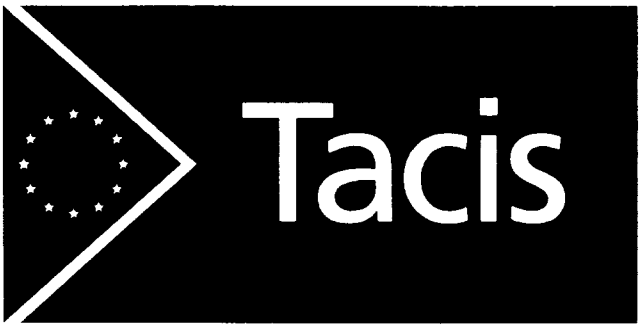

Port Network Plan and Improvement Programme:
Renovation of the Ferry Terminals of Baku and Turkmenbashi

Environmental Analysis Report - Baku
September 1997

LIST OF CONTENT

ANNEXES

1.0 INTRODUCTION

As a part of the EC financed Tacis-Traceca project concerning with the rehabilitation of the ferry terminals in Baku and Turkmenbashi, this report provide an environmental impact assessment of the future development at the Baku site.

After environmental screening, this project has been classified as B/0 according to EBRD environmental procedures, see ref. /5/. The heading B means that "Partial environmental analysis" is required. The heading 0 indicates that an environmental audit is not required.

Partial environmental analysis can vary considerably depending on the type of project, but normally it involves the specification of the environmental guidelines or standards which should be met by the project. This should be possible without undertaking any major study, although studies might be needed in certain cases. In accordance with this guidance, the environmental assessment has been written in the format required by both Azerbaijan authorities and by EBRD, see ref. /1/ and /2/.

In practice the environmental assessment has partly been based on a report prepared by the local design institute "Kaspmornii project" as part of the present project (copy enclosed as Annex 2) and partly on the recent environmental assessment prepared in relation to the development of the Port Master Plan, se ref. /3/.

During the course of the project, preliminary environmental evaluations have already been carried out in connection with the screening of the various layouts that have been studied before arriving at the final project proposal. These evaluations have been reported in Phase 1 report, January 1997 (environmental bacground conditions) see ref. /4/ and in the Phase 2, Pre-design and Feasibility note, December 1996 (initial environmental evaluation), see ref. /6/.

2.0 OPERATIONAL CONTEXT

2.1 Purpose, Need and Development Timetable of the Project

The ferry terminals in both Baku and Turkmenbashi ports today face various and serious problems that are of major constraint to a proper and smooth use of the terminals, se ref. /4/. If not addressed in a proper way, these problems may constitute a threat to the continuation of the ferry service on the sea route linking the two ports. This ferry service is a crucial element on the Traceca transport corridor linking Europe and the Caucasus region with the Central Asian countries.

To relieve the situation of the ferry terminals, EC has committed itself under the Tacis-Traceca programme, to finance the Consultancy Services of the present project concerned with the rehabilitation of the ferry terminals in Baku and Turkmenbashi.

Design of the project is completed and tendering for construction is expected to start early 1998. EBRD is expected to provide the major part of financing through loans.

The operational and technical outline of the ferry terminal project subject of the present environmental analysis have been described in detail in reports prepared earlier, as part of the present project, see ref. /4/ and /7/.

2.2 Legal and Institutional Framework

The information in this chapter follows in general ref. /3/.

Governmental Institutions

Azerbaijan State Committee on Ecology and Control of Natural Resources Utilization (ASCE) has the overall responsibility for the implementation of the environmental legislation in Azerbaijan. It consists of different bodies dealing with different ecological aspects, like air, water, waste management etc.

Other authorities and institutions in charge of ecological matters are:

- Ministry of Health, State Sanitary Inspectorate
- Ecological Expertise Administration
- State Inspection of Caspian Sea Protection
- Caspian Marine Scientific Research Institute
- Hydrometeorological Institute
- Academy of Sciences
- Caspian Agency
- Ecological Institute of the Azerbaijan Aerospace Agency

These authorities and institutes act independently but co-operation takes place. Most of the institutions are equipped with laboratories for various kinds of investigations and analysis. It has been decided that environmental policy shall be based on information from all institutes. As a first step, a conference on the ecological state of the Caspian Sea was held by these institutes in 1994, during which it was agreed that all institutes dealing with environmental matters should be combined to a "State Ecological Monitoring", which is likely to be realised this year.

Non-Governmental Organisations

The following non-governmental organisations are active in the Republic of Azerbaijan:

- Environmental Society
- The Green Movement of Azerbaijan
- The Environmental Union of Azerbaijan
- The Green Party of Azerbaijan

National Environmental Regulations

The legislation and regulations relevant to environmental aspects of the port project are the following:

The Law on Nature Protection and Nature Utilisation in the Azerbaijan Republic 1992, which requires that the nature of the Azerbaijan Republic and its resources are obliged to be protected. This law is at present under revision.

Environmental Analysis: Just recently, the Azerbaijan State Committee on Ecology and Control of Natural Resources Utilisation (ASCE) has worked out together with the UNDP an EIA directive and approved it on April 27, 1996, ref. /1/. It provides specific regulations to ensure that all possible consequences of proposed activities are considered before the activities are started, with the aim to identify and to avoid or minimise negative impacts of any development proposal.

Public Participation - "Scoping". According to the "EIA Handbook for Azerbaijan" public involvement is required in any EIA process. It must be made sure that the public is entirely informed about the proposed projects. A scoping meeting has to be convened which must be attended by experts and by representatives of groups (i.e. NGOs, community groups) that are considered to have a genuine interest in the proposed project.

The National Ecological Plan of Actions (NEPA) has been developed by the ASCE with the participation of World Bank specialists as an instrument to combine the nature protection objectives with the economic and social development of the country.

International Agreements

Up to now there does not exist any international law or convention for the protection of the Caspian Sea. The reason for this is said to be the fact that the Russian Federation and Iran wish to define the legal status of the Caspian Sea first. At present, consultants from UNDP and representatives of the five states bordering the Caspian Sea are working out an international convention.

In 1995, the parliament of Azerbaijan ratified the framework convention of the UN on Change of the Global Climate.

3.0 DESCRIPTION OF THE PROPOSED PROJECT

The location and layout of the ferry terminal project in Baku is shown on the map in Annex 3.

With the overall objective of creating an adequate and well-functioning ferry terminal, the rehabilitation project is meant to address and solve the following main problems:

- The poor state of repair of the ferry terminal infrastructure and facilities,
- The inadequate terminal layout and insufficiency of facilities, and
- The deficiencies due to change of water level of the Caspian Sea

A terminal development plan has been prepared in this respect.

Due to the present low level of traffic, the uncertainty in the momentum of the economic growth and traffic increase, the present stop in water level increase of the Caspian Sea and the wish to maximise the financial feasibility it has been proposed to implement the Terminal Development Plan in phases according to the pace of growth in terminal activities and possible reactivating of rise in Caspian Sea water level.

