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LIMA DISASTER PREPAREDNESS REPORT

VOLUME II:

Port of Callao Infrastructure Security and Emergency Evacuation Needs

by

Robert Gersony

in collaboration with

Raymond Lynch
Tony Jackson

for

Office of U. S. Foreign Disaster Assistance

Agency for International Development

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The Lima Disaster Preparedness Report has 15 sections:

Volume I:	Methodology Employed
Volume II:	Port of Callao Infrastructure Security and Emergency Evacuation Needs
Volume III:	Electricity
Volume IV:	Water and Sewerage
Volume V:	Heavy Equipment Rehabilitation and Maintenance
Volume VI:	Airport and Aircraft Resources
Volume VII:	Education
Volume VIII:	Food
Volume IX:	Housing
Volume X:	Health
Volume XI:	International Donor Coordination
Volume XII:	Critical Abstracts from the Literature: A field perspective on major earthquakes: Peru, 5-31-70 Nicaragua, 12-23-72 Guatemala, 2-4-76
Volume XIII:	Review of Earthquake Prediction by Brian Brady
Volume XIV:	Other Issues
Volume XV:	Summary

FOREWORD

This is one section of a fifteen volume report concerning disaster preparedness in Lima, Peru. It was researched in Lima by a team of disaster specialists during the period July - November, 1981, for the Agency for International Development's Office of U. S. Foreign Disaster Assistance and USAID Mission in Peru. The report is supplemented by a considerable number of maps, charts and resource documents which are located in the USAID/ Peru Disaster Preparedness Resource Library in Lima.

June 1982

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TABLE OF CONTENTS

PAGE NO.

Table of Maps, Charts, Illustrations, Appendices and Separate Accompanying Volumes .....

Executive Summary..... 1

Introduction..... 4

PORT OF CALLAO INFRASTRUCTURE SECURITY

- General Description..... 6
- Vulnerabilities of the Port..... 12
- Proposals for Mitigating Disasters..... 13
- Recommended USAID Post-Disaster Operations..... 16

LA PUNTA AND THE PORT OF CALLAO EVACUATION NEEDS

- Description of the Problem..... 19
- Division of Responsibilities in the Zone..... 19
- History of Tsunamis..... 20
- Suggested Strategies for Disaster Mitigation..... 27
  - -- Kuruiwa Tsunami Study..... 27
  - -- Suggestions By Other Agencies - "The Seven Point Approach" 28
  - -- Pro's and Con's of the "Seven Point Approach" 31
  - -- Implementation Measures..... 34
  - -- Recommended USAID Role in Further Related Activities..... 38

List of Contacts 43

MAPS, CHARTS, AND APPENDICES

MAPS

A. Aerial Potographic Configuration of El Callao

B. Panoramic Photographic View of El Callao

C. Distribution of Seaports Throughout Peru

D. Blueprint of El Callao Port

E. Blueprint of El Callao Port Buildings

F. Blueprint of El Callao Port Electrical Systems

G. Blueprint of El Callao Proposed Port Expansion

H. Blueprint of Some Port Vulnerability Areas

CHARTS AND ILLUSTRATIONS

I Shipping Tonnages for Major Peruvian Seaports - 1980

II USAID Post-Disaster Checklist for El Callao Port

III "Tsunami" Flyer

IV "Tsunami Pacific Alert System" Flyer

V Digital Strong Motion Accelerograph

APPENDIX

I Detailed Technical Data on El Callao Port from Puertos del Peru

II Survey Data on Peruvian Ports gathered by USDA

SEPARATE ACCOMPANYING VOLUMES*

I Puertos del Peru, ENAPU-PERU

II Memoria ENAPU - 1980 Annual Report of ENAPU-PERU

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*Located in USAID/Peru Disaster Resource Library and from ENAPU-PERU authorities.

EXECUTIVE SUMMARY

Although it is administratively a separate unit from the rest of the City of Lima, El Callao is an integral and vital part of Metropolitan Lima. It is also, on balance, the area of the city perhaps most vulnerable to disasters. More than most others in Lima, its soils tend to magnify seismic waves, thus provoking in the same event greater proportinate damage in comparison with other city areas. El Callao's vulnerability includes substantial risk to life and property from Tsunamis. The area contains the city's highest risk industrial complex -- the Port of Callao. Many of the area's buildings -- including structures intended as provisional housing for the population after the 1940 earthquake -- are serious fire risks. The new expansion areas of the city -- called pueblos jóvenes -- in El Callao seem to be the most vulnerable to fires which, in some cases, destroy 50% of some settlements more than once each year.

Because of its importance to the national economy, and because of its vulnerability to many kinds of inter-related disasters -- earthquakes, Tsunamis, widespread fires, port explosions, etc. -- El Callao's problems are the special focus of this section.

The Port of Callao

One of 25 national ports, the Port of Callao handles more than 55% of national imports, and a total of 20% of tonnage handled by all ports. As 75% of Peru's industry is based in Lima, port operations are key to the national economy. The port contains numerous grain silos; gas and chemical storage areas; warehouses sheltering flammable raw materials; and a two-kilometer 14" - 16" propane line containing at all times a load of 1,350 barrels of LPG. Port officials expressed two areas of need in which, they assert, disaster mitigation activities are possible:

(a) The need for automatic electrical cutoff of all port facilities when seismic movement passes the equivalent of 3.0 Richter. Especially because of multiple risks of fires and explosions caused by risky electrical installations, and the consequent risk of major disaster, the officials endorse the installation of an accelerograph at ELECTRO-LIMA's La Marina sub-station.

(b) The need for objective security assessments by an outside expert. For example, there is some disagreement among security officials about the type of equipment needed to remove hazardous accumulations of fuel-sludge inside the port's wave-breakers. In another case, a number of the port officials believe that propane installations are inadequately protected and represent a danger for the entire port; an objective outside assessment is suggested to establish the facts to assist security officials in persuading other authorities of this danger.

In case of an actual earthquake, it is recommended that USAID/Peru include among its immediate priority activities an assessment of the impact of the disaster on the port, and a draft checklist is provided for this purpose. Assistance to the port in establishing operations is recommended as a priority within the post-disaster assistance options, especially if the SEABEES or Army Corps of Engineers are available.

La Punta and Port of Callao Evacuation Needs

El Callao, at present, does not have a plan for life-saving evacuation of the civilian population in the event of Tsunami. Primary responsibility for these functions rests with the National Civil Defense System, although the Peruvian Navy has many key installations in the zone. Tsunamis could be generated by earthquakes immediately off-shore, in which case the maximum warning period before landfall of a Tsunami would be 20 to

30 minutes; or they could be generated elsewhere in the Pacific, in which case up to 12 hours or more of alert could be expected.

Such events have occurred before in Peru's history. In 1746, for example, two Tsunami waves destroyed much of El Callao about ninety minutes after an off-shore earthquake. Of the area's 5,000 inhabitants, only 200 reportedly survived. Nineteen vessels were destroyed, and one was carried 1½ kilometers inland.

In recent times, there have been false warnings leading to panic, evacuation and looting (1980); failed attempts at evacuation after an actual earthquake (1974); and one actual warning by the Hawaii Tsunami Control Center which was not acted upon as late as three hours before predicted landfall (1979). While Tsunamis did not occur in any of these events, they demonstrated the need for some type of alert system and evacuation plan.

One vertical evacuation plan suggested by a recent study, and a second "seven point" evacuation plan suggested by local officials, are discussed in this study. At present, the "seven point" proposal seems more desirable. The main purpose of the discussion is to suggest some of the proposes alternatives for further consideration and development. It is recommended that USAID remain involved in this area under further phases of Disaster Preparedness Program.

INTRODUCTION

Although it is administratively a separate unit from the rest of the City of Lima, El Callao is an integral and vital part of Metropolitan Lima. It is also, on balance, the area of the city perhaps most vulnerable to disasters. More than most others in Lima, its soils tend to magnify seismic waves, thus provoking in the same event greater proportinate damage in comparison with other city areas. El Callao's vulnerability includes substantial risk to life and property in the event of Tsunamis. The area contains the city's highest risk industrial complex -- the Port of Callao. Many of the area's houses -- including structures intended as provisional housing for the population after the 1940 earthquake -- are serious fire risks. The new expansion areas of the city -- called pueblos jóvenes -- in El Callao seem to be the most vulnerable to fires which, in some cases, destroy 50% of some settlements more than once each year.

Because of its importance to the national economy, and because of its vulnerability to many kinds of disasters -- earthquakes, Tsunamis, widespread fires, port explosions, etc. -- El Callao's unique problems are the special focus of this section. Because its many vulnerabilities are linked together, they are integrated into this section even though, in theory, they correspond to some other sectors included in this overall review.

Aerial Map A illustrates the configuration of El Callao from the air, while Map B provides a panoramic view of the area. El Callao province contains a population of about 265,000 persons, according to the 1981 census. About 5,500 persons reside in the peninsula, called La Punta, which stretches like a hook into the sea; another 5,000 - 10,000 are employed in the Port of Callao.

This description will focus primarily on two aspects of El Callao: the port, and La Punta, with occasional reference to other areas of the province.

THE PORT OF CALLAO INFRASTRUCTURE SECURITY

- General Description

Although it is only one of about twenty-five national ports, El Callao alone handles more than 20% of the tonnage which moves through Peru's seaports. While its share of exports is not very high, it may handle more than 55% of the country's imports, including important raw materials for national industry. The degree of industry's dependence on this port is substantial: over 75% of Peru's manufacturing industry is based in Lima and El Callao and depends, almost exclusively, on the Callao Port. Much of the 25% of Peru's population which resides in Metropolitan Lima depends on the Port of Callao for some of its basic foods, such as the wheat, whose flour provides two of the City's main staples: bread and noodles.

Map C, at the following page, illustrates the distribution of major national seaports and describes the major products managed by each. Appendix I, extracted for Puertos del Perú, an encyclopedia of information about Peru's seaports, provides detailed information about El Callao Port: its history, cargo, warehousing, handling equipment, navigational data and detailed maps. This brief description provides information in great detail, and although the book from which it is drawn was published in 1973, its data is generally current. For more current cargo handling history, Chart I provides shipping tonnages for 1980 for not only Callao, but for all major Peruvian seaports.

Additional data (see Appendix II) was provided in April, 1981, by the Port Authority -- ENAPU-PERU -- to the U.S. Agricultural Attache, as part of a routine survey of port resources conducted in behalf of the

PRINCIPALES PRODUCTOS MOVILIZADOS POR TERMINALES

1. Petróleo Crudo

2. Petróleo Crudo
Petróleo Crudo
Petróleo Crudo

3. Petroleo y derivados
Productos Quimicos
Acero-Maqui-Repuestos
Petroleo Crudo

4. Petróleo Crudo
Petróleo Crudo

5. Pescado Congelado Petróleo y derivados-
Guano-Aceite de Pescado-Algodón
Pescado congelado Harina de Pescado
Melones Pieles-Urea Aceites Comestibles
Sulfato de Amonio Parafina Madera

6. Abonos-Urea Leche Hojalata-Asbesto
Azúcar Algodón-Petróleo/derivados

7. Azúcar-Urea

8. Mercaderías Tara Arroz-Urea Sulfato de Amonio
Parafina

9. Harina de Pescado

10. [illegible]
Zinc-Plomo-Papel Tara
Trigo-Urea Sulfato de Amonio
Pulpa de Papel
Petroleo/derivados-Guano

11. Harina de Pescado-Plomo
Aceite de Pescado-Zinc concentrados
Conserva de Pescado-Arrabio-Cobre-Acero
Repuestos-Petroleo y derivados-Hierro

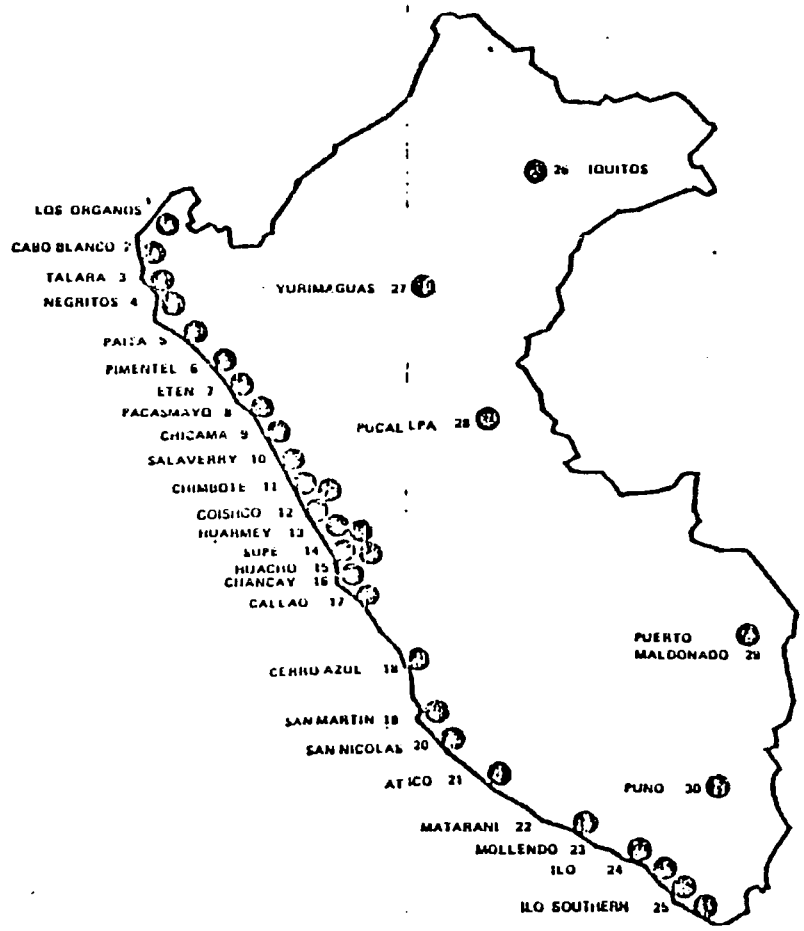
12. Pescado Congelado

13. Harina de Pescado

14. Harina de Pescado-Papel
Pulpa y Pasta de Papel Urea
Petróleo y derivados

15. Harina de Pescado Plomo concentr.-Nitrofosca
Sulfato y Fosfato de Amonio-Urea

16. Harina de Pescado-Sulfato de Amonio Urea



EXPORTACION
IMPORTACION
CABOTAJE

17. Concentrados de Zinc Concentrados varios
Baritina-Mercaderías en General
Harina de Pescado Aceite de Pescado
Algodón-Café
Productos Alimenticios-Trigo-Acero
Aceites Comestibles
Petróleo y derivados-Productos Químicos
Repuestos y Maquinarias
Petróleo/derivados-M.G.

