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ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT OF ATASH MARINE BASE

Final, Revision 4

2005

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1 SUMMARY

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.

This EISA report identified potential environmental and social impacts, evaluated their actual and stakeholder perceived significance, suggested effective measures to reduce impacts of high significance to acceptable levels and developed the framework of the environmental management system that will allow the verification of the impact predictions and monitoring of their changes over the project duration. In addition this study suggested a thorough plan for information disclosure and consultation with the stakeholders including the local community, regional and national public.

To ensure the transparency of the impact identification process to the reader, the text describes in detail methodology of the impact assessment. Next, the requirements of Kazakhstan regulatory authorities for the project and the risks associated with non-compliance are described.

After that the current environmental and social conditions at and around the Base are described in their dynamics to allow the segregation of natural fluctuations and the existing impacts from those associated with the Base activities.

Description of technical aspects of the project is developed on the data from the approved Feasibility Study to provide the required detailed specifications for EIA stage. In the case when exact specifications were not known, the worst case was accepted. In this chapter the alternatives for the project, the location, scale, layout and operation conditions are evaluated.

Further the text evaluates impacts and their significance, suggests mitigation measures and estimates residual impact. It was determined that the planned development 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 environment is predicted, but there will be no impact of critical significance and only dredging, wave breaker and wharf construction and sea reclamation are judged to create high significance impact. These high significance impacts and other impacts of medium significance can be effectively reduced to the low or negligible level with mitigation measures suggested.

In social-economic assessment no critical or high significance impacts were predicted. Only one negative impact from the construction vehicles movement along the Atash road was valued to have medium significance for 20 Atash households. This impact is also expected to be effectively reduced to low level by the suggested mitigation measures. To check the effectiveness of these measures additional noise, traffic and residents opinion surveys during the construction phase are suggested. The project is predicted to produce medium positive impact on the local land use, utilities, infrastructure, housing and livelihood from the Base operation. Other impacts were mainly rated to have low positive significance. However, to ensure that the changes in the predicted impacts are noted and dealt with over the project duration, a strategy for the stakeholders' consultation and disclosure is drawn.

2 STATEMENT OF ENVIRONMENTAL CONSEQUENCE

This chapter is a stand alone standard requirement of Kazakhstan legislation. It repeats the other parts of the text and serves as a formal summary of the EIA.

Project name	Environmental and Social Impact Assessment of Atash Base Construction
Source of Finance	Various
Facility Location	Republic of Kazakhstan, Mangistau region, Atash village (east coast of the Tyub-Karagan Bay, by Atash village)
Company Address	Balykshi LLP, Mangistau region, Tyub-Karagan district, Fort-Shevchenko city, Murat Uskembayev street, 12
Full Name of the Facilities	Atash Marine Base
Brief Designation	Environmental and Social Impact Assessment (EIA) of Atash Marine Base Construction project
Ownership	"Balykshi" LLP
Submitted project materials (full title of the documentation)	Environmental and Social Impact Assessment of Atash Base Construction
Project management	**Vladimir Merkouriev** *Tel.:* +7 (3272) 717 720/717 731 *Fax:* +7 (3272) 644 082 *e-mail:* vmerkouriev@ecocentre.kz "CaspiEcology Environmental Services" LLC

2.1 PROJECT PERFORMANCE

2.1.1 Facility Description

Land taken	Coastal area - 4 ha, Sea water area – 4ha.
Radius and area of the Sanitary Protection Zone (SPZ)	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 portable 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

2.1.2 Nature Use and Consumption of Materials

1. Types and volumes of raw materials **a)Local** **b) Imported**	Assembled and complete specialized equipment will be delivered from Kazakhstan, Russia and Europe. Other materials will be supplied from local Kazakhstan sources according to availability and price.
2. Heat and Power supply	Heat from 3 boilers on oil fuel 500kW each, territorial power supply, diesel generator 500kW in cases of emergency shutdown of electric power supply
3. Energy resource demand	Desalination plant, accumulator charging of ships and load-factor facilities, electromotors of pumps, machines, compressors and tuggers, etc. Premises and area lighting, navigation lights. Food preparation.

2.1.3 Nature Use and Possible Environmental Impact from the Planned Activity

2.1.3.1 Atmosphere

List of substances emitted to the atmosphere	Diesel fuel combustion products - nitrogen oxide and carbon monoxide, hydrocarbons, silica oxides, fluoride, fluorine hydride, welding aerosol and suspended substances, sulphur, soot, benz(a)pyrene, benzene burning materials.
Emissions, tons/year *Construction (18months)*	Total volume of air emissions is – 64.04 tons/year: • Manganese and its oxides 0.001380 • Soot 0.297282 • Limestone dust 13.716864 • Inorganic dust, 70-20 % SO2 37.411694 • Welding aerosol, including: 0.012000 • Nitrogen dioxide 5.945581 • Nitrogen oxide 0.106973 • Sulfur dioxide 0.743394 • Carbon monoxide 3.865070 • Hydrocarbons 0.000028 • Xylol 0.032000 • Benz(a)pyrene 0.000008 • Formaldehyde 0.074318 • Kerosene 1.783638 • White spirit 0.048000
Operation	Total volume of air emissions is – **27,69** tons/year • Manganese and its oxides 0.000690 • Soot 0.230208 • Suspended substances 0.030600 • Welding aerosol 0.006000 • Nitrogen dioxide 3789430 • Nitrogen oxide 0.053487 • Sulphuric acid 0.000680 • Sulfur dioxide 3.334,056 • Carbon monoxide 8.913,934 • Hydrocarbons 9.889,024 • Xylol 0.320000

	• Benz(a)pyrene 0.000003 • Formaldehyde 0.025476 • Kerosene 0.611424 • White spirit 0.480000 • Emulsol aerosols 0.001127
Mobile sources	Vehicle, construction and loading equipment, welding machines
Stationary sources	Chimneys of boiler and emergency power diesel generator

2.1.3.2 Aquatic environment

Water consumption (m^3/day)	10.8 m^3/day (4066 m^3/year).
Water supply source:	Bauta desalination plant at the construction stage and Base desalination plant at the operation stage.
Volume of water discharge treated on treatment facilities (m3): *Construction (18months)*	Volume of sewage water is expected to be amount to 3769 m^3/year 5.2 m^3/day (60 working, 100 at maximum)
Operation	10m^3/day
To the recycling	None due to absence of sewage treatment plants

2.1.3.3 Land

Description of land taken: **Arable lands** **Forestation** **Pastures** **Disrupted lands**	 none none none none
Disrupted lands requiring recultivation	Recultivation is not required because the area taken will further serve industrial purposes

2.1.3.4 Subsurface

Presence of natural resources, fresh water and other economically and environmentally valuable resources.	none

2.1.3.5 Vegetation

Types of vegetation, partially or completely impacted, including:	Rare and endemic species are not registered at the Base construction area. The main vegetation species are: Suaeda acuminata, Salsola nitraria, Peganum harmala, Frankenia hirsuta, Argusia sibirica, Crypsis schoenoides, Atriplex tatarica, Peganum harmala, Capparis spinosa, Lycium dasystemum, Atriplex tatatica, Anabasis aphylla, etc.

Areas of forest cuttings	None
Volumes of acquired timber	Negligible
Vegetation pollution with toxic substances	Significant vegetation contamination is not expected

2.1.3.6 Wildlife

Sources of direct impact on fauna	Vehicle and vessels traffic and associated air emissions, noise and vibration.
Impact on the protected natural areas, (reserves, national parks, sanctuaries)	There are no conservation areas within the construction area

2.1.3.7 Wastes

See table 8.3

2.1.3.8 Emergency

Potentially hazardous facilities and types of work	Fuel transferring and storage system, bunkering
Hazard of emergency occurrence	Hazard of emergency occurrence is low. Among possible emergencies, the most probable are small fuel leakages during fuel filling, which are to be collected immediately with spills containment equipment. Spills on insulated Base surface will entail only insignificant air pollution. Probability of a large spill, explosion and fire is less than once over Base operation period.
Radius of potential impact	Radius of impact from small spills is several meters from the source.
Nature of the impact	Sea water contamination

2.2 CONCLUSION

Forecast of the environmental conditions and possible consequences of the Base operation to social life.	With prudent revenue management, the projects can lead to positive social change in local scale and minimal negative environmental change mainly in water area of the bay.
Liabilities of the developer for creation of favorable living conditions for the population during construction, operation and decommissioning phases	Development contractor will perform additional mitigation measures that will described in Mitigation and Monitoring Plan has been developed for the project. Environmental management procedures will be incorporated into the Environmental Management System (EMS) that should also be developed for the project and presented into three main sections: 1. Mitigation measures: a discussion of the activities that were found to result in significant environmental impact, the base case mitigation measures and the additional mitigation measures to be adopted to reduce impact significance with indication of residual impact. 2. Environmental Management: an overview of the project's EMS structure. 3. Monitoring Plan: a discussion of the monitoring activities that will be adopted to ensure that the additional mitigation measures are being implemented and that further mitigation is being incorporated into designs, operations and procedures as well as to measure actual environmental impact of the project against the predictions made within this EIA report.

3 INTRODUCTION

CaspiEcology Environmental Services (CE) was commissioned by Balykshi LLP (Base Operator) to perform an Environmental and Social Impact Assessment (ESIA) for the Atash Marine Base construction and operation which is situated in the Tyub-Karagan Bay, Mangystau Region, Kazakhstan.

This ESIA is a necessary element for the approval of the planned development and is considered as integral part of the overall environmental work program that the Base Operator will develop and implement to ensure sound protection of the environment during the construction, operation and decommissioning stages of its activity at the assessed site. The ESIA will be submitted to the Ministry of Environmental Protection (MEP) for review in order to receive their approval prior to commencement of construction activities.

The primary purpose of the EIA is to identify potentially undesirable effects, and to identify suitable measures to prevent such effects or to mitigate them to acceptable levels. Levels of acceptability are defined by legislation, policy decisions, public consultation or the environmental sensitivity of the development area. This allows the regulatory authorities to balance the economic benefits of the proposed program against the cost to the environment and to ensure that the operator provides adequate environmental protection.

The ESIA can also be used to inform interested parties of the proposed operations and expected impacts. Consequently, the report on the ESIA process is technically sound but also is understandable by non-technical readers. Where appropriate this document makes use of previous environmental documents prepared for the area, consultation and liaison with the MEP and its regional representatives, as well as Kazakhstan scientists and experts. Technical project information has been provided by the Base Operator.

4 ASSESSMENT METHODOLOGY

4.1 INTRODUCTION

An environmental impact is defined as: "*Any change to the biophysical environment, positive or negative, that wholly or partially results from a project activity or associated process*" (ISO 14001: Environmental Management Systems - Specification with Guidance for Use (ISO, 1996))

The potential for an environmental impact exists where a project activity can interact with the biophysical environment. Impacts can be either negative or positive.

The primary objectives of the impact assessment are to establish the significance of identified potential impacts that may occur as a result of a project activity being undertaken. The significance of an impact is identified by the product of the probability of occurrence and the environmental consequence of the activity.

Unacceptable impacts (i.e. those that cannot be sustained by natural systems) will require examination of alternative and/or additional mitigation measures above and beyond those already incorporated in the base design for the project/activity. Environmental impacts have been identified and assessed for routine activities, non-routine but planned activities and potential accidental events.

The Environmental Impact Assessment was performed in several stages

1. Scoping the project
2. Gaps prioritization and filling
3. Reviewing project alternatives
4. Assessment of impacts
5. Risk assessment
6. Suggestion of impact monitoring and mitigation measures, framework for the Environmental Management Plan.
7. Review by the developer and the environmental protection authorities, consultations with the public

The following Sections describe each of the assessment process steps.

4.2 SCOPING

Scoping identifies which of the activities has a potential to interact with the natural, legal and socio-economic environments. It was conducted early in the ESIA process to focus on the priority issues for the rest of the EIA process. Scoping was performed in the following order:

1. The existing legislative, environmental and socio-economic data relevant to the proposed development area was collected and reviewed;
2. Existing engineering design definition with respect to the proposed development was gathered and organized for ESIA. All project elements have been considered including

fabrication, transportation, construction, operation, maintenance and decommissioning. Routine, planned but non-routine and unplanned (i.e. accidental) events are considered;

3. Project stakeholders were identified and their importance to the Project was ranked.
4. Gaps in data were determined and priority for their filling established.

Identified project activities and legal, environmental and socio-economic receptors were integrated into matrices (Tab 4.1). The matrix was subsequently assessed to identify every possible case of potential activity-receptor interaction. Where it was considered that an activity-receptor interaction was possible, the cell was marked. Every identified interaction was assessed and ranked in terms of its consequence and probability thus enabling the determination of the overall significance of the impact.

Tab 4.1 Example of environmental and socio-economic impact matrix

Receptors / Activity	*Atmosphere*	*Coastline*	*Groundwater*	*Surface water*	*Sea*	*Soil*	*Geology*	*Landscape*	*Costal flora fauna*	*Land flora fauna*	*Archaeology*	*Fishing*	*Shipping*	*Land use*	*Local population*	*Local employment*	*Utilities*	*Community infrast*	*Transport*	*Industr Infrastr*	*Economics*
Construction Phase																					
Land acquisition and tenure														■	■		■	■			
Ground clearance and grading	■			■	■	■		■		■	■			■	■	■	■		■		■
Modification of existing services	■													■	■	■			■	■	■
Excavation of drainage	■		■		■	■		■		■	■			■	■	■					
Fencing and lighting	■							■		■				■	■	■					
Access road and railway spur construction	■			■	■	■		■		■	■			■	■	■			■		■
Workforce mobilisation															■	■		■	■		■
Construction site facilities/ services/ utilities/ operations	■				■										■	■	■				■

4.3 GAPS PRIORITIZATION AND FILLING

Identified data gaps are prioritized according their usefulness for impact assessment and feasibility of their filling in the timeframe of the assessment. Then the decision is made which gaps to fill.

4.3.1 Methodology of social and environmental baseline study

The baseline data collection work comprised a number of main elements:

- collection and interpretation of all secondary data sources;
- field visit;
- consultation with key stakeholders;
- compilation and interpretation of data collected;
- extrapolation from the previous studies;
- preparation of baseline report; and
- incorporation of data into the ESIA process

4.3.1.1 Secondary information sources

Numerous secondary data sources, including published government statistics, ministry data, published and unpublished socio-economic studies and regional development plans, were identified and accessed and these are referenced by footnote where appropriate in this chapter. Each document was reviewed to ensure that the data was relevant and up-to-date. It should be noted that there is a lack of formal, consistent and comprehensive data collecting and recording processes at a regional and local level.

4.3.1.2 Field study

The field visits provided site specific information to augment the information collected during the secondary data search. The data from the following stakeholders was reviewed and assessed:

- Akim of Bautino village;
- Bautino Public Utilities Department;
- Council of Tyub-Karagan district;
- Department of Internal Policy and national language support, District Council;
- Regional Department of Internal Affairs;
- Tyub-Karagan district policlinics;
- Central mosque of “Kazakhstan Muslim Spiritual Organization” filial (Fort Shevchenko)

There was no sociological survey done to date in the study area. However, the results of the population health screening were assessed.

4.4 PROJECT ALTERNATIVES REVIEW

Consideration of project alternatives occurs at two levels as follows:

1. Review of alternatives to the development as a whole including the “no development” option, and
2. Review engineering alternatives within the selected project’s design definition.

Once project alternatives are defined in the Project Concept stages, they are assessed and compared on financial, logistical, technical design, safety and environmental/socio-economic criteria. The stakeholder parties are consulted at this stage to determine their views on suggested alternatives. The project alternative that is determined as likely to result in the best balance in regards to the above criteria and results of consultation is typically the one that moves forward into the detailed design phase.

4.5 CONSULTATIONS

Project stakeholder consultation is a vital component of the EIA process. The consultation process focuses on providing information on the proposed project in a manner that can be understood and interpreted by the relevant audience, seeking comment on key issues and concerns, sourcing accurate information, identifying potential impacts and offering the opportunity for alternatives or objections to be raised by the potentially affected parties; non-governmental organizations, members of the public and other stakeholders. Consultation has also been found to develop a sense of stakeholder ownership of the project and the realization that their concerns are taken seriously, and that the issues they raise, if relevant, will be addressed in the ESIA process and will be considered during project design refinement.

Consultation with all project stakeholders began during the Scoping phase and continues throughout the entire ESIA process and will continue into the construction and operational phases of the developments. All relevant stakeholders were identified using the most recent and accurate information available. This has ensured that people who may be affected by or have an interest in the proposed project have had an opportunity to express their opinions and concerns. Views have been sought at the local, regional and national levels.

4.6 ENVIRONMENTAL AND SOCIO-ECONOMIC ASPECTS AND IMPACTS IDENTIFICATION

4.6.1 Definition of environmental aspects

The International Standard Organization’s standard for Environmental Management Systems (EMS), ISO 14001 defines an environmental aspect as: “*An element of an organization’s activities, products or services that can interact with the environment*.” An environmental or socio-economic impact may result from any of the identified project aspects; that is, activity-receptor interaction.

Methods of socio-economic impact assessment are given in general terms here. More detailed description is given in Appendix 3.

4.6.2 Determining impact significance

Once all project environmental aspects are identified, the level of impact that may result from each of the activity-receptor interactions is assessed. In assessing the level of impact that an activity may cause, two key elements are considered: namely

- **consequence:** the resultant effect (positive or negative) of an activity's interaction with the legal, natural and/or socio-economic environments; and
- **probability:** the probability that an activity will occur.

4.6.2.1 Consequence

To assign a level of consequence to each environmental and socio-economic impact, criteria were defined in the following tables. If for a particular aspect the impact corresponds to the descriptions from more than one ranking, then the highest negative or lowest positive ranking is taken. To limit disadvantages of the accepted method of the consequence assessment, it was viewed as a helping tool for a professional to make the final decision. Where information external to the below presented consequence rankings information was used for making the impact significance decision, an explanation is given in the text.

4.6.2.1.1 Air quality

Category	Ranking	Peak concentration (20-30min) MPC shares	Day average concentration MPC shares
Negligible	1	not discernable	< 1 MPC
Low	2	<0.75 MPC	1-1.5 MPC
Medium	3	0.75-1 MPC	1.5-2П MPC
High	4	1-1.5 MPC	2-4 MPC
Very High	5	> 1.5 MPC	>4 MPC

4.6.2.1.2 Dust

Category	Ranking	Description
Negligible	1	No measurable or notable increase
Low	2	Measurable and notable increase in dust levels
Medium	3	Nuisance to people but no adverse health effects or on crops/property
High	4	Significant nuisance to people or with sensitive individuals affected, or minor property or crop damage
Very High	5	Very significant nuisance to people with measurable health effects, or significant damage to property or crops

Note 1: Nuisance takes account of duration by the inherent assumption that in order to cause a nuisance the impact must last for a reasonable duration (e.g. greater than one week or repeated impacts).

Note 2: The above criteria are qualitative in nature, but require professional judgment in order to assign the appropriate ranking

4.6.2.1.3 Traffic impact

The approach for determining severity/consequence for traffic impacts relates to changes in traffic flow and the presence of receptors, as well as the duration of the impact. Impacts upon the road system itself will be limited by upgrading of the roads required to the standards required to enable project activities, such as heavy vehicle movement.

The presence of receptors (e.g. built -up areas, villages, schools, pedestrians, etc.) is a necessary prerequisite in order for impacts to occur. The next consideration is the percentage increase in traffic flow, with the following rankings assigned:

- Not measurable – Very Low
- <5% increase – Low
- 6-10% increase – Medium
- 11-20% increase – High
- >20% increase – Very High

The final consideration in determination on the consequence/severity level is that the duration of the impact. Should any of the above noted increased traffic flows be predicted to occur for more than two weeks duration, the next consequence/severity level up will be used.

4.6.2.1.4 Noise

Category	Negligible	Low	Medium	High	Very high
Ranking	1	2	3	4	5
Construction	Ambient noise level raised by <3dBA (not perceptible by most people) and less than $L_{Aeq\ 5\ minutes}$ 70/75dB(A)[1] outside dwellings between agreed daytime working hours and limit of $L_{eq(1\text{-}hour)}$ 45 dB(A) [2] at night (to avoid sleep disturbance)	Ambient noise level raised by 3-5dBA and less than $L_{Aeq\ 5\ minutes}$ 70/75 dB(A) outside dwellings between agreed daytime working hours and limit of $L_{eq(1\text{-}hour)}$ 45 dB(A) at night	Ambient noise levels at sensitive receptors raised by 6- 10 dB (A) and less than $L_{Aeq\ 5\ minutes}$ 70/75 dB(A) outside dwellings between agreed daytime working hours and limit of $L_{eq(1\text{-}hour)}$ 45 dB(A) at night	Ambient noise levels at sensitive receptors raised by >10dB (A); or exceedance of $L_{Aeq\ 5\ minutes}$ 70/75 dB(A) outside dwellings between agreed daytime working hours and limit of $L_{eq(1\text{-}hour)}$ 45 dB(A) at night	As for Level 4 and either tonal or impulsive noise present.
Operation residential areas	$L_{eq(1\text{-}hour)}$ <45 dB(A) [3] at night and $L_{eq(1\text{-}hour)}$ <55 dB(A)[3] during the day	$L_{eq(1\text{-}hour)}$ <45 dB(A) at night and $L_{eq(1\text{-}hour)}$ <55 dB(A) during the day but ambient noise level raised by no more than 3dBA	$L_{eq(1\text{-}hour)}$ <45 dB(A) at night and $L_{eq(1\text{-}hour)}$ <55 dB(A) during the day but ambient noise levels at sensitive receptors raised by 3- 6dB (A)	Exceedance of $L_{eq(1\text{-}hour)}$ <45 dB(A) or $L_{eq(1\text{-}hour)}$ <55 dB(A) during the day As guidance any operational noise of duration greater than 1 hour and exceeding the above standards and that is more frequent than once per week	Exceedance of $L_{eq(1\text{-}hour)}$ <45 dB(A) or $L_{eq(1\text{-}hour)}$ <55 dB(A) during the day and tonal or impulsive noise present As guidance any operational noise of duration greater than 1 hour and exceeding the above standards and that is more frequent than once per week
Operation	$L_{eq(1\text{-}hour)}$ <70 dB(A)[3]	$L_{eq(1\text{-}hour)}$ <70 dB(A) and ambient noise	$L_{eq(1\text{-}hour)}$ <70 dB(A) ambient noise levels at sensitive	Exceedance of $L_{eq(1\text{-}hour)}$ 70 dB(A)	Exceedance of $L_{eq(1\text{-}hour)}$ 70 dB(A) or $L_{eq(1\text{-}hour)}$ and tonal or

[1] World Bank Group "Pollution Prevention Abatement Handbook - General Environmental Guidelines". Recommended level for Industrial installations

[2] WHO "Guidelines for Community Noise" (1999)

[3] World Bank Group "Pollution Prevention Abatement Handbook - General Environmental Guidelines". For a residential area, the World Bank recommend that daytime limits do not exceed L_{Aeq} 55dB daytime, and L_{Aeq} 45dB night-time, or a maximum 3dBA increase than the existing noise level should the existing ambient noise level already exceed 45dBA

Category	Negligible	Low	Medium	High	Very high
Ranking	1	2	3	4	5
industrial/commercial areas		level raised by no more than 3dBA	receptors raised by 3- 6dB (A)		impulsive noise present

4.6.2.1.5 Soils property

The severity/consequence of impacts on soils has been evaluated by taking account of the following factors:

- The magnitude of the impact, as determined by its intensity and extent in space and time;
- The vulnerability of the soils to the change caused by the impact; and
- The ability of the soils to recover from the impact.

Category	Ranking	Erosion	Reduced productivity	Waterlogging	Sediment transport to water courses
Negligible	1	Soil erosion generally not discernable	generally not discernable	generally not discernable	generally not discernable
Low	2	Soil erosion predicted to occur at approximately the same rate as soil formation	Discernible, last <3 months	Water predicted to remain in surface depressions < 3 months after construction	Visible sediment predicted in watercourses for < 3 weeks after construction and no obscuration of the bed
Medium	3	Soil erosion predicted to be visibly active but no rill and gully formation evident	Limited, lasting 3-12 months	Water predicted to remain in surface depressions 3-12 months after construction	Visible sediment predicted in watercourses for > 3 weeks after construction but no obscuration of bed
High	4	Rill and gully formation predicted to be evident	Moderate, last 1-5 years	Water predicted to remain in surface depressions for 1-5 years after construction	Visible sediment predicted in watercourses for > 3 weeks after construction and obscuration of the bed
Very High	5	Rill and gully formation predicted to be extensive	Extensive, last >5 years	Water predicted to remain in surface depressions permanently	Permanent features in watercourses

4.6.2.1.6 Contamination

Category	Ranking	Description
Negligible	1	Concentrations below MPC
Low	2	MPC concentrations exceeded by <25% in project area and can affect
Medium	3	MPC concentrations exceeded by <25-50% in project area and can affect
High	4	MPC concentrations exceeded by <50-100% in project area and can affect
Very High	5	MPC concentrations exceeded by <100% in project area and can affect

MPC= maximum permitted concentration in soil. When absent, Dutch Intervention Standards are used. Their use here is to provide a measure of impact rather than as a trigger level for intervention during construction should any contamination be exposed

4.6.2.1.7 Landscape

Assessing the consequence/severity of landscape and visual impact is a qualitative process, which relies upon subjectivity and reasoned judgment supported where possible by evidence.

Category	Ranking	Impact on Visual Receptors (resident and transitory)	Duration, and extent of change in landscape / Quality and value of Landscape
Negligible	1	Change in view not discernable from most viewpoints	No noticeable change in landscape / or landscape is low quality
Low	2	Few viewpoints affected / minor change in view	Virtually imperceptible change in the landscape; or Reinstatement within 1-2 years
Medium	3	Many viewpoints affected / moderate changes in view	Changes in the natural landscape in a localized area; or Reinstatement in 2-5 years
High	4	Majority of viewpoints affected / major changes in view	Change in natural or high value landscape over an extensive area; or Reinstatement in 5-1 0 years
Very High	5	All of viewpoints affected	Change in natural or high value landscape over an extensive area; and Reinstatement not possible

4.6.2.1.8 Surface Water – quality and quantity

Category	Ranking	For surface water used, or may be used, as a resource, being of sufficient quantity and quality	Effect on Beneficial Users
Negligible	1	No discernible change in surface water baseline conditions and no discernible change in downstream river discharge.	No effect
Low	2	Change of <25% in any parameter from the MPC; or visible sediment observed for less than 3 weeks; or <15% decrease of downstream river discharge for no more than 1 day.	Temporary effect
Medium	3	Change of 25-50% in any parameter from the MPC; or visible sediment observed for more than 3 weeks; or 1540% decrease of downstream river discharge for 1-2 days.	Short term but reversible effect
High	4	Change of 50-100% in any parameter from the MPC; or visible sediment observed for more than 3 weeks; or >40% decrease of downstream river discharge for 2-3 days.	Long term but reversible effect
Very High	5	Change of > 100% in any parameter from the MPC; or visible sediment observed for more than 3 weeks; or >40% decrease of downstream river discharge for >3 days.	Permanent and irreversible effect

MPC= maximum permitted concentration in fish containing water bodies. If no fish present, MPC for potable water can be used. When both MPCs do not exist for a pollutant, Dutch Intervention Standards are used.

4.6.2.1.9 Groundwater-quality and quantity

Category	Ranking	For surface water used, or may be used, as a resource, being of sufficient quantity and quality	Effect on Beneficial Users
Negligible	1	No discernible change in groundwater baseline conditions and no discernible change in groundwater resource quantity.	No effect
Low	2	Change of <25% in any parameter from MPC or depletion of resource that does not recover within 6 months post construction (within 10% of original elevation).	Temporary effect
Medium	3	Change of 25-50% in any Parameter from the MPC or depletion of resource that does not recover within 6-1 2 months post construction within 10% of original elevation).	Short term but reversible effect
High	4	Change of 50- 100% in any parameter from the MPC or depletion of resource that does not recover within 1-2 years post construction (within 10% of original elevation).	Long term but reversible effect
Very High	5	Change of > 100% in any parameter from the MPC or depletion of resource that does not recover after 2 years post construction (within 10% of original elevation).	Permanent and irreversible effect

MPC= maximum permitted concentration in potable water. When both MPCs do not exist for a pollutant, Dutch Intervention Standards are used.

4.6.2.1.10 Cultural heritage

Information on archaeological features normally only becomes available during the construction phase of the project due to the intrusive nature of the process. Therefore, the assignment of accurate consequence/severity prior to the construction phase is often not possible. Nonetheless, there are a number of factors to be taken into account in assigning the consequence/severity of a potential impact on archaeology. A 1 to 5 score is assigned for both “Disturbance Probability” and “Protected Status”.

Category	Ranking	Protected Status	Destruction Probability
Negligible	1	Resources whose importance is unknown, sites of uncertain date or character	Deposits will not be affected, because of distance from the pipeline, or method of construction.
Low	2	Resources which have little or no archaeological or historical value, or where remains may have been previously destroyed	A small (1-10%) proportion of the surviving deposits damaged or destroyed
Medium	3	Locally important resources of low or minor importance	A moderate (10-25%) proportion of the surviving deposits damaged or destroyed
High	4	Regionally important resources of a reasonably defined extent, nature and date and significant examples in a regional context	A large (25- 50%) proportion of the surviving deposits damaged or destroyed
Very High	5	Internationally and nationally important resources, legally protected remains of national importance	Most (50-100%) of the surviving deposits damaged or destroyed

4.6.2.1.11 Socio-economic Impact

The evaluation of socio-economic impacts involves the assessment of both quantitative and qualitative data and the use of professional judgment. Quantitative data collected through national sources or local level interviews is assessed and analysed by traditional economic or sociological techniques. However, qualitative data collected using the same methodology is more open to interpretation. In addition, what is a major impact to one person, one household or one community may be a minor impact to another according to specific personal circumstances. Hence, the results do not lend themselves easily to being ranked or assessed in exactly the same way as environmental data. As a result, the application of assessment language in the evaluation of results tends to be more qualitative in relation to the socioeconomic impacts than in the equivalent environmental sections.

In assessing the impact consequences, the following factors are taken into consideration:

- Impact probability
- Changes to the assets that households depend upon for their livelihoods
- The duration of this change: short-term disturbance (e.g. during construction only), long term (e.g. during operation period) or permanent
- The manageability of the change and potential for it to lead to further changes beyond the control of the project
- The ability of the affected people to adapt to changes and thus maintain livelihoods over the long-term

To determine the required level of socio-economic impact assessment the variations between households' reaction to the same impact was studied first[4]. Because the impacts did not vary significantly between households, community level impact assessment was considered as sufficient.

Category	Ranking	Definition
Catastrophic	5	• Emergency situation with harmful consequences to human health (e.g. fatalities) • Disastrous consequences on the livelihoods of individuals (e.g. curtailment of access to primary income source). • Calamitous consequences on those seeking to access community facilities and utilities

[4] For example, a poor household dependant upon natural resources over which it has no legal rights may not have access to compensation or may be ill equipped to use compensation money in an appropriate way.

Category	Ranking	Definition
		(e.g. resettlement of large numbers (1,000s) of households). • Disastrous consequences on the economy (e.g. all employment and supplier sourcing out of Kazakhstan). • Breach of company social policy and/or legislation.
Major	4	• Negative impact on human health and safety which can not be contained or results in serious injury or increased mortality • Potential or perceived impact on ability of household to maintain livelihood/store of assets to an extent not acceptable to affected people (i.e. access to income source restricted over lengthy periods of time). • Permanent or perceived permanent reduction in quality of life • Permanent cultural change to which the communities are unable to adapt • Widespread perception of missed opportunity to improve quality of life, resulting in frustration and disappointment • Result in tensions with communities which lead to sabotage to construction or operation by local communities, or outbreaks of violence between workers and communities • Serious impact on access to community facilities and utilities (e.g. resettlement of large numbers (10s – 100s) of households). • Notable consequence on the economy, at a local, regional and/or national level (e.g. virtually no local sourcing of supplies or personnel) - Breach of company social policy and/or legislation
Moderate	3	• Potential or perceived impact on ability of household to maintain livelihood/store of assets in short term • Potential reduction in quality of life in short term • Potential disruption to lifestyle in short term • Perception of missed opportunity to improve quality of life • Possible or perceived short term (less than a week) decrease in access to infrastructure and utilities to which community is unable to adapt • Containable modest impact on human health and well-being with no increased mortality but which may result in high levels of complaint in the short term (e.g. noise, light, odor, dust, injuries to individuals). • Moderate impact on individual livelihoods (e.g. restricted access to income source). • Moderate impact on the wider economy, at a local, regional and/or national scale (e.g. only moderate levels of employment and supplies sourced within Kazakhstan). • Potential breach of company social policy and/or legislation.
Minor	2	• Possible short term decrease in quality of life (e.g. isolated incidents related to ethnic tensions, short (days) restriction on access to infrastructure and utilities or income source like pastures or fishing areas, short (hours) water or electricity supply disruption) • Limited and occasional impact on human health and well-being (e.g. occasional dust, odors, traffic noise). • Long lasting impacts to which the community is able to adapt (e.g. increased access to information/possible slow cultural change or changes in economic structure) • No discernable long term effect of the local economy • Sparse impact on the wider economy, at a local, regional and national level (e.g. limited procurement).
Negligible	1	• Very limited impact on the wider economy at a local, regional and/or national scale (e.g. no discernable indirect and induced development).
None	0	• No impact on human health. • No impact on livelihoods. • No impact on community facilities/utilities. • No impact on the wider economy.
Marginal Positive	+	• Marginal enhancement in health and safety of local population • Limited improvement of individual livelihood or assets (e.g. additional employment opportunities leading to higher income) • Limited improvements to community infrastructure or utilities • Marginal enhancement in social capital (e.g. local skills) • Marginal impact on the wider economy (e.g. limited local procurement)

Category	Ranking	Definition
		• Isolated evidence of plausible view of some stakeholders on the Base operator
Moderate Positive	++	• Moderate enhancement in health and safety of local population • Moderate improvement of individual livelihood or assets • Moderate improvements to community infrastructure or utilities • Moderate enhancement in social capital (e.g. local skills) • Moderate impact on the wider economy (e.g. intermittent local procurement) • Enhancement of relationship between the Base operator and communities
Significant Positive	+++	• Notable by local population enhancement in its health and safety • Significant improvement of individual livelihood or assets (e.g. more than one person in a household employed by the Base Operator or its subcontractor) • Significant and long term improvements to community infrastructure or utilities • Sustainable enhancement in social capital • Moderate impact on the wider economy (e.g. intermittent local procurement) • Sustainable good relationship between the Base operator and communities • Notable impact on the wider economy (e.g. extensive use of local supplies)

4.6.2.2 Probability of an event

Five probability criteria were defined. Due to absence of prior statistical data on probability of an event or activity, for this impact assessment the probability of an activity occurring has been taken as "certain" (i.e. ranking level 5).

Category	Ranking	Definition
Certain	5	The impact will occur under normal operating conditions.
Very Likely	4	The impact is very likely to occur under normal operational conditions.
Likely	3	The impact is likely to occur at some time under normal operating conditions.
Unlikely	2	The activity is unlikely to but may occur at some time under normal operating conditions.
Very Unlikely	1	The activity is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances.

4.6.2.3 Significance

The significance of the impact is expressed as the product of the consequence and probability of occurrence of the activity, expressed as follows:

Significance = Consequence x Probability

Tab 4.2 below illustrates all possible product results for the five consequence and probability categories.

Tab 4.2 Environmental aspect significance rankings as consequence-probability product results

Critical	**5**	**10**	**15**	**20**	**25**	*5*
High	**4**	**8**	**12**	**16**	**20**	*4*
Medium	**3**	**6**	**9**	**12**	**15**	*3*
Low	**2**	**4**	**6**	**8**	**10**	*2*
Negligible	**1**	**2**	**3**	**4**	**5**	*1*
	1	*2*	*3*	*4*	*5*	

Consequence →

Probability →

Based on its consequence-probability score, each environmental aspect was again ranked into five categories or orders of significance as illustrated in Tab 4.2.

From this matrix, those impacts that fall into the “critical” (i.e. >16) and “high” (i.e. 9-16) can be identified. These impacts require further examination and analysis in terms of identifying activities for which additional to that incorporated in the project’s base case design mitigation measures will be required (Section 0).

Impacts that have been determined to have a significance ranking of “>9” are considered to be significant and hence require examination in terms of alternative and/or required additional mitigation to reduce the level of the potential impact. Approaches and techniques for mitigation are discussed in Environmental Mitigation, Management and Monitoring (Sections 0 and 11).

An environmental receptor might be impacted by more than one project activity. Where this has been found to be the case, the higher impact significance ranking is taken as the significance ranking for the subject receptor. It should be noted that it is often difficult to compare environmental impacts consistently across different natural and socio-economic environments. In evaluating the environmental and socio-economic aspects, emphasis is placed on specific cause and effect relationships.

Scientific evidence as well as predictions based on observation of previous similar activities has been used in the impact assessment process. Where it has not been possible to fully quantify the effect that an activity may have on the environment or a component of the environment, or where there is a lack of scientific knowledge, qualitative judgment has been used. Such judgments have been based on a full understanding of the proposed development, the impact assessment team’s extensive experience in assessing oil and gas production activities and the team’s knowledge of the environment of the region in which the project’s activities will occur.

4.6.3 Residual impacts

Residual impacts are impacts that remain after mitigation measures, including those incorporated into the project’s base case design and those developed in addition to the base design, have been applied. The impact assessment process described above has identified where impacts are likely to occur. The mitigation and management assessment (Sections 0 and 11) identifies where environmental management effort additional to that in the base design, is required. The residual impacts assessment identifies which project activities are likely to result in a semi-permanent to permanent change in the natural (i.e. physical, chemical, biological) and/or socio-economic environments. The significance of this change is also assessed.

4.6.4 Cumulative impacts

The 1998 IFC “Procedure for Environmental and Social Review of Projects” states that that an environmental assessment should also address cumulative impacts (draft Guidance Note # [G]; OP 4.01). The objective of the cumulative impact assessment is to identify those environmental and/or socio-economic aspects that may not on their own constitute a significant impact but when combined with impacts from past, present or reasonably foreseeable future activities associated with this and/or other projects, result in a larger and more significance impact(s).

Examples of cumulative impacts include:

- the recurring loss of habitat in areas that are disturbed and re-disturbed over an extended period;
- additional emissions as a processing plant is extended and expanded over a period of time, and
- the ongoing development of employment opportunities and enhancement of local labor skills base as successive projects (related or unrelated) come on stream

Activities proposed under the project have been assessed in terms of their potential to:

- cause impacts including transboundary impacts;
- contribute to existing environmental stresses and impacts, and
- contribute to cumulative impacts in their own right due to the fact that the project may be immediately followed by further phases of development.

The methodology described above has also been generally applied to assess the significance of identified potential project cumulative impacts.

4.6.5 Transboundary impacts

The World Bank OP 4.01 stipulates that transboundary impacts, (i.e. impacts that cross the border of Kazakhstan into neighboring countries) should be considered during the ESIA process. The assessment of transboundary impacts for the ESIA examines social and economic issues relating to the sourcing of labor, goods and services from the international market.

4.7 ENVIRONMENTAL HAZARD AND RISK ASSESSMENT

Environmental Hazard and Risk Assessment (EHRA) is a process whereby the impact assessment team can:

- confirm its understanding of the project with the design engineers;
- identify to the design engineers areas of potential environmental concern; and
- jointly develop alternatives so that potential impacts can be proactively mitigated.

To identify the potential environmental hazards associated with each proposed activity key project engineers and Health, Safety and Environment (HSE) advisors were consulted. The consultations focused on specific areas as follows:

- Workshop construction, installation and commissioning, and
- Workshop operation and processes including planned routine activities; planned but non-routine activities, and unplanned or accidental activities.

The consultations were used to confirm the impact assessment team understands of the project design and as an opportunity to gather additional information on the project where necessary. The process culminated in the development of a list of activities and the identification of potential corresponding environmental hazards. It is important to note that existing mitigation measures designed into the project were considered during the consultations.

4.8 MITIGATION OF POTENTIAL IMPACTS

Mitigation measures are the actions or systems that are used, or have been proposed, to manage or reduce a potential negative impact or enhance a positive impact. Many mitigation measures are already included in the base project design and these have been taken into consideration during the impact assessment process.

Impacts that are identified as having a significance ranking of “high” or “critical” have been further analyzed to identify additional mitigation measures that are potentially available to eliminate or reduce the predicted level of impact. Potential mitigation measures considered included:

- alternative approaches and methods to achieving an activity’s objective (e.g. pipeline routes and the terminal site position, materials transporting methods, recruitment sources);
- engineering design solutions;
- operational control procedures (e.g. construction timing restrictions, internal fines for damage)
- management systems (e.g. sensitive areas management, compensation plans for land or livelihoods, reporting mechanisms for the Community Liaison Officer and key performance indicators for contractors);
- social and economic investment programs;

Additional measures are developed using professional judgment and experience within the legal, technical, political and economic constraints of the project and may involve policy changes, technical solutions or various forms of compensation. The project team, community and other stakeholders have been consulted to ensure that the mitigation measures are both practical and appropriate. The results of the mitigation analysis are presented in Chapter 11. Following assignment of mitigation measures, the residual impact is evaluated.

4.9 MONITORING

It will be necessary to monitor and audit project development and operation. Monitoring will provide the information necessary for feedback into the environmental management process and will assist in identifying where additional mitigation effort or where alteration to the adopted management approach may be required. To assist in the implementation of identified mitigation and monitoring strategies, an Environmental and Social Mitigation and Monitoring Plan Framework will be developed and modified as the Project progresses. It will describe the various environmental management strategies and generic procedures for their implementation. Further, it will identify the management roles and responsibilities for ensuring that monitoring is undertaken and that the results are analyzed and any necessary amendments to practices are identified and implemented in a timely manner. It will be important for the Project contractor(s) to consider the provisions and requirements of the Plan when developing their own environmental management arrangements for the works program. Bridging documents linking contractor Environmental Plans, to those detailed in this ESIA will be developed.

5 LEGISLATIVE REQUIREMENTS FOR PROJECT

5.1 EUROPEAN UNION REQUIREMENTS

5.1.1 Air quality

Air pollutants come from a wide variety of sources, both mobile and stationary. This Section deals the legislation concerning general air quality assessment and management and the legislation on controls of emissions from mobile sources, i.e. transport related emissions from motor vehicles and fuels.

Legislation on controls of emissions from stationary sources is dealt with in Section F, concerning emissions from industrial installations and power generation, and in Section C, concerning emissions from waste incinerators.

A series of directives control emissions from motor vehicles and fuels through technical requirements on the vehicles and through limits on the presence of substances such as lead and sulphur in fuels. Additionally a Directive on emissions from engines to be installed in mobile machinery is due to be adopted soon.

Because very few Light duty motor vehicles will be involved in the project, regulations on Emissions from them is not included in this text. Similarly regulations on the lead content are not presented because Unleaded petrol is used.

5.1.1.1 The Auto-Oil program

Directive 94/12/EC requires that the Commission proposes standards to be enforced after the year 2000, according to a new multi-faceted approach, based on a comprehensive assessment of costs and efficiency of all measures aimed at reducing road transport pollution. Besides tighter car emission standards, the proposal should include complementary measures, like an improvement in fuel quality and a strengthening of the car fleet inspection and maintenance program. The proposal should be based on the establishment of air quality criteria and associated emission reduction objectives and an evaluation of the cost/effectiveness of each package of measures, taking into account the potential contribution of other measures such as, *inter alia*, traffic management, enhancement of urban public transport, new propulsion technologies, or the use of alternative fuels. The necessary background investigation and research were carried out within the European Auto-Oil Program. However, in order to achieve the air quality criteria laid down in the Auto-Oil program, additional cost/effective local measures will nevertheless be needed in the most polluting areas.

5.1.1.2 Heavy duty diesel engines for motor vehicles

Directive 88/77/EEC established emission requirements for carbon monoxide, hydrocarbon and nitrogen oxides. Besides a strengthening of the original limits introducing a two stage approval to be implemented in year 1993 and year 1996, requirements for particulate emissions were set with amending directive 91/542/EEC. Amending directive 96/1/EC allowed for some derogation

on the particulate emission limit of smaller engines. In context with the approach explained above a new proposal is currently being prepared in order to introduce stricter requirements from the year 2000 onwards.

5.1.1.3 Smoke emissions from diesel engines of motor vehicles

Directives 72/306/EEC and 77/537/EEC set standards for maximum capacity of diesel exhaust smoke. The main purpose of these standards is the establishment of reference values for roadworthiness testing mentioned below.

5.1.1.4 Roadworthiness Test for Emissions Directive

Directive 77/143/EEC on road worthiness tests for motor vehicles and their trailers, as amended by directive 92/55/EEC, requires testing vehicle emissions in regular roadworthiness tests for the control of carbon monoxide (CO) and the air-fuel ratio for petrol fuelled vehicles and of the opacity of the exhausts from diesel vehicles.

5.1.1.5 Volatile Organic Compounds Emissions

Directive 94/63/EC aims to control emissions of volatile organic compounds (VOC) emissions resulting from the storage of petrol and its distribution from terminals to service stations. It applies to the operations, installations, road vehicles, trains and inland waterway vessels used for the storage and transportation of petrol from one terminal to another or from a terminal to a service station. The provisions of this directive are currently being revised.

5.1.1.6 Sulphur Content in Fuel

Directive 93/12/EEC relating to the sulphur content of certain liquid fuels sets limits on the sulphur content of diesel fuel and other gas oils. Diesel fuel is used in some motor vehicles. Gas oil, also known as light fuel oil, is used for self-propelling vehicles, heating, industrial and marine purposes. With regard to diesel fuel used in road vehicles the provisions of directive 93/12/EEC will be replaced by the requirements of the proposed directive, COM 96/0164 (COD), on the quality of petrol and diesel fuel. With regard to gas oil and heavy fuel oil, the Commission has recently made a proposal to revise the provisions of directive 93/12/EEC.

In order to reduce sulphur dioxide pollution, particularly ground level concentrations in urban areas, the directive imposes maximum sulphur by weight limits for gas and diesel oils. Further reductions in sulphur by weight limits and related emission standards for diesel engines are anticipated.

5.1.2 Water quality

Water is one of the most comprehensively regulated areas of EU environmental legislation. Early European water policy began in the 1970s with the First Environmental Action Program in 1973 followed by a first wave of legislation, starting with the 1975 Surface Water Directive and culminating in the 1980 Drinking Water Directive. This first wave of water legislation included water quality standard legislation on fish waters (1978), shellfish waters (1979), bathing waters (1976) and ground waters (1980). In the field of emission limit value legislation the Dangerous

Substances Directive (1976) and its Daughter Directives on various individual substances were adopted. A second wave of water legislation followed a review of existing legislation and an identification of necessary improvements and gaps to be filled. This phase of water legislation included the Urban Waste Water Treatment Directive (1991) and the Nitrates Directive (1991). Other elements identified were revisions of the Drinking Water and Bathing Water Directives to bring them up to date (proposals for revisions being adopted in 1994 and 1995 respectively), the development of a Groundwater Action Program and a 1994 proposal for an Ecological Quality of Water Directive. Also, for large industrial installations, the IPPC Directive (finally adopted in 1996) covered water pollution as well.

Regulation on dangerous substances discharges is superseded by the RoK legislation that prohibits any discharges into the Caspian Sea which is the only discharge accepting water body in the area.

5.1.2.1 Drinking Water Directive

Directive 80/778/EEC relating to the quality of water for human consumption is designed to safeguard human health by establishing strict standards for the quality of drinking water. A revision of the Directive proposed by the Commission is presently being negotiated in Council and the European Parliament. The objective of the revision is to bring legislation up to the state of science and experience, to review the parametric values and to improve the management structure.

5.1.2.2 Fish Water Directive and Shell Water Directive

Directive 78/659/EEC on fish water quality seeks to protect those fresh water bodies identified by Member States as fish waters. For those it sets water quality standards for salmonid waters and cyprinid waters. Where the water quality in such designated waters is not in compliance with the standards, programs to reduce pollution have to be set up. Requirements on sampling and monitoring are laid down. Directive 79/923/EEC on shellfish water quality seeks to protect those coastal and brackish water bodies identified by Member States as shellfish waters. For those it sets water quality standards. Where the water quality in such designated waters is not in compliance with the standards, programs to reduce pollution have to be set up. Requirements on sampling and monitoring are laid down.

5.1.2.3 Groundwater Directive

The Water Framework Directive seeks to control the direct and indirect discharge of certain substances into the groundwater. The List I substances any discharge to groundwater is prohibited, for List II substances the discharge must be subject to an elaborate authorization procedure. The Project may affect groundwaters via fuel spills but it does not plan to discharge effluents in the groundwater. The RoK legislation prohibits any discharges in the groundwater within the 2 km protective zone around the Caspian.

5.1.2.4 Bathing Water Directive

Directive 76/160/EEC on the quality of bathing waters seeks to ensure the quality of bathing water throughout the ED, both for fresh water and coastal waters bathing areas. The Directive

lays down 19 physical, chemical and microbiological parameters and requires Member States to monitor their bathing areas according to set rules for sampling frequencies and parameters.

5.1.3 Nature protection

EU nature protection legislation consists of two principal directives and two regulations. The directives concern the protection of natural habitats in the European Union and the flora and fauna which inhabit them. The regulations limit the import and trade within the European Union in endangered flora and fauna, and establish a monitoring and inspection system for the protection of Antarctica. The Habitats Directive 92/43/EEC has become the main mechanism for protecting European species of fauna and flora as well as their habitats. It establishes an EU-wide framework to maintain biological diversity by the conservation of natural habitats and wild fauna and flora. The Birds Directive 79/409/EEC protects wild bird species and sites of importance for the maintenance of populations of wild birds. It establishes a scheme for the protection of all naturally occurring species of wild birds in the Community, their eggs, nests, young and habitats. It requires the identification and adequate protection of breeding sites and sites of importance for migratory species, it regulates hunting seasons and practices.

Regulation EC/338/97 guarantees the fulfillment of EU nature protection obligations under the Washington Convention on International Trade in Endangered Species. It will be regularly amended to implement the decisions taken by the parties to the Washington Convention. The Seal Pups Directive 83/129/EEC bans the import of products such as shoes and clothes made with the skins of seal pups, except those killed by the Inuit people in a traditional manner. Regulation 90/3943/EEC on the Protection of the Antarctic implements inspection and observation requirements under the Convention on the Conservation of Antarctic Marine Living Resources.

5.1.3.1 Habitats

Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora aims for the maintenance of biodiversity within the European territory of the Member States through the conservation of natural habitats and of wild fauna and flora. Many habitat types in Europe have deteriorated and a growing number of species have become threatened or increasingly rare. The directive aims to establish a “favorable conservation status” for habitat types and species selected as being of EU interest. A European ecological network known as '”Nature 2000” will be established. Each Member State must draw up a list of the sites within their territories which are of potential EU importance. The areas listed are in proportion to each Member State's share of the habitat type in need of protection. All sites protected under the Birds Directive 79/406/EEC, are also included in the “Nature 2000” network. A single list of sites of EU importance will then be compiled and should be adopted by June 1998 from which time the sites are subject to particular protection obligations. These include taking “appropriate steps” to avoid deterioration of the habitats and assessing any plans or projects which are likely to have a significant effect on the sites. Land use planning measures should include policies aiming to ensure the ecological coherence of the “Nature 2000” network and to maintain landscape features of importance to wildlife, especially those which enable species migration, propagation and genetic exchange. Member States must also establish a system of strict protection for the listed animal and plant species of EU interest. This prohibits deliberate collection, capture or

killing of all such species at any stage in their life cycle or the deterioration or destruction of breeding sites or resting places.

5.1.3.2 Wild Birds

Directive 79/409/EEC on the conservation of wild birds establishes a scheme for the protection of migratory wild birds and their habitats. A general duty is placed on the Member States to maintain the population of all species of naturally occurring birds in the wild state in the EU at a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements. This is to be done by preserving, maintaining or re-establishing a sufficient diversity and area of habitats; that is, by creating protected areas, managing habitats inside and outside protected areas, re-establishing destroyed biotopes and creating new ones.

5.1.4 Waste management

The overall structure for an effective waste management regime is set out in the Waste Framework Directive and the complementary Hazardous Waste Directive. These directives establish the framework for waste management structures, which have been complemented by other more specific directives: One group sets down requirements for the permitting and operations of waste disposal facilities. The other group deals with specific types of waste such as oils, packaging and batteries. For the shipments of waste, the rules that apply are contained in the Waste Shipments Regulation.

Hazardous Waste Incineration is not allowed in the Caspian Sea region. For this reason the Waste Framework Directive on the waste disposal installations is superseded by the RoK restrictions as being stricter. Regulations on Disposal of Titanium Dioxide Waste, PCBs and PCTs do not apply to the project because it will not use components that contain these substances. Because agriculture is not developed in the region, regulations on use of Sewage sludge in agriculture do not apply either.

5.1.4.1 Hazardous waste

This directive defined measures which, in addition to the Waste Framework Directive, have to be applied when dealing with hazardous waste. Hazardous wastes are those listed in Council Decision 94/904/EC which sets up an exhaustive list of hazardous wastes known as the Hazardous Waste List. For the attribution of hazardous properties, reference is made to the testing procedures of Council Directive 67/548/EEC on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labeling of dangerous substances as amended by Council Directive 79/831/EEC. The Directive also tightens some of the permitting and control procedures of the Waste Framework Directive where hazardous waste is involved for establishments and undertakings carrying out their own waste disposal and those which carry out waste recovery operations. Producers of hazardous waste are also brought under the obligation or periodic inspections. Furthermore, producers of hazardous waste along with professional waste transporters are required to keep records of the hazardous waste they handle for inspection by the competent national authorities if they so request.

5.1.4.1.1 Waste oils

Council Directive 75/439/EEC aims to create a harmonised system for the collection, treatment, storage and disposal of waste oils. It allows the Member States to indemnify companies for the unrecovered costs of collecting and disposal of waste oils. It gives the highest priority to the recycling of waste oils, then to their utilisation as a fuel or in an energy recovery operation; and last to their destruction or controlled storage or tipping. Member States must ensure the safe collection and disposal of waste oils. The discharge of waste oils to waters and drainage systems is prohibited.

Any undertaking for the disposal of waste oil must obtain a permit from the competent authority. Any undertaking collecting waste oils must be registered and adequately supervised. Recycled oils may not contain more than 50 parts per million (ppm) of polychlorinated biphenyls and terphenyls (PCB/PCT).

5.1.4.1.2 Batteries and accumulators containing dangerous substances

Council Directive 91/157/EEC was adopted as a specific measure within the framework of Council Directive 75/442/EEC on Waste to mandate the separate collection of spent batteries and accumulators containing certain amounts of mercury, cadmium or lead with a view to the recovery and controlled disposal. The Base Operator must ensure the efficient organization of a separate collection and, where appropriate, the setting up of a deposit system. Economic instruments are allowed to encourage recycling; they must be introduced after consultation. Consumers must be fully informed about aspects of the risks and disposal opportunities.

5.1.4.2 Shipment of Waste

Regulation 259/93/EEC on the supervision and control of shipments of waste within, into and out of the European Community establishes a system for controlling the movement of waste which implements the Basle Convention, the OECD Council Decisions on trans-frontier movements of waste, and the fourth ACP-EEC (Lome) Convention. Whilst the Basle Convention deals only with hazardous waste, the Regulation also covers shipments of non-hazardous waste. The Regulation sets up separate regimes governing shipments within the EU, imports, exports and transit shipments and the different requirements depend on whether the waste is destined for recovery or disposal, and whether it is listed in the annexes on the green, amber or red list. In general terms, it can be said that the amber and red lists consist of hazardous waste and the green list of non-hazardous waste. These 3 lists resulted from workings of the OECD. When comparing the 3 lists of waste under the Regulation on the one hand to the European Waste Catalogue under the Framework Directive and the Hazardous Waste List under the Hazardous Waste Directive on the other, it can be seen that they are different in structure. It must however be remembered that the 3 Regulation lists were drafted for a different purpose to the European Waste Catalogue and the Hazardous Waste List and that all lists must be applied in full.

5.1.4.3 Packaging and packaging waste

Directive 94/62/EC implements the Union's strategy on packaging waste. It aims to harmonise national packaging waste management measures, to minimise environmental impacts of packaging waste and to avoid the erection of barriers to trade within the European Union. It covers packaging and packaging waste, industrial commercial or domestic, regardless of the

materials used. Recovery and recycling targets are established to be met within five years of the enactment of implementing legislation in the Member States. Such legislation must be enacted by mid-1996. By 2001, 50-65% of packaging waste must be recovered, and 25-45% of all packaging waste must be recycled with at least 15% of each packaging material being recycled. The Directive sets the prevention of production of packaging as the first priority. Re-use, recycling and other forms of recovery (including energy recovery) are accepted as equally valid fundamental principles Recycling includes reprocessing and organic recycling (composting), but does not include incineration.

5.1.5 Industrial pollution control and risk management

These directives and regulations cover 4 areas: control of industrial emissions, control of major accident hazards, environmental audits and eco-labeling and control of noise. The first area includes directives which establish requirements for permits for the operation of certain industrial facilities so as to control releases to air and water and wastes. The second area is covered by the Seveso Directive. The third area is covered by EMAS 1836/93/EEC and Eco-Label 880/92/EEC. Noise from motor vehicles and the construction plant equipment is regulated by the forth set of directives. Below a short description of these directives is given.

5.1.5.1 Integrated Pollution Prevention and Control

The goal of the directive is to achieve integrated prevention and control of pollution arising from a wide range of activities by means of measures to prevent or, where that is not practicable, to reduce emissions from industrial facilities to air, water and land, including measures concerning waste, in order to achieve a high level of protection of the environment as a whole. All activities covered by the Directive require a permit. Member States may issue a single permit for releases to air, water and waste from an industrial facility, or issue multiple permits which are integrated through a co-operation procedure involving several permitting authorities. As well as imposing emission limits in environmental permits, Member States must ensure that the permits contain measures designed to ensure that following basic requirements are met:

- all appropriate preventive measures are taken against pollution, in particular though the application Best Available Techniques (BAT);
- no significant pollution is caused;
- waste production is avoided;
- where waste is produced it should be recovered or, where that is technically and economically impossible, disposed of while avoiding or reducing any impact on the environment;
- energy is used efficiently;
- the necessary measures are taken to prevent accidents and limit their consequences;
- the necessary measures are taken upon definite cessation of activities to avoid any pollution risk and return the site of operation to a satisfactory state.

Permits must in particular include emission limit values based on BAT, taking into consideration the potential for transfer of pollution from one medium to another. Other requirements to protect soil and groundwater and concerning waste management must be laid down if necessary. In addition, permits must contain the supplementary requirements necessary to prevent breaches of any environmental quality standard. These requirements apply to new installations from

October 1999 and to existing installations from October 2007. Authorities must reconsider periodically and when necessary update permit conditions.

5.1.5.2 Air Pollution from Industrial Plants

Directive 84/360/EEC on the combating of air pollution from industrial plants is a framework directive, which will be replaced by the IPPC Directive in 2007. Member States must ensure that the types of industrial plants listed in Annex I obtain prior authorization from the designated national or regional competent authority before beginning operation or before any substantial alteration to the plant. Industrial plants serving national defense purposes are exempt from the directive. An authorization may only be issued when the competent authority is satisfied that: all appropriate measures against air pollution have been taken, including the application of Best available technology not entailing excessive cost (BATNEEC); the use of the plant will not cause significant air pollution; none of the applicable emission limit values is exceeded; and all applicable air quality limit values are taken into account.

5.1.5.3 Directive on VOC emissions from industry

A proposal for a Directive on limitation of emissions of volatile organic compounds due to the use of organic solvent in certain industrial activities, COM(69) 538 - final, is currently before the Council and the European Parliament. The objective of the Proposal is to reduce the emissions of VOCs from stationary sources and, hence, to reduce tropospheric ozone. The Proposal aims at an emission cut of at least 50 % (by 2010, compared to 1990 levels) for some 20 main types of solvent-using activities. For each of these industrial sectors, it defines emission reduction targets by means of emission limit values to be achieved either by appropriate abatement technologies or by substitution solutions (low-solvent or solvent free technologies).

5.1.5.4 Seveso Directive

According to updated SEVESO II (2003/105/EC), the 7500m^3 Base fuel storage facility is subject to requirements of Directive on the control of major-accident hazards involving dangerous substances. The Directive require the development of a Safety Management System (SMS), Emergency Plans (both internal and external), major accident prevention plan (MAPP), major accident reporting system (MARS) and land-use plans which include minimum set-backs from residential dwellings.

The MAPP shall be designed to guarantee a high level of protection for man and the environment by appropriate means, structures and management systems. It should include the operator’s overall aims and principles of action with respect to the control of major accident hazards i.e. an internal safety plan which is designed to protect the health of workers and an external safety response plan which notifies the community about an inventory of dangerous substances on site and about major accidents, provides them with means of safety and follows up on the situation after the accident.

The SMS should include the organizational structure, responsibilities, practices, procedures, processes and resources for determining and implementing the major accident prevention policy (MAPP). The following issues should be addressed by the SMS:

- Organization and personnel
- Identification and evaluation of major hazards

- Operational control
- Management of changes
- Planning for emergencies
- Monitoring performance
- Audit and review

The volume of these documents should be proportionate to the major accident hazard presented by the Base.

The operator should send the competent authority a notification prior to the start of construction or operation. The notification shall contain the following details:

- The Operator's name and the full address of the establishment concerned;
- the registered place of business of the operator, with the full address;
- the name or position of the person in charge of the establishment, if different from (a);
- information sufficient to identify the dangerous substances or category of substances involved;
- the quantity and physical form of the dangerous substance or substances involved;
- the activity or proposed activity of the installation or storage facility,
- the immediate environment of the establishment (elements liable to cause a major accident or to aggravate the consequences thereof).

In the event of any significant increase in the quantity or significant change in the nature or physical form of the dangerous substance present or the closure of the fuel storage facility, the operator should inform the competent authority.

The internal emergency plan should include:

- Names or positions of persons authorized to set emergency procedures in motion and the person in charge of and coordinating the on-site mitigatory action.
- Name or position of the person with responsibility for liaising with the authority responsible for the external emergency plan.
- For foreseeable conditions or events which could be significant in bringing about a major accident, a description of the action which should be taken to control the conditions or events and to limit their consequences, including a description of the safety equipment and the resources available.
- Arrangements for limiting the risks to persons on site including how warnings are to be given and the actions persons are expected to take on receipt of a warning.
- Arrangements for providing early warning of the incident to the authority responsible for setting the external emergency plan in motion, the type of information which should be contained in an initial warning and the arrangements for the provision of more detailed information as it becomes available.
- Arrangements for training staff in the duties they will be expected to perform, and where necessary coordinating this with off-site emergency services.
- Arrangements for providing assistance with off-site mitigatory action.

The internal emergency plan should include:

- Names or positions of persons authorized to set emergency procedures in motion and of persons authorized to take charge of and coordinate off-site action.
- Arrangements for receiving early warning of incidents, and alert and call-out procedures.

- Arrangements for coordinating resources necessary to implement the external emergency plan.
- Arrangements for providing assistance with on-site mitigatory action.
- Arrangements for off-site mitigatory action.
- Arrangements for providing the public with specific information relating to the accident and the behaviour which it should adopt.
- Arrangements for the provision of information to the emergency services of other Member States in the event of a major accident with possible transboundary consequences.

The following information should be communicated to the public:

- Name of operator and address of the establishment.
- Identification, by position held, of the person giving the information.
- Confirmation that the establishment is subject to the regulations and/or administrative provisions implementing this Directive and that the notification referred to in Article 6 (3) or the safety report referred to in Article 9 (1) has been submitted to the competent authority.
- An explanation in simple terms of the activity or activities undertaken at the establishment.
- The common names or, in the case of dangerous substances covered by Part 2 of Annex 1, the generic names or the general danger classification of the substances and preparations involved at the establishment which could give rise to a major accident, with an indication of their principal dangerous characteristics.
- General information relating to the nature of the major-accident hazards, including their potential effects on the population and the environment.
- Adequate information on how the population concerned will be warned and kept informed in the event of a major accident.
- Adequate information on the actions the population concerned should take, and on the behaviour they should adopt, in the event of a major accident.
- Confirmation that the operator is required to make adequate arrangements on site, in particular liaison with the emergency services, to deal with major accidents and to minimize their effects.
- A reference to the external emergency plan drawn up to cope with any off-site effects from an accident. This should include advice to cooperate with any instructions or requests from the emergency services at the time of an accident.
- Details of where further relevant information can be obtained, subject to the requirements of confidentiality laid down in national legislation.

