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ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT OF ATASH MARINE BASE

EXECUTIVE SUMMARY

Rev.3

2005

Contents:

1 INTRODUCTION

1.1 GENERAL

The project is one of the first developments in the Tyub-Karagan Bay that are being executed according to internationally recognized standards. Because the Base Operator aims to provide quality service to the Caspian oil and gas offshore operation for many years ahead, it is looking for sustainable solutions to problems that may be associated with the Base development.

1.2 BRIEF DESCRIPTION OF THE PROJECT

The Atash Marine Base is planned to provide marine services to the Caspian Services Group (CSG) fleet of vessels as well as multinational oil and gas companies involved in the offshore oil exploration and production. The Base is planned to be located at the beach below the northern end of Atash settlement, on the eastern shore of Tyub-Karagan Bay (49.3500N, 44.2000E). Tyub-Karagan Bay forms a natural harbor just north of Fort Shevchenko on the eastern shore of the Caspian Sea, and is the northern-most relatively ice-free port in the Caspian Sea. The 1.8 km wide Bay 'opens' to the greater Caspian Sea to the north. The functions of the Base are:

- Fuelling, water adding and accumulator charging of ships and barges;
- Receiving of fecal wastes for subsequent assignment to refining sewage disposal plant in Bautino without additional treatment;
- Ship wintering;
- Services rotation of offshore platform;
- Ship repair and painting;
- Shipping and discharge of non - friable and non-toxic materials by crane from marine vessels.

The onshore site has an area of about 5 hectares characterized by four distinct regions. One being a sand beach, ranging in width from 10m to 60m, bounded to the west by the current shoreline of the Caspian Sea. The maximum height differential of the beach area is approximately 1.5m – it is relatively flat with a slight slope towards the sea. The beach is at the foot of, and is bounded to the east by, a rocky escarpment (approximately 15 to 16m high) and this feature essentially forms the second region. The third region consists of a relatively small area of gently sloping land above and east of the escarpment at the northernmost boundary. A similar area of gently sloping land above the escarpment comprises the fourth region toward the southern end of the site – this accommodates current access, being adjacent to the public road. A public road (running approximately north-south) passes east of the site and runs adjacent to approximately 160m of the southern portion of the boundary. An unpaved track, approximately in the middle of the site, currently serves as access to the beach from the paved road. Public electricity and land-line telephone utility infrastructure run parallel to the public road in the form of overhead wires. No other utility infrastructure (water, sewerage, heating etc.) exists in the vicinity of the site.

The offshore site is anticipated to extend up to 350m from the existing shoreline. A wrecked and partly submerged barge extends from the beach and is orientated approximately WNW-ESE. A dredged channel is similarly aligned and links this wrecked barge with the deeper water mooring area 500m offshore.

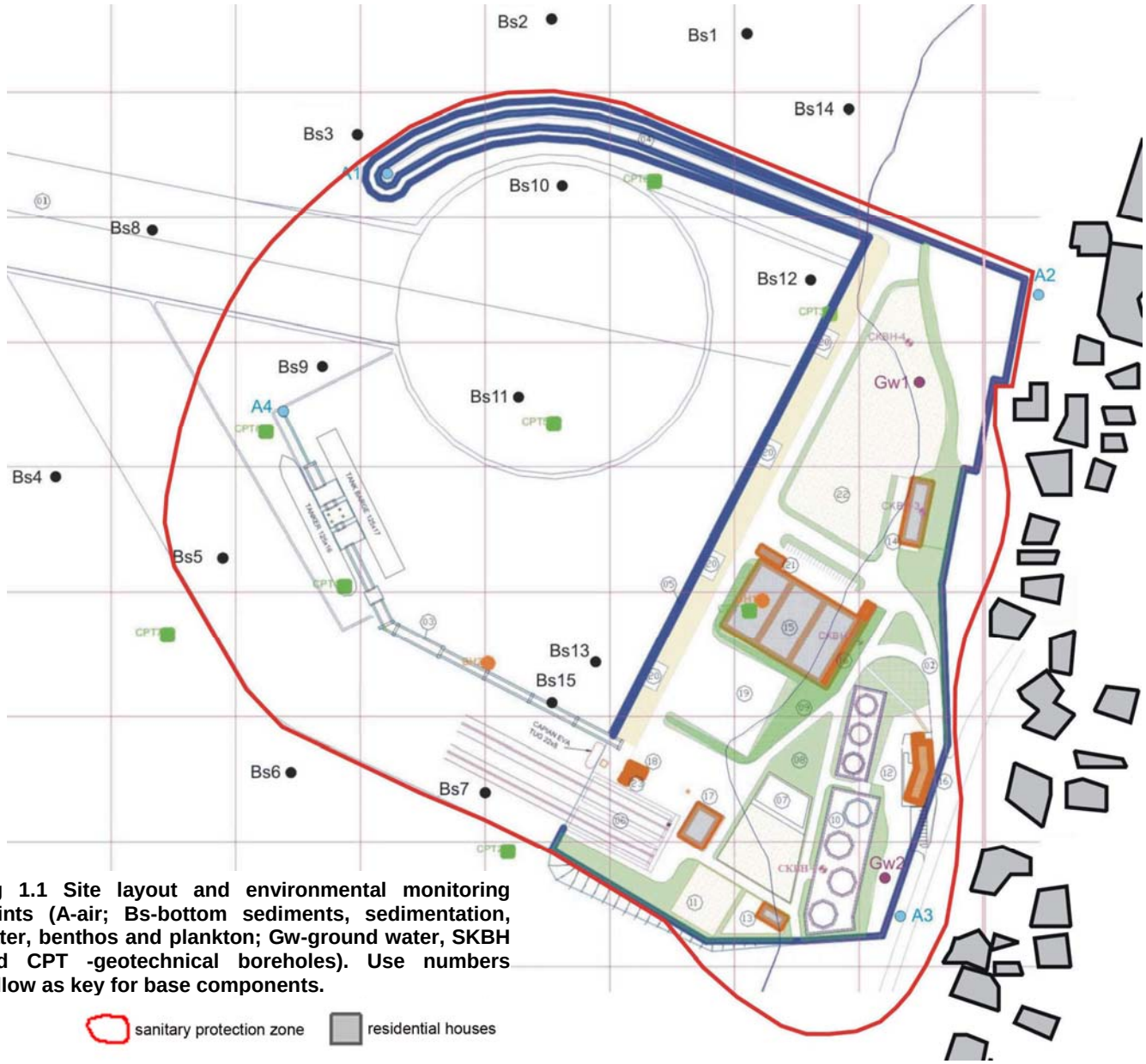

Fig 1.1 Site layout and environmental monitoring points (A-air; Bs-bottom sediments, sedimentation, water, benthos and plankton; Gw-ground water, SKBH and CPT -geotechnical boreholes). Use numbers bellow as key for base components.

The Base will consist of the following main components:

1. Access channel to 4.5 m depth;
2. Access road 300 m, width 7,5m;
3. Service jetty for fuel offloading and intake and water intake;
4. Breakwater;
5. Wharf with points for power supply, water intake, loading/offloading by 120 tons crane, sewage and oily water discharge;
6. Slipway for vessel repair and construction with tuggers and cutwater;
7. Desalination plant with two 1000m3 holding tanks;
8. Civil works;
9. Lay-down area;
10. Fuel storage area;
11. Waste Water Tank;
12. Three 1000m3 standing potable water storage tanks and the water pumping station;
13. Fire water reservoir;
14. Energy centre (power and heat);
15. Closed multifunctional warehouse and support facilities 6000m2;
16. Office and laboratory for fuel testing;
17. Waiting room for rotational crews;
18. Workshop;
19. Cargo storage area;
20. Crane Pad;
21. Truck balance;
22. Future Expansion;
23. Control room

Below a summary of the project is given:

Land taken	Coastal area - 4 ha, Sea water area – 4ha.
Radius and area of the Sanitary Protection Zone (SPA)	Recommended sanitary protection zone towards Atash village – 100 m does not cover the village.
Quantity and number of floors in production units	8 single-storey constructions at 80 000 m^2 area. Tall buildings: three 10m fuel storage reservoirs and three 10m portable water reservoirs, 16m boiler-room pipe
Planned construction of additional social and cultural premises	none
List of main products and the volume of production	Provision of services to vessels supporting offshore production of oil and gas.
Main technological processes	Fuelling, water adding and accumulator charging of ships and barges, ship construction, repair and painting, shipping and discharge of non - friable and non-toxic materials, ship wintering, desalination of sea water
Justification of the social-economic need for the project activity	Base construction and operation will directly or indirectly increase the number of working places for local population and labour contracts for local companies, support service sector and small business development; enlarge the experience of local personnel through work and studying with invited specialists; will improve infrastructure of the region and potable water accessibility; will enhance return of duties in state, regional and district budget.
Construction schedule	Base is planned to be constructed during 18 months, February 2006 – June 2007

1.3 CONSIDERED PROJECT ALTERNATIVES

1.3.1 Introduction

A number of alternative engineering design options were considered starting at a conceptual level including the “no development option” and subsequently adding detail for each conceptual option through the design and planning process. For the major components of the development the project design options were identified and evaluated using a number of screening criteria. Non-viable options were rejected at an early stage in the process and potentially viable options were taken forward for further consideration. The following screening criteria used:

- safety;
- technical feasibility;
- environmental implications;
- capital expenditure (CAPEX);
- schedule and ability to execute the project;
- operating expenditure (OPEX);
- availability of infrastructure and resources;
- operability;
- reputation; and
- partner and government agreement.

It should be noted that the project also considers Best Available Control Technology (BACT) in its selection process and as a mechanism for minimizing releases to the environment in a cost effective and legislatively compliant manner. BACT uses a ‘top-down’ approach to the selection and evaluation of technology, starting with the best technology possible for the application, followed by the next best through to the least appropriate for the requirement. Each technology is considered on a cost benefit basis, taking into account

technical and operational limitations. In the assessment of the options available for the project components and utilities, BACT was determined in many cases by using Best Practicable Environmental Option (BPEO) and environmental cost benefit analysis studies.

This Chapter reviews the main decisions regarding the engineering and design options that were made for the project components in order to arrive at the project's Base Case Design as described earlier.

1.3.2 No Development Option (Discussion of Need for Project)

The main aim of the Atash Base Project is to provide better, quicker and safer services to the fast increasing fleet of the offshore oil production industry. The indication of demand for more service bases comes from the main offshore field's operator AgipKCO. The information in Tab. 1.4 also supports the assumption of growing demand - other developers plan to build 3 more support bases in the Bay. The general policy of the local and central Government towards developing the Bay to support offshore oil production industry also suggest that it is highly likely that the Project territory would be developed as a support base anyway even if this Project does not go ahead now.

Tab. 1.4 Marine operations support bases in Tyub-Karagan Bay

Owner	Function	Location in Bay	Status
1. Agip KCO	Oil operations support	west side	Operates
2. Kazmunaygas	Oil operations support	east side	Operates
3. Kazakhrybflot	Fishing	South	Operates
4. Kazakhrybflot	Fishing	South	Renovation
5. Batys	Military	South	Operates
6. Talshik	Non known	South	Operates
7. Caspian Entergy Group	Oil operations support	South of AgipKCO	Design
8. Tenis Service	Oil operations support	North of Atash Base	Passed Approval
9. Tenis Service	Oil operations support	South of Atash Base	Design

1.3.3 Location

Location of the Base in the Tyub-Karagan Bay rather than outside of it is determined by three main factors: 1) natural shelter from waves and ice and 2) proximity to the existing and prospective infrastructure 3) Kazakhstan policy towards developing the Bay. Also, considering the environmental sensitivity of the territories adjacent to the Bay, the impact on the wildlife would invariably increase elsewhere and the positive social effect decrease.

As to position within the Bay, practically all the land along the shore has been purchased or allocated to specific purposes. Repurchasing of land from the other holder would be expensive to the extent of making the Project non-viable.

1.3.4 Scale

The Base scale is restricted on one hand by 1) prediction of the number of vessels required servicing, by 2) shortage of suitable land at the Bay shore, and by 3) the required clearance at the Bay centre for vessel maneuvering. On the other hand, the minimum size of the Base is restricted by the need to have space for

possible future expansion of facilities. While the offshore parts of the Base are less flexible for expansion, there are some options for potential growth south of the site. In the future, subject to approval, some facilities can also be put above Atash village on the terrace.

1.3.5 Layout

The Base layout was designed to reduce risk of accidents and pollution levels as well as improve working conditions and energy efficiency. Positioning the Fuel Storage Facility 2 km away from the sea shore to comply with the standard requirements for the Sea protection [1] would introduce additional risk associated with laying the pipe a few meters from the residential housing of Atash, pumping fuel 88m up the 3 escarpments and releasing it from this height to fuel the ships. Coupled with a more complicated level of required controls and fire fighting arrangements and the local ground structure the risk increase could be considerable. Accidental release of a sizable volume of diesel at the Farm positioned on the plateau would inevitably turn up in the sea although with some delay. In addition, visual impact of the 10m high silver tanks at the plateau projecting on the skyline would be far greater than when they project onto the escarpment. For this reason it was decided to position the fuel tanks at the Base, in view from the control tower, close to and level with the fuelling taps and the fire fighting system. The 20m high escarpment will protect the village in case of fire or explosion.

Originally considered construction of a 500m long jetty without the breakwater was thought as risky. First, it would greatly restrict vessels maneuvering in the Bay. Second, there would be risk of unrestricted ice pack crushing vessels stuck along the jetty for wintering. Although this original option excluded need for dredging, the consequence of possible accidental release of pollutants in the open sea from vessels damage can be much greater than the temporary effect of dredging. Considering this, the jetty was shortened to 350m and the 430m breakwater introduced to protect the Base from waves and ice. The introduction of the breakwater will not change near shore sedimentation significantly because the currents at the Bay appeared to be simple and mainly wind directed towards or away from the shore.

1.3.6 Operating conditions

Optimal and recommended by SNiP operating conditions (working hours, lighting, heating etc.) have been selected for the Base construction and operation. The exclusion is continuing dredging and steel sheet piling on Saturdays and Sundays during construction. This is done to shorten the activities that hold back the construction of the rest of the Base. If these jobs are not carried out on weekends, the construction phase can slip into the spring period and cause considerably more environmental damage than with the current arrangement.