18. Urea
Abonos

19. Harina de Pescado Aceite de Pescado-Algodón
Zinc Cobre Plomo concentrados
Ajos Melones
Urea-Acero-Fosfato y Sulfato de Amonio
Petroleo y derivados-Guano

20. Hierro-Petróleo y derivados-Hierro

21. Harina de Pescado

22. Harina de Pescado-Zinc-Cobre concentrados
Estaño Café-Ajos
Lana-Trigo-Leche-Hojalata-Urea-Acero
Repuestos y Maquinaria
Parafina-Productos Quimicos-Guano-Acero

23. Petroleo y
derivados

24. Harina de Pescado Aceite de Pescado
Lana-Urea-Acero
Pescado Cong.-Maquinaria
Petróleo y derivados-Guano

25. Cobre Blister Molibdenita-Repuestos
Petróleo Crudo
Manufacturas y planchas metálicas
Nitrato de Amonio-Acero-Cemento
Productos Quimicos-Petróleo y derivados

26. Madera Café Algodón
Barbasco-Trigo Cemento-Leche
Ferreteria-Maquinaria-Calamina
Repuestos-Arroz-Azúcar
Petróleo y derivados-Madera.

27. Víveres
Petróleo y derivados

28. Maderas-Víveres-Yute
Azúcar-Arroz-Petroleo

29. Castañas-Madera

30. Trigo Merc. General-Acero
Repuestos-Leche-Calamina
Productos Alimenticios Pro. Quimicos
Zinc-Estaño-Plomo

MAP C

METRIC TONS OF CARGO THROUGH TERMINALS
1980

TERMINALES	1980												
	EMBARQUE			DESCARGA			CABOTAJE			Total Carga Seca	Total Carga Líquida	Total General	Porcentaje de Variación 1979/1980
	Carga Seca	Carga Líquida	Total Embarque	Carga Seca	Carga Líquida	Total Descarga	Carga Seca	Carga Líquida	Total Cabotaje				
TOTAL GENERAL	7'871,280	2'600,518	10'471,798	2'798,513	210,853	3'009,366	1'263,209	9'628,754	10'891,963	11'933,002	12'440,125	24'373,127	- 4.0
TOTAL ENAPU	1'697,143	284,915	1'982,138	2'740,922	210,853	2'951,775	852,755	5'214,210	6'066,965	5'290,820	5'710,058	11'000,878	- 6.4
A. SUB TOTAL TERMINALES MARITIMOS	1'671,966	284,945	1'956,911	2'705,454	205,171	2'910,625	511,506	4'948,833	5'460,338	4'888,925	5'439,009	10'327,034	- 7.0
01. CABO BLANCO	-.-	51,848	51,848	-.-	-.-	-.-	-.-	42,053	42,053	-.-	93,941	93,941	-71.8
02. TALARA	170	215,910	216,080	73,081	11,959	85,040	-.-	2'403,828	2'403,828	74,051	2'631,697	2'705,748	- 0.7
03. PAITA	81,021	2,422	83,443	86,043	4,925	90,968	19,113	19,292	38,405	166,177	26,639	192,816	- 4.7
04. ETEN	-.-	-.-	-.-	-.-	-.-	-.-	-.-	445,492	445,492	-.-	445,492	445,492	↓ 18.8
05. PACASMAYO	1,282	-.-	1,282	22,813	-.-	22,813	5,212	-.-	5,212	29,287	-.-	29,287	+ 64.0
06. CHICAMA	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	
07. SALAVERRY	82,747	20	82,767	61,108	-.-	61,108	1,006	356,827	357,833	144,861	356,847	501,708	-18.7
08. CHIMBOTE	210,109	10,727	220,836	381,053	25	381,078	373,096	240,710	613,806	964,258	251,462	1'215,720	- 9.0
09. BESIQUE	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	
10. CASMA	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	
11. HUARMEY	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	
12. SUPE	-.-	-.-	-.-	43,548	3,445	46,993	-.-	214,198	214,198	43,548	217,643	261,191	+ 1.2
13. HUACHO	-.-	-.-	-.-	-.-	-.-	-.-	12,065	-.-	12,065	12,065	-.-	12,065	-48.1
14. CHANCAY	-.-	-.-	-.-	3,387	-.-	3,387	10,720	-.-	10,720	14,107	-.-	14,107	+ 41.8
15. CALLAO	886,587	3,978	890,565	1'612,185	91,217	1'703,402	83,071	782,357	865,428	2'581,843	877,552	3'459,395	+ 14.9
16. CERRO AZUL	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	
17. GENERAL SAN MARTIN	50,851	-.-	50,851	112,859	-.-	112,859	-.-	278,903	278,903	163,710	278,903	442,613	-14.9
18 MATARANI	175,867	-.-	175,867	228,770	93,600	322,370	7,222	-.-	7,222	411,859	93,600	505,459	+ 22.6
MATARANI D'y P' BOLIVIA	72,659	-.-	72,659	79,728	-.-	79,728	-.-	-.-	-.-	152,385	-.-	152,385	-20.2
MOLLENDO	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	
19. ILO	130,693	-.-	130,693	61	-.-	61	-.-	165,233	165,233	130,774	165,233	296,007	-47.9
B. SUB TOTAL TERMINALES FLUVIALES	25,177	50	25,227	35,468	5,682	41,150	341,250	265,317	606,567	401,895	271,049	672,944	+ 4.0
20. IQUITOS	20,939	50	20,989	35,468	5,682	41,150	191,378	265,317	456,693	247,783	271,049	518,832	+ 13.0
21. YURIMAGUAS	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	
22. PUCALLPA	4,238	-.-	4,238	-.-	-.-	-.-	149,874	-.-	149,874	154,112	-.-	154,112	-17.9
23. PUERTO MALDONADO	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	
C. SUB TOTAL OTROS TERMINALES	6'174,137	2'315,523	8'489,660	57,591	-.-	57,591	410,454	4'414,544	4'824,998	6'642,182	6'730,067	13'372,249	- 1.9
01. LOS ORGANOS	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	
02 NEGRITOS	-.-	157,586	157,586	-.-	-.-	-.-	-.-	43,319	43,319	-.-	200,905	200,905	+ 79.8
03. BAYOVAR	-.-	2'157,937	2'157,937	-.-	-.-	-.-	-.-	3'990,739	3'990,739	-.-	6'148,676	6'148,676	- 3.5
04. PIMENTEL	14,232	-.-	14,232	25,859	-.-	25,859	-.-	-.-	-.-	40,091	-.-	40,091	-57.1
05. COISHCO	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	
06 SAN NICOLAS	5'856,764	-.-	5'885,784	-.-	-.-	-.-	410,454	30,662	441,116	6'297,248	30,662	6'327,910	- 0.3
07. ATICO	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	
08. ILO SOUTHERN	273,111	-.-	273,111	31,732	-.-	31,732	-.-	349,824	349,824	304,843	349,824	654,667	- 2.0
09 PUNO	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	

CHART I

Embassy.

The data provided covers the following areas:

-- Principal bulk grain importing ports of Peru;

-- Grain storage capacity, by port, in metric tons;

-- Grain storage capacity by private sector flour mill;

-- Grain storage capacity - ONAA (National Food Assistance Office);

-- Detailed storage capacity for private sector;

-- Soyabean oil storage capacity, by private sector processor;

-- Grain and oil storage capacity - expansion plans for future;

Reference should also be made to the Lima Food Supply Study of the food sector of this study for further, up-to-date data on processing, storage and handling capacity of various elements of the food processing chain in Peru.

Two books from which the foregoing data has been drawn are supplementary volumes to this study. They are:

(a) Puertos del Perú, published by the Empresa Nacional de Puertos del Perú - ENAPU-PERU, and

(b) Memoria ENAPU - 1980, the Port Management Agency's annual report of activities.

Five maps (Maps D, E, F, G and H) describing different aspects of port operations are also a part of this study. They illustrate the Port's electrical systems, buildings and warehouses, overall layout and planned expansions, and some of its serious vulnerability zones.

The port area and its immediate environs contain some major warehousing areas: a number of significant grain silos; gas and chemical storage tanks; propane, gasoline and other major fuel storage tanks;

warehouses sheltering flammable raw materials; and a 14 - 16 inch fuel line, running from the petrol storage tanks into the sea (see Map D, Plan of Port). This two-kilometer pipeline contains, for example, a load of 1,350 barrels of liquid propane gas: the line is maintained full at all times, as the port does not possess the equipment required to expel the LPG from the line. Running along the same structure as the pipeline is a 10,000 volt power line, for which there is a electrical sub-station built at sea, as indicated on the map.

There are a number of electrical sub-stations in the Callao area. However, one principal sub-station, called "LA MARINA", is the control point for the entire zone. Like all ELECTRO-LIMA installations, it continues to provide current unless a massive short-circuit is produced in the area, at which time automatic shutdown procedures should begin.

The Port of Callao is part of the ENAPU-PERU national network. ENAPU-PERU is a decentralized, Government-owned and operated corporation, with its own Board of Directors. Although in theory each port has its own management, it seems that the national directors take a particular and direct interest in El Callao's operations.

The port has not suffered much damage in modern times through natural disasters. The 1974 earthquake had the greatest effect of all on them, including the 1940 earthquake: but the damage was limited. One tower collapsed; the columns of the port's 600 cubic meter elevated water tank were twisted, but the tank did not crack or collapse; the water and sewage system broke down, but was repairable; some piers and piles settled a bit. Otherwise, port operations continued fairly normally. Port authorities had expected more damage, because much of the installation is built on

reclaimed land.

Port security officials felt that a description of wind patterns was important to an understanding of their problems: from November through April, winds tend to be northerly, blowing gas fumes (and potential fires) out to sea. From May through October, however, winds tend to be southerly, blowing towards, or into, the port.

The port used to have its own independent system for generating electricity through diesel generators. As ELECTRO-LIMA's service became reliable, the port was put under pressure to "loan" these generators to pueblos jóvenes, new settlements on the outskirts of the city, which still did not have direct electrical services. Over the course of the years, ENAPU-PERU lost control of the equipment and the port now has no standby electrical generation equipment. They will try, in the coming years, to include in their budgets funds for three 500 KVA generators, so that port operations can continue regardless of ELECTRO-LIMA's service. But the hope of seeing the units installed seemed fairly remote at the time port officials were contacted.

Conscious of the constant dangers faced by the port and, consequently, by the employees and local residents around the Port, highly developed security resources have evolved around this area. Each major company has a security division. For example, the Port Authority itself has an elaborate security staff. Each of the petrol companies -- PETRO-PERU (which handles propane and other fuels), SHELL, MOBIL-OIL, and TEXACO have security personnel. And all of the security chiefs have formed a Port Security Committee, which functions under the coordination of the Port's own Security Division Director, Ing. Ricardo Deguezala de la Flor.

Due to some conflicts concerning the degree of security which has been attained by some member companies, Security Committee meetings, depending on the subject on the agenda, tend to be selectively attended.

- Vulnerabilities of the Port

An inventory of vulnerabilities of the Port of Callao -- not including the other companies described in the foregoing paragraphs -- was carried out in March 1981, by a commission comprised of various security officials and engineers. The final product of its work, is a supplementary volume to this study. However, in the following paragraphs, the vulnerabilities of the port and of the area immediately surrounding it, are summarized.

The vulnerabilities of the greater port area are the concern of all of the companies and institutions whose installations are located there, as the security-interdependence among them has been recognized.

The port itself, for example, has several major silos filled with grain and often with explosive grain dust. Located nearby the silos are storage tanks for highly flammable chemicals and gases. Although the propane-fuel line described earlier in this report is used principally by PETRO-PERU, the property belongs to the port, which must be responsible for its safe-keeping. A fire or explosion near the line places not only the line at risk, but also the large fuel storage tanks held not only by PETRO-PERU but by the other private sector corporations mentioned earlier.

The sources of concentrated heat or sparks are multiple: there are provisional and defective electrical lines throughout the port area itself, all capable of emitting sparks which could set off fires and/or explosions. In a severe earthquake, the danger would increase many times. In the port's

warehouses, cotton, textiles and other commodities which can generate their own heat and spontaneous combustion are stored. Were two of the kinds of chemicals and gases to mix in the port area, sufficient heat could be generated to cause fires and explosions. With about 10,000 persons employed in the port area, carelessness is always a danger. In fact, sparks can be generated by persons walking, or by two pieces of iron striking each other.

If they have not yet had a major tragedy, say the security officials, it must be because "Dios es peruano" -- God is Peruvian.

- Proposals for Mitigating Disasters

Port officials suggested two ways in which the natural disaster and other dangers of the port could be mitigated:

(a) Electrical Cutoff: Most security officials embrace the concept of an automatic electrical shutdown for the City as a whole. They are not satisfied, however, that the cutoff level proposed for the City is adequate for the port, and suggested a level corresponding to 2.5 - 3.0 Richter for maximum safety. They feel little risk is run with such a cutoff and that electrical energy can be restored very quickly.

However, the Director of Port Security indicated that one such system would not be enough. He expressed special concern about the propane line and about the silos/chemical tanks within the port.

The group has suggested that an accelerograph be provided for the ELECTRO-LIMA Santa Marina Sub-Station which would cut off the flow of energy at a 3.0 level. (In a later meeting, the BOMBEROS concurred that a level of 3.0 - 3.5 would be the best for the zone.) A letter requesting this type of system on behalf of the Committee was dispatched to ELECTRO-LIMA.

(b) Objective Security Assessment: Though the Security Committee

meets periodically, it has had trouble making assessments of specific security issues to the satisfaction of all members, particularly of those whose security systems are judged inadequate by the Committee.

