REPORT OF THE SURVEY TEAM DISPATCHED TO THE ARGENTINE REPUBLIC FOR CONSTRUCTION OF DEEPWATER PORT

August 1977

Japan International Cooperation Agency

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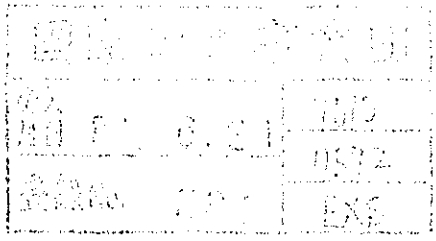

Japan International Cooperation Agency

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1. ITINERARY

Members to the Survey Team

Chisato Tsuruta,

Tomoharu Takahashi, and

Morio Tanaka

Institute for Technical Research of

Ports and Harbors, Ministry of Transport

1. Itinerary of Survey Team in Argentine

Jul 16 (Sat) * 09:00 Arrived at Buenos Aires via Flight AR-321.
Carried machines, etc. cleared the custom.
Greeted by
Mr. Kimoto, Secretary, and
Mr. Yoshikawa, Secretary,
Japanese Embassy in Argentine;
Capt. Torti, and
Sr. Bergeot,
COPUAP: and
Mr. Ando, Sumitomo Shoji.

* Lodged in Hotel Presidente.

* Arrangement together with Secretary Yoshikawa, including the schedule hereafter, interpreter service, etc. Later, walk in the Palermo Park.

* 16:30 To Official Residence of Ambassador for curtsy visit. Talks with respect to the port and harbor condition in Argentine. Preview of the documentary film of Kashima Port arranged to be made at the Residence in the evening of the 17th.

* Further arrangement with Secretary Yoshikawa at the table of supper.

Jul 16 (Sun) * 15:00 To Embassy. Check of the carried flow meter.

* 17:00 To Official Residence of Ambassador. Preview of the film of Kashima, and description of the flow meter to be donated to Argentine.

* Invited to supper.

Jul 18 (Mon) * 11:00 Curtsy visit to Cap. Guevara. Secretaria de Intereses Maritomos, accompanied by Ambassador Kondo and Secreatry Yoshikawa. Presented the flow meter and the documentary film of Kashima. SEIM stated to show all of the results of surveys so far conducted and mentioned the economical aid of Japan to which the team leader replied

that "we came here for technical cooperation and has no authority on the problem of economical aid."

* 15:00 COPUAP Working Panel meeting with the presence of:
  Japanese side: Leader Tsuruta, Takahashi, Tanaka, Secretary Yoshikawa and Mr. Ando;
  Argentine side: Capt. Torti, Capt. Pantin (Copuap), Capt. Valdez (SHN), Dr. Barchilon, AHe. Furlong, Ing. Garcia, Ing. Furlong, Ing. Schwarz, Ing. Escalante and Ing. Petroni (DIGID).

* Remarks of the leader: Technical cooperation to the deepwater port and cooperation to the research institute; The construction of the deepwater port includes a difficulty of balance with the economy rather than the purely technical problems, and it is desired to hear from the Argentine side on this problem; Interested if the undulating geographical feature in the coast would be usable for access channel.

* Capt. Torti stated that COPUAP is an organization composed of SHN, LHA and DIGID and that the investigation was conducted to a considerable extent after the feasibility survey in 1974.

* Ing. Garcia of DIGID presented a model for accumulation of agricultural products to the respective ports.

* Capt. Vardez presented a brief description of the topography of the Punta Medanos coast, a slight change being noted in the configuration of the bottom bank from that late in the 19th century.

* Ing. Schwarz explained the work of DIGID intended to formulate a first plan until the end of 1978 upon the experimental achievements of LHA, etc.

* 1930 Reception at Hotel Plaza (held by COPUAP).

* Heard the status of field observations from Ing. Lanfredi.

Jul 19 (Tue) * 08:00 Called at the hotel, went to LHA.

* Inspected the facilities of LHA.
Hydraulic experiments concerning the river improvement and irrigation dams are of considerable advancement. For experimental facilities relative to the coast and port and harbor, one wave channel and one outdoor wave basin are available. Additionally, one indoor wave channel is being constructed.

* Results of the past observations explained.
Wave observation: Conducted for 8 months during the period of from July 1974 to September 1975; provided water depth, -10m; machine Wave rider.
Coastal flow observation: Float observation conducted from September 1974 to February 1975.
LHA reports will have to be reviewed separately.

Jul 20 (Wed) * 08:50 Dr. Barchilon called us at the hotel, and we went to LHA.
In the morning, the results of the past researches explained successively to yesterday.
Question posed with respect to the scale of the movable bed model experiment - If the experiment is practicable with a horizontal scale of 1/1000? Explained that the experiment would be harder with smaller scale, the limit being about 1/400.
Felt that the intrinsic nature of the drift sand experiment was not properly understood. Explained the specifications of the machines and instruments of our country.

In the course of the morning session, Dr. Perez and Sra. Hartorani, Subsecretaria de Recursos Hidricos, presented themselves at the meeting.

* In the afternoon, a brief representation by the leader of the institute for Technical Research of Ports and Harbors.
Many persons attended including Capt. Torti, Dr. Perez and Ing. Schwart (about 25 persons).
Thought if we had slides showing the social background for birth of the Institute, process of growth from the birth and current status.

* After the representation, Ing. Schwart presented various questions as he was apparently interesed in the work of design standards.

Jul 21 (Thu)* Third day at LHA. In the morning, the leader and Takahashi talked with Dr. Barchilon over the priority of the equipment and materials for A-4 form.

* Tanaka talked with Ing. Castellano and Ing. Clavijo over the drift sand experiment.

  o No drift sand experiment would be practicable without full appreciation of the phenomena at the site.

  o The phenomena resultaing from the coastal drift in the breaker zone and those in the offing are hardly tested under the same concept.

  o For the problem of stability of the bank in the offing, the experiment would be practicable only after the mechanism of formation was clarified.

  o From the foregoing, it would be important to carry out the experiments, classifying them into two kinds.

* In the afternoon, Takahashi continued explanation of the machines and instruments.
Keen attitude of young engineers was impressive.

* Visited the library of the research institute.

Magazines and academic journals are well provided, but apparently on account of no periodic publication of its own, reports, etc. of the other research organizations are meager.

Jul 22 (Fri) * 09:00 Visited SHN, accompanied by Mr. Yoshikawa of the Embassy.
Director Villanueva was absent.
Paid respect to the Deputy Director, then received the explanation of the achievements of investigation, etc. of SHN. The way of explanation, handling of the press personnel, etc. were well disciplines as a military man, with good impression.
Against the condition of LHA, felt a difference in the organizing ability.
The explation was attended by Capt. Torti and Sra. Martorani.

* The organization of SHN explained (by Capt. Young). The deepwater port is charged to Departmento de Tecnica.

* Explanation of the tides, tidal currents and waves by Ing. Lanfredi.
  - o Tide: Tide gauges installed at two points of Mar de Ajo and Pinamar in July 1974 to obtain analog records. Half a year thereafter, digital indication at every 3 minutes added. Currently, data of 3 years are available.
  - o Current: In addition to the float observation, current meters introduced at 4 points in the northern area and 1 point in the southern area for 10 days in September 1975 for observation of the tidal currents.
  - o Waves: Observed at a point of a water depth of -10m in the north and south coasts respectively for 3 months of August to October 1976. Observation being continued since January 1977 at a -10m point on the south side. Another point added in August in the south near the coast.

Visual observations continued at Mar de Ajo and Pinamar.

* Topographical explanation by Dr. Parker.
  - o Described the process of topographical formation with reference to a cross-sectional diagram of strata obtained from the result of boring at 19 points on land. The way of advanceing the explanation is clear, and that of thinking is correct.
  - o Upon comparison of two sounding diagrams with each other, the bank seems to have a considerable change in the water depth, but the center line of the current scarcely changes its position.