[1] Sanitary standard (SanPiN) 3.01.054.97, par. 4.4.2

2 LEGAL AND INSTITUTIONAL FRAMEWORK

2.1 KAZAKHSTAN ENVIRONMENTAL PROTECTION PRINCIPLES

The Environmental Protection Law [2] states general principles of integrated regulation of interactions between society and nature. The law identifies legal, economic and social foundations of environmental protection and is aimed at the provision of environmental safety, prevention of harmful impact to natural systems from economic and other activity, and conservation of biological diversity and rational nature management. The main principles are postulated in the Environmental Protection Law as follows:

- Priority of public life and health protection and insurance of good environmental conditions for life and work;
- Balanced solutions of socio-economic and environmental problems to facilitate transition toward sustainable development in a market-regulated economy;
- Ensuring environmental safety and rehabilitation of disturbed ecological systems;
- Rational use and replenishment of natural resources, gradual introduction of payments for the use of these resources, and economic incentives for environmental compliance;
- Preservation of biodiversity and natural features with ecological, scientific, or cultural significance;
- State control and regulation of the environment and penalties for non-compliance of environmental legislation;
- Prevention of environmental damage through environmental impact assessment;
- Active and democratic participation of the general public, non-governmental organizations (NGOs), and the local authorities in environmental protection; and
- 9. International cooperation.

The main objective of the Kazakhstan environmental legislation is to regulate the relationship between society and the environment in order to improve the quality of the environment while rationally using and replenishing natural resources and reinforcing regulatory compliance.

2.2 ENVIRONMENTAL APPRAISAL OF DEVELOPMENTS IN KAZAKHSTAN

The Ministry of Environmental Protection (MEP) is a central operating agency managing intersectorial coordination of development and implementation of the state environmental policy. MEP includes 5 departments and 4 state enterprises [3]. The State Environmental Expertise and Nature Use Regulation Department (SEE) is concerned with approving activities of the republican scale organizations and projects. The screening criteria for assigning the republican scale are given in the Environmental Impact Assessment Instruction [4]. For the new projects of the republican scale the SEE organizes the State Environmental Review (SER) of the design documentation and issues the final approval but delegates the actual review to its regional (or municipal) branches and an independent environmental consultancy

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2 Environmental Protection Law,1997 N160-1with alterations and additions of 24.12.98; of 11.05.99 r. N381-1; of 29.11.99 N488-1; of 04.06.01 N205-II; of 24.12.01 N276-II; of 09.08.02 N346-II; of 25.05.04 N553-II; of 09.12.04 N8-III; December 20, 2004 N13-III ЗРК; April 15, 2005 №45-III ЗРК; July 8, 2005 № 71-III ЗРК; January 31, 2006 №125-III ЗРК.

3 RoK Ministry of Environmental Protection official site www.nature.kz and List of organizations under the supervision of RoK Ministry of Environmental Protection by the decision of Government of Republic of Kazakhstan of October 28, 2004 N 1113

4 Instruction for performance of assessment of environmental impact from planned industrial and other activity during preparation of pre-feasibility, feasibility, detailed design and design for construction studies, # 68-П, 2004

selected by the project developer for the given list of licensed companies [5]. The smaller projects are approved by the SEE regional (municipal) branches. The review usually lasts for 3 months and must not exceed 6 months without explanation [6(A26)]. The SEE rarely prohibits a development but it can impose the conditions that will make the project uneconomic.

It is prohibited to develop and perform projects having environmental impact without their preliminary assessment. Banks are also not allowed to fund the project that have not obtained the SEE final approval of the detailed design documentation and the EIA that are submitted for the review together. The SEE approval usually comes with further recommendations that are compulsory for implementation. The SEE can apply to the Minister of Environmental Protection to withdraw the SEE approval if the developer does not show that these recommendations are fulfilled in a specified timeframe.

Assessment of environmental impact from the planned Project must be carried out by a company licensed to perform EIAs in Kazakhstan [7] . The need for and scope of Environmental Impact Assessment (EIA) at design stage is specified in the current EIA Instruction EIA [4] but final decision is taken by the regional or central environmental protection authorities. In general such assessment is required for projects that will use natural resources and may negatively impact the environment. All four stages of engineering studies (pre-feasibility, feasibility, detailed design and design for construction studies) must include assessment of environmental impact to the details that the knowledge of the technical specifications of the project permits.

Tab. 2.1 Correlation between the Environmental and engineering stages during design

Engineering stage	EIA stage
Pre-feasibility	Review of environmental conditions
Feasibility Study "TEO"	Environmental Protection Chapter in FS of Preliminary EIA
Detailed design "Tekhprotekt"	EIA
Design for construction	Environmental Protection Chapter *

* provision for significant changes in design and impacts after EIA.

The SEE can release the developer from conducting the next stage if they are convinced by the submitted assessment that the negative effects are absent, small, short-term and benign.

Before the start of any development, licenses have to be obtained for natural resource use, discharges and emissions of pollutants, waste disposal and for undertaking hazardous activities. Environmentally dangerous activities (see [8],[9] for definition) are subject to obligatory state licensing[1(A21)] and environmental insurance[10(A.3,A7.1)]. Items subjected to obligatory determined by the Government. The license is issued only after the positive conclusion of the SEE is obtained. Other specially authorized bodies perform environmental protection, management and state control functions as well [11].

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5 Regulation for Department of Environmental Expertise and Environmental Control under RoK Ministry of Environmental Protection

6 Law on State Environmental Expertise. March 18, 1997 №85-1

7 Law on Environmental Licensing, N 2200, 1995 and Decree on the Ammendments to the Law № 371-II ЗРК, 2003

8 RoK Government regulation of January 8, 2004 N 19 On approval of the list of environmentally hazardous types of economic activity and guidelines of their obligatory state licensing

9 RoK Government regulation of August 9, 2005 №820 On approval of list of works and services included in the licensable industry activities

10 Law on obligatory environmental insurance of December 13, 2005, № 93-III ЗРК

11 List of specially authorized bodies performing environmental protection, management and state control functions in this field. Approved by RoK Government regulation of March 12, 2004 № 311

Other Governmental bodies like The Ministry of Agriculture (forests, waters, animals and plants that have economic value), the Land Protection Agency, the Department of Energy and Mineral Resources and the Ministry of Internal Affairs (prosecution for law violation) perform the state control functions as well [12].

2.3 EBRD REQUIREMENTS TO THE PROJECT

The EBRD will seek to ensure through its environmental appraisal process that the projects it finances are environmentally sound, designed to operate in compliance with applicable regulatory requirements, and that their environmental performance is also monitored. It will pay particular attention to requiring appropriate and efficient mitigation measures and management of environmental issues, which may have legal, financial, reputational and environmental implications. It will seek to realize additional environmental benefits through the projects it finances.

The EBRD requires that projects that it finances meet good international environmental practice. Therefore, the EBRD will require that projects be structured so as to meet: (i) applicable national environmental law; and (ii) EU environmental standards, insofar as these can be applied to a specific project. Where such standards do not exist or are inapplicable, the compliance to other sources of good international practice, including relevant World Bank Group guidelines, the approach of other IFIs and donors, and good industry practice is required. The EBRD will not finance projects that would contravene country obligations under relevant international environmental treaties and agreements, as identified during the environmental appraisal.

EBRD requires those people potentially affected by the project will have the opportunity to express their concerns and views about issues such as project design, including location, technological choice and timing, before a financing decision is made by the EBRD. At a minimum, the Base Operator must ensure that national requirements for public consultation are met. In addition, he will have to follow the EBRD's own public consultation requirements. The EBRD also supports the spirit, purpose and ultimate goals of the UNECE Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters and the UNECE Convention on Environmental Impact Assessment in a Transboundary Context.

Atash Base Project is classified as Category A because it could result in potentially significant adverse future environmental impacts which, at the time of screening, could not readily be identified or assessed. An Environmental Impact Assessment (EIA) that includes Environmental Action Plan (EAP) was therefore required but hazard analyses or risk assessments was not considered as necessary.

Monitoring and evaluation is required to ensure that the environmental standards and components are included in legal agreements and to keep track of the ongoing environmental impacts associated with projects and the effectiveness of mitigation measures as a “feedback” mechanism. These procedures include annual reports on the implementation of the EAP, provisions for environmental reporting, periodic environmental audits by independent experts, the inclusion of environmental performance criteria in the definition of “Project Completion”, exit audits, and/or monitoring visits by EBRD personnel. The EBRD will require to update EAP if significant changes in project or environment had occurred.

[12] List of specially authorized bodies performing environmental protection, management and state control functions in this field. Approved by RoK Government regulation of March 12, 2004 № 311

3 DESCRIPTION OF STAKEHOLDERS CONSULTATION AND DISCLOSURE

Stakeholder identification is undertaken to determine organizations and individuals who may be directly or indirectly affected (positively or negatively) by the developments proposed and who may be able to impact or contribute to the work due to their expert knowledge of and/or experience in the region. The importance of the stakeholders to the Project is given throughout the text and is ranked from a very important stakeholder (v.high) to stakeholders whose influence is very limited (v.low). Broadly, the stakeholders can be divided into the state authorities, local enterprises and the public. Fig 3.1 illustrates the relevant importance of identified stakeholders and their potential impact. The description of specified stakeholder is given below.

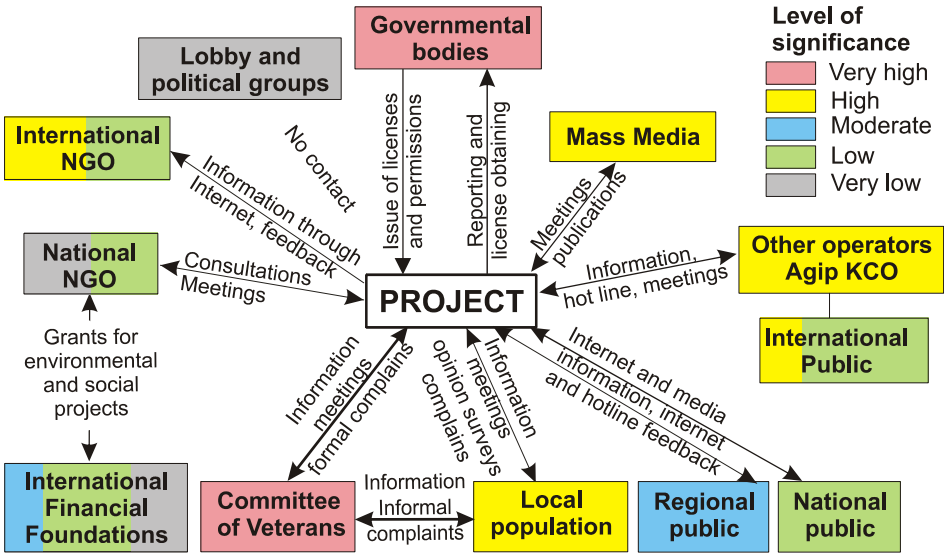


Fig 3.1 Stakeholder groups and their relevant importance for the Project

Large number of telephone conversations was held during ESIA to identify stakeholders, collect information and record their opinion for the project. Meetings were held with the key stakeholders including the local council officials, teachers, doctors, educated people, fishermen and others. All questionnaires distributed among 200 houses (32%) of Bautino and Atash villages were filled.

The Public Hearing was held in the most convenient location and time - at the Atash village library on Saturday afternoon. Posters were sited at all publicly attended places 7 days in advance. Teachers, doctors, the council officials, the mullah, the AgipKCO and other local stakeholders were invited personally but only the head of the Bautino and Atash Council came. The meeting attended mostly older people although the local NGO “The Council of Veterans” was present. The attendees were concerned about environmental issues, work opportunities, council plans for resettlement of Atash village and the infrastructure improvement: heating, water supply and road repair. The resettlement to Fort Shevchenko with better infrastructure was viewed as an improvement as long as the same housing is provided. The attendees suggested Balykshy to help with the repair of 2 two-store houses at Atash. Questions were asked about the size and the position of the construction camp but no specific concern was noted. It was noted that AgipKCO funds the construction of gas pipeline to the area but Balykshy could help to the poorest houses to connect to the mains. The limitations to the hiring of local residents and contractors were

generally accepted but the suggestion was made to train the 2-4 perspective local school graduates as specialists for the Base. A general resentment about the abandonment of various compensations for working in an arid climate that was paid in Soviet times was expressed. The concensus was to approve the project and to make recommendations taking into account the expressed concerns and suggestions.
After the completion of draft ESIA the public notes about the project and the identified impact were distributed among the key public representatives and the posters placed at the public places. The notes and posters had a free telephone hotline number for feedback and the addresses where the report could be found. A person was appointed to be responsible for documenting and acting on the feedback. Comments could also be posted to the mail box at the Bautino council. To the date no feedback has been received.

The final ESIA including the public consultation information was made publicly available at least for 60 days at the following places:

- Full ESIA reports at EBRD London headquarters and its office in Almaty;
- Full ESIA reports at the Central Library in Aktau and the Bautino village council;
- Executive (non-technical) summary at EBRD web site www.ebrd.com
- Short summary in the local newspapers;
- Short summary on the Base Operator Web Site www.caspianservicesinc.com

4 BASELINE ENVIRONMENTAL AND SOCIO-ECONOMIC CONDITIONS

4.1 CLIMATIC CONDITIONS

Climate is sharply continental with high winds, large fluctuations of weather conditions within the year, moderately cold winter and very hot summer. Average temperature ranges from 2.4°C in December and January to 27.3°C in August. Minimum temperatures range from -5.3°C in February to 21.9°C in August while maximum temperatures go from 10.7°C in December to 39.9°C in August.

In May hot weather (32.9°C) establishes and remains until late in the year. In October the temperatures still reach 29.2°C, but by November, the temperature reaches only 17°C. Further, the temperature does not get above 14.3°C until March and averages between 2.4 and 3.7°C. According to the state meteorological data collected since 1966, the lowest air temperature was -25°C in 1968. Over the 30 years period (1976-2006) the lowest temperature was in 1994 and 2006 (-23°C).

Relative air humidity depends on the temperature regime of the air and moisture delivery to the area. In winter humidity rises to 75-80%. Short thaws occur rarely and fogs take place in March-April (5-6 days per month). Average annual amount of precipitations is 168mm which grades the area as arid. Warm season (April – October) is characterized by very low amount of precipitation – less than 100mm. The highest amount of precipitation takes place in May - June and December that is about 9-13mm per month. Precipitations fall in the form of short-time rains in spring, rare downpours and storms in summer and drizzly rains with change to the snow in autumn; snow in winter. Snow cover is shallow – 25-30cm, becomes stable in December till the middle of March; low level of snow cover is also stipulated by the impact of strong wind regime. During the strong winds the snow is blown out from the elevations to the craters, where snowdrifts occur up to 1.5m in height. Wind speed, at which the snowstorms occur, is 15-20m/sec, prevalent wind speed in summer 2-5m/sec. Freezing-of-soil maximum depth is 0.8m. There are two high periods in the annual course of atmospheric precipitation in May and in October-November.

The typical wind ranges between 5 and 7m/sec with the average annual wind speed being 5.3m/sec. The maximum winds can reach 15-20m/sec (Fig 6.5). In the winter the eastern and south-eastern winds prevail, while in summer the dominant winds have western and north-western direction (Fig. 6.4). Snow and dust storms and cold and hot winds are typical here. Calm days occur only 1-2% of the time.

