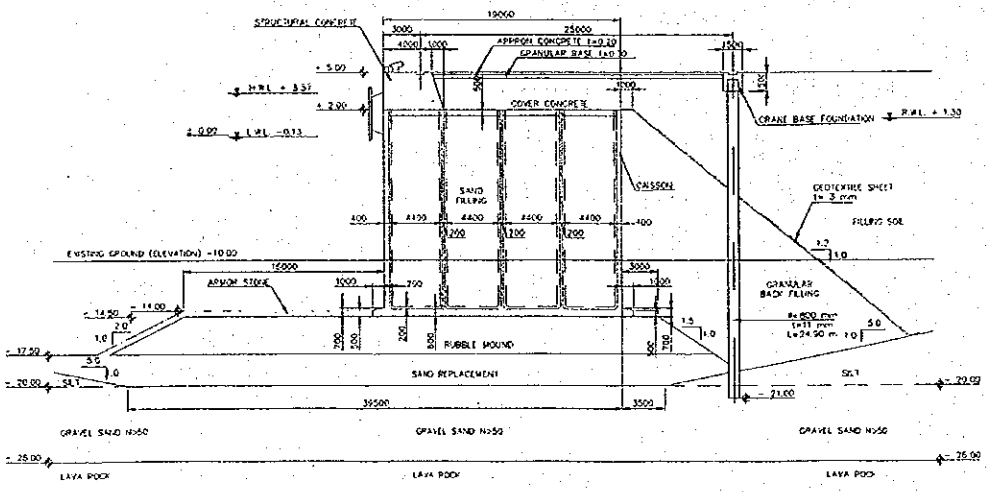
The civil works are designed considering the natural condition in the project site and referring to the authorized design standards, codes, and manuals. The seismic coefficient adopted in the design is 0.20G taking into account the latest earthquake data. The geological and geotechnical conditions in the project site are investigated by core boring and laboratory tests.

Five alternatives, namely concrete caisson, vertical steel pile, combined steep pile, steel sheet pile and steel sheet pile cellular cofferdam types are examined for the Container, Multi-purpose and Passenger Berth structure. The comparison study is made in aspects of construction cost, durability and maintenance cost. The caisson type is recommended for the Container and Multi-purpose Berths. The dolphin type with retrial steel piles is applied for the Passenger Berth.

As for the revetments, the rubble mound type is selected as the most economical and stable structure.

The proposed port area is located offshore in front of the existing Cutuco Port, having a land area of approximately 27 ha. The volume of soil to be filled is approximately 3.0 million m^3 and the soil obtained from the proposed access channel dredging will be used for reclamation fill.

Soil improvement is required to minimize ground subsidence in the terminal area. The displacement method is finally selected through comparison of various soil improvement methods.



CHAPTER 5 DESIGN OF ACCESS CHANEEL

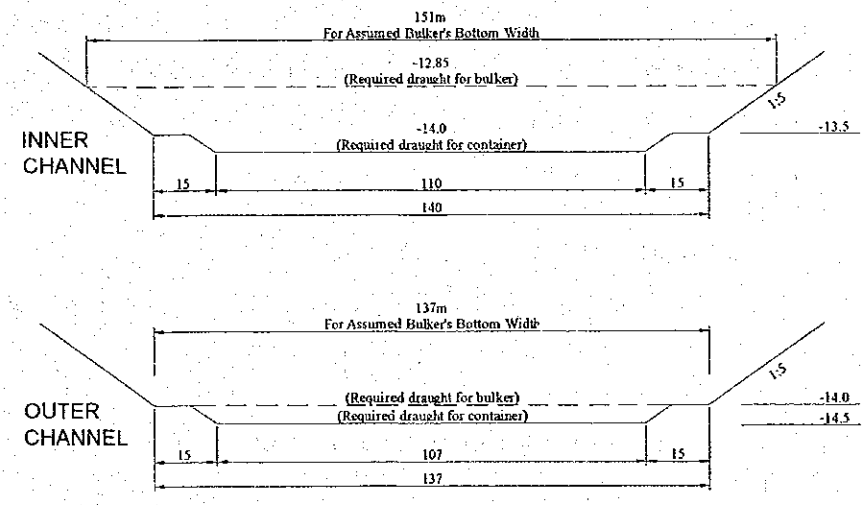
The access channel is designed in consideration of the expected ship sizes, natural conditions, and expected ship passage pattern. Due to low traffic and required initial dredging cost, the channel configuration is designed as one way navigation. The total underkeel clearance for the channel is determined taking into account the vertical motion induced by waves, squat and disastrous net underkeel clearance.

The channel has a bend at the point of Zachatillo Island where a lighthouse will be installed to aid navigation.

In order to determine horizontal alignments under severe tidal current, a fast time ship maneuvering simulation is conducted. The design ship size, water depth, winds, waves and currents are incorporated into the simulation under with/without tugboat assistance conditions.

The following table shows the required widths of the access channel based on the results of the fast time ship maneuvering simulation.