* After the presentation, simple cocktail party with the presence of

  Capt. Garrido, Capt. Paccioretti,
  Capt. Torti, Capt. Valbez,
  Capt. Buscallia, Capt. Nawratill,
  Capt. Young, Capt. Paone,
  Ing. Lanfredi, Dr. Parker and
  Sra. Martorani.

* 16:00 The Kashima Port documentary film was projected in the COPUAP projection room.
  About 100 persons gathered. No so much appealing because of the absence of a wide lens.
  At the outset, remarks of the leader.
  Stressed the economy of the port.
  After the show, some questions:
  - o Who is responsible for administration of the port?
  - o Why constructed at Kashima?
  - o What enterprises are concerned?
  - o Depth of the channel?

  and so on.

Jul 23 (Sat) * 09:00 Departed the hotel for inspection of the Tigre area. Operated the donated current meter on board the ship to the site. Hardly measurable

on account of a weak current. At the dockyard, inspected the marine research ship under construction, etc. Party on board the ship with attendants of:

Japanese side - Kitamura, Ambassador
Kimoto, Councilor
Yoshikawa, Secretary
Tsuruta, leader of the survey team
Takahashi, member
Tanaka, member

Argentine side - Capt. Torti
Capt. Buscallia
Sr. Bergeot
Ing. Gracia
Dr. and Sri. Barchilon

and Mr. Kurokawa and Mr. Kiuchi.

* In the evening, listened to the tango.

Jul 24 (Sun) * In the afternoon, city sightseeing.

Jul 25 (Mon) * In the morning, inspection of the Buenos Aires Port. Accompanied by Capt. Torti and Sr. Bergeot. Sr. M. R. Bottessi, Director of NABIGATION Dept., and Ing. L.A. Roura, Division Chief, stated that the port capacity would be enhanced to a considerable extent through redevelopment of the port facilities and improvement of the transportation system, that the port facilities were obsolete and that two power plants were hindering the port development.

* 12:00 Luncheon at the Secretaria de Estado de Intereses Maritimos.
Attendants:
Ambassador Kitamura, Secretary Yoshikawa,
Leader Tsuruta, Takahashi and Tanaka;
Capt. Guevara, Capt. Torti,
Capt. Villanueva, Capt. Valdez,
Dr. Barchilon and Capt. Babino.

* 15:00 Went to SHN and discussed with Dr. Parker over the problems of the bank.
  - o The mechanism of formation of the bank is not yet known. Received a proposal for joint study from the Scholars of U.S.A.
  - o It is difficult to say that the bank has been stabilized completely.
  - o There is only one deep available for use as an access channel.
  - o As a personal opinion, the site is not considered to be suitable for a port.
  - o Intended to investigate the layer structure at the bottom.

Jul 26 (Tue) * 08:00 Gathered at SHN for trip to Punta Medanos. After luncheon upon arrival and slightly before 15:00 hours, started for travel by car along the sand beach to the Punta Medonas Lighthouse for inspection of the north coast.
  - o The north caost is a flat beach (1/20) with a low backshore (about +2.0m).
    The beach materials are of about 0.15mm.
    The beach has a width of about 50m.
  - o On the lighthouse, seen the waves breaking over the bank in the offing.
  - o The beach is apparently milder than the old Kashima.

* Lodged in a hotel in Mar de Aja.
  Participants:
  Capt. Torti, Capt. Buscallia,
  AHe. Furlong, Ing. Langredi,
  Dr. Parker, Dr. Barchilon,
  Ing. Castellano and Ing. Clavijo; and
  Leader, Takahashi and Tanaka.
  Additionally, personnel of the field camp joined the inspection.

Jul 27 (Wed) * 09:00 Departed for inspection of the south coast.
  - o Against the north coast, the south coast is of

the beach materials in the form of grains (0.2 0.3mm), higher backshore (+3+4) and greater width.

o But, a beach aspect similar to that of the north coast appears at a certain interval.
If such is related in one way or another to the bank in the offing.

o The sand dune in the back is, so to speak, a desert, and such a configuration is not seen in Japan.

* Waited arrival by helicopter of the distinguished personnel (Ministerio de Economia, Secretaria de Estado de Intereses Maritimos, Military representative, Governor, etc.), but not arrived because of fog in Buenos Aires.

Hul 28 (Thu) * 09:00 Dr. Barchilon and Ing. Clavijo came to the hotel, and so Ing. Castellano one hour later. Answered to their questions concerning the experiment, field survey and machines and instruments.

o For the experiment, stressed what I told to Ing. Castellano on July 21.

o For the investigation of the bank behavior, it would be required first to grasp the characteristics of the behavior by repeated soundings and then estimate the related external forces.

o The experiment, field survay and execution of the work should be carried out in parallel.

* 11:00 Curtsy visit to Ing. Camba, Secretaris de Estado de Transporte y Obras Publica, accompanied by Councilor Arao and Secretary Yoshikawa of the Embassy and Dr. Barchilon.

* Luncheon meeting given by Dr. Barchilon.

* In the afternoon, discussion continued with the members of LHA.

* 16:00 At the Embassy, arrangement with the councilor (in charge of the policy) and Secretary

Yoshikawa in the presence of the Ambassador with respect to the policy of technical cooperation.

- o First, study in Japan of the young and promising personnel of LHA (6 to 7 months, 1 to 2 officers).
- o Second, dispatch of an expert or experts (specialized in coast engineering) at an appropriate time after completion of the study in Japan (70 to 80 days).
- o Machines and materials to be donated should be what is really important and universally applicable and consist mainly of indoor experimental machines and materials.
- o Outdoor observatory machines and materials should be of the purchase base, products being introduced.
- o What if the visit to Japan of the high ranking officers be accommodated at the own expense of Argentine.

Jul 29 (Fri) * 10:19 COPUAP Working Panel meeting.
Discussion with reference to the impression at the inspection of Punta Medanos. Many questions with respect to the Kashima Port.

- o In the outset, the leader stressed the economical background of port construction (the port investment should be in the order of several percent of the whole investment) and also the difficulty of transferring the cargos handled by the existing port.
- o The technical point of the deepwater port is in the stability of the bank so that the investigation in this line and training of the research personnel are urgently required.
- o Punta Medanos is greater in the coastal drift s sand than Kashima.
- o Explained the target of collaboration for technical cooperation according to the result of arrangement at the Embassy on July 28.

Attendants:

Capt. Torti, Capt. Buscaria,

Capt. Pautin, Img. Petroni,
Ing. Schwarz, Ing. Garcia,
Ing. Castellano, Ing. Lanfredi,
Ing. Clavijo and Dr. Parker; and
Leader, Takahashi and Tanaka, and
Secretary Yoshikawa.

* 12:45 Talk with Capt. Guevara, Secretaria.
  o Stated that while the Leader Tsuruta stressed importance of the economy of the port, it was a national policy to have a deepwater port in Punta Medanos so that it was requested to consider whether or not the construction was practicable from the purely technical point of view.

* In the afternoon, preparation for travel back to Japan.

* 21:30 Supper meeting at the Official Residence of the Ambassador.
  Attendants:
  Ambassador Kondo, Councilor
  Secretary Yoshikawa,
  Secretaria Cuevara, Deputy Secretaria
  R. F. Bondoni, Channel Department Chief
  Villanueva, Capt. Valdez, Capt. Torti,
  Leader, Takahashi and Tanaka.

Jul 30 (Sat) * Departed Argentine via Flight AR380.
Honored the send-off of Capt. Torti,
Sr. Bergeot and Secretary Yoshikawa.