4.2 ATMOSPHERIC AIR QUALITY

State monitoring of air quality in the studied area is not implemented. Air quality has been monitored by Agip KCO since 1998. They have been performing quarterly monitoring at four different locations and found most samples within acceptable ranges. They monitored for dust, CO, SO2, THC, CH4, NO, and NO2. The only exceptions were in the third quarter of 2003: excessive dust at three sites and THC at two; in the second quarter: excessive dust at two sites and THC at two sites; and in the first quarter: excessive THC at two sites and NO at one site. The fourth quarter showed no excessive levels of any measured contaminant. The only major contamination seemed to be in the second quarter when THC levels exceeded MPC by three times. All other results were below MPC levels.

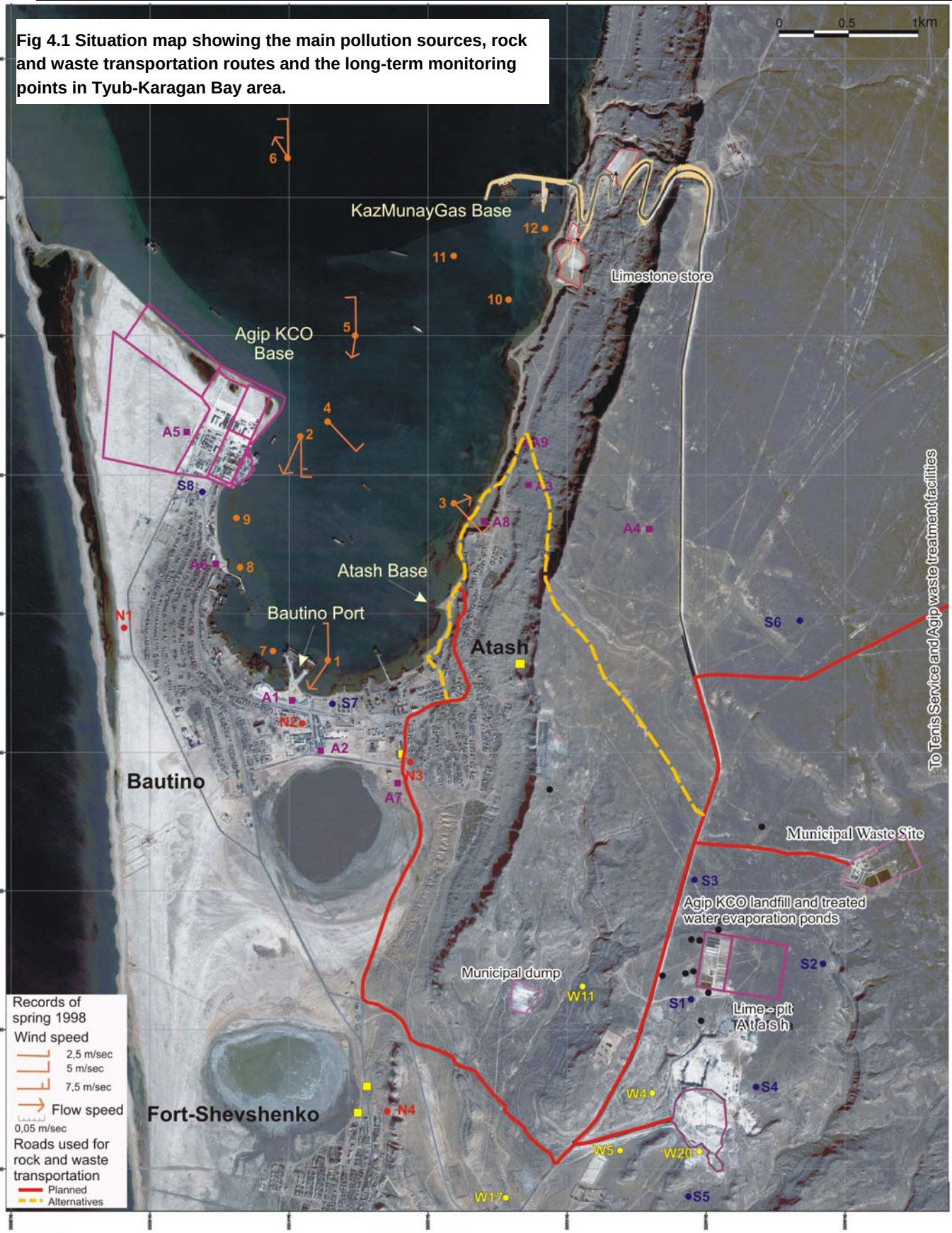


Fig 4.1 Situation map showing the main pollution sources, rock and waste transportation routes and the long-term monitoring points in Tyub-Karagan Bay area.

The following air pollution sources exist in the area:

Source	Pollutants emitted
Agip KCO base	CO, NO_x, SO_2, hydrocarbons, acrylic aldehyde, soot
KazMunaiGas base	the same as above
Bautino harbor:	
Facilities and equipment of drilling mud production shop	CO, NO_x, SO_2, hydrocarbons, acrylic aldehyde, soot, dust
Maintenance shop equipment	NOx, silicon oxide, iron oxide, manganese oxide, fluoride, dust, lead from welding and painting
Diesel power stations and power generators on shore and at barges	CO, NO_x, SO_2, hydrocarbons, acrylic aldehyde, soot
Fuel storage tanks	volatile hydrocarbons
Agip KCO quarry	dust, NO_x, hydrocarbon, benzapyrene, soot
KazBalyk fleet base boiler (cold period)	CO, NO_x, SO_2, hydrocarbons, soot
Evaporation fields of the waste treatment plants	volatile hydrocarbons, odor
Municipal dump	Methane, dioxides, CO_2, SO_2, soot, odor
Gas and wood (cold period) burning at private houses	CO_2, SO_2, soot,

Tab. 4.3 Concentration of volatile organic compounds in the air of the studied area, September – December, 2002 (µg/m^3).

Volatile organic compounds	Hazard class	MPC for residential area	Northern border of Agip KCO base (A5),			Northern border of Bautino village (A6)			North-west border of Atash village (A8)		
			Average	Range	No. of exceeds*	Average	Range	No. of exceeds*	Average	Range	No. of exceeds*
Benzpyrene	1	0.01	0.1327	0.001-0.36	2	2.040	0.001-8.18	5	1.2209	0.002-2.67	3
Carbon sulphide	2	30	6.667	4.67-17		2	0-7		4.105	0-11.52	
Hydrogen sulphide	2	8	6.582	2.33	1	2.283	1-3.2		1.375	0-4	
Sum of mercaptans			0.265	0-0.9		0.0783	0-0.4		2.25	0-4	
Methyl mercaptan	2	0.009	0.17	0-0.6	3	0.0567	0-0.3	3	0.955	0-3.82	1
Ethyl mercaptan	2	0.05	0.073	0-0.25	1	0.0017	0-0.01		0.86	0-3.44	1
Toluene	3	600	51.405	96-109		47.893	52.92-234		39.4713	0-157.885	
Xylol	3	200	63.200	0-148.96		51.126	0.064-205		32.569	0-127.595	
1,3-butadiene	3	3000	257.5	430-600		510.67	1124-1940		105.75	0-423	
Sum of saturated hydrocarbon	4	30**	69972.5	117600-162290	2	138770	10-526 850	2	28812.5	0-115250	1
Sum of unsaturated hydrocarbon	4	5000	1427.5	2400-3310		2830	0-10752	2	588	0-2352	
Butene-1, butene-2, and isobutene	4	3000	1000	1680-2320		2200	0-7530	2	411.625	0-1646.5	
Thiophene	4	600	0.25	0-1		0.0833	0-0.5		0	0	

*-over the monitoring period ** - Decree of Senior State Sanitary Doctor, RoK №56, 11.11.2002

As shown in the data given above (Tab. 4.2), the dust concentration exceeds the permitted levels for residential areas by 1.9 times, nitric oxide – by 2 times, hydrocarbons – by 3 times. The largest number of exceedances was registered in the II and III quarters. This can be explained by the industrial activities

related to the navigation period. The norm for hydrogen sulphide is also exceeded by 2 times at some areas. Concentrations of other analyzed pollutants were within the limits and below MPC.

Analysis of volatile organic compound concentrations indicates that the most significant contribution into the air pollution is provided by mercaptans and benzpyrene. The concentration of methyl mercaptans was up to 424 MPC, ethyl mercaptans – 68.8 MPC, benzpyrene – 818 MPC. The large excess of the mercaptans can be explained by a very strict MPC, but also by operations in the base, associated with the oily waste. As the excess of benzpyrene was observed only in heating season, it is most likely that the main sources are heating systems and ovens powered by diesel fuel.

There are also excesses by butenes (up to 2.5 MPC), unsaturated hydrocarbons (up to 2.1 MPC) and saturated hydrocarbons (up to 17.5 MPC). Excesses by other ingredients were not detected. (Tab. 4.3).

4.3 TOPOGRAPHY AND GEOLOGY

Absence of permanent surface streams causes a low sedimentation rate in the Tyub-Karagan Bay. Erosion and sedimentation are driven mainly by winds but seasonal surface water and vegetation break the flat lying limestone are embedded with silt and form gullies at the edges of the highest relief structure The Usturt Plateau. A steep escarpment that enframes the plateau (also known as Chink) rests on the Novocaspian erosion terrace some 20m down the slope which stretches flat 180m and ends with another escarpment 9-20m high. The terrace formed by limestone is overlaid by Novocaspian sands and sandstones. The lower flat erosion terrace spans for 200m and ends with the third escarpment 14m high that dips into the slightly inclined beach to the sea. This terrace is formed by Khazarian limestones overlaid by Khvalynian sands.

In the lower part of the terraces, where clay rocks replace hard limestone, the slopes flatten out considerably and form smoother relief. Land slides and deep gullies are evident along the sea end of the plateau. Land slides occur as a result of the limestone sliding off the thick Oligocene and Miocene clays that are inclined towards the sea.

The shore is characterized by a small, steady supply of eroded material and by very slow erosion of the shore rocks that slightly protrude into the sea. The escarpment at the Base site is beyond the waves' reach despite the shore flatness but nearby the modern erosion relief forms (benches and wave niches). Accumulative forms are poorly developed only in the invasions of the shore where they often have signs of the secondary erosion.

Coastal areas at the Bay and the lower part of the plateau escarpment are formed by the dome of Saurinian anticline built of unconsolidated coquina limestones that are easily eroded leaving behind isolated rocks.

The Base site is underlaid by a regional groundwater seal made of Neogenic clays overlaid by a thin layer of Quaternary limestone boulder–pebble on top (70%) in the gravel containing sand matrix. Both gravel and sand are a product of the local limestone erosion. The thickness of this layer gradually diminishes from 2.1m at the south of the site to 0.3m at the north. The average density 1.66 g/cm^3 can be increased to 1.95 g/cm^3, optimal humidity – 0.18 and relative compaction ratio is 1.04.

The depth of the second layer exceeds 25m. It consist of dense (density 1.82 g/cm^3) light-green to dark grey semi-solid to tight plastic clay with thin interlayers of dusty sand and sandy-clay. This layer is likely to act as a regional seal for shallow groundwater aquifers.

The general geological structure of the area is more diverse although the regional seal (solid grey or brown clay) continues throughout. It is composed of Paleogene and Neogene deposits with unconsolidated Quaternary marine deposits on top. The following main layers exist at the area:

1. loam soil with shell (0-0.5m);
2. gray-brown sand with shell and gravel (to 3-4m) or loose sand with clay and shell inclusions (to 8.2m), substituted in places by dark-grey clay or loam (to 6-8.5m)
3. Solid grey or brown clay is more frequent from 20 and deeper but in some places occurs at shallower depths.
4. Limestone frequently occurs at the depth of 8-12m.

4.3 HYDROLOGICAL CHARACTERISTICS

Surface water is represented by the Caspian Sea. Main factors influencing the regime of streams in the North part of Caspian Sea are winds (mainly horizontal), variations in water density (vertical), Volga, Terek, Sulak, Samur and Ural rivers flows, shoreline and sea bottom relief.

The sea part of the Base has depths to 6.8 meters; currents are determined mostly by winds. Wind induced sea surges that occur 3-20 times a year can raise the sea level at the Base site by 0.8m. Surge duration can vary from several hours to 6-8 days. Normally they last 2-3 days.

Non-wind induced Caspian Sea level change is subjected to both seasonal fluctuations due to river inflow and evaporation changes and long-term fluctuations. Annual range of seasonal fluctuations is about 30 cm with the maximum in June-July and minimum in December-January. Diversity of opinions about the reasons of long-term fluctuations of the Caspian level suggests that all geological, hydrological and climatic factors may influence the long-term level of the Caspian Sea.

In recent years water characteristics in Tyub-Karagan Bay have changed little. Variations of temperature, salinity and dissolved oxygen are most likely to be seasonal. Data from an April 2004 survey showed that temperature, dissolved oxygen, pH and salinity do not change significantly with depth. Turbidity changed with depth randomly and did not depend on the total depth at the sampling point of the sampling point position in the Bay. The highest difference of 38% was observed at stations 10 (higher at bottom) and 1 (higher at surface).

4.4 WATER SUPPLY AND WASTEWATER REMOVAL

Drinking water for major part of the population of the studied area comes from the three artesian wells of Ketyk water abstraction. Although they are positioned downstream from the municipal STF and the Tenis Services Landfill, the analyses showed no metals and petroleum hydrocarbons in it. Regularly collected analyses data by the Sanitary-Epidemiological Station (SES) (coliphages, coliforms, pathogens, pH, ozone, associated and free chlorine, chlorides, ammonia, nitrates and nitrites, sulphates, total hardness and total dissolved solids) was not available for assessment but SES qualifies this water as not suitable for consumption mainly on the base of its excessive salinity.

The quality of the water taken by the Sea Water Desalination Plant to produce potable water is unknown, because the monthly analysis of abstracted seawater is performed only for components that impact on the desalination process: pH, total salinity, hardness, chlorides and sulfates. The SES periodically analyzes the

desalted potable water for the contaminants named for the Ketyk water abstraction wells (above). No analyses have been performed for hydrocarbons or metals. Because a single analysis of desalinated water can not give conclusive information on its long-term quality, it was decided not to sample the potable water from the plant. The contamination of the Bay water is characterized by accidental releases of mainly oily substances. The dilution and degradation of such releases occurs in a short period of time and, as monitoring data shows, contamination does not persist or accumulates.

Wastewater in the area comes from two major sources: domestic water and current operations. Drilling sludge free of recycled drilling mud from offshore operations is brought to the Bay by AgipKCO and separated into liquid and solid phase in the insulated sludge pits at its support base. Solid phase undergoes thermal desorption at the Agip Base Thermal Desorption Unit. Treated inert waste and residual water are disposed at the municipal sewage treatment facility (built by Agip KCO) which has 6 drill cuttings disposal pits with total volume 18 000m^3 and 5 evaporation ponds with approximate volume 15 000m^3. The pits are properly engineered with 0.5m clay screen, drainage collection system and a 0.5m ground cap. Ponds have a geomembrane but the condition or other details of the ponds' construction is not known.