Phase I Works (Minimum Investment Plan with Targeted Intermediate Implementation)

- Renovation of marine works/berths
- Renovation of ramp structures
- New vehicle reception, waiting and disembarkation areas
- New dangerous goods area
- New ticketing and border control buildings/check-points
- New passenger pavilion building
- Renovated passenger setting-off/picking-up area
- New passenger skywalk (partly)
- New Ro-Ro ramp structure
- Widening of access road

Phase II Works (Additional Investment Plan with Targeted Implementation by or before the Year 2010, Depending on the Pace of Growth in Terminal Activities and Possible Raise in Caspian Sea Water Level)

- raise of level of land base of ramp
- raise of level of administration area and remaining access road
- new passenger terminal and administration building
- new container yard (probably in main port)
- new trailer yard (probably in main port)
- raise of level of rail yard
- container handling equipment

The environmental impact assessment presented in this report is only concerned with the phase I development, planned for immediate implementation.

4.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

The information in this chapter on the physical environment follows in general the Kaspmornii report, Annex 2, to which shall be referred for further details.

The Location and the Profile of the Sea Bottom

Baku ferry terminal is located on the northern shore of Baku bay, which is situated on the southern cost of Apsheron peninsular between Shickov cape on the west and Sultan cape on the east. The bay is protected by islands Nargin, Plita, Wulf and Peschatiy. The last one has been connected to the mainland by a manmade dike.

The relief of bay bottom is relatively uniform; from Sultan cape to the wide pier of Baku sea port is laying a narrow shallow with depth up to 5 m, which further occupies the northwestern corner of the bay between the mainland and Bailov spit, and turns into underwater continuation of the spit. The shallow waters continue towards the south of Bailov spit up to Shickov cape. The depth is gradually increasing going further out of the costs, and in the central part of the bay the depth reaches 7-9 m.

The Wind Regime

Baku bay district is characterised by the dominating winds coming from the north during most of the year. Especially in the summer time are northerly winds dominating, whereas southerly winds are more common in the spring.

The Wave and Current Regime

The wave regime in the bay basin is determined by the dominating wind direction. The southern winds are creating the highest waves at the port area and these situations are characterised by major resuspension and dispersal of the silt and the sand from the sediment bottom. A dominating current direction in Baku bay is missing.

During south and south-westerly storms the wave impact zone touches almost all areas of the bay basin, excluding north-east corner towards the north from Bailov spit and the coastal strip of Nargin island. Frequency of such situations can reach 6-7 occurrences per year with the average of 5 hours duration.

The Sea Water

Analysis of total hydrocarbons (THC) and heavy metals in the sea water at Baku ferry terminal and port basin have been carried out during different years, the results are shown in table 1.

	1982	1989	1993
Total hydrocarbons (THC)	2.13	1.24	0.50
Phenol	0.018	0.016	0.011
Copper (Cu)	0.004	0.003	0.002
Nickel (Ni)	0.007	0.003	0.002
Vanadium (V)	0.004	0.003	0.003
Chrome (Cr)	0.014	0.011	0.12?
Mercury (Hg)	0.0004	0.0003	0.0001

Table 1. Average concentrations of heavy metals and total hydrocarbons (THC) in the sea water at the ferry terminal for three different years. Figures in mg/l.

The Bottom Sediments

The sediments in the bottom of the bay consist in most parts of silts and sands, in limited areas, limestone bottoms and spots with empty shell can be found.

The sediment at the ferry terminal can be characterised as silt. In table 2, various parameters of heavy metals and the concentration of total hydrocarbon (THC) in the sediment, is given. It has not been possible to obtain information of the analytical procedure, but it must be stressed that, in particular, the sediment content of THC seems to be unrealistic high even taking the pollution situation into account.

	1982	1989	1993
Total hydrocarbons (THC)	170000.0	147000.0	131000.0
Phenol	10.0	7.0	3.0
Copper (Cu)	40.0	36.0	32.0
Lead (Pb)	19.0	11.0	10.0
Nickel (Ni)	50.0	51.0	49.0
Vanadium (V)	70.0	63.0	64.0
Chrome (Cr)	400.	340.	320.
Mercury (Hg)	-	1.0	0.6

Table 2. Average concentrations of heavy metals and total hydrocarbons in the sediment at the ferry terminal for three different years. Figures in mg/kg dry weight.

Soil on the GROUND

The ferry terminal is constructed in an area of reclaimed land. Due to influence from the industrial zone close by, the surface soil of the ferry terminal area is reported to be polluted. Results of analysis of the surface soils of the ferry terminal area are shown in table 3.

		Average concentration
Zinc	(Zn)	31.
Manganese	(Mg)	480.
Copper	(Cu)	18.0
Lead	(Pb)	19.0
Nickel	(Ni)	14.0
Vanadium	(V)	34.
Chrome	(Cr)	19.
Mercury	(Hg)	0.097

Table 3. Analysis of the surface soil at the ferry terminal. Figures in mg/kg dry weight.

Zoobenthos

In the area close to the ferry terminal the bottom fauna is completely missing. In general in Baku Bay the diversity of the bottom fauna is limited, but the abundance of a few species of oligochetes and mussels is rather high. These species are originally migrated from the Azov- and Black Sea. Endemic species to the Caspian Sea are not found in the Baku bay.

Fishery

Commercial fishing does not take place in Baku Bay. Anglers can be observed near the port area. According to general information from relevant institutions, the fish of the area is considered not suitable for human consumption.

Surface- and Sewage Water Discharge

Industrial as well as urban effluent is discharged directly into the harbour. The quality of the discharge is not exactly known but according to estimations of the ASCE and "Bakusewarage" PC, in 1993 alone, 2,000 tonnes of oil products, 225,000 tonnes of dry sediment, 35,000 tonnes of sulphates, 56,000 tonnes of chlorides, 5 tons of phenol, 88 tons of iron and other polluting substances were discharged into the bay with the untreated drained water. The concentration of oil products in the drained water of oil refineries was exceeding the norm by 11 times, that of phenol by 6-8 times, and that of iron and copper by 3 times.

Municipal Waste Management

The garbage of the city of Baku is claimed to be collected daily and brought to a garbage dump near Balakhani where it is partly burnt and partly buried. Obviously, the collecting system can not cope with the amount of garbage produced by the city, parts of the coast line and the bay itself are used as dump sites for municipal waste. In addition, wastes are burnt in streets and parks.

Waste Reception from the Ferries

At the ferry terminal, sewage is pumped from the ferry directly to the municipal sewage system.

Solid waste and garbage is collected at the ferry terminal and afterwards brought to the garbage dump near Balakhani.

Oily waste is collected from the ferries by barges, and taken to a refinery for further treatment.

Dangerous Cargo

Dangerous Cargo carried on the ferries is dealt with in accordance with Azerbaijan rules, which have been taken over from the Soviet rules, similar to the International Maritime Organisations (IMO) Dangerous Goods Code. For the time being the amount of dangerous goods handled in the terminal is very limited and no dedicated area for storage of this cargo exists. A safety inspector do have the overall responsibility for the safe handling of this type of goods.