2. PARTICULARS OF TECHNICAL QUESTIONS POSED DURING THE DISPATCH

(TAKAHASHI MEMORANDUM)

Arrangements, Explanation and Exchange of Views
(Takahashi Memorandum)

1. Improvement of the Facilities, Equipment and Application Technology of the Laboratorio de Hidraulica Aplica (LHA)

The LHA having a period of seven years elapsed since its establishment has now the site and a research building provided and possesses, as main research facilities, seveal experimental wave basins and wave channels and one electronic computer. But. the facilties are generally of basic equipment, being medium or small in the scale, and the research personnel, facilities, apparatus and machinery still remain to be improved.

Thus, for the LHA which is required, as a member to the Systema Complejo Portuario de Ulturamar en Aguas Profundas (COPUAP), to assume the resposibility for hydraulic model experiments and collect the field survey data through its own observations in addition to the macroscopic field surveys conducted by the Servicio de Hidrografia Naval (SHN) and analyze them as required for said experiments, it is imperative to improve the facilities and equipment for model experiments, machines and instruments for field surveys and apparatus for analysis of the data and, at the same time, train the competent engineers. Presently, the training of engineers is made in the form of a request to Japan for acceptance of the trainees, dispatch of the experts, etc. On the other hand, for the deeepwater port construction project, construction of model wave basin has been initiated, and a field survey plan is being formulated, through not specifically but conseptually. But, the LHA has little equipment or machinery available for experiment or observation on one hand and is not experienced in such survey on the other, it has a great concern in the examination of the specific procedures for experiment and observation and improvement of the experimental and observatory equipment.

Dr. Barchillon and the researchers of relatively young generation of the laboratory have been tackling these problems positively and earnestly, and it was not rare that the exchange of opinions lasted to the midnight.

The exchange of opinions was carried out in the form of

questions from the Argentine side with respect to the machines and facilities listed in Form A-4, or appended Table 1, presented previously from the Argentine side (13 items for the hydraulic laboratory equipment, 10 items for the field survey equipment and 12 items for the electronic equipment) for which, and for any other machinery and apparatus that were considered to be necessary, the Japanese side prepared the catalogues and other related documents, and to the observation procedure, etc. for which references including research reports, texts for training (or the Institute for Technical Research of Ports and Harbors), etc. were provided, and also the questions from the Japanese side with respect to the particulars of the past surveys at Punta Medanos. For the LHA personnel, specific details of almost all subjects were unknown and of no experience, our technical guidance ended in merely explaining the basic way of thinking, principle, etc.

It was interesting that in the course of discussion, questions were often raised with respect to the practices of, and problems in, manufacture of the machines, instruments, etc. that would seem to be possible for them to produce (manufacture by the domestic technology of Argentine).

The principal members of the Argentine side with whom the opinion was exhanged, subjects attracted the attention of the Argentine side and details of the exhange of opinions will be described in the following.

Members of the Argentine side:

Dr. Barchillon, Chief, LHA,
Ing. clavijo, LHA researcher, and
Ing. Castellano, LHA researcher.

(1) Laboratory Equipment

a. Small propeller current meter

In the Technical Service Department (Servicio de Tecnica - See Organization Chart) of LHA is produced a non-contact current meter with a propeller diameter of about 10 m/m after the Otto type as well as an accompanying electronic measureing circuit, and along with a resistance-wire wave gauge, it is one of the most proud measuring instruments of LHA.

The experiments currently carried out in the laboratory

are limited largely to those concerned with the river, dam and bay current, and efforts are thus exerted for acquisition and self-development in the future of smaller and higher precision current meter.

For such problem, our Research Institute is also endeavoring for improvement, and presently it is possible to produce a smaller instrument. But, from the current level of technology, about 15 to 10 m/m is considered to be a practical limit of the diameter of the propeller that provides features adapted for universal application and satisfies the requirement for ease of handling.

b. Multi-element analog recorder

The LHA is now in use of oscillators, amplifiers and recorders, but they are not much and seem to be obtained separately (by donation?). Thus, the LHA is interested in determination of the specification and acquisition of the recording apparatus which is required for the experiments to be carried out in a smooth and adequate manner in the future and, particularly, for the deepwater port experiments where a number of elements such as waves, current and level will have to be measured simultaneously at many points in uniform accuracy.

Comparative examination was made of the catalogues including the Japanese products, and some Japanese products were listed for pen writing oscillograph. But, for the high speed analog recorder, they mistook the magnetic oscillograph for the cathode ray oscillograph and seem to be racking their brains at the choice. Further, in connection with the acquisition of such type of recording apparatus, opinions were exchanged of the characteristics of combination with the sensor and preamplifier to be used, adaptability of the Japanese products examined at LHA (confusion of the laboratory instruments with the industrial instruments, quality of the manufacturers, etc.) and necessity of an analog recorder of a frequency characteristic of 20,000 Hz for the hydraulic experiments scheduled tentatively, and it was arranged to show the data of preferable Japanese products later.

c. Sand level meter for experiment of littoral sand

It seemed that the Argentine side intended to exchange the

opinions on the design of this instrument as a newly developed one. But, we explained that such instrument was already available commercially in Japan and stressed the importance of designing the mounting frame to suit to the facility to be used at the site and thus promised to give the relevant data later.

d. Tidal wave generator

The LHA personnel had a knowledge of the concept and basic form of the apparatus and sought our opinions regarding the problems in design, but no specific facility plan was ptoduced. Thus, it was arranged to present some design plans at our Research Institute, exchange the opinions as required and thus cooperate to the designing at the LHA.

e. Irregular wave generator

Same in the case of the tidal wave generator above.

Further, should the apparatus be manufactured in Argentine, there would be some machines and materials that were hardly obtainable in Argentine. If such machines and materials were imported from Japan, our Port and Harbor Research Institute would cooperate for preparation of the required special specifications and technical negotiation with the manufacturers in Japan.

f. Electronic model ship steering device

We explained that any experimental facility plan as required tentatively for formulation of the deepwater port construction plan would hardly be implemented at this stage in the light of the significance of its object and expectable effect and on account of the economical as well as technical burden and time limit assumed by COPUAP and also that it was outside the technical field in which we were specilized, and st ated that we would introduce experts in such field if required in the future.

(2) Field Observation Machines and Materials and Observation Procedure

a. The field surveys were heretofore carried out by the survey boat and frogmen of the SHN. Where the LHA desired to perform an investigation independently, there was no service of charter available at the site, and it had to ask the cooperation of SHN every time. It was thus understandable that the LHA desired to have a survey boat of its own.

But, the image of the survey boat they entertained in their minds was such that it was a small survey boat of the updated type having an automatic electronic survey system, etc. mounted (such as seen in the District Port Construction Bureaus in Japan) on one hand and a convenient leisure boat capable of carrying a vehicle on the other, with the advantages of both vessels and the easiness and fear of the unexperienced marine works intermingled. Thus, it was difficult to obtain any appreciable result in the exchange of opinions with respect to the questions we had prepared (on the type and size of the boat, intended works, efficiency, safety, mobility, personnel, expense, etc. as related with one another).

b. Self-recording current direction and speed meter

Greatest was the concern about the current meter for laboratory use as well as field application. The current observation is the only item of field investigation for which the LHA has a considerable extent of experience and technology.

Accordingly, the subjects of discussion were realisticand extended over not only the current meter itself but the float, dyes and the method of current observation in use of aircraft or satellite.

At present, the LHA has a unit of Otto type stationary self-recording current direction and speed meter and another unit of portable current meter designed for rivers. Thus, from the experience in the river surveys heretofore conducted and in connection with the survey fot the deepwater port at Punta Medanos, it feels keenly the necessity of simultaneous observations by means of a number of current meters and desires earnestly to provide them but not to such an extent as to desire self-development and manufacture seen in the case of the laboratory instruments.