Two particular examples were cited:

-- Inside the wave-breakers which protect the port from the sea, on the northern side, an accumulation, sometimes as thick as two inches, of fuel-sludge has developed. This flammable material comes from spillages at the end of the pipeline or at a gasoline-station at-sea, located just off-shore but within the wave-breakers. All kinds of oil and fuel are trapped there, and the Security Committee sees this as a fire and explosion danger to the zone.

Funds were appropriated by the Port for the purchase of rather costly equipment required to remove the sludge periodically using a suction tube. However, differences of opinion developed within the Port as to whether the best type of equipment to get was a mobile, floating suction unit, or a stationary one. The argument was of such duration (and was never settled) that the fiscal year in which the funds had been appropriated elapsed and the financing was lost.

The problem continues, but neither side accepts the judgment of the other as to which would be the best strategy.

-- All of the Security Chiefs expressed grave concern about the PETRO-PERU propane installations (the PETRO-PERU representatives did not attend the meeting) which, they all agreed, was the greatest security risk in the zone. There are two specific areas of concern: first, the propane line, which begins in an area where all the companies have their installations, runs underground for a part of the way, then above the the surface; and second, PETRO-PERU has an installation which fills propane

cylinders and tanktrucks right in the same storage area. According to the Chiefs, the security of the installation is inadequate and a danger to all the companies and their personnel. Some of the representatives said that they could smell the fuel 300 meters from the cylinder plant. One of their concerns was that the plant is located at the only evacuation point from the zone a route which must serve the employees of all of the companies in a moment of emergency.

As a possible solution for these two dilemmas, the Committee asked whether USAID could make available an independently-selected security specialist for a period of two working weeks. All members of the Committee would have to agree to accept the recommendations of such a specialist, and, even if some refused, the Port Authority would have a more formal and independent basis -- more likely to be recognized in the Ministry -- for pursuing the matter.

The risk of massive, lethal explosions in the port area is a daily reality. An explosion in one spot can set off a chain reaction which could cause not only a major fire, but a catastrophe which would bring with it loss of life and extensive loss of property. It could also paralyze fuel, industrial, and other economic operations in Lima for a considerable period. With these risks in mind, the Security Committee suggested the strengthening of the automatic electrical cutoff system and the provision of an independent expert. Private corporations in the United States have offered to provide such expertise. The problem is that a representative of any of the corporations is not necessarily accepted as objective by all the others.

- Recommended USAID Post-Disaster Operations

There are three aspects of port operations which will be of direct interest to USAID:

1. Assessment of Damage and Needs: At the earliest point, as part of USAID's disaster assessment operations, the damage sustained by the port and its operational capacity should be verified. A checklist, prepared at a recent OFDA Seminar, appears as Chart II at the next page and includes some suggested points to cover.

2. Receipt of USAID Cargo: USAID will want to verify as quickly as possible after the earthquake whether the port would be capable of handling relief cargo which might be dispatched by sea to Peru even though emergency relief supplies might not be shipped in that manner. The information will be an important component of the formulation of an overall response strategy.

3. Direct Assistance to Port: Because it is so vital to the City USAID might want to consider the Port as a possible candidate for emergency engineering assistance, such as can be provided by the U.S. Army Corps of Engineers or the SEABEES. These teams could assist in accomplishing provisional repairs which will permit more active port operations. In Dominica, the SEABEES erected a large double-warehouse for the port, all of whose warehouses were destroyed in Hurricane David. These warehouses permitted relief supplies arriving by sea to be handled with adequate protection against the rain and with improved security.

It is unlikely that USAID would provide generator assistance to the Port. In the event that this is viewed as desirable, however, it should be noted that all port systems operate on a 220V/60 cycle system except the silos, which are operated on a 440V system.

Port authorities will quickly decide whether some shipments will have to be diverted from arrival at Callao to some of their other ports. Puertos del Perú, (Separate Accompanying Volume 5).

EMERGENCY SEAPORT OPERATIONS

CHECKLIST*

1. In general terms, what damages has the Port suffered?

2. Is the port operational during daylight hours_____

   hours of darkness_____

3. Working hours of Customs Authorities_____

4. What is the Port's history of turnover time? What effect did the disaster have on turnover time?

5. Has agreement of port authorities on clearance and priority berthing be gained?

6. Has waiver of fees, duties and charges on delivering ships and on donated disaster items been gained?

7. Can Port handle containerized shipments? (Dimensions, if limited: Can Port handle roll-on/roll-off shipping stock? (Dimensions, if limited:)

In providing data on damage and operations, it is suggested that reference be made to the Map/Port Plan which is a part of this report.

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*As presented by Milton D. Freundel on behalf of the Management Sub-Committee, Office of Foreign Disaster Assistance (OFDA)/USAID Post-Disaster Assessment Techniques Seminar, June 1 - 2, 1981, Washington D.C.

LA PUNTA AND THE PORT OF CALLAO EVACUATION NEEDS

- Description of the Problem

During the past 400 years, Tsunamis have struck the coast of Peru on at least 24 occasions. Because of its configuration and its sea-level position, parts of El Callao are especially susceptible to Tsunami risk.

Tsunamis can be generated in two ways which affect Callao:

(a) Undersea earthquakes off the coast of Peru which reach a level of 8.0 Richter and above can generate Tsunamis which will reach La Punta, for example, in 20 - 30 minutes. While the population of El Callao would know that the earthquake had occurred, it would have no way of judging whether the event had been of sufficient magnitude to generate a Tsunami.

(b) Undersea earthquakes elsewhere in the Pacific Ocean can generate Tsunamis. These waves travel across the ocean rapidly (up to 1,000 kilometers per hour, according to one source) and may fall on Callao. However, because of a control and early warning system in Hawaii, Peru would normally have at least 12 hours of notice of such a risk.

The waves can strike El Callao's coast at various rates of intensity and height, and one researcher has estimated that a height of 16 meters would not be unusual in one of these isolated events.

- Division of Responsibilities in the Zone

The National Civil Defense System is the national agency which has the responsibility and the authority to order the evacuation of El Callao with respect to its civilian population. This is one of the numerous disaster-related mandates accorded to this important organization.

Because of its strategic and economic importance, in addition, two organizations have considerable influence and expertise, as well as authority, in the area:

The Armada Peruana -- Peruvian Navy -- has the greatest influence in the zone. Within El Callao are the main Naval Base (see Port Map); the Naval Academy (Escuela Naval), located at the tip of the La Punta peninsula; the Hydrographic and Navigation Institute (Dirección de Hidrografía y Navegación), located right at the neck between La Punta peninsula and the mainland. Finally, one of the area's major industries, CIMA, a shipyard, operates under the auspices of the Navy.

The other major authority in the area is the Port Authority, ENAPU-PERU. While there are several other major corporations in the area (such as PETRO-PERU, TEXACO, SHELL, MOBIL-OIL, and others), ENAPU-PERU exercises normatives authority over them by virtue of their ownership of some of the land and key facilities used by the corporations. However, it should be noted that the Operations Director of the Port is a retired Naval Officer, and there appears to be considerable liaison between the two institutions, as the Port and the Naval Base share the same geographical area.

- History of Tsunamis

It has not been possible under this study to undertake exhaustive research on previous Tsunamis in Peru. However, for the purpose of general guidance, a chronological history of major Tsunamis which have affected El Callao itself appears on the following pages. This information is drawn directly from a study* entitled, "Protección de Lima Metropolitana ante Sismos Destructivos", undertaken by Ing. Julio Kuruiwa H., a National Engineering

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* Published study is included in USAID/Peru Disaster Reference Materials Library

5.1.5 HISTORIA DE TSUNAMIS EN LIMA DESDE 1540 HASTA 1975.

DATOS			EFECTOS
1586	Julio	09	En el Callao, las olas invadieron 300 m. tierra adentro. El mar invadió aproximadamente 10 Km^2.
1678	Junio	17	El Tsunami causó en el Callao y otros puertos vecinos muchos estragos.
1746	Octubre	28	Hora y media después de la ocurrencia de un terremoto local muy destructivo, 2 Tsunamis destruyeron el puerto del Callao. De 5,000 habitantes que habitaban en el Callao en aquella época solo sobrevivieron 200. Diecinueve barcos incluyendo las de guerra fueron destruidos o encallados, uno de ellos fue varado 1.5 Km. tierra adentro. En otros puntos de la costa también hubo destrucción especialmente Chancay y Huacho.
1806	Diciembre	01	Varias embarcaciones fueron encontrados tierra adentro. La ola levantó un ancla de tonelada y media y la depositó sobre la casa del capitán del puerto. Las olas alcanzaron 6 mts. de altura.
1868	Agosto	13	Algunos daños en el Callao, fueron destruidas algunas embarcacio

			nes pequeñas. El Tsunami causó graves daños en la costa de Chile hasta Concepción.
1877	Mayo	09	Un Tsunami moderado originado en Chile causó daños en los muelles.
1952	Noviembre	05	Tsunami originado en KAMCHATKA incrementó en 2m. el nivel de las aguas del Callao.
1960	Mayo	22	Tsunami originado frente a las costas del Chile, incrementó en 2.20m. el nivel de las aguas en el Callao.
1966	Octubre	17	50 minutos despúes de la ocurrencia de un Tsunami destructivo con epicentro a 120 Km. NW. de Lima, el nivel de las aguas del Callao se incrementó en 3.40 m. La mayor destrucción fue localizada en Casma donde fueron afectados varias fábricas de pescado.

University (UNI) professor with a special interest in disaster planning.

As can be seen on the chart, the earliest recorded Tsunami occurred in July, 1586, when Tsunami waves reached 300 meters into El Callao, flooding about ten square kilometers. The most destructive Tsunami occured in October 1746, when two Tsunami waves destroyed the Port of Callao about ninety minutes after an off-shore earthquake. Of the area's 5,000 inhabitants, only 200 survived. Nineteen vessels were destroyed, and one was carried 1½ kilometers inland.

Since that time, according to the Kuruiwa and other reports, damage has been minor. However, people are aware of the Tsunami risk. Three observations concerning Tsunami-related matters were related during interviews with Naval and Port officials responsible for the area:

(a) During 1980, the Navy was undertaking some emergency evacuation simulation exercises elsewhere in Peru, and, perhaps for this reason, a rumor began in El Callao that a Tsunami was coming. Numerous residents evacuated the area, and widespread looting by others was reported.

(b) In 1974, Lima suffered an earthquake and many residents of La Punta feared that a Tsunami would be generated. Those who had vehicles began to evacuate. But within five minutes the one major road which can be used for vehicular (and pedestrian) evacuation was completely paralyzed. People were so desperate to leave that they began to drive their cars over the sidewalks, impeding pedestrian evacuation. In general, the situation was chaotic and there was little evacuation.

Port authorities reported the same chaotic and unplanned evacuation, with vehicles blocking the only thoroughfares through which the population and the cars themselves could evacuate.

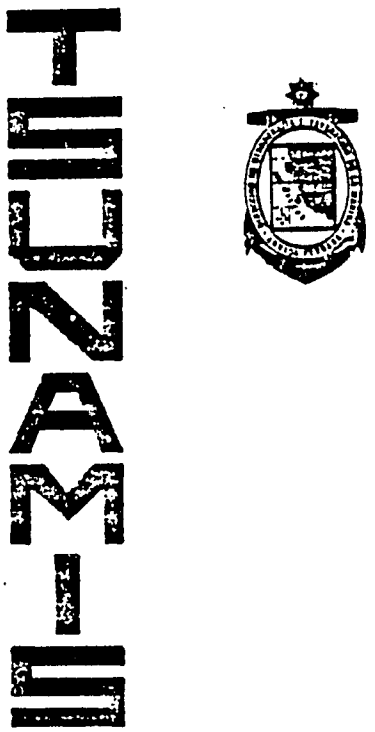
(One electrical engineer reported that falling electrical cables

remained hot for 15 - 20 minutes after the 1974 earthquake before the electrical relay system cut off the power. This made pedestrian evacuation even more dangerous).

(c) One scientific expert reported that in 1979, a 12-hour warning notice was issued by the Tsunami Control Center in Hawaii. As time elapsed and the warning was not withdrawn, the Navy -- which has evacuation authority over its own forces -- ordered an evacuation, which was completed about three hours before the anticipated landfall of the Tsunami. Upon receipt of the warning from Hawaii, the Naval authorities immediately notified the National Civil Defense System. However, as of the time that the all-clear signal was given, under three hours before the anticipated landfall, no public information had been released.

One of the problems in the area is that there is no way to signal any kind of alert or warning. There are no sirens, flags or other signals, nor has the population been prepared to receive, understand and act upon any type of communication. For example, there is no "yellow alert" advising the population to be alert to the danger and to standby for further word; no "red alert" signal to advise of an imminent danger, even though the amount of warning time between the occurence of the earthquake and land could be as little as 20 - 30 minutes. There has been no substantial education program, for the public or in the schools about the issue, except that the Hydrographic and Navigational Institute of the Navy has issued in limited numbers some bulletins (see Charts III and IV at following pages).

There are also some unknowns in connection with possible Tsunamis. One, for example, is what the impact of San Lorenzo Island, located right off the La Punta peninsula, would have on a large wave. Clearly, the



EDUQUEMONOS PARA ACTUAR
EN SITUACIONES DE EMERGENCIA

SISTEMA DE ALERTA EN EL PACIFICO

TSUNAMI . . . ?

Esta palabra es usada internacionalmente para designar a las olas que se producen cuando ocurre un movimiento sísmico (terremoto) cercano al océano o en el fondo del mismo.

¿ QUE CARACTERISTICAS TIENE UN TSUNAMI?

Principalmente su alta velocidad en mar abierto, las olas pueden desplazarse hasta 1,000 kilómetros por hora cuando cruzan el océano; otra característica es su extremada longitud de onda y su pequeña altura.

Cuando estas olas llegan a las costas la velocidad disminuye, por efecto de la disminución de la profundidad produciéndose un incremento en su altura, que según las características de la pendiente del fondo del mar y de la playa, pueden alcanzar hasta 30 metros.

¿ SE HAN PRESENTADO TSUNAMIS EN EL PERU ?

La historia nos dice que sí. Desde hace cerca de 400 años este tipo de olas se han presentado en nuestras costas unas 24 veces, ya sean generadas por terremotos submarinos lejanos o cercanos, siendo estos últimos los que han ocasionado mayores daños a la población costera.

¿ ES POSIBLE PREVENIR LOS TSUNAMIS ?