Oil Spill- and Fire Fighting Equipment

Oil spill combating equipment is apparently in a poor condition. Two small oil sweeping vessels are placed on shore, but claimed to be operational.

Emergency exercises are not carried out any longer.

Two fire fighting boats exist in the port, one of which is written off. The port is not in the possession of fire fighting trucks.

Socio-Economic and Cultural Issues

The ferry terminal is located near to the city centre in the immediate vicinity surrounded by other port activities and industrial activities.

Besides the port staff employed in the terminal, the ferry terminal area also is the setting of several small private businesses, like kiosks, restaurants and a hotel, providing employment and income to local people. Further, the transit traffic through the terminal will add to business in general in Azerbaijan during transit through the country.

5.0 DESCRIPTION AND ASSESSMENT OF THE SIGNIFICENT ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT

5.1 Impact Related to Construction

Rehabilitation of the ferry terminal will comprise the following works affecting the water area:

- Driving of sheet piles for renovation of berthing structures
- Driving of piles for new ro-ro ramp
- Cleaning of sea bottom for scrap in ferry berth area
- Reclamation of land between the ferry terminal and quay berth no. 10 of main port
- Demolition of water pier

At the present water levels, neither maintenance nor new deepening dredging operation are foreseen in relation to this project.

If carried out properly, the construction activities are not expected to increase sediment loads in the harbour or in adjacent coastal waters significantly, either through excessive runoff or from earthmoving operations.

The area of reclamation is inside the port and today heavily polluted with poor water circulation and virtually no life at the bottom.

Due to the settings referred to above, significant impacts on the water quality caused by project is not expected.

Presently, fill materials for reclamation works normally are taken from an approved area at sea about 45 min. of sailing from Baku. Stone material of good quality for embankments may be delivered from existing quarries inland (Gangja) and no new quarries are expected to be opened for this project.

During the construction phase noise and exhaustion from construction machinery and traffic at the construction site will be generated. This effect is not considered to be a problem to surrounding communities due to the location of the terminal and since it is of short term and temporary anyhow.

Solid waste and garbage will be collected and afterwards brought to the garbage dump near Balakhani.

5.2 Impact Related to the Future Operation of the Ferry Terminal

The new layout of the renovated terminal based on a clear identification of the different traffic categories and separation of traffic flows will improve significantly to the safety of operations and the quality of services.

In addition, it will significantly improve the efficiency of operations and the capacity of the terminal.

The reclamation will eliminate an area with poor water circulation and the associated inconveniences. Otherwise no significant impacts on the hydrodynamics of the bay/port area are expected.

No area of wetlands of natural importance are lost.

As stated in section 4.0 solid wastes from the ferries are received by the authorities in the port and afterwards brought to the garbage dump near Balakhani. System for sewage will be upgraded allowing pumping directly from the vessel into the municipal sewage system. Used oil and oily wastes will continue as at present, to be delivered by barges to the nearby oil refinery for further treatment. These treatment options are expected to continue in the future, also in a situation where the ferry traffic is increased.

The provision of a separate area for storage of dangerous goods will improve the safety of operations compared to the present situation.

A separate problem connected to the project is that the public sewage system of Baku is insufficient. As a consequence, sewage discharge is polluting the bay of Baku. Upgrading of the public sewage system should be of highest priority for Baku.

The expected increase in the traffic to the ferry terminal will have negative impacts on the surroundings of the traffic corridor as regards

- Increased noise and exhaust pollution
- Increase in risk of traffic accidents
- Contribution to traffic congestion in central points

Besides widening the access road which is part of the project, there is little that can be done to relieve this development within the framework of the present project.

It shall be mentioned that the establishment of a dedicated port traffic corridor might be the answer, but this shall be studied in conjunction with the elaboration of general traffic master plan for Baku City which is highly needed.

Increase in traffic will have a positive impact on the economy both through direct payments for terminal services and indirectly through connected business activities.

As explained in Annex 2, a future fall in water level and increase in vessel operations may require maintenance and/or deepening dredging. Despite that deepening will have a negative influence on the sea water, this influence will be of single character and be of

less harm than what might be expected from continued pollution from the berthing and sailing operations of the ferries.

In case of future dredging works efforts shall be aimed at using environmental friendly dredging methods and carefully analysing the materials to be disposed.

6.0 ENVIRONMENTAL MONITORING

6.1 Construction Phase

Earth moving operations in relation to the land reclamation works are expected and this may result in run-off of important amounts of sediments to the water column if these operations are not carried out in a proper and controlled manner. Despite the present poor water quality in Baku Bay, excessive sediment loads from run-off are undesirable due to the potential threat to the water and bottom environment. Monitoring of the reclamation operations are therefore recommended in order to minimize possible negative environmental impacts. The monitoring program should be outlined and agreed in co-operation with the authorities in Azerbaijan.

Due to the fact that dredging operations and opening of new quarries are not expected, chemical analysis of sediment samples from the harbour and the bay, is not a necessity, in relation to the baseline study.

6.2 Operation Phase

The project will up-grade existing facilities, regarding waste management and provide new facilities regarding traffic handling operations that will improve the present environmental situation of the terminal. Monitoring should therefore only consist in checking that the project is completed as planned.

In the longer run, environmental monitoring may become relevant in connection with an important increase in traffic and lowering of the water level, see Chapter 5.2.

7.0 CONCLUSION, SAFEGUARDS AND MITIGATION MEASURES

With respect to the present environmental situation in the Port of Baku, in the city itself and in Baku Bay, which has been described as "disastrous" by nearly all institutions concerned, negative impacts of the planned phase 1 project can be considered as negligible, in fact, in several ways the project is expected to contribute to an improvement of the environment (safer operations, better working conditions, increase to economy).

Besides the need for improvements regarding the handling of oil and chemical spills, which is described as part of the evaluation of the general port, see ref. /3/, the only concern regarding the ferry terminal concentrates on long-term development in connection with important increases in traffic and change in water levels. In these cases, both the traffic access to the port/terminal from the land side (dedicated traffic access corridor), and from the seaside (maintenance/deepening dredging) should be re-analysed.

ANNEXES

1. List of References

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8. Phase 2, Detailed Design Report - Baku, March 1997 (Tacis/RAMBØLL).

Annex 2
Environmental Assessment Report from Kaspmornii

EC- Tacis/Traceca Programme

RECONSTRUCTION OF FERRY TERMINAL IN BAKU

ENVIRONMENTAL ASSESSMENT

BAKU 1997

EC- Tacis/Traceca Programme

RECONSTRUCTION OF FERRY TERMINAL IN BAKU

ENVIRONMENTAL ASSESSMENT

Director of KASPMORNIIPROJECT	Mustafaev F. A.
Leader of the group of specialists	Bagirova T. G.
Head of BEL?	Babayev A. S.