Presetnly, in Argentine, there is no facility for examination and certification of large current meters (limited to the self-recording type).

c. Projection type float

In the exchange of opinions concerning measurement of the current in a surf zone, the Argentine side showed a very keen interest in the method of observation by means of the projection type float used in Japan and also in the investigation at Mar del Plata in which we had participated and a desire to obtain the

detailed data which would enable self-production of the projector, projection float, powder, etc. We gave an explanation specifically and stated that with respect to the design drawings and preparation of the powder, we would consult with the manufacturers and introduce them, if possible.

d. Wave measuring instrument

A wave rider of the type of accelerometer had been in use for observation at Punta Medanos (See the paragraph of past field surveys conducted by SHN), and the LHA was going to provide a one of the type same to that it had lost previously.

The LHA had recovered and preserved the hydraulic wave gauge of the slidable resistor type (product of Kyowa Shokogyo, Japan; model PW) used in the observation of the Mar del Plata Port in which we participated ten years ago (sensor missing). Thus, it desired to obtain the design drawing of the sensor and repair and restore the gauge for use.

However, the place where the observation is planned at Punta Medanos this time is closer to the coast than the current point of measurement of the SHN so that the effect of breaking waves is by no means negligible for installation of the instrument. Apart from this, it is desired to plan the wave observation near Bs As (Rio de la Plata river bank). Taking these together, opinions were exchanged with respect to the way of selection of the machine conforming to the object of wave observation, conditions at the site and data to be processed. But, apparently on account of little experience in processing of field wave data, the Argentine side scarcely realized the significance except only that a great amount of money would be required for loss or failure of the wave instrument in wave observation (three units lost, two units restored for repair on account of failure and one unit being used currently at Punta Medanos since the start of observation in July 1974 by means of wave rider) or maintenance (in the observation at Rio Grande with an ultrasonic direct recording wave instrument of Nailpick, an expense of $1,500/week to $5,000/3 days was required for maintenance including change of the tape).

Apparaently from this reason, they showed greater interest in the stereophotogrammetric method and Stasia type wave gauge than in the automatic observation instruments. Particularly, for

the stereophotogrammetric method, they had the questions prepared for the construction and function of the camera and the actual method of photographing at the site. Further, for the step resistance type wave gauge, they sought our opinion on the points of problem in manufacturing and desired the design drawings. We replied that the electrode, measuring circuit, etc. would involve the knowhow of the respective manufacturers and, upon study, would be introduced to them so far as practicable.

e. Wave direction meter

In the survey of the deepwater port, visual ovservation of the wave direction (single photographing method of the azimuth system) was in practice, and the necessity of the detailed measurement of wave direction by means of instrument seemed to be realized only in concept.

The ultrasonic wave direction meter aroused their interest in that it would provide the data of observation of the current along with those of the wave direction, and for the strain gauge type wave direction meter, they asked the design drawings apparently because they had thought that it would be possible for them to produce the instrument by themselves.

f. Wave observation radar system

For the exchange of opinions concerning the indoor experiment and field observation, the LHA had prepared the following systematically arranged questions on what they had the greatest concern.

(a) In the normal radar, the reflection of electric waves from the sea surface appears as sea clatters at random over the whole surface of the field (or eliminated through circuit arrangement), but why the wave peak line alone is given as an image? Also, is it possible to distinguish the progressive wave from the breaker line?

(b) When used for current observation, why the reflected signal from a small float is isolated from the sea clatter to permit followup of the movement of the float?

(c) Resolution and measurement accuracy of the radar developed by the Institute for Tecnical Research of Ports and Harbors for observation of the waves, and construction and functions of the radar reflector for float.

(d) Could we understand that the foregoing explanation would be applicable to the river area?

(e) If said radar (CPSH-4) is used for wave obserbation at Rio de la Plata, what is the facility plan (or, more particularly, the condition for installation of the scanner) with the service area taken as 20 to 30 km?

For the questions (a) through (e), explanation was made according to the report (in English version) of our Institute and with the aid of pictures, and for the question (e), we showed that the height of installation of the scanner would be 100 m or more. Further, with respect to the question (c), we proposed to show the data on ROUNEBERG lens later.

(3) Electronic Equipment, etc.

Initially, a period of three days (July 19 to 21) was allotted for arrangement and exchange of opinions with the LHA, but one more day was added (July 28, with the COPUAP Working Panel meeting suspended). Further, during the tour of inspection to Punta Medonas, the arrangement and exchange of views were also made (after supper on Julh 28). But, with respect to the problems concerning item (3) shown in the appended Table 1 and those concerning items (1) and (2) except that stated above, the exchange of opinions was scarcely carried out because of the shortage of time and had but to end in delivery of the information materials and catalotues we had carried.

In addition to the problems related to the foregoing (1) and (2) and appended Table 1, there were topics raised from time to time and here and there concerning the following matters for which we offered the materials we had carried.

a. Expansion and improvement of the electronic computer (IBM-360/65, 260 KW, presently not available due to model change or stop of production) and peripheral equipment - experiment control and data acquisition, on-line processing.

b. Prevention or early discovery of loww or theft of the current meter float, wave gauge buoy and any other marine instrument, and method of tracing in the event of loss..

c. Construction of an observation tower on the sea at Punta Medonas - No work base; no power available on the proximate land;

and difficulty of maintenance of the marine facilities (counter-measures to fishing boats).

d. Laboratory equipment

Automatic multi-point simultaneous water sampling apparatus, automatic control of flow, etc.

e. Field observation equipment

Turbidity meter, scouring meter, submarine camera, etc.

2. Field Survay Conducted by Servicio de Hidrografia Naval (SHN)

As a member of the Deepwater Port Committee (Sistema Complejo Portuario de Ultramar en Aguas Profundus - COPUAP), the SHN assumed the responsibility for survey at the site and started observation of the tides, waves, etc. from July 1974. The main items of investigation are:

a.	Tidal current	Self-recording current meter and float,
b.	Wave	Wave gauge and visual observation (wave direction and wave height),
c.	Tide	Self-recording tide gauge,
d.	Coastal topography	Sounding and boring (on land),
e.	Meteorological observation	Wind direction, wind speed, etc. (assumed by the meteorological Division of SHN), and
f.	Ecology.	

The area of investigation at the site of the deepwater port at Punta Medanos extends bout Punta Medanos from Mar de Ajo (about 20 km in the north) to Pianmar (about 30 km in the south) and to the offing of a depth of about -20 m (about 20 km off the coast) and onto the land for about 5 km. The area of past investigation and observation and the points of measurement are briefly represented in the appended Figure 1.

The data acquired through the investigation at the site arranged at the SHN (preparation of a register through primary processing) and some of them were distributed to the LHA, etc. Now, fow the marine phenomena (referring to the foregoing items a thorugh c), a higher order of analytical processing of the data is being attempted, and for the topography, land phenomena,

meteorological conditions, etc., collection, processing and analysis of all sorts of data are being advanced. In this type of survey and investigation in Argentine, the SHN has the oldest history and highest level of accumulation of the technical capacity and, unlike the LHA which is highly motivated but is still in the stage of creation, seems to be tackling the present survey with confidence and proud.

With respect to the result of the past survey at the site, the SHN is still in the process of analysis and examination of the data and is going to summarize them together with the data collected hereafter. But, this time, we had part of the data furnished which we brought back together with another material furnished from the LHA or the statistical report of the wave survey at the site from July 1974 to May 1975 (Estudio del Complejo Portuario de Ultramar en Aguas Profundas, Abril 1976 - Note: The contents are not consistent with the title).

(1) Current

Observation of the current in the sea area before the Punta Medanos sistrict is carried out in use of the float, self-recording current meter, dyestuff and isotopic sand.

The survey by means of the float was carried out several times in the area before the survey zones along the south and north beaches of Punta Medanos during September 1974 to February 1975. Injection of the floats was aimed to the points of 200 m, 1,000 m and 5,000 m from the shore-line, and an observation boat and many frogmen participated in the work. Where the SHN performs a work of injection and recovery of floats or a work of collecting bottom materials or sounding near the shoreline, it is usual that the frogmen of the Navy (submarine work squad?) are mobilized, and this is a feature not seen in Japan and seems to constitute a background for such a work to be carried out relatively with ease.