More information about the Seveso II requirements is given in http://mahbsrv.jrc.it/Framework.html.

5.1.5.5 Eco-management and Audit Scheme (EMAS)

The EMAS encourages the voluntary participation in the development of internal environmental management systems and audit programs as a means to improve the environmental performance. Thus, it does not restrain the Base activities. The eco-label Regulation establishes an EU eco-label award scheme which is intended to promote the design, production, marketing and use of products with a reduced environmental impact during their entire life cycle. The eco-label gives consumers information about the environmental impacts of products.

The scheme requires participating sites to:

- establish and implement policies, programs and management systems
- audit the performance of their site; and,
- provide environmental performance reports to the public.

It applies to manufacturing, energy and recycling industry sites and may be extended to other sites on an experimental basis. Participants must take the following steps:

- adopt an environmental policy - it should include compliance with regulatory instruments, continued improvement in environmental performance, and the reduction of environmental impacts
- conduct an environmental review of the site
- introduce an environmental program and environmental management system
- carry out an environmental audit within a maximum cycle of three years;
- prepare a publicly available environmental statement including in particular details of site-based environmental impacts.
- conduct an independent verification of the environmental statement through independent verifiers accredited under the national accreditation systems.

National or international environmental management and audit systems other than the EMAS may be considered as equivalent if they are identified in the Official Journal of the European Community.

5.1.5.6 Noise from vehicles and machinery

5.1.5.6.1 Motor Vehicles

Directive 70/157/EEC introduces limits on the sound levels of noise for road vehicle and gives requirements for measuring sound levels and exhaust systems and silencers. Several amendments, the latest by Directive 96/20/EC, have reduced these permissible sound levels. Limit values for eight types of passenger and goods vehicles range from 74 dB(A) to 80 dB(A). It applies a system of optional harmonization to the approval of motor vehicles and exhaust system.

5.1.5.6.2 Construction Plant and Equipment

Noise measurement methods: Directive 79/113/EEC on the determination of the noise emission of construction plant and equipment introduces a test method for determining the noise emissions of construction plant and equipment, that is, machinery, appliances, plant and installations or components thereof which are used to perform work on civil engineering and building sites. Equipment primarily intended for the transport of goods or persons and agricultural and forestry tractors are not included. The tests procedures applying to construction plants must be applied to determine the maximum sound emission levels of equipment for which detailed requirements concerning sound levels are laid down in separate directives.

Permissible noise emission are laid down within the framework of directive 84/532/EEC on the EEC type-examination for construction plant and equipment, with regard to harmonized requirements for these types of equipment, in seven separate directives, each of them concerning particular equipment. All the seven 'daughter' directives require that the products covered must be labeled with a mark indicating the noise levels guaranteed by the manufacturer, and contain annexes which define a method of measuring airborne noise and a spot check procedure for checking the conformity of production models with the type examined.

EEC type-examination certificates are valid for a period of five years and may be renewed.

Directive 84/533/EEC lays down noise limits for the environment and related requirements for the issuance of an EEC type-examination certificate for compressors.

Directive 84/534/EEC lays down noise limits for the environment, noise limits at the operator's position, and related requirements for the issuance of an EEC type-examination certificate for tower cranes. It lays down limits for the lifting mechanism, the energy generator and the assembly comprising the lifting mechanism and energy generator.

Directive 84/535/EEC lays down noise limits for the environment and related requirements for the issuance of an EEC type-examination certificate for welding generators.

Directive 84/536/EEC lays down noise limits and related requirements for the issuance of an EEC type-examination certificate for power generators.

Directive 84/537/EEC lays down noise limits for the environment and related requirements for the issuance of an EEC type-examination certificate for concrete breakers.

Directive 86/662/EEC lays down noise limits and related requirements for the issuance of an EEC type-examination certificate for earth-moving machines used on civil-engineering and building sites. Additional it requires labeling of the products with the noise level at the operator's position.

5.2 EBRD REQUIREMENTS TO THE PROJECT

While the EBRD requirements reflect some of the other international financial institution requirements (e.g., World Bank for public sector and IFC for private sector), there are some important additional requirements with reference to European Union requirements and international conventions and treaties.

The EBRD promotes environmentally sound and sustainable development. The used by EBRD definition of “environment” incorporates not only ecological aspects but also worker protection issues and community issues, such as cultural property, involuntary resettlement, and impacts on indigenous peoples.

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 realise additional environmental benefits through the projects it finances.

The EBRD supports a precautionary approach to the management and sustainable use of natural biodiversity resources. It actively seeks to contribute to the implementation of relevant principles and rules of international environmental law. These principles and rules are set forth in instruments such as treaties, conventions and multilateral, regional or bilateral agreements, as well as in relevant nonbinding instruments. Legal documents for the EBRD’s investment in a project will include specific provisions reflecting the EBRD’s environmental requirements. The regulations consider not only construction impacts but also environmental and social impacts well into the future. They cover all aspects from preliminary assessments to monitoring and evaluation to accounting for changing circumstances. Thus it is expected that all EBRD-

financed projects support and advance good environmental and health and safety standards throughout the region.

The EBRD believes that progress towards sustainable development can best be achieved by working within a sound regulatory and policy framework that uses market mechanisms to promote environmental protection and provides suitable social safety nets for vulnerable members of the community. In recognition of the strong links between good environmental performance, commercial efficiency and competitive advantage, the EBRD encourages and supports governments to provide the right signals to individuals and businesses, particularly through Bank financed projects and selected technical cooperation initiatives. The EBRD, through its technical cooperation programme, also provides training programmes and other mechanisms for enhancing the projects it finances

The EBRD is committed to enabling dialogue with its stakeholders by promoting four basic principles regarding public information and consultation. These are: (i) transparency; (ii) compliance with the mandate and accountability to shareholders; (iii) willingness to listen and receptivity to comment; and (iv) safeguarding the business approach to implementing the mandate.

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.

To further pursue the goals of public information and consultation, the EBRD also maintains an Independent Recourse Mechanism (IRM). The purpose of the IRM is to provide a venue for complaints or grievances from people who are, or are likely to be, directly and adversely affected by an EBRD-financed project. Additionally, the IRM may assess whether the Bank could usefully employ one, or more, problem solving techniques, such as independent fact-finding, mediation, conciliation or dialogue facilitation, to assist in resolving the problems underlying the complaint.

The EBRD pursues four strategic directions in environmental considerations: (i) integrating environmental considerations into the project cycle; (ii) promoting environmentally oriented investments across all sectors; (iii) mainstreaming environmental considerations through the EBRD's sectoral and country strategies and technical cooperation activities; and (iv) building partnerships to address regional and global environmental issues. It is the responsibility of the Base Operator to provide the EBRD with all information required for the environmental appraisal to the satisfaction of the EBRD.

In order to determine the EBRD's environmental and public consultation requirements, screening is used. This categorises projects and specifies the types of environmental information required in order to assess environmental risks, liabilities, regulatory compliance, any adverse environmental impacts and other concerns. Screening is also used to identify potential environmental benefits or enhancements which could be built into proposed projects. Direct investment projects Direct investments are categorised under three categories, A, B or C, depending on the type, location, sensitivity and scale of the project seeking EBRD funding and the nature and magnitude of its potential environmental impacts, to determine the level of

investigation requirements. The screening process also determines whether an Environmental Audit is required (Category 1) or not (Category 0).

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) was therefore required but other types of investigations, such as hazard analyses or risk assessments, that may also be required, was not considered as necessary.

In comparison, Category B is given to the projects that are judged to produce less adverce impacts. They require only an Environmental Analysis the scope and format of which can vary, but will typically be narrower than the scope of an EIA. Projects classified as Category C are judged to result in minimal or no adverse future environmental impacts and therefore requires neither an EIA nor an Environmental Analysis. In addition EBRD can carry Initial Environmental Examinations (IEEs) where insufficient baseline information is available.

For many projects, including the Atash Marine Base Project, it is necessary to develop an Environmental Action Plan (EAP), sometimes also referred to as an Environmental Management or Monitoring Plan. The EAP must document key environmental issues and require a long-term or phased approach, such as compliance with expected future regulatory requirements, including compatibility with EU or other international legal requirements, standards and practices. EAPs are agreed between the EBRD and the Base Operator and become part of the legal agreement with the Bank. In cases (not for the Base case) of where existing operations are not in compliance with regulatory requirements and existing permits, the proposed actions and schedules for these areas of non-compliance are agreed with the competent environmental and/or health and safety authorities. The EAP must be approved by the Bank prior to final review of the project by EBRD management.

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 EBRD shall identify other sources of good international practice, including relevant World Bank Group guidelines, the approach of other IFIs and donors, and good industry practice, and require compliance with the selected standards. The EBRD will not finance projects that would contravene country obligations under relevant international environmental treaties and agreements, as identified during the environmental appraisal. In addition, projects will also be structured to meet IFC Safeguard Policies on indigenous peoples, involuntary resettlement and cultural property if they involve potential impacts related to such matters.

The EBRD will make recommendations and encourage the Base Operator to bring his activities that are outside the scope of the EBRD-financed project into compliance with good international practice within a reasonable timeframe. This particularly relates to the Base waste management practices.

In the case of financing for existing facilities, the operator will be required to include a programme for achieving compliance with the EBRD's requirements.

Monitoring and evaluation are requirements of the EBRD which serve two purposes. The first is to ensure that the applicable environmental standards and various environmental components of projects included in legal agreements, such as the implementation of an EAP, are complied with by the Base Operator. The second is to keep track of the ongoing environmental impacts

associated with projects and the effectiveness of mitigation measures as a “feedback” mechanism. These procedures include compliance with 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.

Operations are monitored on an ongoing basis by the operation team and the Environment Department throughout the Bank’s relationship with the project. The EBRD requires that project the Base Operator submits periodic reports on the implementation of EAPs and any other environmental requirements. As a rule, annual reports will be expected. EAPs may be updated or revised to the satisfaction of the Bank, and changes will be summarised in the Project Summary Document on the Bank’s Web site. The Project Evaluation Department (PED) evaluates projects against two environmental dimensions: environmental performance and environmental change. Environmental performance captures the achievement of project objectives, while environmental change captures the difference between the environmental performance before the project started and its performance at the time of evaluation. When material changes are envisioned, an appraisal of the proposed changes will be carried out in accordance with the EBRD policy and any additional environmental or public consultation requirements incorporated into the modified/restructured project.

5.2.1 The EBRD's principles of public consultation

The EBRD's principles of public consultation are documented in the Bank's Environmental Policy (EP), Environmental Procedures (EPr), and the Public Information Policy (PIP). Both the EBRD Environmental Procedures and the Public Information Policy require a thorough scoping procedure, which will involve the Base Operator consulting with representatives of the locally affected public and with government agencies, as well as with other organisations. They must have the opportunity to express their concerns and views about issues such as operation design, including location, technological choice and timing, before a decision on EBRD financing is made. At a minimum, sponsors must ensure that national requirements for public consultation are met and that EBRD's own public consultation procedures are met. The Bank's Board of Directors will take into account the comments and opinions expressed by consultees, and the way these issues are being addressed by sponsors, when considering whether to approve an operation.

Following the completion of environmental investigations, EBRD requires that the public is provided with adequate information on the environmental aspects of the operation to enable them to provide the Base Operator with comments on the proposals. To facilitate this, the Base Operator must make the EIA and an Executive Summary publicly available, fulfill the requirements of the relevant national legislation, and allow 60 days for public comment prior to the Bank's Final Review of an operation and its consideration by the Board.

The EBRD strongly encourages Base Operator to place EIAs on their websites to improve public accessibility to the documents, and to otherwise release information in electronic, as well as written format. Where an EIA has been released on a website, the EBRD's website will provide a direct link to the Base Operator's website.

The EBRD encourages Base Operator to leave EIAs in the public domain indefinitely, and at least for the life of the Bank's involvement with the project. In no case should the EIA be

removed prior from the public domain prior to Project Completion, and will in any event, remain permanently in the public domain through the EBRD offices in London and the country in which the project is located.

A Project Summary Document (PSD) will be prepared for each project, and will be released on the Bank's website with an Environmental Annex which summarises the results of environmental due diligence and the environmental action plan, at least 30 days prior to consideration by the Board of Directors.

For projects that have raised significant environmental or health .and safety issues, or which have aroused the particular interest of the public or NGOs, the EBRD encourages the commitment to on-going information and communication programmes. For example, the Bank may require the results of ongoing environmental monitoring to be made available to the public.

5.3 REQUIREMENTS OF INTERNATIONAL CONVENTIONS AND TREATIES

In the implementation of its Environmental Policy EBRD takes into account the relevant international conventions and would ask the Base Operator to follow them regardless of whether Kazakhstan has ratified them or not. Kazakhstan has ratified all main international conventions showed in Tab. 5.1.

Participation of Kazakhstan in the international environmental cooperation is specified in the Environmental Safety Convention of Republic of Kazakhstan as a priority. The systematic and purposeful work in this way has been possible on 1998, when the Committee of International Environmental Conventions was created at the Ministry of Natural Resources and Environmental Protection. The National Strategies and Action Plans for the biological diversity protection and rational use and desertification fighting and the National Program on the ozone-destruction substances exclusion were prepared. The Inter-departmental Centre for Climate Global Change Issues was also created.

Tab. 5.1 International environmental conventions (Protocols), ratified by the Republic of Kazakhstan

Name of convention / protocol	Ratification year
Convention on EIA in a Transboundary Context (Espoo) 1991	-
Convention of the World Meteorological Organization	1993
International Convention on the Civil Liability for Oil Pollution Damage	1994
Convention on the Safety of Marine Living Resources	1994
Convention on the Biodiversity	1994
World Heritage Convention	1994
Framework Convention on Climate Change (UN)	1995
Contract to the Power Charter and Protocol to the Power Charter for the environmental aspects and power efficiency issues	1995
Convention on the Prohibition of Military or any other Hostile Use of Environment	1995
Convention on Desertification (United Nations)	1997
Convention on the Ozone Layer Protection (Vienna)	1997
Protocol on the ozone-destruction substances (Montreal)	1997
Convention on wetlands	1997
Convention on the Protection of Migrating Wildlife (Bonn)	1997
Agreement on the protection of African and Eurasian wetland birds	1997
Convention on the International Trade of Endangered Wildlife and Fauna	1999
Convention on providing the access to information, public participation in decision-making process and justice in environment protection (Aarhus)	2000
Convention on the Environmental Impact Assessment in trans-boundary context	2000
Convention on the Trans-boundary Impact of industrial emergencies	2000
Convention on the Protection and Use of Trans-boundary Watercourses and International Lakes	2000
Convention on the Trans-boundary Air Pollution at the Long Distances	2000
Amendment to the Montreal Protocol on ozone-destruction substances (London)	2001
Convention on the Control of Trans-Boundary Hazardous Waste Transportation and Removal (Basel)	2003

5.4 KAZAKHSTAN REQUIREMENTS

5.4.1 Main Principles

The main principles are postulated in the Environmental Protection Law (EPL[5]), which is a comprehensive document designed to include all concepts and aspects of the environmental control without focusing on details.

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.

The main principles of environmental protection are:

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

The objects of protection include air; water; soil; flora; fauna; ecological systems; climate; the ozone layer; and designated areas and natural features that have special ecological, scientific, and/or cultural value.

5.4.2 Environmental Protection Authorities

The environmental protection authority (EPA) consists of the Ministry of Environmental Protection (MEP) and its regional and district offices. The district offices report to the regional offices, which, in turn, report to the MEP. The MEP structure is as follows:

1. Strategic planning and analysis department
Environmental assessment and planning board
- Strategic planning division

4. Organizational and financial department
- Devision of budget planning and work with state enterprises
- Devision of state procurements and

[5] Environmental Protection Law, 1997

- Environmental and economical assessment division
- Summary analytical division

Board of environmental monitoring and scientific and information supply

- Environmental monitoring division
- Scientific support and information division

2. Environmental expertise and nature use regulation department

Environmental expertise board

- Industrial project expertise division
- Strategic environmental assessment division
- Division of environmental expert activity coordination

Nature use regulation board

- Nature use regulation division
- Environmental audit and licensing division

3. Department of legal support and international cooperation

Legal support board

- Legal support division
- Division of standards and methodologies

International cooperation board

- Devision of international contract implementation
- Devision of international contracts internal control
- Devision of accounting and reporting

Organizational and personnel board

- Devision of staff and national language introduction
- Devision of documentation support

5. Committee of environmental control at the Ministry of Environmental Protection, Republic of Kazakhstan

Operational inspection response board

- Devision of air protection and radiation situation control
- Devision of subsoil, surface and ground water protection control
- Devision of biological and land resources protection, production and consumption waste control

Board of control activity planning and assessment

- Devision of law enforcement and control activity planning
- Devision of environmental situation analysis and relation with nature users
- Devision of metrological and analytical control

6. Republican enterprise «Informational-analytical center»
7. State republican enterprise «KazAviaMet»
8. State republican enterprise «KazGidroMet»
9. State republican enterprise "Kazakh research institute of ecology and climate"
10. Regional (municipal) departments of environmental protection

The MEP has the following responsibilities:

1. Ensure the implementation of policies and programs (Department of environmental policy and sustainable development);
2. Approve (within its competence range) the environmental quality standards and conditions, usually in reference to internally developed regulatory documents (Department of international cooperation and legal maintenance);
3. Manage the Environmental Protection Fund; (State Control Department)
4. Issue licenses for hazardous activities; permits for use of natural resources, discharges and emissions of pollutants, and waste disposal; and licenses for environmental auditors (Department of licensing and expertise);
5. Determine the limits and quotas for environmental resource use, pollution and waste disposal.; (State Control Department)
6. Manage the State Monitoring System and the State Inventory of Designated Areas and Objects and Endangered Species (State Control Department);

7. Control the use and replenishment of flora and fauna (Department of state control, Wildlife and vegetation monitoring office).

Only the Licensing and Expertise Department and in particular its State Environmental Expertise Office is concerned with the design stage (ESIA) of the Project. As one would expect in a highly bureaucratic institution like MEP, the departments interlink only when formal procedures require so. In the case of the development stage there does not seem to be a requirement to show ESIA to any other departments. Similarly, at the construction and the operation stages the Department of State Control takes sole charge. The same departments exist in the regional environmental protection offices and they are involved in these same stages but as a consulting MEP rather than permitting body. Their permitting powers come only when the MEP decides that a project is too small to be reviewed at the ministry level.

The Regional Offices can enforce their own legislation if it does not contradict the State legislation or make the environmental standards less stringent. The criteria for delegation of control from top down to Regional and District offices is not well defined, but the size of the development and the magnitude or uncertainty of generated impact are the main factors that determine which agency undertakes approval and control. In the case of the Project the environmental control at the design stage will be carried out by the Ministry of Environmental Protection that will consult its regional offices as well as the external experts. At the construction and the operation stage the control is delegated to the regional offices with the MEP controlling its regional offices for the adherence to the legislation.

In general, the responsibilities of the regional offices are reduced (in comparison with Russia) in favor of the MEP. The regional offices have authority to:

1. Approve local programs and budgets for environmental protection ;
2. Issue (at the level of their authority) compulsory regulations that assume administrative penalty for non-compliance. The regulations are approved no later than two weeks after their publication;
3. Perform environmental control, a function generally performed by MEP local offices;
4. Organize the development and implementation of local programs for the protection and use of natural resources, State Environmental Review (SER), and construction and reconstruction of protected natural resources. These duties clearly conflict with MEP responsibilities [6];
5. Approve the size of payments for pollution and waste disposal and collect them
6. Suspend activities that do not comply with legislative requirements
7. Make suggestions to the central authorities on the protection of environmentally, scientifically, and culturally valuable objects.

The district offices are mainly responsible for control of compliance with environmental requirements of enterprises on their territories. This control is carried out in the form of regular inspections.

[6] Law on Environmental Review, No. 85-1, 1997

5.4.3 Environmental Control at the Design Stage

Assessment of environmental impact from the planned Project must be carried out by a company licensed to perform EIAs in Kazakhstan[7] . In general such assessment is required for projects that will use natural resources and may negatively impact the environment [6]. The decision on its need is taken by the regional or central environmental authorities. The recent instruction on EIA [8] presents an extensive and detailed list of developments that should require EIA. According to this instruction 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. 5.2 Correlation between the Environmental and engineering stages during design

EIA stage	Engineering stage
Review of environmental conditions	pre-feasibility
Preliminary EIA	feasibility
EIA	detailed design
Chapter “Environmental Protection”	design for construction

The SER can release the developer from conducting the next stage if this environmental chapter can prove that the negative effects are absent, small, short-term and benign. The SEE may also be satisfied with preliminary EIA which is performed with the feasibility study and focuses on impact scoping and alternatives. If the positive SER conclusion on the preliminary EIA does not recommend further environmental work, such approval is considered to be final. However, if the results of a preliminary EIA or analogies showed that impacts from the projected development are likely to be considerable or uncertain, the SER recommends performing a full EIA. The fourth stage is the provision for design changes that may arise after the completion of EIA and cause significant changes in magnitude of predicted impacts. This chapter does not have to be included in the design for construction documents if no significant changes from the detailed design documents were made.

Composition of EIA reports can differ between large complex and small benign developments. For example, calculation of the maximum permitted pollution volumes (MPPs) is not required in EIAs for the small and benign developments and is set according to the real discharges at the first year of the operation.

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. According to legislation the contract for nature use between the central environmental protection authorities or the Government and the proponent can be signed only after the issuance of the license for nature use if such is required. The conditions of the contract that contradict the license have no jurisdictional power (A.23[5]).

The license is issued after the positive conclusion of the State Environmental Review that is organized and performed exclusively by the State Environmental Expertise (SEE) or its local offices (A.48[5], A.11.1[6]). Following can be subjected to environmental review:

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

[8] 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

1. All policies, plans and programs that affect environment (A.14.1[6])
2. Contracts and licenses including international agreements that relate to nature use
3. Regulatory documents drafts that relate to nature use and population health
4. Environmental impact statements with results of EIAs
5. Environmental passports produced as a result of environmental and health and safety audits (A.14.9[6])
6. Feasibility studies and project design documentation [9]
7. Documentation that substantiate environmental qualities of new machinery, technology, materials and substances (A.14.6 [6])
8. Results of the assessments of the areas projected for special environmental protection (e.g. nature reserves, zones of environmental crisis etc.)
9. Results of environmental studies (A.14.3 [6])

The Government participates in the review only when international interests of other countries are affected. Similarly, it collaborates with other governments if the developments in these countries would affect the environment of Kazakhstan (A.10.1 [6]). It also defines the procedures of collaboration with other state reviewing bodies.

The other stakeholders: state central and local institutions, public environmental organizations, scientific and expert bodies and individuals can participate in the review but not carry it themselves (A.7.2, 3 [6]).

5.4.3.1 Responsibilities of the State Environmental Expertise

Ambiguity in the legislation does not allow clarifying whether the SEE is entitled to coordinate all environmental works in the country or whether the coordination powers extend only as far as the environmental review goes (A.11.2 [6]). As it has to approve all environmental studies, (A.14 [6]) that would inevitably be included with the documentation for the final review, the developer's compliance with the active methodologies would be assessed at the end.

Documentation of the I and II category developments (see above) are reviewed by the central office, while other two categories are dealt with by its regional offices. Any project with foreign investment must be assessed by the central SEE. Practice showed that the MEP passes EIAs for the small and intermediate size projects to its regional SEE offices. However, for such projects all EIA documentation should be sent to the MEP leaving the central office to decide what to do with the documentation. Care should be taken here as even after agreement the regional SEE office can decide to recommend the central review if in the process of the review it finds that the nature of impacts exceeds the regional office competency. Because the associated delay in obtaining the approval can be costly, in an unclear situation EIA should be sent to the central office.

[9] Feasibility studies are carried out for developers and do not need the state approval. However, if the proponent decides to proceed with the development, he is recommended to consult the SEE before starting with the Technical project and EIA. As part of this consultation the SEE will review the feasibility study and other pre-project documentation available

When EIA is reviewed centrally, a copy of the report is sent to the appropriate regional SEE office to obtain their opinion. Although in this case the regional office does not give final approval, in most cases the MEP does not give permission to proceed without positive conclusion from its regional office.

The collection of payments from the proponent for the review of EIA is the responsibility of the regional SEE offices. They can also contract independent experts for the review.

For particularly large developments the SEE can decide to form the expert commission.

5.4.3.2 State Environmental Review

Presented for review EIA report has to include:

1. Statement on the Environmental Consequences – a short summary in the standard format;
2. Calculation of maximum permitted levels of pollution: discharges, emissions and waste disposal;
3. Assessment of alternatives (including no action option) (A.16.3.2 [6]);
4. Environmental risk assessment with description of possible accidents and the long-term effects (A.16.4.1 [6]);
5. Effective impact mitigation measures (A.16.4.3 [6]) (note: effective, rather than best available for reasonable cost i.e. BATNEEC principle does not apply);
6. Calculation of damage to environment from residual impact;
7. Results of public consultation (A.15.1 [6]).

The review usually takes a month but legislation (A.26.1 [6]) reserves three months for it with the maximum allowed delay of 6 months. The review time can be further extended only by the proponent.

The review starts after all the required documentation is presented. A preliminary review is carried out to assess the completeness of the information. If during the review the documentation is found to be incorrect or incomplete, the process stops and documentation is returned to the developer for correction. SER can ask for additional information during the review. If the information presented promptly, there will be no delay in the review or the need to restart it.

The SEE can ask the proponent to obtain the approval from other state bodies if their interests could be affected by the development. For the near shore and offshore parts of the Project this will involve the approval from the Fishery Committee of the Ministry of Agriculture; for water abstraction and discharges this will be the Committee for Water Resources of the Ministry of Agriculture.

Experts that take part in the review have to insure safety of all given documents and coordinate with the proponent on the issue of confidentiality (A.20.4.7 [6]).

5.4.3.3 Conclusion of the State Environmental Expertise

The negative conclusion of the SEE implies that the reviewed documents have to be corrected and submitted for the second review. The second review can also be carried out if the change

of the conditions of nature use lead to the [substantial] increase in negative impacts and especially in natural resource use, pollution or waste disposal levels (A. 13.2 [6], A.4[10]). The second review can also be initiated [in exceptional circumstances] by the court, the Government of the SEE at any time.

The positive conclusion of the review is usually conditioned to the completion of recommendations. There is no need for the second review in this case.

The conclusion of the review is approved by the head of the SEE and finally signed by the Minister for Environmental Protection. The latter, however, is more of a formality as the main decision is made on the expertise level. Once approved, it is obligatory for compliance but can be disputed in the court (A.64 [5]).

The legislation states that a contract with a supplier of the oil-related activities can not be signed without positive conclusion of the SEE for these activities (A.47 [5]).

The proponent can also appeal against the composition of the SEE commission, methods of assessment used, time taken (if it exceeds the time stated in the legislation), information used and the final conclusion. The composition can be appealed against within 10 days from the SEE participant approval. All intermediate conflicts must be resolved within 7 days from the appeal. The appeals against the decision of the SEE can be reviewed for 1 month or longer if the involved sides agree on it. The conflicts can be resolved with the secondary review [11].

Tab. 5.3 Indexes for calculation of charges for exceeding the MPE

Excess	*Charge index*
< 1,0	1
< 1,5	2
< 2,0	3
< 2,5	4
< 3,0	5
< 3,5	6
< 4,0	7
< 4,5	8
< 5,0	9
> 5,0	10

The SEE and the local offices can waive the previously issued positive conclusion of the review if newly revealed facts imply environmental hazard or if the comments are not followed (A. 17.8 [6]). They also reserve the right to inform banks and other financing bodies of the negative conclusions on the proposals (A. 17.10 [6]) in order to restrict funding of the development.

The conclusion of the SER can be invalidated if the procedures for its undertaking and other regulations are breached (e.g. participation of uncertified experts, falsification of results, and publication of the conclusion before the final decision is made) (A.39 [6]).

5.4.4 Environmental Control During the Construction, Operation and Decommissioning

Two forms of environmental control are exercised in the Republic: the state, and public control. The public control instruments are described in Section 7.7. The state control must have access to the industrial sites and information that is required for the control. It must be able to carry appropriate sampling for analysis of the effectiveness of cleaning facilities.

The developer must inform the authorities about any changes in the approved by the SEE project that may effect the environment. The project will not require the second review as long

[10] Procedures on consultation and issue of permission for special water use. No. 1482, 1994

[11] Instruction on the procedure of conflicts reviewing between proponents, designers of the project documentation and expertise of the Ministry of Environmental Protection, 1993

as re-calculated volumes of the used resources, pollution and waste disposal do not exceed the permitted earlier amounts and the impacts do not increase its negativity (A.50 [5]).

Certain industrial activities can be restricted or prohibited if the Critical Environmental Conditions (deep and stable negative changes in environment that poise hazard to population and nature) have formed in a particular area (A.68 [5]). In this case the Government announces the Critical Environmental Conditions and issues the laws that define the Zones of Environmental Disaster (A.70 [5]). Activities that cause destruction of ecological systems, genetic fund of human, flora and fauna and environmental changes that create hazard for life and health of the population are prohibited (A.47 [5]).

Impact mitigating measures have to be developed during preparation of an environmental impact statement. Seismic surveys (treated as scientific research at sea) must have EIA and provide impact mitigation measures too (34.2 [5]). The most effective methods and technologies must be used to mitigate impacts from the oil-related operations (A.41.1 [5]). On decommissioning the proponent is responsible for rehabilitation of natural resources to the "economically useful conditions" (A. 41.17 [5]). It does not state that the conditions must be the same as at the start of the operation.

EIA for the existing enterprises can be requested by the authorities, the public or the court (A.16.2 [6]). It should be noted that in Kazakhstan environmental audit of impact from an existing enterprise is usually called EIA too. Audit should be carried out according to the Regulations on the environmental audit implementation (Decree of the Government of Republic of Kazakhstan from August 23, 2004 № 889 «On some issues of licensing and environmental audit implementation»).

5.4.4.1 Monitoring

Apart from the State monitoring, which is subsidized from the State Budget, the enterprises have to maintain their own environmental monitoring system (A.23 [5]). The instruments that are used for monitoring must comply with the standards of the Republic (A.25.2 [5]). However, the legislation does not seem to poise restriction on the methods that can be used for monitoring.

Environmental monitoring program must be designed and implemented by the proponent before the start of the oil-related operation (A.48 [5]). All documentation on organization of the air, water and soil monitoring and the results of monitoring must be submitted to the Kazakhstan Hydrometeorological Service (KazGidroMet) for the State Hydrometeorological Review[12]. The office may also review the Feasibility Study, the Technical Report and other project documentation if such review is required by the SEE or the State Main Review (KazGlavGosEkspertiza) that is undertaken by the Ministry of the Construction (MinStroy) (A.4[6]). KazGidroMet issues the methodologies for the monitoring and reviews the related to monitoring instructions that has been issued by the other governmental institutions (A.6 [6]).

The KazGidroMet controls the compliance with the conclusion of the Review. However, in contrast with the authorities of the SEE, it cannot suspend or alter the development in the case of non-compliance but it can ask the Cabinet of ministers to do so (A.6 [6]). The proponent has to pay for the undertaking of the Review. The legislation does not state the exact charge but is

[12] Regulation on the State Hydrometeorological Review, No.959, 1993

likely to be in excess of the expenses incurred during the conduct of the Review as KazGidroMet is allowed to fund all its activities from the received payments (A.10 [6]).

5.4.4.2 Water abstraction and discharge

In addition to the Ministry of Environmental Protection, the control over the water abstraction and discharge is undertaken by the Committee for Water Resources (CWR), catchments areas water-managing consortiums and the public reservoir directorates [13]. The CWR can check the quality of discharged water, the condition of abstraction and discharge measuring equipment and the state testing documentation. It also checks the compliance with the water protection zones and belts regulation, adequacy of protection against flooding and coastal erosion. The CWR controls the introduction of the modern technology and methods for water consumption and pollution minimization. This is supported by the legislation which states that "the most effective technology and methods must be employed for pollution abatement" (A.41.1 [5]).

The CWR inspector regularly inspects compliance with the set limits for water abstraction and discharge volumes and quality. The recommendations of the CWR inspector issued as a result of the inspection are compulsory for compliance. If the recommendations are not followed, the inspector can suspend the operations by shutting and sealing the water abstraction or discharge points. The CWR can not cease the enterprise activity but can appeal to the state bodies that are authorized to do so. The CWR can ask any laboratory to carry out the analysis of the effluents on the enterprise although it seems that there are no provisions for insuring that the analyses are legally viable. The CWR inspectors have a specific uniform and an ID that entitles them to enter an enterprise at any time and demand collaboration in inspection of appropriate facilities. The inspectors can levy a fine or request for compensation to an enterprise or a particular responsible employee. The inspector's decision can be appealed against in the overlooking office but the appeal does not relief the responsible from the fine or compensation obligations.

5.4.4.3 Waste Management

Waste management is controlled through the annual permission issued by the regional environmental protection authorities to generate certain volumes of each waste category and payments for their disposal. Charges for generation of excess waste are calculated using the same principle as for the maximum permitted emissions. The principle of "The Duty of Career" (responsibility for waste from generation to complete degradation into benign substances) is not followed. This mean that to fulfill the current requirements, the operator can simply state that waste is collected by a waste managing contractor without specifying the place and method of disposal.

Reduction, reuse, recycling and recovering of waste is encouraged but only through reduction of payment for waste disposal. Practice of storing contaminated with oil or metal salts ground in an unlined landfill is not punished by the regional environmental protection authorities.

Import of waste can only be allowed by the Government. Goods for which there is no-disposal or recycling technology must not be imported (A.59[5]). Waste disposal from oil related operations

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[13] Regulation on the state control over the usage and protection of water resources, No. 600, 1995

into the sea is prohibited[14]. Waste water, used in the technological processes can be discharged into the sea providing it complies with MPCs and the discharge is authorized by the SEE (A.33.1-2).

5.4.5 Economic stimulation Mechanisms

Provisions for the economic stimulation of environmental protection are well developed and include the following:

1. Payments for resource, pollution and waste disposal;
2. Compensation for environmental damage;
3. Voluntary or compulsory (for hazardous activities) environmental insurance;
4. Discounts for environmentally friendly developments using tax releases and lower–interest rate loans.

5.4.5.1.1 Payments for Resource Use, Pollution and Waste Disposal

The enterprises are charged for resource use, for authorized and unauthorized pollution and waste disposal. The charges per unit of used resource, pollution and disposed waste are determined by the regional (in the Project case Mangistau region) councils and approved by the Ministry of Environmental Protection. These charges are the product of permitted pollution and waste disposal volumes and the set by the regional council rates per unit of volume. The rates are the same for all enterprises in the region. They are revised annually.

Payment for air pollution from mobile sources is calculated for the entire region[15]. The total payment due for collection is the ratio of the regional budget for control and mitigation of this kind of pollution and the volume of fuels that were imported or sold in the region during the previous year. The fuels are also weighed according to their toxicity. It is not stated whether the similar approach is applied to a single enterprise.

During calculation of damage to air from burning crude oil or from evaporation from the oil tanks the mass and toxicity of pollutant, the height of the emission and the air vulnerability are accounted for. These information is used to modulate the payment per ton of emitted pollutant (e.g. for soot it is £1/t). If the emission is authorized the following indexes are used for exceeding the MPE. If it is not authorized, the resulted figure is multiplied by 10. The air vulnerability is accepted to be the highest in large cities and industrial sites (100) and smallest in rural areas (0.8) and forests (0.025)

The calculation of damage to surface waters accounts only for the lost productivity and profit of the other water users. Therefore, if water body is not used for economic purposes it has no value and therefore no payment should be levied for pollution.

Calculation of payment for damage to soils from mud pits, production waters etc. takes into account the cost of creation of the same quality arable land elsewhere and the time required for

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[14] Law on underground resources, 1996

[15] Methodology for calculation of payments for air pollution by mobile sources. RND211.1.03-01 (1996)

it. The index for the best land is 10 times higher than for the poorest quality soil and the index for the longest recultivation (more than 31 years) is 100 times higher than for 1 year period.

If the damage has not destroyed productivity completely, the payment is varied in accordance to the level of pollution. The 5th level (very strong contamination) assumes doubling of the payment for 4th level (strong contamination). The payment also doubles if contamination is more than 1.5m deep. The payment is reversibly proportional to the background (i.e. natural) concentration of a particular pollutant. The background levels should be measured and approved by the MEP or its regional offices prior to the pollution. If EIA is performed, background levels are approved during the State Environmental Review. When no EIA or baseline study was required, background concentrations for a particular region can be estimated using the existing methodologies. Fines collected from enterprises for contamination of soil and groundwater are recommended to be used for remediation of previously contaminated sites (A.2.10 [16]).

The size of the fine for unauthorized pollution is equal to the caused damage to the environment and is calculated according the existing methodologies (e.g. The Price Index. Construction Methodologies for Agriculture). The payment of fine does not release the polluter from the responsibility to clean up. Waste that is not disposed at the designated by local authorities sites is considered as unauthorized.

Discharge of industrial, domestic and other sewage water into the surface water bodies can be implemented basing on the permissions (A66.4.[15]).

Use of domestic, drinking or industrial underground water with limits of outtake from 50 to 2,000 m^3 per day can be implemented basing on the permission, issued by authorized body in the area of water stock use and protection according to the procedure specified by the Government of Republic of Kazakhstan (A66.5. [15]) Payment rates for water system services are established according to the Antitrust laws of Republic of Kazakhstan (A134.2.[15])

Those involved in hazardous activities must compensate for the caused damage if they cannot prove that the damage was a result of *force majeure* or the malice presence of the victim. The amount of compensation is calculated or, in the case when methodologies for calculation are not available, be equal to the actual cost of rehabilitation, and other connected with the damage financial and moral costs including the lost profit. The final decision on the size of the compensation is made by the court.

Toxicity of pollutants is divided into five categories with the first being extremely hazardous and fifth – non-toxic [non-hazardous]. For instance, crude oil has the 2nd category “highly hazardous” and contaminated with crude soil has the 3rd category (4.6-7 [17]).

The payments for resource use and pollution are collected into the Fund for Protection of the Environment (FPE). The FPE can be state or public. The central fund is formed with the transfers from the local funds. Both the central fund and the local funds have jurisdictional independence from the Budget and are designed to subsidize remediation of the most acute environmental problems (A.27.2, A.33[5]).

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[16] Temporary methods of damage calculation from air, soil and water resources pollution with oil products, production waters and sighting of unlicensed oil storage facilities, 1996

[17] The Maximum concentration of toxic compounds in industrial waste of different toxicity” Ministry of Health, 1985

5.4.5.1.2 Compensation for environmental damage

Compensation for unavoidable environmental damage is calculated by specialists according to the Instruction 16 at the EIA stage and after an accidental event that lead to unrepeatable damage to the environment. The payment for damage does not release the operator from obligation to cleanup. When remediation measures are undertaken, damage is calculated for the residual impact.

5.4.5.1.3 Environmental Insurance

In addition to payments for pollution and resource use, potentially environmentally hazardous activities have to take the State Environmental Insurance (A.3[18]) from a licensed insurer. Activity of oil and gas sector is considered as hazardous and, therefore, requiring the insurance.

Insurance compensation cannot exceed the size of the damage to the life, health or property of a third part or environment as a result of damage (A.19.4[17]).

5.4.6 Responsibility for the Past Environmental Legacies

During privatization the Government takes financial responsibility for cleaning past contamination and eliminating other hazards (A.51.3 [5]). In the cases of bankruptcy, liquidation or reorganization of an enterprise environmental audit has to be carried out by an external auditor or the head office representative in the case of bankruptcy (A.52.2 [5]) and with the participation of the SEE in the other two cases (A.53.2 [5]). The new owner takes all responsibility for the environmental condition of the enterprise.

Regulations on the environmental audit implementation (Decree of the Government of Republic of Kazakhstan from August 23, 2004 № 889 «On some issues of licensing and environmental audit implementation») are valid in Kazakhstan. Regulations specify the procedure on the environmental audit implementation by environmental auditors and environmental auditing companies, who obtained the license to provide the environmental auditing activity, according to the specified procedure. Environmental audit is implemented according to the Plan of Environmental Audit, which is prepared by environmental auditor and agreed with the client and audited entity .

[18] «Law on the obligatory environmental insurance», 2005.

Tab. 5.4 Summary of relevant to the project aspects of Kazakhstan legislation

Regulation Name	Summary description
Law of Republic of Kazakhstan from July 15, 1997 №160-1 «On the environmental protection» (modified and amended on31.01.2006. №125-III-ZRK	The low regulates **The main principles of environmental protection**, including the following: • Priority of human health and life protection, **protection and rehabilitation of the environment** favorable for the life, labor and rest; • **Balanced solution of environmental, social and economic problems** in order to turn to the sustainable development under the conditions of market relationships and meet the needs of the present and future generation in strong and favorable environment; • Providing of environmental safety and **disturbed natural ecosystem rehabilitation** in the areas with unfavorable environmental situation; • Providing of **bio-diversity saving and protection of environmentally, scientifically and culturally important bodies**; • State regulation and control, inevitability of responsibility for the environmental legislation violation; • **Prevention of environmental damage**, assessment of potential environmental impact; • Active and democratic participation of population, public communities and local environmental self-government bodies; • International cooperation in the area of environmental protection on the basis of international laws. According to *Clause 4*, the environmentally, scientifically and culturally important bodies and special protected zones are to be protected. Some aspects of specially protected zone activity are regulated by the Law of Republic of Kazakhstan # 162-1 from July 15, 1997 "On specially protected natural areas" (with changes, introduced according to the laws of RoK from 11.05.99, # 381-1; from 23.01.01, # 151-II, 31.01.06 №125 – III ZRK). This law is not given here, as the project route does not cross any protection area. *Clause 68.* **Environmental emergency** Environmental emergency is unfortunate environmental situation, occurred at specific area as a result of man-made activity or spontaneous natural forces with deep and stable negative environmental changes that are hazardous for human life and health, flora and fauna saving. In case of emergency some industrial and nature use activities can be restricted or prohibited as specific areas, nature rehabilitation, and social population protection measures will be provided according to the procedure established by the legislation. **Payment for the natural resource use** According to Clauses 28-30, the payment for the natural resource use is collected from nature-users in the form of general state taxes, local taxes and fees, social payments, established for specific type of nature use. See Regulations «on the Estimation of payments for water resource use» from December 12, 2005 № 554 – Payment for environmental contamination is collected from the organizations and citizens for emissions and discharges, production and domestic waste disposal. See Methodology of environmental contamination payment estimation and Methodology of payment distribution for the air emission from mobile sources ", May 15, 1996. – Payment for environmental contamination over the specified limits in increased sizes, according to the procedure specified by the legislation. – Environmental pollution payment rates are approved by the regional heads (akims) in agreement with the environmental protection department of the MEP. See the Decision of Mangistau region head from November 11, 1999 №259 On the payment rate for environmental contamination for 2000. (modified on 20.04.2000. N 393, according to the regional head decision), Decision of Atyrau region head from December 21, 2000 N2 On the approval of payment rate for environmental contamination for 2001. – See Temporary procedure "On the determination of the damage size provided to the environment due to the violation of environmental laws» (approved by the Minister of the Environment and Bio-Resources of Republic of Kazakhstan, June 21, 1995). – Payment for natural resource protection and rehabilitation is collected from nature-users as a compensation of budget costs for this activity. **Responsibility for the violation of environmental legislation** According to Clauses 84-86: – Physical and juridical persons that are guilty of the environmental legislation violation, will be responsible according to the laws of Republic of Kazakhstan. See Administrative Violation Code and Criminal Code. – Disputes in the area of environmental protection are solved by the law-courts or according

Regulation Name	Summary description
	to the procedures, established by the legislation of Republic of Kazakhstan. – Compensation of the damage provided due to the environmental contamination violation is performed voluntarily or by the court verdict according to the specified procedure, rates and damage calculation methodologies. In case of the absence of procedures or methodologies the compensation is estimated on the basis of the actual costs for the nature rehabilitation, taking into account the material losses.
Law on State Environmental Expertise (March 18, 1997 № 85-1) modified by the laws of Republic of Kazakhstan from 24.12.98 №334-1; 11.05.99 №38-1; 02.07.03 №454-11; 20.12.04 №13-III	This law give the determination of Environmental Impact Assessment, as «...obligatory and integral part of pre-project and project documentation, implemented at all stages of the project (designing, construction, operation), including the following: • Determine the types and levels of environmental impact due to the planned activity, to include the risk; • Forecast the environmental changes due to the planned activity implementation and social-economic consequences; • Develop the environmental protection measures during the implementation of planned activity; • Develop all relevant standard requirements
Water Code of Republic of Kazakhstan fro July 9, 2003, № 481-II ZRK, modified on January 31, 2006 № 125-III ZRK	This Code describes the water use procedures
Water Protection Zones and Belts from 1995	This document establishes the water protection zones around any water bodies
Law of Republic of Kazakhstan from December 4, 2002 «On sanitary and epidemiological prosperity of population» modified on 31.01.06 №125-III ZRK	This Law considers the reasons for epidemics, poisonings and professional illnesses
The Law of Republic of Kazakhstan fro October 21, 1993, №2463-XII «On the protection, reproduction and use of wildlife» modified on 31.01.06 №125-III ZRK	The Law regulates the **Main requirements on the protection, reproduction and use of wildlife**. According to the *Clause 12*, the activity that impacts on the wildlife condition, habitat, reproduction conditions and migration routes, has to be implemented in compliance to the requirements, which provide the safety and reproduction of wildlife, habitats and damage compensation. The following requirements have to be met during the implementation of the activity that impact or can provide the impact upon the wildlife, and habitat: 1) Preservation of biodiversity and integrity of wildlife in the natural freedom; 2) Preservation of wildlife habitat, reproduction conditions, migration routes and concentration places; 3) Scientifically feasible, rational use and reproduction of the animals; 4) Regulation of the animal population in order to safe the biological balance in the nature; 5) Reproduction of wildlife, including the man-made animal breeding, to include the rare or endangered species, with further release to the freedom. <u>Measures on the preservation of wildlife habitat, reproduction conditions, migration routes and concentration places</u> during the designing and implementation of industrial and other activities (Clause 17) : 1. Measures on the preservation of wildlife habitat, reproduction conditions, migration routes and concentration places have to be provided and the areas, which are valuable for the wildlife habitation have to be undisturbed during the disposal, designing and construction of settlements, enterprises, facilities and other objects, implementation of industrial processes and operation of vehicle, improvement of the existing and commissioning of new technological flows, use of unused, coastal, waterlogged, overgrown areas, land melioration, use of forest resources and water bodies, geological survey activity, mineral production, determination of

Regulation Name	Summary description
	agricultural animal grazing areas, preparation of tourist routes and organization of mass rest places. 2. Measures on the preservation of wildlife habitat, reproduction conditions, migration routes and concentration places have to be provided during the disposal, designing and construction of railway, motor, pipeline and other transportation routes, power and communication lines, channels, dams and other water facilities. According to the *Clause* 15, the activity that can result in the rare or endangered animals' death, reduction of population or habitat disturbance are not permitted to the implementation. According to the *Clause 21,* local representative and executive authorities, all nature users have to provide the **assistance to the wildlife** in case of mass disease, risk of its death during the natural hazards and due to other reasons. Persons, who violate the wildlife protection, reproduction and use legislation of Republic of Kazakhstan, are responsible according to the laws of Republic of Kazakhstan (Clause 58).
Decree of the Government of RoK from November 21, 2003, №1167 «On the approval of Environmental Safety Conception of RoK for 2004-2015 »	According to the Item 2.1 The aim of state policy in the area of environmental safety is to **provide the protection of the eco-systems, important community interests and personal rights against the threats occurred as a results of man-made and natural environmental impact**. Item 2.2. The main tasks of the environmental safety are the following: – Save the bio-diversity and prevent the land degradation and desertification; – Prevent the Caspian Sea shelf contamination; – Prevent the natural and man-made emergencies. Environmentally safe development of the country is based on the following principles: – **Eco-system approach** to the regulation of all public relationships for stable development of the country by the means of introduction of scientifically valid limitations, standards and rules of industrial and other activity, which determines the environmentally permitted limits of the nature use and provide the balances management of the environmental quality; – **Subordination of the regional and local tasks** of environmental safety to the global and national purposes of the environmental threats; – **Obligation of the environment and human health damage compensation** (the money is paid by the nature users and persons who provide the contamination); – **Environmental and economic balance** of the development and distribution of production forces (principles of environmental capacity and territorial planning); – **Obligatory of environmental impact assessment** for industrial and other activity with further environmental and sanitary-epidemiological expertise; – **Information distribution and public participation** in the solution of environmental problems through the access to the environmental information, participation in the environmental problem solution process; – **Partnership in the international cooperation** and maintenance of international standards. Item 3.2.2. The problems connected with intensive development of Caspian Sea shelf resources The Framework Convention of Caspian Sea marine environment protection and Regional Strategy of Priority Actions determines the main directions of Caspian Sea commercial resource use between the Pre-Caspian countries regarding to the Caspian environmental protection measures. The State Program of Caspian Sea Kazakhstan Sector Development provides for the special studies before 2005 in order to determine the maximally possible level of hydrocarbon production without any coastal and marine environment damage, geodynamic monitoring, liquidation of abandoned oil wells and other historical contamination, stoppage of associated gas flaring and unauthorized radioactive oil pipe and equipment burial. The result of the studies will be the development of efficient standard environmental requirements that would provide the environmentally safe offshore activity, to include the **Caspian reserve area zoning**. Item 4.1.1. Improvement of nature use economic mechanisms The efficiency of environmental protection efforts of nature users is determined by the creation of financial incentives, as well as introduction of economic tools for environmental protection stimulation. Stimulation of nature user to perform the environmental protection measures and

Regulation Name	Summary description
	rational use of natural resources should be provided using the economic mechanism of nature use that would establish the system of environmental payments. Payments for the environmental contamination provide the economic stimulation of environmental contamination reduction through the mechanism of payment rate increase of over-standard use of resources and over-standard emissions and discharges. Economic tools will promote the establishment of strict standards and norms of entity activity in order to introduce the innovations and rational natural resource use, develop more efficient and low-waste technologies. The environmental damage due to the violation of environmental legislation will be compensated in full scale, taking into account the contamination and damage, rehabilitation costs and other costs.
Decree of the Government of RoK from July 31, 1999, №1087 «On the approval of Special environmental requirements in state reserve area in the Northern part of Caspian Sea»	**Preparedness to the emergency response, actions on the hydrocarbon spills** According to the Item 55, in case of hydrocarbon spill detection the Operator must immediately initiate the spill liquidation efforts. According to Items 8 and 49, each Operator must have the following: – A stand alone Action Plan for hydrocarbon spill approved by the authorized agencies and procedures used for response and mitigation of consequences caused by the spills of hydrocarbon of other contaminants in the sea or coastal line; – Material resources and trained personnel for prevention and liquidation of emergency, including the oil spills. According to the Item 51, Operator will provide the theoretical and practial training of its and coastal service personnel, involving the authorized agencies, under the reality-like conditions. **Regime and limitations of the works** – Item 40. Performance of the work within the reeds (natural biological filter) at the “land-sea” border is regulated by the special permissions from the authorized agencies, taking into account the seasons. – Item 22. Construction of the coastal bases, including: lubricating stores, maintenance stations, etc., will be performed beyond the reserve area with maximally possible use of existent infrastructure. – Item 23. The land reclamation after the coastal infrastructure facility disassembling will be provided according to the project, approved by the authorized agencies. – Item 42. The flying of air transport over the specified areas of the bird habitation and reproduction below 1km is prohibited in order to prevent the disturbance of the birds, except for the special monitoring actions. – Item 43. Level of the equipment and vehicle noise and vibration will not exceed the specified standards. – Item 36. Berths and bases will be planned in the manner that provides the safe maintenance, supply and refueling of the ships. – Item 34. All operations on the refueling, storage, use and transportation of combustible and lubricating materials, solvents and other harmful substances will be provided under the control, with registration in special logs that are the reporting documents. – Item 35. Ship refueling in the sea will not result in the hydrocarbon spills and leaks. **Requirements to the ships and vehicles** – Item 30. Navigation on the drilling sites and coastal zone will be performed according to the navigation regime, approved by the authorized agencies, in order to avoid the negative impact upon the environmentally sensitive areas; – Item 31. Construction and use of the roads in coastal zone of the State Reserve Area in the northern part of Caspian Sea will be provided by the project, approved by the authorized agencies. Any disposal of vehicle (except for the emergency and medical cases) beyond the roads, specified by the project, and existent administrative road network is prohibited; – Item 32. The use of special vehicle (on the low-pressure tires, air cushion, etc.), which slightly disturbs the integrity of the soil and vegetation, is permitted on the moistened areas and shallow water of the coast, as necessary.
Decree of the Government of RoK from May 6, 2000, №676 «On the approval of National Plan of Oil Spill	**Protection of especially environmentally sensitive areas** According to the Item 5.4, the protection of especially environmentally sensitive areas is the priority direction of the oil containment and collection in the sea. As the possibility of the oil containment and collection equipment use is limited when the oil spot reaches the shallow

Regulation Name	Summary description
prevention and response in the sea, internal water bodies of Republic of Kazakhstan (valid till January 1, 2005)	water and reed in the Northern and Eastern Caspian, the primary efforts will be emphasized on these aspects. *Especially environmental sensitive area* (Item.1.10) - is the area, which is the place of the vegetation and wildlife concentration (bird migration, nesting, marine mammals rest, fish spawning and fattening) in some periods. **Oil spill prevention and liquidation plan** According to the Item 3.2., the oil operation Contractors, owners of oil pipelines, ships and other vehicles are responsible for the timely cleanup, oil spill prevention and liquidation. According to this, a stand alone Oil spill prevention and liquidation plan should include the following (Item 4.3.2): – Facility disposal areas, where the oil spills are possible; – Detailed map of environmentally sensitive areas and review of seasonal sensitivity for each species; – Determination of all existent spill risks; – List, disposal place and type of equipment, vehicle, materials, personnel, methodology of spill liquidation for the various spill categories; – List of dispersants, which can be used; – Estimation of the time necessary for the initiation of spill liquidation for the various spill categories; – Personnel training and equipment maintenance schedule; – List of persons in charge, their addresses, procedure on the notification of state bodies. Item 1.14. **Spill of the first level** – this is the small-scale spill that can be liquidated without external assistance by own personnel, using the available equipment under the appropriate spill liquidation plans, approved according to the specified procedure. Item 1.15. **Spill of the second level** – this is larger spill that cannot be liquidated using the resources of the first level and requires the attraction of additional resources from preliminarily prepared coastal bases of responsible part, as well as other companies, as necessary, according to the multilateral agreements, signed between such companies. The National Plan is initiated by the special instruction of the Emergency Commission in very complicated cases (threat for the environmentally sensitive areas, as well as coastal objects, connected to the supply of population vital functions). Material, technical and human resources that are available in special authorized bodies of Republic of Kazakhstan, are to be involved. Item 1.16. **Spill of the third level** – this are large-scale, short-term or long-term spills, the liquidation of which will requires the assistance of personnel and resources from the central executive agencies and international companies, according to the special agreements. The reference of the spill to the third level means the automatic initiation of National Plan. **Spill consequences liquidation** (Items 6.1.2-5) – It is provided for the use of all resources available in the local authority, attraction of additional forces and voluntary participation of population. – The most sensitive wildlife habitation areas, such as seal islands and reed bush, are the primary objects to be protected. – Response methods on the coast include mechanical cleanup and/or use of manual labor, bio-remediation and natural biological degradation. 6.1.5. Rehabilitation efforts can include the following: – Oil cleanup of the coastal line; – Removal of oil waste in order to prevent the secondary contamination; – Cleanup of jetty, piers, berth structures; – Cleanup of ship bodies and underwater structures of cargo, fishery and pleasure vessels; – Cleanup of fishing-tackles; – Reclamation of lands and public areas (roads, dumps, etc.) **Disposal of the oil collected** (Items 6.6.2-3) – The use of mobile tanks for oil collection, including the plastic bags, barrels and boilers for further pumping to the stationary reservoirs, is permitted. – The most efficient method of collection of large oil amount is pumping of oil to the barge and large floating tanks for further transportation to the larger vessel and coastal facilities, located not far from the coastal unloading places. – Processing of collected oil is preferable method of the waste treatment. All possible

Regulation Name	Summary description
	measures to promote the use of available technologies will be provided.
Decree of the Government of RoK from August 19, 1994, №931 «On the procedure of water ways reference to the navigable category»	According to the Appendix to the Decree: the List of valid internal water ways that are open for navigation includes Ural river through the whole length from Rubezhka village in Western Kazakhstan to the mouth and Ural-Caspian channel.
Decree of Kazakhstan Government #19 from January 8, 2004 On the Approval of the List of Environmentally Hazardous types of Economic Activity and Rules of Obligatory Licensing of Hazardous Industrial Activities	Decree of Kazakhstan Government #19 has come into effect in Republic of Kazakhstan on January 8, 2004. This Decree establishes the responsibility of oil production entities, shipping companies and other enterprises (both Kazakh juridical persons as the foreign affiliated companies) to obtain the additional License on the Performing of Environmentally Hazardous Industrial Activities. This Decree approves the list of environmentally hazardous activities for which the License is necessary, including: marine transportation, dredging operations, oil exploration, production and transportation, construction on the coast of Northern Caspian, gas flare incineration , storage, burial, utilization and trans-boundary transportation of hazardous industrial wastes, use of mineral waste, import and export of ozone-destroying substances, production with ozone-destroying substances, use of equipment with ozone-destroying substances, as well as other activities. This License is issued by the Ministry of Environmental Protection in one month after the application (according to the specified procedure) with copy of state registration certificate, license payment invoice (in 11-fold size of minimal estimated index (919 tenge)) and documents that confirm the compliance of applicator with qualification requirements
Decree of the Ministry Cabinet of Republic of Kazakhstan from April 5, 1995, №414 «On the approval of Regulation on the fish protection and fishery control in the water bodies of RoK»	**Regime and restriction of works in fishery water bodies** According to the Items 13-16: – The prohibitions and restrictions of water wildlife use in some water bodies for some periods can be established in order to save and reproduce the water fauna. – Water intake from the fishery water bodies for industrial needs is permitted only if special facilities for prevention of fish fall into the water intake plant are established with approval by the fish protection agencies. – Enterprises must plan and perform the fish saving projects during the engineering, designing and commissioning of new facilities, reconstruction and extension of existent facilities on the fishery water bodies, as well as during the various operations in these water bides and coastal zones. The following is prohibited according to the Item 14: – Discharge the untreated industrial and domestic sewage water, as well as processing, domestic and other waste to the fishery water bodies, coasts or ice of these bodies; – Provide banking and recovery of destroyed banks at the fish spawning areas without the agreement of fish protection agencies; – Make blockages and continuous barriers in the rivers, channels; – Dispose the ground accumulated due to the dredging and bottom-cleaning operations in the fish spawning and wintering areas. **Industrial activity control** Fish protection agency directors, assistant directors, state fish protection inspectors have the right to do the following (Item 17): – Freely visit the enterprises, hydraulic structures and other organizations and facilities at fishery water bodies in order to inspect the compliance to the fishery rules, specified by this Regulation and other standards; give the instructions to be fulfilled on the liquidation of violations. – Fish protection agency directors and their assistants has the right to stop the operations with systematical violation of the regulations, standards and other requirements to the fish and other water wildlife protection, habitation and migration routes until the violation is eliminated. – The facilities with special operation mode are visited according to the specified procedure.
Decree of the President of the Republic of Kazakhstan "About Land" from January 27, 1996	In this Decree the industrial land, transportation, communications and other non-agricultural topics are referred to under a special category.

6 DESCRIPTION OF THE ENVIRONMENT

6.1 CLIMATE

6.1.1 Air Temperature and Humidity

Climate is sharply continental with high winds, large fluctuations of weather conditions within the year, moderately cold winter and very hot summer.

Annual dynamic of air temperature is shown in Tab. 6.1. 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).

Tab. 6.1 Air temperatures in Fort-Shevchenko according to the months, 2004 (°C)

Month	Average	Minimum daily average *	Maximum daily average *	Absolute minimum	Absolute maximum
January	2,4	0,4	5,0	-4,3	10,7
February	3,7	1,4	6,8	-5,3	14,3
March	7,0	4,6	10,2	-0,4	21,4
April	11,6	8,8	15,0	0,7	22,4
May	18,7	16,2	22,2	11,4	32,9
June	23,6	21,0	27,2	15,4	36,9
July	25,3	23,2	27,9	20,3	35,5
August	27,3	24,8	31,0	21,9	39,3
September	21,4	18,8	24,5	14,3	31,2
October	13,9	11,4	16,8	5,4	29,2
November	8,8	6,5	11,6	0,4	17,0
December	2,4	0,4	5,0	-4,9	12,1

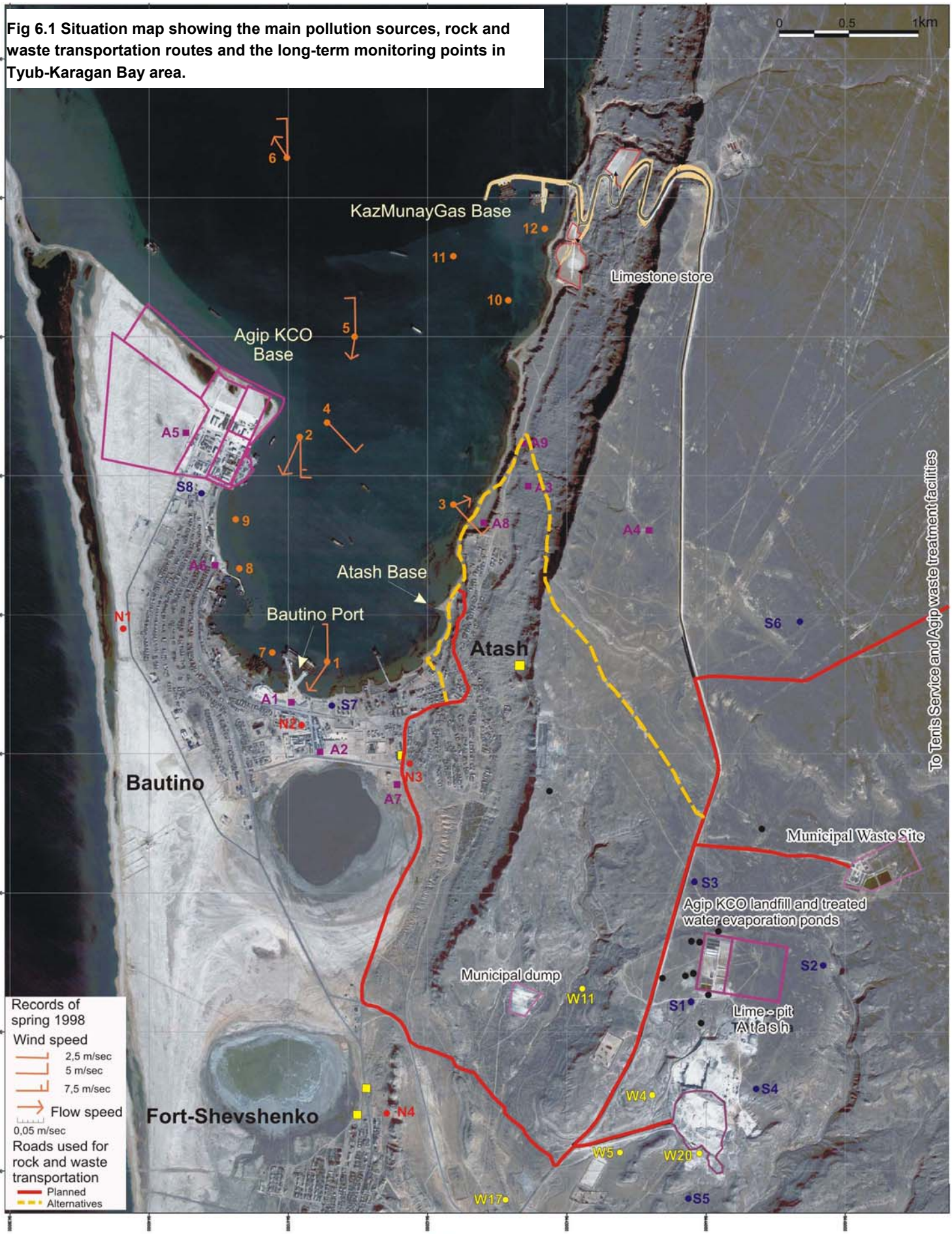
*average of 8 observations in 3 hour intervals

Relative air humidity depends on the temperature regime of the air and moisture delivery. The winter humidity is up to 75-80%. Short-lived rare thaws take place in winter; fogs take place in March-April (5-6 days per month) (Tab. 6.2).