BAKU 1997

CONTENT

Preface

The present report, as a part of the project "Reconstruction of the ferry terminal in Baku", contains Assessment of the Influence to the Environment of suggested plan of the reconstruction of the ferry terminal.

The all information presented here is taken from materials of investigations, carried by employees of Kaspmorniiproject during different years.

In the work is given comparing characteristics of conditions of the environment in different years. Influence of the exploitation of the ferry terminal to the environment and measurements to reduce the negative influence.

1. Natural conditions

Baku ferry terminal is located on the northern part of Baku bay, which is situated on the southern cost of Apsheron peninsular between Shickov cape on the west and Sultan cape on the east (drawing 16878). The bay is protected by islands Nargin, Plita, Wulf and Peschatiy. The last one has been connected with the mainland with man-made dike.

The relief of bay bottom is calm; from Sultan cape to the wide pier of Baku sea port is laying a narrow shallow with depth up to 5 m, which further occupies the all northern-western corner of the bay between the mainland and Bailov spit, and turns into underwater continuation of the spit. The shallow follows again as narrow strip towards the south of Bailov spit up to Shickov cape. The depth is gradually increasing going further out of the costs, and in the central part of the bay reaches 7-9 m.

The wind regime of Baku bay district is characterised by the dominating during year north and south winds, annual average recurrence of which is correspondingly 40.5 and 18.7 %. Major increasing of north winds 49.3 % distinguishes in summer, south winds - 24.7 % - in spring. Annual average recurrence of calms is 7.6 %. Annual average recurrence of strong and stormy winds is characterised in the following table 1.

Table 1.

Gradation of speed m/sec.	Points								Total
	N	N-E	E	S-E	S	S-W	W	N-W	
9-13	10.30	0.16	0.02	0.18	1.92	0.83	0.09	1.11	14.61
14	6.03	0.04		0.01	0.28	0.21	0.02	0.60	7.19
Total	16.33	0.20	0.02	1.19	2.20	1.04	0.11	1.71	21.80
Max. speed	40	20	12	20	28	18	16	28	

The duration of storms is between some hours and some days.

The wave regime on the bay basin is mainly defined according to dominated winds, and specially northern winds, recurrence of which is 16 % with speed 9 m/hours, and the total recurrence of winds of other directions with the same speed is less than 6 %.

But southern winds are the most wavy, which is characterised by major dispersal and increasing of waves on the open sea with deep water.

The influence of the roughness to the bay bottom during north, north-west and south, south-west storms, where the horizontal wave speeds in the given layer are "washing" for silt and sandy soils. During north and north-west storms the "washing" zone touches the big part of the bay basin towards the south from 7 meter isobar, excluding the two small areas on the west and on the east, where the zone border is moved to the north towards less depth, which causes the peculiarities of the bottom orthography. Frequency of such stormy situations can reach 48-50 occurrences per year on the part of the basin between Nargin island - Sultan cape - Plita island on average 11-12 hours duration of the situation. On the rest part of the basin their frequency is not exceed 4-5 occurrences island on average 6 hours duration of the situation. On south and south-west storms the "washing" zone touches almost the all bay basin, excluding north-east corner towards the north from Bailov spit and the coastal strip of Nargin island. Frequency of such situations can reach 6-7 occurrences per year on average 5 hours duration.

Permanent currents in Baku bay are missing, but drif currents are observed, which depend on the wind speed and direction on the surface layer. In the under layers, approximately from the depth of 2-2.5 m, permanent transit flow is existing during the defined winds. This flow comes to north coast of the bay from the sea side through south-west pass between Shickov cape and Nargin island. In north coast it turns towards the east and further towards the south and directs through the south-west pass between islands Nargin, Plita, Wulf in the sea.

In the same time anti-currents, rotations, whirlwinds appear in the bay, which are formed in the branching places of main flow and when it meets with anti-currents. Whirlwinds normally have little speed, weak turbo and insignificant exchange with transit flow, and form "stagnant zones".

Such zones are located on the north and south sides of Bailov spit, between Nargin island and Sultan cape, and around northern coasts of Nargin island. Anti-cyclone water rotations, which can be shifted to the south-east and south- west depending on the transformation of the main flow, are formed in the central part of the bay. The current speed in this layer on the central part of the bay during strong north wind increases towards the centre of anti-cyclone rotation from 0.2 up to 0.6 m/sec. Speeds analogous in volume are observed also on the south-east pass of the bay between the islands Nargin and Plita.

The ground deposits of the bay consists of dominating silts and sands, in separate places limestone and shell spots can be met.

The content of suspended fractions in the water of the bay is defined according to weather conditions and also intensity of vessel sailing, and it can be changed within rather wide limits from 2-5 mg/l in calm weather, 50 mg/l during winds up to 11m/sec. and to 220 mg/l on strong storms.

2. Atmosphere

Considerable influence to the pollution of the atmosphere on Baku ferry terminal area, makes its direct closeness to the industrial zone, so called "Black city", where there are oil refining, machinery factories and shipyards. Background concentrations of pollution in the atmosphere on Baku ferry terminal area are shown in table 2.

Table 2.

Polluter	PDK mg/m3	Volume of average annual concentrations mg/m3 on wind gradations				
		Calm	North	East	South	West
Dust	0.15	0.326	0.430	0.496	0.310	0.341
Sulphuric gaz	0.20	0.233	0.340	0.398	0.209	0.224
Carbon oxide	3.0	2.831	3.613	3.793	2.774	2.793
Nitrous oxide	0.24	0.150	0.208	0.231	0.130	0.198
Soot	0.05	0.110	0.145	0.152	0.097	0.100
Fluoric hydrogen	0.005	0.003	0.006	0.007	0.004	0.005
Hard fluorines	0.020	0.221	0.026	0.030	0.018	0.021

As one can see in the table, maximum concentrations of pollution of atmosphere on Baku ferry terminal area is during the period of increasing of north and west winds, which confirms the negative influence of the industrial zone.

3. Soils

All the ferry terminal area is reclamation soil. Long time exploitation and the influence of the close industrial zone coursed pollution of surface layer of the ferry terminal area. Results of analysis of surface soils of the ferry terminal area are shown in table 3.

Table 3.

Polluter	PDK mkg/g	Average concentration mkg/g
Oil Products		
Lead	20	19
Manganese	1000	480
Copper	3.0	18
Zinc	23	31
Nickel	4.0	14
Chrome	6.0	19
Vanadium	150	34
Cobalt	5.0	17
Mercury	2.1	0.097

As one can see in the table, the soils of the area is polluted with copper, zinc, nickel, chrome, cobalt and oil products.

4. Sea Water

Baku bay waters really completely polluted with oil products, distribution of which is rather stable on the basin and is caused by the location of pollution sources and by circulation character of water. On the picture 1 schemes of distribution of average concentrations of oil products in conventional units during stable north and south winds. According to these schemes the major concentration of oil products is during north winds and also during south winds on coastal strip along the coasts and on the north-west part of the bay in the north of Bailov spit. In this case concentration of oil products is considerable higher on increasing south winds than on north winds. The last situation is explained by entering into the bay an additional quantity of oil products from the open sea and by head of industrial waters thrown into the sea. The major concentration of oil products is in the surface water layer, the list - in the middle layer. Concentration of oil products increases again in the layer on the bottom, which is due the secondary pollution of the water in the border "water-soil" on stirring up the deposits during currents and roughness, but on absolute volume, as a rule, is less than on the surface layer.