Black and oil-contaminated water from off-shore operations and from support bases is disposed via waste contractors in unprepared and open Koshkar-Ata Liquid Waste Disposal Lake 4km north east of Aktau and 6km east of the Caspian Sea. Apart from oiled water, this Lake historically accepted heavy water from the MAEK nuclear power station, untreated and treated sewage. The lake is a local environmental and health hazard object mainly because of radioactive and metal rich salt airborne transport from the dried areas.

A new waste disposal and treatment site is about to come to operation 11km east of the Atash Base. It will release the load on Koshkar-Ata Lake from the Tyub-Karagan Bay operators as they are likely to use this facility to dispose their hazardous waste.

4.5 SOIL AND VEGETATION

Soil cover of the area to be constructed for the Base consists of soils with various degrees of formation, erosion feature, mineralization and man-made disturbance. Generally, soils are characterized by low potential fertility that is stipulated by the aridity of desert zone, relief, high underlying and outcropping of thick hard-rocks, mineralization (coastal zone), and destructed vegetation. Man-made disturbance of soil and vegetation is well expressed. This is conditioned by excessive grazing, harvesting of the plants by local population. The soil is referred to the classification of low-productive pastures by its suitability.

Soil at the Base site was sampled at 3 soil profiles for total petroleum hydrocarbons. Those sampled intervals were selected that could most likely accumulate organic pollutants. Results showed concentrations above the background but nowhere near the MPC for soil (100mg/kg)*.

Vegetation cover of the studied site and adjacent area is characterized by heterogeneous spatial structure, flora poverty and low level of biodiversity due to the natural and climatic features of the region. Flora includes about 100 species of higher vascular plants, which are typical for adjacent deserts. Environmental conditions of vegetation existence can be considered as extreme due to the lack of water, high temperature and significant soil profile salinity. In this connection, the most wide-spread species are the species which historically have the adaptive capacity appropriate to the habitat.

Vegetation cover of the base construction area is formed by ecological series growing on the seashore. Clusters of monocyclic halophyte Suaeda acuminata with foliage cover at most 10% vegetate in the feeder and piled up phenomena area of the shore. Salsola nitraria, Peganum harmala and Frankenia hirsute have

been registered here as well. Communities and clusters of Argusia sibirica with foliage up to 60% and thicksets (70%) of Salsola nitraria P.M and Peganum harmala predominate on the coastal terrace. Roadside growing variations of Crypsis schoenoides, Atriplex tatarica, Peganum harmala, etc. vegetate along the area-adjoining road. Single plants or clusters of Capparis spinosa, Lycium dasystemum, Atriplex tatatica and Anabasis aphylla with foliage cover from 10% to 20% represent vegetation of cliffs and slopes.

Presence of this species community (in particular Anabasis aphylla, Peganum harmala, Atriplex tatarica and Capparis spinosa) indicates a strong man-made disturbance. Comparison of flora monitoring results in April and July testified that the main impact to the local vegetation is made by ranging (goats, camels) and annual cutting out all perennial bushes for house heating. Ranging of cattle and cutting-out of bushes take place at neighboring areas as well. Rare species were not registered within the site of perspective construction and adjacent areas. Therefore, existing condition of vegetation on the site has low ecological value.

Vegetation of the adjacent areas is more diverse but in the same way is highly degraded.

Marine vegetation is also of concern at the site. Seven species of macrophytes were detected over the last 5 years in Tub-Karagan bay: two higher aquatic plants (*Zostera marina, Potamogeton pectinatus*), two green filamentous algae (*Oedogonium sp., Mougeotia sp*.), two red algae (*Polysiphonia setrularioides, Ceramium hypnaeoides*) and stonewort (*Chara tomontosa*). Out of them a single small (15cm) shoot weed Z.minor dominates. Single representatives of others are thinly distributed through the shallower parts of the Bay. Even biomass of Z.marina is not great. It is limited from the shore end by the plant's inability to attach to loose sand and rock and from the deep end by reduced sunlight penetration, higher water turbidity and a thick layer of unconsolidated organically rich silt. As a result it is absent from the northern more stony and sandy part of the Base offshore area and covers only 10-15% of the sea bottom at the outmost part of it. In addition, at the south end of the Base offshore area thick (1.5m) mats of dead Z.marina accumulate, preventing any growth of new plants. Although high energy of the Bay environment causes high mortality of the fast growing Z.marina, the bulk of the dead weeds is imported from the shore areas at the open sea.

Halohydrophyte Zostera marina (Vzmornik malyy) is a perennial plant. Because it is rich in protein and low on cellulose, it is consumed by fish and birds. Domestic animals do not eat it. It uses water for pollination and flowers and releases seeds into water in June-August. Vegetative proliferation also occurs. Uprooted plants can migrate considerable distance and set their branched roots on new ground. Most of them however end up at the shore but seeds can be blown back to the sea. In the Bay it can grow practically at any depth. Its absence at the north part of the Base site can only be explained by the plant's inability to set its roots in the medium coarse sand although in other places the plant can be found on sands. Large dense communities, weed meadows, characteristic for this plant were also not recorded at the Base site even in lower energy environments on the deeper, more silty and organic reach grounds. Their height, normally being 20-70cm (sometime reaching 1m), was only 15cm at the Base site. The reason for these plants' inability to establish properly at the Base site is difficult to interpret. Sewage seepage from Atash village is unlikely to produce such effect. Other pollutants are found to be at their lowest concentrations here. Man-made physical disturbances also are not great. It is also unlikely that such scarcity is due to seasonal variations because the assessment was made in July when the plant biomass should be at its highest. Perhaps a combination of natural factors has created a local anomaly that is unsuitable for the plant.

4.7 WILDLIFE

Wildlife of Tyub-Karagan Bay has been removed by industrial activities. Not much information, therefore, exists on its value in the Bay. However, the wildlife of Tyub-Karagan Peninsular is relatively diverse and represented by one species of amphibian (8.8%), 16 species of reptiles (32.7%), 230 species of birds (47.2%) and 31 species of mammals (17.4% of total composition of RK fauna). Among animals of the region studied, there are rare and endangered species entered in the Red Book of Kazakhstan: 1 species of reptiles, 23 species of birds and 2 species of mammals.

Besides rare species of animals in the area studied, there are more than 20 species of birds and 8 species of mammals being targets of amateur and commercial hunting. Among them there are important fur games (wolf, fox, Caspian seal, etc.) as well as aquatic and marsh birds (geese, ducks, sandpipers and Rallidae)

Animals of the studied area are unevenly distributed throughout the region. Among Bautino Bay adjacent areas the most densely populated are coastal habitats, where up to 40 species of aquatic and marsh birds have nests. The number of birds in these habitats increases considerably in the period of seasonal migrations. A large amount of rare birds entered in the Red Book (flamingo, pelicans, ardea and swans) can be found here.

Most part of the Bay area is flat urban landscape (sea port, village with communication lines) and absence of animals here is stipulated by severe environmental conditions.

Analysis of the available information and our own research in fauna of the Bay and adjacent desert landscapes shows that the number of terrain vertebrata (reptiles, birds and mammals) is 7-8 times lower than in the adjacent landscapes due to severe natural environment (soil salinity, absence of vegetation, poor food potential and protection).

4.8 CURRENT LEVEL OF INDUSTRIAL AND DOMESTIC WASTE GENERATION

The local waste generators are:

- Agip KCO Base;
- Bautino port;
- Kazmunaygas oil operation support base;
- Kazakhrybflot fishing Base;
- Batys military base;
- Sagatash" JV ship repair company;
- Talshik base;
- Shagala hotel and
- Households and administrative buildings.

The waste managing facilities include:

1. Municipal STF and the landfill;
2. AgipKCO non-hazardous waste landfill and treated water evaporation ponds;
3. AgipKCO Base drilling mud treatment facility;
4. AgipKCO hazardous and non-hazardous waste management facilities;
5. Tenis Services LLP hazardous and non-hazardous waste management facilities;

In addition, two unattended dumps nearby the STF are still places for occasional illegal dumping of solid and liquid waste (Photo 6.4). The sites were inspected on two occasions within the interval of two years and on both occasions they had fresh signs of liquid and solid waste disposal.

The non-hazardous waste and sewage is collected by the Fort Shevchenko municipal services who take them to the sewage treatment facility (STF) that also has two open pits for disposal of solid waste. The facility was built by Agip KCO. It is guarded and fenced yet the management is at the low level: waste documentation is vague; waste is not segregated at the source and is not checked for the presence of hazardous materials when brought in and dumped at the side of two 724m^2 and 770m^2 pits from where about 20 manual workers drag it into the pits; solid waste, paints, solvents etc. is frequently burned to reduce the volume (Photo 6.5) and self ignition is frequent; light items are dispersed from the uncovered pits around the site by wind and odor and flies are overwhelming in hot days; liquid waste from ships often contain hydrocarbons which the active biological unit cannot clean and which in high concentrations can destroy the cleaning ability. Blasting at the limestone quarry 1km south of the site affects the integrity of the geomembrane liners at the 3 792 m^2 buffer pond for untreated sewage and at the 13 647m^2 evaporation ponds of treated sewage from ships and houses.

Pit waste burning is also practiced by both the residents and the municipal waste transporters.

The Tenis Service LLP hazardous and non-hazardous waste disposal and treatment facility 11km east of the Atash Base (Fig. 6.8) accepts waste from its parent company KazMunaiGas. On inspection, the site looked unused (Photo. 6.6). It had several empty evaporation ponds but no other facilities or structures including a truck scales. It was reported that the first batch of non-hazardous waste has already been received and buried. No information could be obtained on the waste handling, treatment and disposal procedures except for the statements that it complies with the RoK requirements and Tenis Service LLP has all necessary permits to operate this site. According to the regional environmental protection authorities, the site has been properly designed. It has an adequate groundwater monitoring network.

A new AgipKCO hazardous and non-hazardous waste disposal and treatment facility is being constructed next to the Tenis Service LLP facility. It is planned to start working in autumn 2006 and is being built according to the international standards. It is expected to have several waste treatment units but the exact information on the design was not available.

Both Tenis Service LLP and AgipKCO facilities are designed with sufficient capacity to accommodate all offshore oil extraction industry waste for some years ahead.

Drilling sludge free of recycled drilling mud from offshore operations is brought to the Bay by AgipKCO and separated into liquid and solid phase in the insulated sludge pits at its support base. Solid phase undergoes thermal desorption at the Agip Base Thermal Desorption Unit. Treated inert waste and residual water are disposed at the Agip landfill with 6 treated drill cuttings disposal pits with total volume 18 000m^3 and 5 evaporation ponds with approximate volume 15 000m^3. The pits are properly engineered with 0.5m clay screen, drainage collection system and a 0.5m ground cap. Ponds have a geomembrane but the condition or other details of the ponds' construction is not known. The site is guarded and the waste is accepted on the truck volume base. There are no scales to weigh the trucks.

4.9 SOCIO-ECONOMIC ASPECTS AND ECONOMICS OF THE REGION

In order to identify the project's socio–economic aspects a matrix was compiled of all the project activities and socio-economic receptors. The receptors were based on the information contained in the following socio-economic baseline and the stakeholder consultation process.

Information for this social-economic study was collected at local and regional levels. Local level information was necessary to detect the impact of project-specific planned development. Data collection concentrated on the area around the project site. Meanwhile, the information for the regional development allows the assessment of economic and social impact on a wider scale, for example, contribution into the oblast economic development, improvement of manpower qualifications, and influence on population composition and demand for service. The following information has been studied:

- Population, including demographic and migration models;
- social development and social infrastructure indicators, including education, health, recreation, unemployment, employment, emigration, ethnic tensions, traditions;
- social organization, including group hierarchy, family models;
- Social development priorities;
- Economic activity, including employment and labor market, community structure, distribution of income, goods and services, income levels;
- Cultural heritage, including cultural and religious buildings and any other distinctive features;
- Development priorities and activities of development programs especially the strategic context of the regional development

It should be noted that the regional and local level information was gathered mainly through conversations with several key persons and verified in meetings with the population

Total number of work places increases each year, but this does not take place in all sectors evenly. The 16% increase of 2003 and 14% of 2004 were mainly due to the oil production and mining industries. There has also been an increase in the social and public sector but local fishing industry continues to decline.

The official reporting data indicates that the highest wages in the district are in the communication and transport companies. However, according to the data of inquiries, the most profitable work is in the oil production industry, where the standard wage is over 67,000 tenge per month (i.e. twice the average regional salary). Moreover, in the oil industry, shiftwork allows for additional casual earnings to be made during rest time.

At the same time employment in the area of education, health protection and other public, social and personal services does not provide significant income and this increases the acute deficiency of employees in the area of education and health protection. It should be also noted that the high salary earners commonly support a wider family in which members often do not work or work in the low paid sectors like the public sector.

5 ENVIRONMENTAL IMPACT ASSESSMENT

5.1 GENERAL DESCRIPTION OF SOURCES OF ADVERSE ENVIRONMENTAL IMPACTS

Tab. 5.1 Environmental impact significance summary (activities that caused negligible impact and receptors effect on which was negligible were omitted)

Receptors / Activity	Atmosphere	Soil	Groundwater	Seawater quality	Sea sediments	Visual impact	Terrestrial plants	Marine plants	Terrestrial animals	Marine animals	Base personnel	Impact description
Construction												
Temporary camp, office and storage space	5	5				5	5					Vehicle emissions, noise, dust, vegetation removal
Dredging	5			8	10			8		15		Emissions, noise, sediment suspension, benthos burial, benthic habitat destruction
Wavebreaker, Wharf front, sea reclamation	5	5	5	4	10	5	5	8		15		Emissions, dust, sediment suspension, benthos burial, aquifer compaction, soil loss
Piling	5	5		4								Emissions, noise, vibration
Construction site facilities	5		5			5	5					Emissions; noise
Base components construction	5	5		4								Emissions, small oil spills
Vehicles operations	5	5				5	5		8			emissions, noise, small oil spills
Fire/ explosion	5	3	3	3	3		4		4		5	Emissions, groundwater pollution, visual impact
Vessels and trucks accidents	3		3	3				4		4		Emissions, fuel and hazardous waste spills
Operation												
Maintenance dredging	3			5	5			8		8		Same as for construction dredging
Seawater desalination				5				8		8		Energy use, plankton death, brine discharge
Runoff collection system				2								Excess runoff redirection into sea once in 2-3 years
Waste disposal	4		4						4			Risk of groundwater contamination at disposal site
Utilities operation	5											Emissions from boilers and emergency power generator
Fire/ explosion	8	6	6	6			4	4	4	2	8	Heat, emissions, groundwater pollution, visual impact
Fuel export/import equipment failure	5		6	6	6			4	4	8		Contamination, toxicity, pollutants accumulation, fitness reduction
Vessels and trucks accidents	3		6	6				4		4		Emissions, fuel and hazardous waste spills
Decommissioning	3	2	2						2			Air emissions, noise, risk of small oil and fuel spills

A total of 26 routine planned non-routine project activities and possible accidental events were identified for each of the elements of the proposed project and each activity was assessed against the environmental receptors present in the project development area (Tab. 5.1). The assessment found that all project

activities stated in Tab. 5.1 will produce negative impacts but none of them would result in environmental impacts of “critical” significance. The majority of the activities associated with the development would result in only negligible or low impacts on the surrounding environment. Only 2 were considered to have a potential to cause environmental impacts of “high” significance on marine environment in the Base area. Impacts from these and other activities that are valued to have medium significance can be effectively reduced to the low or negligible level if the suggested in mitigation measures are accepted.