Si es posible. Para tal fin, existe un SISTEMA INTERNACIONAL DE ALERTA CONTRA LOS TSUNAMIS EN EL PACIFICO, del cual forman parte la mayoría de los países que circundan el Océano Pacífico, el Perú es miembro de este Sistema por intermedio de la Dirección de Hidrografía y Navegación de la Marina de Guerra. El centro de alerta del Sistema se encuentra en Hawaii-Honolulu. Cuando este centro emite una alerta, la Dirección de Hidrografía difunde a Defensa Civil y a todas las Capitanías de Puerto. Defensa Civil posteriormente se encarga de alertar a la población civil costera para que tomen las medidas de precaución.

¿ QUE OTRAS COSAS DEBEMOS SABER ACERCA DE LOS TSUNAMIS ?

- *Que no todos los terremotos causan Tsunamis, pero muchos de ellos sí; cuando Ud. sepa que ha ocurrido un terremoto en el área del Océano Pacífico, manténgase alerta para cualquier posible comunicación autorizada.*
- *Que un terremoto ocurrido en el área inmediata a la suya deberá interpretarse como una advertencia natural de un posible Tsunami; en consecuencia, NO PERMANEZCA EN AREAS COSTERAS BAJAS LUEGO DE HABERSE PRODUCIDO UN TERREMOTO LOCAL.*
- *Que un Tsunami no está compuesto de una sola onda, sino de una serie de ondas, si Ud. ha sido evacuado como resultado de una alerta autorizada, MANTENGASE ALEJADO DEL AREA DE PELIGRO MIENTRAS NO ESTE SEGURO QUE HAYA PASADO LA SERIE DE ONDAS COMPLETAS.*
- *Que la aproximación de un Tsunami es algunas veces precedida por una alza o baja notable de las aguas en la costa. Esto constituye una alerta proporcionada por la naturaleza sobre posibles Tsunami y DEBE SER TOMADA EN CUENTA POR AQUELLOS QUE HABITAN AREAS COSTERAS BAJAS.*
- *Que en la actualidad no existe ningún medio para determinar por adelantado la amplitud o el tamaño de los Tsunamis en localidades específicas. Un Tsunami pequeño en una playa puede volverse gigantesco a unas pocas millas de distancia, NO SE DEJE ENGAÑAR POR EL TAMAÑO INSIGNIFICANTE DE UNO DE ELLOS*
- *Que el Sistema de Alerta Contra los Tsunamis no emite alertas falsas. CUANDO UNA ALERTA ES EMITIDA, EXISTE UN TSUNAMI EN POTENCIA. El Tsunami del mes de Mayo de 1960 mató a 61 personas en Hilo (Hawai), posiblemente ellos pensaron que era "SOLO FALSA ALARMA".*
- *Que todos los Tsunamis SON POTENCIALMENTE PELIGROSOS, aún cuando no golpeen todo el litoral del Pacífico ni produzcan daños.*
- *Que nunca SE ACERQUE A LA PLAYA PARA OBSERVAR UN TSUNAMI, cuando Ud. puede ver la onda, estará posiblemente demasiado cerca para que pueda escapar de ella.*

Que debido a la imprenta, LOS TSUNAMIS VISITAN TODAS LAS COSTAS DEL PACIFICO. Esto significa que las alertas le servirán de ayuda, cualquiera sea el área donde Ud. habite.

- *Que durante una emergencia de Tsunami, los Organismos oficiales y otras organizaciones tratarán de salvar vuestra vida. PRESTELES SU MAYOR COOPERACION.*
- *Que si el Tsunami es de ORIGEN LEJANO, Ud. estará seguro si se encuentra a DOS KILOMETROS DE LA COSTA Y A UNA ALTURA MAYOR DE 15 METROS SOBRE EL NIVEL DEL MAR.*
- *Que si el Tsunami es de ORIGEN LOCAL no correrá peligro si se encuentra A UNA ALTURA MAYOR DE 30 METROS SOBRE EL NIVEL DEL MAR Y A 2 KILOMETROS DE LA COSTA.*

CONTRIBUCION DE LA MARINA DE GUERRA DEL PERU
A DEFENSA CIVIL

direction of the wave would be a variable factor. But questions such as these have been raised: would the island divert the wave; would it divide the wave only to have the two sides converge on the peninsula; etc.

Some research is underway at this moment. The United Nations Disaster Relief Organization -- UNDRO -- has financed a study by Ing. Julio Kuruiwa, referred to earlier, principally to determine the Tsunami risk and advise on evacuation measures.

- Suggested Strategies for Disaster Mitigation

The Kuruiwa Study, whose tentative conclusions have been disseminated widely by its author in lectures and television appearances, includes vertical evacuation for immediate emergencies. For example, there is a tall, modern bank building, which is a strong concrete and steel structure, at the end of La Punta. Kuruiwa has suggested that this and other similar future structures be used for vertical evacuation. Keys to the bank would be left with a neighbor or watchman, who would be authorized to open the building in case of emergency.

In the interviews conducted for this study, a few questions concerning the vertical evacuation scheme emerged repeatedly, as follows:

(a) The Bank building is open during limited hours in the week, perhaps 40 out of 168 hours per week, or about 25% of the time. During 75% of the week, the building is closed and business operations are discontinued. The employment of the bank building as a full-time evacuation strategy raises questions.

Whether the Bank or building authorities would permit an informal -- or even a formal -- arrangement for opening the building in the middle of the night is doubted by some who are familiar with security procedures. Whether

it would occur to people to go to the Bank in the middle of the night, is another doubt.

(b) People expect after-shocks subsequent to a major earthquake. They will tend to evacuate buildings, not enter them. The idea of entering a building while the ground is still shaking is not culturally acceptable, argue critics of the plan. Further, there is a danger of falling glass and debris as well as risk of other injuries.

(c) Some argue that people will not be convinced (and some of them do not themselves appear to be convinced) that such structures can withstand Tsunamis, whether or not, in fact, they have such strength. As there have been no strong Tsunamis in 235 years, there are few Tsunami-veterans around to provide further information.

(d) Others feel that the strategy is good, but that open vertical parking lots need to be constructed throughout Callao, with special anti-Tsunami design. However, even advocates for this version of the vertical evacuation plan feel that it is rather unlikely that such construction will begin, and in the meantime the area remains without a plan.

-- Suggestions by Other Agencies - "The Seven Point Approach"

The Hydrographic and Navigational Institute of the Peruvian Navy and some Civil Defense operations officials have tentatively suggested that an integrated system be implemented which would perform the following functions:

1. Where possible, alert the population four or five hours in advance of the possibility of the need to evacuate La Punta, the Port, and other areas in their environs. This would require a policy-decision for

activation.*

2. Alert the population of the need to immediately evacuate the danger zones. This type of alert would need to be provided under two circumstances:

(a) When early warning has been received and, for example, item 1. above, has been implemented, the risk to the population remains high as the landfall approaches; and

(b) When the earthquake has occured off the Peruvian Coast and its level has exceeded the equivalent of Richter 8.0.

(3) Advise the population that the risk, or the event, have passed, so that residents may safely return to the area.

(4) Safeguard the property of area residents, and insure the security of Naval, Army and business installations, during evacuation procedures.

5. Educate the public about Tsunamis through the school system, the local Civil Defense organizations, businesses, civic groups, churches, and

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* It would not be expected that the entire population would initiate evacuation if it received a timely warning. For example, Lachman, Tatsuoka, and Bonk, in Human Behaviour During the Tsunami of May 1960 (Science , N.Y. 133 (1961), 1405-1409), provide the results of a survey of behaviour of 327 people from the area struck by a tsunami in Hawaii. Though 95% of the sample heard the warning siren four hours before the wave and most had also heard it from radio and television only 41% evacuated. Fifteen percent (15%) of the remainder felt they were in no danger and ignored the signal. Most of those who did not evacuate waited for some official confirmation or instructions and stayed awake until the impact at 1:00 a.m.

Those who did show adaptive behaviour did not differ significantly from the other in terms of formal education, but a higher proportion had experienced a disaster before. Of the various ethnic groups involved in the survey, a higher proportion of Hawaiians evacuated.

It is concluded that disaster warning should be unambiguous and include specific directions for adaptive measures.

other organizations. Such education should include instruction on the interpretation and instructions of the three respective alert-signals described in 1., 2., and 3., above; of the security measures to be implemented under 4. above, and other matters relevant to disaster preparedness.

6. It appears advisable that, within the National Civil Defense System, the Director or Acting Director of the Hydrographic and Navigational Institute be given the authority to alert the civilian population to at least danger-thresh-hold described in 2., above, if not 1., as well. This delegation would strengthen the National Civil Defense System, adding another action-arm to its arsenal of forces mounted to mitigate disasters. It would also insure that a technically-competent, local authority, familiar with the on-the-ground situation in El Callao, can make the most rapid possible decision in the event of an emergency. The All-Clear signal described in 3., above, could be reserved to the National Civil Defense System or delegated as part of the recommended procedures.

7. Prohibition of Vehicular Evacuation In principle, officials on-the-scene in La Punta and the Port who were interviewed in the course of this study recommend that vehicle evacuation be prohibited.

The guiding principle behind this proposed prohibition is that the purpose of the evacuation is to safeguard human life from the possible effects of a Tsunami. The primary purpose is not to accelerate the mobilization of Port workers or other residents across the city, nor is not to safeguard vehicles. A main goal is, on the other hand, to permit the majority of pedestrians -- and the population as a whole -- an opportunity to escape the area. The advantages, disadvantages, and realistic chances

of implementing this policy are discussed in the following section.

Based on the interviews conducted in the course of this study, the seven-point recommendations produced by the majority of local officials familiar with the problems of the zone, and other technical authorities, appears to offer decided advantages for the moment over the vertical evacuation approach. In the next section, some advantages, risks and contingencies of each approach are examined.

-- Pro's and Con's of the Seven Point Approach

In this section, a variety of scenarios related to the system described above are considered.

SCENARIO 1. The "Red Alert" Signal Functions - The Tsunami Occurs

This is the main goal of the warning system under consideration. Some number of lives would be saved, and in the emergency case, hundreds or even thousands could be involved.

Evacuation of La Punta, the most critical zone, is possible. The positive extreme of the possibility is the evacuation of the Naval Academy. In a simulation exercise, the Academy was evacuated and the cadets jogged to a high safety point on the mainland. The entire exercise was completed in fifteen minutes.

As stated, however, this is a positive extreme which cannot be replicated by the population as a whole. What it does indicate is that some proportion of the population can evacuate to a safe zone within the absolute minimum period of 20 - 30 minutes.

In addition, false or hysterical evacuations, with the additional

risk of accidents and looting, have been reduced.

SCENARIO 2. The Red Alert is Activated - But the Tsunami Does Not Materialize

An automatic alert would only be activated by an 8.0 Richter earthquake, an event which would be universally recognized as a reasonable cause for evacuation. In case the "manual" alert were considered, the authorities would take every reasonable precaution to minimize a false alarm without placing the population at risk.

In both cases, the ALL CLEAR signal would be given as soon as it could be ascertained that the danger had passed. This would occur rather quickly, and people could return to their homes and businesses.

Security surveillance would have been activated simultaneously with the evacuation alert, attempting to minimize the disruption and looting which might ensue. It might well be, however, that an evacuation caused by such an official alert would be taken seriously by potential looters as well and that they might join in the evacuation rather than in the looting. This would mean that the looting which took place during the hysterical evacuation of 1980 would not reoccur.

However, two risks are run in this scenario:

(a) Would the public again respond positively in the event of a future alert of the same kind?

(b) Would there be a political backlash for the occurence of the incident?

The general consensus is that the public would understand the importance of the alert and that it is implemented to protect lives. It is doubted that there would be a political backlash unless the alert were

frivolously implemented by the authorities. In the end, the education program and the people's common sense would converge to make it clear that it is in their own interests, and that of their families, to avoid a Tsunami castastrophe.

SCENARIO 3. Alert is Not Activated - Tsunami Occurs

This is precisely the situation in which Callao finds itself today. The country would have to rely on radio news and neighbor-to-neighbor alerts, speakers mounted on helicopters, etc. It is unlikely that this system could alert people in time for a genuine emergency. However, an earthquake off the Peruvian Coast itself should alert the population to the risk.

There is also a corollary scenario: people await the alert, which does not occur; hear instructions on radio to evacuate but, as they have not heard the sirens, do not evacuate, later find themselves caught in the Tsunami wave.

There are numerous measures which can be taken in the implementation of such a project to insure that this kind of contingency does not arise, and they are described later in this section. However, it is believed that the population will be more inclined to accept any type of alert than the contrary. This is a contingency which must be balanced with the more significant positive aspect that there is a 99% chance that the system will function adequately and that many lives could be saved as a result.

In essence, the conclusion is that the worst possible situation is what exists today.

SCENARIO 4. Frivolous Activation: Terrorist, Pranksters, Mechanical Failure

Measures to assure that such contingencies do not occur are discussed under the implementation section and are believe to be rather

adequate. However, as the system has an ALL-CLEAR signal, the frivolous alert can be counter-manded almost instantaneously.

Prohibition of Vehicular Traffic

A final point which must be addressed is the feasibility of prohibiting vehicular traffic when emergency evacuation (30 - 60 minutes) is required.

There is little argument that if vehicles are used to evacuate these zones, the majority of those who could escape will not. There is also, however, serious question as to whether the use of vehicles can be prohibited.

The problem of La Punta is serious because (see Aerial Maps A) there are only two roads between the peninsula and the mainland: one is for inbound traffic, one is for outbound traffic.

In the event of an alert, one option would be to make both roads outbound only, prohibiting inbound traffic (there is fairly little of it in any case).

The prohibition of vehicular traffic for evacuation would apply only when there are 60 minutes or less available for such flight. If early warning is received, then the "red alert" must be given with a degree of anticipation that takes into account the traffic problems which arise in such a process.

The policy concerning the use of vehicles need not form a part of the overall policy contained in the other "six points"; it can be studied separately, and its practicality (or enforceability) established.

-- Implementation Measures

To implement the system described in the foregoing pages, a

reasonably simple approach has been suggested:

1. Sirens would be installed in three heavily-guarded military installations in the area: one siren each at the Naval Academy and the Navy Base; and two at the Army Base "Real FELIPE" between these two points, facing in either direction.