Observation by means of the self-recording current meter was performed in September 1975. The instruments used were of Otto type (apparently), and we were explained that the observation was continued for ten days with one unit of the instrument installed in the offing of the south beach and four units (including one installed at a depth of -13.5 m) in the offing of the north

beach. But, in the talk at the LHA, they said that the observation was carried out for three months at the location outside the bank about 10 km in the offing (but the LHA is not yet in receipt of the data of the observation from the SHN) and that according to the SHN Two Years Program starting from 1977, the observation was to be carried out ten points and would have already been executed for three months.

The followup survey with dyestuff was performed with a helicopter. But, apparently, it failed to provide a satisfactory result, as in the case of the followup survey with istopic sand.

The acquired data are being processed at the SHN, and no report is yet forthcoming. But, from the talk of the LHA engineer who had a glimpse of some of the data and was present in part of the observation, the following characteristics may be gathered of the coastal current.

The current is north bound at the time of rising tide with a maximum speed of 50∿60cm/sec as observed by the self-recording current meter at a point of -13.5 m depth in the offing of the north beach and south bound at the time of ebbing tide with a maximum speed of 70∿40 cm/sec.

The followup data of float shows a trend of north bound flow along the coast at a point 200 m off the coast either in the south or north and regardless of the tide except a very few cases. A similar trend is also shown within 1 km from the coast, but far off the coast, the current shows a rather complex stream line, and off the south and north beaches of Punta Medanos, a stream in a direction of SE to E (some cases of NE) seems to be predominant. But, there are engineers who maintain that the influences of wind and drift current. Thus, this characteristic is not certain.

Whether or not there is a lip current is not obvious, but some say that it is generated off the south beach at an interval of 5∿6 km. Further, at about 10 km south of Punta Medanos, there is a point where drifts deposit relatively concentratively, and there was an instance of a float injected off the north beach straying and drifting to the beach of the point two or three days after. When we inspected the site, we were unable to find such a point of accumulation of the drifts. They said that such a phenomenon was not seen in the coast north of Punta Medanos.

Observation of the coastal current is carried out almost all over the objective area of the survey, but the time of observation is different from area to area and from point to point so that it seems to be difficult to derive any appreciable conclusion from the data of a round of surveys in the past.

(2) Waves

The wave observation is effected with three measurements a day by means of wave rider and visual observations of the wave direction and height at Mar de Ajo and Pinamar.

In the wave rider observation, the instrument was installed at two points, one in the offing of the north beach and the other in the offing of the south beach of Punta Medanos at a depth of -10 m during the period of from July 1974 to September 1975 (Appended Drawing, Wave riders Nos. 1 and 2), and thus there were obtained data of about eight months. The wave riders used in this observation (SHN, 2 units; and LHA, 1 unit) were all lost.

Thereafter, the observation was reopened in Auguts to October 1976 with installation at two points, one in the offing of the south beach and the other of the north beach, as stated above, at a depth of -14 m, but the instruments failed to function properly. Presently, the unit installed in Janauary 1977 at a point slightly south of the offing of Punta Medanos at a depth of -10 m is working. It is also scheduled to install an additional unit in the offing of the south beach near the coast in Ajgust 1977.

That the point of installation was of a relatively shallow depth at -10 m and located inside the tip end of the bank, was allegedly for prevention of the fishing hazards on one hand and due to spatial restriction in the receiving sensitivity of the radio telemeter.

Originally, the wave gauge of the type having an accelerometer mounted on a buoy is to be used on a free buoy or in a region of deepwater waves and does not seem to be a preferable method. But, it may be unavoidable if the economy and ease of handling are taken into consideration under the present situation.

The maximum signifiacnt waves observed during July 1974 to September 1975 are 2.6∿2.8 m at No. 1 point of measurement (off the south beach) and 2.2∿2.4 m at No.2 point of measurement

(off the north beach), the former occurring in September and the Latter in November and December, and No. 1 point being of higher wave by about 20 percent average than No. 2 point.

Relatively large waves emerge in August to November, and in April and May, there is no emergence of waves with a height ($H_{1/3}$) of 2 m or more at No. 1 as well as No. 2. The waves of a height ($H_{1/3}$) of 1.8 m or more are predominant, at No. 1 point of measurement, in SE, followed by SSE, seen slightly in E and S, but not in ESE. At No. 2, they emerge only in ESE and E, as will be seen naturally if the topographic difference from No. 1 taken into consideration. Although it is not appropriate to discuss the characteristics of waves from the data of a relatively short period on one hand and the corelationship of the measurements with the factors of deepwater waves. The foregoing result of observation shows a relatively good agreement with the statistics of waves at Mar del which we has summarized previously if the geographical factors, or the influences of swells due to a strong depression proceeding east in the south (along 50°S line) in winter (July and August) and those of waves due to a depression proceeding south along the La Plata River in summer or occurring over the Pacific coast at about 35°S and crossing east the South merican Continent, are taken into consideration. The Argentine researchers have apparently noted this point, and it is seen here and there that they are carrying out the analytical work upon comparison with said survey report of Mar del Plata.

At the LHA, the recurrence probability of wave height is provided upon the foregoing data of observation (1974 to 1975) (at No. 1 point of measurement, the 10 years probability $H_{1/3}$ is about 3.6 m, and at No. 2 point, it is about 3.1 m). But, during the period of observation extending over fifteen months, the data acquired of No. 1 point are for little more than five months, and those of No. 2 point are for about three months only. Then, the foregoing attempt seems to be rather reckless.

During the tour of inspection to the site, we noted a relatively large quantity of wave bubbles ashored the south beach of Punta Medanos at an interval of about 4 to 5 km, and this is interesting when considered as related to the bottom configuration before the beach.

(3) Tides

With buoy type tide gauge installed on a steel pipe well attached to the fishing piers at Mar de Ajo and Pinamar respectively, the observation has been carried out since September 1974.

The record is obtained as a pen writing analog record and, upon elapse of half a year after the installation, as a digital record on punched tage with a sampling interval of 3 minutes.

According to the brief representation at the SHN Head-quarter, the analog and digital records were obtained in a smooth manner at both points over the last three years. But, according to what a field officer told us, the water pipe (about 15 mm diameter x about 20 cm length at the lower end of the steel pipe well of about 50 cm diameter) was often clogged with sand deposited at the upper part so that it had to be changed at an interval of two to six months. Therefore, the data seem to be of somewhat doubtful quality. Here, the speed of feeding tha analog recording paper at Mar de Ajo and that at Pinamar are in a ratio of approximately 1:2, and if there is any reason, it is not known.

At first, it was expected that the long period waves such as seen at Mar del Plata with a period of about 20 minutes would appear along the coast in this area. The field officer had a similar cognizance. But, so far as we looked into the data, no record was found. Here, it is not known whether the absence of long period waves in the record is due to a failure in the tide gauge facility (clogging of the water pipe, well diameter and buoy configurat ion, and complicated counterweight mechanism) or to actual absence of the phenomenon of long period waves or to actual absence of the phenomenon of long period waves or to a failure of detection from the locational relationship of the point of measurement ot the geographical conditions.

According to the result of our previous survey at the Mar del Plata port, 502 cases of long period waves (secondary undulations with an amplitude of 30 cm or more) could be extracted from the S.E.O.P. tide record over the period of nine years. There were cases where a predominant period of about 25 minutes was overlapped by a subperiod of 4 to 15 minutes, and the waves with a period of 40 minutes appeared once. The maximum amplitude was 1.3 m, and the waves with an amplitude of 50 cm or more constituted

were nearly 30 percent. The frequency of occurrence was greatest in November (6.7 times/month). Seasonally, the waves appeared greatly in summer (December to February) but not in winter (March to August), and those with a large amplitude of about 1 m appeared largely in March to September.