Investigations of water pollution in Baku ferry terminal and port basin have been carried out during different years. Indices of water pollution in Baku ferry terminal and port basin are shown in the table 4.1.

Distribution of concentrations of oil products depending on the depth is characterised in the following.

Average concentrations of oil products
in sea water

Table 4.1.

Polluter	PDK ml/l	1982	1989	1993
Oil products	0.05	2.13	1.24	0.50
Phenol	0.001	0.018	0.016	0.011
Copper	0.005	0.004	0.003	0.002
Nickel	0.01	0.007	0.003	0.002
Vanadium	0.1	0.004	0.003	0.003
Beryllium	0.0002	0.0002	0.0002	0.0002
Chrome	0.2	0.014	0.011	0.12
Mercury	0.0001	0.0004	0.0003	0.0001

As one can see in the table, the sea water of Baku ferry terminal basin is polluted with oil products and phenols, the content of heavy metals in average are within the normal limits. In the same time tendency of decreasing of pollution is observed, which is explained by recession of production in last years, by increasing of water exchange due water level rising and starting to use Greater Baku sewerage.

In the table 4.2. is shown the general chemical content of water in the region of ferry terminal.

According to SNiP 11-28.73, the sea water in the given region is mild aggressive on sulphate to concrete with Port-land cement, Puzzolan cement, blast furnace cement

and to concrete of high density with sulphate resist Port-land cement and Puzzolan cement.

Table 4.2.

Chemical content of Baku bay water
(ferry terminal region)

Components of chemical content	Unit of measurement	Depth of sampling		
		surface	middle	bottom
Dry remaining	mg/l	12815.0	12850.0	12875.0
Total salts	mg/l	12524.7	12543.7	12655.0
CO_3	mg/l	0	0	0
	mg/equ	0	0	0
HCO_3	mg/l	244.0	244.0	244.0
	mg/equ	4.0	4.0	4.0
Cl	mg/l	5106.0	5106.0	5175.0
	mg/equ	148.0	148.0	150.0
SO_4	mg/l	3038.9	3053.3	3034.0
	mg/equ	63.2	63.4	63.1
Ca	mg/l	280.6	280.6	280.6
	mg/equ	14.0	14.0	14.0
Mg	mg/l	729.6	729.6	705.3
	mg/equ	60.0	60.0	58.0
Na + K	mg/l	3247.6	3252.2	3337.3
	mg/equ	141.2	141.4	
pH		8.4	8.36	8.31
Total liquid	mg/equ	74.0	74.0	72.0
carbonate hardness	mg/equ	4.0	4.0	4.0
permanent hardness	mg/equ	70.0	70.0	68.0
Aggressive CO_2	mg/l	0	0	0

5. Ground deposits

Soil of Baku bay is Apsheron and Quaternary deposits, which are completely covered with Modern deposits. Apsheron deposits are mainly consisted of sandy clay and slime-shell. Consistence of the clay is from hard to fluid-plastic, break up volume from 0.6 m to 3 m.

Quaternary deposits are consisted of loam and clay. The loam is of dark-grey and green-grey colour from half-hard to fluid-plastic consistence with break up volume from 0.3 m to 4.2 m. The clay is from dark-green-grey and red-brown colour from half-hard - soft-plastic consistence. The break up volume of the clay is 1.0 - 2.7 m.

Modern deposits are sands and silts. The sands are of grey colour, small and dusty of middle density, break up volume from 0.6 to 5.0 m. The silts are loamy and with clay mixed with shells, latent-fluid and fluid consistence. The break up volume of the silts is from 0.2 to 12 m.

Ground deposits of Baku bay are in all places, as sea water, polluted with oil products. Average content of oil products on the surface layer of the ground deposits of the bay with a volume of 0.5 m is increasing on the direction from the East towards the West, from 15-30 mg/l to 150-200 mg/l, reaching the major volume in the north-west corner of the bay, limited from the South by Bailov spit. In the layer of ground deposits of 0.5-1.0 m the concentration is sharply decreased, and actually doesn't exceed 16 mg/l in the eastern part and 80 mg/l in the western part of the bay.

The ground deposits of the scoop and the access channel are fluid-plastic silt. The main polluters of ground deposits are oil products. Equally with oil products ground deposits are polluted with heavy metals. In the table 5 are shown average concentration of pollution on the surface layer of ground deposits of the basin of the ferry terminal in different years.

Table 5

Average concentrations of pollution in the ground deposits in mg/g of soil

Polluter	1982	1989	1993
Oil products	170.0	147.0	131.0
Phenol	0.010	0.007	0.003
Copper	0.040	0.036	0.032
Lead	0.019	0.011	0.010
Nickel	0.050	0.51	0.049
Vanadium	0.070	0.063	0.064
Beryllium	0.002	0.001	0.001
Chrome	0.400	0.340	0.320
Mercury	-	0.001	0.00061

As one can see in the table, the ground deposits of Baku ferry terminal basin is heavily polluted with oil products. According to "Table of the indices of pollution of ground deposits" accepted by international association of congresses on navigation (appendix 1), ground deposits of Baku ferry terminal basin classified as polluted with chrome salts.

6. Hydra-biological characteristics

The content on zoobentos (ground animals) in Baku bay is very poor. Mainly bentos organisms are in the region of Nargin island. There one can find the following types: nargis, balanus, mitilaster, cerastoderma, abra. These organisms have been met only in separate samples, and they were missing in the regions of heavy pollution.

The total biomass of bentos in 1989 was from 3.6 to 202.04 g/m2, 40 -1520 for one square meter. Abra, mitilaster and balanus, which live with filter method, had higher indices among ground animals. Types, which are not filtrates, perish quickly in conditions of intensive pollution except oligochets P. deserticoia. Al the types found in the bay bentos are of Azov and Black Sea origin. Azov and Black Sea types are more standable to pollution than Caspian aborigines.

In general we can conclude that Baku bay is poor with bentos animals.

In the scoop and the access channel of the ferry terminal ground fauna is completely missing.

7. Micro-biological characteristics

Result of pollution of Baku bay is the change of hydro-hydrobiological character, related to natural biological processes. Coming of industrial and domestic sewage of Baku city into the bay led to sharp infringement of productive-destructive environment processes. Statitionary coming of hydro-cabons of oil origin was a reason of death of plankton organisms, specially filtrates, which are one of the main representatives of active form of biodegration of organic substratum. Oil and its complicated components transferred by current, wind, distributed in contiguous parts of the bay and made considerable losses to fauna-flora of the exchanged water.