Siren specifications would include: ability to broadcast three easily distinguishable signals; ability to be powered by batteries; ability to be activated by electronic signal, if possible. The battery would be placed on a continuing electrical charge, but the sirens must be able to operate perfectly with the battery even if it is not being charged.

2. An accelerograph located at the Hydrographic and Navigational Institute (hereinafter referred to as the Institute) would automatically trigger the "red alert" signal on all three sirens when an earthquake reaches or surpasses the 8.0 Richter Level. Its energy source will be similar to the sirens. Chart V on the following page is a description of the type of accelerograph required for the project.

3. The National Civil Defense System would delegate to the Director of the Institute the authority to activate the "red alert" if a Tsunami generated outside the Peruvian coastline area threatens El Callao. Guidelines and procedures approved by Civil Defense would guide the Director's actions.

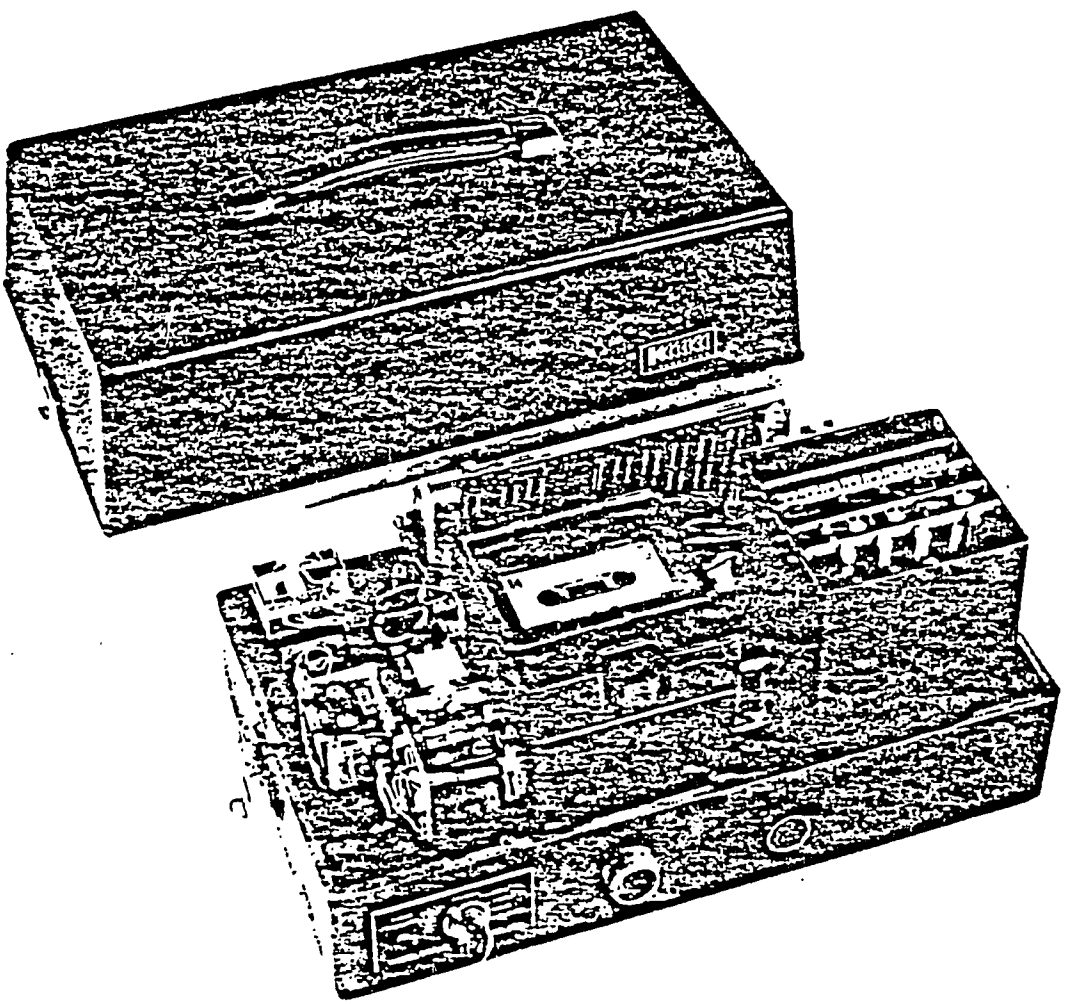
The Institute maintains 24-hour a day vigilance, and a Duty Officer is always present at the Institute. If at any time, the Hawaii Control Center maintains an active alert for Callao when a Tsunami is within three hours of landfall, the Director of the Institute will automatically activate the "red alert". This will be done in order to insure that the

KINEMETRICS

EARTHQUAKE ENGINEERING INSTRUMENTS

DSA-1

Digital Strong Motion Accelerograph



The DSA-1 Strong Motion Accelerograph is the most advanced of Kinemetrics' accelerograph product line. It encompasses all functions from field sensors through a tape format system to displayed data, which is then ready for interpretation. When triggered by an earthquake, the analog output is converted to digital at 200 samples per second and recorded on a certified digital cassette. By recording digitally, the dynamic range can be expanded to 2000:1, about 20 times that of analog instruments.

The optional Pre-Event Memories (PEM) hold 2.5 or 5 seconds of three-channel data at all times; as a result, pre-event information, including the P-wave arrival, is captured for each event. Complete playback support is available, providing computer-compatible tape and strip-chart records from the DSA-1 cassette.

The DSA-1 is useful in programs where both engineering and seismological objectives are important, and in other situations where ultra low noise and wide dynamic range are critical.

KINEMETRICS INC., TWO TWENTY TWO VISTA AVENUE, PASADENA, CA. 91107 (213) 795-2220 - TELEX 67-5402 KMETRICS PSD

GENERAL DESCRIPTION

The DSA-1 is a self-contained triaxial strong motion accelerograph which converts the analog outputs of three force balance accelerometers into proportional digital values. It then records the digital data onto a four-track magnetic tape cassette. The basic system includes a micro-power trigger, orthogonal force balance accelerometers, rechargeable batteries, cassette recorder, key-switch controls and associated circuitry in a water-tight cast aluminum housing. Options available with the DSA-1 provide maximum flexibilty for the user. They include pre-event memory, external battery power, time code receiver, and time code generator.

TECHNICAL SPECIFICATIONS

Recording System

Recording Medium
- Certified magnetic tape digital cassette, 0.150 inches (3.8 mm wide) x 300 ft. (92 meters).

Recording Head
- 4 track parallel tape: 3 data, 1 vertical parity

Recording Type
- Digital, phase encoded

Tape Speed
- 2.5 inch/sec.

Recording Time
- 20 minutes

Recording Density
- 1280 bpi

Dynamic Range
- ±66 dB for ±2.5 volts

Sampling Rate
- 200 samples per second per channel

Starting-up Time
- Less than 100 ms

Tape Format
- Samples are recorded in 16 bit words:
  - 2 word sync bits (fixed)
  - 1 coded data bit
  - 12 binary A/D bits
  - 1 LRCC bit
  - (During each 64th sample period all zeros are recorded on all four tracks for synchronization).

Coded Data
- Track 1: instrument serial number and sampling rate
- Track 2: 2 pps time pulse
- Track 3: optional WWVB or TCG-1 time code
- Track 4: parity

Input Voltage
- ±2.5 volts single ended

Frequency Response
- dc to 50 Hz (3 dB point), -12 dB/octave rolloff above 50 Hz.

Analog Channel-to-Channel Sampling Skew
- 625 microsec. @ 200 samples/sec.

Analog-to-Digital Resolution
- 12 binary bits; 11 bits, plus sign (1 part in 4096).

Transducers

Type
- Triaxial force balance

Natural Frequency
- 50 Hz

Range
- ±1 g full scale (½ g, ¼ g and 2 g optionally available).

Damping
- 70% critical

Temperature Effects
- ±2% of full scale from 0° to 160°F (-18° to 71°C)

Bandwidth
- dc to 50 Hz (3 dB point), -12 dB/octave rolloff above 50 Hz.

Output
- ±2.5 volts full scale

Calibration
- Provision for damping and natural frequency commands.

Seismic Trigger and Alarm Systems

Starter
- Sensitive Direction: Vertical
- Acceleration Set Point: 0.01 g (adjustable)
- Frequency Range: 1 Hz to 15 Hz (± 3 dB)

Event Indication
- Electro-magnetic event indicator

External Event Alarm
- 12 Vdc to actuate external alarm

Interconnection
- Provision for common starting of 2 or more DSA-1 units.

Power Requirements

Voltage
- +12 and -12 Vdc

Standby Current
- 0.15 mA @ +12V

Recording Current
- 300 mA from +12Vdc (nominal)
- 300 mA from -12Vdc (nominal)

Battery Capacity
- Four internal 2.6 amp-hour six-volt batteries. Provide at least 30 min. recording after 6 months in standby without charging.

Battery Charger
- Float charger (operates from 110 Vac or 220 Vac) supplied.

PHYSICAL CHARACTERISTICS

Housing
- Watertight cast aluminum base and cover.

Size
- 0.25 m wide x 0.43 m long x 0.22 m high (10" x 17" x 8½").

Weight
- 43 pounds (19.5 kg)

Operating Temperature
- 30°F to 130°F (0°C to 55°C).

Humidity
- 100% RH.

Mounting
- Single tie-down bolt (¼-20).

OPTIONS

1. ½ g, ¼ g, or 2 g full scale sensitivities.
2. Internal seismic trigger can be either vertical or horizontal (or optionally both).
3. Internal WWVB or DCF-77 receiver to provide day, hour, minute, and second timing for each recorded event. WWVB reception available in U.S. and parts of Canada and Mexico only. DCF-77 reception available in Central Europe and parts of Eastern Europe.
4. Internal TCG-1 Time Code Generator to provide day, hour, minute, and second timing for event identification.
5. Pre-Event Memory (PEM) can be added. Up to two memory boards, each containing 2.5 seconds of PEM, can be added at the factory or in the field. With PEM the standby current becomes 30 mA at + and -12Vdc and battery life becomes 30 minutes of recording after two days standby without charging.
6. An external battery pack can be substituted for the internal batteries. This extends battery life with PEM to three days standby without charging and includes an event counter.
7. External accelerometers (FBA-3) can be ordered, or a special housing can be ordered which allows accelerometer in DSA-1 to be removed and mounted in special housing.

RECOMMENDED SPARE PARTS AND SUPPLIES

1. Spare certified digital cassette.
2. Desiccant envelope is optional, but recommended, particularly in humid locations.
3. Spare 6 volt rechargeable batteries, GC-626-1 (set of four).

ORDERING INFORMATION

1. Specify sensitivity: 1 g, ½ g, ¼ g, or 2 g.

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population has an opportunity to evacuate by vehicle.

4. Either the Executive Secretary of the Civil Defense System or the Director of the Institute (by Civil Defense delegation) will activate the warning "yellow alert" or the "ALL CLEAR" signals when guidelines and procedures and the corresponding circumstances so warrant. Should the authority be delegated to the Director of the Institute in order to insure the safety of the public, this delegation will not relieve him of the responsibility to keep the Civil Defense Director informed of all such actions as quickly as possible after they are taken or, if possible, before they are taken.

5. Prior to and simultaneous with the installation of the siren equipment, a public education campaign will be conducted to insure that the population is aware of the purpose of the alert program, the meaning of the three signals, and the measures which should be taken to respond to them. This campaign will be conducted in the schools, community groups, businesses, and industries by a combination of agencies:

(a) Through the Ministry of Education, under the auspices of its Civil Defense Liaison Officer, Dra. Lia Fernandez Arriaran, to all the schools in the area and through the schools to the parents.

(b) Through the Security Divisions of the businesses and industries of the area, including the Port Authority, to the workers in the area.

(c) Through the 2a. Región de Defensa Civil, to the local Civil Defense groups and, in cooperation with the Ministry of Housing's regional social promoters to other settlement areas and communities affected by the policy.

(d) Through the publication of permanently-placed posters explaining the system.

(e) Through the public media, through public service announcements, press coverage of the siren-tests, interviews, and visits to key officials to the area.

6. Upon the activation of a Tsunami alert, the Navy (and other) helicopters stationed at JORGE CHAVEZ International Airport implement contingency plans (practiced in simulation exercises) to evacuate the helicopters to higher ground. Through the coordinated program described in the foregoing paragraphs, the Navy will also cooperate by using their helicopters to provide aerial security surveillance for the evacuated areas. Law and order measures and special authorities considered appropriate by the Civil Defense, Guardia Civil, Military Forces and other responsible for maintaining law and order in such emergencies will be developed to minimize looting and disorders.

7. Maintenance, control and testing of the sirens and triggering equipment will be conducted jointly by the Institute and the IGP.

-- Recommended USAID Role in Further Related Activities

USAID's technical assistance in the development of this project was requested in a letter (see following page) from the Executive Secretary of the National Civil Defense System, Admiral Edmundo Masias S., on September 18. It would be appropriate for USAID to continue to provide technical assistance to the development of this project, keeping in mind that the details of the illustrative system proposed herein will require careful examination, review and revision. This process must involve meetings

COMITE NACIONAL DE DEFENSA CIVIL
SECRETARIA EJECUTIVA

Lima, 12 SET. 1986

Oficio Nº 1840 DC/SE (11.2)

Señor
LEONARD YAEGER
Director de la Agencia para el
Desarrollo Internacional AID.

Asunto : Solicita cooperación técnica internacional.

Tengo el agrado de dirigirme a Ud., para manifestarle lo siguiente:

1. De acuerdo a las conversaciones sostenidas con el Sr. ROBERT GERSONS experto de la AID, esta Secretaría Ejecutiva considera conveniente enfocar dos problemas que podrían presentarse en caso de ocurrir un sismo de gran magnitud en Lima Metropolitana.

2. Entre éllos tenemos, el problema eléctrico de Lima en caso de ocurrencia de un movimiento sísmico.

3. Asimismo , de producirse un tsunami en las partes bajas de la costa de Lima, el problema de evacuación, en las acciones de preparación y prevención.

4. Por lo expuesto, teniendo en cuenta estas consideraciones, solicito a Ud. tenga a bien disponer las acciones que permitan contar con el apoyo necesario por su Institución, que significa de mucho interés para esta Secretaría Ejecutiva.