Ship Type	Container		Bulker	
	Outer	Inner	Outer	Inner
Required Width of Channel	130 m	140 m	137 m	151 m



CHAPTER 6 DESIGN OF BUILDINGS AND UTILITIES

The supporting facilities such as buildings, infrastructure, and utilities are constructed on-shore.

The building floor areas are determined to accommodate the number of persons and their utilization. The materials for buildings construction are selected in consideration of availability of local products in order to achieve easy and low maintenance cost. The structural design is carried out on the basis of geographic data, climatic conditions of the proposed site and considering building values, materials and stress/load

combinations in order to accomplish safe and economical structure. All buildings are finished with local made products in order to achieve easy and low maintenance cost of the building facilities. Building design is considered to give an attractive appearance and to match the environment. The port Administration Building is designed to present a symbolic impression and partially finished with a local made slate stone masonry, while container gates at the main entrance into the port area are designed with a motif of sea wave on their exterior face.

CHAPTER 7 DESIGN OF EQUIPMENT

In order to handle 275,000 TEUs of containers expected in 2015, two units of gantry cranes capable of loading/unloading containers to/from Panamax type container vessels are installed in the Container Terminal. The performance specifications of the cranes are designed to handle 35 boxes per hour on average. The cranes are of rail mounted single rifting gantry crane with rope trolley type.

Also considering hard oceanographic conditions such as high current speed and rough waves, 22 km single way approach channel, and assistance in turning basin, it is concluded to procure two units of tugboat (3,600 PS) to be stationed in and used exclusively by the Port.

CHAPTER 8 CONSTRUCTION AND IMPLEMENTATION SCHEDULE

The Project works consist of the following three (3) components:

(1) Civil and Building Works
(2) Procurement of Cargo Handling Equipment
(3) Procurement of Floating Equipment

The financing of the project costs is expected to be made by JBIC and BCIE. The procurement of services and goods will be proceeded basically in accordance with the JBIC guidelines

CEPA will procure a consulting firm for the construction supervision through the short-listing method. A contractor will be selected based on the JBIC guidelines through international competitive bidding (ICB). The construction period of Civil and Building Works is expected to be 36 months.

For procurement of the cargo handling equipment and floating equipment manufacturers will be selected through international competitive bidding (ICB). The contract period for the cargo handling equipment is 20 months and that for the floating equipment is 16 months.

The overall work execution and procurement schedule is shown in the chart below.

YEAR		2002				2003				2004				2005				2006			
MONTH		J-M	A-J	J-S	O-D	J-M	A-J	J-S	O-D	J-M	A-J	J-S	O-D	J-M	A-J	J-S	O-D	J-M	A-J	J-S	O-D
Bidding by ICB Method and Contract Award for Procurement of Contractor																					
Package A:																					
Civil and Building Works																					
Prequalification of Bidders	3 months																				
Bidding Procedure	3 months																				
Evaluation of Bids and Contract Award	4 months																				
Construction	36 months																				
Package B:																					
Procurement of Cargo Handling Equipment																					
Prequalification and Bidding	9 months																				
Design and Manufacture of Equipment	15 months																				
Sea Transportation	1 month																				
Removal of Reinforcement and Performance Test	2 months																				
Training on Crane Operation and Maintenance	2 months																				
Package C:																					
Procurement of Floating Equipment																					
Prequalification and Bidding	9 months																				
Design and Manufacture of Equipment	14 months																				
Sea Transportation	1 month																				
Demonstration Trial and Final Inspection	1 month																				

CHAPTER 9 COST ESTIMATE

The unit rates and prices for labor, materials, plant and equipment are estimated based on the current price level of July 2002.

The exchange rate used in the estimates is 1 US$ = JY 120.00

and 1 US$ = ¢ 8.75

The price escalation factor applied to the local currency between the time of preparation of this estimate and the project implementation period is estimated at 2 %.

The total Project Cost is estimated at 116.3 million US$.

CHAPTER 10 PORT OPERATIONS AND MANAGEMENT

The La Unión Port will have three types of marine terminals: One Container Terminal, one Multi-purpose Terminal, and one Passenger/Ro-Ro Terminal.

Under the strong privatization policy undertaken by the GOES, it is expected that CEPA will administrate the Port and function as a Landlord while the port services will be solely provided by private operators based on a concession agreement.

The concessionaires of the Container Terminal and Multi-purpose Terminal might be separated into two different entities. Under this same privatization scheme it is also recommended that the tugboats procured under the Project be handed over to a private operator to provide stevedoring services on a license agreement.

CHAPTER 11 ECONOMIC AND FINANCIAL EVALUATION

The economic evaluation for the Project is made under the assumptions of the base year of 2001 and the project life of 30 years. The economic viability expressed in Economic Internal Rate of Return (EIRR) is computed and an EIRR of 16.4% is obtained for the base case.

The financial viability of the Project is examined from the viewpoint of capital investment. The Financial Internal Rate of Return (FIRR) on gross capital bases is calculated and compared with the assumed average interest rate of the funds. The resulting FIRR of the Project is 13.4% in the base case.