Tab. 6.2 Temperature seasonal variation

Season	Day temperature °C	Night temperature °C
Winter	-8 , -15	- 25
Spring	-5 , +5 (at the beginning of the season) +10 , +20 (at the end of the season)	-10 , -15 (at the beginning of the season) -2 , +10 (at the end of the season)
Summer	+25 , +30	+15 , +25
Autumn	+15 , +20 (at the beginning of the season) +2 , -5 (at the end of the season)	+5 , +10 (at the beginning of the season) -5 , -10 (at the end of the season)

Fig 6.1 Situation map showing the main pollution sources, rock and waste transportation routes and the long-term monitoring points in Tyub-Karagan Bay area.



6.1.2 Precipitation

By the conditions of precipitation the area is referred to as an arid region. 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. Average annual amount of precipitations is 168mm. 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. (**Fig 6.1**)

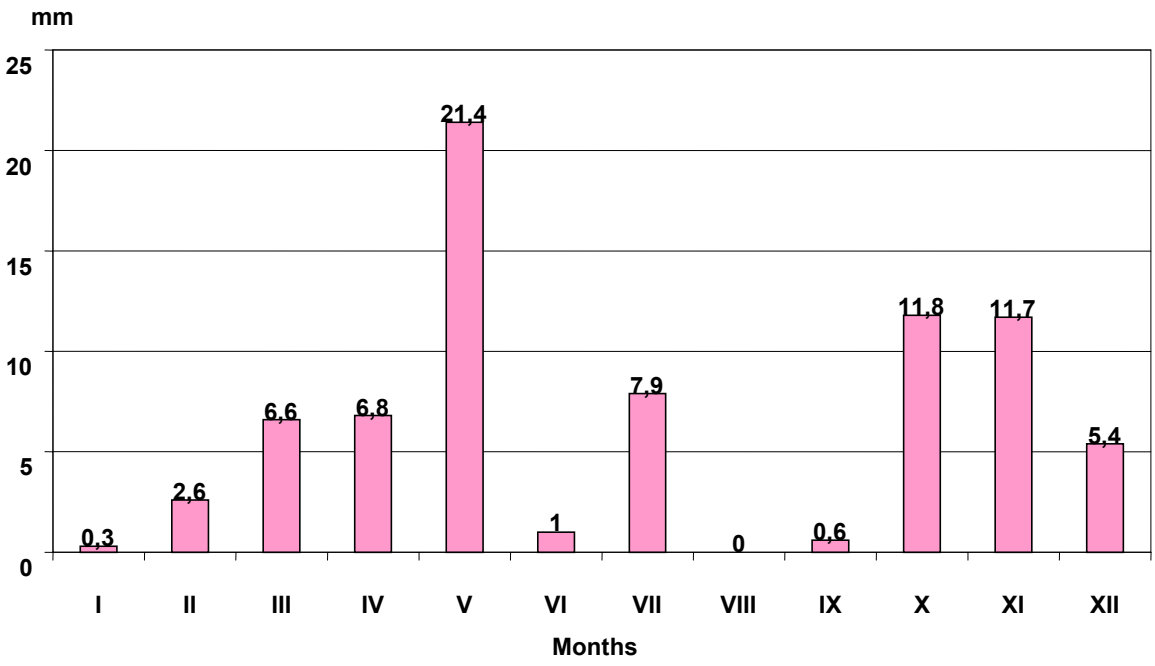


Fig 6.1 Average monthly precipitation for 30 years period (1976-2005). Data from Bautino meteorological station.

The 30 year records of peaks (above 18mm) in daily precipitation show that although the events' frequency correlates with the average monthly precipitation (i.e. most of them occur in May and November), the events with the highest volume of precipitation are fairly random. The events' distribution through the years show that they are "lumped" in 6 years with 3-5 years breaks in between Wind Regime

Tab. 6.3 Peaks (above 18mm) in daily precipitation (in mm) for 30 years period (1976-2005). Data from Bautino meteorological station.

Year	Date	Month	Precipitation
1976	28	5	27.1
1976	27	11	19.7
1979	26	4	32.9
1981	9	2	19.0
1981	2	5	56.2
1981	6	11	23.2
1981	30	11	23.2
1982	5	5	22.3
1983	6	5	20.0
1983	20	7	18.7
1985	22	3	18.0

Year	Date	Month	Precipitation
1988	1	5	35.1
1988	31	8	36.2
1990	21	5	18.8
1990	12	7	26.8
1995	23	9	20.5
1997	10	4	55.2
1997	3	6	38.1
1997	3	7	38.1
1998	27	6	22.0
1999	15	9	27.5

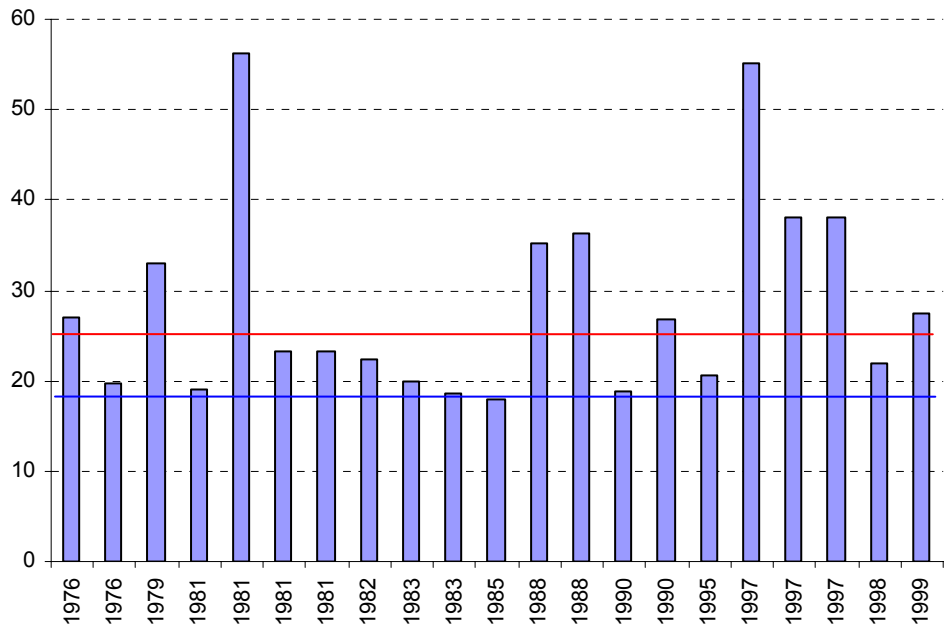


Fig 6.2 Peaks in daily precipitation (in mm) for 30 years period (1976-2005). Read line shows precipitation level that can be captured by the projected runoff holding tanks (2000m3) if they are empty and blue line if they are 1/3 full. (Data from Bautino meteorological station).

6.1.3 Wind

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 in 1-2% of the time.

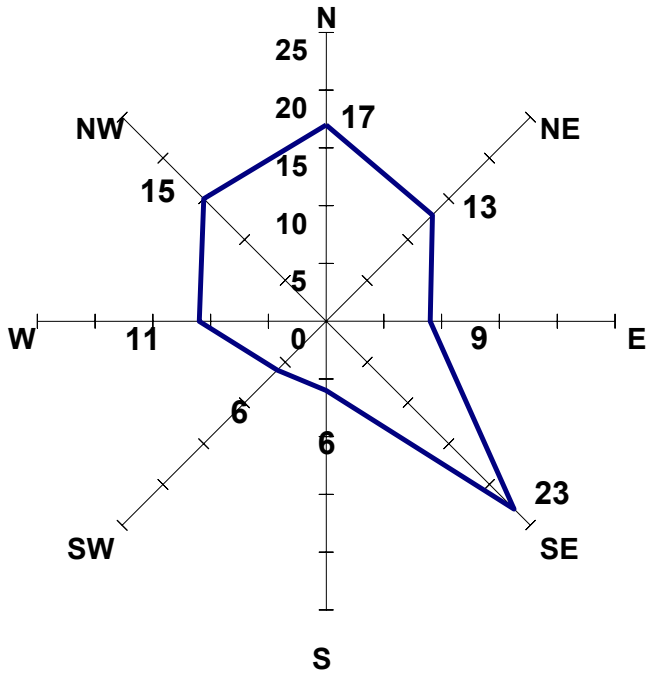


Fig 6.3 Recurrence interval (%) of wind directions in eight bearings, 2004.

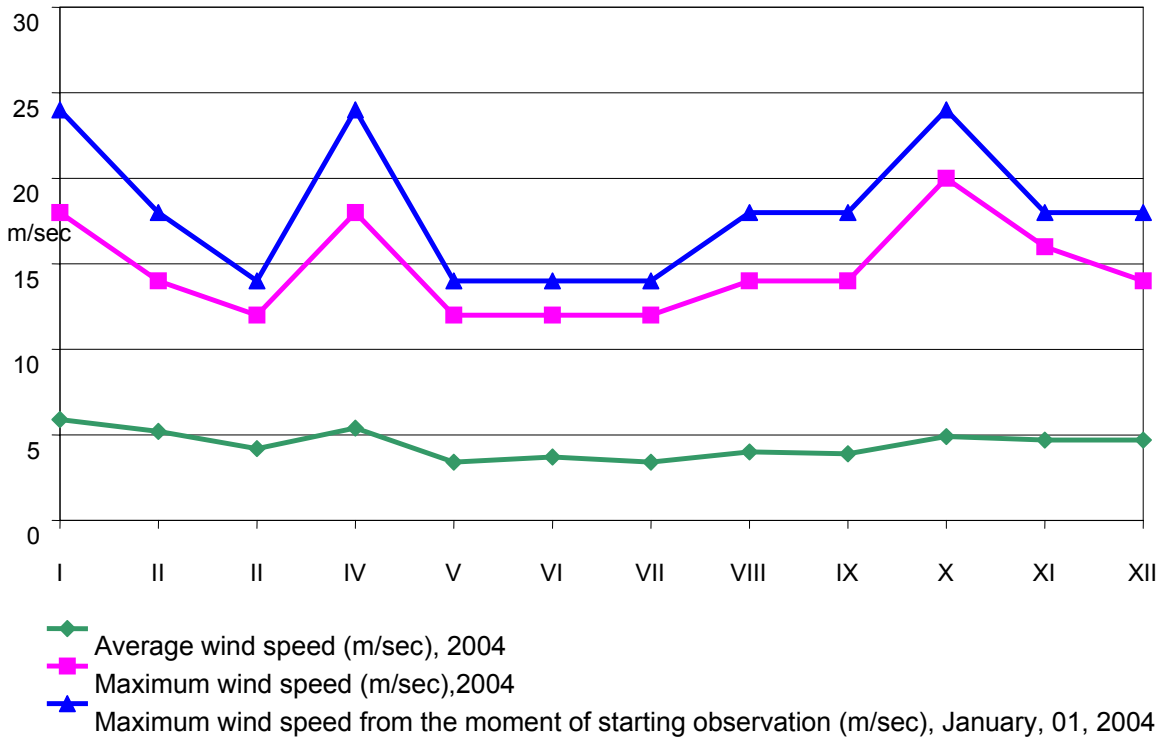


Fig 6.4 Recurrence interval (m/sec) of wind speed according to months, 2004.

6.1.4 Ice Situation

The most of the North Caspian freezes up every year. The first ice occurs in the north-east in the middle of November, after that it appears in the north to about 3m depth where a 1.5m icepack forms. This ice pack can reach 6m height at places where the wind blew the ice on an obstacle. In December ice formation covers deeper waters. The period between first ice and formation of stable cover can vary from one week to two months (average 3 weeks)

The thickest ice is in the north-east at the end of December- beginning of November, in the west it is at the end January- beginning of February, at Kulaly Island and in the Tyub-Karagan Bay it forms at the beginning of February.

Water salinity also affects ice formation. Being on average 12-13% the salt level in the Middle Caspian Sea depends on the water and wind transport of salt from land.

6.2 VEGETATION

6.2.1 Onshore vegetation

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 spread species are the species which historically have adaptive capacity appropriate to the habitat.

Xerohalophytes are dominating species and referred to the life-forms of dwarf semi-shrubs, suffrutex, dwarf shrubs, herbaceous perennial and monocyclic plants with short (ephemera and ephemerals) and long vegetation periods. The most numerous families are the following: Chenopodiacea, Asteraceae, Poaceae, Cruciferae and Limoniaceae. Landscape role is played by the species of Artemisia, Anabasis, and Halocnemum.

Changes in composition and structure of communities can be detected through the connection with soils that occupy specified relief points.

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.

ent (April 2005)

2005)

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.

There are sparse groups of wild-growing species on the sands and silt, among hard rock fragments. The following species predominate: Tournefortia sibirica, Atriplex tatarica and Lepidium perfoliatum. These species have no resource significance, but play the soil protective role under the current conditions. Dwarf semi-shrubs (Convolvulus fruticosus, Nanophyton erinaceum) that are not eaten by animals and perennial plants (Echinops ritro, Vexibia alopecuroides) can be detected sometimes among rocks, on slopes.

Ravine and coastal chink slopes are deposited by silt and limestone, in upper part they are cuspate, in the middle part – steep (30-40°), covered by stones, rocks and dissected by small ravines. Vegetation is mainly in cracks and fine-grained soils and represented by shrubs (Caragana grandiflora, Atraphaxis replicata, Astragalus turcomanicus, Convolvulus fruticosus), perennial grasses (Echinops ritro, Falcata vulgaris, Haplophyllum obtusifolium, Silene cyri, Zygophyllum turcomanicum) and ephemerals (Allium albanum, Poa bulbosa, Catabrosella hymilis). Such communities are widespread at steep eroded slopes (chinks) hanging to the sea.

Endemic species can be detected on the slopes of ravines and cavities: Crataegus ambiqua, Rubia cretacea, Artemisia gugranica, Astragalus ustiurtensis, Stipa pseudocapillata, Euphorbia sclerocy. Probability of such species occurrence is very low, as this area has been economically used for many years and vegetation is changed greatly.

Nanophyton erinaceum, Anabasis brachiata communities are spread on outcrops of Jurassic and Cretaceous sandstones with participation of Salsola laricipholia. Nanophyton erinaceum, Anabasis salsa and N. erinaceum, Artemisia terrae-albae predominate on the slopes of rudaceous rank soil. In spring period these communities include ephemera and ephemerals (Poa bulbosa, Eremopyrum triticeum, Lepidium perfoliatum). Communities have the low projective cover degree - 10-20%.

Relief depressions are covered mainly with perennial alkali grass communities with predomination of dwarf semi-shrubs (Nanophyton erinaceum, Anabasis salsa, A.eriopoda, A.aphylla). Perennial alkali grass and Artemisia communities form the complex structure in the relief depressions. The structure usually includes ephemeral herbs (Poa bulbosa, Catabrosella humilis) and herbaceous plants (Medicago coerulea, Arenaria serphyllifolia, Chorispora tenella, Lycopsis orientalis and other). Alkali soil areas are covered by halophytic shrub communities (Tamarix hispida, T.gracilis, Kalidium caspicum). There are communities of monocyclic succulent alkali grass (Suaeda corniculata, S.acuminata, Salicornia europaea) along the coast in alkali depressions with shallow ground waters.

Flat areas of slope topes are covered by dwarf semi-shrub communities (Nanophyton erinaceum, Anabasis salsa). Desert communities prevail in plateau plains with domination of 3 Artemisia species (Artemisia lerchiana, A.terrae-albae, Artemisia gurganica). Gramineous plants are typical for sandy clay rank soils: Agropyron desertorum and Stipa caspia. There is abundance of ephemera in early spring in Artemisia communities (Eremopyrum orientale, Poa bulbosa,

Catabrozella humilis, Lepidium perfoliatum, Descurainia sophia, Strigosella intermedia, Allisum turcestanicum). Small hillocky micro-relief formed due to the activity of rodents (launce) is typical for the areas covered by Artemisia. Sub-dominants in Artemisia communities on salted variations of zonal soils are Salsola orientalis, Anabasis aphylla.

The most elevated, well drained parts of the plains with brown soils of various salinity degrees and drifted Aeolian coat are occupied with sparse ephemeral communities (Eremopyrum triticeum, Lepidium perfoliatum, Descurainia sophia, Strigosella intermedia), which are secondary and formed by suffrutescent of zonal Artemisia communities, suffered by high man-made impact.

There are outcrops of spring water in northwest part of peninsula, in Tamshily tract; these springs infiltrate from the slopes of ravines and chinks. Meadow communities with predomination of reed (Phragmites australis), cynodon (Cynodon dactylon), mesophytic forbs motley grasses (Epilobium minutifolium, Potentilla anserine, Scutellaria galericulata) and arboreous-shrub vegetation (Salix alba, Morus alba, Tamarix ramosissima, Kalidium capsicum) are formed here under the conditions of additional watering.

6.2.2 Marine vegetation

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 small single shoot (15cm) 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, bulk of the dead weeds is imported from the shore areas at the open sea.

Halohydrophyte Zostera marina (Vzmornik malyy) is a perennial plant [19]. Because it is rich in protein and low in cellulose, it is consumed by fish and birds. Domestic animals do not eat it [20]. It uses water for pollination and flowers and releases seeds into water in June-August. Vegetative proliferation also occurs. Uprooted plants can migrate considerable distances and set their branched roots on a new ground [21] [22]. 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 organics reach grounds.

[19] Illustrated Plant Determination Book of Kazakhstan. Vol 1, Almaty, 1969, 644p.

[20] “Forage plants of meadows and pastures of USSR” Vol. 1, Moscow-Leningrad, 1950, 688p.

[21] “Flora of the USSR”, Vol.1, Leningrad, 1934, 302p.

[22] Bykov B. A. “Dominant plants of the Soviet Union vegetation”, Vol. 2, Almaty, 1962, 436p.

Its height, normally being 20-70cm (sometime reaching 1m), was only 15cm at the Base site. The reason for this plant's 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 combination of natural factors created a local anomaly that is unsuitable for the plant.

6.2.3 Phytoplankton

Composition, distribution and biomass of phytoplankton in Tyub-Karagan Bay depend on the season, depth and fluctuation of water transparency, temperature and salinity. In the Bay transparency, temperature and salinity fluctuates considerably. Within one season these characteristics change mainly as a result of storms and sea surges. Depth varies from 0 to 12m. As the depth increases bellow 3-5m, the biomass decreases in 2-3 times. Green and blue-green algae become more diverse but diatom algae dominate in biomass. Phytoplankton practically does not exist at depth bellow 7m.

However, greatest changes occur with changes in seasons. Biomass is average in spring (25% of total for the year) is greatest in summer and autumn (65%) and lowest in inter (10%).

Over 70 species of algae can be found in spring plankton with the most numerous species being diatoms (52) and green algae. Blue-green and pyrophytic algae diversity is not great. Maximum concentration of phytoplankton in spring is at the depth of 3-5m reaching on average 304.7mln cells/m^3 and biomass 218.5mg/m^3.

In summer the core of biomass is created by diatom Rhizosolenia fragilissima with Cyclotella meneghiniana, Diatoma elongatum, Synedra acus and helping her along. Caspian endemics Hyalodiscus sphaerophorus, Chaetoceros subtilis var.subtilis and Rhizosolenia capsicum proliferate in early summer but replaced by Actinociclus ehrenbergii and Aphanizomenon flos-aquae in late summer.

In autumn productivity is still high and can reach 3 290mln.cell/m^3 and 2.6-8.1 g/m^3. The highest productivity is at 7-9m depth. The diatoms (mainly Thalassiosira incerta), green alga Binuclearia lauterbornii and sometime peridineans become dominant for the expense of the warmth loving blue-green algae. Endemics of Thalassiosira family are also typical (Th.variabilis, Th.caspica).

As the water becomes colder in winter, diversity falls and diatoms Rhizosolenia calcar-avis and Cyclotella meneghiniana become dominant. Average biomass in pelagic zone falls to 0.9 g/m^3.

6.3 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 on 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 met here.

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

In spite of their relative abundance in the coastal habitats, commercial species of birds and mammals are little used by local inhabitants. Organized commercial hunting for trade mammals is not developed in the Tuyb-Karagan Peninsula; marine mammals (Caspian seal) are obtained in the north part of the Caspian Sea within Atyrau Region.

In spite of that chemical indices of some parameters are higher than background levels for other marine areas of Northeastern Caspian, biological communities of Tupkaragan bay do not indicate the excessive stress. Some hydrocarbon contamination of marine bottom deposition presents in the area of old harbor in Bautino, and this can provide the impact upon the structure of macro-benthos communities in this area. Nevertheless, significant change of environmental contamination was not detected over the last years.

The seal is the only mammal that inhabits the Caspian Sea. His basic living cycle takes place in the South and Middle Caspi. At the end of October mature seals go along the east coast to the North Caspi, where on the ice they have calving, reproduction and molt. In March remigration of seals starts. Cases of considerable amount of seals at the Tyub-Karagan Bay have not been registered. Land mammals do not use the studied area either.

6.3.1 Birds

The bird fauna of the studied region is more diverse in comparison with other groups of terraneous vertebrates and represented by 230 species (47.2% of total fauna in Kazakhstan). This bird fauna can be divided into three groups by the nature of residence: nesting – 73 species, non-migratory birds and wintering birds – by 6 species, and birds that encounters only during migration – 145 species[23]. There are rare and endangered species, listed in the Red Book of Kazakhstan, among the birds of Tyub-Karagan peninsula - 23 species (Tab. 6.4).

[23] Karelin G.S. Travel of G.S. Karelin in the Caspian Sea // Notes of the Russian Geographical Society on general geography. Vol. 6. St. Petersburg, 1883. 479 p.; Bostanzhoglo V.N. Ornithological fauna of the Aral-Caspian steppe // Materials for learning fauna and flora of the Russian empire. Dept. of Zool. No. 11. M., 1911. 410p.; Birds of Kazakhstan. In 5 vol. Alma-Ata, 1960-1974 (5 volumes); Gistsov A.P. Bio-diversity of the birds in reserve zone of Northern Caspian // Natural reserve of Kazakhstan. Almaty, 1997. 33-36p.

Tab. 6.4 Species composition and population of birds on Tyub-Karagan peninsula

Species name	Nest	Migrate	Winter
Aythya farina		IV,X-XI	
Aythya fuligula		IV,X-XI	
Aythya marila		IV,X-XI	
Clangula hyemalis		IV,X	
Bucephala clangula		IV,X	
Melanitta fusca		IV,X-XI	
Mergus albellus		IV,X	
Mergus serrator		IV,X-XI	
Mergus merganser		IV,X-XI	
Falconiformes family			
Pandion haliaetus		IV,IX-X	
Pernis apivorus		IV,IX	
Milvus migrans		IV,IX	
Circus cyaneus		IV,IX	
Circus macrourus		IV,IX	
Circus pygargus		IV,IX	
Circus aeruginosus	III-VII		
Accipiter gentilis		III-IV,X	
Accipiter nisus		IV,IX-X	
Buteo lagopus		IV,X	XI-III
Buteo rifunus	IV-VII		
Buteo buteo		IV,IX-X	
Circaetus gallicus		IV,IX	
Aquila rapax	IV-VII		
Aquila heliaca	IV-VIII		
Aquila chrysaetos		III,X-XI	
Haliaeetus albicilla		III,X	XI-III
Falco cherrug	IV-VIII	IV,X	
Falco subbuteo		IV,IX	
Falco columbarius		IV,IX	
Falco naumanni		IV,IX-X	
Falco tinnunculus		IV,IX-X	
Galliformes family			
Coturnix coturnix		IV,IX	
Gruiformes family			
Grus grus		IV,IX-X	
Anthropoides virgo		IV,IX	
Rallus aquaticus		IV,IX	
Porzana porzana		IV,IX	
Crex crex		IV,IX	
Gallinula chloropus	IV-VII		
Fulica atra	V-VII		
Otis tarda		IV,IX	
Chlamydotis undulata	IV-VII		
Charadriiformes family			
Burhinus oedicnemus	IV-VII		
Pluvialis squatarola		IV-IX	
Charadrius hiaticula		IV,IX	
Charadrius dubius	IV-VII		
Charadrius alexandrinus	IV-VII		
Charadrius asiaticus	IV-VII		
Eudromias morinellus		IV,IX	
Chettusia gregaria		IV,IX	
Vanellus vanellus		IV,IX-X	
Vanellochettusia leucura		IV,IX	
Arenaria interpres		IV,IX-X	
Himantopus himantopus	IV-VII		
Recurvirostra avosetta	IV-VII		
Haematopus astralegus	IV-VII		
Tringa ochropus		IV,IX-X	
Tringa glareola		IV,IX	
Tringa nebularia		IV,IX	
Tringa tetanus		IV,IX-X	
Tringa erythropus		IV,IX	

Species name	Nest	Migrate	Winter
Tringa stagnatilis		IV,IX	
Tringa hypoleucos		IV,IX	
Xenus cinereus		IV,IX	
Phalaropus fulicarius		IV,IX	
Phalaropus lobatus		IV,IX	
Phylomachus pugnax		IV,IX-X	
Calidris minuta		IV,IX	
Calidris temminckii		IV,IX	
Calidris ferruginea		IV,IX	
Calidris alpine		IV,IX-X	
Calidris alba		IV,IX-X	
Limicola falcinellus		IV,IX	
Limnocryptes minimus		IV,IX	
Gallinago gallinago		IV,IX-X	
Gallinago media		IV,IX-X	
Scolopax rusticola		IV,IX-X	
Stercorarius Parasiticus		IV,X	
Numenius tenuirostris		IV,IX	
Numenius arquata		IV,IX-X	
Limosa limosa		IV,IX-X	
Limosa lapponica		IV,IX	
Glareola nordmanni		IV,IX	
Stercorarius pomarinus		IX-X	
Larus ichthyaetus	IV-X		
Larus minutus		IV,IX-X	
Larus ridibundus	IV-X		
Larus genei		IV,X	
Larus argentatus	IV-X		
Larus canus		IV,IX-X	
Chlidonias niger	IV-IX		
Chlidonias leucopterus	IV-IX		
Chlidonias hybrida	IV-IX		
Gelochelidon nilotica	IV-X		
Hydroprogne caspia		IV,VIII-IX	
Sterna hirundo	IV-VII		
Sterna albifrons	IV-VII		
Columbiformes family			
Pterooles orientalis	IV-VII	IV,IX	
Syrrhaptes paradoxus	IV-VII		
Columba livia	I-XII		
Streptopelia turtur		IV,IX	
Cuculiformes family			
Cuculus canorus	IV-VII		
Strigiformes family			
Bubo bubo	I-XII		
Asio otus		IV,IX-X	
Asio flammea		IV,IX-X	
Athene noctua	I-XII		XI-III
Caprimulgiformes family			
Caprimulgus europaeus		IV,VIII-IX	
Apodiformes family			
Apus apus		IV,IX-X	
Coraciiformes family			
Coracias garrulus	IV-VIII		
Alcedo atthis		IV, X	
Merops apiaster	IV-VII		
Merops superciliosus	IV-VII		
Upupa epops	IV-VII		
Passeriformes family			
Riparia riparia	IV-VII		
Hirundo rustica	IV-VII		
Delichon urbica		IV,IX	
Galeriida cristata	I-XII		
Calandrella cinerea	IV-VII		

Species name	Nest	Migrate	Winter
Calandrella rufescens		IV,X	
Melanocoripha calandra	IV-VII		
M.bimaculata	IV-VII		
M.leucoptera		III,X-XI	
Eremophila alpestris	I-XII		
Alauda arvensis		IV,IX-X	
Anthus trivialis		IV,IX	
Anthus pratensis		IV,IX	
Anthus cervinus		IV,IX	
Motacilla flava	IV-VII		
Motacilla lutea		IV,IX	
Motacilla citreola		IV,IX	
Motacilla feldegg	IV-VII		
Motacilla alba		IV,IX-X	
Lanius collurio		IV,IX	
Lanius minor		IV,IX	
Lanius exubitor	IV-VII		
Oriolus oriolus		IV,IX	
Sturnus vulgarus		IV,IX-X	
Pastor roseus		IV,IX	
Corvus monedula		III,X	
Cornus frugilegus		III,X	
Cornus cornis			
Bombycilla garrulus		III,X	XI-III
Cettia cetti	IV-VII		
Locustella fluviatilis		IV,IX	
Locustella naevia		IV,IX	
Acrocephalus agricola	IV-VII		
A. dumetorum		IV,IX	
A. palustris		IV,IX	
A.scirpaceus	IV-VII		
A.arundineceus	IV-VII		
Hippolais caligata	IV-VII		
Sylvia nisoria		IV,IX	
Sylvia atricapilla		IV,IX	
Sylvia borin		IV,IX	
Sylvia communis		IV,IX	
Sylvia curruca	IV-VII		
Sylvia nana	IV-VII		
Phylloscopus trochilus		IV,IX	
P.collybita		IV,IX-X	
P.sibilatrix		IV,IX	
P.trochiloides		IV,IX	
Ficedula hypoleuca		IV,IX	
Ficedula parva		IV,IX	
Muscicapa striata		IV,IX	
Saxicola rubetra		IV,IX	
Saxicola torquata		IV,IX	
Oenanthe oenanthe		IV,IX	
Oenanthe pleschanka		IV,IX-X	
Oenanthe deserti	IV-VII		
-Oenanthe isabellina	IV-VII		
Monticola saxatilis		IV,X	
Phoenicorus phoenicorus		IV,IX	
Erithacus rubecula		IV,X	
Luscinia luscinia		IV,IX	
Luscinia svecica		IV,IX-X	
Turdus pilaris		III,X	
Turdus merula		IV,X	
Turdus iliacus		IV,X	
Turdus philomelos		IV,X	
Turdus viscivorus		IV,X-XI	
Regulus regulus		IV,IX	
Remiz pendulinus		IV,IX	

Species name	Nest	Migrate	Winter
Passer domesticus	I-XII		
Passer montanus	I-XII		
Petronia petronia		IV,X	
Fringilla coelebs		IV,X	XI-III
Fringilla montifringilla		IV,X	XI-III
Chloris chloris		IV,X	
Spinus spinus		IV,X	XI-III
Carduelis carduelis		IV,X	XI-III
Acanthis cannabina		IV,X	
Acanthis flavirostris		IV,X	
Pyrrhula pyrrhula		IV,X	XI-III
Coccothraustes coccothraustes		IV,X	
Carpodacus erythinus		IV,IX	
Emberiza citronella		IV,X	
Emberiza schoeniclus	I-XII		I-XII
Emberiza rustica		IV,IX-X	
Emberiza bruniceps	V-VII		
Emberiza hortulana		IV,IX	

Species of birds, listed in the Red Book of Kazakhstan are shown in bold, I-XII – months of residence

Tab. 6.5 Species composition and population of birds on Tyub-Karagan peninsula in April, 1997

Species	Coast	Flooded areas	Deserts
Phalacrocorax carbo	59	-	-
Egretta alba	32	-	-
Egretta garzetta*	3	-	-
Ardea cinerea	23	-	-
Phoenicopterus roseus*	510	-	-
Anser anser	14	-	-
Cygnus olor	48	-	-
Tadorna tadorna	551	14	-
Anas platyrhynchos	115	-	-
Anas crecca	2404	-	-
Anas strepera	2	-	-
Anas acuta	56	-	-
Anas querquedula	615	30	-
Netta rufina	22	-	-
Aythya ferina	20	-	-
Aythya fuligula	150	-	-
Mergus merganser	2	-	-
Buteo rifunus	-	5	-
Aquila rapax*	-	1	4
Falco naumanni	-	-	7
Coturnix coturnix	-	3	-
Porzana porzana	-	1	-
Fulica atra	980	-	-
Charadrius alexandrinus	12	16	-
Vanellus vanellus	30	2	-
Himantopus himantopus	73	5	-
Haematopus astralegus	1	5	-
Tringa ochropus	16	13	-
Tringa tetanus	6	4	-
Tringa erythropus	38	50	-
Phalaropus lobatus	1	1	-
Phylomachus pugnax	90	62	-

Species	Coast	Flooded areas	Deserts
Calidris alpine	300	50	-
Gallinago gallinago	99	2	-
Numenius arquata	10	7	3
Limosa limosa	39	27	-
Circus aeruginosus	1	1	-
Larus ichthyaetus*	15	-	-
Larus ridibundus	11647	112	-
Larus argentatus	452	6	-
Gelochelidon nilotica	2	-	-
Sterna hirundo	144	27	-
Bubo bubo*	-	1	-
Apus apus	-	2	-
Upupa epops	-	1	2
Riparia riparia	-	24	-
Hirundo rustica	-	2	38
Galeriida cristata	-	2	-
Calandrella cinerea	-	104	92
Melanoco-ripha bimaculata	-	2	-
Motacilla flava	10	208	-
Motacilla alba	-	12	-
Lanius exubitor	-	7	2
Cornus frugilegus	-	2	-
Cettia cetti	1	-	-
Locustella luscinicides	-	1	-
–Hippolais caligata	-	2	1
Sylvia curruca	-	2	1
Sylvia nana	-	1	-
Phylloscopus collybita	-	2	-
Oenanthe deserti	-	-	2
Oenanthe isabellina	-	-	9
Phoenicorus phoenicorus	-	3	3
Luscinia svecica	-	6	-
Emberiza schoeniclus	-	2	-
Total birds:	**18593**	**830**	**164**
Number of species:	39	43	12
Population – birds/km^2	185.9	8.3	1.6

Tab. 6.6 Composition and population of birds on Tyub-Karagan peninsula coast in 1996

Species	Months		
	VIII	IX	X
Podiceps nigricollis	-	2	-
Podiceps griseigena	-	4	-
Podiceps cristatus	178	193	27
Phalacrocorax carbo	2144	421	111
Botaurus stellaris	2	-	-
Ixobrychus minutus	1	-	-
Nycticorax nycticorax	3	-	-
Egretta alba	17	72	205
Egretta garzetta*	-	5	30
Ardea cinerea	39	68	79
Ardea purpurea	1	2	1
Platalea leucorodia*	1	-	-
Plegadis falcinellus*	17	-	-
Anser anser	-	-	15
Cygnus olor	1	27	11
Tadorna tadorna	6	-	-
Anas Platyrhynchos	-	27	1474
Anas crecca	763	10	2535
Anas strepera	32	20	407
Anas Penelope	-	8	-
Anas querquedula	4	-	25
Anas acuta	12	12	322
Anas clypeata	4	-	-
Anas sp.	-	209	-
Netta rufina	345	53	590
Aythya ferina	-	577	16
Aythya fuligula	-	90	13
Bucephala clangula	-	4	-
Mergus merganser	8	-	4
Aythya sp.	-	2939	-
Pandion haliaetus*	1	2	1
Haliaeetus albicilla*	-	1	-
Circus aeruginosus	7	19	3
Circus sp.	2	3	-
Accipiter nisus	-	2	-
Falco subbuteo	1	-	-
Falco tinnunculus	-	18	-
Rallus aquaticus	-	1	-
Gallinula chloropus	-	1	-
Fulica atra	220	2494	3806
Charadrius dubius	6	2	-
Charadrius alexandrinus	4	-	-
Vanellus vanellus	2	16	-
Tringa hypoleucos	1	-	-
Tringa ochropus	4	-	-
Tringa tetanus	4	4	-
Phylomachus pugnax	15	6	-
Calidris minuta	4	-	-
Calidris alpine	20	-	-
Gallinago gallinago	12	3	-
Numenius arquata	2	-	-
Limosa limosa	10	-	-
Glareola pratincola	5	-	-
Stercorarius parasiticus	2	-	-
Larus ichthyaetus*	96	1	4
Larus ridibundus	10	34	2100
Larus genei	6	5	-
Larus cachinnans	349	159	670
Larus canus	2	3	-
Gelochelidon nilotica	29	8	-
Hydroprogne caspia	-	27	-
Chlidonias niger	10	-	-
Chlidonias hybrida	32	-	-
Sterna hirundo	72	1	34
Sterna albifrons	20	-	-
Cuculus canorus	1	-	-
Caprimulgus europaeneus	2	-	-
Alcedo atthis	1	-	-
Merops apiaster	87	-	-
Merops superciliosus	8	4	6
Upupa epops	2	-	-
Apus apus	10	-	-
Riparia riparia	296	-	-
Hirundo rustica	12	64	-
Motacilla flava	180	1	-
Motacilla alba	1	14	-
Sturnus vulgarus	-	1000	-
Lanius exubitor	1	-	-
Cornus frugilegus	-	1	-
Cornus cornis	-	1	-
P.collybita	1	6	-

Species	Months		
	VIII	IX	X
Ficedula parva	-	1	-
Saxicola torquata	-	1	-
Oenanthe isabellina	-	1	-
Phoenicorus phoenicorus	-	6	--
Luscinia svecica	-	5	9
Turdus philomelos	-	12	7
Turdus pilaris	-	-	4
Acrocephalus arundinaceus	12	-	-
Passer montanus	-	4	25
Fringilla coelebs	-	123	89
Fringilla montifringilla	-	-	17
Emberiza schoeniclus	1	1	-
Total birds:	**5099**	**8798**	**12641**
Total species:	**63**	**58**	**32**

Tab. 6.7 Composition and population of birds on northeastern coast of Caspian Sea according to the data of aerial census in spring of 2002-2003

Species	Seal islands		Tyub-Karagan – Mertvyi Kultuk	
	02	03	02	02
Podiceps cristatus	-	-	1	-
Pelecanus onocrotalus*	-	-	-	-
P. crispus*	-	-	-	8
Phalacrocorax carbo	19	21	50	176
Egretta alba	24	29	-	-
Egretta garzetta*	-	-	-	-
Ardea cinerea	3	4		2
Ardea purpurea	2	2	-	-
Phoenicopterus roseus*	2	-	20619	2452
Anser anser	-	-	10	25
Cygnus olor	20	112	135	47
Cygnus cygnus*	4	16	3	-
T. ferruginea	-	-	22	16
Tadorna tadorna	2		2282	22
Anas platyrhinchos	2	12	-	145
Anas strepera	2	-	-	-
A. crecca/querquedula	1550	830	910	4000
Anas clypeata	-	-	-	-
Netta rufina	266	210	20	750
Aythya ferina	95	350		540
A. fuligula	50	120	860	1800
Bucephala clangula	-	-	-	20
Mergus albellus	6	26	6	-
Mergus merganser	-	-	-	-
Fulica atra	6500	7630	2800	1800
Circus aeruginosus	1	-	-	-
Aquila rapax*	-	-	-	1
H. albicilla*	-	2	1	4
Limosa limosa	-	-	-	-
Ph. Pugnax	-	-	70	830
Larus ichtyaetus*	-	-	2	-
L. ridibundus	1800	150	3042	3070
Larus genei	-	-	290	800
L.cachinnans	358	90	1278	165
Sterna hirundo	-	-	720	-
Species	Seal islands		Tyub-Karagan – Mertvyi Kultuk	
	02	03	02	02
Total birds	**10706**	9822	33625	16693
Number of stations	**10**	10	20	20
Birds per km^2	1070	982	1681	834

Coastal habitats of birds were used as migration and short-term stay of birds during migration until recently (before sea level increase), and only formed bushes of emergent vegetation (especially in Mangyshlak bay) has changed the composition of summer nesting bird fauna over the last 10 years. At present time at least 40 species of marsh complex birds nest in reed bushes (Tab. 6.7). Among of them: Podiceps cristatus, Phalacrocorax carbo, Botaurus stellaris, Ixobrychus minutus, Egretta alba, Ardea cinerea, Cygnus olor, 7 species of duck (T. ferruginea, Tadorna tadorna, Anas platyrhinchos, Anas strepera, A. crecca/querquedula, Anas clypeata and Netta rufina), Circus aeruginosus Linnaeus, Gallinula chloropus, Fulica atra, 5 species of sandpiper (Charadrius dubius, Charadrius alexandrinus, Himantopus himantopus, Recurvirostra avosetta Linnaeus and Haematopus ostralegus Linnaeus), 9 species of gull and tern, 4 species of warbler and Emberiza schoeniclus.

At the same time, the population and nesting density of marsh birds within the studied region is significantly less than in pre-delta areas of the Ural and Emba rivers due to the sharp fluctuation of sea level and surges[24].

[24] Gistsov A.P., Berezovikov N.N. Contemporary state of the animal world of the Ural Delta // The animal world of the Suth Ural and North Caspian. Orenburg, 1995. P. 7-9.

Relatively small number of birds – 23 species nest in terraneous cenosis, adjacent to the Bautino bay: Aquila rapax, Aquila heliaca, Falco tinnunculus, Chlamydotis undulata, Burhinus oedicnemus, Charadrius asiaticus, Pterooles orientalis, Syrrhaptes paradoxus, Bubo bubo, Coracias garrulus, Merops apiaster, Merops superciliosus, Galeriida cristata, Calandrella cinerea, Calandrella rufescens, M.bimaculata, Eremophila alpestris, Lanius exubitor, Sylvia curruca, Sylvia nana, Oenanthe deserti, Oenanthe isabellina, Emberiza bruniceps). Hirundo rustica, Passer montanus, Passer domesticus Linnaeus, Athene noctua, Columba livia – these 5 species (stress tolerant birds) are associated with human buildings. Stress tolerant birds inhabit mainly the developed and modified areas (most part of the area has been changed by humans).

A study of terraneous vertebrate baseline in Bautino bay was implemented from 20 till 28 of July, 1998, according to generally accepted zoological methodologies (Novikov, 1953; Gavrilov, 1977 and others). Moreover, the data of the previous years was used (1996-1997 and aerial census in 2000-2004).

The population of terraneous vertebrates on the Tyub-Karagan peninsula is very low. The birds here are mainly encountered only in coastal habitats or during migration and in watering-places. Here the birds which eat plants and bushes nest on the slopes of the chink: Sylvia nana, Sylvia curruca, Emberiza bruniceps as well as some birds of prey (Buteo rifunus, Falco tinnunculus and others).

The population and density of nesting birds in the natural desert landscapes is relatively low – 9-50 birds per km^2 (in average 17 birds/km). At the same time the population of birds near the industrial and residential buildings, where there are also trees and open water sources, is higher than the population in natural desert landscapes. This is also due to the stress tolerant species.

In the period of seasonal migrations from the end of March till the middle of May and from the end of August till November the number of birds in coast habitats increases tens times (Tab. 6.4 -6.7). In spring there are numerous flamingo (Phoenicopterus roseus), shelduck (Tadorna tadorna), Anas querquedula, Fulica atra, Larus ridibundus and L. argentatus. In autumn Phalacrocorax carbo, Anas querquedula, Netta rufina, Aythya ferina, Fulica atra, Larus ridibundus, L. argentatus and Hirundo rustica migrate in large quantities).

The population of birds increases greatly during the seasonal migration in terraneous cenosis, especially along the roads that coincide to the flight way. Here it is possible to see both the inhabitants of open areas and hardy-shrub species - *Sylvidae*, *Turdidae*, *Fringillidae*, *Emberizidae*. In this period, especially in autumn (September-November), the deaths of birds on the road is very common on account of young birds.

Reserves of aquatic and marsh birds, which are the targets of amateur hunting in the coastal line of the reeds, are quite numerous – *Anas plathyrhinchos*, *A. acuta*, *Anas cressa* and *Anas querquedula*, *Nette rufina and Aythya ferina*, *Fulica atra* and *Charadridae*.

The zone of stable wintering for water fowls and near-water birds is on the coast at Aktau city and Karakol lake, where there are up to 20,000 *Cygnus olor* and up to 70,000-100,000 diving-ducks (*Aythya fuligula, A. marila, Clangula hyemalis, Bucephala clanga*) in winter. It is possible to see Phalacrocorax carbo, Aythya marila, Bucephala clangula, Podiceps ruficollis Pallas and Larus cachinnans in Bautino bay during the winter in small numbers. In mild winters the nearest wintering places were found to be in Mangyshlak bay. The following birds spend the winter in terraneous cenosis and Atash village in small numbers: *Corvus frugilegus* and *C.cornix, Passer*

domesticus and *P. montanus*, *Fringilla coelebs*, *F.montifringilla*, which is often encountered at human dwellings and domestic waste dumps.

6.3.1.1 Rare and endangered birds, listed in Red Book of Kazakhstan

Rare and endangered birds have not been detected within the Base construction area. Nevertheless, the information on such species, which are present in the Tyub-Karagan bay adjacent areas, is given below to provide an overall picture.

Pelecanus onocrotalus. It is one of the largest birds of Pelecaniformes family. This species can be detected in Tyub-Karagan peninsula only during the migration in April and August-September. The nearest nesting areas are the water bodies of Turgai cavity in Northern Pre-Aral and Emba River mouth on Caspian coast. It is listed in Red Book of Russia[25].

Pelecanus crispus. It is a large bird of the Pelecaniformes family; weight is up to 13kg. It can be detected only during migration in April and August-September. The nearest nesting areas are the water bodies of Turgai cavity and the Emba River mouth. It is listed in Red Book of IUCN and Russia.

Platalea leucorodia. This species can be found in the studied area only during migration in April and August-September. The nearest nesting areas are the northern Caspian coast and Turgai cavity lakes, where there are up to 400 pair[26].

Plegadis falcinellus. This species can be found in the studied area only during migration in April and August-September. The nearest nesting areas are the northern Caspian coast and Turgai cavity lakes. Total population in the nesting areas is 340-400 pair.

Egretta garzetta. This species can be found in the studied area only during migration. The nearest nesting areas are at the Emba River mouth and northern coast of the Caspian. Total population in Kazakhstan is 1,000 pair.

Phoenicopterus roseus. This is a rare species with decreasing population and local habitats. This species can be found in the studied area only during migration in April and August-September. The nearest nesting areas are the Mertvyi Kultuk sor, where up to 20,000 birds[27] can be found in summer period. Up to 35,000 birds migrate through the studied area along the coast.

Cygnus cygnus. This is a rare species with decreasing population. This species can be found in the studied area only during migration in March-April and October-November. The nearest wintering areas are Mangyshlak bay and Karakol lake near Aktau city, where up to 1,000 birds winter.

Pandion haliaetus. It is a rare bird and can be found only during migration in April and August-September. Total population in Western Kazakhstan is 25-30 birds.

Circaetus gallicus. This species is encountered in the region from April till September, a small number nests on the Buzachi peninsula and mountain Mangyshlak.

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[25] Red Book of RSFSR. M., 1983. 356 p.

[26] Red Book of Kazakhstan. Wildlife. Almaty- Istanbul, 1996. 327 p.

[27] A.P. Gistsov. Flamingo in North-Eastern Pre- Caspian // Selevinia, 3, 1994. p. 89-92.

Aquila rapax Temminck. This is one of the most numerous eagles in the fauna. It can be found from April till October. Density of nesting on the Tyub-Karagan peninsula can reach 0.8 birds per 10km of the route.

Aquila heliaca Savigny. This species is rare everywhere, it is encountered in the region from April till October. It nests in small numbers on the Tyub-Karagan peninsula.

Aquila chrysaetos. It is a large bird of the Falconiformes family; weight is up to 6.5kg, wing spread is up to 2m. It is encountered in the region only during migration in March and October-November. It has been used in Kazakhstan since the old days as a stalker bird for fox and saiga hunting. Traditional hunting using this bird has been regenerated over the last years.

Haliaeetus albicilla. This is one of the largest birds of our fauna; weight is up to 7kg. It is encountered during migration in March-April and September-October. It is listed in Red Book of Russia.

Falco cherug Gray. This is a falcon of moderate size with decreasing population. It is encountered in the region from April till October; a small number of this species nests in the Aktau Mountains. At present time it is in speculative demand in Middle East countries as a stalker bird.

Grus grus Linnaeus. It is a species with rapidly decreasing population. It is encountered in the region only during migration in April and August-September.

Anthropoides virgo Linnaeus. The population of this species is regenerating everywhere. It is one of the smallest sweeps of our fauna. It is encountered in the region from April till September, nests in small numbers in the landscapes adjacent to the fields. It is listed in the Red Book.

Otididae. It is a rare and endangered species. It is encountered in the region only during migration in April and August-September. It is listed in the Red Book of Russia.

Chlamydotis undulata Jacquin. This rare bird is encountered in the region from April till September. A great part of the Kazakhstan population of this species is concentrated on the Buzachi peninsula, to the north of the studied area[26] .

Chettusia gregaria Pallas. This is a medium-size sandpiper of Charadriiformes family. It is encountered in the studied area only during migration in April and August-September.

Larus ichthyaetus. This is one of the largest gulls of our fauna. It is encountered in the region from April till October. The nesting of this bird in the reeds of the Buzachi coast is possible. It's listed in the Red Book of Russia.

Pterooles orientalis. This is a bird which is larger than the domestic pigeon of the Columbiformes family. The population is decreasing everywhere. It is encountered in the region from April till October. Small numbers nest on the Tyub-Karagan peninsula.

Syrrhaptes paradoxus. Rare birds of the Columbiformes family. It is encountered in the region from April till October, nests in small numbers.

Bubo bubo. This is the largest bird of the Strigiformes family. Its mode of life is both settled and migratory. It nests in the region in small numbers.

6.3.2 Mammals

Tab. 6.8 Mammals of Tyub-Karagan peninsula

Class, species	Comparative population	Note	Class, species	Comparative population	Note
Insectivota family			***Gazella subgutturosa****	R	In the Red Book
Erinaceus auritus	T		*Saiga tatrica*	T	Commercial species
Erinaceus aethyopicus	R		*Rodentia family*		
Crocidura suaveolens	R		*Spermophilus pygmaeus*	R	
Chiroptera family			*Allactaga elater*	T	
Myotis mystacinus	R		*Allactaga major*	R	
Eptesicus serotinus	T		*Stylodipus telum*	R	Plague circulator
Vespertilio murinus	R		*Allactaga sibirica*	R	Plague circulator
Carnivora family			*Dipus sagitta*	T	
Canis lupus	T	Commercial species	*Cricetulus migratorius*	T	Plague circulator
Vulpes corsac	R.	Commercial species	*Microtus socialis*	T	Plague circulator
Vulpes vulpes	T	Commercial species	*Ellobius talpinus*	T	
Mustela nivalis	R.	Commercial species	*Meriones tamaris- cinus*	R	Plague circulator
Mustela eversmanni	T	Commercial species	*Meriones lybicus*	R	Plague circulator
Vormels peregusna*	R	In the Red Book	*Meriones meridianus*	T	Plague circulator
Pinnipedia family			*Rhombomys opimus*	T	
Phoca caspia	T	Commercial species	*Mus musculus*	T	
Lagomorpha family			*Rattus norvegicus*	R	
Lepus tolai	T	Commercial species			

Note: R – rare, T - typical

Fauna of mammals in the Tyub-Karagan peninsula and adjacent areas is relatively poor and represented by 31 species (17.4% of total composition of Kazakhstan mammals), among which 2 species (Vormels peregusna and Gazella subgutturosa) are referred to the category of rare and endangered animals and listed in the Red Book of Kazakhstan[28], [29], [26]. Quantitatively the most widespread family is Rodentia (15 species, Tab. 6.8), among of which 8 species are the transmitting agents and circulators of infections dangerous for human and domestic animals.

The group of predators is quite numerous (7 species), most of which are the targets of hunting (Canis lupus, Vulpes corsac, Vulpes vulpes, Mustela nivalis, Mustela eversmanni and other). Among this group there are numerous Canis lupus, Vulpes vulpes, Mustela eversmanni in the region and Phoca caspia – in the water area of the Caspian Sea.

Phoca caspia is the single species of seal which inhabits only the Caspian Sea. The population of this animal was about 1 million seals at the beginning of XX century, and its annual

[28] Mammals of Kazakhstan. Alma-Ata, 1969-1983.

[29] Book of genetic stock of Kazakh SSR fauna. Alma-Ata, 1989. 215 p.

production was up to 120,000 seals[30]. The production of Phoca caspia over the last years is within 60-70 thousand seals, and population varies within 360-400 thousand seals, according to expert estimation.

The seal is distributed evenly within the whole water zone of the Caspian Sea and only in late autumn and winter (November-March) forms a significant concentration in the northern part of the sea. Almost all the population of this animal is concentrated on Ural Borozdina during the reproduction and molting season (January-March)[31]. Later, in April-May, seals distribute through the whole water zone. The population of Phoca caspia near the coast of Buzachi peninsula is low and does not exceed 2-3 seals per km^2 of water route in August-October. Molting and litter areas are located beyond the studied area.

Monitoring of widespread rodents, which are the transmitting agents and circulators of infections (Allactaga saltator, Scirtopoda telum and Dipus sagitta, Cricetulus migratorius, Meriones tamariscinus, Meriones erythrourus, Meriones unguiculatus and Phombomys opimus) has been performed by the Antiplague Service of the Republic of Kazakhstan over the last ten years (including the Pre- Caspian region). Registration of the population is implemented according to standards using mashers, installed in-line, and traps within 1 ha area (with calculation of holes). Rodents with twilight and night life mode (Dipodidae and others) are registered from cars using the headlights. The values of population, depending on the registration methods, are recalculated per the registration area – 1ha, per 100 trap/days, or 10 km of route.

The population and density of Phombomys opimus colonies in natural desert landscape is quite low and varies from 0.6 to 6 animals/ha. Density of Meriones unguiculatus and Meriones erythrourus colonies is less (0.2-4.8 animals per 100 trap/days). Allactaga elater is the most numerous among the Dipodidae family. This animal is over 90% of the total population of this family (5 animals per 10km of the route).

The density of background species colonies (Microtus socialis, and stress tolerant species – Mus musculus) varies from 0.6 to 6 animals per 100 trap/days even in the natural landscapes near Bautino bay. At the same time the small mammals in the zone of periodic flooding are replaced, and in the industrial zone these animals are present singly (less than 1 animal per 1 ha) due to desertification and habitation contamination.

In contrast to the rodents, predators (Canis lupus, Vulpes vulpes and others) with night life mode visit the various areas (including modified landscapes) more often. Numerous traces are evidence of this. Here Saiga tatarica and Gasella subgutturosa were also registered.

Given data on the habitation and population of mammals in the area of the Tyub-Karagan peninsula is evidence of their irregular distribution. Population of background species in the various types of desert (Dipodidae and Gerbillinae) in natural habitats is relatively low. Coastal areas are also poorly inhabited by rodents due to periodic flooding. Rare colonies are associated with sharp coasts or dams, bodies of road, etc.

Large mammals (Canis lupus, Vulpes vulpes and Gasella subgutturosa) just visit some areas of the peninsula due to the impropriety of habitations.

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[30] B.I.Badamshin Population and commercial reserves of Caspian Seal (Phoca caspia) // Marine mammals. M.,1969.

[31] Krylov V.I. Ecology of the Caspian seal. Finnish Game res., 1990, 47. p.32-36.

Especial attention should be paid to the rare and endangered species of mammals, listed in the Red Book of Republic of Kazakhstan, which require protection (Vormela peregusna and Gasella subgutturosa).

Vormels peregusna. This is a rare species with rapidly decreasing habitat, with the status of category III. It inhabits the deserts of various types. It predominates in sandy deserts. Population greatly fluctuates and is stipulated by the density of colonies of the main nutrition object (Gerbillinae and Citellus). This species leads a sedentary life in the areas with plenty of rodents, or migrate seasonally. It's very rare in the studied area.

Ovis vignei arcal. This is a small sheep of Bovidae family, Artiodactyla order. This species is non-migratory. It is the single representative of Argali which inhabits the desert zone with a severe continental climate. The population of this species within the mountain areas of Mangyshlak is 5,000-6,000 heads. It can visit the chinks within the Tyub-Karagan peninsula.

Gazella subgutturosa. This is a rare species with decreasing population in some areas of Kazakhstan, with the status of category III. It inhabits the sandy, clayey and macadam deserts with broken ground. About 200,000 heads were registered in the republic before the 1930s. At present time there are up to 50,000 heads, half of which are associated with the Mangistau region. The population of this species at Buzachi and the Tyub-Karagan peninsulas is 16,000-20,000 heads [26].

6.3.3 Fish

According to various surveys starting in 1994, fish volumes in the Bay have no economic value and fish diversity is considerably lower than in the open sea. In various seasons three species of sturgeon, five species of herring, one to two species of carp, two species of mullet, and 16 other fish species, mainly gobies, were recorded. The most abundant are *Neogobius fluviatilis palassii*, *Proterorhinus marmoratus*, *Neogobius lessleri gorlap*, *Neogobius caspius*, *Hyrcanogobius bergi.* Their number varies between 10 and 40 individuals per 10 min of trawling. *Rutilus rutilus caspicus* is also widely - spread in the Bay. *Stizostedion marina* fattens near the shoreline but spends winter in deep water (30-100 m). *Cyprinidae* and *Stizostedion marina* is sparsely distributed in the Bay. On the other hand the Red Book species *Rutilus frisii Kutum* can be found here.

Sampling for fish has been undertaken from 1998 during AgipKCO Tyub-Karagan Bay monitoring only at station 6 at the Bay entry. One gill netting for 15 or 16 hours and one 5 minutes trawling were performed at each survey. The data obtained provides an approximate representation of the fish populations in the Bay, and not a quantitative assessment of fish abundance, species diversity or their biological status.

Drift net catches have included Russian sturgeon, herring (shad and kilka), roach and several species of goby (Tab. 6.9). Large quantities of lobsters (species not known) were also caught in the drift nets in October 1999 and April 2000. Trawls have yielded a number of species of goby only (Tab. 6.10). The highest abundances and biomasses were recorded in the October and August surveys. Fish caught in August 2000 were measured and assessed for gonad development: they ranged in length from 3.2 to 9.4 cm; approximately 70% of the catch was female.

Single individuals of Russian sturgeon have been sampled on two occasions: May 1998 (specimen 69 cm long) and*April 2002 (specimen 97 cm long). The individual collected in 1998 was described as being in a poor physical state, lacking adipose tissue and with possible liver cirrhosis. A plastic bag was found in the gut. The individual caught in 2002 was in a good state. The most diverse catch occurred in October 1999, when 50 fish from eight species were caught. In August 2001, 17 fish from three species were caught, while in some surveys no fish were caught. Fish caught in August 2000 were measured, aged and assessed for gonad development: they ranged in length from 9 to 33 cm and in age from 2 to 5+ years; approximately 70% of the catch was female.

Tab. 6.9 Number (N, ind./net-day) and biomass (B, kg/net-day) of fish in net catches (data of Agip KCO monitoring at Tyub-Karagan bay, spring of 1998 and Aptil, 2002).

Fish species	May 1998		December 1998	October 1999[1]	April 2000	August 2001		April[2] 2002
	N	B				N	B	
Russian sturgeon - *Acipenser guldenstadii*	1	2.5	-	-	-	-	-	1
Brazhnicovs shad - *Alosa brashnikovi*	-		-	22	-	12	1.54	-
Big-eyed shad - *Alosa saposhnicovi*						4	-	-
Kilka - *C/upeonel/a delicatulata caspia*	-		-	2	-	1	0.003	-
Roach - *Rutilus rutllus caspicus*	-		-	6	-	-		-
Round goby - *Neogobius me/anostromus affinis*	-		-	12	-	-		-
Monkey goby - *Neogobius fluviatllis pallasi*	-		-	3	-	-		-
Ratan goby - *Neogobius ratan goebe/i*	-		-	1	-	-		-
Caspian goby - *Benthophilus*	-		-	1	-	-		-
Gobies (unidentified) - Gobiidae spp	-		-	3	-	-		-

In October 1999, 675 individuals of lobsters with total mass of 19.5 kg were caught in nets. In April 2000, 60 individuals of lobsters with total mass of 3 kg were caught in nets.

A total of 17 fish, belonging to three different herring species were caught in July 2001 (Tab. 6.11). Twelve of the fish caught were Brazhnikovs shad, the remaining fish were four big-eyed shad and one kilka, and the total biomass of the catch was 2.713 kg. Individuals ranged in length from 9 to 33 cm and in age from 2 to5+ years; approximately 70% of the catch were female.

The levels of aliphatic hydrocarbons and metals recorded in fish tissues in Tyub-Karagan Bay in the spring 1998 monitoring were similar to those recorded in other parts of the northeast Caspian during the OKIOC 1996 and 1997 baseline surveys. Aliphatics in sturgeon liver were twice the concentration in muscle (71 and 30 mg/kg), n-alkanes were in the range of 3-4mg/kg, copper, iron and zinc were the dominant elements in fish tissues, in terms of total concentrations. The carbon preference index (CPI) suggested that the n-alkanes originated from both biogenic and petrogenic sources.

Tab. 6.10 Number (N, ind./5-minute trawl) and biomass (B, kg/5-minute trawl) of fish in trawl catches (data of Agip KCO monitoring at Tyub-Karagan bay, spring of 1998 and June, 2003).

Fish species	May-98		Oct-99		Apr-00		Jul-01		Aug-01		Jun-03	
	N	B	N	B	N	B	N	B	N	B	N	B
Monkey goby - *Neogobius fluviatilis pallasi*	2	8.4	11	46	4	8.6	7	33.2	7	33.2		
Goad goby - *Neogobius gymnotrachelus macrophthalmus*	3	>36.8	3	3	-	-	-	-	-			
Caspian goby - *Benthophllus magistri abdurachmanovi*	2	-	-	-	-				-			
Caspian goby - *Caspiosoma caspium*	2	-	-	-	-		2	0.8	2	0.8		
Round goby - *Neogobius melanostromus affinis*	-	-	2	23	-		6	17.7	6	17.7		
Tube-nosed goby - *Proterorhinus marmoratus*	-	-	-	-	4	6.1			-			
Caspian goby - *Benthophilus macrocephalus*	-	-	5	5	6	13.1			-			
Knipowitschia longicaudata	-	-	-	-	-		6	2.8	6	2.8		
Russian sturgeon - *Asipenser guldenstadti*											1.7	-
Persian sturgeon - *Asipenser guldenstadti persicus*											8.4	-
North Caspian roach (Vobla) – *Rutilus rutilus caspicus*											637	-
Big eyed shad - *Alosa saposhbicovi (Grimm)*											10.2	-
Agrakhana shad - Alosa sphaerocephala											5.1	-
Total	9	45.2	21	77	14	27.8	21	54.5	21	54.4	663	13.1

The single specimen of sturgeon caught in the spring 1998 baseline survey was subjected to parallel analyses for heavy metals content by RoK and UK laboratories. Although there were some differences in absolute values of metals between the RoK and UK data (likely to be due to differences in extraction and analytical procedures), both data sets showed similar overall trends (Tab.6.12). Differences in concentrations of certain metals were observed between the different types of tissues analyzed.

Mercury results from the analysis of fish tissues sampled during previous northeast Caspian surveys have shown levels over a wide range, from less than the detection limit to up to 4.92 ng^{-1} dry weight, so both sets of results could be regarded as being of the correct order of magnitude.

The results showed the levels of metals to be generally higher in sturgeon than in goby tissues, and this was mainly attributed to the diet of the sturgeon that includes a large quantity of small fish.

The fish population and diversity is considerably higher in the open sea. More than 854 fish species inhabit this area; the main being sturgeons, herrings, cyprinoids, mullets and poachers. They comprise more than 75% of Caspian ichthyofauna. The northern Caspian Sea is also inhabited by anchovy kilka, which is the main fodder for seals and some fish.

Tab. 6.11 Relative numbers and biomass of fish in 16 hours net catch in July 2001

Fish species	Max length, cm	Min length, cm	Weight (kg)	Gonads state	Age, years
Alosa saooshnicovi	24.0	21.0	0.18	Female III	4+
A. saposhnicovi	21.0	19.0	0.16	Female III	3+
A. saposhnicovi	26.0	23.0	0.23	Male II-III	4+
A. saposhnicovi	25.0	21.0	0.14	Female III	4+
Alosa brashnikovi	21.0	17.0	0.06	Female II-III	3+
A.brashnikov	30.0	26.0	0.21	Female III	5+
A brashnikov	30.0	26.0	0.19	Female III	4+
A.brashnikov	33.0	28.0	0.23	Female III	5+
A.brashnikov	23.0	19.0	0.09	Male III	2+
A.brashnikov	33.0	28.0	0.23	Male II-III	4+
A brashnikov	28.0	24.0	0.18	Female III	5+
A.brashnikov	33.0	27.0	0.21	Female III	4+
A.brashnikov	25.0	22.0	0.10	Male III	3+
A.brashnikov	31.0	27.0	0.02	Female III	4+
A.brashnikov	28.0	24.0	0.16	Female III	4+
A.brashnikov	27.0	23.0	0.14	Male MI	3+
Clupeonella delicatula caspia	9.0	7.5	0.003	Male III	3+

Tab. 6.12 Concentrations of metals in fish tissues in mg/kg (dw), (from AgipKCO Tyub-Karagan Bay monitoring).