Dios guarde a Ud.

with a variety of agencies, such as those provided in the List of Contacts.

Official authority to consider these matters was extended by the Commander of the Peruvian Navy in letters (at following pages) of October 21, 1981, to the Director of the Hydrographic and Navigational Institute and the Commander of the Naval Base. It was not possible, however, to make contact with the Base Commander because of scheduling problems. The Institute staff indicated that the Base Commander is often guided by his technical staff with respect to the matters under discussion.

In addition, it appears certain that the project would require 100% USAID Grant Funding. The cost of the accelerograph -- probably the most expensive single item involved -- would be $10,000 or less. The cost of the sirens and their triggering devices is unknown. It is believed that the Army and Navy would cover installation costs and that IGP would cover maintenance costs, but that is not absolutely certain.

Certain funds would have to be set aside for educational materials for the school system, through the Ministry of Education, and for the posters, which will need to be of durable quality.

MINISTERIO DE MARINA
COMANDANCIA GENERAL DE LA MARINA

Lima, 21 Octubre 1981

V.1000-686

Del: Comandante General Acc. de la Marina

Al: Comandante General de la Base Naval del Callao

Asunto: Entrevista.-Sobre

Anexo: 1) Copia fotostática de la Carta de la Embajada de los Estados Unidos de América en el Perú de fecha 19 Octubre 1981.

1.-Comunico a Ud. señor Contralmirante, que el señor Roberto P. GERSONY experto por la Oficina de Apoyo para Desastres de la Agencia Internacional para el Desarrollo (AID) del Departamento de Estado en Washington D.C., tiene autorización para entrevistarse con ese Comando, para tratar sobre los problemas que podrían presentarse en caso de ocurrir un sismo de gran mangnitud.

Dios guarde a Ud.
El Vicealmirante
Francisco MARIATEGUI Angulo

DISTRIBUCION:
Copia: Jef.E.M.G.Mar.
Jef.Of.Enl.EMGM.
Archivo.
Lgt.

MINISTERIO DE MARINA
COMANDANCIA GENERAL DE LA MARINA

Lima, 21 Octubre 1981

V.1009-688

Del: Comandante General Acc. de la Marina

Al: Director de Hidrografía y Navegación

Asunto: Entrevista.-Sobre

Anexo: 1) Copia fotostática de la Carta de la Embajada de los Estados Unidos de América en el Perú de fecha 19 Octubre 1981.

1.-Comunico a Ud. señor Contralmirante, que el señor Roberto P. GERSONY experto por la Oficina de Apoyo para Desastres de la Agencia Internacional para el Desarrollo (AID) del Departamento de Estado en Washington D.C., tiene autorización para entrevistarse con esa Dirección, para tratar sobre los problemas que podrían presentarse en caso de producirse un Tsunami en las partes bajas de la Costa.

Dios guarde a Ud.
El Vicealmirante
Francisco MARIATEGUI Angulo

DISTRIBUCION:
Copia: Jef.E.M.G.Mar.
Jef.Of.Enl.EMGM.
Archivo.
Lgt.

(42)

List of Contacts

The list of contacts (see following pages) contains the names of those directly involved in the matters raised in this section, and the education, local civil defense, and fire department (BOMBEROS) officials who should be involved in the consideration of such an effort. In addition, BOMBEROS Commander Carlos Camino Rivera can be counted on to assist in the Port Security Project, together with his professional electrical contractor Ing. Elec. José Aguirre, who is also Professor of Electrical Engineering at the university.

LIST OF CONTACTS

Capitán de Corbeta A.P. (R)
Cesar Lezameta Bizetti
Sub-Gerente Operativo
Empresa Nacional de Puertos (ENAPU-PERU)
Terminal Maritimo Callao
Edificio Administrativo, 3er. Piso
El Callao
Lima

Teléfono: 299210 Anexo 355
Cables : ENAPUPERU
Apartado Postal 260

Ing. Ricardo Deguezala de la Flor
Jefe
División de Seguridad
ENAPU-PERU
Same Address as above

Teléfono: 292109 (direct)
229210 Anexo 328

Ing. Pedro Ludwigson Paggi
Jefe
Departamento de Vigilancia y
Protección de Planta
División de Seguridad
ENAPU-PERU
Same Address as above

Teléfono: 229210 Anexo 360

Sr. Esteban Cicirello Miglioiri
Administrator
Terminal Maritimo El Callao
Same Address as above

Capitán de Navio (refer to as Comandante)
Jorge A. del Aguila Sánchez
Sub-Director
Dirección de Hidrografía y Navegacíon
de la Marina
Avenida Gamarra No. 500
Chicuito
Callao
Perú

Teléfono: 299868
291974

LIST OF CONTACTS (CONTINUED)

Comandante César Vargas Faucheux
Jefe
Departamento de Oceanografía
Dirección de Hidrografía y Navegación
de la Marina
Avenida Gamarra No. 500
Chucuito
Callao
Lima

Teléfono: 299868
291974

Capitán de Fragata (refer to as Comandante)
Luis Osorio Ramal
Oficina de Enlace del
Estado Mayor General de la Marina
Ministerio de la Marina
Avenida Salaverry Sin Número
Distrito de Jesús María
Lima

Teléfono: 245304 (direct)
314620 Anexo 227

Coronel (EP) Carlos Abad Araujo
Director
2a. Región de Defensa Civil
Lima

Dra. Lia Fernandez Arriaran M.
Civil Defense Liaison
Ministry of Education
Oficina de Bienestar de Personal
Avenida Avancay
(Parque Universitario sin numero)
Lima

Teléfono: 275680 Anexo 206

LIST OF CONTACTS (CONTINUED)

Dr. Ronald Woodman Pollit
President Ejecutivo
Instituto Geofísico Peruano (IGP)
Avenida Armendares 497
Miraflores
Lima
Peru
(ca. prolongación del Arco en Miraflores)

Teléfono: 471771

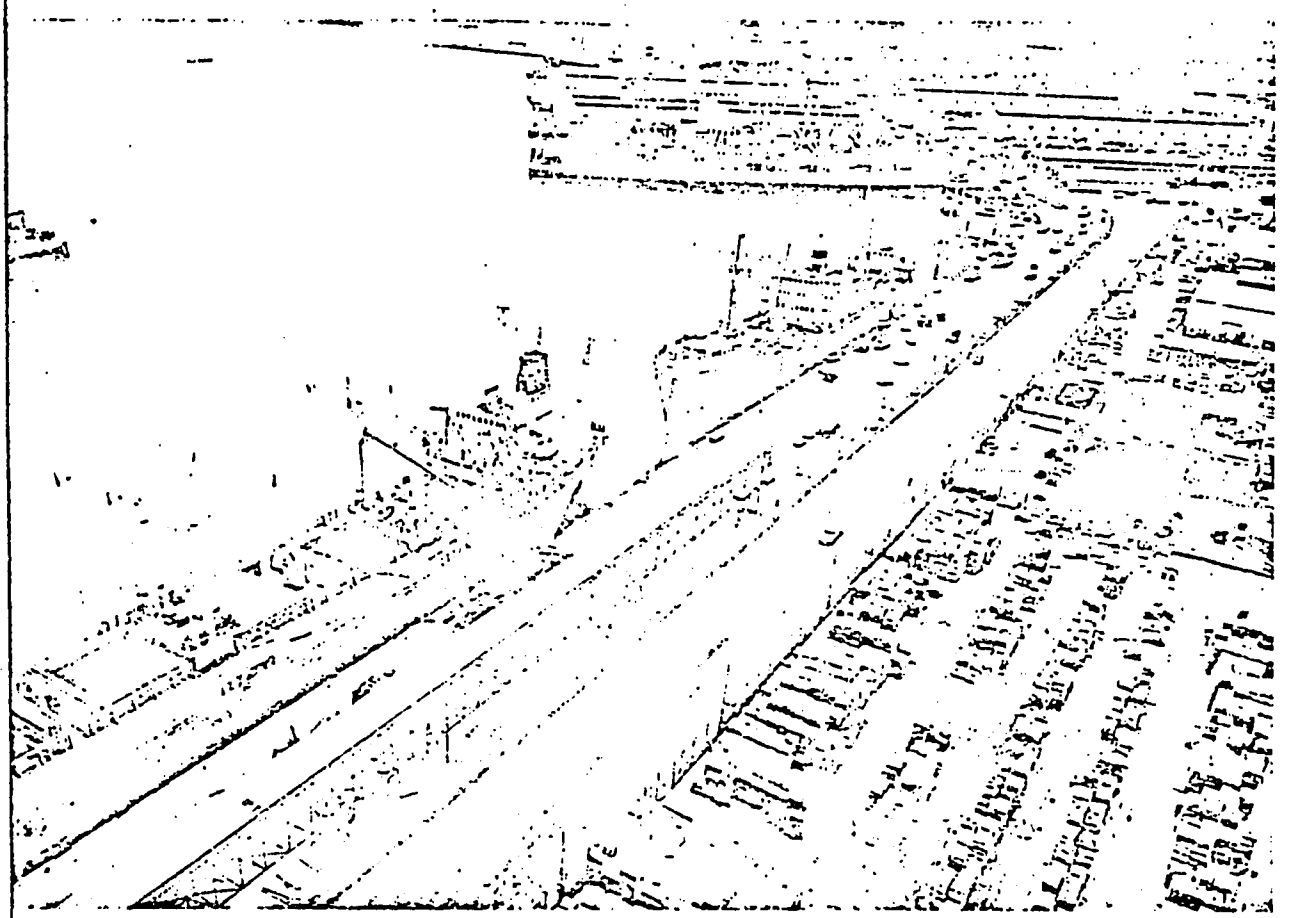
Brig. Gral. C.B.P.
Carlos Camino Rivera
Vice-Comandante General del
Cuerpo de BOMBEROS del Perú
Rebeca Oquendo 353
P.O. Box 1244
Lima 5
Peru

Teléfono: 244005
249830
247070
HOME: 229527 (only emergencies)

Ing. Luis Ganoza de Zavala
Sub-Gerente de Producción
y Control de Sistemas Eléctricos
ELECTRO-LIMA
Oficina Principal
Jirón Lima 261 (ca. Palacio Nacional)
Lima

Telefono: 814141

CALLAO



Reseña Histórica

El Callao ha sido el puerto mayor del Perú desde los días de la Conquista y posterior establecimiento de la República.

Las primeras instalaciones para atraque de naves, fueron construídas entre los años 1870 a 1875, en la parte denominada Muelle Dársena.

El primer barco a vapor acoderó a este Muelle el 19 de Julio de 1877.

Fue en el año 1869 que el Gobierno del Perú autorizó a la firma Templeton y Bergmann & Cía. a construir y hacer funcionar el área del puerto que se conoce por el nombre de "Antiguo Muelle Dársena". Las obras amparadas por dicho contrato fueron terminadas alrededor del año 1877, haciéndose adiciones menores en contratos posteriores con los señores Dreyfus Hermanos & Cía. y con la Societé General Francaise.

Otras modificaciones en el Muelle Dársena fueron ejecutadas al amparo de contratos con la Frederick Snare Corporation en 1938. Posteriormente en el año 1947, la Frederick Snare Corporation construyó un muelle marginal al costado norte del Muelle Dársena. Hasta comienzos de siglo, el primer puerto del país se llamaba Terminal Marítimo Leguía y su administración estuvo a cargo de la compañía constructora y posteriormente del Ministerio de Hacienda y Comercio.

En el año 1952, por Decreto Supremo, se creó un organismo autónomo encargado de la administración del puerto: La Autoridad Portuaria del Callao. Bajo este régimen de independencia económica y administrativa, el Terminal Marítimo introdujo múltiples cambios en los sistemas administrativos y operativos, ejecutándose nuevas obras de ampliación, se logró un mejor equipamiento, adoptándose modernos sistemas mecanizados para las operaciones de embarque y descarga, al mismo tiempo que se tecnificó al personal.

En la actualidad, Callao está considerado como un Terminal Marítimo de primera categoría, en razón del volumen de carga que moviliza y del número de buques que atiende. Desde Enero de 1970 pasó a integrar la Empresa Nacional de Puertos, ENAPU-PERU, Organismo Público Descentralizado del sector Transportes y Comunicaciones, encargado de la administración de los Terminales Marítimos, Fluviales y Lacustres del país.

Breve Descripción.

El Puerto del Callao está constituido por una rada exterior abierta, protegida por el Sur. La rada exterior sirve de primer fondeadero para cualquier clase de barcos, con profundidades de más de 39'.

Las condiciones especiales en lo que se refiere a corrientes marinas, mareas, ausencia de lluvias, etc. ofrecen máximas seguridades.

El ingreso al puerto tiene 180 m. de ancho y las naves pueden ingresar con 30' de calado normalmente y hasta con 34' en pleamar.

La profundidad en los amarraderos varía de 27' a 37'.

La rada interior tiene aproximadamente una milla cuadrada de área y está limitada por tierra y por dos rompeolas.

Ubicación Geográfica.

Lat. 12° 03' S.
Long. 77° 09' O.

Zona de Influencia.

El Terminal Marítimo del Callao está situado en la Provincia Constitucional del Callao, distante de Lima, Capital de la República, apenas unos 15 kilómetros. Por su posición geográfica en relación al País y su ubicación hemisférica en el área del Pacífico, el Puerto del Callao posee una vasta zona de influencia que se refleja en los grandes volúmenes de carga por conceptos de cabotaje, importación y exportación. Los productos que moviliza son diversos, van desde carga general hasta minerales, productos agrícolas, ganaderos, pesqueros, combustibles, etc., que proceden de diversas regiones del país, en el caso de exportaciones. El Callao en el plano nacional, moviliza alrededor de la quinta parte del tonelaje total del país.

Vías de Comunicación.

Conectado con la Capital de la República por cuatro autopistas. Todas ellas son cruzadas en forma transversal por la Av. Elmer Faucett que une el Aeropuerto Internacional "Jorge Chávez" con la Capital.

Desde el Puerto del Callao se puede trasladar fácilmente a cualquier lugar del país: por la Carretera Central al interior y, por la Carretera Panamericana al norte y sur del país.

Hay empalme al Ferrocarril Central del Perú que une Lima con el interior del país, cruzando la Cordillera de los Andes.