While it was not possible to clarify the cause of occurrence, this much can be said that the occurrence is not directly related to the meteorological and marine conditions in the vicinity of the site. But, looking from the season of occurrence, these waves seem to be closely related to the meteorological disturbances occurring in the high latitude depression zone in the south. Additionally, there are many other factors to be noted such as propagation of surface disturbances occurring in the Antarctic Zone and South Pacific due to versatile causes, interference of the continental shelf in the front, generation of edge waves, etc.

Anyway, it is not natural that the phenomenon seen at Mar del Plata is not seen in the Punta Medanos area. Thus, in this deep-water port program, it will be important to grasp the actual condition of the long period waves in relation to the examination of the utilization of bank valley for channel, disturbances in the port, rolling and pitching of the vessels, etc. and consider investigation of such waves from a separate point of view from the tide observation. If further conjecture is allowed, these waves may not be unrelated to the formation of the bank extending south from Punta Medanos.

(4) Miscellaneous

The data furnished from Argentine, including those specifically described in the foregoing (1) through (3), should be examined carefully so that they would serve for the technical cooperation to be extended hereafter.

Figure 1 Punta Medanos survey area arrangement diagram.

1 - - A zone (North beach)

2 - - Tide gauge

3 - - Wave height measuring point

4 - - Wave rider No. 2 (Jul 74 - Sep 75)
Note: Lost.

5 - - Sounding line No. 41

6 - - Sounding line No. 49

7 - - Punta Medanos Lighthouse
Wave rider receiving station

8 - - B zone (South beach)

9 - - Sounding line No. 89

10 - - Sounding line No. 97

11 - - Wave rider (Jan 77 -
Note: Position not definite?

12 - - Wave rider No. 1 (Jul 74 - Sep 75)
Note: Lost.

13 - - Isotopic sand injection point

14 - - Wave direction measuring point

15 - - Tide gauge

1. Preparation for Experiment at LHA and Important Questions to Us (Tanaka Memorandum)

For the deepwater port experiments, they were constructing an indoor wave basin. The shed of the basin was nearly completed, and the work of the basin floor and wall was under way. For the wave generator, they told that an arrangement was made for a regular wave generator having the wave generating machine traveling on rails and permitting change of the wave direction with ease. or water supply to the basin, the pump facility of the adjacent existing basin would be utilized. Then, the piping work only would be required.

From the foregoing condition and taking the Japanese pace of work as a standard, a period of six months would be required before start of the experiment.

For the experiments, it was thought that they had no definite plan yet so that we were not in a stage of making a detailed arrangement with them. The principal questions posed to us during our stay with respect to the experimental problems are:

a) How the experiments were carried out in the case of the Kashima Port?

b) To what extent could the plane scale of the model be red reduced? Could a scale of 1/1000 be practicable?

c) What do you think of the rule of similarity of the model?

(The foregoing from Dr. Barchilon, Chief of LHA.)

d) How much time would be required for experiments?

e) If the LHA members could carry out the experiments satisfactorily although they are young and not experienced?

(The foregoing from Capt. Torti, Chairman of COPUAP.)

2. Answers to the Questions from Argentine Side

a) Way of carrying out the experiments in the case of the Kashima Port - In the case of the Kashima Port, with a foxed bed model constructed at the site and a movable bed model in the Research Institute, various problems arising out of the progress of the work at the site were confirmed experimentally over the period of five years to execute the work. The time of excavating the central access channel was determined upon confirmation through experiments that the effect of sheltering from waves was

sufficiently provided.

b) Scale of the model

Smaller rate of reduction of the model is of course preferable. But, depending on the extension of the objective area and scale of the facilities, a scale of 1/300 to 1/400 is tolerable. If a too great rate of reduction is taken to produce a small model, the experiments become extremely delicate and difficult. For example, with greater rate of reduction of the model, there will be an increasing number of items to be controlled such as wind, temperature, dust, etc., securing the similarity will become harder. The proposed scale of 1/1000 is scarcely practicable.

c) Similarity rule in the movable bed experiments - T

There are many discussions on the similarity rule in the movable bed experiments, but each of these discussions handles only a limited portion of the complicated phenomena of littoral drift. After all, what is important in the experiments of littoral drift is to investigate in detail and grasp the phenomena of littoral drift at the site, then look, through trials and errors, for a method that would permit reproduction of the phenomena in the model as much as practicable. Further, the sand movement in the deep-water area and that in the breaker zone are considerably different in the mechanism, and it is difficult to reproduce them simultaneously in the same model. Therefore, it is desirable to test the problems in the offing and those in the breaker zone separately. Specifically, in the case of Punta Medanos, the problem of stability of the bank in the offing should be handled separately from the problem of sand deposition or erosion in the peripheral are of the port. Particularly, the problem of stability of the bank can scarcely be tested before the mechanism of formation of the bank is clarified. Depending on what external forces are involved in the formation of the bank, the method of experiment as well as the required facilities will vary completely.

d) Time required for experiments - Preliminary experiments will have to be started once the mechanism of formation of the bank has been clarified. Then, including the preliminary experiments, a minimum of 1.5 years will be required.

e) Ability of LHA personnel

The LHA personnel may be unexperienced, but they are young

and diligent researcher. If they study in Japan for, say, half a year, they will surely be able to execute their tasks, and we will spare no effort for cooperation.

3. TECHNICAL VIEWS ON PUNTA MEDANOS COAST

(TANAKA'S PERSONAL OPINION)

1. Characteristics of Punta Medanos Coast upon the Result of Investigation of the Argentine Side

1.1 General description of the area

The objective area is a seashore extending for about 45 km on both sides of Punta Medanos (Medanos meaning the sand dune), which is located at about 300 km SSE of the capital Buenos Aires, to Mar de Ajo at 15 km in the north and to Pinamar at 30 km in the south. In the coast, a broad due zone develops. Particularly, the bare dune developing in the south of Punta Medanos is of a scale not seen in our country. In the back of such dune zone, there spreads a swamp zone with lagoons such as Laguna Salada and Laguna los Chilcas. Thus, except the Mar de Ajo and pinamar areas developing as a sightseeing site, the whole area is a deserted and unutilized land, and it is quite natural to think of a port development.

1.2 Seashore condition

The seashore condition in the north of Punta Medanos differs considerably from that in the south. The north coast has a very gentle foreshore slope of 1/30 to 1/40, and the backshore has a height of only about 2 m above the mean sea level. The beach materials are fine, with a median diameter of about 0.15 mm. On the other hand, the south coast has the seashore condition changed at a certain interval, and there appear alternately a gently sloped configuration similar to that of the north coast and an area having a sharp slope (1/10 to 1/15) and a high backshore (about 4 m above the mean sea level). The beach materials are coarse (with a median diameter of about 0.3 mm), and a number of shells and thin strips of sandstone are seen.

1.3 Development process of shore configuration

According to what Dr. Parker (SHIN) has described upon the cross section of layers, etc. assumed from the result of boring conducted at 19 points on land, at the lower part of this area is present a compact old layer over which a new sand layer of the dune is present. Accordingly, the existing dune is geologically a relatively new and still growing layer. He said that the dune

developed from the south to the north to form a so-called barrier to keep the swampy land inside. The argument belonged to his speciality and was very clear.

4.4 Submarine topography

The submarine topography of this area is a very paricular one. In the north of Punta Medanos, a very gentle slope is formed, and it takes 15 to 20 km to reach a depth of -15 m. In the south, several lines of banks running south to north are present. At the crown of such a bank, the depth is shallow at 10 m or less, but at the valley, it is about -16 -18 m. The interval of the peaks of the banks is 2.5 5 km of average about 3 km.