The weighed average of interest rates of JBIC Loan, BCIE Loan, and Local Bank Loan is estimated to be 4.11%.

CHAPTER 12 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

The environmental assessment for the Project was completed and approved by MARN on 15 December 2000 (Resolution MARN-N 400-2000) with the following conditions:

- Implementation of 14 Mitigation Measures
- Posting of Security Guarantee by CEPA
- Implementation of 18 Environmental Conditions

The following additional environmental surveys are conducted to collect additional information required for the study and predictions of sediment dispersion behavior.

1) Ecological survey in the reclamation area (benthos, marine biology)
2) Ecological survey in the borrow area (terrestrial plant and animal)
3) Offshore ecological survey in the dredging area (tidal current, water quality, seabed material, benthos)
4) Offshore ecological survey in the dumping area (water quality, seabed material, benthos)
5) Fishery activity survey
6) Present condition survey (water quality, seabed material, benthos)
7) Air quality observation
8) Water quality for future monitoring purpose (water quality)

Based on the additional environmental study, certain Mitigation Measures and Permit Conditions are proposed to be amended including the following major items:

- Omit from **Mitigation Measure 6** the incinerator to treat solid waste from the operating port;
- Omit from **Mitigation Measure 8** the use of silt curtains around the dredger and disposal site; Shift the location of the offshore dumping site closer to the dredging area; Monitor turbidity instead and set Trigger Levels to protect any

sensitive areas, with dredging being required to cease if Trigger Levels are reached.

- Add **Mitigation Measure 16** relating to dumping of dredged spoil, which limits reclamation to 27 ha for the port and 31 ha for the onshore dumping areas.
- Amend **Permit Condition 13** to allow port construction to commence before the La Unión bypass has been completed. Instead, an alternative route of access shall be provided for the port traffic before at road is finished, to keep heavy traffic out of La Unión City.

The above proposed conditions were agreed by MARN.

CHAPTER 13 CONCLUSION AND RECOMMENDATION

- It was confirmed that viability of the Project is quite sound and feasible from the technical, economic, and financial aspects. The early implementation of the Project is prerequisite and CEPA must extend strong port sales for potential port users to assure and expand the port cargo.
- To allow the port development to play an important role in the country and in Central America, and to contribute economic and financial benefits, CEPA shall coordinate with relevant authorities and governments concerned in the implementation and promotion of the Project.
- Periodical monitoring of the depth of the channel and turning basin shall be performed by CEPA during the construction and operation stages. Since the estimated soil deposit volume is significant and the approach channel is a vital facility of the port, CEPA shall prepare a future maintenance scheme based on the monitoring results.
- CEPA shall proceed with a privatization scheme as early as possible so that necessary change in the yard layout plan of the Terminals can be accommodated in relation with the cargo handling system to be introduced by the concessionaire before the Project starts;

  Buildings

  —Port administration building
  —CFS
  —Maintenance and repair shop

  Yard layout

  —Container stacking area
  —Pavement

Summary of changes item in Detailed Design Study from FS Study

Item	FS	D/D	Reason
Traffic Forecast	Traffic volume in 2015 Dry and Liquid Cargo 1,496,500 ton Container 157,812 TEU	Traffic volume in 2015 Dry Cargo 841,000 ton Container 275,000 TEU	
Design Ship	Container Berth 40,000DWT Multi-purpose Berth 50,000DWT Passenger Berth 15,000GT	Container Berth 55,000DWT Multi-purpose Berth 50,000DWT Passenger Berth 25,000DWT	Reviewing the design ship, the size of container and car carrier (RoRo) are increased.
Berth	Depth and Length Container Berth –13m 300m Multi-purpose Berth –13m 260m Passenger Berth –7.5m 220m	Depth and Length Container Berth – 14m 340m Multi-purpose Berth – 14m 220m Passenger Berth – 9.5m 240m	-ditto
Access Channel	Width 150m (Inner and Outer) Depth - 11.0m (Inner and Outer)	Width 140m (Inner) 137m (Outer) Depth - 14.0m (Inner) - 14.5m (Outer)	Widths of Access Channel are reduced based on the results of Ship Maneuvering Simulation. Water Depth is determined with conditions of no tidal restrictions.
Dumping Area of Dredged Materials	Dumping area was located at around 4km offshore from berth area.	Offshore dumping area is determined at around 25km from berth area. Onshore dumping areas are set at both sides of berth area.	Despite of the recommendation of F/s, MARN designated the offshore dumping area at around 50km from the berth area. But the distance is reduced to 25km taking consideration of environmental study made in detailed design stage.
Planning Location	The west corner of main berth was set at in the distance of 360m from the end of Punta Gorda Berth.	The west corner of main berth was set at the distance of 630m from the end of Punta Gorda Berth.	From the results of geological survey, soft soil layer was found to be thicker near the Punta Gorda Berth. Through the comparison of alternative port layouts, the final location is determined.

THE DETAILED DESIGN ON PORT REACTIVATION PROJECT IN LA UNION PROVINCE OF THE REPUBLIC OF EL SALVADOR

FINAL REPORT

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