Species	Tissue	As	Ba	Cd	Cr	Cu	Fe	Pb	Hg	Ni	V	Zn
Sturgeon (single specimen 1998)	Muscle	<0.5	3	<0.5	3.2	10.8	121	<8.0	0.07	<4.0	<2.0	112
	Muscle		*2*	*0.28*	*3.4*	*15.74*	*81*	*0.45*	*0.34*	*1.7*		*24*
	Liver	<0.5	13	<0.5	<2.0	7.6	65	<8.0	3.56	<4.0	<2.0	74
	Liver		*7.2*	*0.5*	*n/d*	*16.3*	*643*	*0.15*	*0.21*	*n/d*		*108*
Goby	Muscle	<0.5	4	<0.5	<2.0	6.2	21	<8.0	1.71	<4.0	<2.0	41

Spawning and migration of fish run along the east sea coast. Providing the weather allows, in March, herrings arrive for spawning from the south. They are followed by mullets. Migration of cyprinoids and other small size species begins in April from the north of the Caspian Sea. At the same time, sturgeons (beluga, starred sturgeon, sturgeon and *Acipenser nudiventris*) enter the Ural River for spawning. In the middle of summer downstream migration of spawned sturgeons and young fish takes place. In autumn there is an inverse process of migration of herrings and mullets to the south and small fish to the north.

6.3.4 Zooplankton

Zooplankton diversity in the Bay is low. Overall, 33 zooplankton species from 9 groups were recorded in Tyub-Karagan Bay since 1998 (Tab. 6.13 and 6.14). In spring communities develop similarly to the open sea areas but in summer and autumn diversity is notably lower in the Bay. At depths more than 2m the population increases by 10 times and biomass by 3-4 times when water warms in spring. At shallow water changes are smaller. This could be due to water contamination or higher water temperature fluctuations that are known to greatly affect zooplankton diversity. But other factors like water depth, proximity to the shore and seasonal variation complicate the picture. As zooplankton diversity depends on phytoplankton availability,

natural and man-made factors that impact on phytoplankton have a knock-off effect on zooplankton.

6.3.4.1 Seasonal variations

Seasonal variations are greatly dependant on water temperature. Both diversity and biomass tends to increase from spring to summer and decrease in winter. The number of groups and species is at its maximum in the middle (June/July) or at the end (October) of the main productive period, and is minimum at the beginning of the spring bloom (April).

Zooplankton density and biomass observed in early April, with the seawater temperatures of 8 to 9°C, are low, averaging 3,183 individuals /m^3 and 9.21 mg/m^3. The numbers are dominated primarily by copepods (46%) and rotifers (36.1%). The number of barnacle larvae is also relatively high and accounts for 17.5% of the total value. Mollusc, polychaete, foraminiferan larvae, hydra and infusorians are also present. The biomass is also dominated by copepods (71.8% with *Cirripedia* larvae contributing 16.2% of the biomass) and rotifers (11.6%).

Occasional cladocerans are recorded in the deep water. These thermophilic crustaceans normally winter on the seabed in deepwater areas and return to the water column under favourable water temperature regime. The sparse numbers of mollusc larvae provided evidence of a low level of spawning activity in early spring.

The increase of water temperatures in late spring (14-15°C) permits the rapid development of short life-cycle rotifers *Synchaeta,* mass breeding of barnacles and appearance of thermophilic Cladocera. The abundance and biomass of copepods falls, possibly due to increased fish grazing.

In summer and autumn diversity and numbers reaches its peak. On average 19 taxa are found in summer and 20 in autumn. The water temperature in late October is sufficiently high (11 to 13 °C) to maintain intensive zooplankton growth in the Bay. Zooplankton abundance and biomass at this time exceeded spring and winter values by at least one to two orders of magnitude. Numerically dominant groups at this time are the copepods and barnacle larvae, with numbers of rotifers also significant. Taxa characteristic of this time of year include the jellyfish *Blackfordia virginica,* Cladocera and various mollusc and polychaete larvae.

In December zooplankton reduces to ten, mainly perennial, taxa. Copepods and rotifers again being the most abundant groups, with copepods dominating in terms of biomass (94%). Larvae are very scarce at this time, due to settlement and development as seabed invertebrates. Thermophilic taxa disappear.

6.3.4.2 Spatial variations

The zooplankton diversity and biomass varies considerably throughout the Bay. The number of individuals varies between 161 and 9,263 /m^3, and biomass ranged from 0.35 to 28.75 mg m^{-3} (Tab. 6.15, 6.16). The greatest species richness is recorded at deeper waters (8-9m), and lowest at the Port and the Base site. While at the Port this could be a response to acute industrial pollution, at the Base site lower diversity (with heavy domination by just one species) is likely to be a result of Atash village sewage and burned waste leachate seepage into the sea. The highest zooplankton number and biomass at the Base site (5.016 individuals /m^3 and 16.6 mg/m^3) also supports this conclusion. Low diversity and evenness index values

are noted at the monitoring stations north of Bautino (9) and at the north east shallow end of the Bay (10).

Tab. 6.13 Frequency of occurrence of zooplankton organisms (%), Tyub-Karagan Bay surveys, May 1998 - April 2004, Agip KCO

Taxa	1998		1999	2000	2001	2002	2003	2004
	May	Dec	Oct	Apr	Aug	Apr	Jun	Apr
Ciliata								
Tokophrya mollis (Kent)	-	29	-	-	-	17	-	8
Vorticellidae gen.sp.	-	-	-	-	-	-	-	17
Hydrozoa								
Hydrida sp.	17	-	11	-	-	8	-	-
Moerisia pallasi (Derzh.)	-	-	-	-	8	-	8	-
Blackfordia virginica (Mayer)	-	-	56	-	58	-	33	-
Foraminifera	50	15	11	10	42	67	8	-
Nematoda	-	-	-	-	-	-	33	25
Rotifera								
Synchaeta stylata (Wierz.)	50	43	100	100	100	17	100	75
S.vorax (Rouss)	50	15	-	-	-	17		75
S.littoralis (Rouss)	83	86	-	100	33	42	8	8
S.cecilia (Rouss)	33	-	89	40	75	100	100	67
Trichocerca caspica caspica (Tsch.)	-	-	11	-	-	-	33	-
Proalidae gen.sp.	-	-	-	-	8	-	-	-
Brachionus quadridentatus (Herm.)	-	-	11	-	-	-	-	-
Keratella sp.	-	-	11	-	-	-	-	8
Keratella tropica tropica (Apst.)	-	-	-	-	-	-	8	-
Rotifera gen.sp.	-	-	-	-	-	-	-	8
Cladocera								
Podonevadne trigona (Sars)	17	-	67	30	67	-	100	8
P. camptonyx (Sars)	-	-	22	10	75	-	58	-
P.angusta (Sars)	-	-	-	-	50	-	58	-
Pleopis polyphemoides (Leuck.)	-	-	100	20	100	-	92	8
Evadne anonyx (Sars)	-	-	-	-	50	-	33	-
Polyphemus exiguus (Sars)	-	-	11	-	-	-	-	-
Copepoda								
Calanipedae aquae-dulcis (Krit.)	100	100	100	100	67	92	100	92
Acartia clausi (Giesbr.)	83	100	100	70	100	67	75	-
Limnocalanus grimaldii (Guerne)	-	-	-	10	-	-	-	-
Halicyclops sarsi (Akat.)	50	100	100	30	83	83	83	42
Paraergasilus rylovi (Mark.)	-	-	11	-	-	-	-	-
Harpacticoida gen. sp.	67	29	22	-	17	42	8	-
Schizopera neglecta Akat.	-	-	-	-	-	-	17	-
Acartia tonsa Dana	-	-	-	-	-	-	-	100
Others								
Cirripedia nauplii (barnacle larvae)	100	100	100	100	100	75	100	100
Mollusca larvae	83	-	100	80	100	83	100	25
Polychaeta larvae	100	-	33	90	25	8	-	-
Crustacea larvae	-	-	-	-	-	-	8	-
Total taxa: 33	14	10	20	14	19	14	22	16

The spatial distribution of fauna across most of the Tyub-Karagan Bay survey area is relatively homogeneous, with differences in sediment type and water depth leading to some variability. Species composition (Tab. 6.19), relative abundance and biomass are stable. It neither shows any specific trend with time nor varies notably with seasons. Multivariate analysis shows 56% similarity between all stations over the years of observation.

The most notable change has been a decline in both number of taxa and number of individuals at the Port (station 7) since 2001. In 2002 it was the only place over the four years that did not to contain any *A. ovata* and worms dominated (59%). This could be due to pollution and marine plant damage associated with the port activities. In 2000 mollusc *C. lamarki* was recorded for the last time. It may have disappeared from the Bay area or is present as single individuals. On the other hand in the same year Hydrozoa appeared.

Tab. 6.14 Numbers (thousand individuals m-3) and biomass (mg m-3) of the main zooplankton groups and community indices (H‘, bit mg-1; e) in Tyub-Karagan Bay from May 1998 to April 2004, Agip KCO

	1998	1998	1999	2000	2001	2002	2003	2004
	May	Dec	Oct	Apr	Aug	Apr	Jun	Apr
Numbers								
Copepoda	0.86	2.08	14.2	1.95	6.69	0.14	2.39	1.463
Cladocera	-	-	0.26	0.02	3.43	-	1.02	0.001
Rotatoria	1.29	2.15	2.05	12.88	4.65	0.053	65.11	1.149
Cirripedia nauplii	0.72	0.08	5.28	4.16	9.37	0.014	1.23	0.556
Mollusca larvae	0.12	-	0.27	0.14	3.51	0.023	8.22	0.014
Polychaeta larvae	0.14	-	-	-	single	single	-	-
Hydrozoa	-	-	0.005	-	0.01	-	0.01	-
Total	3.15	4.13	22.075	19.15	27.66	0.23	77.98	3.183
Biomass								
Copepoda	4.54	40.97	70.6	6.16	23.65	0.55	9.8	6.61
Cladocera	-	-	7.43	0.96	120.95	-	38.72	0.04
Rotatoria	1.44	2.38	4.64	13.38	7.06	0.02	73.85	1.07
Cirripedia nauplii	2.17	0.23	15.83	12.48	28.13	0.04	3.68	1.49
Mollusca larvae	0.03	-	0.06	0.7	0.77	0.01	1.76	<0.01
Polychaeta larvae	0.56	-	-	-	-	-	-	-
Hydrozoa	-	-	70.88	-	11.6	-	5.53	-
Total	8.78	43.58	169.44	33.68	191.76	0.62	133.35	9.21
H′ (average)	2.06	1.35	2.14	1.90	2.15	1.73	2.09	1.78
E (range)	1.79-2.85	0.76-2.78	1.31-2.72	2.05-2.60	1.34-2.68	1.32-2.89	1.76-2.30	1.55-3.06

Tab. 6.15 Distribution of numbers (thousand ind. m-3) of main zooplankton groups, Tyub-Karagan Bay survey, April 2004, Agip KCO

Station	Depth (m)	Rotatoria	Copepoda	Cladocera	Mollusca larvae	Cirripedia nauplii	Hydrozoa	Total
01	5.6	0.842	0.921	-	0.032	0.476	-	2.271
02	8.0	0.331	2.145	-	-	0.330	-	2.806
03	3.5	2.647	4.632	-	-	1.984	-	9.263
04	9.0	0.138	0.433	-	-	0.069	-	0.640
05	8.9	0.075	0.130	0.005	0.005	0.025	-	0.240
06	10.5	0.858	2.244	0.009	-	0.726	-	3.837
07	6.5	1.768	1.632	-	0.136	1.224	-	4.760
08	6.5	2.721	1.360	-	-	0.408	-	4.489
09	7.0	1.899	1.519	-	-	0.506	-	3.924
10	5.1	2.244	1.980	-	-	0.792	-	5.016
11	9.3	0.071	0.071	-	-	0.019	-	0.161
12	6.8	0.196	0.488	-	-	0.117	-	0.801
Average		1.149	1.463	0.001	0.014	0.556	-	3.183

6.3.5 Benthos

Diversity of the Bay benthos is lower than in the open sea but molluscs diversity has increased most noticeably since the start of the monitoring in 1998. *Nereis diversicolor* dominates in Crustacea species (Tab. 6.16). Molluscs contributed most of the biomass (49-89% Tab. 6.16). This is largely due to the abundance of *Abra ovata*, although other molluscs eg *Didacna trigonoides*, make a significant

Survey time	Vermes		Crustacea		Mollusca		Total
	number	%	number	%	number	%	
Number of individuals/m^2							
Apr-98	34 066	95	629	2	1 346	4	36 041
Dec-98	6 600	68	1 200	12	1 900	20	9 700
Oct-99	2 666	52	144	3	2 339	45	5 149
Apr-00	3 413	80	155	4	674	16	4 242
Aug-01	2 057	55	460	12	1 206	32	3 723
Apr-02	2 448	65	269	7	1 058	28	3 775
Jun-03	2 138	65	248	7	926	28	3 312
Apr-04	1950	52	128	3	1 676	45	3 754
Biomass (g/m^2)							
Apr-98	22.60	10	1.90	1	200.00	89	224.50
Dec-98	51.80	24	8.20	4	158.80	73	218.80
Oct-99	35.00	16	6.30	3	182.80	82	224.10
Apr-00	25.60	30	18.00	21	42.10	49	85.70
Aug-01	40.30	23	18.70	11	118.70	67	177.70
Apr-02	32.80	25	16.20	12	82.70	63	131.70
Jun-03	24.24	21	5.69	5	84.19	74	114.13
Apr-04	23.82	18	14.27	11	93.46	71	131.55

Tab. 6.16 Mean number of individuals and biomass of the main groups of zoobenthic organisms

Contribution, too. Worms exceed molluscs in numbers (up to 95%) but have less biomass (10-30%) Crustacea has the least numbers and biomass. Similarly the temporal variations are larger in molluscs for biomass and in worms for numbers. This is mainly due to slight variations in the average numbers of the less common taxa.

Tab. 6.17 Distribution of biomass (mg m-3) species diversity index (H□, bit mg-1) and evenness Index (e) for zooplankton, Tyub-Karagan Bay survey, April 2004, Agip KCO

Station	Depth (m)	Rotatoria	Copepoda	Cladocera	Mollusca larvae	Cirripedia nauplii	Hydrozoa	Total	H′	e
01	5.6	0.58	4.75	-	0.01	1.43	-	6.77	1.69	2.00
02	8.0	0.34	8.42	-	-	0.99	-	9.75	1.44	2.06
03	3.5	2.29	20.51	-	-	5.95	-	28.75	1.93	2.14
04	9.0	0.15	1.98	-	-	0.21	-	2.34	1.68	2.40
05	8.9	0.08	0.62	0.16	<0.01	0.08	-	0.94	2.08	2.46
06	10.5	0.81	10.89	0.29	-	2.18	-	14.17	1.73	2.05
07	6.5	1.73	5.30	-	0.03	3.67	-	10.73	2.12	2.51
08	6.5	2.85	4.21	-	-	1.22	-	8.28	2.38	3.06
09	7.0	1.83	6.08	-	-	1.52	-	9.43	1.92	2.47
10	5.1	1.93	14.52	-	-	0.17	-	16.62	1.40	1.55
11	9.3	0.08	0.21	-	-	0.06	-	0.35	1.36	2.85
12	6.8	0.13	1.86	-	-	0.35	-	2.34	1.66	2.38
Averg		1.07	6.61	0.04	<0.01	1.49	-	9.21	1.78	-

Tab. 6.18 Summary community statistics based on grouped abundances for macrobenthos samples, Tyub-Karagan Bay surveys, December 1998 to April 2004, Agip KCO

Survey time	No of stations sampled	Number of taxa groups		Number of ind. /m^2		Shannon-Wiener diversity (log_2)	
		min	Max	min	max	Min	max
Apr-98	6	no data					
Dec-98	7	6	17	7 040	13 920	1.3	2.97
Oct-99	9	2	8	1 980	8 440	0.91	1.9
Apr-00	9	3	8	920	22 130	0.13	2.31
Aug-01	12	2	10	430	8 490	0.74	2.15
Apr-02	12	2	11	540	7 920	0.5	2.44
Jun-03	12	4	11	1 340	5 900	1	2.05
Apr-04	12	4	11	2 270	6 000	0.86	1.68

Tab. 6.19 Taxonomic composition and frequency of benthos occurrence (%) at 12 stations of AgipKCO Tyub-Karagan Bay monitoring surveys

Taxa	May 1998	December 1998	October 1999	April 2000	August 2001	April 2002	June 2003	April 2004
Abra ovata (Phil)	100	100	100	100	100		100	100
Balanus improvisus Darwin	17	14	11	10	50	33	33	25
Cerastoderma lamarcki (Reeve)	-	-	11	3	-	58		91.7
Chaetogammarus pauxi/lus (Grimm)	83	-	-	-	8	8		
Chaetogammarus warpackowskyi G.O.Sars	-	14	-	-	-	-	8	16.7
Corophium chelicorne G.O.Sars	17	-	-	10	8	-		25
Corophium monodon G.O.Sars	17	-	-	-	8	-		
Corophium mucronatum G.O.Sars	-	-	11	-	8	-	66	16.7
Corophium nobile G.O.Sars	-	14	11	-	32	16		
Corophium robustus G.O.Sars	17	-	-	-	-	16		
Corophium sp.	-	-	-	44	40	58		8.3
Crustacea - crustaceans						50		
Dicerogammarus haemobaphis (Eichwald)	-	-	-	10	-	8		
Didacna longipes (Grimm)	-	-	-	-	8	92		
Didacna trigonoides (Pall.)	-	-	-	-	8	-	8	
Dreissena polymorpha (Pallas)	-	28	11	10	-	-	16	
Fabric/a sabella caspica Zenkewitsch	-	28	-	-	-	66	25	
Gammarus spp	-	57	-	10	32	-	58	50
Gme/ina sp	-	-	-	-	8	66	8	
Hydrozoa - hydroids						8	16	
Hypania invalida (Grube)	17	14	11	22	8	33		
Hypaniola kowalewskii (Grimm)	-	57	-	-	8	8	25	25
Hypanis caspia (Eichw.)	-	28	-	18	66	-	25	
Hypanis plicata (Eichw.)	-	14	22	11	-	-		
Hypanis vitrea (Eichw.)	-	28	-	12	-	8		
Manayunkia caspica Annenkova	83	100	-	-	8	16	41	
Moerisia maeotica	-	-	-	-	8			
Moerisia pallatf (Derzh.)	-	-	-	33	-	-		
Mollusca - molluscs						58		
Mytilaster lineatus (Gmel.)	17	14	11	10	41			
Nematoda sp.	83	28	-	-	8	100	8	
Nereis diversicolor O.F.Muller	100	100	100	100	91	43	100	100
Niphargoides (Niphargogammarus) aequimanus G.O.Sars	83	-	-	-	8	-		
Niphargoides quadrimanus (G.O.Sars)	-	-	-	-	8	8		
Niphargoides sp	-	-	22	10	-	-		
Oligochaeta sp.	67	71	11	10	50		50	50
Pandorites p/atycheir (G.O.Sars)	-	-	-	10	-	8		
Pterocuma pectinata (Sowinshy)	50	28	-	-	8	8	33	
Pterocuma rostrata (G.O.Sars)	-	-	11	10	8	-		25
Rhithropanopeus harrisii (Gould)	17	43	44	55	50		66	83.3
Schizorhynchus bilame/latus (G.O.Sars)	33	43	-	-	8	16		25
Schizorhynchus eudorel/oides (G.O.Sars)	67	57	55	22	8	16	16	8.3
Schizorhynchus knipowitchi (Derzhavin)	-	14	-	22	8	-	8	25
Stenocuma graci/oides (G. O.Sars)	33	-	-	-	8	-		
Stenocuma gracilis (G. O.Sars)	67	-	-	-	-	-		16.7
Stenogammarus deminutus (Stebbing)	-	-	-	-	8	-		
Stenogammarus macrurus (G. O.Sars)	-	-	11	-	8	8		
Stenogammarus similis (G.O.Sars)	-	-	-	22	8	8		
Stenogammarus spp	-	-	-	10	8	-		
Vermes - worms						8		

6.3.6 Amphibians and reptiles

Fauna of Amphibia and reptiles of Tyub-Karagan peninsula is relatively poor and this is stipulated by the environmental conditions. High soil mineralization, presence of large alkali soil network without any vegetation, heavily continental climate, and flat relief increases the severity of the climate, especially during the wintering in open winters.

Amphibia in the area of Bautino and adjacent areas are represented only by one species Bufo viridis (Tab. 6.20) the active life mode of which is since April till September. The capability of this animal to tolerate the high air dryness, night life mode and use of temporary brackish water bodies for spawning let to this species to inhabit the areas that are far from the permanent water bodies. During the investigation in April and June, 2005 the traces of this species presence were not registered within or near the work area.

Reptiles at Tyub-Karagan peninsula are represented by 16 species (32.7% of total composition of Kazakhstan reptiles). The basis of reptiles is desert complex – 11 species (Agrionemys horsfieldi, Alsophylax pipiens, Tenuidactylus russowi, Tenuidactylus caspius, Phrynocephalus helioscopus, Ph.mystaceus, Ph.guttatus, Agama sanguinolenta, Eremias velox, Eryx milliaris and Psammophis lineolatum). Other species (Natrix tessellata, Elaphe quatuor-lineata, Elaphe dione, Agkistrodon halys) have the wide intrazonal distribution. Such diversity of the reptiles is stipulated by several reasons, mainly by Caspian Sea level fluctuation and features of ecosystem development at seaside flat areas[32].

Tab. 6.20 Amphibia and reptiles

Class, species	Activity	Areal	
	Month	Ground	Shoaling
Amphibia	IV-IX		
Bufo viridis	IV-IX	Typical	Typical
Reptilia			
Testudinea			
Agrionemys horsfieldi	IV-VIII	Typical	
Squamata			
Alsophylax pipiens	IV-IX	Typical	
Tenuidactylus russowi	IV-IX	Rare	
Tenuidactylus caspius	IV-IX	Rare	
Agama sanguinolenta	IV-IX	Numerous	
Phrynocephalus helioscopus	IV-IX	Typical	
Ph.guttatus	IV-IX	Rare	
Ph.mystaceus	IV-IX	Rare	
Eremias velox	IV-IX	Rare	
Eremias arguta	IV-IX	Typical	
Natrix tessellate	IV-X		Typical
Eryx milliaris	IV-IX	Rare	
Elaphe quatuor-lineata	IV-IX	Rare	
Elaphe dione	IV-IX	Typical	Typical
Psammophis lineolatum	IV-IX	Typical	
Agkistrodon halys	IV-IX	Rare	

The Red Book species are in bold

The most significant specific weight in the modern fauna is associated with the Middle Asia Desert Complex. European-Siberian and Central-Asian complexes, which have been settled from the north and east, are represented to a lesser degree. Reptiles at Tyub-Karagan peninsula are represented by 16 species (32.7% of total composition of Kazakhstan reptiles). The basis of reptiles is desert complex – 11 species (Agrionemys horsfieldi, Alsophylax pipiens, Tenuidactylus russowi, Tenuidactylus caspius, Phrynocephalus helioscopus, Ph.mystaceus, Ph.guttatus, Agama sanguinolenta, Eremias velox, Eryx milliaris and Psammophis lineolatum). Other species (Natrix tessellata, Elaphe quatuor-lineata, Elaphe dione, Agkistrodon halys) have a wide intrazonal distribution. Such diversity of the reptiles is stipulated by several reasons,

[32] V.V. Neruchev, N.F. Vasilyev Fauna of North-Eastern Pre-Caspi reptiles // Zoology Bulletin, 1978, 6. p. 36-41.

V.V. Neruchev and others. Reptiles of Northern Pre-Caspi deserts // Wildlife of Southern Ural and Northern Pre-Caspi. Orenburg, 1995. p. 94-96.

mainly by Caspian Sea level fluctuation and features of ecosystem development at seaside flat areas (Tab 6.20). Irregularity of the area colonization is traced at present time during the analysis of reptile distribution in the Pre-Caspian plain. Middle-Asia species are represented in the highest degree in Emba-Usturt sector (including Buzachi and Tyub-Karagan peninsulas). Agrionemys horsfieldi, Tenuidactylus caspius and Agama sanguinolenta do not penetrate beyond Emba to the north. Habitation border of Tenuidactylus russowi and Psammophis lineolatum, passes through Ural-Emba interfluves[33].

Quantitatively, the most numerous reptiles in natural clayey, alkali and partly sandy deserts of the region are Eremias arguta, in sandy areas – Eremias velox, Phrynocephalus mystaceus and Ph.guttatus.

The most numerous species in the areas with low man-made stress are Phrynocephalus helioscopus, Eremias arguta and Agama sanguinolenta. Density of their colonies is up to 3-4 animals per 1km of the route or 1.5-2 animals/ha. In the same areas the following snakes are registered: Elaphe dione, Psammophis lineolatum and Agkistrodon halys, however the population of these species is lower than the population of lizards –0.4-0.5 snakes/ha (up to 1.5 snakes per 1km of the route). The density of Alsophylax pipiens, Tenuidactylus caspius and Tenuidactylus russowi colonies is at this level.

The coastal cenosis is inhabited more densely. Here Natrix tessellate and Elaphe dione are numerous. Their population is up to 5-6 snakes per 1km of the route. Distribution of other reptiles in these habitations is limited and many species have been replaced due to the periodic floods.

Especial place in reptile distribution is occupied by modified landscapes (dams, bodies of roads, power lines, oil pipelines, residential and industrial buildings), which provide a positive impact in general, enriching the lifeless areas (especially alkali soil desert) with new environmental niches for habitation of some snakes and lizards. Density of reptiles in modified landscapes is higher, as a rule. However, animals here are threatened due to the oil contamination (pipelines) from spills and motor roads.

Generally, the studied area is inhabited by reptiles irregularly. The highest density of colonies is registered in coastal habitations (at poor specific composition), then in modified areas (dams, roads, power linnets, etc.) and natural desert areas, adjacent to Bautino bay. At the same time the reptiles are characterized by high degree of dependence on the environment and can play a significant role in the biocenosis of the region; some species can be reliable indicators of environmental status and used for monitoring.

In contrast to other terraneous vertebrates reptiles are driven by humans more often (direct aimless elimination). Snakes, the most of which are not poisonous, suffer from this aspect to the highest degree. So educational work for the local population and personnel will be required to save these animals.

The rarest snake - Elaphe quatuorlineata – can be registered within the studied area. This species is listed in the Red Book of Kazakhstan.

[33] K.T. Paraksov. Reptiles of Kazakhstan. Alma-Ata, 1956. 229 p.

Elaphe quatuorlineata is a rare species with decreasing population, inhabits the various landscapes (consolidated fixed and semi-fixed sands, clayey and stony deserts), and sometimes inhabits human buildings. It can be registered in the studied area from April till September; the population is very low. This species is the target of entrapment and captivity maintenance, so it requires the protection everywhere.

6.3.7 Key sensitivities

The environmentally sensitive areas on the coast of Middle Caspi for wildlife (terrestrial vertebrates) are Mangyshlak bay and adjacent Seal Islands, where the population of water and near-water birds is quite high during migration period (April-May and September-October), nesting period, and in wintering period during mild and warm winters. Molting and litter areas of Caspian Sea (Phoca caspia) can take place in these areas in hard winters.

The Base construction site and adjacent areas are rarely used by animals due to the presence of humans and more significant water contamination and industrial noise in comparison to the open sea. Single visits of seals for fish hunting, the number of which can rise for a short time as a result of plankton mass increase, are possible. Deterioration of weather conditions usually interrupts such visits.

Most of the valuable and protected birds also prefer the bay adjacent areas: Seal Islands, Mangyshlak bay, coast to the south from Aktau city to Karakol Lake and Kazakh bay. Most of the water and near-water birds, including the species listed in Red Book of Kazakhstan stay here for rest and eating during the migration (April – the first half of May and September – October).

Only the birds that can tolerate and even benefit from human presence were registered during two study of the Base area in April and July, 2005. These are swallows, which live in rock ledges, and sparrows. Gulls and gannets were registered more seldom.

Nevertheless, it is necessary to note that Tyub-Karagan bay (as the Base construction site), in direct proximity to the specified sensitive zones, is not used by animals due to its intensive development by humans for industrial purposes. North Caspi is one of the most valuable areas in the Northern Pale-Arctic and the main point through which millions of water and near-water birds migrate annually. According to expert assessments, up to 3 million ducks, 500,000 geese, 10 million gulls and sand-pipers fly here annually. During migration along Buzachi peninsula at the border of Northern and Middle Caspi the migratory flow can include up to 3-5 million water and near-water birds, consisting of habitants of Central and Northern Kazakhstan and Western Siberia. In spring the migratory flow of birds from Mediterranean and Black Sea wintering turns along the western coast of Caspi and distributes through the flood-land of the Ural and Emba, and this part of the flow at the level of Mangyshlak bay crosses the sea and reaches the nesting areas along the northeast coast on the Emba River flood land. Birds reach the wintering areas by the same routes in autumn. About 100,000-150,000 water fowls spend the winter in the Middle Caspi – in Mangyshlak bay, Karakol Lake and Kazakh gulf.

6.4 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.

6.5 SOILS

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 and harvesting of the plants by the local population. The soil is referred to the low-productive pastures by its suitability classification.

According to the natural zoning the studied area belongs to the Tyub-Karagan peninsula, which is included in the structure of flat Mangyshlak[34]. The Tyub-Karagan peninsula is the western extension of the Karatau elevations. This is a plateau with a flat and undulating relief. The area of plateau rapidly falls from elevation head to the sea to -28m.

Regarding the soil zoning, the area is included into the structure of Tyub-Karagan billowy and wavy-knap region of brown solonetzic soils and solonetzs (Faizov, 1970, Borovskiy, etc., 1974)[35 36].

Soil formation rocks at the plateau are Eluvial and Eluvial-Deluvial deposits of tertiary rocks, 0.5-1.5m in thickness, more seldom – 2-3m. There is a thick Sramatian limestone under the Eluvial deposits. This limestone outcrops at coastal escarps as a thick layer. The soil formation rocks in the coastal line between the plateau and sea are represented by young layer-type shelly-sandy deposits.

Soil cover in the narrow coastal line consists of sandy-shelly mineralized drifts that are replaced by sandy-alkali soils. Sandy-alkali soils are incipient soil formations, the generation of which is connected with the initial phase of soil formation process development.

Sandy-shelly drifts occupy narrow coastal part and offshore bar. They are represented by young, layer-type, mineralized marine water-saturated deposits. There isn't any vegetation or algal felt on the surface.

Sandy-alkali soils of the coastal line are formed under the conditions of shallow high-mineralized ground water (1-1.5m) and characterized by moisten, layer-type, mineralized, many-colored profiles with gleying traces at the depth of 20-30cm. Vegetation is represented by single species or rare groups of Suaeda. Foliage cover is up to 10%. These are the youngest soil formations, which have insignificant amount of humus (0.05-0.1%) in surface horizon.

Brown desert sweet soils, mainly eroded and weakly developed, predominate on the slopes, while the soil formation rocks deposits at shallow depth. They are characterized by low thickness of soil profile (30-50cm), which has been reduced due to the outwash, low thickness of humus horizon, poor differentiation by genetic horizons and high macadam content.

Brown eroded soils are formed under the conditions of broken inclined relief and poor surface grassing. This soil can be found rarely in silt accumulation areas. There are the processes of

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[34] Natural conditions and natural resources of USSR. Kazakhstan. Moscow. 1969. 482 p.

[35] K.Sh. Faizov "Soils of Kazakh SSR". Edition 13. Guryev region. Alma-Ata. 1970. 351 p.

[36] V.M. Borovskiy, E.U. Dzhamalbekov, A.H. Gaizulina, A.M. Moldabekov, A.G. Usachev, T.P. Turkova "Soils of Mangyshlak peninsula". Alma-Ata.1974. 223 p.

rain-wash and outwash, which are accompanied with silt soil layer loss and re-deposition to the lower parts of slopes. Vegetation cover is represented by rare groups of Frutescent and Petrosimonia triandra, foliage cover is 10-20%.

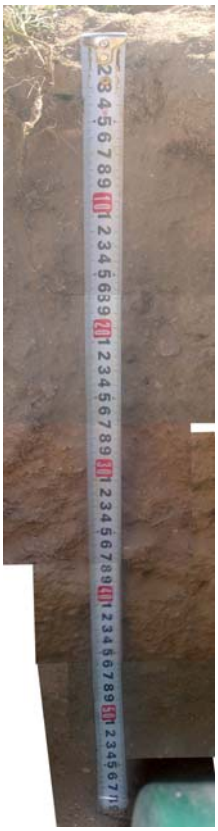
Soils are characterized y low humus content, high carbonate content, alkalinity. Sandy clays and light loamy soils predominate in granulometric composition. These soils are pliant to washout and deflation.

Brown weakly developed soils are spread on slopes and cones of erosive material outcrop in combination with brown eroded soils and hard rock outcrops. The feature of described soils is macadam content, profile enrichment with skeleton (poorly weathered rock fragments). Vegetation is rare. Foliage cover is 10-20%. Brown weakly developed soils consist of insignificant amount of humus (from 0.4 to 1%), carbonate profile is well expressed, and the maximum of carbonates is at the bottom part of humus horizon. The soils have an alkaline reaction of soil solution (pH 8.0-8.3). Loamy soils and sandy clays predominate in granulometric composition.

The morphological description of three profiles in the lower part of erosive material outcrop cones is given for characterization of brown weakly developed soils.

Profile №1 deposits in the lower part of the escarpment slope. Vegetation is represented by rare groups of Salsola nitraria P.M and Peganum garmala L.. Foliage cover is 20%. Reaction with HCl acid was strong. Surface of the soil is irregular, fine-pebbles, rank. Visible carbonate inclusions are from 16 cm. The freely soluble salts are from 30cm.

0-6 cm Whitish-gray, dry, loose, loamy sand, silty, with rare roots of plants, macadam inclusions



6-16 cm Light-gray, dry, consolidated, loamy sand, silty, with rare roots of plants, inclusions of fine limestone fragments

16-30 cm Grayish-brown, moist, consolidated, loamy sand with thin loamy inter-layers, unstable lumpy-silty, with rare yellowish inclusions of carbonates, black inclusions of manganese, rare roots of plants, inclusions of red-brown small-sized macadam

30-31 cm Light-brown, dark, moist, consolidated, heavy-loamy, lumpy, with large white veins of salts and carbonate inclusions

31-41 cm Pale-gray, moist, consolidated, loamy sand, with dark-brown loamy twisting inter-layers, non-structured, with plenty of small-sized macadam fragments of limestone

41-65 cm Pale-brown, yellowish, moist, consolidated, loamy sand, non-structured, with inclusions of red-brown macadam and small-sized macadam fragments of limestone, shells

65- 70 cm Red-brown small-sized macadam with inclusions of medium-sized limestone fragments.

Profile №2 deposits in the lower part of escarpment slope. Vegetation is

represented by rare groups of Aeluropus and Petrosimonia triandra. Foliage cover is 5-10%. Surface is irregular, fine-pebbles, covered by fragments of limestone – macadam, vegetation waste, broken shells. Reaction with HCl acid was strong. Carbonates in the form of rare spots are from 18cm. The freely soluble salts are within 21-24cm.

0-5 cm Grayish-brown, dry, loose, friable, silty, loamy sand, with roots of plants, macadam fragments of limestone.

5-18 cm Grayish-brown, dry, loamy sand, consolidated, lumpy-silty, with single roots, macadam fragments of limestone.

18-24 cm Pale-brown, light, fresh, consolidated, with thin heavy loamy dark-brown and greenish-brown inter-layers, lumpy, with roots of plants, inclusions of carbonates, salt veins, inclusions of macadam fragments of limestone.

24-68 cm Pale-brown, fresh, non-structured, loamy sand, with small-sized inclusions of macadam fragments of limestone, red-brown macadam, shell and pebble.

Profile №3 deposits in the lower part of the abrupt coast under rare vegetation. Foliage cover is 10%. Reaction with HCl acid was strong. Carbonates in the form of rare spots are from 5 cm. Surface is irregular, fine-pebbles, covered by rare fragments of limestone – macadam, shell.

0-5 cm Pale-gray, dry, loose, friable, loamy sand, silty, with plenty of plant roots and inclusions of small-sized macadam.

5-16 cm Pale-gray, dry, consolidated, loamy sand, unstable lumpy-silty, non-structured, with rare large spots of carbonates, plenty of plant roots.

16-24 cm Pale-brown, dark, dry, consolidated, loamy sand, lumpy, with inclusions of carbonates in the form of whitish spots, rare plant roots, large and small fragments of limestone.

24-46 cm Pale-brown, yellowish, fresh, loamy sand, consolidated, silty, with rare veins of carbonates, single plant roots.

46-58 cm Grayish-brown, dark, moist, loamy sand, consolidated, unstable lumpy-silty, with plenty of carbonates and limestone fragments.

Brown desert solonetzic and alkali rank soils are widespread on the plateau. Vegetation is represented by Artemisia and Anabasis salsa communities; foliage cover is 40%. Ground water is at a significant depth (5-12m) and does not provide impact upon the soil formation processes. Brown soils of the plateau have relatively developed profile. Thickness of humus horizon is 25-30cm. The inclusions of carbonates in the middle and lower part of humus horizon, all-round presence of large amount of water-soluble salts (sulphates), crystal gypsum and limestone fragments in the lower horizons of the profile are typical for these soils. The limestone plate underlies these soils. Light loamy soils and various loamy types predominate in granulometric composition.

Thus, the studied area includes the soils that have low agricultural and economic value. The outcrops of hard rocks occupy the large areas and are the waste land.

Tab. 6.21 Grain composition and type of soil at the Base site

Profile #	Sampled depth (cm)	>10	10-5	5-2	2-1	1-0.5	0.5-0.25	0.25-0.1	0.1-0.05	0.05-0.01	0.01-0.005	0.005-0.001	<0.001
1 south of site	6-16	6.8	9.7	9.0	7.0	4.3	7.4	3.9	13.9	22.6	6.1	5.5	3.8
	16-35	-	3.0	4.4	7.0	14.6	15.1	5.2	16.1	14.3	6.2	8.3	5.8
	41-65	-	5.9	7.8	10.7	21.2	22.2	7.0	8.2	7.7	2.3	3.7	3.3
2 mid of site	5-18	-	7.7	8.6	6.4	4.2	11.6	4.5	14.1	20.1	6.4	9.2	7.2
	21-24	-	1.8	1.0	0.8	3.1	27.3	6.6	11.1	19.0	6.3	13.4	9.6
	46-68	-	0.8	1.6	3.6	21.1	51.8	6.5	3.0	5.4	0.9	2.4	2.9
3 north	0-24	1.6	4.9	5.4	5.8	8.1	9.3	6.0	22.5	17.5	6.4	8.1	4.4
	38-60	1.0	2.8	2.9	4.4	7.6	14.8	6.8	21.6	17.6	5.0	10.0	5.5

6.6 SEABED SEDIMENTS

Seabed shallow sediments were examined at 7 points (BS1-7) during fieldwork in July 2005. Seabed stratigraphy was determined from three 25m boreholes (BH1-3) drilled in June 2005 (Fig 8.1) for points position). Within the offshore part of the Base site and around it Quaternary silty sands and sands are well developed. They lay on Neogenic source rock or clay.

Shallow (0-5cm) sediments survey gave the following results:

BS1 Depth 2.90 m. Multicoloured with brownish appearance fine grained, semi rounded poorly sorted sand with very few medium sized shell fragments. No large rocks, organic matter or weeds.

BS 2 Depth 5.00m. Isolated weeds grow on dark grey organically rich very fine silt with about 20% of fine sand and shell fragments

BS3 Depth 5.40m. Dark grey organically rich silty clay with about 5% of fine sand and occasional shell fragments

BS4 Depth 5.30m. Dark grey organically rich fine silt with numerous and intact shells of brachiopods, gastropods and bivalves and few small well rounded pebbles. Visually in situ sediments appeared to have fine grey sand but this did not show in the sample. Isolated short (15cm) weeds.

BS5 Depth 6.50m. Black organically rich silty clay with shells and small well rounded pebbles

BS6 Depth 5.80m. Very soggy black organically rich silty clay with weeds mat on top

BS7 Depth 4.90m. Black organically rich fine silt with is overlaid by 1.5m of dead weeds mat

So on average the site surface sediments consist of grey to black silt with sandy band near the shore at the north end and thick dead weed mats at the south edge.

Drilling showed that from the north to about the middle of the site the first 2-3.8m consist of semi compacted (density 1,92 g/cm^3) medium to coarse sand with gravel (up to 20%) (BH1 and 3). At the south end of the site it is replaced by organically rich light (density =1.62 g/cm^3) silty sand and silt of almost muddy consistency with sand interlayers in about 20% of this layer (BH2). Light-green to dark grey plastic clay with sand interlayers lie under them. The layer density is 1.88 g/cm^3. It stretches further than the drilling depth (25m). This layer is likely to be continuation of the regional seal for the shallow groundwater aquifers found onshore.

6.7 HYDROLOGICAL CONDITIONS

Surface water is represented by the Caspian Sea. Main factors influencing the regime of streams in the North part of the 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 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 maximum in June-July and minimum in December-January. Diversity of opinions about the reasons of long-term fluctuations of Caspian level suggests that all geological, hydrological and climatic factors may influence the long-term level of Caspian Sea.

In the recent years water characteristics in the Tyub-Karagan Bay have changed little (Tab. 6.22), Variations of temperature, salinity and dissolved oxygen are most likely to be seasonal. Data from 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 the stations 10 (higher at bottom) and 1 (higher at surface).

Tab. 6.22 Basic physio-chemical parameters of sea water in the Tyub-Karagan Bay, May 1998-June 2003

Parameters	May 1998	December 1998	October 1999	April 2000	August 2001	April 2002	June 2003
Transparency (m)	-	7.4	1.6	3.7	4.2	2.4	2.4
Turbidity (NTU)	8.2	-	-	1.3	14	25	40
Surface temperature (°C)	12.3	4.3	11.7	14.8	22.6	7.6	20
Bottom temperature (°C)	12.1	2.8	11.7	14.4	18.2	7.5	19.6
Salinity (‰)	10.2	7.8	8.0	8.2	12	12	11
pH	8.7	8.5	8.4	9.0	8.3	7.9	8.4
0_2 (mg/l)	9.8	12.3	9.6	-	10.1	3.1	9.9

6.8 HYDROGEOLOGICAL CONDITIONS

Four boreholes were drilled at the site in May-June 2005. Groundwater at the Base Site was encountered at depth of 0.6 m 0.9 m but only in two boreholes (CKBH 1 and 2 on Fig.8.1) that lie about half a meter lower than the other two boreholes (3 and 4). The thickness of groundwater at the lower southern part of the site did not exceed 1.5 m. Apart from the low thickness of the aquifer; the absence of a distinct ground water table at the site is also evident as seen by large variations and high diversity of chemical composition and a wide range of salinity (10.6-18.8 g\l).

Tab. 6.23 Groundwater properties at CKBH 1 borehole at the Base site.

Parameters	Mg/l	$Mg_{equivalent}$/l	$Mg_{equivalent}$/l in % to total
Na+K	3857.1	167.7	57.1
Ca	701.4	35.0	11.9
Mg	1106.6	91.0	31.0
Total cations	5 665.1	293.7	
Chlorides	7 171.0	202.0	68.8
SO_4 (sulphates)	4 159.3	86.5	29.4
HCO_3 (hydrocarbonate)	317.2	5.2	1.8
Total anions	11 647.5	293.7	
Sum of salts	17 312.6		
Dry residual	17 838		
Hardness (total)		126	
Hardness from carbonates		5.2	
pH			7.1

Tab. 6.24 Water properties at the well in Atash village (used only for garden and cattle)

Cations				Anions			
Component	mg/dm^3	$mg\text{-}eq/dm^3$	% $mg\text{-}eq/dm^3$	Component	mg/dm^3	$mg\text{-}eq/dm^3$	% $mg\text{-}eq/dm^3$
Sodium	410.00	17.83	51.30	Carbonates	ND	ND	ND
Potassium	60.00	1.54	4.40	Hydrogen carbonate	204.40	3.40	9.70
Calcium	146.10	7.30	21.00	Chlorides	551.30	15.50	45.00
Magnesium	98.50	8.10	23.30	Sulphates	568.80	11.84	34.30
Ammonium	ND	ND	ND	Nitrates	230.40	3.72	10.80
Iron (+2)	ND	ND	ND	Nitrites	0.20	0.00	0.00
Iron (+3)	ND	ND	ND	Fluorides	1.12	0.06	0.17
Sum	715.00	34.76	100.00	Sum	1556.20	34.52	100.00
Mineralization	2277			Total hardness		15.4	
Mineralization 1/2 HCO3	2175			Carbonate hardness		3.35	
Solid residual	2231			Permanent oxidability perm	No		
pH	7.8			SiO2	6		

As at the site, and throughout the Tyub-Karagan peninsula, the shallow groundwater aquifers are not protected from surface contamination because of high permeability and the relatively poor water holding capacity of the ground that overlies them. Most of them recharge by infiltration of precipitation. The flow at the site follows the regional direction: from plateau (NE) to the sea (SW) but proximity to the sea and the shallow relief allow seawater to interfere with the near shore groundwater level and chemistry.

Tab. 6.25 Water properties at the Ketykskiy water intake well (used for drinking by the majority of local population)

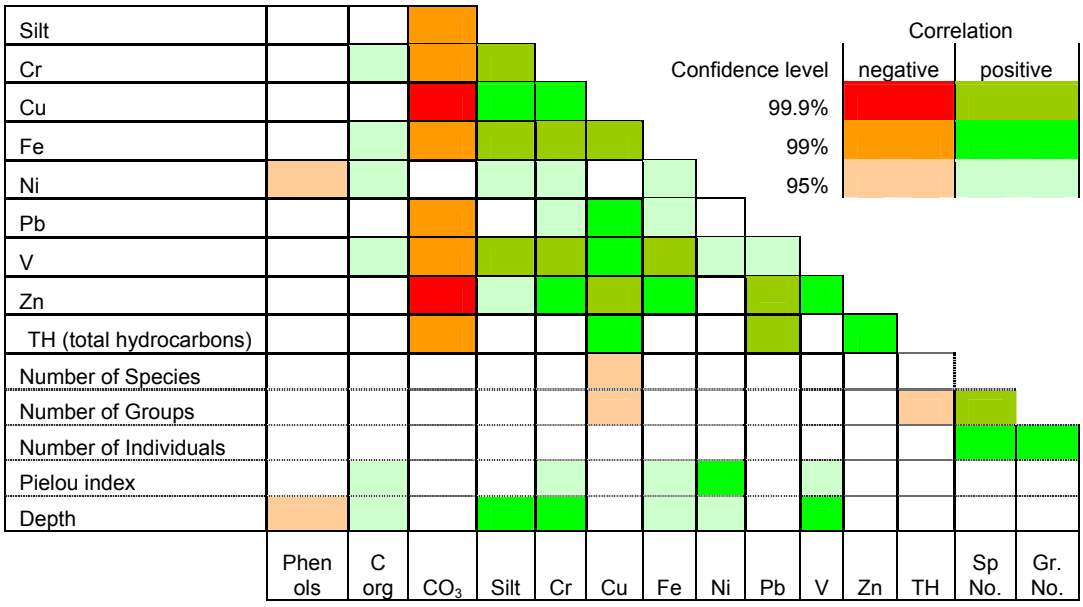
Cations				Anions			
Component	mg/dm^3	mg-eq/dm^3	% mg-eq/dm^3	Component	mg/dm^3	mg-eq/dm^3	% mg-eq/dm^3
Sodium	420.00	18.26	62.30	Carbonates	ND	ND	ND
Potassium	2.60	0.07	0.20	Hydrogen carbonate	140.30	2.30	7.80
Calcium	82.10	4.10	14.00	Chlorides	572.20	16.10	55.00
Magnesium	83.90	6.90	23.50	Sulphates	496.00	10.33	35.20
Ammonium	ND	ND	ND	Nitrates	33.20	0.54	1.80
Iron (+2)	ND	ND	ND	Nitrites	ND	ND	ND
Iron (+3)	ND	ND	ND	Fluorides	1.26	0.07	0.23
Sum	589.00	29.33	100.00	Sum	1243.00	29.37	100.00
Mineralization	1839			Total hardness		11	
Mineralization 1/2 HCO3	1769			Carbonate hardness		2.3	
Solid residual	1921			Permanent oxidability perm	No		
pH	7.9			SiO2	7.5		

6.9 EXISTING POLLUTION

Information on existing pollution was separated from the physical environment description given earlier in this chapter to emphasise the industrial load that is already tolerated by the plant and animal communities in the Bay. To provide the link between physical properties of abiotic and biotic parameters and existing pollution, the following correlation exercise is presented for the marine environment.

The analysis of Kindall rank correlation coefficients of abiotic and biotic parameters from AgipKCO Tyub-Karagan Bay survey in April 2004 showed the association between high silt/clay content and increased water depth, as well as indicating the relationship between silt/clay and sediment metals. The results also highlighted a link between the general macrobenthic parameters with sediment total hydrocarbons and copper, reflecting the slightly reduced communities found at the inner Bay where higher levels of contamination were found.

Tab. 6.26 Kindall rank correlation coefficients analysis of abiotic and biotic parameters, (from AgipKCO Tyub-Karagan Bay survey, April 2004). Parameters that had no correlation were omitted for clarity.



Existing data for the onshore environment is not sufficient to perform a similar analysis. Instead, such dependencies are described in the impact assessment section.

6.9.1 Air emissions

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, NOx, 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, CO2, SO2, soot, odor
Gas and wood (cold period) burning at private houses	CO_2, SO_2, soot,

Tab. 6.27 Average daily concentrations of the main air pollutants in the studied area (mg/m3). Data from spring 2004 Agip KCO survey. See for point's location.

Point number	Quarter	Dust	CO	SO_2	THC	CH_4	NO	NO_2
A1	IV	0.05	0.1	0.0024	0.7	0.3	0.0033	0.0023
	III	**0.14**	0.4	0.0003	**2.0**	1.0	0.0032	0.0022
	II	0.07	0.5	0.0052	**4.5**	2.3	0.0057	0.0040
	I	0.01	0.7	0.0063	**1.9**	5.0	**0.118**	0.0082
A2	IV	0.05	0.1	0.0025	0.7	0.2	0.0021	0.0015
	III	**0.12**	0.5	0.0001	**2.0**	1.0	0.0008	0.0006
	II	**0.11**	0.4	0.0049	**4.3**	2.1	0.0052	0.0036
	I	0.08	0.7	0.0068	1.5	5.2	0.0117	0.0082
A3	IV	0.05	0.1	0.0022	0.3	0.1	0.0023	0.0016
	III	**0.19**	0.2	0.0001	0.3	0.1	0.0012	0.0009
	II	**0.18**	0.4	0.0058	1.2	0.7	0.0060	0.0042
	I	0.01	0.9	0.0064	**1.9**	6.6	0.0122	0.0086
A4	IV	0.06	0.1	0.0003	0.1	0.1	0.0008	0.0003
	III	0.1	0.2	0.0001	0.1	0.1	0.0011	0.0008
	II	0.09	0.6	0.0063	1.2	0.6	0.0049	0.0034
	I	0.02	1.0	0.0071	1.0	4.3	0.0111	0.0078
MPC		0.10	3	0.05	1.5	50	0.06	0.04

State monitoring of air quality in the studied area is not implemented. Air quality monitoring has been provided by Agip KCO since 1998. This report indicates the results of the last surveys of the main pollutant concentrations – hydrocarbons, nitric oxides, sulfur dioxide, hydrogen sulphide and mercaptans, implemented on 2004. In addition there is data on the survey of organic compound concentrations, performed by Agip KCO on 2002 (September – December).

As shown in the data given below (Tab. 6.27), 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 amount of these excesses took place in the II and III quarters. This can be explained by the navigation period, i.e. the period of intensive activities for offshore operation support. 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.

Tab. 6.28 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

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. 6.28).

6.9.2 Sea water contamination

The only discharge that is allowed in the Bay is the Desalination Plant processed seawater which should logically not add contaminants, although this has never been checked. Overall, the recorded concentrations of all measured parameters indicated that the Tyub-Karagan Bay water is affected by a combination of natural processes. But occasional accidental spills and domestic sewage seepage do produce some impact. This is most notably observed in the enclosed area of the Bay close to the Bautino port. In general, the available data varied over time but no clear overall trends have been observed. Any changes which were detected over this period most probably were caused by seasonal variability. Yet, presence of e-coli in the water poses a tangible threat to the public health, especially to swimmers.

Marine monitoring has been performed by Agip KCO since 1998 and has been initially based on seven stations. Two additional stations 8 and 9 were added in 1999 and three further stations 10, 11 and 12 in 2001. Specifically, surveys have been undertaken in April/May 1998 (baseline)

and December 1998; October 1999; April 2000; August 2001; April 2002; June 2003; April 2004.

Water quality fluctuations recorded during these surveys were probably due to seasonal changes. Recorded in April 2004 slightly elevated (over the maximum permitted for fish containing water bodies) phenols and total dissolved nitrogen concentrations, could come from algal decay, sewage discharges from the shore or vessels operating in the area, but no clear spatial trends were detected. Hydrocarbon and metals levels in the water were generally within typical ranges recorded over the monitoring period although an above-MPC value for copper was recorded at station 12 in 2004.

The benthic environment was physically and chemically heterogeneous, both spatially and temporally. The recorded concentrations of all measured parameters indicated that the Tyub-Karagan Bay sedimentary environment is influenced by a combination of natural processes and a degree of anthropogenic disturbance, most notably observed in the enclosed area of the Bay close to the Bautino port where several wrecked ships are visible. However, the majority of the temporal variations observed are likely to be due to natural variability or seasonal effects.

Sediment hydrocarbons may originate from a wide number of various different sources, both natural and anthropogenic. In the case of Tyub-Karagan Bay, the elevated levels of hydrocarbons found in the sediments are primarily derived from anthropogenic sources. Indicating that weathered inputs of oil products, mainly diesel and other heavier fuel oils, are likely derived from discharges from historic and current shipping activities. In addition, there may be inputs originating from illegal discharges and land run-off from the nearby settlements.

The average total hydrocarbon levels in the sediments collected in April 2004 from Tyub-Karagan Bay were similar to the previously recorded values, with the same trend of higher hydrocarbon concentrations in the enclosed part of the Bay (notably at stations 01, 07, and 08), and this may be indicative of a localised input of petroleum hydrocarbons at this location.

Sediment concentrations of the metals analysed have generally remained at, or below, baseline levels recorded in May 1998 and no clear trends of variation over time were evident.

6.9.2.1 Hydrocarbons and Phenols concentration

Levels of total hydrocarbon concentration in water samples were low, with the levels recorded in April 2004 falling below the Maximum Permissible Concentration (MPC) for oil products in water (0.05 mg l^{-1}). No clear trends can be observed at the present time.

Concentrations of phenols in samples from Tyub-Karagan Bay and average values of the previous surveys are shown in the Tab. 6.29. Total Hydrocarbon (TH) concentrations in the water samples collected from the water column were generally low, ranging from <0.01 to 0.04 mg/l (table). Some increased phenol levels (0.002-0.014 mg/l) were observed in April 2004 on the stations 1, 2, 3, 4, 6, 8 and 10.

Practically, all of the phenol concentrations recorded in the water in April 2004 exceeded the MPC value of 0.001 mg^{-1}. The average value found in the Bay area (0.005 mg l^{-1}) was similar to those recorded previously (<0.0005 to 0.007 mg l^{-1}), excluding the unusually high value of 0.021 mg l^{-1} recorded in 2003. No clear spatial trends were observed in the data.

As for previous surveys, in October 1999 MPC excess was detected on the five stations (2, 6, 7, 8 and 9), in December 1998 the MPC excess was detected only at the station 5, and in May 1998 – no phenols was detected. It is impossible to determine the source of these compounds now; however, they could be delivered from degraded marine vegetation or from sewage from shore or ships.

6.9.2.2 Nitrogen and Phosphorus

Nitrogen and phosphorus total content on the survey zone is within limits specific for North-East Caspi. Nitrates and nitrites content don't exceed the MPC. The main nitrogen form in the water is nitrate nitrogen.

Tab. 6.29 Levels of hydrocarbons, phenols and nutrients in the water column (mg l-1), Tyub-Karagan Bay survey in April 2004 and comparison of average concentrations with results of the previous surveys

Station	TPH		Phenols		NH_4		NO_2		NO_3		Total N		PO_4	
	surface	seabd	surface	seabed	surf	seabed	surface	seabed	Surface	seabd	surface	seabed	surf	seabed
01	<0.01	<0.01	0.008	<0.001	0.079	0.041	0.007	0.005	0.040	0.060	12.53	6.88	0.028	0.023
02	<0.01	<0.01	0.002	<0.001	0.180	0.063	0.003	0.005	0.111	0.123	2.87	2.73	0.026	0.029
03	<0.01	<0.01	0.001	0.014	0.036	0.056	0.004	0.001	0.112	0.119	2.15	2.06	0.034	0.040
04	<0.01	<0.01	0.007	0.004	0.023	0.059	0.005	0.010	0.104	0.103	2.06	2.02	0.039	0.036
05	<0.01	<0.01	<0.001	0.003	0.056	0.142	0.001	0.005	0.143	0.125	3.24	3.34	0.038	0.043
06	<0.01	<0.01	0.003	0.005	0.031	0.036	0.008	0.007	0.079	0.068	61.26	18.65	0.038	0.042
07	<0.01	0.02	<0.001	<0.001	0.033	0.036	0.003	0.001	0.063	0.078	22.92	33.97	0.034	0.050
08	<0.01	<0.01	0.004	<0.001	0.021	0.033	0.007	0.001	0.103	0.107	19.76	20.52	0.018	0.061
09	0.02	<0.01	<0.001	<0.001	0.045	0.026	0.006	0.001	0.083	0.086	7.61	9.49	0.042	0.063
10	<0.01	0.04	0.008	<0.001	0.041	0.033	0.009	0.010	0.196	0.174	9.82	4.29	0.054	0.027
11	<0.01	<0.01	<0.001	<0.001	0.044	0.036	0.006	0.004	0.103	0.265	6.82	4.64	0.018	0.032
12	0.02	0.02	<0.001	0.001	0.023	0.033	0.004	0.005	0.198	0.233	2.85	6.28	0.019	0.026
Average	0.02	0.03	0.005	0.005	0.051	0.050	0.005	0.005	0.111	0.128	12.82	9.57	0.032	0.039
	0.023		0.005		0.050		0.005		0.120		11.20		0.036	
Jun 2003	0.013		0.021		0.183		0.004		0.216		2.01		0.032	
Apr 2002	0.022		0.003		-		-		-		-		-	
Aug 2001	0.030		0.007		0.053		0.006		0.038		4.02		0.010	
Apr 2000	0.016		0.007		-		-		-		-		-	
Oct 1999	-		0.003		0.060		0.001		0.195		1.39		0.014	
Dec 1998	0.014		0.002		0.109		0.003		0.097		3.59		0.020	
May 1998	0.011		<0.0005		0.095		0.002		0.037		-		0.020	
MPC[1]	0.05		0.001		1.0		3.3		45.0		-		-	

\- Not sampled

[1]MPC values taken from: Summarised list of Maximum Permissible Concentrations (MPC) and Estimated Safe Impact Levels (ESIL) of hazardous substances for water of fishery water basins, 1990 and Sanitary rules and norms of surface water protection from contamination SanPiN, RK no 3, 01.070.98

The increase in regularity of average nitrates content, observed from May 1998 to October 1999, didn't last (except of June 2003), and levels, registered in 2001 were similar to the background. It is impossible to give a correct estimate of any biogenic matter content in the water column because of insufficiency of data which completely describe seasonal and yearly changes in the region.

The ammonium nitrogen (NH_4) content in surface and bottom layer water samples was from 0.021 to 0.142 mg/l. The nitrite (NO_2) concentrations ranging from 0.001 to 0.010 mg/l, and nitrate (NO_3) content was registered within an interval of 0.040-0.265 mg/l, total nitrogen was between 2.02 and 61.26 mg/l (Tab. 6.29).

The elevated total nitrogen levels were recorded in both the inner and outer Bay areas (stations 01, 07, 08 and 06). The elevated values can be attributed to the presence of organic nitrogen compounds of unknown origin. There was no spatial pattern evident.

6.9.2.3 Metals concentrations

The concentrations of the most analysed metals in water were lower than their detection limits or MPC values (Tab. 6.30-31). Copper was the only metal that came close and just above MPC.

Tab. 6.30 Metals levels in surface waters, Tyub-Karagan Bay survey in April 2004

Station	Metals (μg l^{-1})										
	As	Ba	Cd	Cr	Cu	Fe	Hg	Ni	Pb	V	Zn
01	<0.06	6.19	<0.03	2.38	2.81	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
02	<0.06	6.95	<0.03	2.70	2.97	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
03	<0.06	4.00	<0.03	4.00	1.77	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
04	<0.06	5.10	<0.03	2.78	2.25	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
05	<0.06	7.66	<0.03	1.68	2.95	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
06	<0.06	8.57	<0.03	3.70	4.00	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
07	<0.06	12.93	<0.03	2.84	4.70	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
08	<0.06	6.55	<0.03	5.78	3.64	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
09	<0.06	7.12	<0.03	5.75	3.67	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
10	<0.06	9.00	<0.03	3.58	4.24	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
11	<0.06	7.30	<0.03	2.83	3.89	<0.05	<0.04	<0.05	1.54	<0.02	<0.03
12	<0.06	10.95	<0.03	3.20	5.17	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
Average	-	7.69	-	3.44	3.51	-	-	-	-	-	-
MPC*	10	100	10	20	5	50	0.1	10	10	1	50

* MPC values taken from: Summarised list of Maximum Permissible Concentrations (MPC) and Estimated Safe Impact Levels (ESIL) of hazardous substances for water of fishery water basins, 1990 and sanitary rules and norms of surface water protection from contamination SanPiN, RK no 3, 01.070.98

Tab. 6.31 Metals levels in bottom waters, Tyub-Karagan Bay survey, April 2004

Station	Metals (μg l^{-1})										
	As	**Ba**	**Cd**	**Cr**	**Cu**	**Fe**	**Hg**	**Ni**	**Pb**	**V**	**Zn**
01	<0.06	8.43	<0.03	2.12	3.41	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
02	<0.06	3.48	<0.03	2.14	2.05	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
03	<0.06	5.05	<0.03	2.00	2.42	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
04	<0.06	4.62	<0.03	2.00	2.21	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
05	<0.06	13.46	<0.03	2.81	4.44	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
06	<0.06	6.05	<0.03	3.11	3.18	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
07	<0.06	6.43	<0.03	4.60	3.64	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
08	<0.06	9.25	<0.03	5.00	4.22	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
09	<0.06	10.72	<0.03	3.21	4.68	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
10	<0.06	10.43	<0.03	3.01	4.65	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
11	<0.06	13.04	<0.03	3.00	4.95	<0.05	<0.04	<0.05	<0.01	<0.02	<0.03
12	<0.06	8.95	<0.03	3.82	4.24	<0.05	<0.04	<0.05	0.41	<0.02	<0.03
Average	-	8.33	-	3.07	3.67	-	-	-	-	-	-
MPC*	**10**	**100**	**10**	**20**	**5**	**50**	**0.1**	**10**	**10**	**1**	**50**

* MPC values taken from: Summarised list of Maximum Permissible Concentrations (MPC) and Estimated Safe Impact Levels (ESIL) of hazardous substances for water of fishery water basins, 1990 and sanitary rules and norms of surface water protection from contamination SanPiN, RK no 3, 01.070.98

Tab. 6.32 Concentration of hydrocarbons and phenols (mg\kg) in bottom sediments outside the proposed Base layout

Sample ID	HC	Phenols
BS-1	5	<0,01
BS-2	11	0.015
BS-3	5	<0,01
BS-4	10	<0,01
BS-5	10	<0,01
BS-6	12	0.01
BS-7	<5	<0,01

6.9.3 Sediment pollution

Sediment pollution was analyzed from the results of:

1. Agip KCO Tyub-Karagan Bay monitoring at 12 stations that has been performed since 1998;
2. Analyses of sediments from two 2.5m boreholes collected in July 2005 by PGS Onshore Inc Aktau branch for

obtaining permission to use dredged material as a fill for the Base;

3. Analyses of sediments samples collected by CE field team around the Base site at the perspective environmental monitoring points in July 2005.