1 - - Valley

2 - - Bank peak line

Unless such a valley portion of the banks is used as an access channel to the port, it is undoubtedly very difficult to consitruct a port with a depth of -15 m or more in this area. Consequently, confirmation of the stability of banks is the key to provision of a port in this area.

1.5 Stability of submarine banks

Now comparing the chart of sounding survey in 1974 to that in 1966-1967 (provided such comparison is practicable of a limited area), it is seen that the depth has changed considerably here and there. But, generally, a trend of increasing depth at the valley and decreasing depth at the peak is noted, but there is no proof to indicate that the bank has changed its position. The data are still short-coming to give any definite conclusion.

1.6 Tide

The tide is a clear double day tide. Departure from the normal sea level is about 0.8 1.5 m. It is not yet grasped if there is any difference in the tidal trend at Mar de Ajo from that at Pinamar and to what extent, if any. Further, the undulation of a period of 15 to 20 minutes noted allegedly at Mar del Plata about 200 km in the south from here is not yet grasped clearly. If such undulation is present actually and its

characteristics are important in relation to the mechanism of formation of the banks and an important problem to resolved hereafter.

1.7 Tidal current

Using the float and current meter, a number of observations of the tidal current were made. But, in this area, the submarine topography is complicated so that the location of the point of measurement and water depth are likely to have great effects. Thus, they have not yet grasped the whole aspect. Multi-layer and multi point simultaneous observations are desired hereafter.

According to the result of the continuous observation carried out in use of self-recording current meters at four points in the vicinity for about ten days in September 1975, the current is about 1.5 knots maximum, and the most frequently occurring speed is about 0.5 knot. As an ocean current, the speed seems to be more or less intensive. For the current direction, the observations at the four points are characteristic respectively. But, from the reasons that the observations were not carried out simultaneously and that the correspondence to the complex submarine topography was not clear, they are hardly be regarded as a general trend.

1.8 Waves

The observations were all made with waverider type measuring instruments (accelerometer type). According to the result of the observation conducted by LHA over the period of rom July 1974 to September 1975 (at points of a depth of -10 m), the waves have a logarithmic normal distribution of height with the largest occurrence frequency at about $H_{1/3}$ = 0.8 1.2 m, and the maximum significant wave height in the recurrence period of 10 years is about 3.5 m. The period extends over about 3 11 seconds, but that of the largest frequency is about 6 seconds. Seasonally, the waves are relatively calm in winter.

1.9 Longshore current and volume of littoral drift

The speed of the longshore current obtained through float observation is approximately proportional to the wave height in a relationship of

$$V\ (m/sec) = kH\ (m) \qquad k = 1\ (1/sec)$$

and in both south and north coasts, the north bound current is apparently predominant in the frequency of occurrence and speed.

The volume of the longshore drift calculated according to the Shore Potection Planning Design (1966 edition) is as follows.

Period	South coast	North coast
Sep - Dec 1974	N bound 121,000 m^3 (1,700 m^3/day)	N bound 36,600 m^3 (600 m^3/day)
Apr - May 1975	S bound 9,000 m^3 (300 m^3/day)	S bound 12,000 m^3 (300 m^3/day)

The foregoing is an estimation for a relatively short period and does not represent an annual amount but gives an impression that the sand drifting north is predominant generally in an amount much greater than that seen along the cost in Japan.

2. Opinion Based on the Survey Result and Field Inspection (Mainly with Respect to Littoral Drift)

If the discussion is limited to the littoral drift, two points are noted for this seashore. One is that the north bound drift is obviously predominant, its amount being much greater than that seen along any of the coasts in Japan, and the other is naturally the problem of stability of the banks in the offing.

2.1 Problem of longshore drift

Our country belongs to the Alps Orogenic Zone. The block is thus divided into complicated fractions so that the sand beaches extend only for several tens kilometers and open to the sea in the form of an arc generally (except the Enshu Nada shore). Accordingly, the sand beaches are generally stable, and the longshore drift is of a small amount. This is because the Nature is apt to take a stable form so that the smaller the unit of topographic configuration, the easier to come to a stable state.

In the seashores where the stratum is least subjected to folding and the block is simple as in the case of the East Coast

of America or the North Sea coast in Europe, the coast line is still in the process of coming to stability so that the longshore drift is usually of a large quantity. Referring to the net drift, there is a difference of about one order between the shores in Japan and the East Coast of America.

This coast is in the category of the East Coast of America. Particularly, in the south coast, it seems that there is the north bound drift in an amount of 500,000 m^3 or more annually.

Such a large amount of longshore drift continues deposition on the south beach of Punta Medanos, while it breeds the banks in the offing in the course of its travel to the north. (Comparison of the chart of sounding in 1974 with that in 1966 is illustrative of an astonishing amount of deposition, that is, 15×10^{-3} km^3/year of 15 million m^3/year.[Note 1)])

The effect of blocking such a large amount of north bound sand by the port appears as deposition on the upper side of the port and erosion on the lower side. Considering the peripheral area as it is being utilized, the erosion may not pose a serious problem. However, the deposition on the upper side may induce a problem of shoaling of the port. Moreover, it seems to have a possibility of causing movement of the banks as described later.

Note 1) The annual longshore drift of 500,000 m^3/year and the deposition of 15,000,000 m^3/year are at varianceby two orders. Such difference may be attributed to the accuracy of measurement and that in estimation of the amount of longshore drift, but the details are not known presently.)

1 - - Deposition area

2.2 Problems of banks in the offing

The banks are composed of sandy materials. Considering from the depth and wave conditions, they are probably not the remains of the old configuration of the ground such as "drowned valley" or "submarine old river" but are apparently of new and live configuration of deposition. Probably, they belong to the topographical category called the shoreface-connected ridge" seen along the Central Atlantic Coast in North America or the coasts

in Florida, Alabama or Texas. The shoreface-connected ridges have a difference in depth of 2/3 of the mean depth or 10 m or more between the valley and the peak, and the distance between the adjacent ridges is about 2 to 5 km. The banks are of a length of about several tens kilometers and develop at an angle of 25 to 35 degrees to the shoreline in the upper direction of the drift.

With respect to the shoreface-connected ridges, the results of observations along the Atlantic coast of America (Virginia, northern part of North Carolina, etc.) are available, and there are many discussions presented on the mechanism of generation, but none of them is yet established as a definite one. However, the most convincing theory among them assumes that the bank is a kind of sand wave formed by a current combining the current in a direction right angle to the shoreline and that parallel to the shoreline which are caused by wind and waves.

In most of the cases the two charts of sounding different in the time of observation for several tens years show changes in the configuration of the shoreface-connected ridges, valleys deposited into mountains and mountains scoured into valleys. However, it is not known if there is any information obtained of the speed of movement.

3. Policy for Further Study

In pursuing the two problems described in the foregoing chapter, we should follow the following policy.

3.1 Problem of longshore drift

With respect to the longshore drift, its predominant direction is obvious. The tasks to be carried out hereafter are, therefore, nothing but the grasping of its amount and prediction of any effects of the port construction.

The former is a difficult work under the present condition. But, fortunately, it is expected, in this area, that the longshore drift will decrease sharply at the point of Punta Medanos and that the greater part of the drift traveling north will deposit there. Note 3) Thus, through repeated soundings in the area in the vicinity of Punta Medanos, estimation of a considerable high accuracy will be possible.

The effects of the port construction are to be predicted through movable bed experiments. In the drift model experiments, it will be difficult to simulate the phenomena along the coast and those in the offing at the same time. It is, therefore, preferable that the problem of the longshore drift be isolated from the problem of the banks in the offing and tested separately.

Application of a simple numerical model is also conceivable.

Note 3) If the deposition onto the Punta Medanos area is represented by Q, north bound drift on the south coast by Qs and north bound drift on the north coast by Qn, then

$$Q = Qs - Qn$$

but Qs Qn, then Q Qs.