5.2 ATMOSPERIC AIR QUALITY

The project description data shows that air emissions will be generated mainly due to the operation of heavy equipment and vehicle, as well as during cargo handling operations at the site in the several first months of construction, when the peak of activity is expected.

At the construction phase the emissions will be greatly higher, but their duration will be shorter. The principle impact from air emissions can be on Atash village residents, especially at its northern part. Swallows, inhabiting the escarpment at the Base, and their chickens will be affected by high concentrations of pollutants in calm days, especially during the chicken feeding nestling period, when the flights for food are often. Other birds will not fly to the emission sources at the distances at which the emission concentrations are toxic for them. Seals, the appearance of which is unlikely due to vessel activity and lack of fish reserves, can be harmed due to the distribution of heavy pollutants depositing on the sea water surface.

The following figures give a view of air emissions that will be generated by this project. It is important to realize that the majority of the air pollution will come from the construction phase and will cease when operations begin. In figure 1.2 it is evident that by far the largest volume of pollution will come from dust generated by construction.

Fig.5.1 Estimated volumes of solid emissions at construction phase

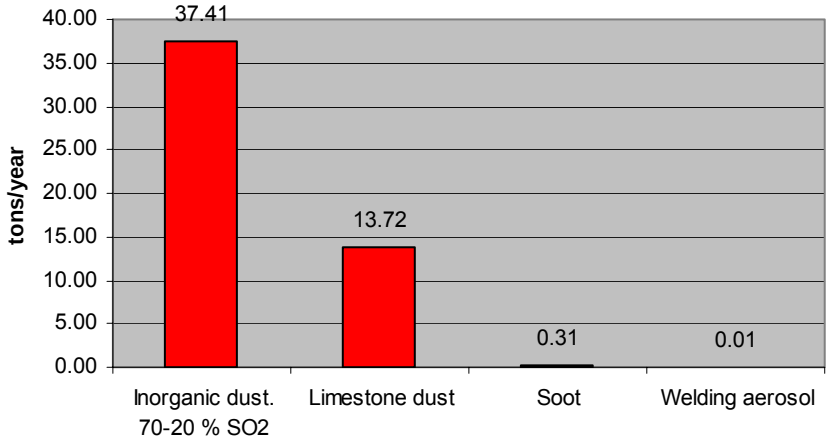


Fig 5.2 Estimated volumes of suspended solids emissions at construction phase. Note the difference in scale measuring unit

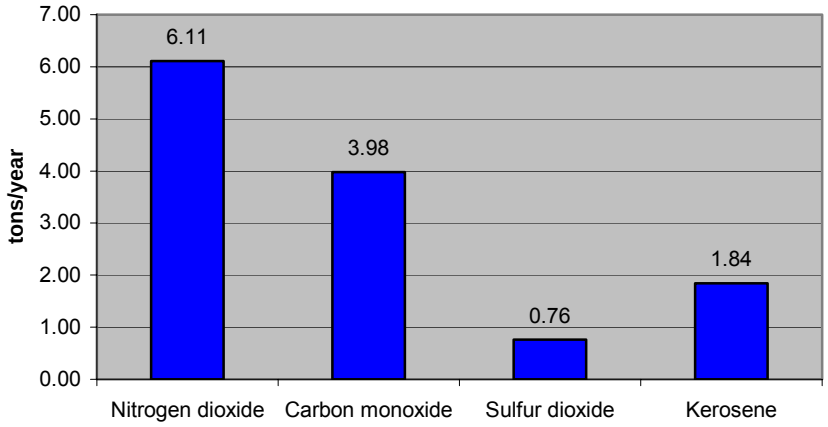
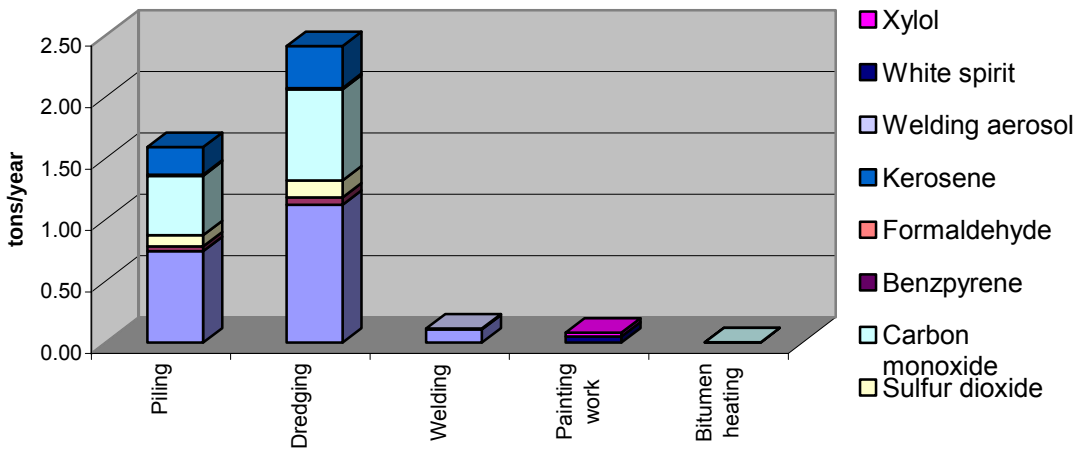


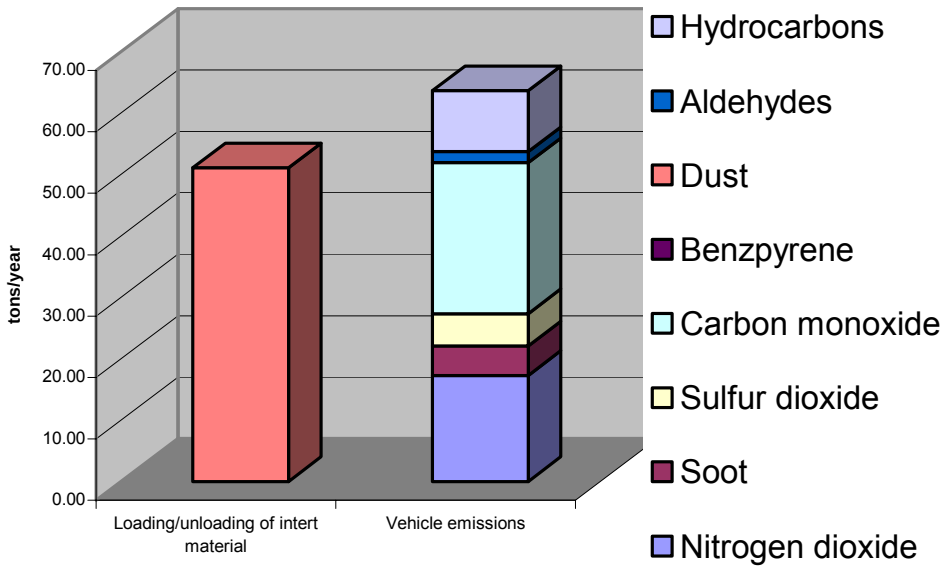
Figure 5.3 shows the relationships between the different air pollutants generated at the site. It is evident from this data that the dredging operation will be the main contributor. After the construction phase, dredging will only have to be done to maintain channel depth, probably less than once in 10 years.

Fig 5.3 Air emissions structure (tons per year) by emission source and details of air emissions structure



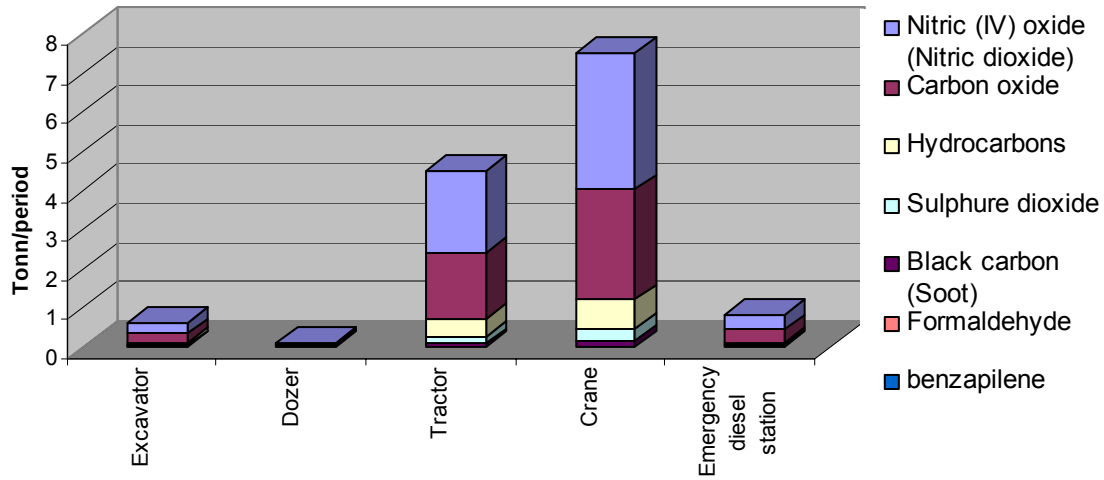
Here we can see that the actual processes used in operation of the Base will create less pollution than the vehicles used. Vehicle traffic will be a major factor for air pollution, noise pollution, and safety.

Fig 5.4 Air emissions structure (tons per year) by emission source and details of air emissions structure. Note the difference in scale measuring units



As above, the importance of vehicle operation is shown as a major contributor to air pollution. The crane will be the largest polluter. Again it should be stressed that these are in use usually only during the short construction phase.

Fig 5.5 Emission structure from the Base diesel engines



These show the drop in air pollution generation between the construction phase and the operations phase. As mentioned above, the dredging operation is the largest contributor.

Fig 5.6 Maximal peak emissions (g/sec) at the stage of (a) construction and (b) operation

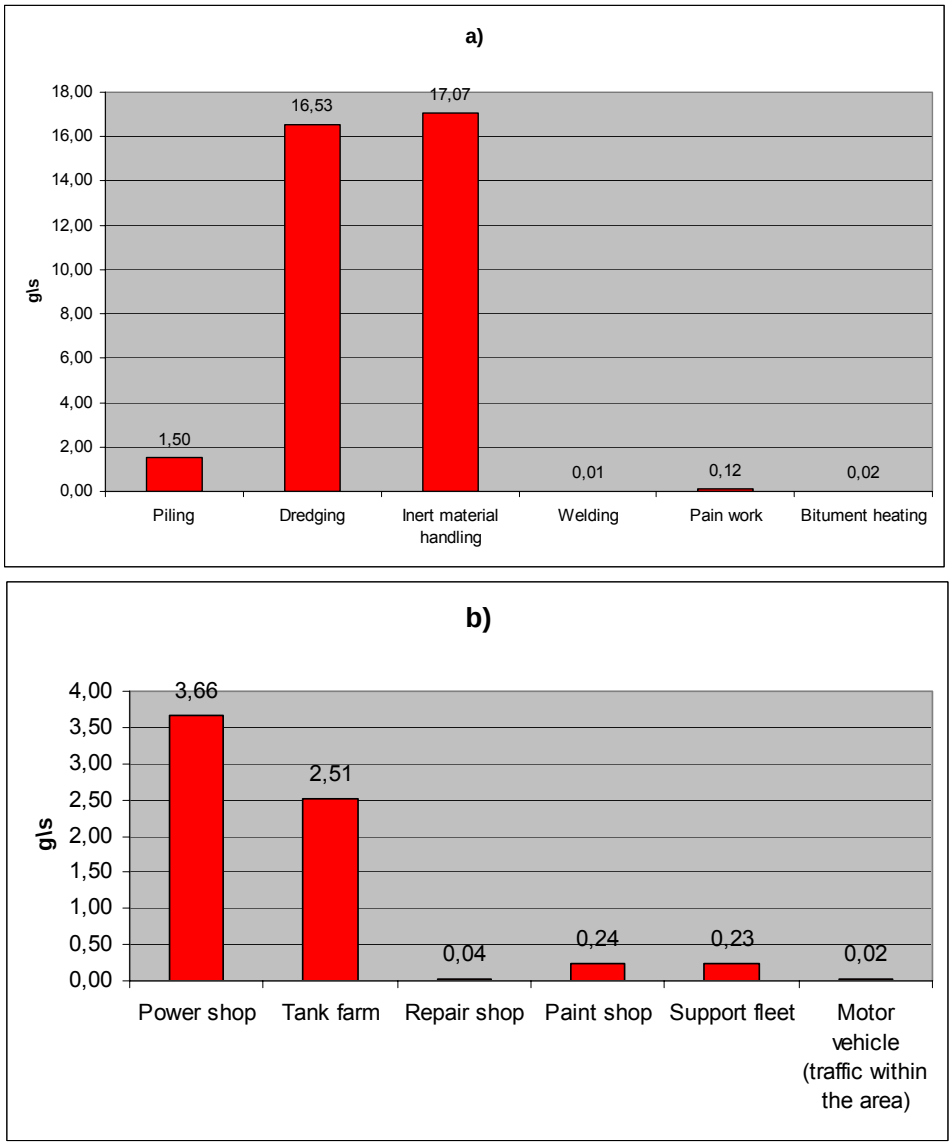
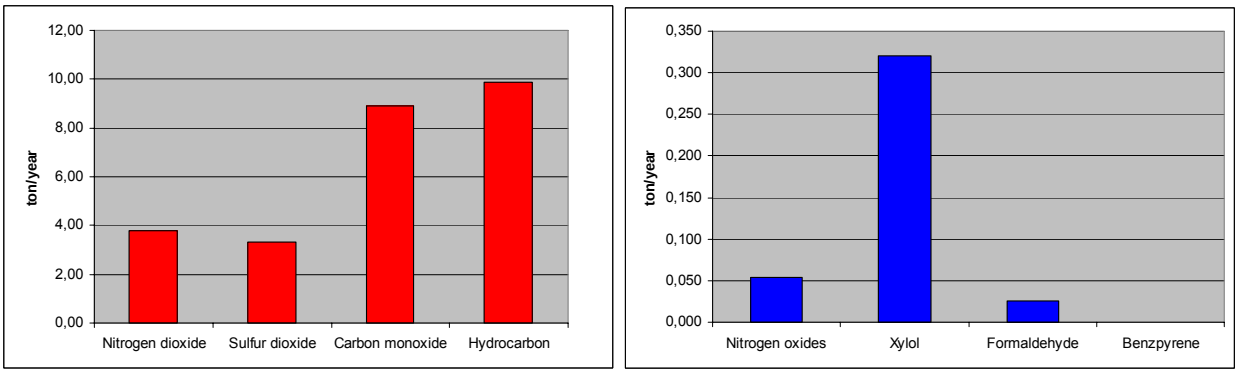