Por vía marítima, el Puerto del Callao está unido particularmente con los Países de la Costa del Pacífico y en general con todos aquéllos que cuentan con las ventajas de la navegación.

Ayudas a la Navegación.

Establecimiento de puerto: 5.36 hrs.
Amplitud de marea durante sicigias: 0.90 m.
Promedio amplitud de marea: 0.55 m.

Dragado: El dragado se efectúa con equipo propio de acuerdo a un plan anual de dragado.

Protección: El Puerto está protegido por el sur por el litoral de Chucuito, La Punta y la isla de San Lorenzo. Además hay dos rompeolas, el Norte de 2,175 m. y el Sur de 1,090 m.

Faros: En el canal de ingreso al Puerto del Callao se encuentran dos faros denominados Faro Norte y Faro Sur.

Boyas: El canal de ingreso está marcado por boyas luminosas ubicadas a 1,000 m. de la boca de los rompeolas y separadas una de otra a 180.5 m.

Fondeaderos: Fondeadero libre para toda clase de embarcaciones en la rada exterior del Puerto.

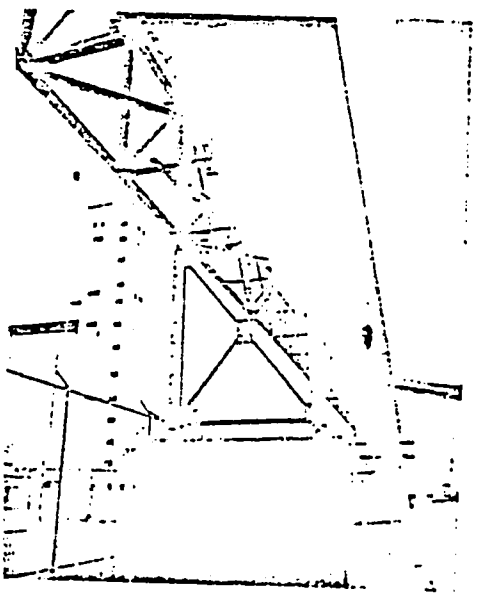
Practicaje: Es obligatorio. El servicio de Prácticos es cubierto por Capitanes experimentados del Terminal Marítimo del Callao.

Facilidades Portuarias.

—**Muelles:** Cuenta con Ocho Muelles para atraque directo.

—**Amarraderos:** Existen 21 amarraderos repartidos del modo siguiente:

- 2 Amarraderos (1A, 1B) en el Muelle Nº 1
- 2 Amarraderos (2A, 2B) en el Muelle Nº 2
- 2 Amarraderos (3A, 3B) en el Muelle Nº 3
- 2 Amarraderos (4A, 4B) en el Muelle Nº 4
- 3 Amarraderos (5A, 5B, 5E) en el Muelle Nº 5
- 2 Amarraderos en el Muelle Nº 7 (Muelle de Petroleo)
- 5 Amarraderos (9A, 9B, 9C, 9D, 9E) en el Muelle Nº 9. Los Muelles 9D y 9E prestan atención a naves menores y sirven para reparaciones.
- 3 Amarraderos (11A, 11B, 11C) en el Muelle Nº 11.



Ampliación de la Faja Transportadora de Granos.

Nota: La longitud promedio de los Amarraderos es de 600 pies.

Material Flotante:

— 2 Remolcadores de 850 HP.
— 1 Remolcador de 500 HP.
— 1 Draga "Oficial de Mar Landa" de succión y cortador de 600 m³.
— 1 Draga "La Perla" de 715 HP .
— 3 Lanchas de acero "Bahía" de 235 HP c/u.
— 3 Lanchas de casco de madera.
— 2 Ganguiles de 150 m³.

Equipo de Manipuleo de carga.

— 61 Tractores
— 27 Elevadores de Horquilla de 3,000 lbs.
— 26 Elevadores de Horquilla de 4,000 lbs.
— 18 Elevadores de Horquilla de 5,000 lbs.
— 36 Elevadores de Horquilla de 6,000 lbs.
— 8 Elevadores de Horquilla de 7,000 lbs.
— 4 Elevadores de Horquilla de 10 Tns.
— 3 Elevadores de Horquilla de 20 Tns.
— 22 Elevadores prensas de 5,000 y 6,000 lbs.
— 2 Elevadores Bobineras de 6,000 lbs.
— 2 Acarreadores de 6 tns.
— 6 Grúas para cilindros de 3 tns.
— 4 Grúas de 10 tns.
— 1 Grúa de 30 tns.
— 12 Grúas de 1.5 tns. a 3 tns.
— 5 Locomotoras de 120 tns.
— 3 Locomotoras de 210 tns.
— 2 Locomotoras de 60 tns.
— 29 Carros de Línea tipo plataforma entre 10 y 50 tns.
— 21 Carros de Línea tipo cajón entre 15 y 30 tns.

AREAS TOTALES — AREAS DE CARGA Y FACTOR DE UTILIZACION DE CARGA EN ALMACENES ANEXOS Y ZONAS

NOMBRE	AREA TOTAL m²	AREA CARGA m²	FACTOR DE UTILIZACION DE CARGA	ALTURA DE ESTIBA-m	AREA DE OFICINAS	OBSERVACIONES
ALMACENES						
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]					[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]					—
ANEXOS						
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
2A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
3A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
3B	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
7	[illegible]	[illegible]	[illegible]	[illegible]	—	
8	[illegible]	[illegible]	[illegible]	[illegible]		
9	[illegible]	[illegible]	[illegible]	[illegible]	—	
10	[illegible]	[illegible]	[illegible]	[illegible]	—	
10A	[illegible]	[illegible]	[illegible]	[illegible]	—	
11	[illegible]	[illegible]	[illegible]	[illegible]	—	
ZONAS						
1A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1B	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1E	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2B	[illegible]	[illegible]	[illegible]	[illegible]	—	
2A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
2C	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
3B	[illegible]	[illegible]	[illegible]	[illegible]	—	
5	[illegible]					[illegible]

— 145 Vagonetas de 30 tns.
— 250 Vagonetas de 10 tns.
— 22,400 Paletas.

—Equipos portátiles para embarque y descarga de Mineral y Harina de Pescado.

—2 Torres Neumáticas para granos con capacidad de descarga de 75 toneladas por hora cada una.

—16 Silos circulares de concreto con capacidad total de 23,171 toneladas métricas.

Edificio de Operaciones y Reservorio Elevado de Agua.

En este edificio, que consta de seis pisos, se encuentran las Oficinas de la División de Oficina Expedidora de Permisos, Dpto. de Tráfico, Dpto. de Almacenes, Sala de Sesiones de la Junta de Operaciones, Oficina y Dormitorio de los Prácticos y Estación de Comunicaciones, entre otros servicios.

En la Parte superior de este edificio se encuentra el reservorio de agua con capacidad de mil metros cúbicos que dota de agua a todas las instalaciones portuarias, así como a las naves que atracan en los muelles del Terminal.

Estación de Pasajeros.

Próximamente tendrá lugar la inauguración de la Estación de Pasajeros, ubicada en la explanada advacente del Amarradero 5A del Terminal Marítimo del Callao. Consta de dos plantas. En la primera estarán distribuidas las instalaciones necesarias para la recepción y aforo de equipajes, oficina para vistas de aduana y "stands" para agencias marítimas. En la segunda, los servicios de cafetería para atención de pasajeros y visitantes, instalaciones de cocina, sala de estar, amplio recibo y "stand" para informaciones de turismos en el Perú, agencias de turismo y venta de souvenirs, revistas y artesanía popular.

Seguridad Portuaria.

—**Vigilancia:** Está a cargo del Servicio de Capitanías y Guardacostas.

—**Seguridad Industrial y Protección de Planta:** La protección del Puerto está a cargo de la División de Seguridad que dispone de un servicio permanente de vigilancia y una brigada contra incendio la que está provista de un moderno equipo y personal altamente especializado.

Servicios.

—**Agua:** El Terminal Marítimo, mediante el Reservorio Elevado provee de agua a todas las instalaciones portuarias así como a todas las naves que acoderan en sus muelles.

Teléfono: Puede ser instalado a solicitud. (opcional).

—**Basura:** En cada muelle existen depósitos para basura. Estos depósitos son utiliza-

dos para los desperdicios que son recogidos dos veces por día.

—Energía Eléctrica: Se puede proporcionar energía eléctrica de 110, 220 ó 440 voltios CA y CD.

—Aire: Los muelles disponen de instalaciones de aire de 100 Lbs./Pug. ².

Estadísticas:

—Barcos Entrados al Terminal Marítimo del Callao: 1970.

Peruanos	309	Tns.	1'338,170
Extranjeros	1,299	"	5'593,092
	1,608		6'931,262

—Barcos Entrados al Terminal Marítimo del Callao: 1971.

Peruanos	321	Tns.	1'420,965
Extranjeros	1,083	"	4'834,080
	1,404	Tns.	6'255,045

—Barcos Entrados al Terminal Marítimo del Callao: 1972.

Peruanos	204	Tns.	994,990
Extranjeros	1,105	"	5'320,123
	1,309	Tns.	6'315,113

—Tonelaje Movilizado: 1970.

	Carga Seca	Carga Líquida	Total
Impt.	1'362,793	162,152	1'524,945
Expt.	1'277,920	41,397	1'319,317
Cabt.	30,706	1'024,058	1'054,764
	2'671,419	1'227,607	3'899,026

—Tonelaje Movilizado: 1971

	Carga Seca	Carga Líquida	Total
Impt.	1'471,354	258,009	1'729,3[illegible]
Expt.	1'322,454	90,830	1'413,2[illegible]
Cabt.	29,111	1'060,406	1'089,51[illegible]
	2'822,919	1'409,245	4'232,164

—Tonelaje Movilizado: 1972.

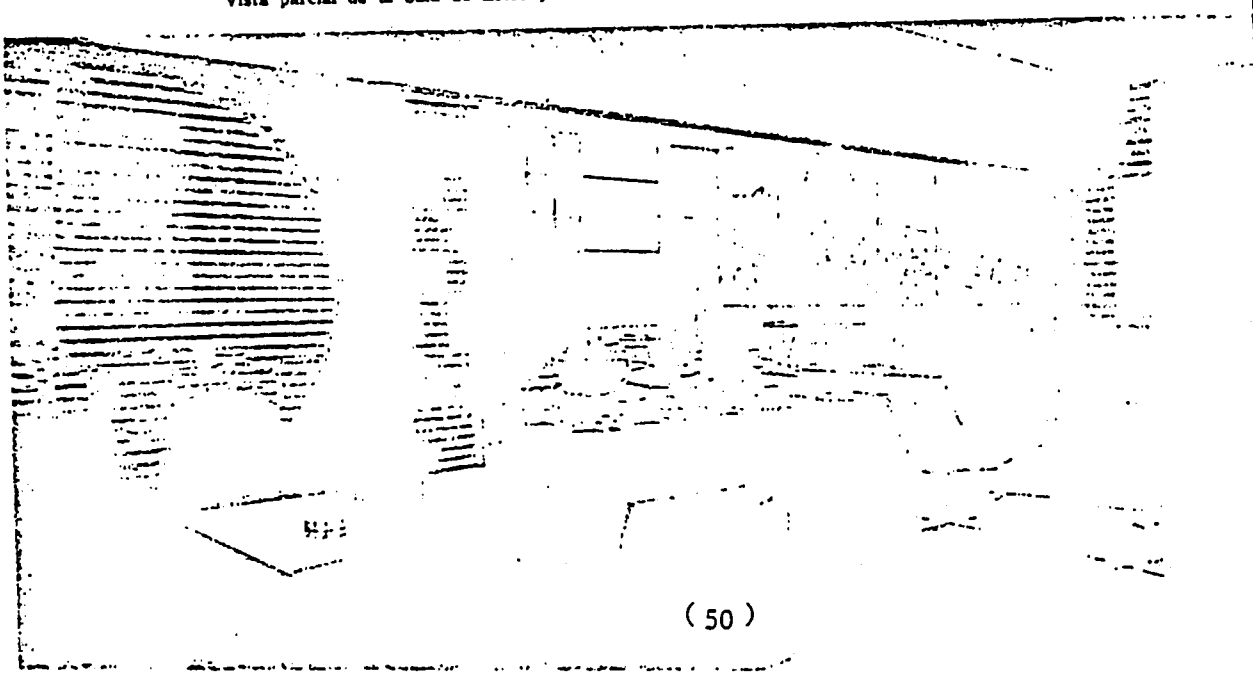
	Carga Seca	Carga Líquida	Total
Impt.	1'655,811	176,460	1'83[illegible],271
Expt.	1'665,898	105,371	1'771,269
Cabt.	51,313	793,550	844,863
	3'373,022	1'075,381	4'448,403

Gremios Marítimos:

Los gremios marítimos dependen de la Comisión Controladora de Trabajo Marítimo. Son:

—Estibadores:	
Titulares	907
Postulantes	607
—Tarjadores:	
Titulares	88
Postulantes	48
—Maniobristas:	
Titulares	138
Postulantes	140
—Parihueleros y vagoneteros:	
Titulares	108
Postulantes	225
	2,311

Vista parcial de la Sala de Estar y Cafetería de la moderna Estación de Pasajeros del T.M. del Callao.



APPENDIX II

SECTOR TRANSPORTES Y COMUNICACIONES

EMPRESA NACIONAL DE PUERTOS
ENAPU - PERU

OFICINA PRINCIPAL
TERMINAL MARITIMO DEL CALLAO
EDIF. ADMINISTRATIVO 3er. PISO
CAULES. TLLEX: ENAPUPERU
APARTADO POSTAL - 280
TELEFONO 290310
CALLAO

APR 10 RECD

Callao, 03 de Abril de 1981

No.223 -81 TC/ENAPU/GG

Señor
Richard L. Barnes
Agregado Agrícola Embajada
de Estados Unidos de
Norteamérica
Av. Inca G. de la Vega 1400
LIMA.-

Ref. : Su carta s/n del 27/02/81

Tengo el agrado de dirigirme a usted adjuntando a la presente la información solicitada respecto a las facilidades con que cuenta la Empresa Nacional de Puertos (ENAPU-PERU)para la descarga de granos en los.- Terminales Marítimos del Callao, Matarani, Salaverry y Terminal Fluvial de Iquitos. En cuanto al Demurrage ó demora en la descarga de granos, sugerimos solicitar dicha información a la Compañía Peruana de Vapores (CPV), entidad que lleva estadísticas acerca de este aspecto comercial.