Oil and its homologies, confirmed by biological degradation, being adsorbed during years accumulated on the soil of the bay, as a result, concentration of many such substances were accumulated on the soil of the basin. Isolation of ground deposits led to a sharp deterioration of increasing conditions of microbe zinnous in it and almost took away the important function in mineralization of organic substratum of wide group of aerobic bacteriums.

Hydro-biological investigations of the sea water in Baku bay showed that the total quantity of bacteriums fluctuates within the limits of 760 thousand and 4.1 million cells in 1 ml. A big quantity of bacteriums is along the coast of the bay. The central part of the bay is characterised by equal distribution of bacteriums, the annual average

quantity of which was 2 million cells in 1 ml. Quantity of bacteriums was not more than 1.7 million/ml.

So it was defined that the quantity of bacteriums from the coast to Nargin island decreased 2-5 times.

Saprophit bacteriums, differing from the total amount of bacteriums by their quantity, with the help of which the presence of microbe cells - alive, dead and other forms, give an opportunity to separate physiologically active micro-organisms, which take part in biodegratation of organic substance. Investigations carried out during many years showed the increasing of the quantity saprophit bacteriums. But during the last years due the start of Greater Baku sewerage and the stop of running of domestic sewer into the bay, the quantity of saprophit bacteriums started to diminish.

Investigations also showed, that oil-oxidising bacteriums, growing in different oil products, are widely distributed both in water and in ground deposits. Quantity of oil-oxidising bacteriums in water fluctuates within the limit of 10-100 thousand/ml. The oil-oxidising bacteriums play an important role in the cleaning of water and ground deposits.

On the basin of the ferry terminal average quantity of saprophit bacteriums in the water is 50 thousand/ml., in the ground deposits is 30 thousand/ml of dry soil. Oil-oxidising are 90 thousand/ml., in the ground deposits 32 thousand/ml of dry soil.

8. The second time pollution of the environment in the process of the exploitation of the ferry terminal

The main second time pollution of the environment in the process of the exploitation of the ferry terminal happens during the birthing and sailing out of ferries.

The ferries during sailing through the channel and manoeuvring in the scoop of Baku port, due shallow waters, stir up the ground deposits by propellers and happens the second time pollution of the sea water.

Experimental investigations have been carried out in 1989 to define the degree of negative influence of the exploitation of the ferries to the sea, the investigations have been carried out in calm weather to avoid the influence of wind. The speed of current in the investigated area was 12 cm/sec. The samples have been taken directly in the scoop and in ranges of 100 m, 250 m and 500 m far from the scoop. The samples have been taken before and after passing of the vessel every one hour during 4 hours. Taking into account the pollution of ground deposits the taken samples have been analysed for oil products. The results of analyses are shown in the table 8.

Table 8.

Concentration of oil products in the sea water

Sample taking time	Ranges of taken water samples			
	in the scoop	100 m	250 m	500 m
Before passing of vessel	0.50	0.47	0.08	0.45
Immediately after 0.25 hours of passing of the vessel	7.23	0.62	0.49	0.43
1 hour	6.45	3.84	2.7	1.91
2 hours	3.24	3.63	2.31	1.80
3 hours	2.13	2.20	1.68	1.06
4 hours	1.05	0.97	0.82	0.61

As one can see in the table, influence of second time pollution continues more than 4 hours. Taking into account, that in the process of exploitation arrival and departure time is 3 hours, so second time pollution of the sea water in the basin and access channel of the ferry terminal will be permanently.

The second source of second time pollution with less intensity are drain waters. As it was mentioned in the part 3, the territory of the terminal was very polluted in the process of long time exploitation. The rain waters takes the pollution and together with these fells into the sea.

10. Conclusions

The sea water and the ground deposits of the basin and access channel as of all Baku bay are very polluted. The main polluters are oil products. As the investigations showed, the exploitation of ferries promotes the second time pollution of the sea water. The pollution of the terminal territory also negatively influences to the water. Taking into account that the ferry terminal is located in the industrial zone, its influence to the atmosphere is so insignificant, that it can be neglected.

Sewage disposals (settling tanks) must be envisaged in the process of reconstruction of the ferry terminal to avoid pollution of the sea with drain sewage.

The main second time pollution of the environment in the process of the exploitation of the ferry terminal happens during the birthing and sailing out of ferries. This

happens in connection of shallow depth in the basin and access channel of the ferry terminal. To avoid such pollution deepening works, which have not been carried out during many years due the rising of Caspian Sea level, must be carried out. Despite deepening have negative influence to sea water, this influence will be of single character and will make less harm then permanent pollution during the birthing and sailing out of ferries.

The State Inspection of Caspian Sea Protection gives permission for deepening works.

Organisation, who is planning to execute the deepening works, together with inquiry must present "Materials for Getting Permission for Deepening Works".

Picture 1. Fields of average concentrations of oil products in conventional units during north (1) and south (2) winds.