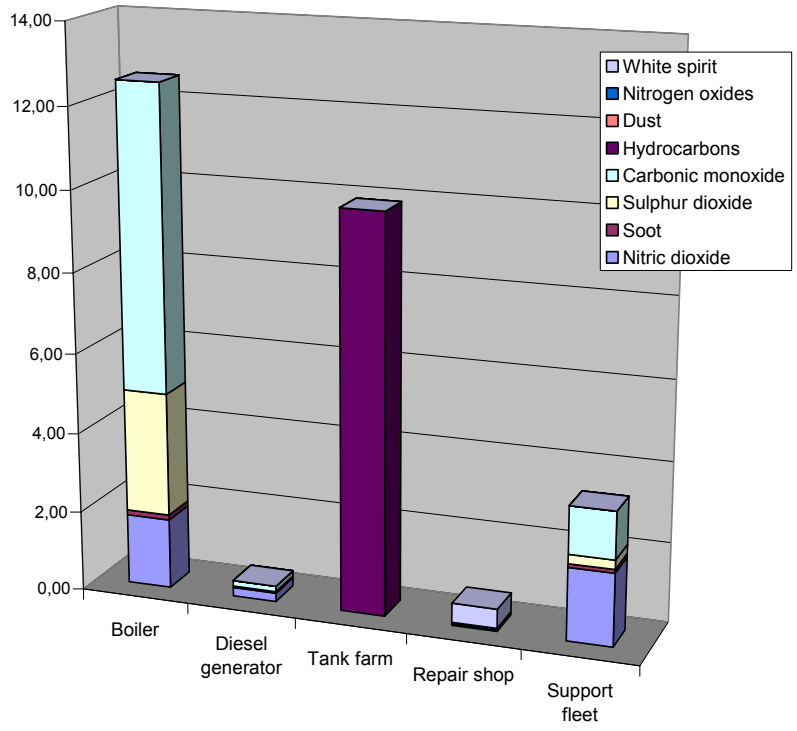
Figure 5.7 is the overall picture of air pollution for the operation of the Base given for 8 different pollutants. Even at peak operations, the levels are not excessively high.

Fig. 5.7 Estimation of air emissions at operation phase (ton/year)



This represents the yearly emissions of pollutants by the Base. After the construction phase and use of the crane and dredging equipment it is evident that the levels will fall. These levels shown here are typical of industry standards.

Fig 5.8 Structure of air emissions (tons per year) by the emission sources and details of emission structure



The impact signicicance of air emissions is therefore valued as:

Probability	5	Impact will occur under the normal work.
Consequence	1	Adverse, direct, short-term, temporary, local, revertible.
Significance	5	Low

5.3 WATER REQUIREMENT AND WASTEWATER REMOVAL

Impact from operation phase is considered to be low. A continuous flow of brine from the Desalination Plant will be discharged directly into the sea 30m from the wharf front from the pipe under the jetty access bridge. About 31 litres of brine will be discharges each second. The accepting water will freely flow under the bridge and thus will dilute the increase in salinity to the background level a very short distance from the end of the discharge pipe making the “excess salinity cloud” very small and constant. No flash discharges are planned.

Sewage will be held in two 1000m3 septic tanks and when accumulated, transferred to the STF for treatment. With a 200m3/day capacity the Plant can accept the additional volume (10m3/day) generated by the Base. The Plant active biological degradation unit built by AktStroyProyekt works effectively. Treated

water flows into the adjacent evaporation ponds for further passive degradation with sun and oxygen. The concrete lining of the ponds effectively prevent water from escaping into environment but explosive works at the nearby Atash limestone quarry increasingly threaten their integrity as the quarry widens.

5.4 SURFACE WATERS

Impact from construction will mainly relate to increased concentration of suspended solids which will normalise about 2 days after the activities that cause sediment disturbance cease. These activities are dredging/ landfill and the wave breaker and the wharf front construction in February--April. The impact on seawater quality from construction can be considered as reversible, short term low to medium.

As a result of dredging, fine material will be brought into suspension making water less transparent. Lesser sunlight penetration will be counteracted by removal of ice at the dredged area. Therefore decrease in temperature of the deeper water that could occur in summer, will not happen in winter time.

The dark grey to black colour of top sediments implies that organic material in it is mainly decomposed anaerobically. Bringing this layer into more oxidised water will set off anaerobic decomposition that will strip some dissolved oxygen from water. Yet removal of ice will counteract this effect too. Suction power of the dredging machine will also localise this form of impact to the area few tens of meters away from the dredged channels.

According to the analyses results dredged sediments contain insignificant concentrations of pollutants. Copper concentration in sediments has exceeded MPC but AgipKCO 8 year monitoring has also reported elevated level of copper in water of the Bay. As there is no obvious source of copper input, this may have some natural origin. Based on this data, it is possible to conclude that the concentration of pollutants in the seawater resultant from dredging is unlikely to cause any concern.

The wave breaker and the wharf front will be constructed from uncontaminated limestone. Dust from earthwork will enter seawater but its volume will be considerably lower that amount of suspended solids from dredging discussed earlier. The higher density and more globular structure of dust will facilitate faster deposition at sea bottom.

	Dredging / landfill		Earthworks	
Probability	4	The impact is very likely to occur under normal operational conditions.		
Consequence	2	Change of <25% in any parameter from the MPC; visible sediment observed for less than 3 weeks, impact does not spread more than few tens of meters from works	1	No discernible change in surface water baseline conditions and no effect on other seawater users
Significance	**8**	**Medium**	**4**	**Low**

It should be noted that this impact does not consider risk of accidental events..

5.5 UNDERGROUND WATER

Base construction activities that potentially interfere with subsurface hydrogeological conditions include elevating the ground by 3.5m and sea reclamation. All underground facilities, foundations and services (power cables, sewage and drainage pipe work) will be laid in the elevated ground, above the existing aquifer and thus will not interfere with it. Soil compaction and layers mixing will nevertheless reduce ground permeability and thus the rate of discharge into the sea as well as the seawater backflow during wind

surges. Yet, such reduction will affect neither groundwater nor seawater in any significant way. It is likely to affect only the area immediately above the Base. Further up the gradient, water flow rate will be evened out by diversion around the reclaimed and compacted shore.

During normal operation, the natural surface drainage will be altered and will change groundwater levels and salinity just under the site. The change will be counteracted by lesser ground permeability and thus will not be significant.

Probability	5	Certain to occur under normal operating conditions
Consequence	1	Negligible adverse: Impact largely not discernable and, on a local scale being absorbed by the natural environment. Permanent change in aquifer structure on 6ha area. No discernible change in groundwater baseline conditions and in groundwater resource quantity. No effect on beneficial users
Significance	**5**	**Low**

5.6 SOIL

About 4 ha of land will be compacted, mixed and buried irreversibly under a 3.5m cap. However, the soil has no agricultural or ecological value. It does not support either feed crop or rare or endangered vegetation. So the burial of 4ha under a 3.5m ground layer will not impact significantly on the land resources of the region.

Soil damage at the Atash limestone quarry, from which the rock will be extracted for construction of breakwater and wharf front, should be taken into account during the preparation of the quarry EIA. Carbonate dust form the shell rock transportation on the hard surface road (10.2km) to the Base will impact on the soil along the road. Burial of the fertile soil layer will reduce the light penetration and deteriorate the ventilation. Soil chemistry will not change as added calcium is inert and present in abundance in soil already. Top soil burial is also unlikely to produce measurable impact. Generated by rock transportation small volumes of limestone dust will mainly fall down on the road right-of-way which soil that has been altered by earthworks already. This dust will be washed out by rain and resedimented in micro depressions. Therefore impact on the composition of micro-flora and insects will be negligible.

The Base solid waste will be transported to the Tenis Service Landfill in closed containers and will produce no impact on soil along the road.

Thus, the impact on soil will be confined to the construction site and its significance will be low due to low agricultural and ecological value of this soil.

Probability	5	certain to occur under normal operating conditions
Consequence	1	adverse, direct, permanent, local, irreversible but on the already damaged soil
Significance	**5**	**Low**

5.7 ASSESSMENT OF IMPACT ON VEGETATIVE COVER

The area impacted by the project has no rare species or endangered communities that require specific protection.

The operation phase will produce no direct impact on vegetation. During construction, vegetation on 3.4 ha of the beach will be completely and permanently removed as a result of construction. Its low agricultural and ecological value as reflected by high disturbance, low vegetative cover, presence of the same species

on adjacent territories and absence of rare or valuable species suggest that even its permanent burial will have low significance.

The plants on the top of the cliff at the north end of the Base will be damaged during the construction camp and office installation, vehicle maneuvering and temporary storage of material. Because the current Base layout does not intend to pave or use this area excessively during operation, it is likely that existing vegetation will recover to the existing state in 2-3 years.

Probability	5	certain to occur under normal operating conditions
Consequence	1	Direct adverse, permanent destruction on small area, actual and measurable Indirect through air – adverse short-term, intermittent, local, reversible actual but difficult to measure
Significance	**5**	**Low**

5.8 WILDLIFE

Impacts on fauna can be directly due to mortality, sub-lethal health degradation and displacement and indirectly as a result of habitat alteration (creation, loss, improvement, degradation or fragmentation).

Onshore vertebrates are almost absent from the Base area. Day and night observations during 2 weeks in April and July did not record any signs that the area is used by terraneous animals and birds for nutrition, nesting or rest. Perhaps, this can be explained by the quite high level of disturbance due to the proximity of residential areas, presence of the beach and a berth for private boats. Swallows that live in the upper part of the escarpment and sparrows that live in the village will hardly be affected by the development as they are very tolerant to such disturbances and benefit from being next to them through reduced predation and competition from other species. Sparrows also can feed on human food waste.

The short-term surveys may have not shown the whole picture and some migration of mammals may occur along the beach at other times. The base will practically eliminate such migration. Animals would have to pass along a narrow corridor between the fence and the village or move up the slope to pass the village from the east. Yet, considering the low ecological value of the shoreline further south from the Base site, it is unlikely that such impact will be significant. For most animals that use shoreline as a food and water source other marine support bases to the north of the site would stop their migration before they reach the site fence.

Onshore animals' mortality may increase from increased traffic along the 8.2km part of the road from Atash village to Atash Waste Treatment Plant. There will be no additional impact within Atash village and perhaps very little at the lower, more inhabited area. At the chink and plateau it will be almost impossible to separate the Base impact from the activities of the other operators that use the road. However, mortality from additional traffic associated with the Base will be low because the trucks will operate only during day time. This will also allow larger animals to cross the road at nigh without risk of being killed. Mass mortality due to migration of amphibians or invertebrates to breed is very unlikely due to the absence of distinct breeding areas along the road. Yet, a busy road can effectively separate smaller mammals, reptiles, amphibians and invertebrates from their breeding or feeding grounds. Although those that dare to cross the road risk being killed, it is envisaged that the number of individuals which will perish on the road will be below the naturally high population fluctuation range for these animals.

Noise may displace certain sensitive species further away from the road. This may reduce the chances to survive or breed for animals which experience shortage in nesting or feeding grounds. In the desert flat relief roads (especially their elevated parts) always attract various small animals. First, the road rainwater runoff produces lush vegetation on the slope and in the depressions at both sides made when soil was moved to construct the road body. Second, reptiles and rodents use the road body to make burrows. Third, finding insects on the road surface is easier than in the desert but this is counteracted by higher exposure to attack by prey birds.

Collision with large animals represented by domestic camels and cows is unlikely because of work restriction to daylight hours. Due to the industrial activities, large wild animals have not been recorded in the area and therefore collisions with them especially during day time are highly unlikely.

Probability	4	The expected traffic volume is very likely to occur under normal operational conditions
Consequence	2	adverse, direct and less of indirect, long-term but intermittent, localised, reversible quantitative, actual, summative with traffic from other operators
significance	**8**	**Medium**

5.9 WASTE MANAGEMENT

Hazardous liquid and solid waste and nonhazardous ignitable solid waste, liquid and non-combustible waste constitute the main volumes of waste during construction operation phases.

The local area has three official facilities where the Base waste is likely to be disposed:

1. Municipal Sewage Treatment Facility (STF) and the landfill built by Agip KCO and given to the Municipal Services of F.Shevchenko to operate;
2. Tenis Services LLP hazardous and non-hazardous waste management facility;
3. AgipKCO hazardous and non-hazardous waste management facility.

It is not clear at this stage whether the control over these facilities can be implemented to the degree required by the EU Directive and the World Bank guidelines. To ensure that no undue impact is created by the waste generated by the Base or channeled through the Base, the operator will not start the activities that generate waste until such control can be effectively implemented. The control will be expressed in assessment of the waste transportation, treatment and disposal activities and machinery and regular audits of their effectiveness that will include examination of monitoring and inspection results and spot sampling of treated sewage.

It should be noted that hydraulic fluid, lubricant oil, greases, oiled rugs and tires generated during construction will be related to the activities of the equipment provider who should handle such waste in a centralized manner when servicing vehicles at his permanent or temporary premises.

Some potential impact can be generated by the liquid waste disposal truck tanks overturn or major leaks. The risk of spillage of sewage waste along the road to the municipal sewage treatment plant will not be great considering that its probability is minimized by the control and audits of the waste contractor. The significance of such spill along the road will also not be too great because of the absence of sensitive habitats, water bodies and shallow aquifers that could be affected. Spilled sewage can create a notable nuisance and some potential health hazard if it is spilled in the Atash village but it will be quickly localized

and collected according to the Base Operator's environmental management plan. The residual sewage will soon degrade under the sun and microbiological action.

Properly contained and labeled, the liquid hazardous waste will cause no impact at the site. Oily water leaks during the intercepting well emptying into the waste contractor tank trucks (one 6m^3 tank truck every other week or 176m^3/year) will drain back into the well. Other hazardous liquid waste like acids/alkali from the laboratory and the workshop (produced in average volumes of 17 L/month), residual paints thinners, solvents and coatings (max 7.25 tons per month) from the workshop will be kept in closed and labeled containers on the bounded impermeable plot. The volume of solid hazardous waste will mainly depend on occurrence of an oil spill as most of it will be oiled rugs and absorbents. On average around 90kg will be sited each month.