Aprovecho la ocasión para reiterarle los sentimientos de mi más alta consideración.

Atentamente,

FTO/nba.

cc. : SO
DIVI
p.c.
Archivo

OFICINA PRINCIPAL
TERMINAL MARITIMO DEL CALLAO
EDIF. ADMINISTRATIVO 3er. PISO
CABLES: TELEX: ENAPUPERU
APARTADO POSTAL - 288
TELEFONO 30210
CALLAO

SECTOR TRANSPORTES Y COMUNICACIONES

EMPRESA NACIONAL DE PUERTOS
ENAPU - PERU

PUERTOS PRINCIPALES
DONDE DESCARGAN GRANOS

1. PROFUNDIDAD OPERATIVA

T.M.CALLAO:	12.30 mt.	Para Buques de 25,000 D.W.T.
T.M.MATARANI:	12.00 mt.	Para Buques de 25,000 D.W.T.
T.F.IQUITOS:	Zona del Terminal:	24.00 mt. creciente (Diciembre a Mayo)
		14.00 mt. vaciante (Junio a Noviembre)
	Ruta del Atlántico:	14.00 mt. creciente (Diciembre a Mayo)
		4.00 mt. vaciante (Junio a Noviembre)
		Para Buques de 6,000 D.W.T.
T.M.SALAVERRY:	10.00 mt.	Para Buques de 20,000 D.W.T.

2. PLANES DE EXPANSION Y FUENTES DE FINANCIAMIENTO

T.M.CALLAO: Se realizan constantes obras de mantenimiento y de mejoras para ofrecer un servicio óptimo, tales como:

- La Rehabilitación y Reequipamiento de los Silos (1979-1980).
- Balanzas, Instalaciones Eléctricas, etc. (1979-1980).
- Amarradero 5F (1981).
- Terminal de Contenedores (1981).

El financiamiento se efectúa con recursos propios y con participación de entidades financieras nacionales y extranjeras.

T.M.MATARANI:

- Prolongación Muelle Lado Norte (1979)
- Construcción Central Térmica (1980)
- Equipamiento Central Térmica (1981)
- Reparación Muelle Marginal (1981)
- Estudio Ampliación del Puerto (1981)

Ing. Freddy Romero V.

SECTOR TRANSPORTES Y COMUNICACIONES
EMPRESA NACIONAL DE PUERTOS
ENAPU - PERU

OFICINA PRINCIPAL
TERMINAL MARITIMO DEL CALLAO
EDIF. ADMINISTRATIVO 3er. PISO
CABLES. TELEX. ENAPUPERU
APARTADO POSTAL - 200
TELEFONO 29410
CALLAO

PUERTOS PRINCIPALES DONDE DESCARGAN GRANOS

2)

T.F.IQUITOS:

- Construcción de un Almacén cerrado (1978-1979).
- Construcción del Nuevo Muelle Flotante de 183 mts. de longitud con puentes basculantes (1979-1980).
- Sistema de Comunicaciones (1981).

El financiamiento se realizó con recursos propios en un 52% y del BIRF con un 48%.

T.M.SALAVERRY:

- Reparación de Faja Transportadora de Azúcar a Granel (1979-1980).
- (*) Construcción del Molo Retenedor de Arena (1981)
- (*) Dragado Integral del Puerto (1981)

El financiamiento es por recursos propios.

(*) Endeudamiento externo con la firma ganadora de la Buena-Pró de la Licitación convocada.

3. CAPACIDAD DIARIA DE DESCARGA DE GRANOS A GRANEL

T.M.CALLAO:	9600 Tn/día
T.M.MATARANI:	2760 Tn/día
T.F.IQUITOS:	720 Tn/día
T.M.SALAVERRY:	No tiene sistema de descarga de granos a granel.

4. PROMEDIO DE PAGO POR DIA EN LA DEMORA DE DESCARGA (DEMURRAGE) POR BARCO

Por consulta ante la División de Operaciones se sabe que no es de incumbencia de ENAPU. Está supeditado al Contrato de Fletamento suscrito entre las partes interesadas. En todo caso, la Compañía Peruana de Vapores (CPV) lleva estadísticas de este aspecto comercial.

Ing. Freddy Romero

SECTOR TRANSPORTES Y COMUNICACIONES
EMPRESA NACIONAL DE PUERTOS
ENAPU - PERU

OFICINA PRINCIPAL
TERMINAL MARITIMO DEL CALLAO
EDIF. ADMINISTRATIVO 3er. PISO
CABLES. TLLEX. ENAPUPERU
APARTADO POSTAL - 280
TELEFONO 299210
CALLAO

5. TIPOS DE FACILIDADES PARA DESCARGAR GRANOS A GRANEL QUE EXISTEN EN CADA PUERTO

T.M.CALLAO:
- 2 Torres neumáticas para granos
- 1 Faja transportadora recientemente ampliada.
- Potencia: 1400 H.P.
- Rendimiento: 400 Tn/hora

T.M.MATARANI:
- 1 Torre neumática con 2 bombas de succión
- 1 Faja Transportadora de Granos
- Potencia: 250 H.P.
- Rendimiento: 115 Tn/hora

T.F.IQUITOS:
- 3 Equipos absorbentes de granos, marca "VIGAN" de tipo móvil.
- Potencia: 160 H.P.
- Rendimiento: 30 Tn/hora.

6 y 7. TIPOS DE FACILIDAD DE ALMACENAMIENTO DE GRANOS Y SU CAPACIDAD

T.M.CALLAO:
- 16 Silos de concreto, con 23,171 T.M. de capacidad total.

T.M.MATARANI:
- 39 Silos de concreto y metálicos, con 20,500 T.M. de capacidad total.

T.F.IQUITOS: No existen Silos y la descarga es directa a camiones.

T.M.SALAVERRY: No existen Silos para Granos y la descarga es directa a camiones.

Callao, 2 de Abril de 1981.

ES CONFORME

FRV/hrp.

Ing. Freddy Romero V.

1. CAPACIDAD DE ALMACENAMIENTO DE GRANOS EN CADA PUERTO

Cuadro N° 1

CAPACIDAD DE ALMACENAMIENTO PARA GRANOS POR PUERTOS (ENAPU)

CALLAO

10 Silos antiguos	1,000 TM c/u		10,000 TM
4 Silos nuevos	2,000 TM c/u		8,000 TM
		TOTAL.....	18,000 TM

MATARANI

1 Silos Fijos		10,500 TM
1 Silos Acero de amarr..		10,000 TM
	TOTAL ...	20,500 TM

SALAVERRY

No dispone de silos

PAITA

No dispone de silos

MOLLENDO

No dispone de silos

2. CAPACIDAD DE ALMACENAMIENTO DE GRANOS EN SILOS Y PATIOS EN CADA MOLINO DE TRIGO

CAPACIDAD DE ALMACENAMIENTO DE TRIGO POR MOLINO

Cuadro N° 2

MOLINOS	Silos T.M.	Losas T.M.	Pampa T.M.	Total T.M.	Total Puerto
Callao					
Nicolini Hnos. S.A.	2,700	50,000	-	52,700	
Cia. Mol. Santa Rosa S.A.	10,500	22,500	-	33,000	
Cia. Mo. del Perú S.A.	6,150	20,000	-	26,150	
Molino Excelsior	13,000	20,000	-	33,000	
Molitalia S.A.	3,800	-	9,500	13,300	
Molino El Triunfo	50	450	-	500	158,650
Matarani					
Soc. Industrial del Sur S.A.	11,400	-	-	11,400	
Nicolini Hnos. S.A.	18,000	-	-	18,000	
Mol. Valencia	2,500	1,050		3,550	
Mol. Barberis (Cuzco)	-	700	-	700	33,650
Salaverry					
Molinera Inca S.A.	18,000	3,500	-	21,500	21,500
Paita					
Cia. Molinera del Perú	10,000	-	-	10,000	10,000
Iquitos					
Mol Iquitos Guiulfo S.A.	2,680	1,300	-	3,980	3,980

TOTAL: 227,780

3. CAPACIDAD DE ALMACENAMIENTO DE GRANOS EN ENTIDADES DEL GOBIERNO Y FIRMAS PARTICULARES

Cuadro N° 3

CAPACIDAD DE ALMACENAMIENTO DE GRANOS EN ENTIDADES DEL GOBIERNO Y FIRMAS PARTICULARES

INFRAESTRUCTURA DE COMERCIALIZACION DE LA OFICINA NACIONAL DE APOYO ALIMENTARIO

O.N.A.A.

ALMACEN	CAPACIDAD TM.
Lima (Av. Argentina	12,000
Trujillo (Salaverry)	3,600
Cajamarca	1,000
Puno	1,800
Arequipa (Matarani)	1,000
Arequipa (Arequipa)	100
Huaraz	800
TOTAL	20,300

CAPACIDAD DE ALMACENAMIENTO PARA

GRANOS EN MOLINOS Y PLANTAS ALIMENTOS BALANCEADOS

PRIVADOS

Cuadro N° 4

USUARIO	Depósito Abierto TM.	Silos TM	Loza Techado TM	Total TM
[illegible]lini Hnos. S.A.	30,000			30,000
[illegible]ina Perú S.A.	10,000	10,000	———	20,000
[illegible] Santa Rosa S.A.	7,000	———	———	7,000
[illegible]linos Talagaki	3,000	———	———	3,000
[illegible]linos Mayo S.A.	3,000	———	———	3,000
[illegible]lindustrias S.A.	1,500	———	500	2,000
[illegible]ntos Vitasa S.A.	6,000	1,000	———	7,000
[illegible]rinal S.A.	10,000			10,000
[illegible]ntos Protina S.A.	750	———	———	750
[illegible]lino San Francisco	80	———	250	330
[illegible] la Chacra a la Olla	600	———	———	600
[illegible]lino San Sebastian	———	———	1, 800	1,800
[illegible]sa	———	———	1, 400	1,400
[illegible]San Martín de Porres	3,000	———	———	3,000
[illegible]lino El Dorado	300	———	300	600
[illegible]sto Migone	———	———	100	100
[illegible] Laura Alberto [illegible]rón	———	———	1, 000	1,000
[illegible]lino La Nacional	100	———	———	100
[illegible]lino La Costa S.A.	120	———	———	120
[illegible]lino San Pedro	500	———	300	800
[illegible]ntos Camino	———	———	800	800
[illegible]l	———	———	2, 000	2,000
[illegible]lino Las Vegas	———	100	———	100
[illegible]sto Pretel Vidal	———	———	150	150
[illegible]lino La Alegría	———	———	250	250
[illegible]lino La Chalaca	250	———	250	500
[illegible]risa SCRL	600	———	400	1,000
[illegible]ación Cárdenas	———	———	500	500
[illegible]ma EIRL	300	———	———	300
[illegible]	———	4,300	———	4,300
[illegible]olini Hnos.(Truj.)	10,000	———	———	10,000
[illegible]ur (Arequipa)	———	3,000	3,000	6,000
[illegible]TAL	87,100	18,900	13,000	119,000

INFRAESTRUCTURA DE ALMACENAMIENTO PRIVADA DE FRIJOL DE SOYA

Cuadro N° 5

Compañía	Ubicación	Tipo	Capacidad T.M.
Copsa	Callao	Abierto	5,000
Copsa	Sullana	Abierto/techado	4,000
Cippsa	Lima	Abierto	4,000
Ipsa	Huacho	Abierto	5,000
Olsa	Lima	Abierto	2,000
Cilusa	Cañete	Abierto	2,500
C. Romero	Piura	Abierto/techado	3,000
Sindi	Piura	Abierto/techado	2,000
Total			27,500

4. PLANES DE EXPANSION PARA ALMACENAMIENTO DE GRANOS

PROYECTO ALMACENES GENERALES DE DEPOSITO DE LA SELVA

OFICINA GENERAL DE INGENIERIA - MINISTERIO DE AGRICULTURA

Cuadro N° 7

	Meta Global		Construidas a 1980		Meta 1981		Requerimiento 1982	
	N° de Módulos	capac. TM	N° de Módulos	Capac. TM	N° de Módulos	Capacid. TM	N° de Módulos	Capac. TM
Bagua	6	4,000	6	3,000	1	500	1	500
Tingo María	8	4,000	4	2,000	-	-	4	2,000
Yurimaguas	3	1,500	3	1,500	-	-	-	-
Tocache	4	2,000	3	1,500	1	500	-	-
Uchiza	4	2,000	3	1,500	1	500	-	-
Moyobamba	1	500	1	500	-	-	-	-
Rioja	6	3,000	3	1,500	1	500	2	1,000
Tarapoto	5	2,500	5	2,500	-	-	-	-
TOTAL	39	19,500	28	14,000	4	2,000	7	3,500

ALMACENES CENTRALES DE DISTRIBUCION

OFICINA GENERAL DE INGENIERIA - MINISTERIO DE AGRICULTURA

Cuadro N° 8

Almacenes Centrales Provincias	UBICACION		META	
	Departamento	Distrito	Ambiental (TM)	Refrigerado (TM)
Cuzco	Cuzco	Cuzco	5,000 *	------
Barranca	Lima	Barranca	4,000 *	------
Huacho	Lima	Huacho	1,500 *	------
Puno	Puno	Juliaca	3,000 *	------
Chimbote (Traslado)	Ancash	Chimbote	500 *	------
Ica	Ica	Ica	2,400 *	------
Huancayo	Junin	Huancayo	2,400 *	------
Trujillo	La Libertad	Trujillo	4,800 *	------
Puno	Puno	Puno	1,200 *	------
Tacna	Tacna	Tacna	1,200 *	------
Piura	Piura	Piura	4,800 *	------
Arequipa	Arequipa	Cerro Colorado	4,800	1,000
Chiclayo	Lambayeque	Chiclayo	7,200	500
Iquitos	Loreto	Maynas	4,100	500
Mercado Mayorista N° 2	Lima	San Luis	———	650
Pucallpa	Ucayali	Pucallpa	2,500	450
		TOTAL	49,400	3,100

(*) Terminados en 1980.