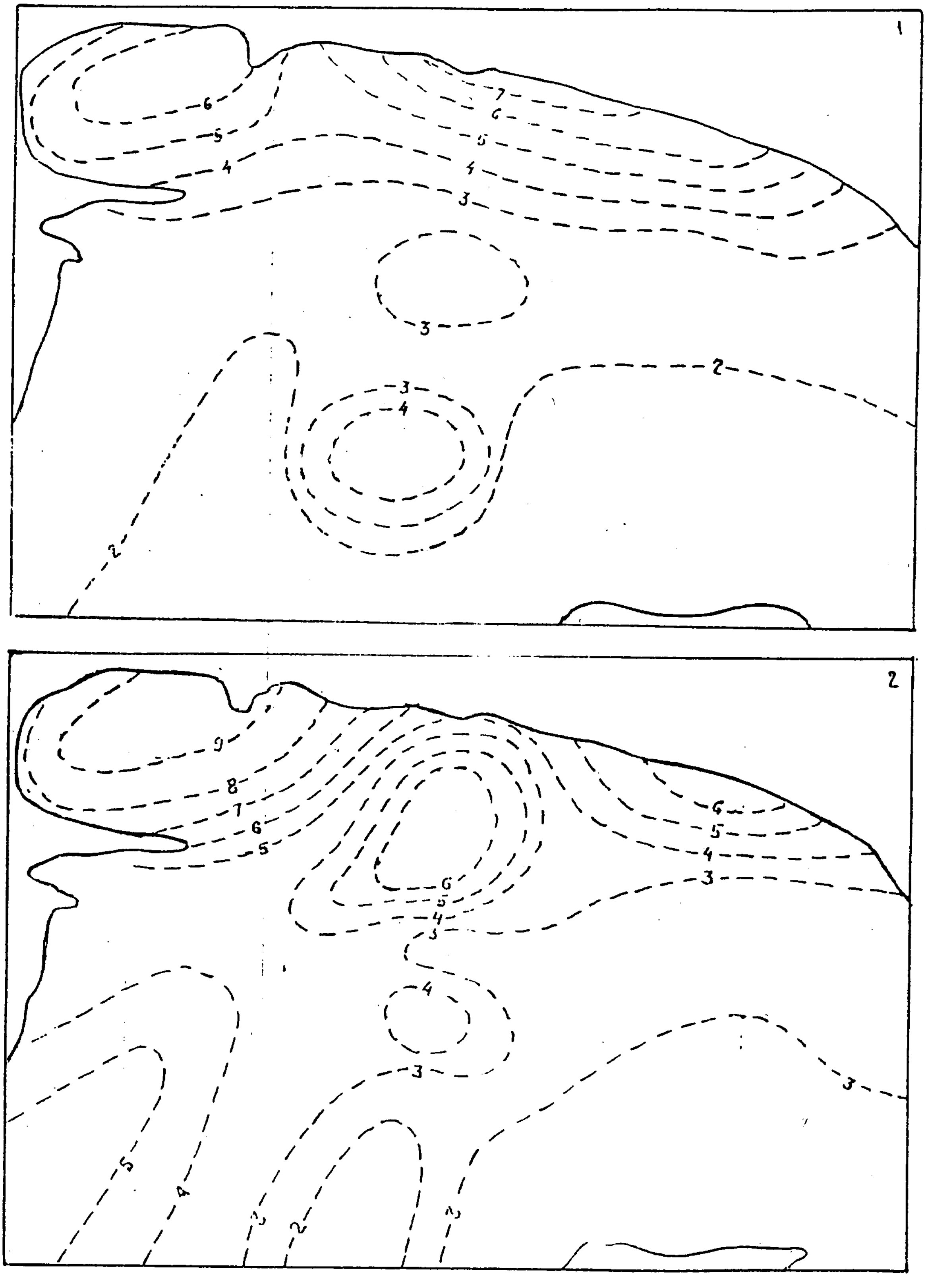


Рис.1 Поля средних концентраций нефтепродуктов в условных единицах при устойчивых северных (1) и южных (2) ветрах

Appendix 1
page 1

T A B L E
of indices of pollution of ground deposits
(according to the data of international permanent association of congresses on navigation)

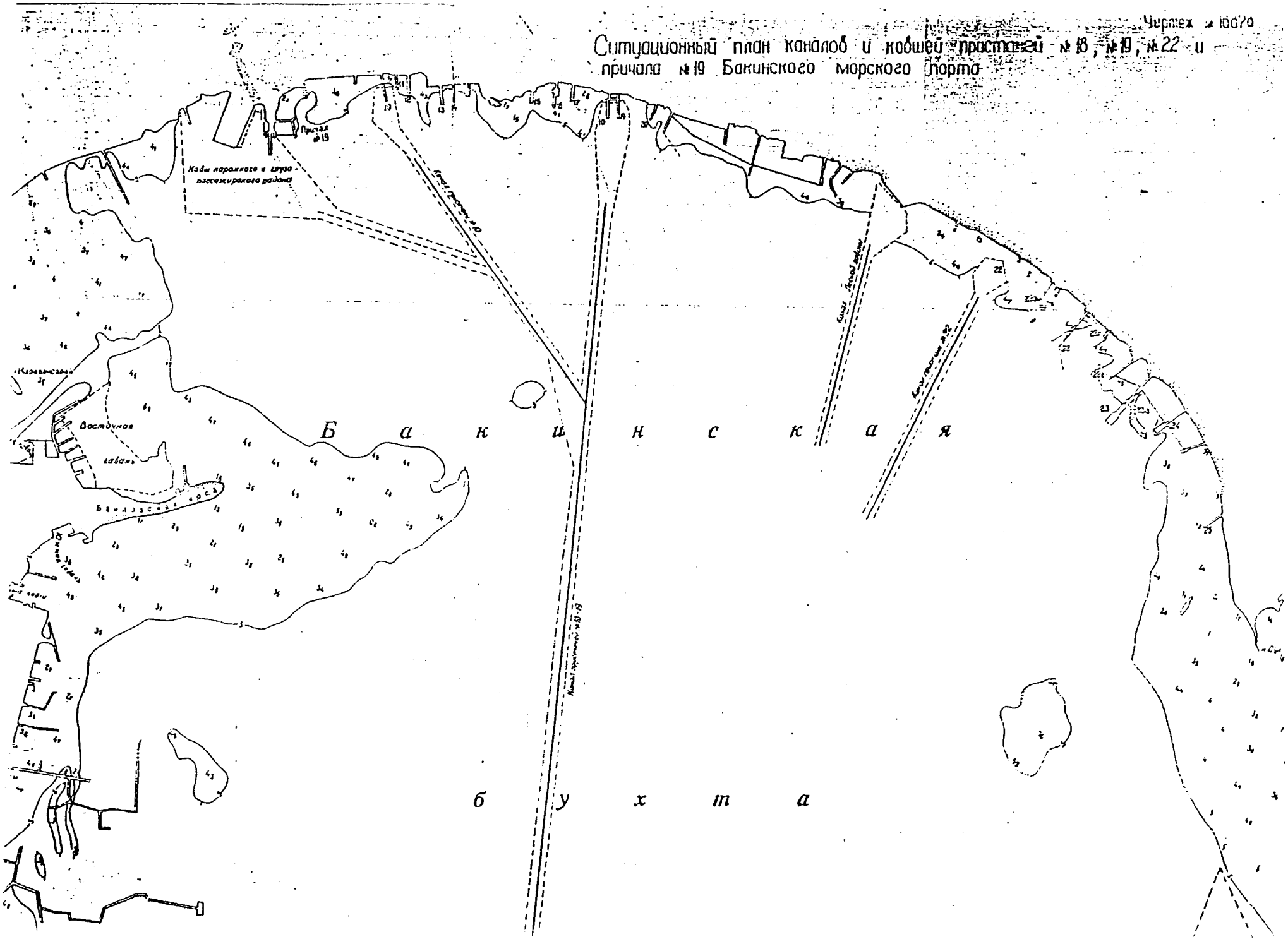
Polluter or parameter	Typical volume of unpolluted soil	Insignificantly polluted soil	Polluted soil	Heavily polluted soil	Very heavily polluted soil
pH (acid)	6-7	5-6	4-5	2-4	>4
pH (alkali)	7-8	8-9	9-10	10-12	>12
Sulma	0-30	30-50	50-100	100-500	>500
Arsenic	0-30	30-50	50-100	100-500	>500
Cadmium	0-1	1-3	3-10	10-50	>50
Chrome	0-100	100-200	200-500	500-2500	>2500