The potential impact of transportation and disposal of at the newly constructed waste disposal site of Tenis Service LLP is likely to be minimal considering that the site is constructed according to the current requirements of the environmental and health and safety controlling authorities. This means the shallow groundwater monitoring wells are installed at four sides of the site and geomembranes and the membrane protective layers are installed.

	Liquid waste escape		**Fire and explosion at site**	
Probability	2	The impact is unlikely to but may occur at some time under normal operating conditions of waste contractor and the waste disposal site.	1	Fire or explosion is very unlikely to occur under normal operating conditions of the disposal site but may occur in exceptional circumstances.
Consequence	2	Minor: at disposal site: adverse, direct, long-term, cumulative, localised, partially reversible, quantitative, actual; along the road: visual, short-term, localised, reversible.	4	Major: Local scale impact resulting in very high groundwater contamination and air pollution. Health hazard to Aktau population and air pollutants transport and precipitation at sea damage to the natural environment and its ecological processes; adverse local and national media attention.
Significance	**4**	**Low**	**4**	**Low**

Tab. 5.1 Calculation of the annual waste volume, generated during the base construction (*0.6*) operation (87) and decommissioning (8)

Category/ type of waste	Waste volume (ton or m^3)				Disposal method
	< 1	< 10	< 100	> 100	
Hazardous liquid waste (hazard class III)					
Oily water from site and slipway drainage, seawater fuel spills and drums and fuel tanks cleaning		8		**176**	To drainage interception well or slipway drainage holding tank then by tank trucks to Tenis Service waste disposal facility
Water from drums, cans and scrap metal cleaning		**9**			To slipway drainage holding tank then by tank trucks to Tenis Service waste disposal facility
Used oils at workshop and fuel at testing laboratory	**0.8**				
Residual paints, thinners, solvents and coatings	***0.6***		**87**		In sealed and labeled containers to Tenis Service waste disposal facility
Acids and alkali from laboratory and workshop	**0.2**				Recovery, neutralizing in the lab then in sealed and labeled containers to Tenis Service waste disposal facility
Hazardous solid waste					
Oiled rugs, spill cleanup absorbents, fuel tanks sludge, fuel filters(class III)	***0.7***	**1**, 1			Delivery to Tenis Service waste disposal facility
Fluorescent tubes (hazard class I)	**0.1**				Crush at site and transport to Tenis Service waste disposal facility, utilization of mercury at MAEK facility in Aktau
Nonhazardous combustible solid waste (hazard class IV)					
Office dry waste	***0.2***	**0.5**			In enclosed containers to Tenis Service landfill
Packaging, paper and cardboard	***0.5***	**1.5**			Concentration, transport to Aktau
Wood	***0.5***	**1**			In enclosed containers to Tenis Service landfill, utilized by local households
Nonhazardous liquid waste (hazard class IV)					
Not oily runoff				**952**	In $10m^3$ tank trucks to municipal sewage treatment facility then evaporation ponds
Sewage		4		**3769** **1898**	
Nonhazardous noncombustible solid waste (hazard class IV)					
Construction inert waste and interceptor sumps sand		**2**	***90***		In dump trucks to municipal landfill
Glass bottles		**2**			Concentration, to local retailers of drinks
Plastic, broken glass	***0.5***, 0.6	**9**			In enclosed containers to Tenis Service landfill
Cleaned batteries and capacitors, metal and plastic drums and cans, scrap metals and candle ends of electrodes		***6***, **7**	**45**, 61		Cleaning by steam of oiled, acid residues for collection by VtorCherMet companies from Aktau
Electric wire	***0.5***, 0.7	**3**			

6 SOCIO-ECONOMIC IMPACT ASSESSMENT

6.1 SUMMARY OF SIGNIFICANT SOCIO-ECONOMIC IMPACTS

Tab. 6.1 Summary of significant socio-economic impacts (activities that caused negligible impact and receptors effect on which was negligible were omitted)

Receptors / Impact sources	National economy	Regional Economy	Local economy	Local land use and livelihood	Health and safety	Local utilities, infrastructure and housing	Impact description
Construction							
Workforce import		+5	+5	-5			Regional contractors employment, jobs in local service sector, informal economy development but disruption to local population
Local workforce utilisation			+5	+5			Limited skill transfer through temporary employment and subcontracting of local companies
Rock and Base components transportation				-8	-8	-5	Air pollution and dust, noise, vibration and risk to pedestrians of 20 houses due to the trucks
Operation							
Workforce import		+5		+5			Increase in demand for qualified and semi-qualified labour and enhancement of skills of employed staff
Local workforce utilisation			+5	+8			Increase in demand for qualified and semi-qualified labour and enhancement of skills of employed staff
Base operation	+3	+5	+5	+8		+8	Tax revenue; infrastructure and utilities improvement; local socio-economic problems reduction;
Seawater desalination				+5	+5		Additional source of potable water = reduction on cost of water=reduction in consumption of unhealthy water
Waste transportation and disposal		+5	+5				Local waste contractors use but air pollution, vibration, noise, risk to pedestrians and road damage from 1 truck every 10 min from 9:00 to 18:00 = 50-55 trucks /day
Fire/explosion			-3	-3	-3		Economic loss, Possible loss of lives, air pollution
Fuel export/import equipment failure			-4	-4	-4		Air pollution and visual impact from fuel spills on land and sea
Decommissioning			+5	+3			Loss of local jobs but land release for other uses

Out of 36 discovered and assessed types of work 10 types are considered as the potential sources of significant impact. As a whole, the Atash Marine Support Base development can cause the insignificant long-term impact upon the social and economic environment of the area. None of impacts were assessed as critical or high. Only stone and base components delivery will provide the negative moderate impact on the residents of 20 houses along the southern part of the main street in Atash village. Negative impact due to the fires, explosions and spills is assessed as low. Other impact types are positive, thought negligible.

The main positive impact will be increase in demand for qualified and semi-qualified labor and enhancement of skills of employed staff. Skills enhancement will come not only from the foreign specialists but also from contractors that will come mainly from Aktau but also from Atyrau, Almaty, Astrakhan' and less likely from Aktobe.

As seen from the project description section about 80 workers from Aktau will be joining the project at the start. This number will be reduced to 45 after the first 6 months. Despite small numbers, the positive impact will be enhanced by employing the bulk of the workforce in off season. The same benefit will apply to the regional contractors.

The main impacts associated with social and cultural interaction issues will result from influx of workers to the Atash area. As stated above, the total number of employees on-site at any one time will be a maximum of around 100 during 3 months and on average 60. Of these the proportion of locally employed will be around 10%. The bulk of the remaining workforce will come from Aktau and the adjacent regions. Apart from the municipal waste collection and some occasional port services, local companies will hardly be involved. Both, local employees and subcontractor restrictions are due to their inability to provide the work of the required quality.

. Income figures, employment profiles and economic activity spread indicate that the local average and low incomes residents will try to take advantage of increased opportunities for the informal sector which is in fact supported even by the high income oil industry shift workers that often work as taxi drivers their in free time.

Local suppliers and vendors may increase prices to take advantage of increased local cash flows. This may negatively impact those in the community who have not benefited from the project employment opportunities and create greater inequalities within the local community.

7 MEASURES FOR MINIMIZATION OR ELIMINATION OF NEGATIVE IMPACTS

7.1 CONSTRUCTION AND NORMAL OPERATION

Although this chapter serves to suggest ways of decreasing high significance impact to acceptable levels, some practical and cost effective suggestions are also made to minimise medium and low significance forms of impact even further.

The main part of environmental impact to be produced at the construction phase will be of low significance. Impacts of high significance will be on sea sediments and marine animals mainly from dredging and land reclamation. Medium significance is assigned to impact on seawater, marine plants and terrestrial animals.

The dredging and reclamation technology of cutter suction and transportation via a pipe selected by the Base Operator uses large amount of seawater but due to the high negative pressure the plume of suspended solids around the working cutter is minimal. Performing dredging and land reclamation in the shortest time in the cold period with the lowest biomass of marine animals and plants already reduces impact significantly. Therefore it is unlikely that changes in technological approaches can reduce the significance of the named impacts and the focus should be put on proper process management. The Base Operator must therefore ensure that the dredging contractor has developed a dredging program that complies with the World Bank Environmental, Health and Safety Guidelines for Port and Harbour Facilities,

1998 and meets the findings of this report, including turbidity monitoring. He should try to keep suspended solids below 200 mg/L. If recorded turbidity exceeds the concentrations predicted in this report in impacted areas, silt curtains should be used.

Starting dredging at the sea and moving towards the shore can reduce the duration of the impact giving more time for the outward dredged areas to recover. This would require a longer pulp pipe because reclamation will have to start from filling the land but it also may be most technically feasible starting dredging at the wharf front when the dam is completed.

Operation of vehicles at the construction site will generate dust. For dust reduction on dry, windy days it is recommended to use 2-3 powerful water pumps that would be able to diffuse the sea water to a great distance. Dusting along the used part of Atash village road will be reduced using water tank trucks, watering the road several times per day. Signal for the need for water application will be sent from the local meteorological station. In order to determine the moisture and speed of wind at which the application is necessary, it is recommended to register these indices at the beginning of the construction works when the greatest dust concentration in surface air is detected.

Vehicle operation along the 8.2 km road from Atash village to Atash quarry will be carried out during day ours and thus may cause only moderate summative impact on the terrestrial animals and increase risk for of cattle to be killed and of traffic accidents. There is no better alternative from the source along the route to bring the required rock to the site. Installation of additional restricting road signs will not be allowed by the police on this public road. An effective measure can be for the Base Operator to carry out a traffic survey at the start of the rock haulage and then apply for installation of some warning signs like a “steep slope” etc. The drivers of the construction contractor should be screened for experience and accident records, and instructed on safe driving for this specific assignment. This instruction should be tailored for the existing road conditions and traffic and include the results of the traffic study. A driver’s “Route List” must include the restrictions required by legislation and safety considerations like working hours, maximum speed and load, use of lights and seat belts, etc. The only measure that may reduce the risk for cattle is speed control.

Therefore only high environmental awareness of the Base Operator and its contractors will allow the reduction of the significance of the named impacts as the work starts by making minor alterations “on the ground”.

The Base Operator should ensure that the Atash limestone quarry used for the construction is developed and operated in accordance with the World Bank General Health and Safety Guidelines and in the General Environmental Guidelines, so that potential impacts on air quality, water resources, ambient noise levels and sensitive natural environments are minimized. The quarry must have a closure and reclamation plan that incorporates the following provisions:

- The land should be restored, to the extent feasible and practicable, to conditions capable of supporting prior land use, or uses that are equivalent to the prior land use.
- Significant adverse effects on groundwater resources are prevented or mitigated.
- Erosion is prevented and self-sustaining development of a productive ecosystem is possible.

Since the currently selected waste management facilities do not have provisions for controlling incoming waste composition, the Base Operator should ensure that waste generated at the Base is properly segregated to eliminate risk of improper disposal of hazardous waste

7.2 MEASURES FOR ACCIDENT PREVENTION, LOCALISATION AND RESPONSE

The potential for fuel spills resulting from accidental events has been considered since the early stages of the Project design and the focus has been on reduction of the probability and volume of spills. This has included a minimisation of potential leak sources at the facilities and the design of adequate leak detection procedures. For example, an overspill at two fuelling points will be sensed by the hydrocarbon sensors that will activate an automatic shut down valve on the export pipeline. In the unlikely event of this safety equipment failure, fuel may spill into the sea. To mitigate the impacts associated with the spill on the sea water, sediments and animals, the Base must be equipped with spill localisation and collection gear and a tug that can quickly install the barriers and suck diesel and the water-in-oil emulsion. Dispersants are not permitted to be used in the sea; neither is in situ burning as well.

The key tool for reducing or removing negative impacts is the Emergency Response Plan. The purpose of which is to provide guidance to those involved in responding to a fuel spill incident and to initiate all necessary actions to stop or minimise any potential adverse effects of air, water, or soil pollution. The primary step in The Base Operator response to an accidental release of fuel should be to first notify the relevant contactors of the occurrence of the incident and to categorise the size of the leak using the following criteria, to determine the appropriate action:

Tier 1 (Minor Event): - Tier 1 incidents are defined as small local leaks, which require no outside intervention and can be dealt with on site by local staff.

Tier 2 (Serious Event): Tier 2 incidents are larger leaks, which require additional resources and manpower from the other Bay operators.

Tier 3 (Major Event): Tier 3 incidents are very large, possibly ongoing, leaks, which may require additional resources outside the capacities of all Bay operators. The closest high capacity response Base will be AgipKCO Base in the Ural River delta.

This system is internationally recognised as the most pragmatic approach, avoiding excessive costs and seeking shared resources for large, infrequent events.

The Base Operator therefore should prepare an Emergency Response Plan which addresses incident reporting, agreements with the other Bay operators to share the spill response capabilities, contractor databases, etc. This plan should be updated with changes in the Base specifications. The plan should contain all necessary contact details for appropriate logistical support, together with pertinent contact details for local authorities, NGOs and other relevant bodies for responses to the different tier events. This will allow direction and guidance in responding to a fuel spill. The plan will also include an assessment of the adequacy of available response equipment and mobilisation effort required for the leak scenarios identified in the risk assessment with recommendations provided (where necessary).

Presence of such Plan and effective agreements with the other Bay operators and AgipKCO to use their facilities for Tier 3 events is likely to reduce the significance of impact from fire, explosion, and leaks from the fuel export/import equipment and from the vessels or trucks collision to the low level.

Tab. 7.1 Summary of environmental and socio-economic mitigation measures for significant impacts

Phase	Activity	Significant impact description	Mitigation measures	Residual impact
Construction	Dredging , wavebreaker and sea reclamation	High to medium negative impact on sea water, sediments animals and plants	Perform works in the shortest time in the cold period when the marine biomass is the lowest. Store the top organically rich layer on the barge and application after the dredging of a particular part is complete	Medium
	Vehicle operation	Medium negative summative impact on the terrestrial animals, road condition, pedestrians and 20 households from hauls along the 8.2 km road from Atash village to Atash quarry	Construct temporary road along the beach to reduce number of affected houses to 8; repair surface and edges of the affected part of Atash street; Control speed, consult residents of affected houses, perform noise and traffic survey, consider other named measures if speed control is not effective	Low
Operation	Maintenance dredging	Medium negative impact on sea sediments and marine animals. Also on seawater, marine plants and terrestrial animals.	Same as for dredging during construction but consider if dredging with an excavator is more appropriate for “spot dredging”	Low
	Fire / explosion	Medium negative on air, seawater, sediments and groundwater economy and personnel from heat, leaks, pollution, visual impact	Environmental management system development and maintenance, fire drills, fire protection equipment regular inspections	Low
	Vessels and trucks accidents	Medium on ground and sea waters, low on air and marine environment	Speed control, contractor auditing	Low
	Fuel export/import and storage system failure	Medium negative impact from diesel spill on the sea water, sediments and animals.	Maintain the Emergency Response Plan and equipment for tire 1 spills, made arrangements with the Bay operators for tire 2 and with Agip KCO for tire 3 spills.	Low
Decommissioning		Low negative from noise at site and vehicles movements but there will be no residents nearby, low positive from employment	Work in day time, low intensity, collect residual fuel and dispose properly	Negligible negative and low positive

8 ENVIRONMENTAL MANAGEMENT PLAN FRAMEWORK

Environmental performance should be one of the key performance parameters of the project. A framework of the Health, Safety and Environmental (HSE) Management System that should be developed and adopted by the Base managers is described in here. This should be implemented through formulation of a site specific HSE policy that should then be supported by a number of documents, procedures and practice that, taken together, form the basis of the Environmental Management System (EMS). Environmental management follows a hierarchical structure that is reflected in ISO14001: Company philosophy formulates the policy that in turn sets the requirements for the management system to be developed. The system should consist of the following main components:

- List of significant environmental impacts identified during ESIA stage;
- Legal and other requirements for operation set in ESIA text;
- Environmental improvement objectives and targets;
- Environmental management program and continuous improvement plan;
- Defining organisation and responsibilities;
- Operational control;
- Monitoring changes in environmental conditions;
- Control of contractors and suppliers through proper records keeping and regular auditing;
- Managing non-conformances, taking corrective and preventative actions;
- Emergency preparedness and response;
- Training, awareness and competence; and
- Communication.