While the first study give adequate spatial and temporal picture of contamination, the other two studies give site specific results. Positions of the AgipKCO monitoring points are given in Fig 6.1. Positions of the other sampling points are given in Fig 8.1.

6.9.3.1 Hydrocarbons and phenols in sediments

No hydrocarbons were detected by PGS in the 1.5kg bulk samples. CE field team collected samples from 5cm depth directly into 0.25 jars and has frozen them. Analyses showed low concentrations

Hydrocarbon and phenol concentrations in sediments are described in tab 6.33, 6.34 and graphically represented in Fig. 6.5. Hydrocarbon concentrations in bottom sediments have not indicated the large changes over the survey period. Maximum values usually were registered at stations 1 and 7 and recently at station 8 in the inner part of bay. This was expected taking into account the presence of some visible ship fragments in this bay and oil films on the water surface.

The sediment phenol concentrations were slightly higher in the inner part of the bay with the highest levels being recorded at stations 01, 03, 07 and 08. The levels obtained on April 2004 were similar to the values recorded previously. Similarly to the phenol concentration in sea water, this is the result of less mixing of water levels. As a result, the natural marine vegetation decays materials. Oil and sewage degradation products are not delivered to the sea, but deposit in the bay.

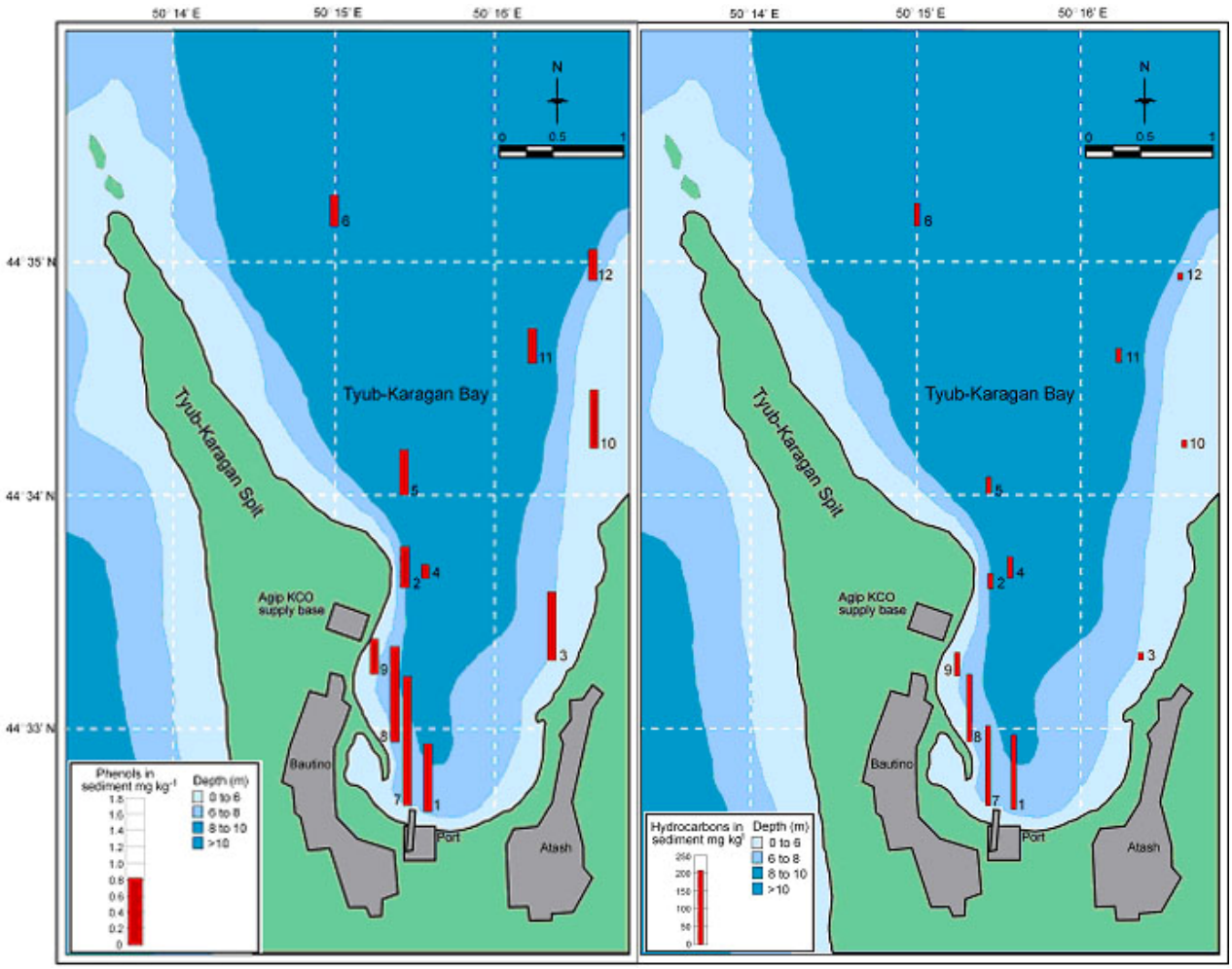


Fig 6.5 Sediment phenols and hydrocarbons concentrations, April 2004

Tab. 6.33 Total hydrocarbon concentrations (mg/kg) in benthic sediments (from AgipKCO Tyub-Karagan Bay surveys)

Station	May 1998	Dec 1998	Oct 1999	Apr 2000	Aug 2001	Apr 2002	Jun 2003	Apr 2004
01	153	-	-	198	161	220	195	208
02	222	-	107	19.7	32.9	37.9	56.2	43.0
03	34.9	-	34.9	24.3	3.3	9.3	18.6	19.6
04	91.8	-	-	44.8	65.9	55.4	82.5	60.1
05	31.6	-	57.1	46.0	20.0	50.5	86.5	47.3
06	55.8	-	56.9	22.5	21.6	27.8	55.1	63.6
07	291	-	322	167	1 164	1 777	648	224
08	-	-	-	176	157	204	316	190
09	-	-	-	5.1	70.5	7.9	266	66.1
10	-	-	-	-	13.7	17.4	32.4	20.2
11	-	-	-	-	17.0	26.2	36.0	38.6
12	-	-	-	-	4.5	17.2	23.5	17.8
Average								

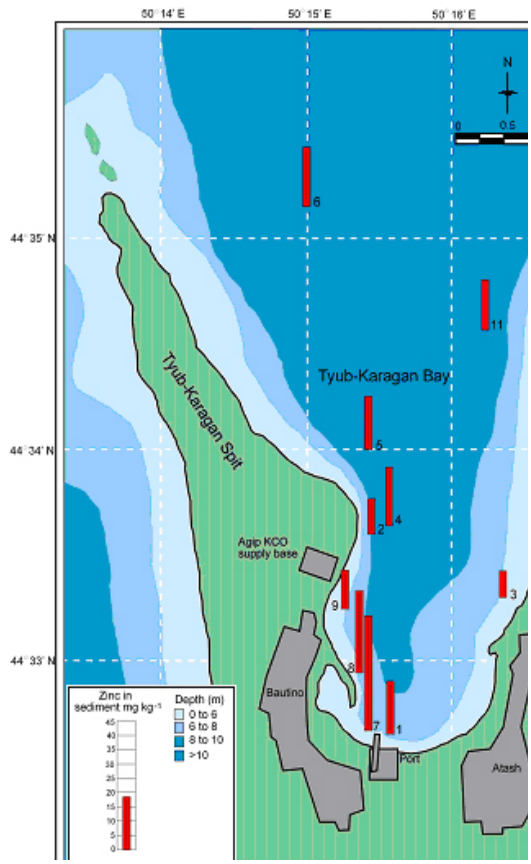


Fig 6.6 Spatial representation of sediment zinc concentrations, April 2004

Tab. 6.34 Phenols concentrations (mg/kg) in benthic sediments (from Tyub-Karagan Bay surveys)

Station	May 1998	Dec 1998	Oct 1999	Apr 2000	Aug 2001	Apr 2002	Jun 2003	Apr 2004
01	0.37	0.69	0.42	2.84	0.01	0.273	2.42	0.83
02	0.18	1.22	0.87	0.22	0.23	0.050	1.63	0.50
03	0.06	0.19	0.29	8.05	0.02	0.009	<0.25	0.83
04	0.13	0.58	0.45	0.65	0.25	0.016	0.32	0.17
05	0.16	0.24	0.34	0.75	1.29	0.122	1.28	0.55
06	0.22	1.10	0.76	0.77	1.02	0.132	1.86	0.39
07	0.01	1.90	0.32	0.83	1.04	0.121	2.95	1.57
08	-	-	0.70	0.74	0.40	0.012	1.52	1.17
09	-	-	0.80	0.19	0.04	0.007	2.43	0.43
10	-	-	-	-	2.59	<0.001	1.09	0.71
11	-	-	-	-	0.67	0.01	0.75	0.43
12	-	-	-	-	0.29	<0.001	<0.25	0.37
Average	0.16	0.85	0.55	1.67	0.65	0.075	1.63	0.66

6.9.3.2 Metals in bottom sediments

The concentrations of eleven metals were measured in each sample: As, Ba, Cd, Cr, Cu, Fe, Hg, Ni, Pb, V, and Zn.

The metals data obtained from the 2004 survey are shown below. The spatial distribution of sediment zinc is displayed in Fig 6.4. The spatial variability of sediment metals was generally relatively low, however, it was noted that slightly elevated levels of lead and zinc were recorded near the Bautino port at stations 07 and 08. The levels of cadmium and mercury were lower than their detection limits at all stations. The metals concentrations were generally within the ranges recorded previously. The exceptions were sediment nickel concentrations, which were

slightly lower than historic levels, and lead values which were slightly higher than in recent surveys.

Tab. 6.35 Analyses of sediments from two 2.5m boreholes collected in July 2005 by PGS Onshore Inc Aktau branch and analysed by the Aktau Sanitary Epidemiological Service.

Sampled point	Sampled depth (cm)	TPH (mg/kg)	Metals (mg/kg)					Specific energy of radionuclides Bk/kg		
			Cu	Pb	Cd	Zn	Hg	Ra-226	Th-232	Ka-40
CPT 2	0-50	ND	1.8	6.0	ND	6.2	ND	0±5	9.9±4	108±35
CPT 2	50-150	ND	5.2	6.2	ND	8.0	ND	10.72±7.2	4.2±4.1	50.5±32.3
CPT 2	150-250	ND	10.1	6.9	ND	7.7	ND	0±4	10.3±3.5	112±38
CPT 3	0-60	0.18	2.0	1.6	ND	2.5	ND	0±5	14.3±6	152±41
CPT 3	60-100	ND	4.8	2.3	ND	3.0	ND	0±5	10.3±8	201±47
CPT 3	150-200	ND	5.5	4.8	ND	3.3	ND	0±5	18.3±8	312±51
CPT 3	200-250	ND	6.2	4.8	ND	3.0	ND	0±7.2	30.4±8	403±76
MPC or background*		1000	3.0	32.0	0.5	23.0	21.0	11-52	7.5-48	110-740

*MPC-Maximum Permitted Concentration is given for soil as a guideline. There is no MPC for bottom sediments. Typical background energy is given for radionuclide from Moiseyev A.A and Ivanov V.I., "Dosimetry and radiological hygiene manual"

Tab. 6.36 Levels of metals in benthic sediments (mg kg-1 dw) (from Tyub-Karagan Bay survey, April 2004).

Station	As	Ba	Cd	Cr	Cu	Fe	Hg	Ni	Pb	V	Zn
01	4.0	374	<0.05	1.0	4.3	5,007	<0.05	<0.1	8.3	8.8	18.7
02	2.9	516	<0.05	1.8	3.0	4,516	<0.05	<0.1	3.2	8.8	12.5
03	4.9	288	<0.05	<0.2	1.7	3,674	<0.05	<0.1	2.8	7.1	9.4
04	4.2	287	<0.05	5.4	4.8	6,813	<0.05	0.4	6.0	14.6	20.6
05	4.2	195	<0.05	4.9	4.7	6,645	<0.05	<0.1	5.8	14.0	18.8
06	3.9	136	<0.05	7.7	5.4	7,487	<0.05	4.8	5.5	16.0	20.6
07	3.8	292	<0.05	2.5	4.7	5,844	<0.05	<0.1	13.2	9.4	40.1
08	4.7	251	<0.05	3.3	7.1	6,544	<0.05	<0.1	10.1	10.8	28.7
09	3.3	344	<0.05	0.5	3.4	4,711	<0.05	<0.1	4.5	8.8	13.6
10	4.4	205	<0.05	<0.2	1.9	3,828	<0.05	<0.1	2.5	6.5	9.6
11	3.6	117	<0.05	4.2	4.3	6,630	<0.05	0.3	4.9	13.2	17.7
12	5.2	99	<0.05	<0.2	1.7	3,594	<0.05	<0.1	2.0	7.0	7.8
MPC											

Tab. 6.37 Metals concentration ranges (mg/kg) in benthic sediments (data from Tyub-Karagan Bay surveys, May 1998 to April 2004).

Parameter	May 1998	Dec 1998	Oct 1999	Apr 2000	Aug 2001	Apr 2002	Jun 2003	Apr 2004
As	6.9 - 10.1	7.2	5.8 - 11.0	3.2 - 7.1	<6	<6	<6	2.9 - 5.2
Ba	216 - 570	422	210 - 338	201 - 608	138 - 308	115 - 447	218 - 665	99 - 516
Cd	0.06 - 0.20	0.1	<0.05	<1	<0.05	<0.25	<0.25	<0.05
Cr	18 - 36	10	5 - 33	8 - 54	4.8 - 25.1	3.4 - 22.6	4.0 - 17.4	<0.2 - 7.7
Cu	11 - 23.3	8.0	3.8 - 23.0	4.6 - 27.0	2.5 - 24.4	1.2 - 19.0	5.1 - 18.0	1.7 - 7.1
Fe	7,7 - 18,3	10,280	5,9 - 15,6	420 – 17,9	3,3 - 17,7	2,0 - 17,2	4,5 - 17,4	3,7 - 7,5
Hg	<0.04	0.06	<0.05	<0.1	<0.1	<0.1	<0.1	<0.05

Ni	12.0 - 29.0	8.0	6.2 - 26.0	2.6 - 17.9	3.0 - 20.0	1.3 - 20.0	9.2 - 25.3	<0.1 - 4.8
Pb	16 - 32	11	<2 - 4.6	<1.5 - 22.0	<1.5	<1.5	<1.5	2.0 -13.2
V	18 - 42.3	19.0	14.0 - 25.0	14.4 - 54.8	7.1 - 30.0	4.6 - 20.8	13.5 - 33.4	6.5 - 16.0
Zn	30 - 60	22	3.6 - 49.0	6.8 - 71.3	7.4 - 45.7	8.0 - 124.0	15.0 - 56.0	7.8 - 40.1

6.9.4 Groundwater Contamination

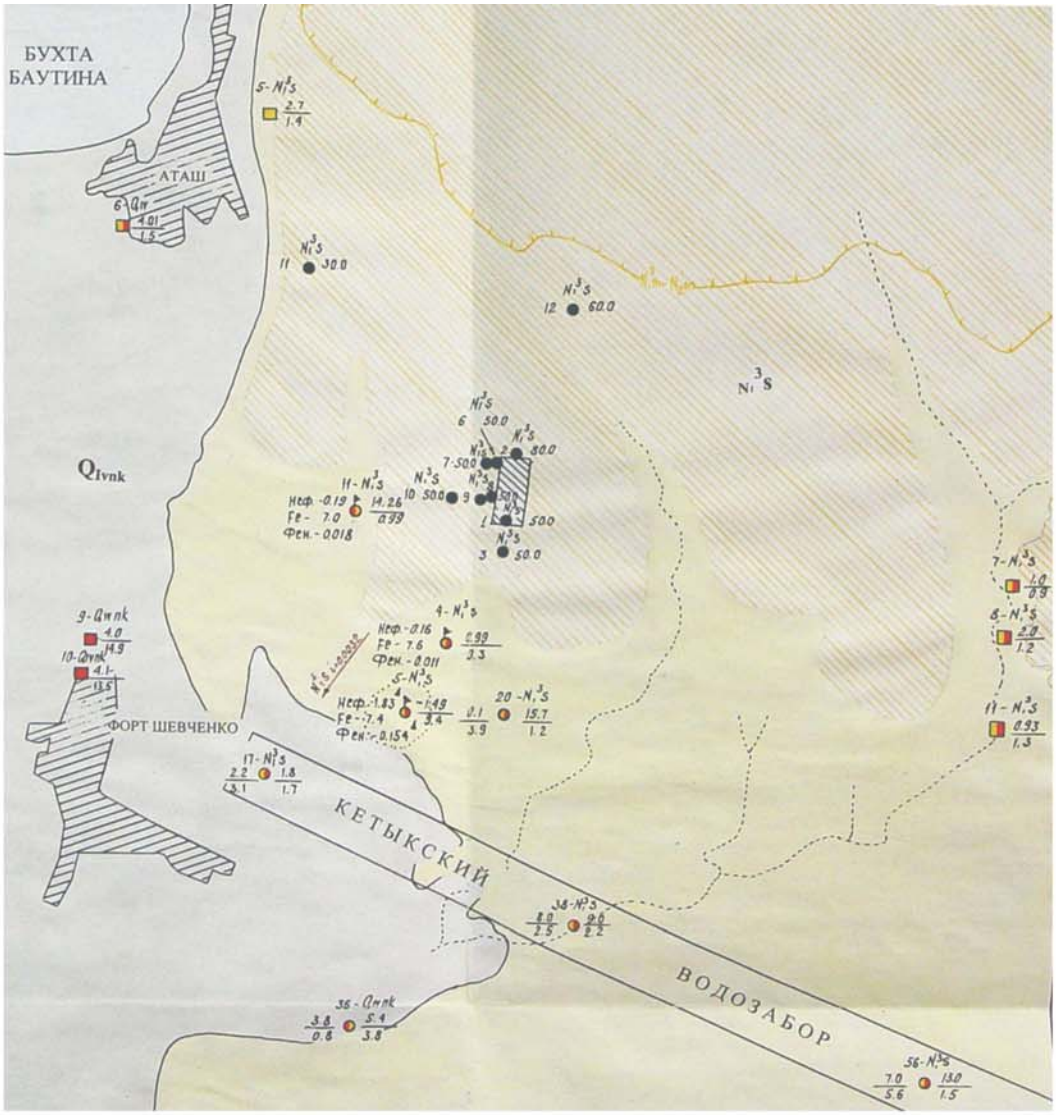
Groundwater in the studied area has been distributed sporadically, most likely following cracks in limestone. Contamination of groundwater at the site was not examined because close contact with the sea water will not allow forming a meaningful conclusion from the results. Examination of the well at the south end of Atash showed a low (0.12mg/l) concentration of petroleum hydrocarbons in it that could originate from the adjacent road. The well east of the village recharges from the rainfall. As of the time of assessment it had a small puddle of standing water. It was not examined for contamination.

Other data came from the long term monitoring of AgipKCO waste management facilities. Wells 4, 5 and 11 have been selected to characterize the regional groundwater quality (Tab. 6.38). In addition, water quality was checked at well 17 that lies down gradient from these wells and serves as a drinking water source for a large proportion of the local population.

Tab. 6.38 Pollution content in ground water (mg/L) in forth quarter of 2004 (AgipKCO monitoring data). Values in excess of the maximum permitted concentrations (MPC) in potable water are shown in bold.

Pollutant	Well 4	Well 5	Well 11	Average	MPC
Ammonia (NH_4)	1,39	1,52	0,11	1	-
Nitrites (NO_2)	0,18	0,008	<0,003	0,06	3,3
Nitrates (NO_3)	1,9	0,3	2,1	1,4	45
Fluorine (F)	0,33	0,34	0,74	0,47	1,5
Oil products	0,13	**0,99**	**0,73**	**0,6**	0,3
Phenols	**0,011**	**0,028**	**0,022**	**0,02**	0,001
Ferrum (Fe)	7,1	8,5	10,4	8,7	0,3
Cuprum (Cu)	0,05	0,05	0,008	0,04	1
Nickel (Ni)	**0,17**	**0,16**	0,09	**0,14**	0,1
Cadmium (Cd)	**0,02**	**0,02**	**0,003**	**0,014**	0,001
Cobalt (Co)	0,08	0,07	0,012	0,05	0,1
Plumbum (Pb)	**0,1**	**0,11**	0,02	0,08	0,03
Zinc (Zn)	0,09	0,08	0,03	0,07	1
Silicic acid (SiO_2)	1	1,8	5,5	2,8	10
Carbon dioxide (CO_2)	ND	ND	1,89	0,63	1
Synthetic Surfactants	**1,75**	**1,7**	**1,9**	**1,78**	0,5
BOD, mg O_2/dm^3	**21**	no data	**4**	**10**	3
COD, mg O_2/dm^3	**1400**	5	**1500**	**1533**	<30
Permanganate oxidizing capacity mg O_2/dm^3	4,5	**7,6**	2,2	4,8	5
Phosphate	0,02	0,01	0,03	0,02	3,5

Although the potable water standards are exceeded for 6 pollutants (iron results are not indicative in the monitoring wells with metal casing), in comparison with the results for the previous years' surveys, there is a clear pollution reduction trend. For instance, although phenols still are 20 times higher than MPC, their concentration has halved in comparison to the previous quarter.



Novocaspian modern aquifer. Sands with shell

Water-permeable, but almost arid, Lower-Miocene and Upper Pleiocen horizon. Oolitic limestone.

Miocene Sarmatian local aquifer. Limestones with rare clay and marl layers and lens. Clays

Hydrogeological well. At the top: number in the map and index of water-bearing subdivision age. On the left: in numerator - debit, l/sec; in denominator - fall, m. On the right: in numerator - depth of standing level, m; in denominator - water mineralization, g/l

Well. At the top: number in the map and index of water-bearing subdivision age. On the left: debit, l/sec, On the right: in numerator - water level depth, ,m; in denominator - water mineralization, g/l

Monitoring well. At the top: number in the map and index of water-bearing subdivision age. On the right in numerator - absolute mark of standing water level, m; in denominator - water mineralization, g/l; on the left - index of pollutant and its concentration, mg/l. Fill corresponds to the water chemical composition

Dry monitoring well. At the top: geological index of the rock on the bottom; on the left: number on the map, on the right: depth (m), chemical type of the water: yellow - sulphate, red - chloride

Drilling sludge landfill, evaporation lagoons

Direction of ground water flow and index of water-bearing subdivision

Counter of ground water pollution with oil materials over MPC=0.3 mg/l

Fig 6.7 Schematic hydrogeological map of the project area (scale 1:25000)

High concentrations of lead (2.7 MPC) and nickel (1.4 MPC) can be explained by their excessive presence in soil tested during the same monitoring program (Tab. 6.41). Excess in cadmium (14MPC) is difficult to explain. Considering elevated values for surfactants, BOD and COD, it may be that all these pollutants come from the monitored landfill.

Tab. 6.39 Total level of MPC overrunning by the main pollutants in 2004.

Quarter	Oil products	Phenols	Fe	Ni	Cd	Pb
1	3,4	42	47,7	1,4	19	2,1
2	3,3	79	24,5	1,1	19	3,0
3	1,8	40	21,7	1,1	15	2,7
4	2,0	20	29,0	1,4	14	2,7

The highest levels of pollutants in groundwater in and the 1 and 2 quarters of 2004, could be explained by more active transport by percolating thaw and rain water but information for a longer period of time is needed to detect such seasonal variations.

6.9.5 Potable Water quality

Drinking water for a major part of the population of the studied area comes from the three artesian wells of Ketyk water abstraction (Fig 6.5). 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 by the Sanitary-Epidemiological Station (SES) analyses data (coliphages, coliforms, pathogens, pH, ozone, associated and free chlorine, chlorides, ammonia, nitrates and nitrites, sulfates, 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.

6.9.6 Soil contamination

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)*.

Tab. 6.40 Concentration of total petroleum hydrocarbons in soil of the Base site.

Profile #	Sampled interval (cm)	TPH mg/kg
1 south	30-44	31
2 middle	5-18	46
3 north	0-24	15

*MEP decree #21-P by 27.01.2004

Soil sampling by Agip gives an idea of soil contamination at the area around the site.

Soil sampling was performed at 8 points, using point 6 as a background, because it is located beyond the area impacted by the landfill and other Agip KCO services (Fig 1.1).

Samples were collected from 0.0-0.5m 2 times per year – in spring and autumn; each sample amount is 3 kg. Content of total hydrocarbons and heavy metal salts were studied in the ground samples. Data on the results are given in Table 6.41. Comparison with MPC for soils assumed according to RND 03.1.0.1.01-96, Appendix 8 for mobile forms, was performed.

Tab. 6.41 Concentration of contaminants in the ground in II and IV quarters, 2004 (mg/kg)

№ of point	TPH		Cu		Ni		Co		Pb		Zn		Cd	Hg
	II q	IV q	II q	IV q	II q	IV q	II q	IV q	II q	IV q	II q	IV q	II,IV q	II,IV q
6	2,0	2,0	15	20	28	28	15	15	24	23	44	50	ND	ND
1	3,1	7,0	21	15	28	ND	12	ND	44	36	44	35		
2	3,7	4,0	20	27	28		13		17	25	50	58		
3	2,5	14,0	21	16	32		12		35	30	40	50		
4	2,0	3,0	17	10	26		11		32	25	40	36		
5	1,5	1,0	15	12	24		11		39	25	43	23		
7	3,0	5,0	15	8	35		13		48	62	44	23		
8	2,7	2,0	15	13	31		12		60	34	40	35		
Average	2,6	4,8	17,4	15,1	29,0		12,4		37,4	32,5	43,1	38,8		
MPC	1000		3		4		5		3		23		2	2,1

The following was determined during the comparison of obtained results with MPC and background concentration:

- Petroleum concentration is lower than MPC everywhere, but at the same time, an excess of background by 2-7 times is detected within the landfill (sites 1-3, 7, 8). This is connected with accumulation of aromatic hydrocarbons, emitted from evaporators where the petroleum concentration is higher than background at site 4, located near Aktau – Fort-Shevchenko road and site 7 of Bautino marine harbor;

- Nickel, cobalt, mercury salts were not detected in heavy metal complex in IV quarter. Mercury and cadmium salts were not detected in II quarter;

- Mercury concentration is higher than MPC by 2.7-9 times at all sites;

- Lead concentration in all samples exceeds the standard by 7.7-20.7 times. The highest excess is noted at sampling points 8 (Agip KCO Base) and 7 (marine harbor area);

- Zinc also exceeds MPC by 1.5-2.5 times, background concentration 50 mg/kg is higher than standard by 2.4 times.

Analysis performed confirms that the concentration of petroleum hydrocarbons increases within drilling sludge landfill due to the accumulation of aromatic hydrocarbons. This is the result of contaminated water discharge from the Base. Excess of petroleum hydrocarbon and lead concentrations over the background is detected within Bautino marine harbor and Support Base. This is the result of these entities' activity.

At the same time there is the natural contamination by heavy metal salts within the landfill, because their concentrations exceed the standards for the ground greatly.

6.9.7 Waste

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;
6. Koshkar-Ata hazardous waste disposal sites.

Photo 6.4 Old municipal dump is still a place for illegal dumping of solid and liquid waste

In addition, two unattended dumps nearby the STF are still places for occasional illegal dumping of solid and liquid waste (Photo 6.4). These 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 a 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. are 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 on 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.

Photo 6.5 The Fort Shevchenko municipal waste disposal and treatment facility. Top: one of two solid waste dumping pits showing drums and manual labor distributing and burning waste; bottom: sewage treatment facility with 150m3 underground tank for untreated sewage, concrete pits for gravity separation and sludge removal, active biological treatment drum (metal shed) and evaporation ponds for treated water (left back).

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 that 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.

Photo 6.6 New evaporation ponds at the Tenis Service LLP waste disposal facilities.

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 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 of 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 a truck volume base. There are no scales to weigh the trucks.

Black and oil-contaminated water from off-shore operations and from support bases is disposed of via waste contractors in the 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. The lake was originally 77km^2 but after the nuclear station MAEK south of Aktau stopped operation in early 90s, it shrank to 35km^2. The lake inspection in January 2006 showed that the lake has shrunken even further. Radioactive and metals-containing salts from the 18km^2 of the dry lake bottom are transported by high (>8-10m/s) wings. Concentration of copper in the dried soil reaches 2 316 mg/kg with maximum permitted concentration (MPC) being 3mg/kg. Lead, chromium, cadmium, selenium, fluorine, ammonia and surfactants are also several times above MPC.

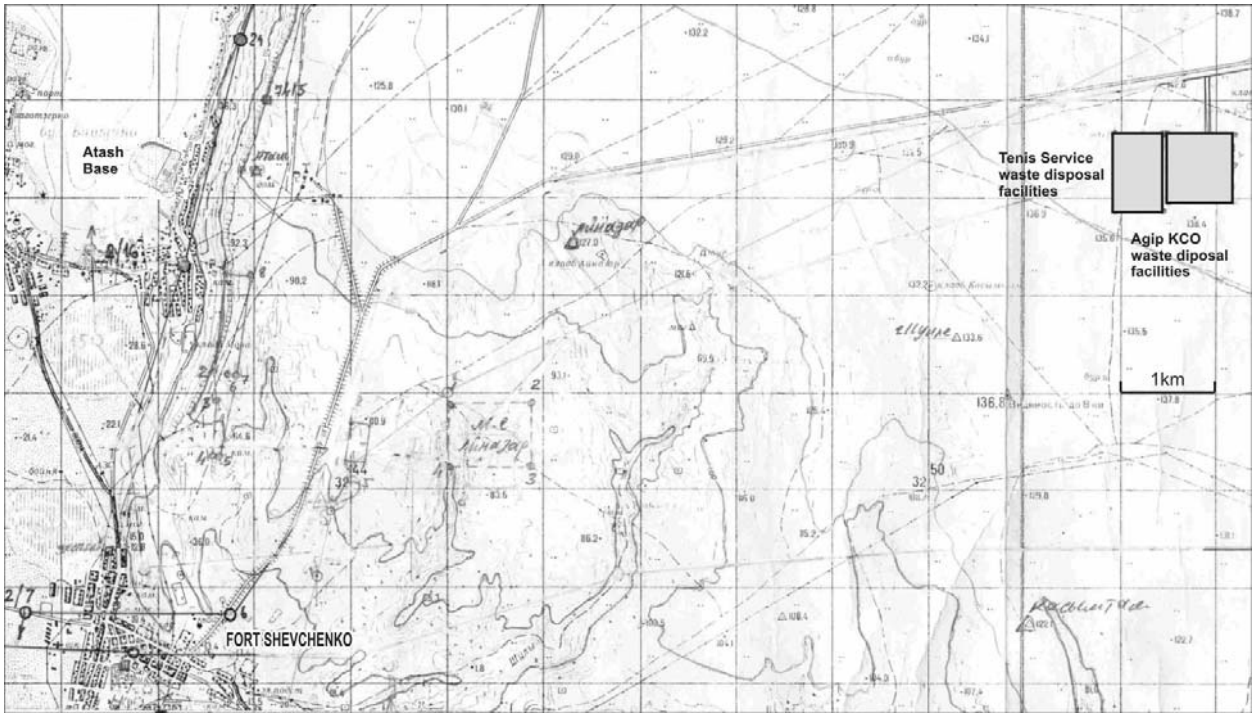


Fig 6.8 Position of the new waste disposal facilities of Tenis Service and AgipKCO.

In seeking ways of keeping the dried areas to a minimum, the local authorities encourage waste water discharge into the Lake. Apart from the oily water, treated and untreated sewage flow into the Lake from Aktau. Findings that neither the Lake nor groundwater under it is connected to the Sea supported the decision to use the Lake as the liquid waste dump. Although, birds and animals can access the water and the shores, though on many inspections none were noted at the Lake. This can be explained by the high salinity of water in which invertebrates and aquatic plants cannot establish. Also the proximity of the Sea reduces the Lake's value to birds and animals.

On the other hand acid water of the Lake (pH 6) increases metals solubility allowing them to be transported with groundwater that discharges to the southeast into the Karahie Depression. Although the environmental sensitivity of this highly saline depression is low, lack of hydrogeological data leaves uncertainty whether or not the contaminated groundwater can find its ways to the lower horizons and eventually discharge into the sea.

To control the amount of waste discharged into the lake the licensed oily water disposal companies are given monthly quotas and are asked to submit the results of analyses of disposed oily-water. Aktau municipal authorities monitor the lake for ionizing radiation levels but not for hydrocarbon content. The authorities also treat this disposal site as a temporary measure and plan to build proper facilities when funds are available.

The hazardous waste landfill is situated at the southwest side of the lake. The site accepts hazardous waste from the whole region. It is fenced and guarded and has an impermeable surface. At the moment, little to nothing is done to the stored waste most of which is not labeled and some is not sealed. The cost of submittal of the waste does not provide sufficient funds for such waste management. There is also no fund that could be used to manage this waste in the future. The inspection of the site was not possible without specific permission. The waste is usually a sensitive issue and any kind of inspection is greatly opposed. No data about the site could be obtained from the regional council too, possibly for the same reason.

The area is also used for disposal of other waste: the MAEK radioactive waste disposal site is on the east side and the municipal dump is next to the hazardous waste landfill. Waste is spread beyond the boundaries of these sites along the whole southwest shore of the lake.

6.9.8 Noise

This EIA is concerned of the overall noise background and the noise created by the Agip KCO and local transport along the main Atash Street which is planned to be used for the rock and liquid waste hauling. The use of the Atash main street is not even. The south part before the turn to Bautino main street has traffic load on average 1 truck/bus every 15 min, while for the other part of the street it is 1 truck/bus every 30 min. The Base development will add 1 truck every 5-7 min for 9 months of construction and 1 truck every 10 min for the operation phase. In addition, development of the area north of the Base may add some traffic, although these operators are likely to use the better road from the Atash quarry to the Kazmunaygaz base.

Noise assessment at the residential area was made by the experts of the National Sanitary Epidemiological Service in 2003. Assessment of the main noise parameters was performed, taking into account the location of industrial facilities, roads and settlements. Measurements were implemented on the basis of the main noise sources in four observation points (Fig. 6.1):

1. The western border of residential area of Bautino settlement;

2. Near the storage of the port of loading from south side of the bay on the border of Bautino residential area;
3. The south-west border of residential area of Atash settlement;
4. The north-east border of residential area of Fort-Shevchenko city.

According to the measurements the equivalent sound level at the existent point 1 varied from 54 to 58 dB. The characteristic of the noise is attributed to wideband spectrum. The temporal behaviour of noise is variable. Instrumental measurements showed insignificant exceeding over maximum permitted level by 1-3 dB (MPL= 55dB). The main noise source is local transport and transport of the company. Nearby to the border of the residential area from the west side there is a by-pass highway which connects Agip KCO Support Base with Bautino - Fort-Shevchenko highway section. The percentage of the Company's vehicles is 85-90% of total traffic flow. Vehicles of the local population form 10-15% of total traffic flow. The major part of vehicles is cars (70-80%). As well, trucks and buses form the other 20-30 % of vehicles.

The main noise source at point 2 is the loading machinery, local and Agip KCO transport. The percentage of Company's vehicles is 65-70% of total traffic flow. The share of their cars is 25-35% of total number of vehicles. In accordance with measurement results, equivalent noise level varied from 62 dB to 67 dB. The average value is 65 dB. The character of the noise is attributed to wideband spectrum. Time behavior is variable. Obtained results are over maximum permitted level (MPL = 55 dB) by 7-12 dB.

The main source of noise at point 3 is local and company's transport. From the south side of the point there is crossing of roads from Atash and Bautino settlements. Basic traffic flow along Atash – Fort-Shevchenko direction consists of 70-80% of cars of local population and 20-30% of trucks and buses. Traffic flow is significantly heavier along Fort-Shevchenko -Bautino settlement direction. The Company's transport share makes up 85-90%. Values of equivalent sound level measured at this point are within the range of 63-67 dB, exceeding the maximum permitted level (MPL = 55 dB) by 8-12 dB.

Equivalent sound level measured instrumentally at point 4 is 57-64 dB. The average value is 60 dB. The characteristic of the noise is attributed to a wideband spectrum. Time behavior is variable. Noise level exceeds maximum permitted level (MPL = 55 dB) by 2-9 dB.

Basic traffic flow of the Company is directed to Bautino/Atash – Atash quarry and forms 80-90%. Cars are about 5-10% of total number of vehicles, while trucks form the other 90-95%. The percentage of Company's transport following along the direction to Fort-Shevchenko-Bautino / Atash settlements, Atash quarry (that is city entrance and exit) is 65-75%.

Noise level excesses of between 1 and 10 decibels were observed in the sampling area over 3 day observation periods. This is related to all transport sources in which Agip KCO has a share. While excesses have been demonstrated, the health risks are related to nuisance rather than pathological effects. The degree of impact in close vicinity to the transportation main roads and objects is non-critical but may be judged to be unfavourable.

7 SOCIO-ECONOMIC BASELINE

7.1 INTRODUCTION

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 emphasized 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 extent, 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 program 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

7.2 GEOPOLITICAL SITUATION

Atash village is located in Tyub-Karagan bay with a fast-developing marine oil production support industry. The bay is the nearest and the main ice-free place where the ships with draft of 3-4m can obtain service. Moreover, it is the nearest place from which limestone can be taken for construction of artificial oil production islands. Proximity to Aktau harbor (132 km) with railway also increases the economic value of the bay. Relative low ecological sensitivity of the Bay and adjacent area make the process of obtaining permission for such operations as waste disposal and limestone production more easy.

The bay was first inhabited in 1849 when Russian fishermen established "Nikolayevskaya" settlement, which was renamed in 1920 to Bautino, after the death of the first head of the

Council. Creation of a fish processing plant in Atash village caused its active development in 1930s.

The main business of the population was fishing. After the Soviet Union collapse fishery industries have been closed and many workers of Bautino harbor have been unemployed. Difficult climatic conditions (lack of quality drinking water and fuel for house heating, desert climate, etc.) added to the outflow of population that had lost its livelihood. So the central and local governments welcome the development of the oil operation support industry, hoping that this will help solve the social issues of the region. The central authorities gladly support the stable political situation in the country for the attraction of western investments.

7.3 REGIONAL LEVEL (MANGISTAU OBLAST)

The area of Mangistau oblast is 165.6 thousand km2 (6.1% of the total area of Kazakhstan). The regional center is Aktau city, which has a large harbor in the Caspian Sea, was founded in 1963. There are 4 rural regions (Beyneuskiy, Karakiyanskiy, Mangystauskiy and Tyubkaraganskiy) and two towns (excluding Aktau), 7 villages, 29 village and rural areas in the oblast. The urban population is 275 thousand persons or 75.9% of total population; rural population is 87.4 thousand persons or 24.1%.

The population of the oblast on 01.02.2005 was 362.4 thousand persons or 2.4% of the population of Kazakhstan. Density of population is 2.2 persons per 1km2 versus the average density index for the republic – 6 persons per 1km2. Ethnic composition of the population is diverse and multi-national; there are about 90 nationalities here, including Ukrainians, Tartars, Germans and others. Aboriginal population of the oblast is Kazakh – 74%, Russian – 17%.

Natural growth of population is characterized by a slight reduction over the last years. This is associated with the tendency of birth rate decrease. This tendency is compensated for by the inflow due to the immigration. Repatriates from the Islamic Republic of Iran return to their historical homeland due to the policy of oralman (Kazakhs who live abroad) repatriation. Over 700 families of repatriates have migrated to the oblast over the last few years. They have obtained accommodation, benefits and free education. The people returned to the oblast include Kazakhs - 84.8%, Russians -9.1%, Azerbaijani - 1.2%.

There are 113 general education schools (88,400 students), 12 colleges (8,500 students), 5 high schools and 4 high school affiliated organizations (17.800 students).

In the Oblast there are 30 medical establishments with 1000 doctors of all categories and 2,800 paramedical personnel.

There are 559 registered industrial companies in the oblast, including 70 large and mid-sized entities. The oblast is in third place in the republic by the total volume of industrial production. The main economic sector is oil and gas industries, the volume of which is over 90% of the total industrial production in the oblast. At present time 59 oil and gas fields are known in Mangistau oblast. Oil reserves in the oblast are 3156.2 mln. tons, raw materials recovered – 1440.3 mln. tons. The power industry determines the economic activity of the oblast and includes the single power supply enterprise – “MAEK-KazAtomProm” LLC. The processing industry is represented by the production of foodstuff, textile and clothing industries, production of rubbers and plastics, mechanical engineering, chemical industry, production of other non-metallic mineral goods and other industries.

Below given the main indices for Mangistau oblast as for April 01, 2005.

Industrial product amount in current price, total	137.9 bln.tenge or 114.5% of the level of the similar period of 2004
including: *- mineral resource industry*	130.6 bln.tenge or 115.5% of the level of the similar period of 2004
- manufacturing industry	2.9 bln.tenge or 132% of the similar period of 2004.
- electric power generation and distribution	4.3 bln.tenge or 103.3% beside the same period of 2004
Physical index of industrial product	114.5%
Oil production	4.0 mln. tons, or by 11.9% more than the similar period of 2004
Including: *- "Mangystaumunaygas" OJSC*	1.3 mln. tons or 107.9 % of the similar period of 2004.
- "Ozenmunaygas" OJSC	1.6 mln. tons, or 114.3%
- "Karazhanbasmunay" OJSC	0.6 mln. tons, or 114.9%
- gas condensate	0.072 mln. Tons, or 102.3%
Gas production	580 mln.m^3, or 96.7% of the similar period of 2004.
Electric power generation	784.9 mln.kWh, or 110% of the similar period of 2004.
Cargo carriage by all kinds of transport	26.0 mln. tons, or 104.7% of the similar period of 2004.
- By shipping through the sea trading port Aktau, including NMSK "Kazmortransflot", total transhipment carried out, ,including :	3462.4 th. tons or 113.0% of the similar period of 2004.
- oil transshipment	1184.5 th. tons or 164.6% of the similar period of 2004.
Telecommunication service	753514 th.tenge or 164.6% of the similar period of 2004.
Farm gross output volume	349.0 mln.tenge or 110.7% of the similar period of 2004.
Production: *- milk*	185.0 tons (111.4% of the similar period of 2004.)
- meat	2312.0 tons (110.8% of the similar period of 2004.)
External turnover, bln.dollars USD (by 01.03.05)	429.0 or 77% to the similar period of 2004.
- export of goods	256.0 mln.USD or 65,9%
- import of goods	173.0 mln.USD or 104.2% of the same period of 2004
Fixed capital investments	19.6 bln.tenge or 186.5% of the same period of 2004
Consumer price index	101.8%
Unemployment rate	1.8% , that less on 0.4 % than the same period of 2004
Administration of the Oblast budget	102.3%
Average monthly nominal salary per one employee	52400 tenge, that is more by 11.5% than the same period of the last year
Domestic building entry	39.4 th. m2 or 337.6% of the same period of 2004
Small business amount (units) (by 01.02.05.)	17446 or 109.8% of the same period of 2004
Small business employment volume, inclusive of private entrepreneurs and farms (by 01.01.05г.)	38521 people or 112.7%
Small business output products volume (by 01.01.05)	18526.5 mln. tenge or 109.8 of the same period of 2004

Mangistau land is plentiful with various mineral resources. The mineral resources are unique and almost have no analogies in the world geology by their diversity, deposit thickness, and fitness to the development. The fields of phosphate rocks, mineral salt and sodium chloride, iron ore, brown coal, nodular phosphate rocks and iron ore, manganese, copper, various mineral salts (mirabilite, thenardite) have been explored. Mangistau limestone – shell rock – is well known not only in CIS countries, but also in several western countries. This limestone is used as building and facing material. In addition to the limestone there are fields of other construction materials in the region: construction stone for macadam and rubble production (8 fields), brick earth (3 fields), construction lime (1 field), sand-gravel aggregate (14 fields), construction sand (3 fields) and others.

Republican roads (910km) and railroads (over 1000km) pass through the Mangistau oblast area. Marine transport is represented by the following enterprises: “International Marine Trade Harbor Aktau” RGP (AMMTP) and “NMSK KazMorTransFlot” CJSC newly established by the Government of Kazakhstan. There are also two harbors: in Bautino and Kuryk villages.

7.4 DISTRICT LEVEL

The region's largest Tyub-Karagan district (12 600km^2) has the lowest level of population. The center Fort-Shevchenko is located 132km from Aktau. The district includes 3 rural administrations, consisting of 5 villages. The main direction of the economics is agriculture.

7.4.1 Population and demography

Data of Statistic Department indicates that the population of Tyub-Karagan district for the second quarter of 2005 is 15,399 persons, and women (7,632) are fewer than men (7,767); Kazakhs (98.2%) exceed Russians (1.1%).

Nationality	Population
Kazakhs	15,122
Russians	168
Ukrainians	13
Tartars	42
Koreans	3
Others	51

Nevertheless, only half of the men reach pension age. This can be explained by the fact that a man, who is the head of family, works more and his physical condition is worse than the condition of a woman. The difference in the pension age between man and woman is 5 years and this aspect also has an impact.

Age	Gender	Population
From 0-15 years old	Men	2749
	Women	2536
From 16-62	Men	4654
From 16-57	Women	4391
63	Men	364
58	Women	755

The population has increased by 1099 persons over the last 6 years. The increase is associated with migration of oralmans to the region due to the development of oil and gas industry.

Oralmans have been coming to the Tyub-Karagan district since 2000. The main share (50%) lives in Akshukur village. This is explained by this settlement being near to Aktau, approximately 20km. About 20% of oralmans live in Taushik village, 20% - in Kyzylozen village and 10% - in Fort-Shevchenko and Bautino. The government gives them land and oralmans can construct houses on these lands.

According to the data for the second quarter of 2005, 370 oralmans live in Tyub-Karagan district. The main mass has arrived from Uzbekistan – 289 persons, Turkmenistan – 79 persons and 2 persons from Iran. About 10% of them are employed in industry and construction, others are in business. All 34 school-age children go to school.

Year	Arrived	Left	Persons, who obtained the citizenship of Kazakhstan	Persons, who did not obtain the citizenship of Kazakhstan	Dead
2000	26	2	18	6	
2001	72		29	42	1
2002	103	2 (1 to Astrakhan, 1 to Aktau)	36	65	
2003	76	3 (to Aktau)	21	52	
2004	68		5	63	
2005	25				
TOTAL	370	7	109	228	1

7.4.2 Employment and wage level

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.

Tab 7.1Average monthly nominal wage by the types of economic activity, tenge, in 2004 (according to the official statistic reports of enterprises)

Production sector	Total	Women	Men
Agriculture, hunting and forestry	14 375	12 603	15 279
Fishery	ND	ND	ND
Industry, to include:	31 321	17 358	34 834
Mining	35 859	22 894	38 064
Processing	ND	ND	ND
Production and distribution of power, gas and water	24 716	13206	29238
Transport and communication	57 680	50 175	61 066
Governmental management	22 745	20 809	28 438
Education	17 917	17 376	20 773
Health protection	14 398	14 500	13 727
Other public, social and personal services	11 304	12 509	9 893
Average for the region	**32 201**	21 952	41 957

7.4.3 Criminal situation

Law-enforcement authority is represented by the Regional Department of Internal Affairs (ROVD), which is managed by the Department of Internal Affairs, located in Aktau. It is known from conversation with the assistant director[37], that 45 crimes were registered within the region in 2005. The leading place is occupied by Karazhanbas region. The main crimes are poaching (10 incidents) and cattle theft (10 incidents). Hooliganisms and thefts were not registered. One severe wounding with intent, resulting to a fatal case, was registered in Fort-Shevchenko. Crimes, committed by non-adults were not registered. Crimes committed by or to foreigners were also not registered. A Citizen of The Philippines was arrested for drunk and disorderly conduct and paid the fine – 97 tenge.

7.4.4 Economic activity

In spite of the increasing influence of the oil production industry, the direction of regional economics is mainly agricultural, although farms are only 37% of the total number of the regional entities (89 versus 242). The influence of oil production industry development (especially offshore) is obvious in the regional centre and almost negligible in the periphery. Nevertheless, there is the risk that agriculture will step down to oil production due to the relative labour intensity. Therefore, the migration of people from villages to the regional centre has

[37] Serikkali T. Bimanov – deputy head of ROVD (Regional Department of Internal Affairs), meeting on 14.07.05

begun. At the moment the volume of agricultural production is the smallest share in the regional output – 11%. Specific weight of livestock number out of the total number for the oblast is the following: sheep and goats - 10%, horses - 16% and camels - 18%. Only a small portion of 89 farms is occupied on irrigated farmland due to the lack of fresh water.

Being interested in saving agriculture and especially cattle farming, the Government implemented the program "Azyk-Tulik", which already helped to stop the cattle population decrease that occurred in the middle of 1990s. At the moment there are 56,484 heads of small stock, 1,108 cows, 5,645 camels, 4,841 horses at the farms. "Taushyk" and "Karagantubek" companies prepared 18,502 centner of the hay, 5,281 centner of them were sold to private persons. The improvement of cattle breeding is being carried out systematically in the region.

Tab 7.2 Volume of output in Tyub-Karagan district, mln. tenge (according to the statistical data of Mangistau region)

Economic activity	2002	2003
Industry	**26**	**26**
Mining, except for the mineral production for power industry	0	6
Processing industry	-	4
Production of foodstuff	-	1
Production of other non-metallic mineral goods	-	3
Production and distribution of power, gas and water	26	16
Collection, treatment and distribution of water	26	16
Index of actual industrial output volume in percents to the previous years	118.9	67.4
Agriculture	**123.5**	**171.3**
Plant growing	0.1	0.2
Cattle breeding	123.4	171.1
Dairy foods, tons	-	1
Meat production in slaughter weight, tons	412.4	530.8
Meat production in live weight, tons	931.6	1187.3
Milk production, tons	931.6	1187.1
Cow milk production, tons	454.9	512.5
Egg production, thousand eggs	20.6	39.0
Production of wool of all types in physical weight, tons	77.0	70.8
Production of sheep hair in physical weight, tons	59.5	52.3
Production of karakul, pieces	2061	3038
Cattle, including	977	963
Cows	592	584
Sheep and goats	37404	39776
Horses	4435	4354
Camels	5199	5106
Birds	667	744
Production of the most important types of industrial goods		
Heat energy, thous. Gkal	-	1.3
Drinking water	139.6	48.4

Financing of investments in construction over 2002-2003 was varied. For example, construction investments in 2002 were financed with local money, and in 2003 – the financing with local money was 1.5%; the other 98.5% were western investments.

Construction investments in 2003 were 1,929 million tenge, out of which 1,680 million tenge – to construction/assembly works and 249 million tenge – to other works. Foreign investments for

measures for natural resource protection and rational use were 735 million tenge. Capital investments in 2003 in actual prices were (in million tenge): 3,158, out of which 12 – to governmental property, 552 – to private property, 2,594 – to foreign property.

Small and medium business is supported in the region to improve the population's living conditions. "Business incubator" has been established in 2004 for the various activity types to support the regional businessmen. There were 364 entities in 2003, and this figure has grown to 413 entities in 2004. The number of the people employed in small business entities has increased over this period. The volume of output in 2003 was 308.3 million tenge, and in the previous year – 92.9 million tenge.

The number of businessmen has risen. This is promoted by the government policy directed to the support of private business due to the issue of interest-free loans (14 in 2003 and 12 in 2004), grants and punishment of persons that hinder business activity. For example, "Bereke" enterprise has obtained a grant in 2004 under the program "Stable development of Caspian Region enterprises", 2 businessmen have obtained money from Mangistau regional foundation of business support for development of their farms, and 14 farms have bought cattle with the support of the "Mangistau" foundation.

7.4.5 Infrastructure

Only Akshukur and Telman village are provided with gas from the Aktau gas pipeline. There isn't gas in other villages. Heating in the cold period is a great problem. The local population uses diesel oil, gasoline, and coal, but these types of fuel are expensive and sold in Aktau. Local population uses imported gas for cooking, which is delivered from Zhana Uzen, but delivery is expensive and unstable. The Akimat plans to provide a gas pipeline from Telman village. About 14 million tenge were already invested into the gas pipeline project development[38].

All population is provided with electric power. The results of inquiry show that the breaks of power supply are often and many respondents equate this problem to the problem of water supply. The power supply for poor people is disabled when they can't pay the expensive bills.

There isn't public transport in the villages, but private taxi and mini-buses are common and go to Aktau and other locations regularly. The number of car owners has increased over the last years. Population consultation indicated that almost each family has one car, some families have two cars. Local people who work shifts at oil companies also work as taxi drivers in their free time. Their daily income is up to 1,500-2,000 tenge.

Aktau – Fort-Shevchenko and Aktau – Kalamkas roads were repaired recently. The main roads of Bautino, Fort Shevchenko and Atash have also been repaired, though the local people tell that the bad roads remain a great problem for them. The residential sector in the region is represented mainly by single-floor buildings. State residential sector is absent and all houses are private or departmental. All houses were privatized at the beginning of the 1990s.

Telephone communication is mainly in the regional centre. Small settlements that are located away from the main roads are provided with telephone and use radio sets to talk with other settlements.

[38] Information was obtained from akim (head) of Bautino village – Vera Petrovna Kurlova, 12.07.05

Situation with liquid and solid domestic waste is described in Section 5.9.27.

7.4.6 Water consumption

Drinking water is a problem for the region. There is no water pipeline, but the possibility of a water pipeline lying from Ketyk field is being considered[39]. People can buy drinking water at "Bauta" LLC – Marine Water Desalination Plant, for 400 tenge/m3. Less expensive water (300 tenge/m3) is delivered by water tanks from 2 wells of Ketyk water intake structure, used by public utilities of Fort-Shevchenko and located in some kilometres to the east from this town (Fig 6.5). Water quality in these wells does not comply with SES requirements. Nevertheless, water analysis for petroleum from the southern well did not indicate its presence (below detection level, 0.05mg/l).

Level of Marine Water Desalination Plant water is unknown, as the analysis of taken water is performed once per month and only for salt concentration, pH, total hardness, alkalinity, chlorides and sulphates. SES analyzes the desalinated water periodically for concentration of coliphage, coliform, pathogen and chemical properties (pH, residual, compact and free chlorine, residual ozone, nitrogen in ammonia, nitrites and nitrates, total hardness, solid residual, chlorides and sulphates), but does not provide the analysis for metals. In contrast to the ground water, the single analysis of desalinated water will not give significant results, because it is assumed that major, accidental discharges of petroleum and oil-contaminated water are typical for the bay (from which the water is taken). Dilution of such discharge is quick and there isn't accumulation of contamination, as the monitoring data indicates (Section 5.9.3.1).

Delivered water is stored in private wells, the bacterial status of which is not inspected. Some residents of Bautino village scoop the fresh water from the pits near the sea, but their debit is low and drinking water fitness was not inspected by SES.

There are plans to construct a desalination plant at Ketyk water intake structure wells, but the Law of Monopolies hinders this. The price of the water from the water pipeline will be limited, according to this law, so the production will be wasteful.

7.4.7 Status of houses and residential construction

In 2003-2004 249 land plots were allocated in Fort-Shevchenko for private ownership, the construction is been implemented at 93 of them. Private owners constructed 1,095m2 of houses by the end of 2004. In Akshukur and Telman villages 285 land plots were allocated and 351.75m2 of houses were constructed. In Taushyk village 32 land plots were allotted for construction of houses.

Local authorities already began the construction of four 2-floor, 8-flat municipal buildings in Fort Shevchenko, 4 at the expense of investors with proposed budget of 90 million tenge per year.

Two shell rock production pits operate in order to provide the needs in construction materials. "ATK" LLC has produced 8,100m3 of stone, 595,000m3 of crushed stone, 75,000tons of limestone in 2004. «MKDSM-asphaltobeton» JSC began the cooperation with subsidiary

[39] Consultation with Bautino village akim

enterprise – “Tyub-Karagan” LLC. At the moment 3 shops of construction materials operate in Fort-Shevchenko.

7.4.8 Mass Media

There are a local Kazakh newspaper “Akketyk Araiy” and regional newspapers “Ogni Mangistau”, “Mangistau”, “Lana”, and “Tumba”. Newspapers are delivered by postmen or bought by local residents in post departments.

High cost of equipment support (computers) and subscription for Internet services means that private access to the Internet is very limited, although some regional communication centres provide access to the Internet and telephone calls.

7.4.9 Health protection

Atash village by disease rate is considered as the most severe. In winter the absence of permanent heating results in serious consequences. Almost 100% of the population suffers from such sicknesses as influenza, bronchitis, acute respiratory disease, and anaemia. The level of tuberculosis disease rate mainly among adults and teen-agers is high, although there are no children who are ill with tuberculosis. Mortality rate (deaths per 1000 persons) in the region has increased by 2.82 over two years, mainly due to the children under 1 year of age (9.3 in 2002, 14.8 in 2003, 28.5 in 2004).

Nevertheless, the population has been paying more attention to its health over the last five years. Day hospital in 2004 was visited by 610 persons in Fort Shevchenko, 431 persons in Akshukur, 442 persons in Taushik. This is related to the increase of income, not with deterioration of health or environmental status.

The top-priority measures under the program “People health” are prevention and cure of tuberculosis, infections, improvement of infant, pupil, teen-ager and recruit health, and mother and child health protection. Vaccination provided to all children of the region in 2003-2004, reduced the influenza disease rate from 124 to 42. Regional polyclinic implements the regional program “Mother and child health protection” for 2004-2006, in particular in the area of free medicine supply for children under 5 years old for some types of sickness, and iron-containing, iodine-containing drug supply for pregnant women.

All departments that provide dispensary and policlinic services (central regional hospital, tuberculosis hospital and regional policlinics) are located in the regional centre.

The number of hospital beds per 10,000 persons has increased from 53.6 in 2002 to 58.1 in 2004 due to the sponsor support of Agip KCO and money from the regional budget.

Understaffed medical personnel are a problem, although the total number has been almost stable over the last four years. Decrease of medical staff began in 2003 but did not continue. The staff decreased to 73 persons from the original number – 90 persons. The decrease was most likely related to low salary, attempts to fine more profitable positions, and with dissatisfaction with the difficulty of work. Nevertheless, about 60% of medical workers are occupied in areas not associated with their specialty.

Medical centres are not present at each village. They often don’t meet the requirements of the sanitary-epidemiological service. There are 2 family ambulance stations in Akshukur and

Taushyk villages; capacity is 15 visits per shift. There are paramedic-obstetrical centres in Bautino, Atash and Kyzylozen.

A Drug store is present only in the regional centre. A private drug-store opened in 2005 in Bautino village, but closed soon.

During the period of 2003-2004 the hospital of Akshukur and Taushyk villages and the regional hospital of Fort-Shevchenko were repaired. IVL-RO-6 and ECG recorders were bought for the regional hospital and Akshukur village. However, the status of the most health protection facilities is unsatisfactory yet. Nevertheless, regional plant emphasizes the increase of the department number, rather than the quality of service and equipment. For example, money from foreign investors is planned to be spent for construction of policlinics for 100 visits with a day hospital for 25 beds in Fort-Shevchenko (385 million tenge) and a paramedic-obstetrical centre in Telman village, and governmental money (124 million tenge) will spent for construction of a tuberculosis hospital for 30 beds in Fort-Shevchenko.

Recently the local authorities have found a sponsor for construction of a medical centre in Bautino that according to the project specifications will have chemist shop, general practitioner, paediatric, dental and gynaecological services.

7.4.10 Education

There are 6 schools in Tyub-Karagan district. Of them 1 school is Russian, 5 schools are Kazakh. At the end of 2005 there were 3,700 pupils in the schools; out of them 300 persons are alumni. The number of teachers has been reduced by 100 persons in comparison with 2002-2003, and was 200 persons at 2004. Lack of teachers of such disciplines as physics, mathematics, chemistry, linguistics, physical culture, and history is mainly associated with young people trying to get engineering skills but not pedagogical ones due to the great difference between the salaries at the moment.

The number of infant schools is 2 and has remained stable over the last years (2002-2005), as has the number of children (1,000 children).

There is the primary school at Atash village, the pupils of which after the graduation are delivered to the secondary schools of the regional centre or Bautino village by school buses in order to continue the education. The distance to the school is a problem for the people as they said.

Measures on the improvement of materials and technical basis at the schools were implemented in 2003-2004. For example, the capital repair of the primary school at Akshukur village has been provided for by the road company. A new school with 320 desks has been constructed at Kyzyluzen village. As a result the capacity of schools has increased by 120 desks (from 3502 in 2003 to 3622 in 2004). The capital repair of secondary mining schools has been provided at Taushyk village. In addition, the capital repair and new equipment and furniture supply has been provided for the school hall and refectory of the school named after E. Omirbayev, the school hall of the school named after Zh. Mynbaev, gym hall of the school named after M. Gorkiy. Boiler room was constructed in the school of Atash village. The sport school for children and youths was also repaired. Good status of equipment at schools is provided due to the support of Akimat and sponsorship of oil and other companies operating within the region. There is a voice recorder room in two schools, Internet – in one school and

computer rooms in five schools. Chemistry, physics, biology and manual training rooms were supplied with appropriate equipment.

The following tasks are included in the plans for the “Kazakhstan on the way of accelerated economic, social and political upgrade” Kazakhstan President's Letter implementation for 2005: construction of nursery schools in Bautino, Akshukur, Tauchik villages with proposed budget of 125 million tenge; construction of secondary school in Telman village in 2005 with proposed budget of 92 million tenge, improvement of material and technical base of the regional education for 2005-2006 at the expense of the regional and local money. Proposed expenses for 2005 are 29 million tenge, for 2006 – 6.8 million tenge.

Especial attention is paid to Tyub-Karagan district program “Auyl mekteb” (Rural school) for 2003-2005 in order to support the Law “On the education”. In general, the regional level of education is fair. There were no children who have not attended school over the year. One pupil has obtained Honour Certificate of Education in 2005. There are no pupils who have not passed the Unified National Testing, so all people have the possibility to enter higher education establishment or secondary technical school of the region, oblast and republic.

One of the greatest problems in the educational system is lack of school teachers.

The Filial of Mangistau technological College was founded in 2001 at Bautino village to support the poor population. Students are trained in this college for 4 specialties: constructor, electric welder, motor mechanic, and oil-gas industry operator. The full-time education is free. At the present time, while all education is payable, this college provides the support for the population. The period of full-time education is 2 years and 10 months, distance education is 3 years. Electric welder specialty is the most popular for the students of the college. A small number enters the faculty of oil and gas industry operator, as it is difficult to find a job without experience.

Distance education is payable. College provides the payable computer training, and strapper training. It was planned to make this education payable since 2006, but it is free yet. There are 11 teachers and 10 technicians (librarians, guards, charwoman, and boiler fireman) at the college.

It is necessary to go to Aktau or other higher educational institutions of the republic in order to get higher education.

7.4.11 Culture

There are four clubs in the region. There is a cultural centre in Fort-Shevchenko for 287 seats, with 18 club departments (chorus, coterie, etc) that include 309 persons. Actors from Almaty and other regions visit the cultural centre over the year. The regional population visits such events with pleasure. There is also an old building of cultural centre, constructed in 1909, but it requires capital repair and heating supply. A youth cultural and sport centre, located in the cultural centre building lets youths spend their free time in the course: ping-pong, chess, and gym simulators. The youth cultural and sport centre is very popular for youths not only of the town, but also nearest villages – Atash and Bautino.

The cultural centre of Akshukur village is for 238 seats with 6 club departments, consisting of 88 persons. The cultural centre was constructed in 1980 and requires capital repair.

The rural club of Taushik village for 150 seats has 2 club departments, consisting of 35 persons. The club, constructed in 1953, requires regular maintenance and heating supply.