3.2 Problem of offshore banks

The problem of the offshore banks will have to be resolved according to the procedure given in the flow chart below.

1 - - Grasping bank behavior

2 - - Repeated soundings
Possibility of utilizing shoreline survey

3 - - Formation of a hypothesis concerning bank formation mechanism

4 - - Analysis of sounding and other data
Collection of information of the other cases

5 - - Theoretical examination of the possibility of hypothesis

6 - - Acquisition of data on external forces verifying the hypothesis

7 - - Experiments for verification of hypothesis

8 - - Hypothesis verified?

9 - - Examination of the effects of port construction

19 - - Model experiments
Theoretical calculations

The first stage is concerned with graping the bank vehaviors or, more particularly, characteristics of movement. For such purpose, repeated soundings will be required. The second stage of

the work is, then, to form every possible hypothesis concerning the mechanism of formation of the banks upon the results of these soundings and information concerning similar topographic configurations at the other places. By this, the points in the subsequent field surveys will be presented clearly.

4. POLICIES CONCERNING DEEPWATER PORT PROBLEMS AND TECHNICAL COOPERATION HEREAFTER

How the Survey Team Considers

The deepwater port is hardly realizable unless the rows of banks and tranches present at 4 to 5 km off Punta Medanos remain unchanged over a long period of time in that the port will have to use such a trench as an access channel.

Whether the Kashima system (extending a groyne close to one of such trenches and creating an artificially excavated port on land) or the Port Island system is employed, if the banks and trenches undergo an extreme topographic deformation in a relatively short period of time upon construction of such port, the port is no longer realized.

As a method of investigation for the former, it will be required to execute sounding surveys of the banks and trenches for two years at a rate of about four times a year to examine any changes and, at the same time, seek the relationship of the change in depth with the other marine phenomena occurring simultaneously.

For the latter, hydraulic model experiments concerning the littoral drift will have to be undertaken by the Laboratorio de Hidraulica Aplica of Argentine.

For the economy, we will be silent in the Capt. Guevara, Secretary, has stated that "The economic survey relative to the port construction will be studied at the Systema Complejo Portuario de Ultramar en Aguas Profundas so that the Japanese Survey Team should only examine whether or not the construction of a deepwater port in the vicinity of Punta Medanos is physically feasible upon consideration of the conditions of external phenomena."

Construction of a deepwater port at Punta Medanos is a very difficult problem defeating comparison with the case of Kashima Port. But, the Servicio de Hidrografia Naval of Argentine is fully equipped in the apparatus as well as personnel so that if they accept our suggestions, they are capable of carrying out a complete investigation by themselves. For the hydraulic experiments, two members of the Laboratorio de Hidraulica Aplica will have a thorough training in Japan. Upon return to Argentine, these two research members will carry out the drift model experiments by themselves, the experts dispatched from the Institute for Technical Research

of Ports and Harbors will only assist them in the experiments. Thus, the Argentine personnel determine by themselves what type of port should be constructed or the construction be given up. Our role is to extend technical cooperation that will serve for their decision and judgment.

COPUAP Future Plans

(1) Surveys are undetaken by the Servicio de Hidrografia Naval. According to the previous plan, the survey is to be completed in 1977. Actually, however, it will be continued for additional two years of 1978 and 1979. Particularly expectable are the several sequences of sounding surveys of the trenches and banks which are regarded to be most important.

(2) The Laboratorio de Hidraulica Aplica will complete the hydraulic model experiments until 1979.

(3) The Direction General de Investigacion y Desarollo will complete all economic studies until 1979 and initiate port planning from 1980.

It is scheduled to receive proposals in 1980 and st art the port construction in 1981. For us, such schedule seems to be rather hasty.

Policies for Future Technical Cooperation to Argentine

Upon arrangement with the Embassy in Argentine, the following presentation was made to the Sistema Complejo Portuario de Ultramar en Aguas Profundas on July 29. At the occasion, we stressed that it was the target our Survey Team would strive to achieve and might not be realized depending on the result of negotiation with the Ministry of Foreign Affairs, financial authorities, etc.

Attachment 1

An engineer will be dispatched who has participated in the surveys and model experiments of Kashima and has experience in the field works. The period is about two months. He will be

dispatched at about the time when the trainees have returned to Argentine and started the model experiments of the deepwater port. (Probably the dispatch will be the next year.)

Attachment 2

At least one trainee will be accepted. For the remaining one, we will try to meet your disire. The period is six to eight months.

For the technical inspection tour, convenience will be offered.

Academic study - this seems to mean the language training which belongs to the responsibility of the Ministry of Education and is not included in the project.

The expense of travel to and back from Japan and the expense of stay in Japan which are required of the trainee will be paid according to the regulations of JICA. The monthly amount of payment will exceed the monthly amount of salary of a researcher of our Research Institute who is of the same age and qualification to the trainee.

The expense of the technical inspection tour will not be disbursed. In the case of a seminar or group training, such expense is included but not for individual training. But, a lodging facility is available in the neighborhood of the the Research Institute (single room with bath and toilet; breakfast and supper provided if desired), and we are ready to help you get the lodging at the facility at a cheap expense so that your people will be able to save the money and make an inspection trip as much as desired.

Attachment 3

Furnishment of machinery according to Form A-4 is designed primarily for improvement of the equipment of, for example, a medical center or vocational training center if such a facility is actually present in the other country and is not applicable to the present case. However, if such equipment and instruments are really required for execution of the hydraulic model experiments, we will consider furnishment of those machines and instruments which are deemed to be most important among them in the form of machines and instruments carried by the dispatched experts.

Micro-propeller current meter.

Multichannel analog recorder.

High velocity analog recorder.

Bottom followers for erosion model studies.

For the following,.design drawings will be delivered:

Analog tide generator, and

Complex wave generator.

The electronic devices for remote maneuvering of ships in models will not be required for the drift experiments for the time being and will be excluded.

FIELD EQUIPMENT

For such equipment and instrumentation, we have given you the English catalogues. It is recommended to study the catalogues carefully, and the purchase should be made at the expense of Argentine. You can of course expect our aid in purchase.

DIGITAL AND ELECTRONIC INSTRUMENTATION

What instruments are required is dependent on instrallation as peripheral equipment to what apparatus and electronic computer in the Laboratorio de Hidraulica Aplica. It is recommended, therefore, that the trainees coming to Japan will carry data of the characteristics of instruments available presently or to be acquired hereafter and consult with the computer and measurement experts of our Research Instutute before purchase which is to be made at the expense of Argentine.

Attachment 4

Actually we came to Argentine.

We will limit our work to the feasibility of installing a deepwater port at Punta Medanos and will mention nothing about the economy since this is up to the COPUAP which will draw a conclusion until 1979. We stressed reiteratedly that no industrial port would be valid in disregard of the economy.

Attachment 5

Inspection of a deepwater port in an advanced country is the primary and important task of the COPUAP so that all of the members of COPUAP should make an inspection tour to Japan with the expense borne, of course, by Argentine.

We will, of course, exert our efforts to approach the authorities concerned so that the Government as well as the Ministry of Foreign Affairs will desire, for promotion of the friendly relationship between Argentine and Japan, to invite as many people as possible in the light of the precedents.

Attachment 6

We have carried an instrument which is of the same type to the electric current meter at (b) and of higher performance, permitting digital indication.

If (b) is available, (a) will no longer be required.

The instruments (c), (d) and (e) should be purchased at the expense of Argentine.

Attachment 7

A list of the reports of the Ports and Harbors Technical Research Institute was furnished.

Additionally, a number of pamphlets were delivered to the Laboratory. They are generally in Japanese, but as there are many people of Japanese descent in Argentine, the translation will not be a difficult job.

We will arrange for any technical books, etc., if desired.

Attachment 8

The schedule shown from the Argentine side included no work in this category of Attachment 8.