Copper (assimilated)	0-100	100-200	200-500	500-2500	>2500
Lead	0-500	500-1000	1000-2000	2000-1%	>1%
Lead (assimilated)	0-200	200-500	500-1000	1000-5000	>5000
Mercury	0-1	1-3	3-10	10-50	>50
Nickel (assimilated)	0-20	20-50	50-200	200-1000	>1000
Zinc (assimilated)	0-250	250-500	500-1000	1000-5000	>5000
Equivalent of zinc	0-250	250-500	500-2000	2000-1%	>1%
Boron (assimilated)	0-2	2-5	5-50	50-250	>250
Selenium	0-1	1-3	3-10	10-50	>50
Barium	0-500	500-1000	1000-2000	2000-1%	>1%
Beryllium	0-5	5-10	10-20	20-50	>50
Manganese	0-500	500-1000	1000-2000	2000-1%	>1%
Vanadium	0-100	100-200	200-500	500-2500	>2500
Magnesium	0-500	500-1000	1000-2000	2000-1%	>1%
Sulphates	0-2000	2000-5000	5000-1.0%	1.0-5%	>5%
Sulphur (free)	0-100	100-500	500-1000	1000-5000	>5000
Sulphites	0-10	10-20	20-100	100-500	>500
Cyanogenium (free)	0-1	1-5	5-50	50-100	>100
Cyanogenium (total)	0-5	5-25	25-250	250-500	>500
Ferrocyanogenium	0-100	100-500	500-1000	1000-5000	>5000
Thiocyanogenium	0-10	10-50	50-100	100-500	>2500
Coal tar	0-500	500-1000	1000-2000	2000-1.0%	>1.0%
Phenol	0-1	2-5	5-50	50-250	>250
Extract of tholuol	0-5000	5000-1.0%	1.0-5.0%	3.0-25.0%	>25.0%
Cyclothecsan (extract)	0-2000	2000-5000	5000-2.0%	2.0-10%	>10%

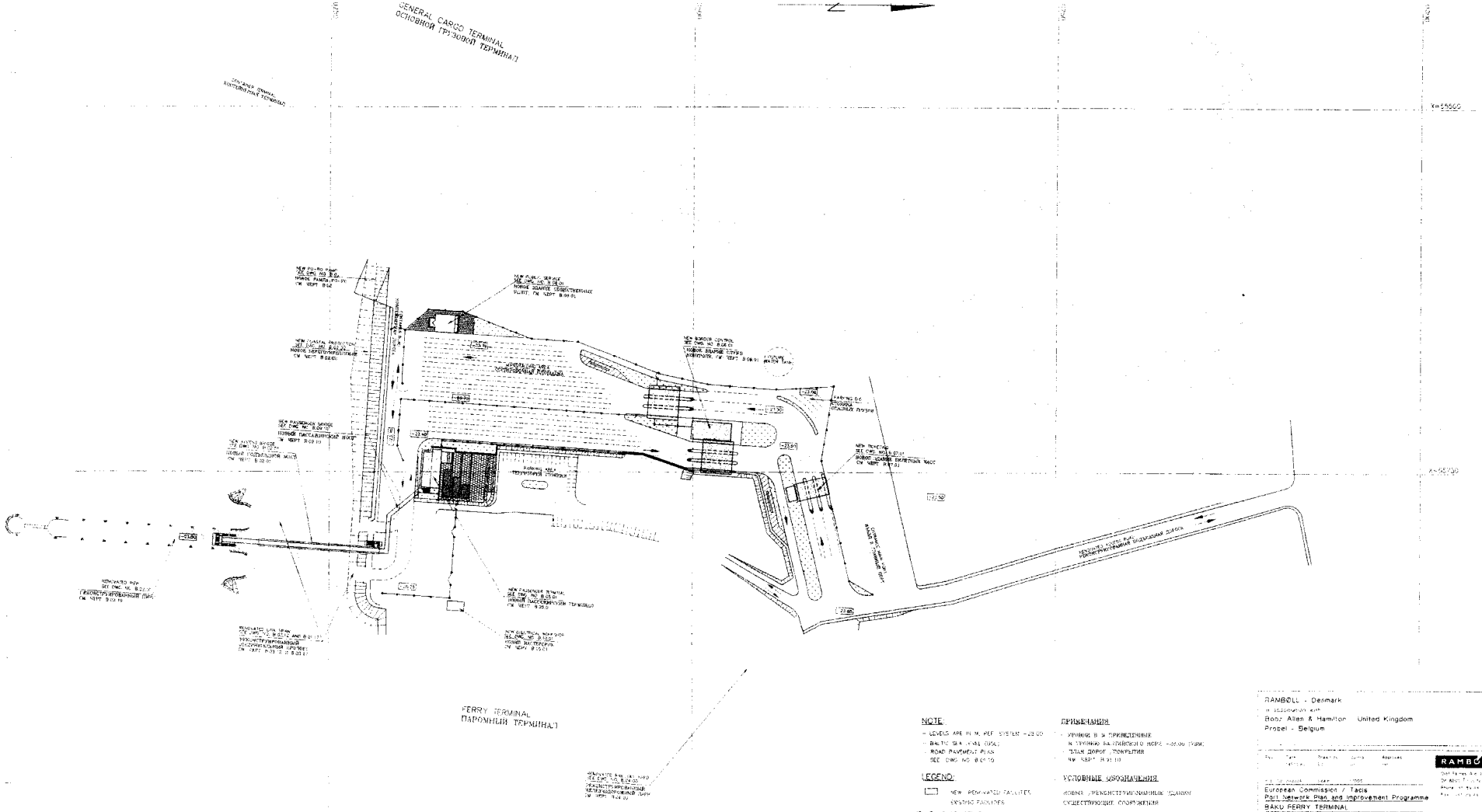
Situation plan of the channels and scoops of the piers No. 18, 19, 22 and birth No. 19 of Baku Sea Port.

Чертеж № 10070

Ситуационный план каналов и ковшей простоев №18, №19, №22 и причала №19 Бакинского морского порта



Annex 3
Baku Ferry Terminal Project Plan



NOTE:

- LEVELS ARE IN M. REF. SYSTEM -28.00 - BALTIC SEA LEVEL (BSL)
- ROAD PAVEMENT PLAN SEE DWG NO. B.01.10

ПРИМЕЧАНИЯ

- УРОВНИ В М ПРИВЕДЕННЫЕ К УРОВНЮ БАЛТИЙСКОГО МОРЯ -28.00 (УБМ)
- ПЛАН ДОРОГ / ПОКРЫТИЯ СМ. ЧЕРТ. N 01.10

LEGEND:

- NEW / RENOVATED FACILITIES
  EXISTING FACILITIES
- NEW FENCE
- -21.50 LEVEL OF RAISED AREA

УСЛОВНЫЕ ОБОЗНАЧЕНИЯ

- НОВЫЕ / РЕКОНСТРУИРОВАННЫЕ ЗДАНИЯ СУЩЕСТВУЮЩИЕ СООРУЖЕНИЯ
- НОВАЯ ОГРАДА
- УРОВЕНЬ ПОДНЯТОЙ ТЕРРИТОРИИ

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European Commission / Tacis
Pan Network Plan and Improvement Programme
BAKU FERRY TERMINAL
NEW /RENOVATED FACILITIES
GENERAL PLAN, WEST
НОВЫЕ / РЕКОНСТРУИРОВАННЫЕ СООРУЖЕНИЯ
ГЕНЕРАЛЬНЫЙ ПЛАН, ЗАПАД

B.01.03