The rural club of Kyzylozen village for 130 seats has 8 club departments, consisting of 77 persons. The club has been repaired and supplied with musical instruments.

There are 8 libraries in the region. The number of readers has been stable over the last years – 6,000 persons. The largest part of them is students of the Technological University and pupils. The libraries are visited more seldom, from 3,000 persons in 2002, to 2,003 persons in 2003 and 2,500 persons in 2004. This is related to the narrow range of books, which has been constant over the last three years (2002 – 2004) and is 118.1 thousand books[40].

There are filial branches of the central regional and central children libraries in all regional villages. One librarian works at each filial branch. The library building in Kyzylozen was repaired, but there are few books.

The filial of the regional library in Bautino village is located in the building of Mangistau Technological College Filial. The library is used by college students and all who wish.

The main problem of the central libraries and filial branches is lack of books. The second problem is lack of heating in winter period. The third problem is need of repair and maintenance.

The Central Municipal Library is planned to be repaired in this year to solve one of the issues

7.4.12 Recreation places

The population spends their free time at beaches. Rural Bautino beach near “Chagala” hotel is the popular recreation place that is available for all. The sand was brought to the beach and sunshades and a low fence installed.

One more beach is an unauthorized beach constructed by Agip KCO within the Base area. The beach is improved by sand, sunshades and fenced. Both beaches are cleaned regularly by Bautino Municipal Housing Department.

Fine and shady “Dunskiy Sad” Elm Park is located 1km to the north of the base and very popular with the local people. There are springs equipped for swimming with healing water (high concentration of hydrocarbon sulphide). Water is also taken for technical needs, but not often due to the distance from the settlements.

There is “Kanga” natural area within Fort Shevchenko, which is popular for amateur fishermen of the local villages, as well as Aktau ad Zhana-Uzen. Entrance is payable due to the increased popularity.

All events – weddings, birthday parties, meeting of Akims take place in “Akku”, “Aibi” café in Fort-Shevchenko, “Aya” café in Bautino village, “Akzhol” café in Akshukur village. The population prefers cafés for celebration rather than homes. This is associated with the increased level of life in the region

[40] Data of Mangistau Regional Department of Statistics

7.5 LOCAL LEVEL – ATASH AND BAUTINO VILLAGES[41]

In XIX and XX centuries Fort Shevchenko and Bautino and Atash villages were considered as the regional fishery centre. Fishery was considered as the main business of local people at all times. There were so-called “sprat fleet” and commercial seal production. Seal bodies and skins were delivered to Kazan for processing.

Bautino and Atash villages were founded in 1924 as settlements to support the Soviet fishery entities. The fish processing plant, Mangistau Fishery Fleet and dockyard were constructed in 1940s. The main sources of living means were dock and fishery industries, which have stopped activity due to the collapse of Soviet system. Urban engineering enterprise – “KazakhRybFlot” was idle in 1990s. It was re-organized, and the profile and name changed in the recent past. “Sagatash” joint venture (Kazakhstan-Azerbaijan) provides the repair of vessels that are stationed at Bautino Port.

At the moment 2,175 persons live in Atash and 1,901 persons in Bautino[42].

Regarding national classifications, Kazakhs in Atash village are 98% of the population and only 2% are Russians and other nationalities. Russians and other nationalities in Bautino village are more than in Atash village (5%). The average age is 26 years. The vulnerable population group: 44% are under 19 years old and 6% are over 65 years old.

As a result of immigration the population has been increased slightly, in spite of migration and the fall of birth rate. Over the period of 1997-2001 27 families (37 persons) have migrated to Bautino. Migrants of Atash village were from Aktau, Zhetybai village; migrants of Bautino village were from Aktau, Almaty, Aktobe, Karaganda, Sevastopol, and Akshukur, Beineu and Akzhaiyk villages. In 2005 7 families (18 persons) of oralmans has migrated to Atash village almost at one time.

7.5.1 Employment

The level of unemployment in Atash and Bautino is high due to the total fall of the fishery industry and, in particular, the recent closing of the Fish Processing Plant. Fishery is still important for some people, though the fishery is often unauthorized. It can include fishing, conservation and smoking of the various fishes (grey mullet, fries, salmon).

There are 12 farms in Atash and Bautino villages, the main activity of which is cattle farming and fishery. There is one café – “Aya”. There are no barbershops, but one private hairdressing saloon is present in Bautino. Tailor's workshops and shoemaker’s shops are absent. The local population, including both skilled staff (accountants, economists, cashiers) and unskilled workers, are employed in the filial of “Teniz Sauda Porty” trade harbor and “Saga Atash” LLP.

The number of active small entities and local people employed in small enterprises of Bautino and Atash is given below.

[41] Local level is determined as the area in 2-5km around the proposed site

[42] Official statistical data of Bautino village Akimat for 2005

№	Name of company	Bautino	Atash	Total number
1	Tyub-Karagan Management Service	13	7	20
2	Waggenborg Kazakhstan B.V.	11	6	17
3	Bautino Development Company	22	14	36
4	Teniz Sauda Porty (trade harbor)	20	9	29
5	SAGA ATASH LLP	10	13	23
6	Tyub-Karagan LLP	10	35	45
7	NEK	3		3
8	Caspi Shelf	13	5	18
9	Atre LLP	14	5	19
10	Ligabue	9	2	11
11	BZhKU	16	16	32
12	ATK	14	8	22
13	Azimut LLP	2	9	11
14	Bekhtel-Enka		11	11
15	Agip KCO			35
16	School named after Mynbayev	20	16/36	72
17	School named after Gorkiy	11	7/14	32
18	Technological College	2	9	11
19	Boskalis-Arhiridon	No data	ND	112
20	Trans Global	No data	ND	34
21	Kaz Post	No data	ND	4
22	Tax Committee	No data	ND	5
23	Hospital	No data	ND	6
24	Bauta JSC	No data	ND	10
25	Life-saving service	No data	ND	2
26	2206 military command	No data	ND	4
27	Maiks	No data	ND	15
28	CaspiEnergyServices	No data	ND	4
29	Regional PB	No data	ND	8
30	ISM LLP	No data	ND	2
31	Narodnyi Bank	No data	ND	6
32	Nauryz Bank	No data	ND	1
33	Payment department	No data	ND	1
34	Hospital of infection diseases	No data	ND	7
35	Regional and children hospitals, ambulance	No data	ND	5
36	Department of Education and Pedagogical Technology	No data	ND	4
37	Regional Social Department	No data	ND	3
38	People's court and prosecutor's office	No data	ND	3
39	Regional akimat	No data	ND	11
40	Kulynshak nursery school	No data	ND	2

№	Name of company	Bautino	Atash	Total number
41	Atlas LLP	No data	ND	6
42	Halliburton	No data	ND	34
43	BIUI Kazakhstan Ltd.	No data	ND	29
44	KarzhanbaiMunaiGas	No data	ND	52
45	KalamlasOilService	No data	ND	54
46	Interteach	No data	ND	3
47	KazMashal	No data	ND	15
48	AZS	No data	ND	5
49	GMS	No data	ND	4
50	KazMorTrans	No data	ND	15
51	Reminal	No data	ND	3
52	KazMunaiMontazh	No data	ND	15
53	School named after Omirbayev	No data	ND	3
54	Cultural department	No data	ND	4
55	ZhMO	No data	ND	3
56	SES	No data	ND	5
57	CaspiHimStroy	No data	ND	5
58	«Balykshy» LLP	No data	ND	2
59	Nazgila LLP	No data	ND	2
60	«Aibi», «Aya» café	No data	ND	7
61	Regional Akimat	No data	ND	10
62	Museum	No data	ND	3
63	Sport and music school	No data	ND	2
64	Zoological veterinary station	No data	ND	1
65	MPS	No data	ND	5
66	Musical school, library	No data	ND	3
67	Trade shop	No data	ND	3
68	KazTeleCom	No data	ND	3
69	STO LLP	No data	ND	4
70	Fire-fighting department	No data	ND	3
71	Business	No data	ND	239
72	Payable public works	No data	ND	114

7.5.2 Status of houses and residential construction

There are a lot of old buildings in Atash village that require repair or demolishing, but the residents continue to live there. There isn't a governmental residential sector in the village; all houses are private or corporative. Since the beginning of 1990s all houses have been privatized. The lack of accommodation was not registered. One private house was being constructed at the moment of the study.

7.5.3 Health protection

There is one obstetrical and feldsher's station in each village – Bautino and Atash, in which one medical specialist works. A private drug-store was founded in Bautino in 2005, but was closed soon.

Atash village by social significance is considered as the most severe. The absence of permanent heating in winter period causes the severe consequences. Almost 100% of population suffers from the catarrhal diseases (influenza, bronchitis, acute respiratory virus disease, and anaemia).

20% of population suffers from the diseases caused by the problems of the respiratory tract, 30%of population has problems with skin and venereal diseases.

There is a non-conforming building of obstetrical and feldsher's station in the village, which is planned to be closed by the sanitary and epidemiological station (SES). Medical equipment is old. «Agip KCO» wanted to procure the necessary equipment. However, as the equipment is not adjusted, the building needs repair, so any equipment cannot be installed in such station and the station itself cannot operate, according to the regulations of SES. This station is the oldest unit of this village. It is very difficult to provide injections for the population in this village. In order to get an injection people need to go to Fort Shevchenko, paying for transportation. Not everybody wants to go to the regional centre for injections. The presence of a good obstetrical and feldsher's station would solve the problem of ambulance and vaccination program implementation.

Residents of Atash and Bautino villages can call ambulance service (telephone number – 03) from the Tyub-Karagan District Hospital. The emergency ambulance arrives at Fort-Shevchenko in one hour.

Uncontrolled infective episodes were not registered over the last years[43].

Consultation with people indicated that unconventional medicine, killing of the hoodoo, “driving out a demon” is provided by an unauthorized wisewoman – Tapshyn Apai, living in Bautino village. Uneducated and poor people, as well as, patients who could not be cured using the traditional methods come to her.

7.5.4 Education

There are Kazakh and Russian secondary schools in Bautino village and elementary Kazakh school in Atash village (up to 5th grade). The total number of pupils in all three schools is 1,123 children. The number of people who work at the schools is 71 teachers and 52 technicians. Both schools have school buses for transportation of students, computer classes and language laboratories. In addition, the Russian school has access to the Internet. Despite the very good “teacher / student” correlation there is a lack of physics teachers. According to the results of consultation with local people, the long distance to the schools is a great problem.

Generally, the quality of education in the villages is fair. There were no children who have not attended school over the year. There are no pupils who have not passed the Unified National

[43] Gulshat B. Shalabayeva - head doctor of Tyub-Karagan District Policlinics

Testing, so all people have the possibility to enter a higher education establishment or secondary technical school of the region, oblast and republic.

As a support to the poor talented children who can get secondary professional education, The Filial of Mangistau technological College was founded in 2001 at Bautino village. The college includes 167 students from Atash and Bautino. Students are trained in this college for 4 specialties: constructor, electric welder, motor mechanic, and oil-gas operator. The period of full-time education is 2 years and 10 months, distance education is 3 years. Electric welder specialty is the most popular for the student of the college. A small number enters the faculty of oil and gas industry operator, as it is difficult to find a job without experience. Full-time education is free. Distance education is payable. College provides the payable computer training, and strapper training. It was planned to make the education payable in 2006, but it is free yet. There are 11 teachers and 10 technicians (librarians, guards, charwoman, and boiler fireman).

7.5.5 Culture

There are no clubs in Bautino and Atash villages. The building of Atash village club has been procured by a private person, but the regional Akimat plans to buy it again and use it for local youths. Both villages have the filial branches of central regional and central children libraries, which are used for general meetings. One person works at each filial. Books are very few, and new books are not procured.

7.5.6 Criminal situation

In general, the criminal situation in Bautino and Atash villages is considered as fair[44]. One precinct inspector and one assistant who are equipped with car and radio work permanently at Bautino regional Department of Internal Affairs (ROVD). They regularly inspect Bautino and Atash villages from 20.00 till 01.00. Usually one drunken person is registered on week-days and 2-3 drunken persons on Friday and Saturday. Drunken people arrested in Atash and Bautino villages are delivered to Fort-Shevchenko. Courts operate in the regional ROVD, Fort Shevchenko.

7.6 ARCHEOLOGY AND CULTURAL HERITAGE

Tyub-Karagan bay occupies the special place in the history of Mangistau. Geographically, this is the corner point of Tyub-Karagan peninsula, and as such, the most favourable area for the people's habitation. Transgressions and regressions of the Caspian Sea periodically changed its coastline, but did not change its significance. It is known that the coast has been inhabited at least since the end of Stone Age (6-5 thous. Years A. C.).

The bay became most attractive during the development of trade relationships between Asia and Europe, during the 13 century. Here, the small settlement – Ketikkala – has existed from the 13-14 centuries. Its remains are located at the northern end of Kurgantash rock range. At the moment the settlement is located 3km from the bay's coastline. But the sea in the 14

[44] Serikgali Tazhigalievich Bimanov – Director Assistant of ROVD, meeting was in 14.07.2005

century was to the south, and trade ships could moor in direct proximity to the settlement. The assumed area of the settlement is about 4 ha. There are fragments of clayware that is typical of the Golden Horde period of Khoresm history. It is known that the goods from China and Azerbaijan area were delivered to Ketiusala. This was indicated by the fragments of clayware collected from the surface.

There is the assumption that a fortress was located at Kurgantash in the 14 century for protection of the bay entrance. The soldiers have found treasure with several gold and silver coins (period of Gold Horde khan Dhzayaibek – 1342-1357) during the construction of Novopetrov Fort in 1846. After some time a trade settlement was established at the walls of the Russian fort. This settlement was constructed for trade with Asian and Europe countries. Perhaps, the bay and settlement are marked under the names of “Melmeselash” or “Mebnemeselash” on the Venetian geographical maps of the Catalan atlas (1367) and Piccigani brothers (1375). Researchers suggest that these names are the corrupt name of Mangyshlak as the marine jetty or, most likely, geographical region.

The expedition team of Bekovich-Cherkassiy founded “Saint Peter” fort in 1717-1719 at the coast of Tyub-Karagan bay. The location of this fort is unknown.

The civil settlement of Russian fishermen – Nikolayevskaya – was founded in 1849 at the western coast of the bay. This settlement was re-named Bautino in the 1920s, after the death of A.E.Bautin – the first chairman of the Village Council.

Local fish manufacturer Z.K. Dubskiy has founded the ice-house, team and small plant for receiving, preparation and storage of fish in the 19 century at the coast of Atash village, to the south of the work site. There aren’t any traces of these facilities at the moment. Creation of the fish processing plant in Atash village caused its active development in 1930s.

There aren't objects of cultural heritage within the base construction site. Two Kazakh cemeteries are located near the site, at Atash village. The Kazakh population of Bautino buries their relatives at these cemeteries or in Fort Shevchenko where there are three cemeteries. The Russian population of Atash and Bautino buries their relatives at the Orthodox cemetery in Fort Shevchenko. Family cemeteries are located in the steppe. In general, there are 7 cemeteries at each settlement.

7.7 DESCRIPTION OF STAKEHOLDERS

Continuous and systematic communication with stakeholders is essential at all project stages to avoid public conflicts, delays and financial loses. Stakeholder identification is undertaken to determine organizations and individuals who may be directly or indirectly effected (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 public. Fig 7.1 illustrates the relevant importance of identified stakeholders and their potential impact. The description of specified stakeholder is given below

7.7.1 Public

7.7.1.1 Legislative Provisions of Public Environmental Control

The concrete legislative requirements for public involvement are confined to public announcements and a public meeting. The ESIA developer has to inform the public through the selected by him media (usually newspapers) about submission of the documentation for the State Environmental Review. This may be duplicated by the SEE. The conclusion of the review can also be published or revealed by other accessible forms, but only if the public requests so which is rarely happens. The minutes of the public meeting must be attached to the EIA. In general the legislation asks for greater public involvement but does not specify this further.

Public and public organizations can organize Public Environmental Review (PER) but its conclusion is not obligatory for compliance PER can be carried out in parallel to the State Environmental Review. It is initiated by the public or scientific community and has to be registered with the local government according the SEE regulation. The PER can not be financed by the Project developer or the Budget. The funds have to come from the public sources. Although PER does not have to be performed by the developer, he is obliged to make the related information available for the review.

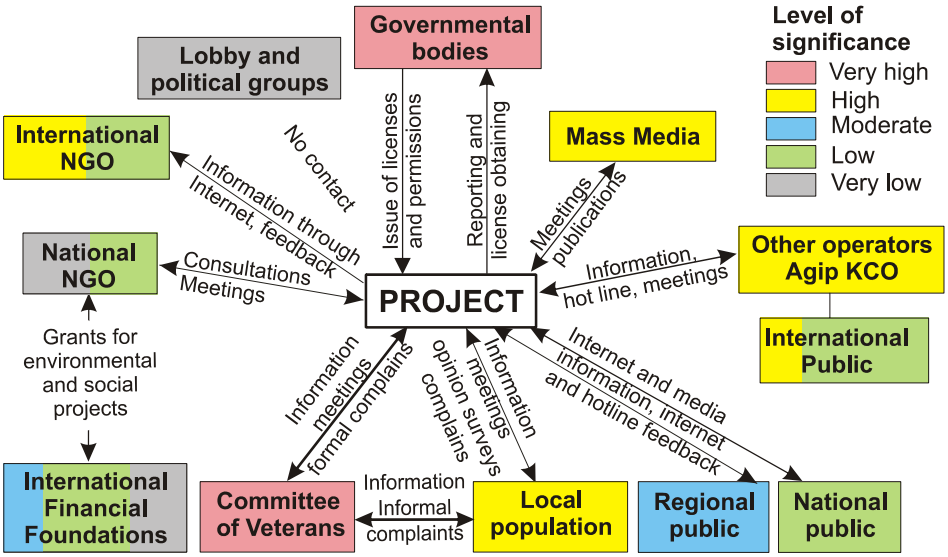


Fig 7.1 Stakeholder groups and their relevant importance for the Project

7.7.1.2 International Public

International public will not impose continuous supervision over the Project activities. In case of large environmental damage as a result of an accident at the Base, the international public is unlikely to single out the Base operator from the overall offshore oil production activities. The main blow is likely to fall on Agip KCO as a sizeable and known target. The International Public influence can potentially be high but indirect through the other stakeholders, mainly the international media and in part the international NGOs who in turn can pressure Agip KCO discouraging usage of the base that created problems. Therefore International Public **can be excluded** from the list of stakeholders providing that media, international NGOs and Agip KCO are considered.

7.7.1.3 National Public

National public is generally concerned about the environmental issues but due to relative population poverty, its scarcity and clustered distribution of environmental problems, the environment earned much lower priority in the minds of people of Kazakhstan than it is the case for some European countries. This is also explained by the fact that people that are most affected by the project are likely to be the prime consumers of benefits from the source of impact.

Potential to influence environmental and social aspects of Project	Low

7.7.1.4 International NGOs

International NGOs although not taking active part in public hearings, have potential to influence the western community and the Project consortium shareholders. They also provide financial support to the local NGOs by this influencing the Project indirectly.

Tab 7.3 International NGOs

Name	Profile	Location	Potential influence Ranking
Central Asia Regional Environmental Center (CAREC)	development of environmental policy, training, management in Central Asia, sustainable development of Pre-Caspian countries	Almaty	High
Green Peace		US	v.high / low
Friends of the Earth		UK	v.high / low
World Wild Fund	Biodiversity grant programs	UK	Low
Green Cross	Biodiversity grant programs	US	Low
Caspi Caspian Watch (Vakhta Kaspiya)	Protection of Caspian Sea	Russia	Low

* Very high in the case of large acute environmental damage and large accidents

7.7.1.5 National NGOs

Tab 7.4. National Environmental NGOs

Name	Profile	Location	Potential influence Ranking
Ecocentre	Wide range of environmental issues throughout Kazakhstan	Karaganda	Low
Tabigat	Wide range of environmental issues	Almaty	Low
EKO (Organization for Ecologists of Kazakhstan)	Providing link between industries, scientists and public to break barriers of different perception on health, safety and environmental issues	Almaty	Low
Ecology of XXI Century	Environmental education	Almaty	V. low
Ecom	Wide range of environmental issues	Pavlodar	V. low
Green Salvation	Legal aspects, publication	Almaty	V. low
“Green Women” Environmental News Agency	Woman participation in environmental problem solution	Almaty	V. low
Landscape	Wide range of environmental issues	Almaty	V. low

In Kazakhstan there are about 100 NGOs whose profile includes environmental protection issues. Many of them are not active; some are set up to attract grants. Very few NGOs earned credibility among the general public (Tab 7.4.). The organizational structure of national NGOs is oriented to the foreign experience. Moreover, the programs of NGOs are financed mainly by the international donor organizations through small grants. Activity of Kazakhstan NGOs is based on the work of volunteers. About 42% of volunteers are students, young employees (17-

30 years old). NGOs play the important role in the reformations of the republic, but their role in environmental issues is less important.

7.7.1.6 International Funding Organizations

International Funding Organizations impact the Project indirectly by providing funds to Kazakhstan NGOs for involving the local communities in the decision-making process. This is mainly done through various forms of information and training. After Kazakhstan began to promote the principles of Orhus Convention about accessibility of environmental information, many funding organizations focused on this aspect too.

Tab 7.5. International funding organizations

Name	Profile	Location	Potential influence Ranking
The Caspian Environmental Program (CEP)	Protection of Caspian Sea, biodiversity studies	Almaty	Medium
ISAR/USAID	Small grants to the public organizations for implementation of joint project emphasized to the solution of the Caspian environmental problems; public environmental monitoring in the Caspian region; trans-national corporations in the Caspian region; alternative ways of the Caspian region development	Atyrau	Low
Ramsar Convention Secretariat	Protection of wetlands in Ural-Volga deltas area	US	Low
The Global Environment Fund (GEF)	Biodiversity studies	UK	Very low
The United Nations Environmental Program (UNEP)	Provision of free access to environmental information, biodiversity studies	US	Very low

7.7.1.7 Population of the region

There will be no negative impact on regional population. The local places of recreation that they visit will not be affected by the development. However, they will be interested in employment and contracting opportunities as well as in the possibility to expand their private businesses in the development area to serve the higher than average income workers. The increase in income of the Project workers from Aktau will not affect Aktau population in any way. The likelihood that workers from the other parts of the region will be employed by the Project is not very high. Thus only that part of the regional population will be interested in the Project that has chances of being employed by it.

Potential to influence environmental and social aspects of Project	Medium

7.7.1.8 Local population

Local communities governed by the councils (see akimats in State Institutions) can follow complaint procedures that have time restrictions on the response. These procedures are actively used mainly by pensioners at the regional and village levels. Efficiency of the claims at the village level is higher due to the intensive activity of the akim, who has worked over 20 years. The Akim at the regional level is replaced often, but assigned from the local people.

The most vulnerable groups (pensioners, women, school graduates, unemployed persons, and poor) and national minorities have no specific privileges in comparison with the main population.

Two Islamic religious leaders – mullahs[45] reside in Fort-Shevchenko and in Taushik village. Yet, their role is mainly confined to support of traditions and spiritual guidance. They do not take active part in social decision-making and have limited knowledge of Russian. Foreign Muslims who often work at Azerbaijan ("Sagatash") or Turkish "Enka Insaat ve Sanayi As") companies, visit the central mosques on work days and Muslim holidays. Orthodox Church is represented only in Aktau and serves functions similar to the mullahs.

Teachers are interested in 100% attraction of the school age children in training process and pass of Unified National Testing – the index of the regional education level. Employment and further education of school graduates are less interesting for teachers.

Private fishermen are interested in activity of fishery, as the employer, and possibility to continue private fishing in the bay and sea. Nevertheless, private fishing in the bay is illegal, and the sea fishing volumes are restricted by the government. So this public group can be excluded from the list of stakeholders.

The tradition, focus on earning money and inherent fear create the situation when the local population is not active. The complaints usually passed through the elderly members of the family that pass this through the Society of Veterans to the authorities. Yet, because the most of negative significant impacts are associated with the local population, its relevant importance is considered to be high.

Potential to influence environmental and social aspects of Project	High

7.7.1.9 Local and regional NGOs

Regional Council of Veterans in Fort Shevchenko and its branches in Akshukur, Kyzylozen, Taushyk and Bautino villages hold an important position in public and take part in the improvement of population life. Many veterans worked in oil industry and fishery. Their impact on the project can be high.

There are no other active social and environmental NGOs at the regional level[46].

Potential to influence environmental and social aspects of Project	High

7.7.2 Mass Media

The majority of population would be affected by the project has the access to television in their homes from where they receive most of their information. The main TV channels include Kazakhstan 1, Khabar, KTK, ORT (Moscow). The Kazakhstan 1 gives time to the regional news during the breaks time 13-14:00 during the week days and 15-19:00 during weekend. Some people have installed satellite dishes and can receive sky TV programs. Radio is accessible to

[45] Arman Zhylkaidarov – mullah of the central mosque of "Kazakhstan Muslim Spiritual Organization" filial in Fort Shevchenko, meeting in 15.07.05.

[46] Various sources and the statement of the head of the District Internal Affairs Department Zharylgapova O.

all. TV and radio programs are broadcasted on both Russian and Kazakh languages in equal proportions but with Russian taking prime times.

Population mainly reads the regional papers “Lana” and “Tumba” in Mangystau Region (with “Ogni Mangistau”, “Mangistau” being a second choice). «Akketyk Araiy» is the most readable regional Kazakh newspaper. All important aspects of the region are illustrated in the regional newspaper. The newspaper is very popular for the local people. In small settlements papers are subscribed for rather than bought in shops.

The scale of the oil and gas industry developments in the pre-Caspian area had no precedence and although the impact may be low and manageable, the inherent in novelty and the scale uncertainty create public perception of potentially serious problems and overall aversion of the associated risks. As a result the media pays high attention to the new large developments and any attempt to withhold the information is readily opposed.

The censorship over the media is limited by the advances of the new technology like Satellite TV and the internet. Yet, these channels are not available to everyone. Use of satellite TV is restricted only by the dish and installation cost. Cable TV is available in Aktau but many cannot afford the rental cost. Internet is accessible only in Aktau where, apart from the ability to plug in from a home telephone, there are several internet cafes with reasonable prices. Internet as a source of information is mainly used by school and university students. Others use it for jobs search and entertainment. The main internet providers are local firms: Kazakh Telecom, Ducat and Nursat. In-country internet information is mainly in Russian.

Potential to influence environmental and social aspects of Project	High

7.7.3 Governmental bodies

7.7.3.1 Ministry of Environmental Protection

The Ministry is the central environmental protection authority. More detailed description of its structure and interests in the Project is given in Legislation Review. Its main functions include:

- Approval of environmental standards and requirements to the industrial and other activities;
- Establishment of limits and quotas of emissions and discharges, water disposal and burial;
- Issue of license for the environmentally hazardous industrial activities, emissions and discharges;
- Control of environmental monitoring, analysis to be performed by the companies and supervision of hydrometeorological situation;
- Conducting of state environmental expertise and coordination of environmental expert activity;
- Issue of license of natural protection engineering, standardization and works in the area of environmental expertise;
- Organization of analytic laboratories activity on the unified methodical basis;
- Through its regional offices issue the annual permission for environmental pollution after the operator pays the charges for pollution in the coming year;

- Consideration of the administrative violation cases, imposition of administrative penalties, making of suit requirements, presentation of the government interests in the environmental legal process;
- Coordination of the activity of other executive agencies, performing the environmental protection and nature use management.

During construction and operation the MEP assesses at the end of each year the application for the Permission for Nature Use which at the most should include:

1. Results of the annual monitoring of air, surface and ground water and soil and checks that they correspond to the predicted in ESIA forms and magnitudes of impact (KazGidroMet).
2. Volumes and character of pollution and generated waste recalculated on the base of the factual measurements and any changes in operation (i.e. new sources of pollution) (State Control Department);
3. Environmental Protection Plan (State Control Department);
4. Environmental Passport for each industrial site (e.g. pump station, jetty, pipeline) (State Control Department);

The two latter documents should be revised annually but if no significant changes in operation occurred, they may not be revised.

If the MEP is not satisfied with the received documentation, it does not issue the Permission for Nature Use and the enterprise starts to pay for its pollution as for not approved volumes, which is ten times higher than if the Permission is obtained. If an enterprise cannot satisfy the MEP requirements for the Permission for several months, the MEP can apply to the Cabinet of Ministers for limiting or shutting down the operation.

7.7.3.2 Regional Department of Environmental Protection

Regional Department of Environmental Protection is the structural unit of the Ministry of Environmental Protection. Regional bodies provide the expertise of the project documentation and impact assessment on the social-economic and environmental situation at the stage of designing and give the conclusion to the Ministry of Environmental Protection, which issues the final approval. These bodies are responsible for the regular control over the period of construction and operation. They approve the annual contamination reports and monitoring results.

Due to the high competence of Mangistau bodies the consultations will be beyond the legislative requirements. This increase of consultation is usually expressed by the submission of plans and programs that would cover the environmental conditions. For example, submission of annual monitoring plant can fix the deviations from the standard in order to reduce the costs and specify the main contaminants. Approval of contaminated soil cleanup plan can help to approve the final phase of the report.

The regional offices also manage the areas designated for protection. The Project activities will not impinge on these areas directly. Poaching is the main problem of the protected areas. A full time inspector of the MEP at each protected area surveys populations of endangered species and controls poaching and amateur fishing and hunting. Tourism and recreation in these areas

is not developed. The main control over fisheries is carried out by the Mangistau Fishery Inspection.

Apart from the MEP regional offices, the sensitive zones offshore and near shore are controlled by the Fishery Committee of the Ministry of Agriculture described bellow.

7.7.3.3 Local Councils

Local councillor and the range of senior council officials from various departments can impose considerable pressure on the development and (in lesser degree) on operation of the Project by applying various mechanisms that can delay the construction. To a certain extent they can influence the outcome of the public hearings. Such conflicts are usually settled on the personal level.

Regional akims are replaced more often in comparison with local Akims. Village Akim is at his position over the long time and familiar with local population. Local population addresses to the Akim with the various issues.

There are panel discussions – meetings of Akims, representatives with Council of Veterans, local people, mullah at the regional and local levels, which are formal and have no actual effect.

7.7.3.4 State Sanitary-Epidemiological Station, Ministry Of Education, Culture and Health

As the State Sanitary-Epidemiological Station (SES) does not require inspection and approval of Environmental and Social Impact Assessment report, its interference at the design and construction phases is within the approval of Health status sections of Feasibility Study and technical reports, plans and programs of social-economical development. SES also control the import of new (not licensed in Kazakhstan) products and technologies. Over the period of operation SES controls the toxicological and chemical contamination, including the approval of oil-contaminated soil management aspects.

7.7.3.5 Ministry on Emergency

The Ministry approves emergency aspects of feasibility studies and technical reports. At operation stage they approve the emergency response plan require annual reporting of emergency protection measures and regularly (once or twice a year) inspect the working sites on subject of compliance with the approved emergency response plan. This Ministry possesses tangible power and if ignored, can cause serious delays at construction and operation stages. The consultation with this authority should be strictly limited to written applications for formal permissions and assistance during inspections of the Project sites. Usually a one person is responsible for maintaining personal liaison with the head of the Local Committee. It also executes the following functions:

- Draw and renew a list of enterprises, which activities are associated with higher risk of emergencies;
- Set specific requirements for each enterprise for emergency prevention measures and emergency control equipment;
- Investigate accidents or assess results of internal investigation;

- Levy compensations and penalties for damage from accidents.

7.7.3.6 1.3.6Ministry of Power and Mineral Resources

Ministry of Power and Mineral Resources in the face of its Committee of Geology and Subsoil Protection is responsible for the state underground water monitoring and issue of permission for the underground water use, as well as state cadastres of radioactive waste burial and sewage water discharge to the subsoil. The ministry also provides the control over the safety of the trunk pipeline operation which is duplication of the Regional Emergency Response Committees functions that perform regular inspections.

7.7.3.7 Ministry of agriculture

Fishery Committee controls Caspian Sea resources. This Committee will be interested in the project part that would affect the sea.

Committee of Water Resources is responsible only for marine water use and discharges to the natural water basin.

7.7.3.8 Ministry of Internal Affairs (Harbour and Military Authorities)

Custom force may influence the operation of the jetty in Atash and regulate the traffic of ships near the Caspian shore. Small Caspian Military Fleet that resides in Aktau supports the custom shore patrolling. They can impose certain restrictions on the ship harboring procedures and, if not accounted for, cause delays in the tanker offloading. From the existing information it is unclear whether they can apply any tangible pressure at the jetty construction phase.

Potential to influence environmental and social aspects of Project	Very High

7.7.4 Other operators in the Bay

The main interested company will be Agip KCO. As shown in Section 7.7.1.2, as the large foreign operator, Agip KCO is interested that its social and environmental policies, plans and programs (PPP) would be included into PPP of its contractors, including the Base operator. Most likely that Agip KCO will impact upon this operator through the contract terms, including regular audit of PPP efficiency.

Another large company is KazMunaiGas that operates and plans to construct two marine operation support bases near Atash Base. Its impact at the social and economic level will be provided by the great discrepancy of KazMunaiGas PPP to the policies, plans and programs, which will be applied by the Base operator under the influence of Agip KCO. Social and environmental aspects can be also used by this operator, who can provide the great impact on the state bodies, for the purpose of competitive activity.

Significance of the local suppliers is increased by the requirements of legislation and governmental units regarding to the attraction of the local contractors. Representatives of the local governmental units can also impose specific contractor for the private purpose, using the various social and environmental tools.

As the local suppliers have no efficient social and environmental PPP, Base operator can get problems with maintenance of Agip KCO requirements, if the contract with Agip KCO will not limit the operator's liability for the delay of waste delivery to Agip KCO contractor.

Potential to influence environmental and social aspects of Project	High

7.7.4.1 Lobby and political groups

Kazakhstan does not have an environmental lobby. The function of the newly created Environmental Committee in the Parliament is to review drafts of legislative documents prepared by the Ministry of Environmental Protection. The Parliament or the regional law making authorities (Maslikhates) has not initiated any environmental improvement. The strong industrial lobby aims to limit environmental control over the industries. Environmental improvements and changes in environmental control of economic activities usually come from the need to comply with international standards and agreements that Kazakhstan ratifies.

There is no political group that has environmental control on its agenda. In general political groups in Kazakhstan are weakened by the strong presidential authority. If not for the Parliament's tendency to raise the issue importance from zero in a matter of few days if the political situation requires so, this stakeholder would have received a very low rating.

Potential to influence environmental and social aspects of Project	Very low

7.7.4.2 Scientific experts and environmental consultations

Scientific experts and environmental consultations will not provide great impact on the project.

8 PROJECT DESCRIPTION

8.1 INTRODUCTION

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 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.

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.

Fig 8.1 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

8.2 CONSTRUCTION

Unlike for operation, the amount of activity during the construction period varies with time greatly coming to its maximum shortly after the start up and then gradually declining and increasingly overlapping with operation activities. Due to the fast-track nature of this project, many construction activities will be performed simultaneously as much as it is practical. The following sequence of construction is suggested:

1. Site and temporary facilities setup (electricity, water, catering etc.);
2. Land clearing and leveling;
3. Land reclamation, the wharf front and the breakwater construction;
4. Piling;
5. Dredging and rock crushing;
6. Service Jetty construction;
7. Installation of the new power line;
8. Permanent buildings construction;
9. Interconnecting pipe-work, electrical and instrument installation;
10. Site hard surfacing

Below is a more detailed description of these processes.

8.2.1 Site and temporary facilities setup

The setup is expected to take 2-3 weeks. A 20 room's modular accommodation camp and a construction office will be installed on top of the escarpment within the land acquisition area to house maximum 60 non-local engineering staff. Workers from Aktau will be brought by buses daily. Local workers will live in their houses. The camp will have its own water supply system and a sewage holding tank. Solid domestic waste will be stored in containers with tight, heavy lids to prevent food scavenging by animals and insects and transported to the local landfill.

2m fencing will be installed around the construction site and the camp at the earliest possible time providing security and controlled access.

8.2.2 Land clearing and leveling

The beach and the escarpment will be cleaned of garbage and large unstable escarpment rocks will be crushed and used for the site infill. This stage will take 1 week. The equipment will include:

- Two hand held pneumatic hammers
- One excavator
- Two 5m^3 dump trucks

8.2.3 Land reclamation, the wharf front and the breakwater construction

Limestone from the Atash quarry 10.2km away will be used[47]. The activity will take about 5 months, 8 hours per day, 6 days per week. The following local equipment will be employed for this work:

a. Breakwater

- 6 dump trucks (moving 48 000m^3/5m3/12 hauls a day/5 months)
- 1 dozers
- 1 excavators

b. Wharf and 0.8m thick cover over site (100 000m^2)

- 8 dump truck (moving 50 000m^3/5m^3/12 hauls a day/4 months)
- 2 dozers
- 2 excavators
- 2 roller

8.2.4 Piling

Steel sheet piling will take place at the wharf front, the slipway and the service jetty. It will continue for about 10 weeks, 8 hours per day, 7 days per week. Around 3200t of piles will be brought from Mangyshlak rail station by 20t trucks in 160 hauls. This corresponds to 3 trucks making 1 haul a day. A mobile crane will be used for piles offloading.

Three piling rigs will work onshore and one rig will work from a barge. All rigs will be pneumatic.

Concrete piling will be done under the onshore structure using the same piling rigs.

8.2.5 Dredging

In order to provide deep water access to the planned wharf front, and long-term mooring positions in the “safe” harbour area, it is planned to dredge the 240 000m^3 of the sea bed material and utilize this material to raise the level of the onshore site by 2.7m, and reclaim additional 6ha to expand the base site area. The remaining 0.8m will be filled by sand and gravel mix and compacted.

During 4-week period in February 2006 the sea bed will be dredged to form the navigation channels, the turning area and the berthing areas (Fig 8.). The dredging will provide adequate channel, maneuvering and berthing areas to permit the operation of the terminal with the critical case being the arrival of a tanker fully loaded with fuel. For this the minimum bottom widths measured at the seabed will be not less than 90m for approach channel and 250m for turning area. The depths of water will be not less than 5m for the approach channel and turning area; 4.5m for the approach to fuelling jetty and 4.2m for the approach to dockside wharf and the slipway.

[47] Work of additional equipment at the quarry is not described as it should be covered by the permitting documentation for the quarry

A not self-propelled dredger will be used that has a 2281 kW diesel pump on board and 552 kW cutter head. An excavator will reclaim all materials from the bottom and load it to a barge. The barge will be transported to the reclamation area by “Caspian Eva” tug.

It is expected that there will be no unsuitable material in the reclaimed area.

Additional crushing and extraction of approximately 10 000m^3 of limestone with the excavator will be performed from the barge driven by the tug. It will take around 4 weeks.

Water recovered with pulp will be settled and pumped out by small diesel pump.

8.2.6 Service Jetty construction

Construction will start with piling from a barge that will last for around 6 weeks. First, the jetty head will be constructed on top of the piles. Then the access bridge will be pushed on top of the piles by counterbalancing. It is not expected that barges will be required for this exercise. The whole construction is expected to last for 10 months.

8.2.7 Permanent buildings construction

The construction will continue for around 9 months and will require about 5000 t of various construction materials that will be brought by trucks from different suppliers and stored at the temporary storage site at the top of the escarpment. To construct the buildings 3 truck cranes, 2 electrical forklift trucks and 2 car lifts will be required. Two small welding machines working 5% of the time 1 gas cutter working 1% of the time will be used during this stage.

8.2.8 Interconnecting pipe-work, electrical and instrument installation

This work will be performed during the whole period of construction. It will involve one backhoe tractor, a mobile crane and a welding machine.

8.2.9 Site hard surfacing

Settlement will take place during the first year of construction. Therefore during the first 12 months of the construction phase the Base surface will comprise 0.8m of compacted sand and gravel mix laid over the 2.7m land fill. As this settles the sand gravel mix will be added and compacted until finally the settlement is complete. Then the cargo area will be covered with steel reinforced pre-cast interlocking concrete slabs with grouted joints and runoff collection system.

About 81 400m^2 out of 100 000m^2 of the site will be paved. This includes both concrete slabs and the tarmac roads. The remaining odd 20 000m^2 will be set aside for possible future development. There will be no activities or storage on it and drainage from it will not be collected.

The site will be accessed via the existing road from Atash settlement. To provide for heavy vehicles and loads and to minimize dust, the road will be resurfaced. In addition the main road at the spur point of the Base access road will be widened and repaired. No additional land will

be taken for the access road upgrading. The rest of tarmac road from Atash to the waste treatment facilities 10.2 km away will be used without upgrading.

8.2.10 Personnel

It is expected that in the period of construction on average 60 people will be working on the base area with the peak of 100 workers for 3 months. It is expected that about 80% of the starting construction force (80 workers) will be brought from Aktau. Foreign management and engineering staff will comprise of 10 people. The remaining 10 will be found locally.

The workforce from Aktau will be driven to and from the site daily. Foreign workers will live in Aktau and come to the temporary construction camp for the working week.

Canteen facility will be provided for the personnel. This canteen will be created for 160 persons and can be expanded for sub-contractors if they do not use their own facilities.

8.2.11 Water consumption

The water demand for household and drinking is calculated according to the requirements of SNiP 2.04.01-85 «Internal water line and water drain of buildings». During construction on average 1.5m^3 of potable water will be consumed per day. The camp will consume another 4m^3 of domestic water per day. Water (5.5m^3) will be brought from the existing Bauta Desalination Plant, located in Bautino village, in 3.6km from the base, and stored in a temporary holding tank. The associated machinery will include 1 tank truck haul from the existing desalination plant each day.

For the irrigation of the construction site, sea water will be taken from the bay by several hydraulic pumps and pulverized in dusting places. According to the estimations and weather data, irrigation will be necessary for the area less than 2.14ha over 130 days per year.

Tab. 8.1Calculation of drinking water needs at the construction stage (determined according to SNiP 2.04.01-85)

Consumers	Unit	Number	Consumption rate, m^3/day	Consumption m^3/day	Discharge m^3/day	Number of work days per year	Consumption, m^3/year	Discharge m^3/year
Domestic and drinking needs	Persons	60	0.025	1.5	1.2	365	547.5	438
Shower needs	Units	8	0.5	4	4	365	1460	1460
Irrigation of construction site with sea water	m^2	21400	0.0004	8.56	0	130	1112.8	0
TOTAL				**14.1**	**5.2**		**3120.3**	**1898**

8.2.12 Power supply

At first the power for the camp, the office and the security lighting will be run from the existing electric power supply at Atash village. A new 10 kV power line will be run from the two new transformers that will be installed at the Fort-Shevchenko substation to the 10/0.4 kV Base substation that comprises of 2x1000 KVA transformers. This will be done at the first stages of construction. For this purpose the infill and piling under the energy centre will be completed as

soon as it is practicable. One 500 KVA emergency diesel generator will be installed at a later stage. The associated equipment will include:

- Drilling rig for electrical posts erection
- Truck for delivering the post and transformers
- Mobile crane

8.2.13 Pollution and Waste Management

8.2.13.1 Emissions to the atmosphere

The principal sources of air emission at construction phase will be construction equipment and vehicle as a result of the following project works:

- Dredging
- Excavation during breakwater, jetty and base foundation
- Limestone transportation from Atash quarry, 10.2km;
- Transportation of the base components from Mangyshlak station, Aktau;
- Piling for jetty, base foundation and wharf;
- Production of electrical power during emergency power shutoff;
- Welding;

Estimated volumes of emissions due to these works are given in Appendix 2.

The dust will be formed during the operation of construction and road equipment, cargo handling, special equipment traffic within the construction area. Diesel fuel combustion materials motor fuel will be emitted from active engines of special equipment, construction and road equipment. The main pollutants at construction phase will be the following (Fig 8.2):

- Pollutants from diesel fuel combustion: nitrogen oxides, carbon monoxide, sulfur dioxide, soot, benzpyrene;
- Non-organic dust;
- Hydrocarbons;
- Hydrogen fluoride;
- Lead;
- Welding aerosol;
- Formaldehyde.

Tab. 8.2 Emissions by pollutants and fom the Base in general during construction stage

Pollutant	Hazardous class	Emissions	
		g/sec	t/year
Manganese and its oxides	2	0.000384	0.001380
Nitrogen dioxide	2	8.430426	6.110040
Nitrogen oxide	3	0.008334	0.106973
Soot	3	0.441827	0.308756
Sulphur dioxide	3	1.050361	0.760605
Carbon monoxide	4	5.464517	3.979809
Hydrocarbon	4	0.000007	0.000028

Xylol	3	0.047222	0.032000
Benzpyrene	1	0.00001	0.000008
Formaldehyde	2	0.105691	0.076613
Kerosene	3	2.553805	1.841008
White spirit	3	0.070833	0.048000
Suspended solids	3	4.29624	13.716864
Inorganic dust (SiO2 -20-70 %)	3	12.777156	37.411694
Welding aerosol	3	0.003334	0.012000
Total		**35.257133**	**64.404398**

Tab. 8.3 Potential sources of air emission at construction phase

Name	Type of work	Number of work hours	Number of equipment
Compressor for piling machine	Piling	560	3
	Piling for building	90	1
Dredging machine	Dredging	192	1
Diesel pump installation	Dredging	192	1
Tug	Dredging	58	1
Excavator, EK 270	Land clearing and leveling	14	1
	Breakwater construction	1000	1
	Land reclamation and wharf construction	800	2
	Dredging	800	1
Compressor for manual pneumatic hummers	Land clearing and leveling	48	2
Dozers, K-701	Breakwater construction	1000	1
	Land reclamation and wharf construction	800	2
Mobile crane, KS-55729	Site and temporary facilities setup	72	1
	Service Jetty construction, pipeline construction, electrical and instrument installation	400	1
	Welding for buildings	900	2
Lifting crane, DEK	Welding	56	1
Dump truck, KAMAZ-5460	Breakwater construction	100	6
	Land clearing and leveling	14	2
	Land reclamation and wharf construction	80	8
20-ton truck	Site and temporary facilities setup	72	1
	Welding	2	3
Car lift	Welding for buildings	900	2
Roller DU-47DM	Land reclamation and wharf construction	800	2

Fig 8.1 Estimated volume of solid emissions at construction phase

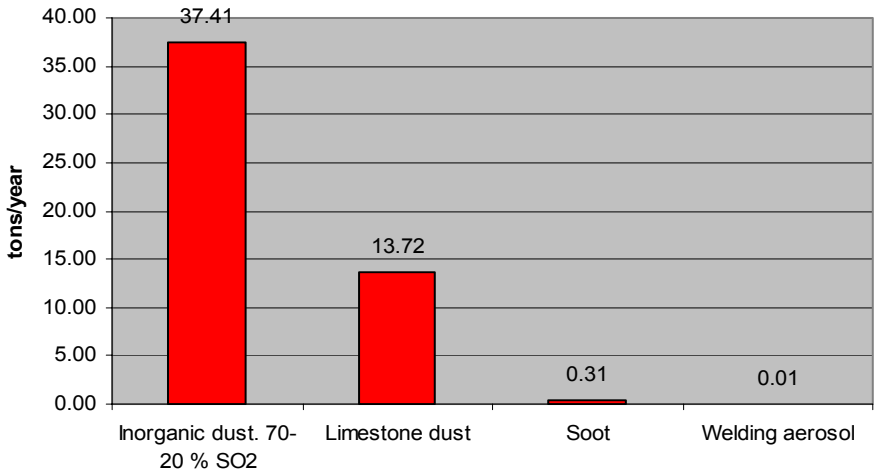


Fig 8.2 Estimated volume of suspended solids emissions at construction phase. Note the difference in scale measuring unit

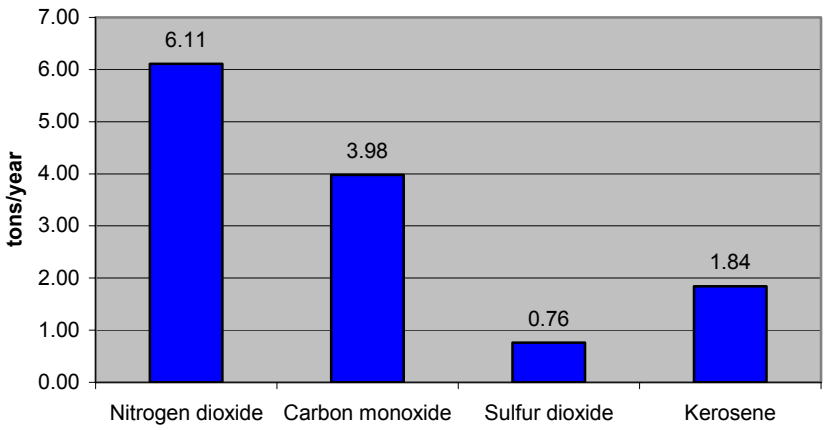


Fig 8.3 Air emissions structure (tons per year) by emission source and details of air emissions structure

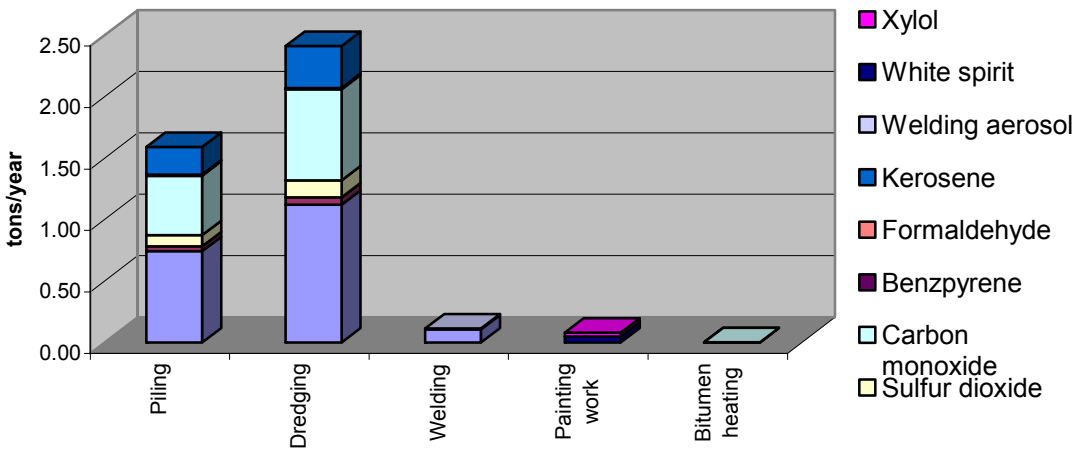


Fig 8.4 Air emissions structure (tons per year) by emission source and details of air emissions structure. Note the difference in scale measuring units

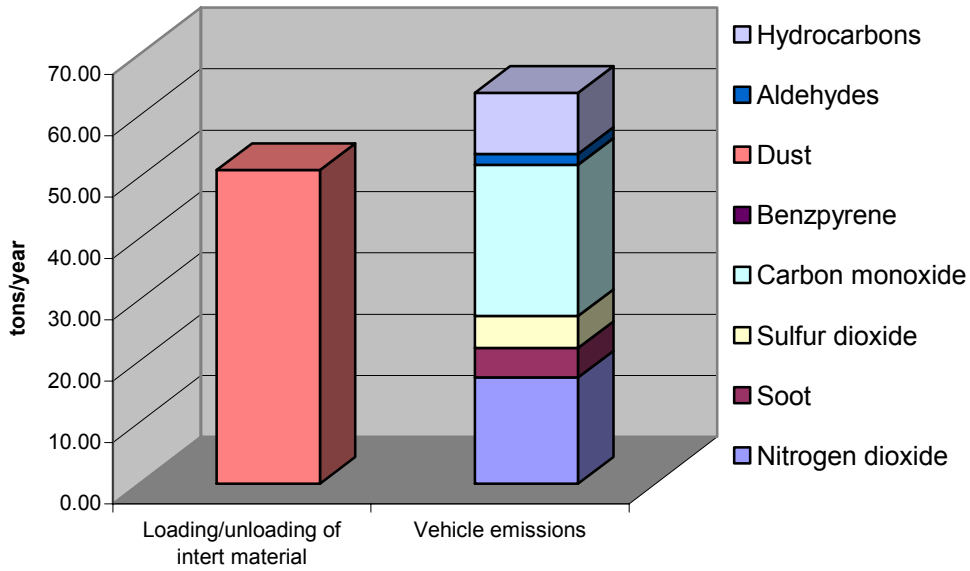


Fig 8.5 Emission structure from diesel engines

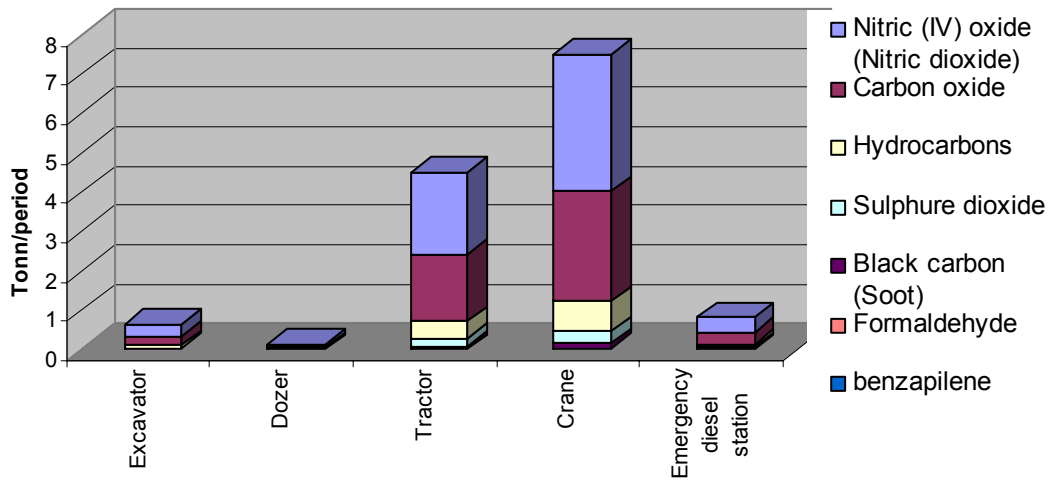
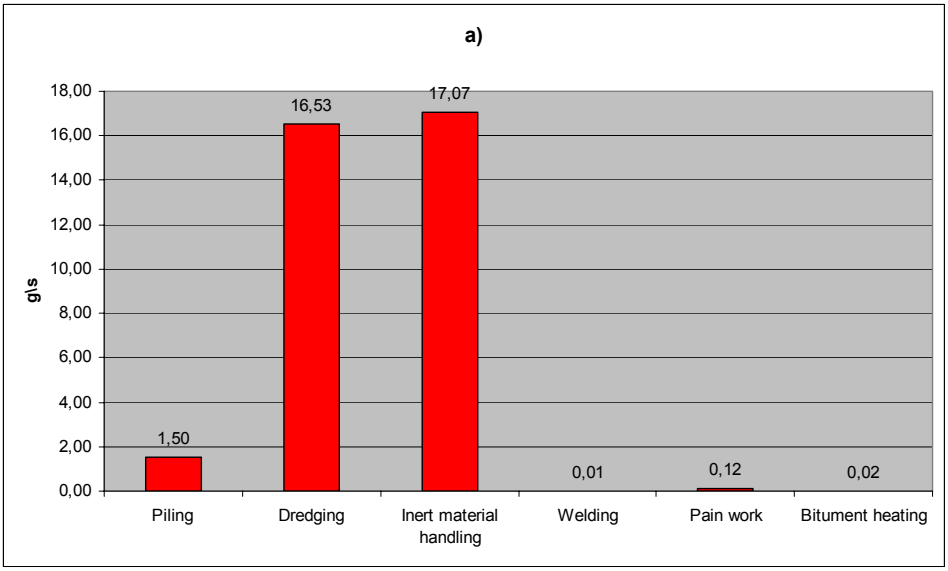
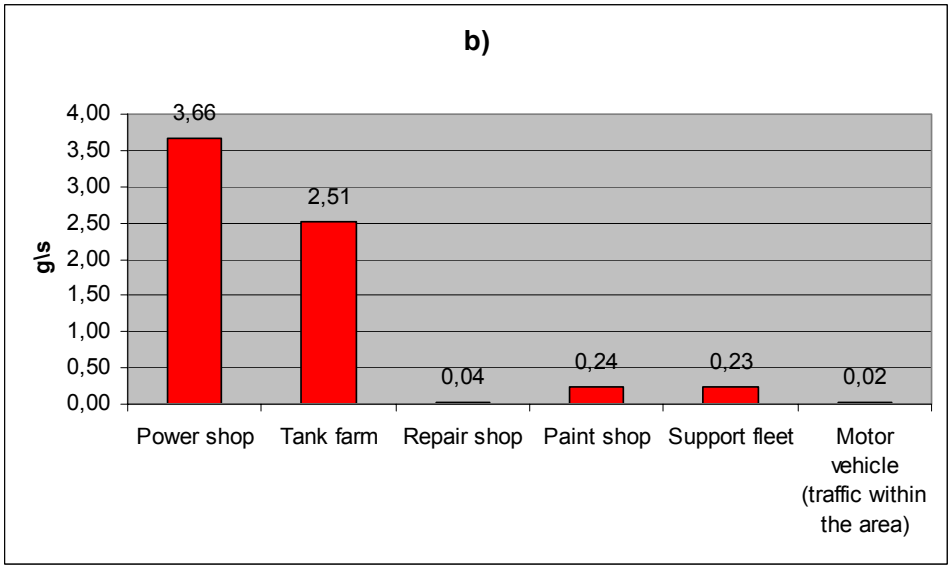


Fig 8.6 Maximal peak emissions (g/sec) at the stage of (a) construction and (b) operation





Estimations indicated (Appendix 1) that Atash and Bautino villages will be in 2MPC area by nitrogen dioxide and sulphur dioxide during 4 weeks of dredging and breakwater construction. Surface concentrations of limestone dust can exceed 2MPC and inorganic dust can exceed 10MPC during the unloading and leveling of limestone.

The northern part of Atash village at the construction stage will be 2MPC area by nitrogen dioxide and 3MPC area by sulphur dioxide and nitrogen dioxide summation.

Estimation of the emission volumes (Appendix 1) indicates that these pollutants at some phases of the construction period will be emitted to the air in relatively large amount, but, taking into account that most of the pollutants are not hazardous and the construction period is short-term, this negative impact will be brief. Pollutants will disperse in a short time to non-toxic concentrations.

As seen from Fig 8.2, without mitigation measures dust can provide the highest contribution to the air pollution, especially on dry and windy days, but the measures of the dust concentration reduction suggested in Section 11 will minimize this impact. Operation of diesel engines of dredging machine, pumps, compressors and vehicle will provide the largest amount of gaseous emissions (Fig. 8.3 and 8.4).

Specific construction equipment activity (dredgers, pumps, compressors) also makes a significant contribution to air pollution due to emissions from high-capacity diesel engines (Fig 8.5).

8.2.13.2 Noise

Noise will be produced by the following equipment:

- Diesel engines (and in less degree mobile parts) of mechanisms and vehicles;
- Four pneumatic piling rigs;
- Four handheld pneumatic hammers during land clearing;
- Pneumatic hammer at the dredging barge.

Especially significant noise will produced during the operation of the piling rigs, bulldozers and excavators. Noise level from the increased traffic is difficult to predict. According to SniP II-12-77 it is 79 dBA at the front of the nearby residential houses. Crane and hoist operation during the Base activity will be episodic and brief, and noise level will be low.

8.2.13.3 Lighting

Sight lighting will be installed for security and safety purposes. It will be directed towards the site and screened away from the adjacent area. As all work is expected to be performed during the light hours, there will be no need for additional lighting but navigation lighting at the barges.

8.2.13.4 Waste

Generated waste volumes were estimated according to RND 03.1.0.3.01-96 and shown in Tab 8.3. Sewage from the camp and the office will be discharged into an underground sewage holding tank that will be regularly emptied by a tank truck. Then the sewage will be taken to the Fort Shevchenko municipal sewage treatment facility.

Tab. 8.4 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 for recycling
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**			

It should be noted that submission of water to Tenis Service waste management facility is a tentative option until its compliance with the project requirements are confirmed.

8.3 BASE OPERATION

The Base is expected to service and provide wintering berth for around 50 vessels including vessels currently owned and operated by CSG (Tab. 8.4). These are going to be shallow draft (<3.0m) vessels, up to 70m in length and 16m beam. Rafted mooring of multiple vessels provides them with essential services (water and electrical power) along the main wharf front and in the sheltered harbour.

In addition a crew transfer berthing of up to 70 person crew transfer vessels of up to 40m length, 8m beam and 3m draft is planned on the main wharf front.

8.3.1 Service Jetty

A service jetty with two berths is planned for a wide variety of vessels to allow the efficient, controlled transfer (both export and import) of fuel and water via a network of pipelines to/from associated storage and processing facilities onshore. Service berth facilities will be located so that access for vessels to be serviced is sufficiently sheltered and unhindered by other marine base operations (loading/off-loading, slipway hauling etc). In addition to these services, shore power (electricity) will be available. Sufficient level access (unhindered by ramps or tight horizontal curve radii) to these service berths will be provided for 20T trucks, a 12T capacity mobile crane, and light trucks with trailer tank trucks as well as necessary emergency and fire-fighting equipment. This machinery will not reside at the jetty and will enter it only occasionally.

Tab. 8.5 CSG Vessel Specification, June 2005

Description	Cargo	Capacity (m³)	Length (m)	Width (m)	Loaded Draft (m)
1. Tanker	F	5000	125	16	4.8
2. Tank Barge (propelled)	F/W/S	2500	125	17	2.3
3. Tank Barge (non propelled)	F/W/S	1500	70	16	2.2
4. Cargo Barge	M	2800 MT	125	16.7	2.5
5. Module Barge (non propelled)	M	1700 MT	86	17.5	2
6. Caspian Maria (MP deck ship)	M		54	13.8	2.8
7. Caspian Eva (tug)	na	Na	22	8	1.7
8. Caspian Dinara (accommodation)	M	Na	52.5	12	2.2
9. Caspian Raushan (crew boat)	na	Na	33.5	7.7	2.1
10. CaspianYelena (supply vessel)	na		63	12	2.5
11. Baskunchak (work barge)	na	Na	123	23.4	2
12. Coastal Bigfoot (survey vessel)	na		40	13	0.8

F-fuel, W-waste, S-sewage, M- non toxic, solid material (pipes, coupling, instruments etc.)

The jetty head will consist of a loading/unloading platform with berthing dolphins at each end. A separate mooring dolphin will be provided to cater for bow ropes. The dolphins will be equipped with fenders capable of accommodating the largest vessel berthing at this jetty. Fendering prevents contact between the vessel and the berths and avoids trapping of the vessel or mooring wire.

Any oily surface water on the jetty berthing station will be collected by floor drains and pipework into a holding tank. The contents of the holding tank will be extracted by tank truck and either transported off site for treatment by others or deposited in the Base surface and storm water holding tank for transportation off site at a later date.

The jetty head will be approached by a 4.2m wide road carried on an access trestle. This road will be continued across the two berthing dolphins and the loading platform. A vehicle turning area will be provided on the mooring dolphin. An access bridge will carry a walkway linking the jetty head with the mooring dolphin.

For safety reasons the tanker manifolds will be placed at a distance of at least 200m from the nearest point of industrial activity.

8.3.2 Wharf

The onshore area will be fronted on the water side by a Dockside Wharf, a 420 m long straight line quay which will be constructed with steel sheet piles. Four loading/off-loading positions are

planned, to accommodate one 120-ton lifting capacity mobile pneumatic-tire crane as a means of transferring equipment and supplies to and from appropriate vessels (up to 125m in length and 3m draft) moored at locations on the main wharf front.

8.3.3 Slipway – Vessel hauling

A slipway facility is planned to provide a means of hauling, side-by-side, two vessels (individually ranging in dimensions up to 70m in length, 18m in width, 3m draft and 1000-ton mass) clear of the water to a 'dry' surface that will allow for unhindered inspections and maintenance/repair work. It is expected that up to 2 vessels will be services each month. The slipway perimeter will accommodate access and operation of a 120-ton mobile crane.

An electrically driven hydraulic lift with a rail system will be built to move vessels to the dry maintenance area. The slipway will not have a gate. The runoff will be collected via interception gutter in a separate holding tank. A valve on the holding tank will prevent collection of sea water during sea surges.