It is important to note that environmental assessment is an iterative process and the results of this ESIA have identified impacts at the Detailed Design stage of the project. The impacts and thus impact mitigation methods can change over time.The process should therefore continue through further project definition. Project specific procedures and training requirements for personnel can then be developed with the roles and responsibilities of the company and the contracted personnel clearly stipulated.

A waste stream inventory identifies predicted wastes for the spectrum of activities for the lifetime of the project including decommissioning. It shows that at the construction and in lesser degree at decommissioning phase mainly inert construction waste and scrap metal will be generated in appreciable volumes. At the operation phase waste will be generated in too small volumes to deserve creation of designated facilities. To comply with the EU waste management strategy the following hierarchy should be adopted:

- reduction;
- re-use;
- recover;
- recycle; and
- disposal.

The Base Operator policy should require that the disposal of all wastes must be justified by demonstrating that recovery, reuse or recycling is not reasonably practicable. For this The Base Operator should take responsibility for proper waste disposal and in this role it should ensure that:

- project contractor(s) have adequate training and follow stipulated waste management procedures for minimising, handling and storing waste;

- waste disposal contractor(s) use licensed facilities for treatment and disposal of waste that meet at least Kazakhstan standards;
- audits are carried out to ensure these are achieved.

Detailed waste management procedures should be put in place including the requirement for waste transfer forms giving an accurate description of the waste. These forms follow wastes to the ultimate disposal site/operator and provide an auditable trail.

Correct disposal or recycling of waste requires suitable and adequate facilities for proper segregation, storage and handling of all waste streams at the point of generation. To address and plan for the management of wastes The Base Operator should develop an Integrated Waste Management Plan (IWMP) the key aims of which should be to:

- verify identified during EIA waste streams and volumes;
- check whether the present arrangements for waste management are optimal;
- ensure the appropriate waste treatment and disposal by the Tenis Service LLP waste management facilities;
- audit and make recommendation for improvement of the Tenis Service LLP liquid and solid hazardous waste disposal facilities.

Even with the small volumes of generated waste an onsite waste collection site for the receiving, handling and recycling of wastes should be established. It should include:

- a segregation area for base metals, batteries, fluorescent tubes, timber, plastics etc.;
- a quarantine area for incorrectly documented and unidentified waste;
- an acids and alkalis neutralizing facilities;
- steam cleaners for thread protectors and oily containers;

Oil-water separation will be carried in the interceptor well and in the fuel storage area holding tank. Segregated and precleaned waste should be transferred separately. It should be checked that at these places segregated waste is not mixed. To ensure that this is happening the Base operator should perform regular audits and introduce waste storage, transfer and handling protocols and waste transfer forms.

Additionally, all personnel employed at the project facilities should receive formal waste management awareness training, particularly regarding the correct waste segregation, storage and labelling procedures and potential recycling of waste. These waste management procedures and associated training programmes should be consolidated in a final IWMP that itself should be identified in and linked to the Environmental Management System (EMS).

8.1 WASTE MANAGEMENT STRATEGY

The Base Operator should develop a Waste Management Strategy and guidelines to addresses all of the waste issues associated with the development. The principles that should underlie the guidelines for waste management are as follows:

- All waste management sub-contractors should be reputable, with expertise in the management of domestic, construction and hazardous wastes.
- Waste management sub-contractors should take control of responsibility for wastes as close to the point of generation as possible.

- The main contractor and waste management sub-contractors must demonstrate a commitment to waste minimization and recycling and provide details of minimization and recycling plans. This may be difficult to impose from the Base operator alone but is more feasible if the key operators in the Bay ally for this purpose;
- Land filling leaves a permanent legacy and only those wastes for which no other economic disposal route can be identified should go to landfill.
- The transportation of waste should be minimized.

No discharges can be made to seawater or groundwater, including seasonally dry depressions unless discharge consent has been issued by the appropriate agency.

9 MEASURES FOR ENVIRONMENTAL MONITORING

The environmental monitoring programme is proposed in order to validate the predicted environmental impacts from the different activities of the project, and to be subject to assurance review through a series of internal and external audits. These should be recorded and reported and corrective actions issued for any non-compliance. Key performance indicators should be developed for the targets and objectives set. The monitoring identified in the EMS should be committed to throughout the life of the project and should include the following checks and controls:

- compliance with the company's policy, legislation and specific regulatory requirements;
- progress against internal operation objectives and targets;
- correct operation of the sewage treatment facilities and
- correct disposal of process wastes.

An audit schedule should be developed as part of the EMS.

Considering the number of the Bay users, it is logical to suggest arranging integrated environmental management and monitoring. But the users have different levels of overall management and at least local operators are unlikely to see any need in it. In whatever form the monitoring programme is going to be arranged, it does not need to be overly complicated or expensive. However, it should be implemented both before and after any additional construction in the Bay.

A site specific survey has already been completed as part of this assignment to fill the gaps in the baseline environmental and social data. Providing there are no delays in the construction schedule, no more assessments are required.

The next session of monitoring should be performed in late spring after the dredging, wavebreaker construction and sea reclamation is completed.

The monitoring of construction activities, including traffic, noise, waste disposal, dredging, will be performed according the Base Operator Environmental Management Plan drafted fro the construction phase.

Operational monitoring should be carried out by a combination of monitors and controls built into the operational process and by sampling and visual assessment.

Air should be monitored for the following pollutants: petroleum hydrocarbons (mainly methane), SO2, NOx, CO, soot and suspended solids that should be analysed for Ca, Mg, Na, Cl2, SO4, Cd, As, Cu, Zn, Pb, Hg and Mn. Sampling should be performed quarterly at 4 stations at the edge of the Sanitary Protection Zone which coincides with the Base border. Air samples should be taken during 3 fair weather days for 25min at each station moving clockwise and covering all 4 stations in 2 hours. The rotation should be repeated 4 times a day starting before the working day. In addition 4 samples should be taken at the background point each day. Overall 12 samples should be collected at each of the 5 stations. Data from the Bautino meteorological station should be collected for the 3 sampling days to verify weather recordings at the stations during sampling.

For construction dust impact monitoring in Atash village, it is necessary to set 2 dust collectors before the construction work above the erosion terrace, near the houses and 3 dust collectors along the used village road part. At first data will be collected once a day, then the frequency of collection can be reduced to the acceptable level depending on the dust amount and weather conditions. Moisture,

temperature, wind data will be collected together with dust information from the local meteorological station over the assessed period. Information will be used to determine the efficiency of dust reduction measures.

Seawater quality should be monitored quarterly. Water samples should be collected directly into precleaned bottles and analysed for TPH, phenols, surfactants, metals (Cu, Ni, Cd, Pb, Co, Zn) ammonia, mineral phosphorus, pH and temperature, electric conductivity and total salinity. After large fuel spills on sea and on land water is monitored for petroleum hydrocarbons and phenols once a week until concentrations fall to the background level in two consecutive measurements.

Marine vegetation and animals should be monitored once a year between late spring and early autumn and once a month after a major spill, fire or explosion until the impact is identified and the trend towards recovery is recorded. Monitoring should be performed for phyto and zooplankton, benthos and plants using standard sampling methods. Biomass and no. of individuals for the impact indicating families should be measured at least. It may be easier however to record all families in the samples.

Sea sediments should be collected on a quarterly basis with a sediment sampler on a rope (0-5cm). It should be analysed for TPH, phenols and metals (Cu, Ni, Cd, Pb, Co, Zn).

Two groundwater monitoring wells should be installed under the escarpment inside the Base fence after construction. The contaminant suit for the first operation year should be the following: TPH, phenols, surfactants, metals (Cu, Ni, Cd, Pb, Co, Zn) ammonia, mineral phosphorus, dissolved oxygen and BOD5, pH and temperature, electric conductivity and total salinity. For the following years only key contaminants should be analysed every quarter. These are those that show levels close or above the water quality standards or have large ranges). Other contaminants should be analysed only once in May or November (the time of the highest shallow aquifer recharge by rain water) and after large accidental fuel spills or fires.

Monitoring changes in sedimentation (erosion) in the dredged channels and around the wavebreaker should be done at least quarterly. This could be done by measuring depths with a rope from a small boat in a quiet day. The sea level measurement should be taken from the gauge and this should be compared with the baseline records at the time of dredging completion. The depth can be measured anywhere but it must be recorded at the BS stations. A more precise method uses a 6m topographic ruler and a theodolite set up on the wavebreaker and the jetty. The theodolite reads the depth and the distance from a ruler while the ruler is put on the sea bottom. Photographing from the same points using the specified camera settings and orientation each time can act as a good precursor to the depth survey. This can be effectively substituted by sharing the purchase of the Quickbird satellite imagery of the Bay with the other operators.

Noise from the Base and the heavy vehicle traffic should be monitored once during construction and once during operation at the fronts of the houses opposite the Base and along the Base – Atash quarry road. For the Base noise level an 8 hour continuous survey is required. For the traffic, the background and the peak noise level during the vehicles passing should be measured. The number of trucks per day should be recorded and compared with the Operator documentation to work out how many of them belong to the Base. At least four transects from the road should be made to establish the noise attenuation patterns. For the noise attenuation study it would be useful to carry measurements at different wind speeds and direction. All measurements should be performed in dB(A) and dB(C). Additional studies may be required if the level of activity at the Base and the traffic from the Base rises considerably.

There is no need to monitor soil, vegetation and animals on land unless a large explosion damages them as stated in the impact assessment section. In this case the vegetation and animals specialists should assess the area and set up a separate monitoring program for it.

Sewage and solid waste does not have to be sampled prior to submittal to the waste contractor. The groundwater around the hazardous waste disposal facility is monitored by the Tenis Service LLP. This, in conjunction with regular audits of the facility and the waste handling documentation described in the environmental management section, should ensure that the disposal process is kept under control. The audits would include assessment of the waste transportation, treatment and disposal solutions, monitoring and inspection results and random checks of the treated waste water for hydrocarbons.

Sea level and meteorological conditions are recorded by the Bautino meteorological station. Additional monitoring of near Base sea level, currents, wind speed and direction should be done during the seawater and marine sediments, vegetation and animals sampling. It is recommended to install a permanent sea level gauge at the jetty head.

Tab. 9.1 Environmental monitoring program summary

Media	Stations	Monitored components	Frequency/ year*
Air	A1-4	Petroleum hydrocarbons, SO_2, NOx, CO, soot and Ca, Mg, Na, Cl_2, SO_4, Cd, As, Cu, Zn, Pb, Hg and Mn in suspended solids	4
	A5-9	Limestone and inorganic dust	**
Sea water	BS12 + + upwind BS	TPH, phenols, surfactants, metals (Cu, Ni, Cd, Pb, Co, Zn) ammonia, mineral phosphorus, pH and temperature, electric conductivity and total salinity	4
Marine vegetation and animals	BS1-13	Biomass and no. of individuals of the impact indicating families of phyto and zooplankton and benthos	1
Sediments contamination	BS1-13	TPH, phenols and metals (Cu, Ni, Cd, Pb, Co, Zn)	4
Sedimentation	BS1-14	Accumulation/erosion rate	4
Groundwater	GW1-2	Level, debit, chemistry and key contaminants	4
Noise	TBD during construction	8-hour L_{eq} for Base; Peak L_{eq} for traffic and 24-hour L_{eq} for background in dB(A) and dB(C)	-

* Monitored components and the frequency can be reduced with time if it is evident from the results that the impact does not change much or if it diminishes irreversibly. For the omitted components then a check up sampling is performed every fourth survey.

** In order to study the correlation between the moisture, temperature, speed and direction of wind with dust concentration in the air, and determine the present condition – once a day. In the future – depending on the necessity to determine the efficiency of dust reduction measures.

10 CONCLUSIONS

The planned development of the Atash Marine Base will create an overall small positive effect due to improvements in employment, skills, infrastructure and utilities and local socio-economic problems reduction. No positive impact on the environment is predicted, yet there will be no impact of critical significance and only three main activities: dredging, wavebreaker and wharf construction, and sea reclamation are judged to create high significance impact on marine environment in the Base area. Application of suggested mitigation measures can reduce these impacts to medium significance and activities that are valued to have medium significance to the low or negligible level. Due to the low number of high and medium significance impacts and unavoidable uncertainty in impact evaluation, mitigation measures were suggested also for the low negative impacts to reduce them even further.

In social-economic assessment only one impact from the vehicles movement along the Atash road was valued to have high significance for 20 Atash households. It is expressed in increase in noise, vibration, air pollution (including dust) and the risk to pedestrians especially children. The same form of negative impact is valued to have medium significance during the construction phase mainly because of its shorter duration. Suggested mitigation measures are thought to be able to reduce this impact to low medium level. By performing the noise, traffic and residents opinion surveys during construction and operation phases this prediction can be evaluated and other suggested measured introduced if further impact reduction is needed.

To reduce the other potentially significant socio-economic impacts the following strategies were developed:

- Continuation of public consultation and information dissemination about the project to the local population through the community relations manager and community liaison officer;
- Minimizing possibilities of destructive contact between the construction workforce and the local community and the possibility of transferring communicable diseases;
- Maximization of locally and regionally sourced labour for facility construction and assembly contracts, focusing on skill transfer and on-the-job training, ensuring that selection;

Although no residual high significance impacts are thought to remain after introduction of mitigation measures, the Base Operator is committed to monitor the local natural and socio-economic environment to make sure that the significance of the named impacts does not increase and new forms of impact do not arise. For this the Base Operator will maintain an effective environmental and social management system the framework for which is suggested above.