8.3.4 Diesel tank farm and distribution system

Land-based fuel storage capacity of 7500m^3 in 3 separate tanks (2 500m^3 each), including a marked, subsurface, piped system as a safe and efficient means of importing (for storage) fuel from: 1) Marine vessels moored at either berth (#1 or #2, not both simultaneously) at the service jetty. The largest anticipated import parcel is 5000m^3, and; 2) Land-based vehicular tankers. The system will also include a marked, subsurface piped system as a safe and efficient means of exporting fuel to marine vessels moored at either berth (#1 and/or #2, possibly both simultaneously) on the service jetty. An effective means for immediate isolated storage and quality testing of import parcels will be provided, as well as a fully computerized means for precisely measuring, controlling and receipting/invoicing all fuel imports and exports.

The fuel storage facility is subject to requirements of the Seveso Directive on the control of major-accident hazards involving dangerous substances. The Directive requirements are described in Section 5.1.5.4.

8.3.5 Breakwater

The breakwater built with local rock will be curved to protect the harbour from the prevalent northerly winds, waves and ice movements. A crest width of 5m will be provided to assist the passage of maintenance vehicles.

8.3.6 Capital Buildings

The workshop is suitable for achieving simultaneous marine maintenance and repair work on two vessels located on the slipway. The workshop is planned to provide a range of maintenance services to vessels including welding, engine repair/maintenance, electrical and electronics repair/maintenance, etc.

A 6000m^2 insulated warehouse segmented into three (3) 2000m^2 separate and fully secure areas. Office and staff facilities are to be accommodated within each of the three segmented

zones of the warehouse shell. The warehouse spaces will be heated for winter operations. The ground floor slab is to be designed to support warehouse loading with double stacked containers and heavy-duty forklift movements.

Desalination plant will operate at 50-70 bar pressure and consume 250kW/h.

Secure base offices capable of accommodating the base operations management and administration; CSGs fleet management; external contractors/clients; security services; base staff facilities.

A transit lounge with bathroom facilities to accommodate up to 70 persons for short periods (1-2 hours) is placed close to wharf area designated as the crew boat mooring point.

A secure control tower facility effectively capable of monitoring and communicating with/directing all base-orientated vessel movements in Tyub-Karagan Bay, and; monitoring and directing all vessel-orientated and land-based activities at the site.

8.3.7 Desalination Plant and water consumption

A sea water reverse osmosis desalination plant with 500m^3/day capacity will provide potable water for the Base staff and the berthing vessels. Most of this water will be exported to the vessels moored either at 2 service jetty births or at 2 service points at the wharf. Water will be abstracted by a pipe positioned on piles under the service jetty access bridge.

The Base daily consumption is determined according to SNiP 2.04.01-85 to be 10.8m^3. The water will be stored in two 1000 m^3 vertical cylinder, steel tanks (to provide 4 days storage) and pumped by an electrically powered water pump (situated in a 6x6x4m station with steel frame and clad walls) to the buildings and the loading berths through fully computerised metering points for precisely measuring, controlling and invoicing all exported treated water supplies to the vessels. The plant will also supply fire fighting water to a 1 000m^3 holding tank. Therefore only the potable quality water will be used at the Base for all needs. For this reason it is planned to join all three water holding tanks by a pipework to allow greater flexibility.

As the visitors of the base will be mainly shift workers, who expect the vessels for departure to the platforms, drivers of trucks and tank trucks, the duration of their visit is assumed as 2 hours per day, and water consumption is assumed as ¼ of administrative worker.

Wet cleaning will be implemented each third day in the area of 1750m^2. About 20% of water after the cleaning will be evaporated, residual water will be discharged into the sewerage system. Water consumption of the heating system is considered as the maximally possible for heating of 9,000m^2.

Tab. 8.6 Estimates of Base demand for potable water (according to SNiP 2.04.01-85)

Consumers		Units	Number	Consumption rate, m^3/day	Consumption m^3/day	Discharge m^3/day	Number of work days in year	Consumption, m^3/year	Discharge m^3/year
Domestic and drinking needs	Workers	Persons	102	0.025	2.55	2.04	365	931	745
	Administrative staff		60	0.016	0.96	0.768	365	350	280
	Visitors		140	0.004	0.56	0.448	365	204	164
	Shower needs	Units	8	0.5	4	4	365	1460	1460

	Room cleaning	m^2	1750	0.00465	2.7	2.2	122	332	332
Heating system	Filling	m^3	190				1	190	190
	Hydro-test		230				1	230	230
	Washing-out		285				1	285	285
	TOTAL				**10.8**	**10.0**		**4066**	**3769**

8.3.8 Cargo area

The 1 720 m^2 cargo area is intended for trans-shipment and short-term storage of goods prior to transporting to the ships. These goods relate to the supply of marine serving related products and the different methods of loading and unloading.

The whole cargo flow needed to be accommodated in the cargo area may be separated into export and import components. The export component includes cargos for the normal operation of marine support services. Import includes the flow of cargo arriving at the marine base and intended for further transportation. Also, all cargo arising from off shore marine works being returned after usage at construction and operation of wells in the sea.

Tab. 8.7 Optimum cargo flow (in 1000 ton/year)

	Products cargo & tools	Field pipes	Fittings instruments etc.	Waste	Potable water
Export	125.0	200.0	40.0	-	180.0
Import	180.0	100.0	46.0	36.5	-

8.3.9 Heating/cooling

A total of 9656 m^2 area and 4 fuel tanks will be heated with 3 class D light fuel oil powered boilers of total capacity 1500 kW. The height of a freestanding boiler flue with a flue velocity of 6 m/s and flue gas temperature of 260 ^{0}C is estimated to be 18 metres; flue gas pressure at 260 ^{0}C - 12 Pa and flue gas volume - 20.5 m³/kg fuel

The class D light oil fuel has calorific value of 45.5 MJ/kg (or 12.6 kW/kg) and a sulphur content of 1%. Assuming the plant is 80% efficient, the net value will be 10.1kW/kg. The estimated amount of fuel used by the boiler plant will be 1500/10.1=148.5 kg at full load. The heating season is calculated to be 180 days, therefore the consumption of fuel oil would be 180x24hrs x80% of full load x 148.5 kg =513.2 tons /year.

Tab. 8.8 Heating Loads

Buildings	Area, m^2	Heating Load kW
Energy Centre	384	27
Desalination	324	27
Administration Building	900	99
Gatehouse	40	4
Transit Lounge and Control	136	21
Workshop and Winch House	1680	100
Water Pump House	36	8
Fire Pump House	36	8
Warehouse and Facilities	6120	572
Tank Farm	n/a	480
Total	**9656**	**1346**

Total heating load estimated at 1346 kW, total boiler capacity to 1500 kW made up by three boilers each rated at 500 kW.

A hot water heating main from the energy centre boiler plant will supply a heat exchanger to provide hot water for heating and domestic use (laboratory, toilets and drench shower). Space heating in the support facilities zone will by wall mounted radiators to maintain a minimum temperature of 21^0 C. Space heating to the storage area will be provided by warm air blowers mounted at high level to maintain a minimum temperature of 19^0 C.

Air conditioning will be by electrically powered split units sized by design. Location will be limited to the administration building, control room and transit lounge.

8.3.10 Energy

Up to 99 000 kW will be used by the Base annually with most of it being consumed by the Desalination Plan (Tab. 8.9). The 10/0.4 kV substation, distribution switchboard, standby power plant and heating plant will be located in a purpose built energy centre. The power will be supplied from the 110/10 kV substation at Fort-Shevchenko that already has two output transformers (10 and 6.3 MVA). To provide spare capacity, two 10 MVA transformers will be installed at the Fort-Shevchenko substation and a new 10kV power line will connect them with a 10/0.4 kV Base substation that comprises of 2x1000 KVA transformers. Electrical distribution throughout the base will be 0.4 kV.

One 500 KVA diesel generator at the energy centre will serve priority circuits in the event of the cutting of main power. Space will be available for a second 500 KVA generator should this become necessary at later stages.

Tab. 8.9 The estimated power consumption for the energy centre

Area	Usage hrs/ day	Load kW (max)	Consumption kW/day	Consumption kW/year
General Lighting	8	5	40	15 000
General small Power	3	3	9	3 000
Desalination Plant*	6	37	222	81 000
Total		45	271	99 000

Vessels batteries will be recharged at 5 berthing points at the wharf but the consumption is not expected to be significant enough to affect the above estimation.

8.3.11 Personnel

Number of employees is determined according to «Standards of technological designing marine ports» РД 31.3.05-97. The personnel staff does not include the employees involved in organization of shipments and stevedore services of the area.

Tab. 8.10 Estimated most likely number of personnel at operation stage

Classification	Quantity	Source
Cargo workers *	68	Local/Regional
Skilled and unskilled workshop workers	8	Local/Regional
Fuel and fire workers at the jetty	4	Aktau
Desalination Plant Technicians	2	Aktau
Fire Services Technicians	2	Aktau
Security	4	Local
General workers (cleaners etc.)	8	Local
Cooks and assistants at canteen	6	Aktau
Office staff	60	Foreign/Kazakhstan
Total Permanent	**162**	
Incoming and outgoing crew	100	Regional
Incoming and outgoing drivers	40	Aktau
Total transiting	140	

* Depends on the cargo flow estimates taken as 727 000 t/year

8.3.12 Pollution and Waste Management

8.3.12.1 Air emissions

8.3.12.1.1 Emissions during standard operation

At the operation phase the number of emission sources and emission volumes will be significantly reduced in comparison with the construction phase. Estimated maximal surface concentrations beyond the Base area will not exceed 1MPC, but the northern part of Atash village during the rare and short power shutdowns (108 hours per year) will be in 5MPC area by nitrogen dioxide and sulphur dioxide. Routine air pollution will take place mainly due to the emissions from the boiler and fuel storage and distribution system (Appendix 1).

Tab. 8.11 The principle air emission sources at Base operation phase

Source	Pollutant
Boiler, pipe – 16m	NO_x, CO, CO_2
Fuel storage unit and 2 refueling points at wharf	Hydrocarbons
Mechanical repair shop	Metal dust and emulsol vapors, wood dust, nitrogen oxides, welding aerosol, manganese oxide, silicon oxide
Power and argon welding machines	manganese oxide, silicon oxide, fluorides, hydrogen fluoride, welding aerosol
Tug (for mooring and manoeuvre)	Diesel fuel combustion materials (nitrogen oxides, carbon monoxide, sulfur dioxide, hydrocarbons, benzpyrene, soot, lead)
Emergency diesel power station	Diesel fuel combustion materials (nitrogen oxides, carbon monoxide, sulfur dioxide, hydrocarbons, benzpyrene, soot, lead)

Note: emissions during the vessel maneuvering entry and departure were not taken into account during the air emission estimation for operation phase, as these emissions are associated with marine operations and will be implemented in the bay even if the Base is absent.

Approximate list of pollutants that will be emitted to the air during the operation of project facilities:

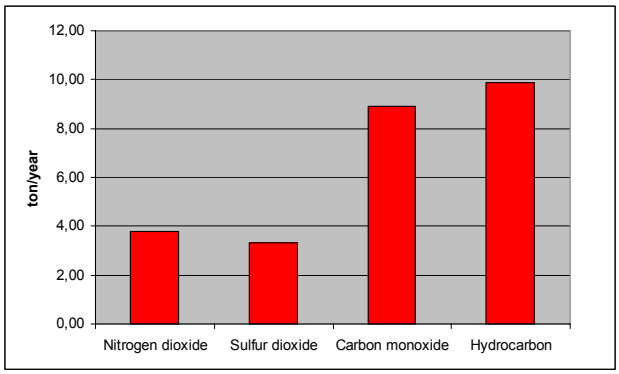
- Diesel fuel combustion materials (nitrogen oxides, carbon monoxide, sulfur dioxide, hydrocarbons, benzpyrene, soot, lead) – from heating boiler, emergency diesel power station, vehicle operation and vessel maneuvering in the sea water area.
- Metal dust and emulsol vapors – during the operation of metal-working machinery, nitrogen oxides, welding aerosol, manganese oxide, silicon oxide – from welding points, during painting works - white spirit, xylol;

- Hydrocarbons vapor from fuel tanks and 2 vessel filling points;

Tab. 8.12 Emissions by pollutants and from the Base in general during operation stage

Pollutant	Hazard class	Emissions	
		g/sec	t/year
Manganese and its oxides	2	0.000384	0.00069
Lead and its compounds		0.000003	
Nitrogen dioxide	2	1.553573	3.78943
Nitrogen oxide	3	0.007212	0.053487
Sulphuric acid	2	0.000225	0.00068
Soot	3	0.083264	0.230208
Sulphur dioxide	3	0.378048	3.334056
Carbon monoxide	4	1.432388	8.913934
Hydrocarbon	4	2.516288	9.889024
Xylol	3	0.094444	0.32
Benzpyrene	1	0.000002133	0.000003
Formaldehyde	2	0.018	0.025476
Kerosene	3	0.435	0.611424
White spirit	3	0.141667	0.48
Benzine	4	0.000421	0.001127
Emulsol	3	0.023611	0.0306
Suspended solids	3	0.003334	0.006
Total annual emissions for the Base		**6.687864**	**27.685448**

Fig 8.7 Estimation of air emissions at operation phase (ton/year). Please not the difference of diagram measuring units



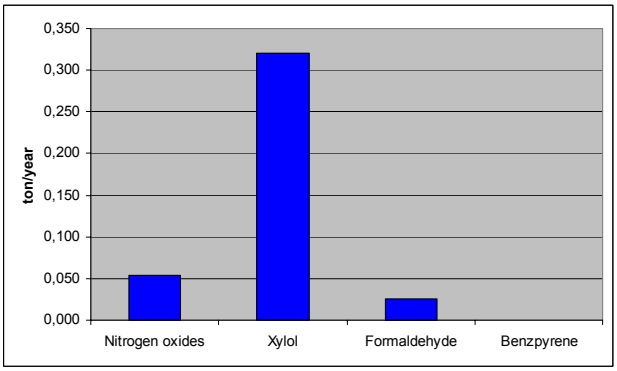
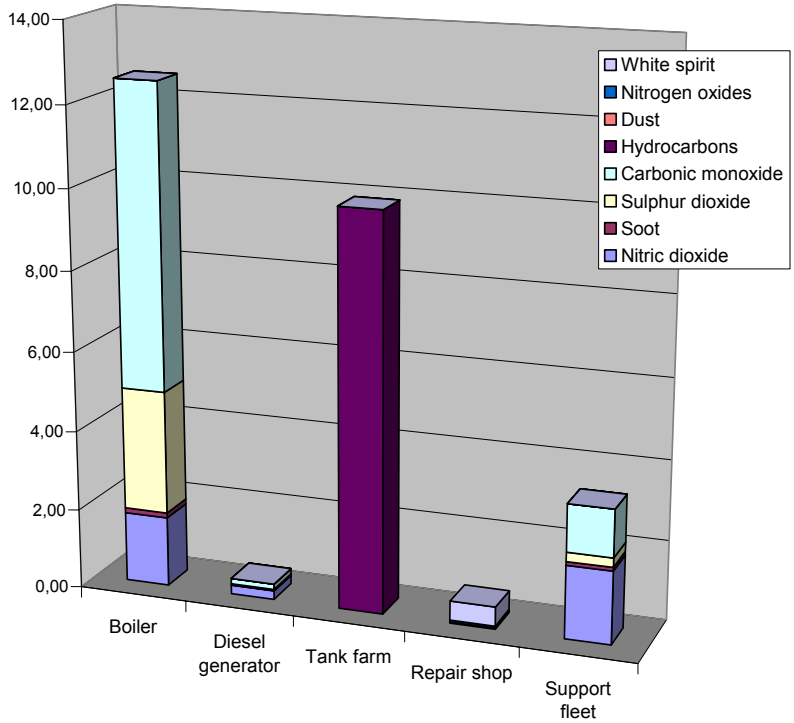


Fig 8.8 Structure of air emissions (tons per year) by the emission sources and details of emission structure



As Fig. 8.9 shows, the greatest contribution into the air emission is provided by the boiler. The greatest contribution by the type of pollutants is provided by hydrocarbons, carbon monoxides and nitrogen oxide.

The support fleet of the Base is represented by one tug, equipped with a diesel engine. All vehicles used within the Base, except for a 12-ton capacity mobile crane, will be equipped with electrical engines; therefore the emissions from mobile sources will be minimal.

8.3.12.1.2 Emergency emissions

The construction of the fuel storage and distribution system will be implemented according to international health and safety standards and equipped with an up-to-date electronic control system. In addition the Spill Response System will be able to contain the unlikely small spills. Possibility of significant spills in the sea, fires and explosions was estimated as less than once per the period of the Base operation.

Thus, the single emergency air emission source will be the emergency power generator. This generator will operate during the period of power supply system repair. Estimations of generator emissions are given in Appendix 1.

8.3.12.2 Waste

The estimated annual waste generation during the Base operation is presented in the Tab. 8.4 .

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. Analysis of peaks in daily precipitation for the 30 year period (1976-2005) in Section 6.1.2 showed that one day in 2-3 years the projected runoff holding tanks (2000m3) will be filled up and some runoff will have to be redirected into the Sea. It is difficult to determine the volume of residual sewages, as the distribution of extreme

precipitation is random by the time and volume (Fig. 6.3). However, as Environmental Assessment Section shows, the residual water will be drained from already cleaned Base area.

8.3.12.2.1 Hazardous liquid waste

During normal operation oily water can be produced during vessel repair and clearing prior to painting and drainage of 8 ha of hard surfaces. On average 3m^3 of oiled water will be produced from each repaired vessel. Because a maximum of 2 vessels can be repaired simultaneously each month, a maximum 24 vessels can be repaired per year. This gives the annual maximum generation of oiled water as 72m^3. According to the company HSE Management Plan any small spills of contaminants on the hard surfaces of the base must be immediately cleaned with available absorptive material. Also all Base drainage will pass through the three sand and oil interceptor sumps: at the main site, the fuel storage area and at the slipway. This means that only remaining stains from accidental small spills will be washed into the drainage system. For this reason it can be assumed that the volume of drained and separated oily water will not exceed 10 litres per day or 4 m^3 per year.

The volumes of accidental spills from the vessel fuel import/export system is more difficult to calculate as adequate statistics on the probability of such events and most likely volumes spilled is sparse. According to Section 9.4 five out of eleven possible events that are likely to occur within 10 years of operation can release in total no more than 500m^3 of diesel into the environment.

If fuel spillage enters the sea, spill containing floats will be employed and a special vessel will use rotating sponges to collect diesel and diesel/water emulsion from the sea surface. If fuel is spilled on the hard surface of the site, it will be localized and swabbed by absorptive material. Escaped fuel will enter the interceptor well through the drainage system. Providing that 10% of diesel will evaporate before collection, 10% will dilute in the seawater, and the result after passive gravity separation the emulsion will contain 20% of water, around 1000m^3 of oily water can be generated every 10 years or on average 100m^3 per year. This makes the maximum possible accumulation of oiled water as 176m^3 per year.

At the jetty head the water will be collected by the jetty head drainage system into the main site sand and oil interceptor sump, to the holding tank and then removed as per Tab. 8.3. Oily water collected from the vessels at 2 berthing points will be sucked directly into a tank truck. In the case when a tank truck is not available, oily water can also be passed through the fuel storage area sand and oil interceptor sump and stored in its holding tank.

Oiled water from the sumps will be removed in a tank truck to the Tenis Service LLP waste disposal facility 11km east of the Base (Fig.6.2). The Tenis Service LLP has a license to dispose and manage such waste.

8.3.12.2.2 Non-hazardous liquid waste

Sewage from buildings, vessels and freed from sand and oil surface runoff water from the holding tanks will be collected into two 1000m^3 underground tanks and then transferred by the municipal services tank trucks to the Municipal Sewage Treatment Facility (STF). This waste transferring and disposing organisation has full license to manage non-hazardous liquid waste. It is assumed that the volume of sewage generated by 160 base staff and 140 visitors will be equal to 10m^3/day (Tab 8.5).

Before collection, sewage and drain water will be checked for hydrocarbon content by the Base laboratory for compliance with the Kazakhstan standards for untreated sewage.

Surface runoff water collection system will be designed and installed in accordance with SNiP 2.03-10-2002. The runoff water will be directed from all hard surfaces (81,400 m²) into a system of underground pipes connected to oily water interceptor and then into two holding tanks 1000m^3 each sized to accept 15% of the annual rainfall given as 117mm/year. As stated in Sections 6.1.2 and 8.3.12.1.1, once in 2-3 years this capacity may be exceeded as a result of an extreme precipitation event. Impact from this overspill on seawater is evaluated in Section 9.2.2.

The bounded fuel tank area (4 600m²) will be drained into a stand alone sand and oil interceptor sump and into a holding tank with a capacity equal to 50% of the annual rainfall (no less than 300m³).

Rainwater runoff from the area above the Base is diverted around the base and is not collected.

8.3.12.2.3 Solid non-hazardous wastes and scrap metal

The scrap metal will include small quantities of pipe cuttings, replaced during the operation, construction and process components. Some small amount of scrap non-ferrous metals – aluminum boards, copper wire, etc. will also be generated. Scrap metal will be temporarily accumulated at the scrap metal heaps at the workshop. When accumulated, metal will be handled to a utilization company.

Other process wastes will be placed into closed containers in designated areas at the Base and then collected by the waste contractor to dispose into the Tenis Service LLP Landfill. The waste transferring and disposing municipal services have full license to manage non-hazardous solid waste.

Sedimented sand and grit from the sand and oil intercepting sump will be periodically removed and analysed by the Base laboratory for compliance with the non-hazardous waste standards for hydrocarbon content. If exceedance is recorded, the sand will be treated as solid hazardous waste and disposed accordingly (see Tab. 8.3).

Glassware (bottles, jars and other glass containers) will be collected at the waste collection site and delivered back to the retailers with further removal to Aktau for recycling.

8.3.12.3 Noise

Noise from the operations at coastal part of the Base will be effectively screened by the escarpment. Pile driving will be 8 hours per day, 7 days per week, for 10 weeks). As well the wharf front and breakwater construction (8 hours per day, 6 days per week, for 5 months) will be more significant. This impact will change, depending on the wind direction and speed, as well as distance from houses, because the noise reduces rapidly within first 200m from the source. Beyond 200m dissipation the rate is not that great.

Especially significant noise is produced during the operation of bulldozers, excavators and diesel facilities: scraper - 83.7 dB; bulldozer at the distance of 100-150m – 65-69 dB. The highest noise level will be noted at work sites. GOST 12.1.003-83 specifies the levels of noise effect and equivalent levels of noise at work places, depending on the degree and intensity within 32.5-8000 Hz. Noise levels and equivalent noise levels at work places are 80 dBa.

During the Base operation, noise at site will mainly be produced by episodic and brief crane and hoist operation. Their noise levels will be around 40-50 dB (A). Sewage and black water tank trucks traffic (at its maximum one every 10min from 9:00 to 18:00) will increase noise impact upon the southern part of the village. It can be expected that the noise can reach 75-79dB(A) at house façades as the trucks pass by. As this road through the village is not used actively and the background noise level in a usual day is low, increase in noise can be considered significant. It should be noted however that the traffic load can vary from zero to maximum one in 10 minutes.

8.3.12.4 Lighting

Sight lighting will be installed for security and safety purposes. It will be directed towards the site and screened away from the adjacent area. To save energy and reduce light pollution floodlights will be controlled by movement detectors and will be effectively located around the base perimeter.

8.4 DECOMMISSIONING

Consideration of the project by the operator and the authorities includes examination and assessment of Base Liquidation Plan. This will allow timely consideration and change of site management for the most suitable variants of decommissioning and base liquidation.

Decommissioning of the Base is not expected for some decades. Even after cessation of the offshore oil and gas operations, the general purpose Base facilities can be used further for another industry like fishing. For this reason decommissioning will include at the most removal of components that can become an environmental or health hazard. At this stage 5 such components are identified:

- Jetty
- Fuel export/import and storage system;
- Sewage and oiled water holding tanks;
- Workshop interior and the slipway components;
- Step down electrical transformer

Jetty and the wavebreaker can become a serious navigation hazard if the navigation lights are not maintained. Deteriorated surfaces of the jetty passage can also be a health hazard if the public access to it is not restricted. It is not viewed as practicable or even feasible to remove the wavebreaker and the responsibility for the navigation light maintenance would have to be transferred to the Harbour Master. The jetty surface steel and other fittings can be recycled. Their removal will be done by the metal cutters incrementally starting from the jetty head and moving towards the shore. Temporary navigation lights will be put in place of removed lights. Piles will be cut off by divers with underwater cutting gear (e.g. thermic lamps) placed on a barge and transferred to the nearest landfill.

Dismantling of the fuel distribution and storage system is essential and obligatory as system components can constitute a danger for the environment. The system is dismantled in the same way as it was constructed, but in reverse order. The equipment is removed, cables and pipelines are taken out. In the course of doing this any contaminated components will be detected and isolated.

Dismantling will be conducted with, electric saws and a shearers. Before decommissioning all metal structures will be prepared in accordance with the requirements of scrap utilizing companies. The companies can determine the maximal size of pieces, surface cleaning degree.

Some components such as valves, pumps, etc. can be used repeatedly and are potentially considered as goods for resale. However, such probability is low as the components can be outdated, depreciated and inappropriate for reuse according to specifications.

The other components or the most part of them will be disassembled and taken apart on the site. Any possible dismantling leaks will be collected into sumps and spills wiped off with the absorptive material. All the options of reuse, recycling and recovery of the decommissioned components will be considered before the disposal at the landfill.

Air, water and soil pollutants volumes associated with dismantling works will be significantly lower than those at the construction stage due to lower volumes of equipment involved in the process, relaxed schedule and simpler logistics.

Decommissioning is expected to be conducted by the local labour. Waste volumes will be insignificant due to small volumes of work. As seen from Tab. 8.4 most of waste generated during base decommissioning can be utilized. Some metal components will require rinsing. Oiled water will be collected by drainage system and then transported to the closest oiled water disposal site. Oil sludge from the interceptor well and the slipway and the fuel storage area holding tanks will be transported to the Tenis Service LLP solid hazardous waste storage site 11km east of the Base (Fig.6.2). Sewage sludge from the sewage holding tanks will be taken to the Tenis Service LLP Landfill.

8.5 PROJECT ALTERNATIVES

8.5.1 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.

8.5.2 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. 8.13 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 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. 8.13 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

8.5.3 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 adjacent to the Bay territories, 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.

8.5.4 Scale

The Base scale is restricted from one end by 1) prediction of the number of vessels required servicing, by 2) shortage of suitable land at the Bay shore, by 3) the required clearance at the Bay centre for the vessel maneuvering. From another end, 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 growing south of the site. In the future some facilities can also be put above Atash village on the terrace subject to approval.

8.5.5 Layout

The Base layout was designed to reduce risk of accidents and pollution levels as well as improve working conditions and energy inefficiency. Positioning the Fuel Storage Facility 2 km away from the sea shore to comply with the standard requirements for the Sea protection [48] 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 more a 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 will 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 18m 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.

8.5.6 Operating conditions

Optimal and recommended by SNiP operating conditions (working hours, lighting, heating etc.) are selected for the Base construction and operation. The exclusion is continuing dredging and steel sheet

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

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.

9 ENVIRONMENTAL IMPACT ASSESSMENT

9.1 IMPACT SIGNIFICANCE SUMMARY

Tab. 9.1 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. 9.1). The assessment found that the project activities all stated in Tab. 9.1 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 Section 11 mitigation measures are accepted.

9.2 IMPACTS ON ENVIRONMENTAL RECEPTORS

This section presents a discussion on potential impacts to environmental receptors that would occur as a result of routine and planned non-routine Base activities. All potential impacts are discussed, whether significant or otherwise, to ensure that all activities have been appropriately assessed. Greater emphasis has been given to the activities that have been assessed to potentially result in more significant impacts.

9.2.1 Atmosphere

Air emissions will be the results of the Base construction and operation. 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 near the emission sources at distances at which the emission concentrations are toxic for them. Seals, the appearance of which is unlikely due to the vessel activity and lack of fish reserves, can be harmed due to the distribution of heavy pollutants depositing on the sea water surface.

9.2.1.1 Construction

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 first several months of construction when the peak of activity is expected.

The wind direction, periodicity and speed, known for this period (February-April) will allow pollutant to distribute towards the southern part of Atash village. Nevertheless, it should be noted that this part of the village is in 700m from the Base, and the population in winter period will spend the most part of time at home with closed windows. Dispersion modeling also indicated that the concentration of pollutants from Base construction sources at the border of the village will not exceed 0.8 MPC for residential areas.

Dredging will be implemented during the first month of construction works in 250-1000m from the village border, within the area that is strongly blown by the winds. The presence of seals and birds near the dredging machine is unlikely. Filling of the Base foundation by recovered ground and leveling will be implemented without the generation of dust, as the ground consists of a large amount of water. Dusting of sand and gravel, dumped above the ground will be also minimal.

Limestone transportation from Atash quarry will result in the air emission of diesel fuel combustion materials along the road and in the Base. Dusting of the limestone will be minimal due to its composition and permanent watering of dumped area with marine water.

As the main part of welding will be outdoor, emissions will not provide the negative impact upon the construction staff; to say nothing of the Atash village population.

Emissions associated with paint works will be negligible, as the construction material will be painted beyond the base, and the most part of metal construction details will be galvanized which excludes painting.

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

9.2.1.2 Base operation

At the end of construction emissions from most above-mentioned sources will cease and volume and content of pollutants will be reduced. Air pollution will be expected mostly from the boiler in the cold period. The energy centre is expected to work during cold part of the year and during power cuts 4, 5 days per year (108 hours). Other emissions will be episodic, from small dispersed sources that allow a good diffusion to concentrations below the maximum permitted for residential areas at distances as little as several tens of meters from the source.

The escarpment between the village and Base is the natural barrier that can change relatively linear distribution of pollutants into a complicated, turbulent flow. Blowing from the Base to the village, wind will raise polluted air and bring it over the village. But with the loss of energy the heavier particles of soot may fall out of suspension. With the wind blowing from the village, the polluted air will be pushed over the sea surface. The birds and seals can be affected here but because of the poor food reserves at the Base and the vessels disturbance few individuals will remain in the polluted air for long enough to cause any effect to their health. The calm weather with mist is considered to be the worst for the pollution dispersion. In this case most of the pollution will remain at the Base as the escarpment will effectively screen the Atash village.

The calculations of pollutants volumes and their dispersion modeling are given in Appendix 1. The results show that that the operation emissions will not significantly affect the local air and the pollutants concentrations at the face of the Atash village will not exceed the maximum permitted for the residential area.

It is recommended therefore that the Sanitary Protection Zone (SPZ) is set to 70m from the Base sources of pollution. The SPZ is shown on Fig. 8.1. It coincides with the Base border everywhere but around the fuel storage farm and the heat and emergency power generating facility

It should be noted however that the calculations and the modeling do not account for cumulative impact that adds to the emissions from the other sources of the fast developing industrial facilities in the Bay.

However, it can be proposed that in unfavorable climatic conditions (calm) and accidental circumstances such emissions can provide a significant impact upon the local population, animals and birds. Such event is short-term and considered as an emergency situation.

On the basis of estimations it was assumed that the mitigation measures to reduce the air emissions during unfavorable meteorological conditions or emergency are not necessary (Appendix 1).

Below the emissions are described in more detail in respect to the sources. Even more detailed description can be found in Appendix 1.

9.2.1.2.1 Energy centre

As seen from calculations of air emissions (Appendix 1), the highest volumes of pollutants will be generated by liquid fuel combustion for heat generation in the cold part of the year. Production emissions in the air that have the highest potential of human health impact include *nitrogen oxides (NOx), sulfur dioxide (SO_2) and carbon monoxide (CO).*

9.2.1.2.2 Fuel storage facility

Diesel vapors will be emitted from pressure vent valves during the tanks filling and from the fuel taps during the vessel filling. Insignificant amount of vapour will escape from the fuel pumps.

9.2.1.2.3 Workshop

Air pollution will occur during the operation of metal-working and wood-treatment machinery, charge of vessel accumulators, welding and painting works. The main pollutants will be: metal and wood dust, emulsol aerosol, welding aerosol, vapors of white spirit and xylol. Being relatively noxious, they are emitted occasionally, in small volumes and, with good wind dispersion, reach non-toxic concentrations quickly.

9.2.1.2.4 Tug, crane and vehicles

Air pollution from the mooring vessels is not accounted in this report as they would moor in the Bay regardless of the Base existence. The Base tug however will emit pollution associated with diesel combustion while transporting and mooring the incoming vessels. The 120t diesel driven crane will also produce certain amount of air pollution while loading and unloading the vessels at the wharf front.

9.2.1.2.5 Emergency emissions and spills

During the rare power cuts (108 hours per year, taking into account the emergency generator and maintenance shutoff) the emissions will increase for a short period due to the operation of emergency diesel generation. About 10% of fuel spills will evaporate. Considering the predicted volume of spills (Section 9.4), the air pollution from spills will be negligible.

Probability	3	Impact likely to occur in emergency and under the domination wind direction towards Atash village
Consequence	1	Negligible, negative, reversible: impact is noticeable, at local level will be absorbed by the environment. Short-term deterioration of air quality.
Significance	**3**	**Low**

9.2.2 Surface water (Sea)

9.2.2.1 Construction

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. Below text shows that 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.

Dark grey to black colour of top sediments implied 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. Basing on this data it is possible to conclude that concentration of pollutants in seawater resulted 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. 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 reviewed in Section 9.3.

9.2.2.2 Operation

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. Accepting water will freely flow under the bridge and thus will dilute any increase in salinity to the

background level at a very short distance from the end of the discharge pipe making an “excess salinity cloud” very small and constant. No flash discharges are planned.

Analysis of peaks in daily precipitation for 30 years period (1976-2005) in Section 6.1.2 showed that one day in 2-3 years the projected runoff holding tanks (2000m^3) will be filled up and some runoff will have to be redirected into the Sea. The consequence of such runoff redirection for the Sea water quality is envisioned to be not notable. This mainly explains that the earlier runoff from Base site surfaces that is captured in the holding tanks would have washed off most contamination if it existed. The probability of a large spill occurring during these extreme precipitation events is also close to none. The proportion of sediment disturbance that could be induced by such excess runoff is Negligible in comparison with the disturbance caused by the rest of runoff from the adjacent territories.

	Brine discharge		Excess runoff discharge	
Probability	5	The impact will occur under normal operating conditions.	2	The activity is very unlikely but may occur once in 2-3 years under normal operating conditions.
Consequence	1	No discernible change in surface water baseline conditions and no effect on other seawater users	1	No discernible change in surface water baseline conditions and no effect on other seawater users
Significance	**5**	**Low**	**2**	**Low**

9.2.3 Groundwater

Base construction activities that potentially interfere with subsurface hydrogeological conditions include construction of elevated by 3.5m ground 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**

9.2.4 Soil

About 4 ha of land will be compacted mixing and buried irreversibly under a 3.5m cap. However, the soil has no agricultural or ecological value. They don’t support either feed crop or rare or endangered vegetation. So the burial of 4ha under 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 by the hard surface road

10.2km to the Base will impact on the soil along the road. Burial of 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 the 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**

9.2.5 Sea sediments

Sea sediments will not be disturbed during normal Base operation while the dredged channels remain at the required depth. Considering sedimentation rates at the Base site, dredged channels' depth may never reach unsafe navigation levels i.e. remain suitable for the entire life of the Base. This is also evident from the shape of the old access channel at the site. Only the 200m closest to the shore is filled with sediments. The other 400m remain suitable for navigation. Enclosure of the bay by the wavebreaker will lower the currents and wave energy and therefore can increase the sedimentation rate in the area shadowed by the wavebreaker (about 8ha). The similar Kaztransgaz wavebreaker 3km north of the Base site shows no notable increase in sedimentation over 5 years of existence. Without the sedimentation data there is uncertainty whether maintenance dredging will be required at all. The sedimentation/erosion monitoring described below will reduce this uncertainty. At the moment it is assumed that dredging will be needed every 10 years at most for the channels and every 5 years in the area shadowed by the wavebreaker. Because in 5 years sediments with near natural stratification, physical and chemical properties are likely to form, impact from such the channel maintenance dredging can be considered to be very similar to the impact from dredging during construction assuming that the same techniques and machinery is used. The amount of dredged material and the area covered by dredging is likely to be smaller however.

Dredging during construction will consist of creating the channels 1-2m deeper than the surrounding sea bottom. First it will remove sediments that are rich in organic material which is one of the essential parts of the whole food chain in the Bay. To a lesser degree it will interfere with the natural gradient of nearshore sedimentation creating steep slopes and flat areas. Organic material will be brought into the dredged channels by currents from adjacent areas and from the open sea. The lower energy than surrounding areas of the channels will facilitate sedimentation. It is expected that the organic layer will be re-established in the channels within 3-5 years after dredging.

According to geotechnical survey results, sediments that will be exposed during dredging will be similar to those that naturally lie on top of the Bay area. For this reason benthic animals, attracted into the channels by the absence of competition for food, will not find the sediments unsuitable for borrowing or propagation.

Some burial of organic layer will occur immediately beside the dredging channel. However the area of significant burial will be very small in comparison to the area subjected to dredging.

		Construction		Operation
Probability	5	The impact will occur under normal operating conditions	2	The activity is unlikely to but may occur at some time under normal operating conditions
Consequence	2	adverse, direct, medium-term, temporary, once, localised, reversible, quantitative, actual	2	adverse, direct, medium-term, temporary, every 10 years, localised on 8 ha, reversible, quantitative, actual
Significance	**10**	**High**	**4**	**Low**

9.2.6 Subsurface Geology

The earthworks at the site would impact on subsurface geological structures. Yet, the area that would be covered by these features is not known to host any economic reserves. The fact that the area would not be available for exploitation by other users as a result of development of a Base facility on the site therefore does **not constitute an impact**.

9.2.7 Visual Impact

The viewers that may be affected by the installation of the Base are the Atash village residents, “Shagala” hotel and its beach visitors. Therefore the following sensitive viewpoints were identified:

1. Shagala hotel patio at the first floor level 1.8km away from the Base;

2. Shagala hotel beach at ground level 1.8km away from the Base;

3 and 4 Gates of two houses at Atash village directly above the Base, 100 m away from the Base. The view is constrained by the escarpment edge.

The main condition for selecting the viewpoints was that a viewer that would assign the esthetic value to the landscape upon which the Base projects will be present there. For this reason the edge of escarpment above the Base was not selected as during two fieldworks no viewers were encountered. People preferred to descend to the beach and sit next to the sea on the benches. As the tourism is unlikely to gain ground in the area it was predicted that this viewpoint will not be used in the foreseen future. Similarly the Base workers were excluded because they derive direct financial and social benefits from its existence and thus are normally not sensitive.

In daytime the “Shagala” hotel visitors will see fuel and water holding tanks projecting on the escarpment face and large barges at the jetty head. Other buildings will be almost impossible to tell from the escarpment face. Limited illumination at night would probably be considered a positive aesthetic factor. Often the view of the Base will be obstructed by vessels and barges that anchor between the Base and the hotel.

A viewer at the beach, although more sensitive than a viewer at the Shagala hotel, will be 2m lower and thus see even less of the base.

Viewers from Atash village will see only the flat marine part of the Base that will project on the sea surface. Although their sensitivity will be the highest, the number of those affected will be confined to the mature residents of two houses and mainly during the warm parts of the year. For this reason the negative impact from heavy equipment working on the wavebreaker and the jetty head construction will be low as it will be performed during winter-early spring months. During the warm periods of the operation there will be no activity visible to the Atash residents.

The barges that they will see from the gates of their homes will be the same as those they see in the Bay at the moment and there will be no more than two barges at a time. Vessels at the wharf front will not be seen but marine traffic generated by the Base may be viewed as some sort of amusement rather than a visual nuisance. This will be minimized by working in cold season when viewers will spend most of their time indoors. At night these viewers will see only the navigation lights at the jetty head, the wavebreaker and the fueling barges. During winter there will hardly be any visual impact because the viewers will leave their houses less often and the activity at the offshore part of the Base will cease.

Thus the visual impact of the Base facilities on the area residents, visitors and passers-by is likely to have “low” significance and the decrease in the esthetic value of the area from the project installations can be considered as negligible.

Probability	5	certain to occur under normal operating conditions
Consequence	1	Adverse, direct, long-term, actual but small, intermittent, localised and reversible
Significance	**5**	**Low**

9.2.8 Vegetation

9.2.8.1 Terrestrial vegetation

The area impacted by the project has no rare species or endangered communities that require specific protection. This section therefore concentrates on impact upon the natural communities that are summarized in Section 0.

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 reflected in high disturbance, low vegetative cover, presence of the same species on adjacent territories and absence of rare or valuable species suggests 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. It should be repeated that the area is now subject to waste dumping, cattle grazing and annual shrub clearance for firewood. Therefore, if this area is not used by the Base operator, vegetation here will have a chance to progress towards more natural community and even serve as a refuge for species that are eliminated from the adjacent areas by human activity. This is not taken into account however, because the operator has the right to develop this area at any time in the future and can destroy vegetation without additional approval. So, for determination of impact significance it is assumed that this area will also be completely and permanently destroyed. Yet, similar to the beach presence of the same species on adjacent territories and absence of rare of valuable species suggests low impact significance.

Indirect impact will come through polluted air along 10.2km the road from the Atash quarry. Transportation of the limestone rock will produce dust. It will come in small volumes from 50 dumptrucks a day for 100 days but because the activity is planned between February and April, it will not impact vegetation. If rock transportation continues into the vegetative period, dust can

reduce plants' ability to photosynthesize and grow. Desert plants are typically tolerant to dusty conditions (e.g. have small leaves with thick wax and hairs) but increased levels of dust may cause additional stress that can be reflected in retarded growth, inability to produce a second lot of seeds or come to fruition at all.

As mentioned earlier in the air quality section, increased concentrations of nitrogen oxides near the surface can upset some species physiological processes when it is absorbed through stomata. Gaseous nitrogen may also provoke formation of ozone in concentrations toxic to plants. Again, due to complete leaf senescence and fall out and other morphological adaptations, the plants of the impacted area are better equipped to withstand such stress. Besides frequent high winds limit chemical impact to rare still periods.

When both dust and nitrogen oxides concentration in the air come to normal levels, plants can recover completely. Rain will remove assimilated dust and nitrogen. Therefore cumulative indirect impact will also be low because of the short duration of construction after which plants will have a chance to recover. There will be no impact accumulation during operation.

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**

9.2.8.2 Marine vegetation

9.2.8.2.1 Construction

Negative impact from alteration of phytoplankton community can take two forms: acute direct from seawater uptake, increased turbidity and water toxicity and long-term indirect by eutrification of the Bay water. Eutrification would normally occur with increased content of nutrients (NPK). While the first form reduces overall plankton biomass, the second form strips oxygen from the water at night and distorts community's composition of the higher order animals, mainly the plankton eaters.

Normal activities that relate to the Base construction and operation is not able to set off eutrification process. The unlikely event of sewage leakage from a vessel damaged during mooring will not be able to set off eutrification unless vessels leakage and illegal sewage discharge will become a common event in the Bay which is also unlikely with the growing supply of sewage offload services and improvement of navigation and mooring practices.

Because no nutrient input in seawater is envisaged during the base operation, the main factor that influence phytoplankton production is the primary production zone water transparency reduction during dredging and earthwork and toxic shock as a result of accidental fuel spills. Impact related to accidental events is covered in the sections bellow.

Dredging and earthwork will be performed in winter when phytoplankton biomass falls to 0.9g/m^3 thus becoming 9 times lower than in summer and autumn.

Uptake of 1.5 million m^3 of seawater during dredging, for making up pulp to transfer the dredged ground to the infill area, will kill 1.35 ton of phytoplankton present in this volume in January. This

volume corresponds to the total volume of water above the area to be dredged[49]. Water will seep through the wharf front barrage back to the sea but very high turbidity levels and physical damage give practically no chance for phytoplankton to survive.

In the most turbid part of the plume concentration of suspended solids can reach 30g/l. At this concentration phytoplankton will die. Because no less than 6 volumes of water will be sucked in the pulp pipe for each volume of sea sediments, it is expected that such concentration will be observed at a distance no more than 1-5 m from the cutting point depending on the sediment structure. Thus, an additional 10-50kg of phytoplankton will be killed [50]. During windy weather this distance will be reduced by dilution. However the area of sublethal effect will increase.

Reduction in phytoplankton production rates is expected within the turbid plume for maximum 4 days after agitation. Such plume with concentrations from the lethal 30 to the background 5g/l will be observed no further than 15m and will occupy less than 111 150 m^3 of seawater [51]. As unused nutrients would remain in the water column and would still be available after plume dilution to the background level, production rates would be expected to eventually return to normal in 4 days.

Construction of the wavebreaker and the wharf front from limestone will displace phytoplankton and reduce photosynthesising rate for 1-2 days but will not kill phytoplankton.

Probability	4	very likely to occur under normal operational conditions
Consequence	2	Direct adverse, permanent destruction but on small area and in least active period, actual and measurable. Indirect through photosynthesis reduction – adverse but short-term, local, reversible, actual but difficult to measure
Significance	**8**	**Medium**

9.2.8.2.2 Operation and decommissioning

No impact on phytoplankton is envisaged during normal operation and decommissioning phases of the Project unless the sedimentation monitoring data shows that maintenance dredging is required. Then the direct mortality from physical destruction of mainly Zostera will be similar to the construction phase described above. It should be noted that the volume of dredged material will be considerably less and therefore mortality from increased turbidity will be negligible. The uncertainty of the need and the frequency of maintenance dredging increase the otherwise low impact significance to **medium**. There will be no Impact on marine plants from decommissioning.

9.2.9 Animals

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). Below both forms of impact are assessed for onshore and offshore animals and for all project phases.

[49] 311 500m^2(total dredged area) *4.5m(average depth) =1 401 750m^3

[50] 2 470m (dredged area perimeter) x 4.5m *0.000 9kg of phytoplankton =10kg for 1m distance from dredging.

[51] 2 470m x 4.5m *(15m – 5m) =111 150m^3

9.2.9.1 Terrestrial animals

As shown above, 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 quite high level of disturbance due to the proximity of residential area, presence of the beach and 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 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 envisioned 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.

However sublethal health degradation can be caused by air pollutants, noise and vibration. Historically scientific quantification and documentation of such forms of impact was difficult due to its subtlety and often non apparent nature. Stress often results in the reduction of immunity to common diseases, lower percentage of egg hatching in birds and reptiles and higher occurrence of fetus abortion in mammals. Survival of siblings can also be reduced. Stressed

animal spends more time trying to cope with it and therefore creates more stress from food deprivation and failures in breeding. Summation of effects from them might decrease the chances of surviving and reproducing due to:

- retreat from favorable habitats;
- reduction of time spent feeding with resulting energy depletion:
- interference during pairing/coupling period;
- unsuccessful pregnancy, increase in spontaneous abortions and fetal re-absorption in mammals;
- non-laying or non-fertilization of eggs in birds and majority of herpetofauna;
- less food resources adjacent to nesting/clutch area resulting in higher rivalry of birds siblings;
- nest abandonment by parents (for those species which lend this type of parental care).

Retreat away from the intensified road traffic can reduce food availability, increase competition and aggressiveness but this will be a small addition to competition with cattle that graze along the road and alter natural habitats considerably.

Vehicle and machinery noise can interfere with animal communication essential for social interaction including reproduction. But because the main noise source – the tank trucks, will be short and appear maximum once in 10 minutes, interference will produce low impact. The summative effect of the overall traffic increase can nevertheless be significant. As a result of anxiety resulted from increased traffic, the daily activity rhythm and nutrition regime can be disturbed; time budget changed negatively and the significant part of time is spent to seek safety. Although mammals quickly become accustomed to the new sounds and lights and demonstrate anxiety or fear only at new noise occurrence, it is likely that animals will be put under significant additional stress by increased traffic irrespectively whether they stay or flee.

In addition to the light and noise, air pollution (NO_x, CO, SO_4, PM10) from the road will affect those that decide to stay. The direct effect will be on the respiratory organs of mammals and to a lesser degree on the skin of reptiles. In general associated pollutants irritate lungs and skin and make organisms more susceptible to viral and bacterial attacks and allergies. Indirectly pollutants can be ingested with plant tissues, seeds or fruits. This however is not expected to cause any problem.

Night lighting at the Base site would be likely to attract insects. This will draw insect eating animals (mainly reptiles and amphibians) to the area. The impact however will be Negligible because no activities that can kill these animals will be carried on at night. Apart from this, there will be no new food sources associated with the project.

The exposure to polluted water will not increase during construction and under normal operation condition. Sewage from vessels and the Base will be treated before it enters the evaporation ponds. The amount of pollutants in this water is not expected to be significant to make bioaccumulation a problem because the Sanitary Epidemiological Service can check this water regularly. Birds and small mammals may use water occasionally for drinking but because it has no food in it and human disturbance is high, will not stay for a long time. Larger animals will be stopped by the plant's fence.

Therefore the main impact from increased traffic will be on rodents and reptiles that live along the Atash – Waste Treatment Facility road.

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**

9.2.9.2 Marine animals

9.2.9.2.1 Construction

9.2.9.2.1.1 Direct mortality

Zooplankton will die in the 1.5 million m^3 of water taken by the dredging machine to transfer the dredged ground to the infill area. Zooplankton will also not survive in 0-52 000 m^3 of water in 0-5m around the dredging point where suspended solids will reach 30g/l [52]. Considering that zooplankton concentration in winter is likely to be no more than 3 500 individuals /m^3 and biomass 10 mg/m^3 , no more than 16kg of zooplankton will be destroyed [53].

The Base site does not seem to contain any specific species that are absent from the other Bay areas and the mortality of which would eliminate these species from the Bay. Natural variation of number and biomass of zooplankton in the Bay can be an order of magnitude. Thus mortality of the stated amount of zooplankton is likely to produce impact of only low significance.

Mortality of benthic invertebrates will occur on 34.26 ha during dredging, the wave breaker and the wharf construction. Complete and partial burial of benthos will occur at another 1.15ha around the dredged and filled area. For the purpose of calculation it can be accepted that about 50% or animals will be able to escape or excavate themselves and impact on them will be sublethal. It should be noted however that crustaceans will have more chances to escape than worms and mollusks. Therefore less than the total benthic biomass calculated below, but more individual organisms, will be destroyed. Yet, this incorporated error will be small due to relatively small area affected.

The only winter monitoring in December 1998 has recorded unusually high level of individuals (9 700 individuals/m^2) and biomass (218 g/m^2) which exceeded all the following observations in other seasons by around 3 times. Considering the observation that benthos numbers and biomass do not vary notably through the seasons and with time, it would be more precise to take the long-term average numbers for calculation of the damaged volume of benthos. With the average numbers of 4 800 ind./m^2 and 164 g/m^2, around 1 672mln of individuals or 57 t of benthos will be killed [54]. Most significantly the benthos larvae that live in zooplankton in warm season but fall to the sea bottom in late autumn will be also destroyed.

With the even distribution of benthic species throughout the Bay there will be no loss of any specific species. However the area stripped of animals can be re-colonised only by slow in-

[52] The area at a distance of 5m from dredging is 11 500m^2, average depth is 4.5m, total volume then 51 750m^3

[53] 1 552 000 x 0.00001kg=15.52kg. See section 6.3.4.1 for zooplankton biomass.

[54] (342 600m^2 x 4 800) + (11 500m^2 x 4 800/2)=1 672 mln indiv. (342 600m^2 x 0.000164t) + (11 500m^2 x 0.000164t /2)=57.129 tones

migration of adult species and recolonisation rate will differ between groups and species. Creation of unnatural depth gradient may hinder recolonisaton rate as the animals that are adapted to the 4.5-5m depth of dredging will have to pass through shallower areas with higher level of water oscillation, faster currents and greater temperature fluctuations. The environment that they will settle in will also have less natural silt and organic mater content. For this reason the 2006 season benthos larvae is unlikely to show satisfactory hatching and survival figures in the next spring. The more complete recovery of benthic communities therefore is not envisaged for 3-4 years and impact on them by construction can be considered as high.

9.2.9.2.1.2 Sublethal effects

In addition to the direct mortality, there will be some sublethal impact on the wider marine animal community. Although increase in concentration of suspended solids in water during dredging will be similar to the increase during storms, different pattern of the solids accilation and propagation and the continuous nature of dredging would make sublethal effects more severe than those produced naturally.

Zooplankton and benthos will have to reduce feeding and spend more energy on escaping burial and cleaning of their filtering organs. Fall in phytoplankton availability will reduce zooplankton survival chances. On the other hand suspended particles may represent food for filtering invertebrates and if this factor limits a population, can counteract negative effects. Also predation by fish will be reduced as fish are likely to leave the area.

In fish, fine-grained particles may cause irritation by abrading protective mucous coatings and thereby increasing susceptibility to parasites, bacteria and fungal infections. Suspended sediment may also reduce visual acuity in fish and hence feeding behaviour and may reduce respiration efficiency due to blocking of gills. Fish species that normally inhabit turbid waters and use their sense of smell more than eyes may be less affected by high levels of suspended sediment than visual feeders but they are less likely to be present at the Base site. Yet, all kinds of fish and Caspian Seal would be expected to exhibit avoidance behaviour in response to increases in turbidity.

Fish and, to a lesser degree, sea birds will be displaced from the dredged and filled areas. Caspian Seal cannot be considered here because the probability that they will prefer the Base site as a feeding ground is very low. Some benthos (especially crustaceans) will be able to escape from burial during offshore earthworks because rock filling will be gradual and have relatively low rate and rock dust and vibration can encourage crustations to leave before they are buried. Dredging will not give such chances to benthos however.

Displacement will be associated with energy expenditure, reduction of feeding and increased possibility of attack by predators and residents of the accepting area. As a result individual fitness and survival chances will be lowered. The significance of this impact will be more for benthos and less for fish and will be reduced by carrying earthworks in winter.

With an empty benthic niche in the dredged area, there is a high chance for an exotic species brought with the incoming vessels to be established at the Base site. This chance is reduced by three factors. First that the vessels will mainly come from offshore operations nearby and port Aktau. Second, that discharge of ballast water will not be allowed in the Base area. Third, that the relatively low diversity of the Bay benthic community suggests that the environment is hostile and a new species will have few chances to proliferate. Unfortunately there is no proper

study that describes the long-term changes in benthic communities in dredged areas of ports. Such study could have allowed the evaluation of the risk from introduction of exotic species.

Overall impact on marine animals from construction activities will be of high significance with higher but less probable impact on benthos.

Probability	4	The impact is very likely to occur under normal operational conditions.
Consequence	3	Local short-term (few months) change in habitat availability and quality, modification of abundance and distribution of species but possibility of fast re-colonization from adjacent areas. Comparable to frequent natural impacts (winds, waves, ice)
Significance	**12**	**High**

For benthos

Probability	5	The impact will occur under normal operating conditions
Consequence	3	Local medium-term (2-5 years) change in habitat availability and quality, modification of abundance and distribution of species. but possibility of slow re-colonization from adjacent areas. Small risk of introduction of exotic species.
Significance	**15**	**High**

9.2.9.2.2 Operation and decommissioning

With zero discharge, marine animals will not be affected by the Base normal operation. If sedimentation monitoring data shows that maintenance dredging is required, then the direct mortality from physical destruction of benthos will be similar to the construction phase described above. However, because the volume of dredged material will be considerably less, there will be less mortality from increased turbidity and the seawater intake. Physical disturbance by vessels is unlikely to be distinct from the natural wind induced disturbance. Although the impact is likely to be low significance, the uncertainty on the need and the frequency of the maintenance dredging increases the impact significance to **medium**. There will be no impact on marine animals from decommissioning.

9.3 IMPACTS ASSOCIATED WITH WASTE MANAGEMENT

The waste stream inventory for construction, operation and decommissioning is given in Tab. 8.4 . The local area has 3 official facilities where the Base waste can be disposed (in the order of increasing priority for disposal):

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 the first two facilities can be implemented to the standards required by the EU and the World Bank guidelines. It is likely that the third facility will comply with the international standards for waste management. Therefore, in the event of failure of the first or second facility to accept or properly treat the waste, it will be transported to the third facility providing the agreement can be reached.

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 agreements are reached and control over the waste management at the selected sites 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. In the case of disruptions in continuous acceptance of waste by these facilities the Base Operator will select and draw agreement with a fourth facility for temporary disposal. This event however is unlikely as the Base will ensure sufficient buffering capacity to bar any such disruption in services.

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.

Impact on animals of increased volumes of sewage water that enters the evaporation ponds at the STF is covered in Section 9.2.8.2. Impact of sewage waters on groundwater quality is covered in Section 9.2.23.

Some potential impact can be generated by the liquid waste disposal truck tanks overturn or major leaks. The impact from transporting of hazardous waste is described in the Section 9.3.1.1. 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 environmental management plan. The residual sewage will soon degrade under the sun and microbiological action.

9.3.1 Hazardous waste disposal

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 (Tab. 8.2).

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 that the shallow groundwater monitoring wells are installed at four sides of the site and geomembranes and the membrane protective layers are installed.

The short distance to the site practically eliminates risk associated with the hazardous waste transportation and illegal dumping. To provide for unlikely event of a truck overturn, the Base Operator will ensure that the waste contractor has provisions for the contaminated ground collection and safe disposal and that its drivers are properly trained to handle hazardous waste and that they have no accidents records.

The risks associated with the Tenis Services disposal site management can be assessed during the site audit after the start of the Base construction. If any deviation from the safe practices is noticed, certain improvements can be suggested. Yet, whether they will be fully accepted is difficult to judge at this time in the project development at least for two reasons. First, the Base will make only marginal contribution to the Tenis Service site businesses that are built mainly to provide for the needs of its parent company Kazmunaigas. Second, the degree of other Bay operators (and in particular AgipKCO) involvement in disposal at this site is not known. AgipKCO is building a new hazardous waste disposal facility next to Tenis Services facilities (Fig. 6.9) and thus may not impose any pressure on the Tenis Services LLP management. On the other hand, if Tenis service LLP refuses to improve its operation practices to comply with international requirements, the Base Operator can draw the agreement with AgipKCO. In any case, until an acceptable waste disposal option is in place, no hazardous waste will be accepted by Atash Base.

	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**

9.3.2 Sewage disposal

Sewage will be held in two 1000m^3 septic tanks and when accumulated, transferred to the STF for treatment. With 200m^3/day capacity the Plant can accept additional volume (10m^3/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.

However, drilling around the ponds did not encounter groundwater at the depth of 80m. This means that pollutants and survived pathogens leaked from the evaporation ponds would likely degrade to non harmful concentrations before they reach the shallow aquifer found at wells 4 and 11 (fig 6.1). Therefore disposal of sewage generated by the Base during construction and operation is considered to be **negligible**.

9.3.3 Non-hazardous solid waste land filling

This waste will mainly consist of remains of inert building construction material. Insignificant amounts of such waste will be generated during operation phase. Decommissioning will generate mainly scrap metal and small amount of cladding from the pump station. Apart from this any other inert waste will be used to infill voids resulted from the underground holding tanks

excavation. Limited air pollution associated with the metal structures cutting and transportation of the construction waste to the Tenis Service Landfill will result in **negligible** impact.

9.4 IMPACTS RESULTING FROM ACCIDENTS

The main source of hazard is the fuel storage site located 100m from Atash village houses that are shielded by the 18m escarpment. The position of the site complies with the legislative requirements[55].

The Site developer has a comprehensive HS&E policy and is committed to develop a detailed emergency response plan in accordance with international standards at the start of the operation. The below text aims to identify the relative environmental and social risk for the Base activities. The accidents that can cause the most significant impact can be defined as:

1. Vessels collision during handling operations and navigation;
2. Fuel tanks partial inventory loss into sea and groundwater;
3. Fuel tanks full inventory loss into sea and groundwater;
4. Fuel pipe rupture;
5. Fuel detectors failure;
6. Automatic shut down valves failure;
7. Oily water tank truck overturn;
8. Diesel overspills at two fuelling points;
9. Diesel ignition or explosion;
10. Fire on vessel or at the fuel storage area;
11. Heavy earth moving equipment refuelling at work place.

Table below shows residual probability of these accidents after installation of described in Section 7 fire and spill prevention and handling systems and procedures.

Tab. 9.2 Probability of an accident by size and source (see above text for source number)

Fuel leak volume m^3	Likelihood (years for 1 event)				
	Likely (in 1y)	possible (in <10y)	unlikely (in <100y)	remote (in <1 000)	extremely remote (in <10 000)
<1	**11**	**7, 8**			
<10		**10**			
<100		**2, 4, 5, 6, 9**			
<1000					
1000-3000			**1, 3**		

The main causes of emergencies are the following:

- Engineering miscalculations during design of infrastructure and equipment characteristics;
- Low quality, worn out or obsolete equipment;
- Human factor (violation of H&S regulations and equipment use guidelines due to negligence or absence of necessary experience or skills);
- Hazardous acts of nature (geodynamic, meteorological, hydrological and geological).

As to infrastructure design, the risks are reduced in the following ways:

[55] SNiP 2.11.03-93 «Oil and petroleum product storage and fire protection regulations» (Tab 1 and 2): minimal distance from the 2,000-10,000m^3 storage to the residential buildings is 100m. SanPiN № 1.01.001-94: Sanitary Protection Zone for the oil and lubricant storages must be 100m.

- Fuel storage tanks will be made from stainless steel;
- Fuel storage area will be bound and sealed to enable the holding of the maximum fuel volume (7500m^3);
- fuel lines will be protected from impact and enclosed in sealed chambers to collect leakage and directed to sumps for extraction;
- The storage facilities will be connected by a subsurface system of pipes to the service jetty fuelling stations. Thus providing a safe and efficient means of importing and exporting fuel via berthing stations;
- Fuel leak detectors and automatic shut down valves will be installed at the fuelling taps;
- Automatic shut down valves will be installed along the fuel pipes.

The operator will have an Environmental Health and Safety and Quality Program that will ensure that equipment is adequately maintained and frequently inspected for signs of malfunctioning. The program will introduce high level of accident prevention procedures and state-of-the-art impact minimization equipment. Yet the operation and safety culture of the local workforce is likely to be on relatively low level at least for the first few years.

According to SNiP 2.03-04-2001 the Base site seismic potential is 6 on the Richter Scale. An earthquake may disrupt the Base fuel distribution and storage system but considering the stability designed in the system and underlying rock structure serious infrastructure damage is highly unlikely.

Thus human factor is likely to be the possible cause of accidents. This is supported by the Ministry of Emergencies data (http://www.mchs.gov.ru) which shows that between 53 and 79% of accidents are connected to human or organizational factors.

The most significant result of accidents named above will be diesel spills in groundwater and seawater. The environmental significance of spills will depend on the volumes of the product spilled, prevailing meteorological conditions, spill place, spill frequency and receptor vulnerability.

In addition fires and explosions may lead to loss of lives, substantial water and air pollution and economic losses.

9.4.1 Base personnel

Base personnel can lose lives or be injured as a result of fire or explosion at the fuel storage area or two fuelling points. The operator Health and Safety Procedures will introduce a safety culture that is designed to monitor and eliminate the potentially hazardous behaviour of personnel prior to a major accident occurring. Calculation of risk to personnel associated with fire or explosion is outside the scope of this assessment. It is possible to predict however that the risk will be highest at the start of the operation, will gradually diminish with years and will not rise providing that trained and qualified personnel are retained and intrinsic motivation to follow health and safety procedures is not lost with time. Pressure to comply with contractual requirements of the main user of the base facilities – Agip KCO is likely to ensure that the safety culture will be maintained throughout the Base life. Therefore impact of accidents to the Base personnel is considered to be low.

Probability	1	The fire or explosion is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances.
Consequence	5	adverse, direct , short -term, permanent, local, irreversible, quantitative, actual
significance	**5**	**Low**

9.4.2 Groundwater and seawater quality

The main source of contamination during construction is spills during diesel refuelling of heavy earth moving machinery. Dozers are unlikely to drive to prepared pads for refuelling which is likely to be done from a fuel tank truck. Spills are likely to be small but fairly frequent. The fuel export and import system will be sealed before it is filled with diesel and thus the possibility of fuel escaping is brought to a minimum. During operation the risk of accidents increases because of increase in the accident significance. This however is compensated by reduction in probability of an event.

Impact on the groundwater from fuel spills at the Base will be negligible due to the proximity to the coastal line and direction of ground water stream to the sea. Nevertheless, ground water will transport the contamination to the sea and should be protected.

However, the potential impact upon the marine environment through the ground water will be significant. During the construction, absence of an impermeable surface will allow contamination to reach ground water and be transferred to the sea. Construction sand and underlying sediments will easily transmit the contamination down to the aquifer. Sea water surges can increase the level of ground water and wash the contamination from the unsaturated zone under the Base to the sea. So the monitoring wells on the Base area could not provide an adequate picture of contamination delivered to the sea with ground water.

Once in the sea, the contaminated ground water is diluted quickly and degrades the water of the whole Bay making pollution monitoring through sea water sampling meaningless. On the other hand, contamination that comes from Atash village can be easily separated from contamination by the Base via installation of monitoring wells upstream of the Base. It is highly unlikely that industrial contamination recorded around The Bautino Sewage Treatment Plant will reach the Base site in any feasible period of time.

After the impermeable concrete surface is installed, the probability of sea water contamination will decrease greatly to the residual risk of leakage through cracks in concrete, sewage pipes and holding tanks.

Transport accidents may involve the overturn of a 10m^3 tank truck with oiled water on the way to the disposal site. Although there will be no fire or explosion risk, the spill will cause soil and groundwater contamination on a local scale. Providing there are no other spills, the environment can effectively degrade released contaminants with time. The accident probability is reduced by a short hauls (10.2km), operation at day time and small traffic density on the way.

		Construction		Operation
Probability	3	The activity is likely to occur at some time under normal operating conditions	2	The activity is unlikely to but may occur at some time under normal operating conditions.
Consequence	1	Minor leakage in seawater dilutes and degrade quickly	3	adverse, direct short -term, temporary, local, reversible, quantitative, actual
Significance	**3**	**Low**	**6**	**Medium**

9.4.3 Marine plants and animals

Fire and explosion will affect marine plants and animals through soot fallout. Soot will disperse widely through the Bay and its concentration at a particular place should not be significant enough to cause detrimental effect on the benthos and benthos eating fish.

A diesel spill will produce greater effect. Marine animals will experience toxic shock and those that can escape will try to do so. Fish and seals can then effectively ventilate their organs and reduce concentrations of harmful fuel components like polyaromatics to non-hazardous levels. Organisms with a reduced ability to evade a spill area, such as plankton and benthos, may be expected to experience greater impacts, including mortality during the early stages of a spill. Rapid evaporation of volatile components of the spilled diesel will reduce the toxicity within a few hours of the spill. Evaporation rate will depend on the water and air temperature and the wind speed.

Heavier fraction of diesel will form water-in-oil emulsion which, if not collected, can persist in water for days killing everything inside it. Hydrogen reducing bacteria will be active at the edges of such plumes depleting dissolved in water oxygen. Eventually the bacteria and waves will break the emulsion into oily balls that will fall to the sea bottom where biodegradation will continue. Sparse sea grass “Zostera marina” can suffer from reduction in water transparency but is unlikely to be significantly affected by fuel toxicity. Benthic filtering animals will experience far greater impact from the oily balls that can clog their filtering organs, killing the animal or reducing feeding time. If ingested some diesel components can accumulate in the benthic animals bodies to concentrations that can be either toxic to the benthos itself or to the benthos eaters.

While the fuel and fuel-in-water emulsion can be collected, the oily balls can persist and be incorporated into the sediments and the food chain. It will attenuate through bacterial degradation and only can be physically removed during the next channel maintenance dredging. The dredged material then can produce further impact on terrestrial environment if not properly disposed of.

		Fire and explosion		Fuel spill
Probability	1	very unlikely to occur under normal operating conditions but may occur in exceptional circumstances	2	unlikely to but may occur at some time under normal operating conditions.
Consequence	1	Soot deposition	4	adverse, direct acute but some long –term and cumulative, local, reversible, quantitative, actual
Significance	**2**	**Low**	**8**	**Medium**

9.4.4 Onshore plants and animals

Fire at the fuel storage area would produce large amount of air pollutants and heat. The escarpment plants and the seed stock on the ground above the fuel storage area would be burned off completely. Lycium dasystemum and Capparis spinosa would not be able to

regenerate. Others (Salsola nitraria, Peganum harmala, Anabasis aphylla and Atriplex tatarica) would reestablish from seeds from the adjacent plants during the next vegetative period.

Further away along the escarpment, plants wmay experience heat shock and internal water loss, stems and leaves can loose turgidity and plants without woody stem can collapse and die. Others can regain leaf turgidity providing there is sufficient rainfall after the fire.

Soot fall out can temporarily (until the next rain) reduce leaf photosynthesis of the plants on the escarpment and also on top of it. Other air pollutants (CO, CO_2, SO_4, NO_x) are unlikely to affect the plant tissue directly; their impact will be regional and summative with the other sources of air pollution. Acid rain is not an issue for the pre-Caspian region because of the high acid neutralizing potential in soil and in the airborne dust. Rain here typically has pH>7.

If chickens or swallows that live in the escarpment are present in burrows during the accident (end May-beg June), they will suffocate from smoke. Adult birds will escape fire but some may die from the heat and smoke of an explosion. Due to very high respiration rate during flight, there is a chance that adults can inhale toxic concentrations of pollutants from which some can die and others loose ability to fly for a short time. Increase in predation during this immobility time is unlikely as the prey birds will also be scared away by the fire. If birds survive this acute impact, they can ventilate and effectively get rid of pollution without irreversible changes to their physiological processes. The finer parts of soot - PM10 can however remain in alveoli for longer time and will act as an irritant making the lungs more susceptible to other pollutants and lowering immunity to infections.

Indirect impact on swallows through depletion of their food stock will not be significant. Swallows eat flying insects, the concentration of which will not be affected greatly if at all after an accident.

Spill of diesel from the fuel export, import and storage facilities will not affect the onshore plants or invertebrates but evaporated aromatic hydrocarbons may produce sublethal impact on adult swallows.

		Fire and explosion		Fuel spill
Probability	1	very unlikely to occur under normal operating conditions but may occur in exceptional circumstances	2	unlikely to but may occur at some time under normal operating conditions.
Consequence	3-4	Possible chicks' mortality, short term damage to the habitat; environmental stress lowering reproductive rates at site only. Natural restoration time 2 to 5 years requiring replanting of Lycium dasystemum and Capparis spinosa	2	adverse, direct short -term, temporary, local, reversible, quantitative, actual on swallows
Significance	**3-4**	**Low**	**4**	**Low**

10 SOCIO-ECONOMIC IMPACT ASSESSMENT

10.1 SUMMARY OF SIGNIFICANT SOCIO-ECONOMIC IMPACTS

Tab. 10.1 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. Mitigation measures for these impact types are proposed in Section 11. Negative impact due to the fires, explosions and spills is assessed as low. Other impact types are positive, though negligible.

10.2 INTRODUCTION

A socio-economic impact is any change to the socio-economic environment, positive or negative, that wholly or partially results from a project activity or an associated process. Relevant (i.e. social-economic) legislation, regulation, standards and policy impacts are considered within the socio-economic impact assessment.

The potential for an impact exists where a project activity has been determined to have the potential to interact with the socio-economic environment. The primary objectives of the impact assessment are to:

- Establish the significance of identified potential impacts that may occur as a result of a project activity being undertaken; and
- Differentiate between those impacts that are insignificant (i.e. can be sustained by existing socio-economic systems) and those that are significant (i.e. cannot be sustained by existing socio-economic systems).

10.3 GLOBAL IMPACT

The scale of the proposed development is too small to consider that its impact on global social and economic situation can be of any significance. Thus, a general positive ranking can be assigned to global impact from the project without further categorization of significance.

10.4 NATIONAL IMPACT

The impact on national level will only be measurable when the Base development is viewed as a part of the whole Tyub-Karagan Bay development in reply to growing demand from offshore operations. Such impact will mainly be beneficial but delayed and long-term. The main negative impact will be from ad hoc development of Tyub-Karagan Bay. With a coherent and comprehensive Bay Development Program, the final result could have been a better resourced and positioned infrastructure that can effectively provide sustainable support for the offshore operations and manage the local social and economic climate. However, such Program would have required coordination of many medium to small investors and invariably would have delayed the Bay development which in turn would have delayed offshore operations expansion with consecutive large losses in national revenue. Therefore, in the frame of this impact assessment, the ad hoc development of the Bay is considered to be the optimal for the overall revenue maximization although, in the long term the ad hoc infrastructure may hold back further Bay development.

The beneficial impact will come in 3 main forms:

1. Direct revenue from taxation of the related to the Base activities;
2. Development of infrastructure and business capacity to serve clients that comply with the international operation standards and
3. Reduction of local socio-economic problems and hence reduction of burden on the Budget funds.

The base will contribute little to economies of scale for the Kazakhstan suppliers of products and services. However, the Tyub-Karagan Bay development as a whole will be more notable in this respect.

In the current political climate in the Republic it is expected that the base revenues will be invested in economic restructuring and development. The funds are likely to be used

- to reduce and improve taxation to boost domestic demand for strategic industries;
- to improve legislative control over development;
- to introduce various tools to encourage foreign investments
- to finance public investment programs to improve national infrastructure, health and education facilities etc.

The effects on the national scale will be delayed but long-term. Although the Base share in either negative or positive impacts is small, the chain of similar projects for the whole Tyub-Karagan Bay infrastructure improvement can produce modest positive and sustainable outcome.

Probability	3	The benefit is likely to occur at some time under normal operating conditions
Consequence	+1	Modest Positive: Moderate impact on the wider economy. beneficial, direct and indirect, long-term, duration depending on geopolitics, strategic, widespread, actual and in lesser degree perceived by population
Significance	+3	Low positive

10.5 REGIONAL IMPACT

On the regional level the Base development will produce higher positive impact than on the national level but taken separately from the Bay development; it is still likely to be hardly discernable. 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.

During operation the number of employees will greatly depend on the workload for the cargo yard and warehouse (Tab. 8.7). With the moderate estimate of the expected flow as 700 000 t/year 68 out of 200 workers will be involved in cargo handling. Although cargo workers will mainly be unskilled and semiskilled and therefore the local labor will be preferred, the local supply is unlikely to fulfill the demand completely and input from other districts and mainly from Aktau will be needed. Because most of cargo handling workers from Aktau will have temporary employment arrangement, it will be difficult for them to commit to relocation of their families to the Atash area. Those that have more security in their contracts will find relocation difficult because of lack of houses in the Bay available for rent or sale. These temporary arrangements may produce significant tension as immigrants will not feel a part of the local community. Yet, the parallel development of the Bay infrastructure may reduce the risks associated with redundancies related to the Base cargo load and people will be more willing to relocate.

Thus, although fluctuation and temporal nature of the workforce demand during operation can negatively impact social atmosphere within the Bay community and in the workers families, the

overall effect of construction on the regional community should be considered as slightly positive.

Probability	5	The impact will occur under normal operating conditions
Consequence	+1	Long term separation of families but limited long-term positive direct and indirect
Significance	+5	Low positive

10.6 WORKFORCE IMPORT IMPACT ON LOCAL SOCIETY

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.

As stated above, around 80 Base employees and subcontractors mainly from Aktau will stay at the construction camp for the working week. Because no more than 6 foreign engineers and managers will use the construction camp during their 20 day shifts, impact from them is considered to be negligent and the main attention is given to the workforce import from Aktau.

Atash and Bautino are economically depressed villages and the prospect of employment is very important for local people. The recruitment of high numbers of expatriates for jobs which locals perceive they can do, will probably lead to a certain degree of resentment amongst the local population. Public consultation held as part of the ESIA process identified employment opportunities as one of the main interests of individuals involved. Specifically, concerns were focused on percentages of employment for local people, skills transfer, trainings and comparability of wages between local and imported workers.

Tensions could arise, if it is perceived that local people could have supplied these skills and could therefore, have benefited from the perceived and actual employment opportunities. These tensions however are unlikely to become associated with the ethnicity of the workforce because the local area has been historically multicultural and cultural composition of imported from Aktau labor is unlikely to differ from the local population composition greatly.

Because the workers will remain at the site construction camp and leave it for weekends, there is little chance for the increase in ethnic and cultural tension. The analogy from the existing camps of Azerian (“Sagatash”) and Turkish (“Enka Insaat ve Sanayi As”) companies supports this conclusion. Having been in the area for several years and hosting 150 workers the companies neither experienced any local pressure nor were blamed by the locals. It is also likely that some of the imported from Aktau workers lived in the area previously or have local relatives.

The male dominance of construction workforce can give rise to cases of unwanted pregnancy, prostitution and increase in occurrence of the sexually transmitted diseases. Amenity of local population to the use of contraception is likely to be low. Again, relatively small and traditional local community and presence of the workers’ relatives are likely to impose certain control in this area.

The workers brought to operate the Base will likely to be inclined to settle in the area and therefore will make an effort to adapt to the local culture and habits. Although they may have

small effect on the prices of housing as described bellow, they will facilitate skill transfer to the local workers. They also may change local perception on Atash and Bautino as a desirable place to live in.

Imported construction workers as well as immigrants for actual and perceived employment may bring communicable diseases to the local area from their point of origin. It is difficult to predict the impact this may have as one infected person may have a significant effect on the health of the local population if preventive and treatment measures are not implemented effectively. Although healthcare measures can be implemented for official workers, it is difficult to implement such measures with respect to an informal inward migrating population. Within the Atash and Bautino, and regional centre Fort-Shevchenko's available basic diagnostic facilities may not be able to detect diseases at an early stage. Reported disregard to the risk of spreading and contracting tuberculosis suggests that people will not immediately seek medical assistance in the district centre.

On the other hand, none of the interviewed stakeholders expressed any concern over this issue in relation to the planned construction and, what is more important, in respect to the existing camps mentioned above. To receive temporary registration in Kazakhstan all external workforce has to pass HIV test. This factors and the Operator's requirement for the Base construction workforce to comply with the Workers Code of Conduct gives the basis to consider that there will be no measurable impact from communicative diseases transfer during operation.

	Construction		Operation	
Probability	5	The impact will occur under normal operating conditions		
Consequence	-1	Low negative direct and indirect, little actual but more perceived, temporary	+1	Moderate long-term benefits to individual livelihoods through skill transfer but small stress on housing prices
Significance	-5	Low	+5	Low

10.7 LOCAL WORKFORCE UTILISATION

The employment opportunities are very much related to the skills required for the project, the skills held by local people and training that can be introduced to ensure greater local involvement in the project operation. Considering relatively low skill of the local labor only about 10% of workers (6-10 people) are planned to be employed locally for the construction.

During the operation fluctuation in the cargo area work load will greatly affect demand for the local semi-skilled labour but the poor qualification and work attitude will remain to be the main obstacle for the increase in proportion of the local labor involvement. Because local residence of the Base staff during the operation is beneficial for the Operator in many aspects, there will be natural desire to select and train prospective workers from the local pool of labor. Therefore despite disturbing the fluctuation of demand, it is likely that proportion of local workers will increase with time far beyond the starting 10%. There is also a possibility that the skilled workers from Aktau or other areas of Kazakhstan will move to the area to take the more long-term positions at the Base. The impact from such immigration is covered in the next section. Here it is important because they are likely to facilitate on-the-job training for the local staff.

Decommissioning will require small number of unskilled and semi-skilled local workers or a local subcontractor but will lead to redundancy of the larger number of the operational staff. The redundant, mainly older and skilled operational staff, will not likely to be re-employed for decommissioning but their skills are likely to be in demand by the other operators at the Bay.

The operation phasing out will be planned and gradual so the staff will have sufficient time to find other jobs.

		Construction and decommissioning		Operation
Probability	5	The impact will occur under normal operating conditions	4	The impact is very likely to occur under normal operational conditions.
Consequence	-2	Limited negative direct and limited temporary positive	+2	Medium long-term benefits to individual livelihoods
Significance	-8	Medium	+8	Medium

10.8 LOCAL ECONOMY

An informal economy is prevalent throughout Kazakhstan. No documented information on the informal sector is available at the local level. 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.

Food for the construction camp canteen will be brought from Aktau but the local demand for the other various consumables is likely to increase. Considering the ease of the wholesale goods supply from Aktau, no significant increase in prices is expected. Any such increase will eventually encourage new small businesses to open, which will keep prices at check. On the other hand, economies of scale will increase the profit for the existing enterprises. Therefore, during the construction period the market will be moderately distorted and negative effects will cancel positive ones.

The impact of the appearance of around 200 new high earners in the area during the operation is likely to be partially counteracted by the traditional in Kazakhstan income distribution among the wider family. As it is likely that the bulk of the new workers will have local relatives and/or have lived in the area in the past, such distribution will benefit the less prosperous locals. However, the long-term and cumulative impact from the other industry development will invariably affect the buying power of those that cannot take advantage from the Bay development. Also, with time the importance of the family institution as the only source of social security may diminish and the high earners will see less need to spread their earnings thin.

This negative impact can be counteracted if the state social security structure improves over the years. At the moment it is very difficult to predict such development but it is possible to state that the effective social security system will not appear for some years at least.

Probability	5	The impact will occur under normal operating conditions
Consequence	+1	Medium long-term and cumulative impact on poor residents counteracted by improvement in social security system that substitutes family support system with time, overall (+)ve
Significance	+5	Low positive

10.9 LAND USE AND LIVELIHOOD

Historically the part of the beach taken by the Base was used by fishing industry for fish offload and processing and subsistence cattle herding. After the fishing industry fell apart, the shore

was only used by Atash fishermen. Cattle (goats and camels) herding continued but because of the poor vegetation cover the land could not support even few animals from Atash village.

A temporary recreational area was established at the Base site a year ago mainly to take advantage of the view and in part of the sea for swimming and amateur rod fishing. The old sunken barge that served as a pier in the fishing industry time, has rusted away and although gives access to deeper water for amateur fishing and swimmers, also exposes them to the high risk of injury. During the July 2005 fieldwork survey two cases of serious cuts were recorded (one being a child). At least one of these cuts was infected with e.coli bacteria and without adequate medical care turned out to be a significant threat to the health of the injured. The barge has no warning signs or access restriction devices.

Enquiries about this recreational area during the Public meeting, interviews and formal questioning showed that the public does not see this as an essential part of their livelihood. Presence of adequate quantity of good places to rest and the second public beach at Shagala hotel that also provides a better view of the cliffs also reduces the impact from removing the temporary recreational facilities from the Base site. It should be noted that the land has remained the property of Balykshi LLP, which kindly allowed for this temporary amenity to be established. The local authorities can move the facilities just south of the Base site onto the council land but knowing their plans to develop the shore industry, they are likely to drop the idea of a recreational area in the midst of the barges and cranes all together.

Atash village fishermen who use the area south of the Base site for boat anchoring will not be displaced by the Base construction or operation activities. Some restrictions on the distance to the base for anchoring are likely to be counteracted by the benefits of the ice and wave sheltering provided by the Base.

On the Base final decommissioning the land will be freed for use by the local population or other users. The site however is likely to retain its industrial character for some decades while the oil and gas offshore operations are active.

Probability	5	The impact will occur under normal operating conditions
Consequence	+1	Low negative from recreational area moving, low positive from removing of the health hazard object – the barge and releasing the land on decommissioning
Significance	+5	Low positive

10.10 LOCAL UTILITIES, INFRASTRUCTURE, TRANSPORT AND HOUSING

Utilities include the supply of electricity and water. Because the Base will have its own electrical line it will not add up to the existing load. A projected new line from Aktau to F. Shevchenko will create sufficient surplus for the future development of the area. Bauta Desalination Plant has adequate spare capacity in potable water production for the demand from the construction to be fully accommodated without any impact on the local supplies. Due to the relatively small demand and the existence of the alternative water source for locals, it is unlikely that the cost of water will increase.

During operation a notable improvement in utilities is expected. The Base Operator's Impact Mitigation Program is likely to involve including laying a gas pipeline from Aktau to Fort-Shevchenko and Bautino. Because there are plans for resettlement of Atash village, there will be need in direct investment into the Bautino – Atash gas pipeline spur.

Local public transport does not exist and transportation is performed by private drivers who are most of the time accessible in convenient places. Charges are not excessive. The construction workers will put hardly any load on this service as they will be transferred to and from the site by the Operator's busses.

Load on several private outlets of food and goods which are regularly replenished using highway will also be minimal because food will be provided to workers by the camp canteen. Medical care is also unlikely to be affected. There is a spare capacity in the waste disposal facilities for the projected scale of the Base operations but not for the other new operators.

Increased load on the local and regional hard surfaced roads will produce negative impact which will be impossible to separate from the impact from the other road users. However, for the 2km Atash village segment it is possible to predict that the Base Operator will be a major user and that impact on the road integrity will be of medium significance.

Housing will not be affected during construction because all workers will be accommodated by the construction camp. Immigrants for work are likely to move in after ensuring support from their relatives and thus the immediate impact will be negligible. The long-term impact of operation can be an increase in house prices, rent and the load on medical services and schools as the work immigrants settle down with their families. The significance of this load should be taken in relation to the size of Atash and Bautino population being 4076 people, which is more than 10 times higher than the incoming Base workers can generate [56]. It is unlikely that houses will be freely available for sale because most of the villagers lived in the area all their lives. On the other hand a two year old message from the local council about the plans to relocate Atash village makes purchasing of Atash houses a lot easier. When questioned, many Atash residents expressed desire to move closer to Fort Shevchenko.

		Construction		Operation
Probability	5	The impact will occur under normal operating conditions	4	The impact is very likely to occur under normal operational conditions.
Consequence	-1	Limited direct and indirect short-term	+2	Moderate beneficial improvement to human health and individual livelihoods. Modest improvements to community infrastructure and utilities
Significance	5	Low	+8	Medium

10.11 HEALTH OF LOCAL POPULATION

The negative impact to health will be from air pollution while any positive impact will be from higher availability of potable water. The size and the character of air pollution are described in the previous chapter. Impact on the Atash and Bautino population from pollution from construction will be minimal. This is mainly because the air pollution sources will be dispersed and dilution by wind is expected to be sufficient to dilute contaminants to unharmful concentrations in the villages. The impact of air pollution to the health of the local residence therefore is considered to be low.

[56] Considering that about 30-50% of the total 200 Base workers is local, and 5% expatriates, the remaining 90-130 incoming workers can increase the total village population by 200-400 inhabitants

During operation most machinery will be electrically driven. The only source of significant impact – the boiler chimney, will operate during winter months when Atash and Bautino population spends most of their time indoors. The long-term and cumulative impact from this source is not considered to be significant and thus the impact from operation on Atash and Bautino residents' air can be considered as Negligible.

Higher availability of potable water may result in reduction on its cost to the extent that it will be cheaper than the water from artesian wells that is considered by the local sanitary epidemiological office as unsuitable for drinking due to high salinity. Therefore reduction in consumption of the artesian water may improve health of the poorest part of the population.

However, air pollution, dust and risk to pedestrians (especially children) from vehicles passing along the 2km segment of the Base – Bautino road is likely to produce impact of high significance for at least 20 Atash households.

Atash village residents are sheltered from the noise that will emanate from the Base construction activities although naturally high and turbulent wind will make propagation of sound waves more uneven and unpredictable. It should be noted that the same high wind naturally produces quite high noise level. The noise and vibrations, associated with vehicles that bring limestone from the Atash quarry and construction material from Aktau will produce moderate impact with the highest intensity for the first 9 months when the rock will be brought for the wharf and the wavebreaker construction. To reduce the traffic load it was decided to carry out these activities one after another. This means that for the first 4 months 1 truck will pass in the Atash road each 5 minutes (96 trucks/day). For the next 5 months traffic will fall to 3 trucks each 20 min (72 trucks/day). After that only occasional trucks from Aktau will pass along the Atash road.

The noise produced by vehicles and loading equipment at the operation stage in the coastal line of the Base can provide some discomfort for people who are accustomed to the calm environment in the village. The main noise and vibration contribution will be provided by tank trucks, delivering the sewage water to the treatment plants. As a whole, two 10t tank trucks go by the houses of the village on working days. No vehicles will be present at night.

		Construction		Operation
Probability	5	The impact will occur under normal operating conditions		
Consequence	-2	Moderate direct 1 month on 20 households and minor but for 1 year from construction equipment	-2	Minor positive from Increase in availability of potable water but Moderate negative on 20 households from air pollution, dust and risk to pedestrians from vehicles , direct intermittent, until resettlement
Significance	-10	High from vehicles	-10	High from vehicles

It should be also noted that the impact from vehicle operation will summate with the impacts from the other road users and can increase with time as the area is being developed further.

10.12 EMERGENCIES IMPACT ON HEALTH AND WELLBEING

The residents of Atash would be sheltered from possible impact from fire or explosion at the Diesel Storage Area or at the other components of the fuel import/export system. Air emissions that reach the village will however be significant with toxic substances within the smoke plume still being above the harmful levels.

During fuel spills into the sea, the fish that filtered and ingested sufficient amounts of fuel contaminated water can become harmful to humans if consumed. Yet, the repulsive smell of this fish and the presence of other food sources will minimize the risk of consumption. It was shown in several studies that hydrocarbons do not accumulate in fish tissues if fish are given sufficient time to clean themselves. Because the predicted spills will occur relatively seldomly (see Section 9.4), with time the surviving fish can clean their organs and muscles by filtering clean water and reducing hydrocarbon concentration to non-toxic to human levels thus becoming again available for consumption.

		Fire/explosion		Fuel spills
Probability	1	The impact is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances.	2	The impact is unlikely to but may occur at some time under normal operating conditions.
Consequence	-3	Modest impact on human health and well-being	-2	Limited impact on human health and well-being
Significance	-3	Low	-4	Low

11 TRANSBOUNDARY IMPACT

11.1 BACKGROUND

Under the terms of the Espoo Convention on Environmental Impact Assessment in a Transboundary Context 1991, a transboundary impact is defined as: "any impact not exclusively of a global nature, within an area under the jurisdiction of a Party caused by a proposed activity the physical origin of which is situated wholly or in part within the area under the jurisdiction of another party". Potential transboundary impacts have been identified to comprise:

- atmospheric pollution through the emission of gases that have a Global Warming Potential (GWP) or contribute to changes in air quality;
- risk of introduced species carried by vessels journeying into the region, from organisms contained in either the ballast water or on the external structure (hull and propellers) of the ships, and;
- increased demand on transportation infrastructure through the movement of equipment and resources for the project.

The risk of accidental events from vessels journeying to the Base is not considered in this transboundary assessment.

11.2 ATMOSPHERIC POLLUTION

In the Sections 8.2.13.1, 8.3.12.1 and Appendix 1 it is seen that the Base operation will not produce emissions in concentrations and rates that can enable pollutants cross the Kazakhstan borders. Most pollutants will decompose and dilute to non toxic concentrations some hundreds meters away from the source during construction and less than a hundred meters during the operation phase. Their atmospheric lifetime is usually 1-2 days. Nitrogen oxides (NOx); sulphur dioxide (SO_2); can persist in atmosphere from 1.5 to 16 days and therefore reach the neighboring countries but in non detectable concentrations. Particulate matter less than 10 microns (PM10) from diesel engines can be carried long distances but as Sections 8.2.13.1, 8.3.12.1 show, its will not be generated in the volumes that can significantly increase exposure to human and animals.

MAEK power station in Aktau, operating using the Uzen field gas, located in 200km to the east from the city, generates electric power for local needs. MAEK has the sufficient reserve of production facilities and gas to generate the additional power volume to be consumed by the Base (especially by the desalination plant), but this will increase the air emissions in Aktau. At the moment it is difficult to determine the size of the emissions increased due to the Base commissioning and operation. Total air impact of MAEK due to the regional economics development is taken into account and controlled through the preparation of MAEK maximally permitted emissions report, emission permission issued by the local environmental protection department and monitoring of air pollutant concentrations in the air of the city. At the moment the concentrations of the pollutants monitored (sulphur dioxide, ammonia and carbon monoxide) do not exceed the maximally permitted concentrations in estimated values and in on-site indices due to the good air circulation of the area.

The identified pollutants can generate acid deposition (wet and dry) and the formation of acid rain but high content of acid neutralizing dust in the local air practically eliminates the risk of acid clouds formation and their impact on neighboring countries.

Kazakhstan has ratified the UN Framework Convention on the Climate Change (UNFCCC) and, therefore, assumed the obligation for the development, implementation and publication of national and regional programs, including the greenhouse gases impact mitigation measures.

Only carbon dioxide will be emitted from the Base out of the list of greenhouse gases[57]. Significant emission of ozone and NO_2 is not expected. Annual volume of greenhouse gases emission will not exceed $7x10^{-6}$ % of predicted total emission volume in Kazakhstan at the construction phase and $3x10^{-6}$ % - at the operation phase. Volume of CO_2, emitted during the power generation for the Base's needs, will be similar.

Ozone-destructive substances will not be emitted by the project activities.

Basing on the above it is possible to conclude that emissions associated with the development are unlikely to produce discernible impact on the air quality on the neighboring countries and notably add up to the risk to health of humans and animals.

11.2.1 Global Warming Potential (GWP)

Kazakhstan ratified United Nations Framework Convention on Climate Change (UNFCCC) and as such and has committed to develop, implement and publish national and regional programs that would include mitigation measures for such gases.

Out of the main greenhouse gases [58] the Base will emit only carbon dioxide. It is not anticipated that NO_2, would be emitted in any significant quantities. The annual GHG generated by the development has been estimated not to exceed $7x10^{-6}$ % of the forecasted GHG emissions for Kazakhstan for construction and $3x10^{-6}$ % for the entire proposed operation period. The volume of CO_2 produced as a result of electric power generation for the Base is likely to be in the same order of magnitude.

11.3 ACCIDENTAL SPILLS

It is not possible that the spills predicted in the Section could impact resources of other countries. Air emissions from a large fire at the fuel export/import and storage system can impact the air quality of the neighboring countries but because the very low estimated probability of such fire (less than ones for the projected existence of the Base); the impact significance is considered to be negligent.

The assessment of comparative risk of accidents has shown that spills of smaller volumes of product would be unlikely to impact the coastline of neighboring countries. Even for very rare larger spills the potential of the movement of fuel into foreign waters and the stranding of oil on

[58] Carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF6) and to a lesser extent volatile organic compounds (VOC)

foreign country shorelines is none. Acceptance of the 3 tiers Emergency Response System suggested in Section 12 will eliminate possibility of even perceived impact.

11.4 TRANSPORTATION OF EQUIPMENT AND RESOURCES

At this early stage of procurement it is impossible to identify the exact routes of transportation. It is however known that about 55% of the total project value is the imported prefabricated material. About 90% of it will come from the Western Europe by boats through the Volga-Baltic Sea Channel. The other part may arrive from Dubai or Baku depending on the tender results.

The increased probability of accidents from the increased activity of vessels in the channel will increase the risk of water contamination. The material brought in will not contain hazardous components, yet other vessels may have them.

The volumes of freight will not be significant enough to overstretch the existing capacity of the Volga-Baltic Channel fleet

Tab. 11.1The vessels that will bring prefabricated material through Volga-Baltic Channel

Period	Tonnes	Commodity	Vessel types
Jan 06	1000	Steel Plate	1 heavy lift ship
Feb 06	1000	Mechanical packages	1 heavy lift ship
March 06	1000	Mechanical packages	1 heavy lift ship
April 06	1000	Mechanical packages	1 heavy lift ship

11.5 INTRODUCED SPECIES

Introduction of *Mneopsis lady* into the Caspian Sea in 2000 is one of the most important issues for the marine environmentalists. *Mneopsis lady* competes with fish (especially Caspian sprat) for zoo-plankton impacting by this on the fish population.

Marine transportation of the Base construction components from Iran and Europe through Volga-Baltic channel during the construction phase can potentially result in the introduction of exotic species in ballast or bilge waters, engine cooling system water, hull and anchor contamination. However, only few ships are expected to be needed to bring the Base components. During the operation phase only the Caspian sea fleet will be serviced by the Base.

In any case, in order to prevent the introduction of exotic species, the Base Operator will oblige all vessels contracted under the project to comply with relevant voluntary standards such as those issued by the International Maritime Organisation (IMO). Additionally, all ships would be required to comply with MARPOL in terms of ship waste management. The potential therefore, for introduction of exotic marine species to the Caspian or the transfer of species out of the Caspian is considered to be minor.

11.6 SOCIO-ECONOMIC TRANSBOUNDARY EFFECTS

Introduction of the Base services may not only help their main consumers – offshore oil and gas operators, but also may facilitate increase in trade and transportation between the Caspian countries generating additional wealth. The effect of the Base on this however is practically impossible to evaluate at this time.

On the other hand the Base will increase competition for the existing service providing bases in the Caspian. Although it is unlikely that the Base activity alone will pose any concern, cumulative effect of the Bautino and Kuryk marine facilities development can be notable outside of Kazakhstan.

The Base will not upset the political relations between the Caspian states. Moreover, it is unlikely that the named above cumulative development of the marine facilities in Kazakhstan will detrimentally impact on these relations.

11.6.1 Resourcing of supplies and employment

The positive impact of increase in employment in the other countries will be negligible because of the small total number of the workforce most of which will be sources from within Kazakhstan.

However, buying prefabricated material mainly from the western Europe countries and in part from Azerbaijan or Iran will generate additional income and perhaps short term work places in these countries

11.6.2 Health

Communicable diseases may be carried from the local community by nationals from other countries and expatriate workers to other countries when they return home. The establishment of the Workers Code of Behaviour, recreational facilities at site and housing workers in ‘open’ but regulated self-contained housing will reduce contact with local population to a minimum therefore reducing the risk of disease transmittal. To receive temporary registration in Kazakhstan the external workforce will have to pass HIV test. This will mainly protect the local population but also will reduce risk for HIV being spread from the local population into other countries.

11.7 CONCLUSSION

Because the assessment found no significant impacts on the other parties outside Kazakhstan, there is no need to notify any other Governments about the proposed activities.

12 MITIGATION MEASURES AND MONITORING

12.1 INTRODUCTION

This Chapter considers all impacts that were identified as being of high significance and, presents to The Base Operator the need for implementing additional mitigation measures and monitoring programmes to address identified significant impacts that are summarised in Tables 9.1 and 10.1. It should be emphasised that the mitigation measures that form part of the project's base case design were considered during the impact assessment process.

Additional mitigation measures as presented in this Chapter will form the basis of the Mitigation and Monitoring Plan to be developed for the project. Environmental management procedures will be incorporated into the Environmental Management System (EMS) that should also be developed for the project.

This Chapter is presented into three main sections as follows:

1. **Mitigation measures:** a discussion of the activities that were found to result in significant environmental impact, the base case mitigation measures and the additional mitigation measures to be adopted to reduce impact significance with indication of residual impact.
2. **Environmental Management:** an overview of the project's EMS structure.
3. **Monitoring Plan:** a discussion of the monitoring activities that will be adopted to ensure that the additional mitigation measures are being implemented and that further mitigation is being incorporated into designs, operations and procedures as well as to measure actual environmental impact of the project against the predictions made within this EIA report.

12.2 ENVIRONMENTAL IMPACTS MITIGATION MEASURES

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.

12.2.1 Construction

The main part of environmental impact to be produced at the construction phase will be of low significance. Impact 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.

12.2.1.1 Dredging

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 Harbor 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.

12.2.1.2 Vehicle operation

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 knocked off 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”.

12.2.1.3 Limestone extraction

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.

12.2.2 Operation

12.2.2.1 Maintenance dredging

It is expected that maintenance dredging will not be required or needed only at 10 year intervals. The uncertainty in the need will be reduced by the results of sedimentation/erosion monitoring. If it appears to be required, dredging must be performed during winter. For this the Base Operator should make provisions for relocation of the vessels set up for wintering or dredging the areas along the jetty and the wharf first, before the vessels come for wintering. In fact, dredging in small portions, although more expensive and logistically difficult, will allow faster colonization by benthic animals.

The volume of dredged ground and the degree of its contamination must be estimated prior to dredging by using the monitoring results. It is likely that this ground will contain less contaminants than the samples taken from 0-5cm depth. If the mixed bulk sample contains excessive contaminants (i.e. above MPCs for soil), it should be treated or stored in an impermeable landfill for future treatment or natural degradation. If the ground is clean, an arrangement can be made with Atash quarry owners and with the authorities to backfill the quarry with the dredged ground. Dredging can also be synchronized with the Base expansion to the south to use the ground for further sea reclamation or raising the beach level. Transporting the clean dredged ground into the open sea and dropping it there is also a viable option providing the permission for disposal can be obtained and the sea bottom with low environmental sensitivity can be found.

The Base Operator must ensure that the dredging contractor develops a dredging program that accounts for environmental monitoring results and includes turbidity monitoring. Here too, the suspended solids should be kept below 200 mg/L. and use the silt curtains if recorded turbidity exceeds this value.

By following these recommendations, the impact from maintenance dredging can be reduced to the low level of significance.

12.2.2.2 Seawater desalination

To prevent killing plankton, the abstraction pipe must be fitted with a plankton screen in a way to ensure easy inspection and maintenance. The brine effluent pipe under the jetty passage can end at any distance from the wharf but it is better to take it to the point where the jetty bends to the north some 200m away from the wharf. The results of the sea bottom and water salinity and benthos composition monitoring next to the pipe will give an idea of the actual impact and thus of the need for further impact mitigation actions. Thus impact on plankton and benthos can be controlled and reduced to low significance.

12.2.2.3 Waste management

To minimize risk of hazardous waste dumping by the waste transporting subcontractor, The Base Operator should ask for the waste handling documentation to be maintained and inspect it periodically.

The Base Operator should also audit the hazardous waste disposal sites. Such audits should be performed once a year and include inspection of security, methods of disposal/storage, documentation, leachate and spill management procedures and equipment, the environmental monitoring results etc. Based on the audit results the Base Operator should negotiate with the Waste Site Operator an improvement program. This program should consist of inexpensive but effective constructive and (if possible) organizational fixes at least for the waste that comes from the Base. However difficult to arrange, it will be considerably more effective to pursue the improvement in alliance with the other site users. Such alliance may have sufficient negotiating power to generate commitment to improvement of hazardous waste management at the Regional Council level without which no change can effectively take place.

The introduction of international practices into the Tenis Service LLP landfill and the hazardous waste management facility should be considered in alliance with the other Bay operators that have to meet the international waste management requirements. Having KazTransGas as the owner and the main client, Tenis Service LLP is unlikely to respond to such demands just from the Base Operator alone. The Base Operator has not allied with the other operators yet but such alliance is very likely in the future. The pressure to comply with the international requirements will also come from appearance of alternative disposal sites and spare disposal capacity in the area.

Because the Base Operator has provided a more than sufficient buffer capacity for wastewater storage for the designed Base wastewater throughput, there is no need to make separate contingency for the irregular truck tanks supply by the waste operator. The local weather conditions will also rarely restrict the waste haulage. However, if the Base wastewater throughput increases significantly, provisions should be made for either further increasing the buffer storage or arranging an alternative transport supplier for occasions when the main contractor fails to supply the required number of trucks. If such failures become frequent, the alternative solutions should be thought to ensure that the flow of waste does not overstretch the sewage treatment work daily capacity and the Base storage capacity.

Increasing the size of the tank trucks is not considered as a feasible way of reducing the traffic volume as there are no tanks larger than 10m^3 available locally. Purchase of such trucks is not economic as it requires sufficient investment and reduces flexibility to change the transportation mode to a pipeline if the Base expands in the future and builds it own sewage treatment facility. Besides, larger tank trucks would create more noise and vibration thus reducing the effectiveness of such a measure.

12.2.2.4 Accidental events

The potential for fuel spills resulting from accidental events has been considered in 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 either of the 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 as well as in situ burning.

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 an fuel spill incident and to initiate all necessary actions to stop or minimise any potential adverse effects of air 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.

12.2.3 Decommissioning

At this early stage decommissioning is predicted to create only low significance positive impact on the employment and land availability and therefore no additional mitigation measures are required here. However, with time, significance of some impacts may increase sufficiently to become a problem. For these reasons more than adequate attention to decommissioning procedures is given below. It also should be noted that because the Base Operator can pass the responsibility for all residual contamination and final decommissioning to a new user or the landowner, the below measures concern the End User rather than the Base Operator.

12.2.3.1 Baseline conditions re-characterisation

It is expected that over the life of the project, there will be some degree of change to the receiving environment within the project area. It is considered therefore; that the environmental baseline would need to be re-characterized on the basis of the continued monitoring (that would be undertaken during the Base operation) changes in legislation and abandonment techniques.

The decommissioning strategy should be developed based on the findings of the Comparative Assessment and should be documented in the draft Abandonment Plan. Potential environmental (and socio-economic) impacts associated with the decommissioning strategy would be dependent on the strategy and the environmental character of the area at the time. These should be assessed via consultation with relevant authorities and stakeholders. Comparative Assessment should consider the options for field abandonment in terms of:

- cost;
- technical feasibility;
- safety;
- environment; and
- external influences.

These five factors should be assessed ranked for each decommissioning option and a most appropriate approach determined and agreed with the stakeholders prior to decommissioning.

The Abandonment Plan should ensure that a recycle and re-use philosophy is followed for all of the decommissioned components to minimize the generation of wastes and maximize the resale value of the installations and equipment. The level of recycling of the Base facilities that could be achieved would, in part, be dependant on suitable recycling facilities being available locally or nationally.

12.2.3.2 Hazardous components decommissioning

Only those Base components would require decommissioning that can become an object of health or environmental hazard with time especially if the public access is regained. The export/import system is likely to be the only component that can qualify as a hazardous object.

To decommission the system residual fuel should be washed off with water and surfactants and collected into the Fuel Storage Area oiled water holding tank from which it should be taken to the oiled water handling facilities. Only after that the export/import system can be disassembled. Absorbent should be available to the disassembling team to handle small spills from valves and filters.

12.3 ENVIRONMENTAL MANAGEMENT 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 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:

1. List of significant environmental impacts identified during ESIA stage;
2. Legal and other requirements for operation set in ESIA text;
3. Environmental improvement objectives and targets;
4. Environmental management program and continuous improvement plan;
5. Defining organisation and responsibilities;
6. Operational control;
7. Monitoring changes in environmental conditions;
8. Control of contractors and suppliers through proper records keeping and regular auditing;
9. Managing non-conformances, taking corrective and preventative actions;
10. Emergency preparedness and response;
11. Training, awareness and competence; and
12. 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.

12.3.1 Contractor environmental management

The environmental performance of all project contractors will clearly be fundamental in the successful environmental management of the project. The implementation of site-specific environmental procedures will be the responsibility of the principal contractors involved including:

- The Base construction contractors;
- The equipment shipping contractor; and
- The waste management contractor.

The Base Operator should examine the construction contractor management procedures to ensure compliance by the contractors with all stipulated mitigation measures. A bridging document should be prepared by the contractor to link his procedures with the Base Operator standards. The bridging document will consist of information on the following:

- Commitment and accountability;
- Human resource management;
- Communications;
- Incident reporting and documentation;
- Emergency preparedness and response;
- Records keeping and
- Change management.

A series of the construction contractor audits should be conducted by The Base Operator to ensure that the commitments to environmental mitigation and management are being implemented.

Environmental awareness and management training programmes should be developed and these should include sessions to ensure an understanding of the main sensitivities present in the project activity areas as well as their role in minimising environmental impacts. The training programmes will be a key component to the successful implementation of procedures adopted to mitigate and monitor environmental impacts. All construction personnel should receive such training and training records should be kept. Personnel selected for specific responsibilities associated with environmental management procedures should receive more detailed training in these areas. These should include at least:

- Waste management;
- Chemical and fuel handling and transfer procedures;
- Leak prevention, handling and response training;
- Site specific environmental sensitivities from this ESIA text
- Environmental audit; and
- Environmental monitoring.

12.3.2 Waste management

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.

A waste stream inventory (Tab. 8.4) 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 volumes too small to deserve creation of designated facilities. To comply with the EU waste management strategy the following hierarchy should be adopted:

1. reduction;
2. re-use;
3. recover;
4. recycle; and
5. 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 correct 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 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 and broken glass, glass bottles, paper and cardboard 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 wells of the main area and the fuel storage area. Segregated and precleaned waste should be transferred separately to the place stated in Tab. 8.3. 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 the waste storage, transfer and handling protocols and the 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 labeling 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).

12.3.2.1 Waste Management Strategy

The Base Operator should develop a Waste Management Strategy and guidelines to address 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 regulatory authority.

12.4 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 amount 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.

12.4.1 Pre-Operational Monitoring

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. Sampling for marine plants and animals and sea sediments should be performed using the methods stated in the next section.

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.

12.4.2 Operational Monitoring

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), SO_2, NO_x, CO, soot and suspended solids that should be analysed for Ca, Mg, Na, Cl_2, SO_4, 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 in a day, then the frequency of collection can be reduced to the acceptable level depending on the dust amount and weather conditions. Moisture, temperature and 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 at BS12 (Fig. 8.1) and the station outside the enclosed area upwind from the Base (BS1-8). 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 at BS1-13 for phyto and zooplankton, benthos and plants using standard sampling methods. Biomass and number 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 at BS1-13 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 BOD_5, pH and temperature, electric conductivity and total salinity. For the following years only key contaminants should be analysed every quarter. They 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 comprises of 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 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 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. 12.1 Environmental monitoring program summary (see Fig. 8.1 for stations position)

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.

12.5 SOCIO-ECONOMIC MITIGATION, MONITORING AND MANAGEMENT

Negative Impact of vehicle operation in the streets of Atash village was valued to have high significance for Atash residents. Medium positive effect from the Base operation will be on the local population from increased employment, skills, infrastructure and utilities improvement and local socio-economic problems reduction. Other activities will result in only negligible and low negative or positive impacts (Tab 10.1). Low negative impacts will be mainly on the local population, its health and infrastructure. Although it is expected that the socio-economic situation will be moderately improved by the proposed development, positive aspects of this development will not necessary apply to those that are disadvantaged by the negative impacts. For this reason the negative impacts are reviewed here separately from the positive impacts. Because of the unavoidable uncertainty in impact determination and the low number of identified impacts of high significance, the low significance negative impacts are also considered in this section. This is also done for the reason that the significance of these impacts may change with time.

Mitigation, monitoring and management measures were determined through drafting of an initial list, its discussion at a workshop held with ESIA team and consideration of written comments received from those who were unable to attend the workshop. This section summarizes the results of this work.

12.5.1 Vehicle operation impact mitigation

Only one high significance impact of the vehicles movement along the 10.2km Base – Atash quarry / the municipal waste disposal facilities road is identified. It is expressed in increase in noise, vibration, air pollution (including dust) and the risk to pedestrians especially children. Twenty households will be affected by this. To reduce the impact of vehicles on the residents of houses next to the road there are several options:

- Reduction in vehicle size
- Foundation reinforcement
- Road upgrading
- Double or triple glazing installation
- Protective screen installation
- Resettlement further away from the road
- Speed control

The problem with mitigation of the named impacts lies in two main factors. First, Atash village is viewed as a place set for resettlement and any investment in it can be considered as a waste of money. Second, there is a high possibility that other operators north of the Base will increase the usage of this road with time, and that cooperation for the joint impacts reduction will be highly improbable.

Reduction in vehicle size is not considered to be effective as this will lead to sizeable increase in number of trucks. Besides the local vehicles providers have trucks of only standard loading capacity.

Reinforcement of the houses foundation will reduce vibration but this is a very expensive measure and usually done to the houses that have high historical value in order to preserve them from deterioration or for the expensive housing estates to preserve their economic value. In the case with Atash where houses are planned to be demolished after resettling people towards Fort Shevchenko such measures will be inappropriate.

The road can be upgraded to reduce vibration and noise but this will require large and expensive construction activity with the existing ground removal and disruption to traffic. The only alternative bypass would be through the Base construction site which is not acceptable for various reasons including safety and security. In the end, the impact from the road construction on the nearby residents can be larger than from the construction phase vehicles. The benefit of reduction of noise and vibration from the smaller and fewer vehicles of the operation phase will not justify the investment.

Installation of double or triple glazing can be considered as a viable option but this will reduce only noise leaving other impacts on the same level. Planting of hedge screens will reduce not only noise but also dust and air pollution but it also will reduce visibility on turns and thus increase the risk for pedestrians.

Resettlement of the houses next to the road will eliminate all the aspects of this impact but will require the investment that may put the economic feasibility of the development of the Base itself at question[59].

Speed reduction in the village will effectively reduce all the named impacts with minor cost of the vehicles daily runs reduction and control procedures implementation. Being probably the most effective measure out of the named above, it has one flaw: difficulty in implementation of control. Perhaps obtaining feedback from the impacted residents can indicate the adequacy of this measure but this should be done with caution as residents may modulate their replies to gain perceived potential benefits from negative answers.

Considering the above arguments it can be concluded that the speed control should be accepted as a starting impact mitigation measure. Maintaining consultation with the 20 affected households coupled with the noise and traffic survey suggested in the monitoring section of this report can determine sufficiency of this measure. Other options can be revisited at a later stage if this measure is proved to be ineffective. It also may be useful to find out the opinion of the impacted residents on the named options.

12.5.2 Mitigation of impacts from other activities

The impact assessment showed that all other negative impacts are produced at the local level. The following measures can be applied in order to mitigate the named impacts:

- Code of conduct formulation;
- Social impact considerations in invitations to tender;
- Construction camp management plan;

[59] Construction of 20 in-exchange houses next to Fort Shevchenko may cost around $600 000

- Information for workers and subcontractors on cultural awareness on induction training;
- Communicable diseases awareness and prevention plan
- Encouraging involvement of the workforce in the community relations programme and community initiatives where possible;
- Developing effective and open complaints procedure;
- Commitments to local and national content of workforce.

Some of these points are discussed in more detail below.

12.5.2.1 Code of Conduct Formulation

The Base Operator should formulate a Code of Conduct to apply to all The Base Operator and contractor personnel working in offices and associated facilities managed by the Base Construction Project Management Team. The Code of Conduct covers issues such as:

- appropriate behavior and dress
- drug and alcohol use
- compliance with relevant laws and policies

The Code of Conduct contains specific points relevant to workers drawn from outside Kazakhstan. Each employee should be required to sign the Code of Conduct and will be bound by it whilst in the employment of The Base Operator or their contractors. Failure to comply with the Code of Conduct will result in disciplinary action.

12.5.2.2 Social Impact Considerations in Invitations to Tender

Social Impact Considerations should be attached to the Invitations to Tender (ITTs) for the Base construction. These considerations specifically cover contractor plans for dealing with:

- management of construction workers
- impact on local employment
- impact on local infrastructure

Successful contractors should be expected to present a Social Impact Management Plan (SIMP), consistent with the mitigation measures already agreed by the Project Management Team, to the Project Management Team for approval. Contractors should be monitored on adherence to these plans.

12.5.2.3 Construction camp management plan

The construction camp will be “open”, and workers will be entitled to leave the camp at any hours. However this should be subject to a code of conduct to minimize the risk of disputes and incidents between workers and local communities. Workers should be required to overnight at the camp. Dedicated recreation and medical first aid should be provided.

The construction camp management plan should include measures to address the four key issues identified by the project to date in relation to construction camps, namely discipline, community liaison, ethnic tensions and market distortion.

12.5.2.4 Communicable diseases awareness and prevention plan

Management of the risks of contracting a communicable disease should be the responsibility of the contractor, with support from the Base Operator occupational health department. All workers should be subject to medical assessment prior to mobilization. All third country nationals (TCNs) should be advised of immunization requirements prior to mobilization to Kazakhstan. Contractors should be obliged to audit compliance with the recommendations and take action where necessary to mitigate the risk of personnel contracting such diseases. The Base Operator should develop a detailed project strategy on this issue.

HIV/AIDS, and other sexually transmitted disease (STD) awareness information, including means of preventing contraction of such diseases, should be included in induction training. In addition, workers should be informed that prostitution is illegal in Kazakhstan and information on the health risks of prostitution should be provided. Community liaison personnel on the project should also provide information on sexually transmitted diseases and the risks of prostitution to the local community. The Base Operator should develop this material, for use by the construction contractor. The Base Operator should develop this strategy through collaboration with other organizations working on this issue in Kazakhstan.

12.5.2.5 Community infrastructure and utilities

Measures to mitigate potential negative effects on community infrastructure and utilities during Base construction should include:

- A public consultation and information campaign;
- Limiting disturbances to utility supplies and services when least likely to impact local users;
- Discussions with service providers to ensure that increase in loadings is not detrimental.

12.6 COMMUNITY RELATIONS

This section sets out the proposed mechanisms for liaison with communities affected by the Project. These mechanisms should be outlined in detail in a Community Relations Programme (CRP) developed prior to work commencing. All stakeholders are expected to be interested in involvement in the project decision-making process and to have access to all relevant information.

12.6.1 Community Relations Programme (CRP) – Base construction

The objectives of the CRP can be to:

- provide communities affected by the project with regular information on the progress of work and related implications;
- provide information on recruitment issues and the recruitment process;
- maintain awareness of safety issues among communities;
- inform The Base Operator of any community related issues that may impact on project works;

- identify any significant new issues that may arise during project works;
- develop a community dispute procedure and manage any disputes between The Base Operator, the contractors and communities;
- maintain constructive relationships between the community and the construction team;
- monitor implementation of mitigation measures and the impact of construction and operation via direct monitoring and feedback from communities; and
- monitor community attitudes to the development and to The Base Operator
- ensure gender sensitive and culturally appropriate processes are utilized in communication and implementation activities.

The responsibility for the CRP should be divided between The Base Operator, the Base Construction Project Management Team, and the contractors.

12.6.1.1 Community relations manager

The HSE Base Construction Manager, in the capacity of Community Relations Manager, should have overall responsibility for liaison with the community during construction.

12.6.1.2 Community liaison officer

A dedicated Community Liaison Officer should be assigned to the project and expected to spend a large period of time with the local community and the team. The CLO's responsibilities will include:

- continue public consultation with local communities affected by ACG, using appropriate communication processes including consideration of gender and cultural issues;
- provide input for ongoing update of the Public Consultation and Disclosure Plan (PCDP);
- provide the local communities with project information and related issues;
- monitor compliance of the contractor's recruitment programme;
- attend public meetings to discuss project related issues;
- survey potential local sub-contractors and suppliers;
- identify any significant new issues that may arise during the construction period;
- work with The Base Operator, local communities and the contractors to resolve any disputes between the parties;
- maintain records of all consultations, and collation and preparation of internal and external reports.

12.6.2 Support of local industrial base and procurement

The project should offer business opportunities for companies at the national, regional and possibly local level. Increased supply from these sources should deliver cost benefits to the project and sub-contractors, if safety, technical and commercial requirements are satisfied. These sourcing opportunities should help maximize positive benefits to the national industrial

base. Measures that should be applied in order to mitigate negative and maximise positive impacts on the national industrial base and national procurement include:

- National/regional/local sourcing of supplies where procurement criteria are met;
- Review of procurement strategy on a regular basis;
- Support for capacity building (e.g. Skills development, knowledge transfer) in regional and local sourcing by providing contracting skills and support for national firms; and
- Effective communication of requirements to sub-contractors.

12.6.3 Employment procedures

Public consultation highlighted the local residents desire to be kept informed of employment opportunities. The Base Operator should therefore ensure that information on employment (e.g. projected number and duration of employment) is communicated at regional and local levels. This should help manage expectations. Employment information provided should include recruitment principles, the likely scale of employment and the level of demand that is anticipated.

The Base Operator should provide an opportunity for the employment of local and other Kazakhstani nationals. Tender specifications should include a pro-active element towards favoring employing from local/national sources and investing in the development of this workforce through skills transfer programmes.

12.6.3.1 Integration of employment issues into contractor selection

Contractors should be required to be consistent with The Base Operator's expectations in relation to employees, relationships and ethics. Decision on the balance between local and imported labor should be not based on set figures but on trainability and physical capabilities of recruits in regard to job competence and HSE&S training". The employment strategy shall also identify any schedule, cost and HSE&S implications of employing local labour, and describe how these should be managed.

12.6.3.2 Integration of training proposals into contractor selection

The objective of the training should be to deliver the maximum possible increase in the number of local employees involved in the project. This should be achieved by identifying activities for which Kazakhstani nationals can be trained within the budget and time available.

Tenderers should be asked to develop a training strategy for potential employees in Kazakhstan. The preferred contractor should work with The Base Operator to finalize and implement this training programme for potential employees. Contractors should be required to include within the training programme training to raise the skill levels of local employees to international standards, and long-term skills enhancement.

12.6.3.3 Strategy on employment

The Base Operator should agree on a level for the proportion of local employment to be used on the project with the contractor and this level of local input should be written into the contractor's contract. The levels of local input should be sub-divided into professional, skilled, semi and un-skilled categories. The Base Operator should require the contractor to monitor the

extent of national employment for a range of different skills levels against the level agreed. Only if suitable personnel are not available from the Tyub-Karagan Bay area, then the particular skilled or unskilled position should go to potential candidates from the region and elsewhere. The Base Operator should consider ways to provide incentives to the construction contractor to meet the level of local employment.

12.6.3.4 Recruitment principles and recruitment plan

The principles should assist in managing the expectations of applicants and reducing the potential for disputes and hostility to the project among unsuccessful applicants. The main principles are outlined below:

- preferential employment of local labour;
- general recruitment procedures should be transparent, public, open to all and publicized in advance including distribution of information to communities affected by the project;
- ensure that recruitment occurs only through authorized hiring processes;
- personnel should be required to meet skills levels defined for each position;
- there should be no discrimination on basis of ethnicity, gender, sexuality or other factors;
- use existing mechanisms for employment.

12.6.4 Communication with local communities and disclosure of information

The consultation process undertaken during the ESIA is presented in the Public Consultation and Disclosure Plan (Appendix 3).

Tab. 12.2 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

13 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 negative 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.

14 REFERENCES

Temporary methods of damage estimation for the air, soil and water contamination by oil, associated water and disposal of non-licensed oil storage facilities, 1996

Temporary methods «Determination of the damage provided to the environment due to the violation of environmental legislation» (approved by the Ministry of Ecology and Bio-resources, Republic of Kazakhstan, June 21, 1995).

Water Code, Rebublic of Kazakhstan, July 9, 2003, № 481-II ZRK modified on January 31, 2006, № 125-III ЗРК

Law on the Environmental State Expertise (March 18, 1997 № 85-1) modified by the laws of Republic of Kazakhstan from 24.12.98 №334-1; 11.05.99 №38-1; 02.07.03 №454-11; 20.12.04 №13-III

Law of Republic of Kazakhstan, from December 4, 2002 «On sanitary and epidemiological prosperity of the population» modified on 31.01.06 №125-III ZRK

Law of Republic of Kazakhstan from 09.07.2004, №593-II «On the protection, reproduction and use of wildlife» modified on 31.01.06 №125-III ZRK

Law of Republic of Kazakhstan from July 15, 1997 №160-1 «On environmental protection» (modified and amended on 31.01.2006. №125-III-ZRK

Law on the Environmental Licensing, N 2200, 1995 and amendments № 371-II ZRK, 2003

Law «On the ratification of the Framework Convention of Caspian Sea marine environment protection»

Law of Republic of Kazakhstan №162-1 from July 15, 1997 “On the special protected areas” (modified according to the laws of Republic of Kazakhstan from 11.05.99, № 381-1; 23.01.01, № 151-II; 31.01.06 №125 – III ZRK)

Instruction on the EIA implementation for the planned industrial and other activity during preparation of the Pre-FS, FS, detailed technical project and construction project, # 68-P, 2004

«Maximal concentration of toxic components in industrial waste of the various toxicity degrees» Ministry of Health Protection, 1985

Methodology on the payment calculation for the air pollution by the mobile sources. RND 211.1.03-01 (1996)

“Methodology on the payment calculation for environmental contamination and Methodology of payment calculation for the air pollution by the mobile sources", May 15, 1996.

Procedure on the state hydro-meteorological monitoring, No.959, 1993

Procedure on the state control of the water resources use and protection, № 600, 1995

Regulations on the environmental audit implementation (Decree of the Government of Republic of Kazakhstan from August 23, 2004 № 889 «On some issues of licensing and environmental audit»).

Regulations «On the calculation of payments for surface water resources use» from December 12, 2005 № 554

SanPiN «Sanitary and epidemiological requirements on the surface water protection», approved by the Minister of Health Protection, Republic of Kazakhstan, 28.07.2004. №506

Combined Decree of the Ministries of Health Protection and Environmental Protection, Republic of Kazakhstan «On the approval of Maximally Permitted Concentrations for contaminants, harmful microorganisms and other soil-contaminating biological substances» from 30.01.2004. №99

«Reference book of dosimetry and radiology », A.A. Moiseev, V.I. Ivanov.

Decree of the Minitry Council from April 5, 1995, №414 «On the approval of the Regulations on the fish protection and fishery control in the water bodies of Republic of Kazakhstan»

Decree of the Government, Republic of Kazakhstan, from August 19, 1994, №931 «On the procedure of water routes classification by the navigation categories»

Decree of the Government, Republic of Kazakhstan, from July 31, 1999, №1087 «On the approval of Special environmental requirements in environmental zone of the Northern part of Caspian Sea»

Decree of the Government, Republic of Kazakhstan, from May 6, 2000, №676 «On the approval of National Soil Spill Prevention and Response Plan (valid till January 1, 2005)

Decree of the Government, Republic of Kazakhstan, from November 21, 2003, №1167 «On the approval of Environmental Safety Concept, Republic of Kazakhstan, for 2004-2015»

Decree of the Government, Republic of Kazakhstan, from January 8, 2004, №19 «On the approval of the list of environmentally hazardous economic activities and regulations on the obligatory licensing of hazardous activities»

Decree of the President of Republic of Kazakhstan «On the Land» from January 27, 1996

Instruction on the procedure on the consideration of conflicts between the project developers and expertise of the Ministry of Environmental Protection, 1993

B.I. Badamshin “Population and commercial reserves of Caspian Seal” //Marine mammals. M., 1969.

V.M. Borovskiy, E.U. Dzhamalbekov, A.H. Faizulina., A.M. Moldabekov, A.G. Usachev, T.P. Turkova. Soils of Mangyshlak peninsula. Almaty.1974. 223 p.

V.N. Bostanzhoglo “Ornitological fauna of Aral-Caspian steppes” // Data to study fauna and flora in Russian Empire. Zoology Department. M., 1911, edition 11. 410 p.

B.A. Bykov “Dominating plants of the Soviet Union flora”, Volume 2, Almaty, 1962, 436p.

A.P. Gistsov “Bird bio-diversity in reserved zone of the northern part of Caspian Sea” //Natural reserved stock of Kazakhstan. Almaty, 1997. p. 33-36.

A.P. Gistsov, N.N. Beresovikov “Modern status of wildlife in delta of Ural River” // Wildlife of Southern Ural and Northern Pre- Caspian. Orenburg, 1995. p. 7-9.

.P. Gistsov “Flamingo in North-Eastern Pre- Caspian” //Selevinia, 3, 1994. p. 89-92.

Illustrated book of Kazakhstan plants. Volume 1, Alma-Ata, 1969, 644p.

G.S. Karelin “Trip of G.S. Karelina through Caspian Sea” // Notes of Russian State Community on General Geography. SPb, 1883, v. 6. 479 p

Genetick stock of Kazakh SSR fauna. Alma-Ata, 1989. p. 215.

“Forage plants of USSR pastures and meadows” Volume 1, Moscow - Leningrad, 1950, 688p.

Red Book of Kazakhstan. Wildlife. Almaty-Istanbul, 1996. 327 p.

Red Book of RSFSR. M., 1983. 356 p.

V.I. Krylov “Ecology of Caspian seals“, 1990, 47. p.32-36.

Mammals of Kazakhstan. Alma-Ata, 1969-1983.

VV. Neruchev, N.F. Valisyev “Reptile fauna in North-eastern Pre- Caspian” // Zoology bulletin, 1978, 6. p. 36-41.

VV. Neruchev and others “Reptile in deserts of Northern Pre- Caspian” // Wildlife of Southern Ural and Northern Pre- Caspian. Orenburg, 1995. p. 94-96.

K.T. Paraskiv “Reptiles of Kazakhstan”. Alma-Ata, 1956. 229 p .

Natural conditions and resources of USSR. Kazakhstan. Moscow.1969. 482 p.

Birds of Kazakhstan. Alma-Ata, 1960-1974 (in 5 volumes);

K.Sh. Faizov “Soils of Kazakh SSR”. Ed. 13. Guryev region. Alma-Ata. 1970. 351 p.

“Flora of USSR”, Volume 1, Leningrad, 1934, 302p.

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Appendices

1 Air emission and dispersion calculation

2 Calculation of payments for environmental contamination

3 Documentation of social and economic study and public consultation